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Following the "general theory of macro-finance", IMI aims to become a world-class think tank, focusing on the studies of international finance, in particular the international monetary system and RMB internationalization. Despite its relatively short history so far, IMI has established itself as a leading research institution and important forum, where industry leaders, policy makers and academic experts from home and abroad share their insights and expertise.

CONTENTS

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Featured Articles

Building a Modern Economic System*

By WU XIAOQIU*

Crucial steps are needed to capitalize on China's success and transform the nation for a greener and brighter future

China and the United States have relatively similar levels of trade, but the scale of the Asian nation's economy is less than two-thirds that of the US. If China is able to construct a modern economic system and a financial system to go with it, it will have huge room for development. In other words, if China wants to realize the sustainable development of its economy, it has to transform its economic system.

To understand the type of economic system that China should construct, I think there are several important elements that we should not miss considering.

First, a modern manufacturing industry, a modern equipment industry and emerging advanced technology industries have to play a key role in the modern economic system. I think the modern manufacturing and modern equipment industries, which are very high-tech, will account for an increasing ratio in China's manufacturing sector. Moreover, service industries will also be really well-developed. This kind of industrial structure will be more competitive, with the traditional industries and industries that are over-reliant on resources reducing their ratios. So industry's technology level will be higher and the economic structure will be more balanced.

Second, the modern economic system has to be green and be able to showcase an ecological civilization. Over the past 40 years, China's economy has witnessed quick growth, but an obvious feature has been its overuse of resources. Natural resources, a demographic dividend and other factors, boosted by China's reform and opening-up, have pushed forward the country's economic growth. Now China has a large population and the demographic dividend is about to disappear. Artificial intelligence and technology will be able to make up for the negative impact brought about by shortages in the labor force. High-tech will ease the negative influence caused by the impact of the population problem on economic growth.

In the past, our leading industries were highly related to natural resources, but that mode of development has severely damaged and threatened our ecological and living environment, so a green, environmentally friendly and ecologically civilized economic system is important.

Third, China's economic system in the future should pursue quality and efficiency rather than quantity. The report of the 19th CPC National Congress does not mention exact figures for a growth target in its development strategy for China by 2025, which means the country needs relatively stable growth, but with a more high-quality, highly efficient economic structure and system. It has to improve the social welfare level. In the past, we pursued GDP growth and

* This is an excerpt from the speech by Prof. Wu Xiaoqiu at the Launch of IMF World and China Economic Outlook on October 31, 2017, co-organized by IMI, IMF Representative Office in China, sponsored by Minsheng Securities Academy.

* Wu Xiaoqiu, Vice President, Renmin University of China

growth in tax and fiscal revenue. These are important for a country, but social welfare is even more important. So we should make sure the whole of society enjoys an improvement in livelihood and quality, which indicates that industries that are closely related to social welfare — such as healthcare, the medical industry, education and elderly care — should improve.

Fourth, the modern economic system should be market-oriented rather than government-dominated. A planned economy doesn't have many advantages and would reduce the dynamics of the economy, even if it were based on big data technology. The modern economic system should be market-oriented, competitive and open. It should allow China's economy to integrate with and become part of the global economy. To some extent, China's economy, in the future, should play a leading role in the development of the world economy.

Fifth, the basis for the modern economic system is the real economy, including modern manufacturing and the modern equipment industry, but at the core should be a modern financial system. Compared with the traditional financial system, the modern financial system will play a role that is more important than ever in the modern economic system. At present, we cannot say that China's financial sector has become the core of China's economy. Even if it has, it doesn't mean the financial sectors would develop without the real economy's development. In the whole process of economic operation and resource allocation, the modern financial system would play a key role but it cannot be self-serving or based on false prosperity. A modern financial system would boost China's stable economic growth and reduce economic risks. Its core function is to help with risk decentralization and risk control, boosting the real economy and taking financial risks within a reasonable scope.

A modern financial system that is core to the modern economic system should have the following three characteristics.

First, it should be highly market-oriented and financial resources should be allocated though the market rather than through organizations. At present, financial disintermediation is stronger than ever in the market. An important symbol of the modernization of a financial system is that in the whole of society's financial assets, the ratio of securitized financial assets should be growing. This means the modern financial system will be different from the past, when financing was the main function, moving on to an era where financing and wealth management are both important.

Second, the modern financial system must be high-tech, as technologies' penetration into the financial arena will be stronger and more obvious than ever. The integration of finance and technology will create strong synergy. Without high-tech, the financial sector will remain at a very traditional stage and financial services will be restricted. For example, in the past we needed to take our ID card to a bank if we wanted to transfer money, but when technology is used we can transfer money just by using our mobile phones. Technology is changing China's financial formats.

At present, China's fintech, or the third-party payment technology based on the mobile internet, is very influential in the world. The new payment format is helping boost China's economic restructuring and transformation.

Third, the modern financial system must be open, as should the modern economic system. From a global perspective, China's financial sector has great potential for growth. China also aims to become an international financial center. In May, 2009, the State Council of China decided that by 2020, China will build Shanghai into an international financial center to match the country's economic and financial environment. This means that, by then, the yuan could be freely exchanged.

Free trading and exchange of the yuan is also important for constructing a modern financial system. On Oct 1 last year, the Chinese currency joined the IMF Special Drawing Rights basket.

The US dollar has a weighting of 41.73 percent in the new basket, 30.93 percent for the euro, 10.92 percent for the yuan, 8.33 percent for the Japanese yen and 8.09 percent for the British pound. Though the yuan is listed as the third, its real market share hasn't reached that far yet, but we are confident of increasing its share. With yuan internationalization and the forming of international centers, overseas capital could also better invest in China's capital market. Bond markets and stock markets that are open, well-developed and with good liquidity will be important for attracting overseas capital to China.

All in all, if China is able to construct a smooth modern economy and financial system, its economic development will be guaranteed.

IMI International Monetary Review

Monetary Policy in Europe: Exit Problems

By NOUT WELLINK*

In 2007/2008 central banks came to the rescue of the whole system. Initially they used their traditional instruments, but step by step they also introduced so-called unconvential policies: forward guidance and quantitative easing. Starting such a policy is relatively easy, ending it is more complex. A balanced, well-communicated, flexible enough exit from the present, ultra loose monetary policy by the ECB is key to a smooth functioning of financial markets. In the following I want to focus on the present, to my mind problematic exit-strategy of the ECB.

A dovish meeting

The ECB was remarkably dovish at its last (25/26 October) meeting. Although it halved its monthly bond buying program for the first 9 months of 2018 from 60 to 30 bln., Mario Draghi stressed several times during the press conference that the decision was for an open-ended programme, adding to it :*"certainly it's not going to stop suddenly. It's open-ended and the large majority expressed its preference for keeping it open-ended"*. So, Draghi clearly announced some further extension of the programme after September 2018. It might be an extension for small amounts and/or a very short period, three months for example, but an extension he promised. This announcement was done during the press conference and not in the press communique. Therefore it remains to be seen whether other governors feel committed. However, if Draghi does not deliver his credibility is at stake. He indirectly paved the road for a further extension by going out of his way in the press conference to stress the flexibility of the programme. He also made it clear that he does not agree with those who fear a scarcity of available assets or an overrun of the self-imposed issuer/issuance limits.

The importance of open-endedness

Why is it so important that the programme is still open-ended? First and foremost, because it keeps all options open for the period after september 2018. That is self-evident. Secondly, Draghi's remark that "*certainly it is not going to stop suddenly*" delays the moment that key policy rates will go up. Why? For several years in a row the ECB-mantra is that it continues to expect the key ECB interest rates *" to remain at their present levels for an extended period of time, and well past the horizon of our net asset purchases"*. Draghi sees the phrase *"well past"* as crucial, as "*very, very important in anchoring rate expectations*" (12 October, Washington). So, if you move the horizon of ending the net purchases backwards, you also move backwards the moment that policy rates will go up.

Not only a future increase in key ECB rates is linked to the termination of net purchases but also the reinvestments from maturing securities are: *"The ECB also decided to reinvest the principal payments from maturing securities purchased under the APP for an extended period of time after the end of its net asset purchases, and in any case as long as necessary*". So, there is a clear commitment that it will take an extended period after the horizon of net asset purchases before the ECB will start shrinking its balance sheet and tightening via this channel its policy.

* Nout Wellink, Member of IMI International Advisory Board, Former President, The Dutch Central Bank

Mind you, these two pledges - repeated by Draghi in a Committee meeting of the European Parliament on 20 November - are regardless of the fact that the European economy is already growing for more than four years in a row and at present on a 2.5% growth path, with unemployment at its lowest level since January 2009.

Why this ultra loose monetary policy

Why is Mr Draghi so adamant to continue the ECB's ultra-loose monetary policy, supported by a clear Governing Council majority. Some time ago Draghi introduced the three p's: *patience, prudence and persistence*. Sticking to the three p's is in his view necessary to realize *"a sustained adjustment in the path of inflation consistent with the ECB's inflation aim of close to but below 2%".* A few years ago he called the latter "*a moral and legal obligation*". The ECB says it needs to be sufficiently convinced that inflation is on a sustainable path to (close to) 2% before ending net asset purchases. If that moment, the moment of the ending of the net asset purchases, would arrive, the ECB runs, to my mind, potentially at least, into serious communication and credibility problems. It has committed and is still committing itself, as of today, in clear, unconditional terms that the next policy steps (the shrinking of its balance sheet and the increase in key policy rates) will only take place after an extended period/ well past the horizon of the ending of net asset purchases. So, the officially communicated exit-policy at this very moment is to only tighten monetary policy well past the moment when inflation is at a sustainable path close to 2%.

It makes no sense that, regardless the economic situation (knowing that we are now already on a 2.5% growth path) the ECB is still sticking, almost blindfold, to its earlier promises. By this approach the ECB is painting itself into a corner and threatens to become the prisoner of its own wordings. I can only understand the present approach if the Governing Council is prepared to take the risk of a higher inflation than 2%, after so many years of falling short of the target. But then they should be transparant about this policy.

The inflation mystery

Let's now reflect on what would happen if inflation in the coming period does not go, in a sustainable way, fast enough into the direction of (close to) 2%. Also in that case there is a growing communication/exit problem. Inflation in the major economic blocs remains surprisingly soft. Central bankers best guess is that consumer prices will soon accelerate, but they don't have a good explanation for the time and again disappointing inflation figures.

In the absence of a good explanation for the low inflation rate, while running the risk of a continuation of the present low inflation environment, it is dangerous to have a "*Whatever it takes*" attitude to realize the (close to)2% goal. Such an approach might result in a completely unbalanced monetary policy. Eventually a central bank is capable of generating nearly any amount of inflation, but after a certain moment finetuning is not possible anymore and serious negative side-effects set in.

To my mind the already long period of low inflation is due to globalisation, technological developments, including the use of the internet, and demographic developments. That is not to say that inflation will not pick up at a certain moment, but it implies that central banks should be less obsessed by a very precise inflation target. Otherwise they run the risk of pursuing too loose a monetary policy for too long a period.

A looming danger

Everything looks fine in the world economy at the moment.For the time being the assumption is that this will remain so for at least the next few years. But what if, within the "monetary policy normalization period", verbally so much extended by the ECB, the world is hit by a slowdown in growth? If the ECB has not started in time reducing its balance sheet and increasing its policy rates, a very unpleasant picture emerges. Insufficient normalization means that when the next crisis will hit us, for whatever reasons, the monetary toolbox of the ECB is almost empty.

In conclusion

The ECB should adjustits self-imposed, irrational exit strategy, caused by sticking too long to certain exit phrases. There seems, from a broader risk management point of view, no alternative to changing its policy and communication strategy. That will not be easy, taking into account the strong views which, until very recently have been taken by the majority of the Governing Concil. At the end of the day, and regardless what has been said in the past, the reality is that in a booming economy central banks have to tighten their policies, even if inflation is not at the targeted value and/or even if they have promised to wait with further tightening for an extended period of time after ending net asset purchases. And if - for whatever reasons -the economy does not remain on track, too delayed a start of the tightening cycle will leave the ECB with an empty monetary toolbox.

The 19th CPC National Congress

Foreign Experts Take on President Xi Jinping's Report*

By ALFRED SCHIPKE, HERBERT POENISCH AND JAYA JOSIE

Members of IMI International Committee share their views on the report delivered by General Secretary Xi Jinping to the 19th National Congress of the Communist Party of China in Beijing on October 18. The following are their comments on Xi's report.

Alfred Schipke, Senior Resident Representative, IMF China

China's focus on structural reforms, addressing over capacity and deleveraging, and allowing the market to play a decisive role are very welcome. This will not only reduce vulnerabilities but also improve the allocation of resources.

Herbert Poenisch, Former Senior Economist of Bank for International Settlements

Remembering Chairman Xi's leadership in Davos, with a stable and prosperous China committed to globalization, clean environment, and world peace we are heartened to read in Chairman Xi's address of China's continuing commitment to its open-door policy, starting with the One Belt One Road.

Jaya Josie, Head of BRICS Research Center, Human Sciences Research Council of South Africa

The key point that President Xi highlighted is how socialism with Chinese characteristics can continue to modernize and rejuvenate China, and contribute toward development for humanity in general and developing nations in particular.

For many developing nations in general and Africa in particular China has been a great partner. Using the principles of the Forum for China Africa Cooperation, China and many African countries have advanced international solidarity between nations. Today China is Africa's biggest trading partner and an important investment destination. However, there are areas where China can improve its level of cooperation with Africa. First, China has made important advances in the internationalization of the RMB and this currency should become the medium of exchange in trade and investment in Africa. This would remove the dependence on the use of foreign currencies such as the US dollar and the Euro for trade and investment. Second, China has made great advances in internet banking and finance technology that will provide Africa with the foundation for promoting small and medium enterprise economic development across the rural populations in Africa.

* This article is published by China Daily on October 19, 2017.

IMI International Monetary Review

Modernity with Chinese Characteristics *

By ANDREW SHENG AND XIAO GENG*

In a world comprising a diverse array of countries, each with its own complex, dynamic, and evolving system, there can be no one-size-fits-all development path. With Xi Jinping's speech at the Chinese Communist Party's 19th National Congress, China's path has now been mapped, with the understanding that the map can and will be revised as needed.

At the start of the 19th National Congress of the Chinese Communist Party (CCP) this month, President Xi Jinping unveiled his "two-stage development plan" to turn China into a "modern socialist state" by 2035. Since then, commentators have furiously debated the theme of "China rising" and Xi's concentration of power in his own hands. They are missing the point.

In fact, Xi's plan is far more comprehensive and forward-looking than most observers seem to think. Much like his predecessors Mao Zedong and Deng Xiaoping, Xi has established a strategy for transforming China into a "prosperous, strong, democratic, culturally advanced, harmonious, and beautiful" country over the next decades. The key to success will be the balance between modernity and CCP-led socialism.

When Xi took over as leader of the CCP in 2012, deep cracks had appeared in both the development model bequeathed to him by Deng and the dominant Western neoliberal model, based on free and open markets. China's rapid industrial growth had brought rampant corruption, growing income inequality, and high levels of pollution. Western countries, too, were facing rising inequality, as they reeled from a global crisis of their own making – a crisis that, among other things, weakened their appetite for Chinese imports.

Recognizing that sustainable development would be possible only within a context of social stability and credible, transparent governance, Xi devoted the last five years to an unprecedented anti-corruption campaign that has brought down 440 senior officials. He also implemented more than 1,500 reform measures designed to rebalance the economy, thereby stabilizing annual GDP growth at a "new normal" rate of 6.7%, on average, during his first term.

Xi's first term thus laid the groundwork for the ambitious plan that he unveiled at the 19th National Congress. That plan establishes a clear and realistic short-term objective of making China a "moderately prosperous society" by 2021, including by increasing per capita income to more than $12,000 per year, the World Bank threshold for a high-income economy.

Xi's report also sets out a longer-term strategy for realizing Xi's much-touted "China Dream" – that is, the country's "rejuvenation" and establishment as a global leader, on par with the United States and other advanced countries – by 2049. According to Xi's vision, a transparent, accountable, empowered, and socially responsible CCP will act as the guardian of this transition.

It is a perfectly logical, albeit complex plan. Yet it seems somewhat incomprehensible to people outside China. This may be because, unlike the standard Western model of competitive party politics that uses periodic elections to direct policy, the Chinese development model relies on a one-party leadership's ability to learn and adapt its agenda accordingly.

For a country as large and diverse as China, this approach makes sense, as it balances stability with flexibility. The country's development is guided not by outcomes in decentralized markets,

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* This article first appeared in Project Syndicate on October 25, 2017.

* Andrew Sheng, Distinguished Fellow of the Asia Global Institute at the University of Hong Kong. Xiao Geng, Member of IMI Academic Committee, President of the Hong Kong Institution for International Finance, Professor at the University of Hong Kong.

but by the choices of a central government, which presides over the provision of public goods, sets rules, and manages institutions. In order to avoid the types of social disruption that political competition could entail, the central government also appoints key provincial and municipal officials and resolves disputes among regions.

Meanwhile, regional and municipal governments engage in policy experimentation at the local level, where markets and communities interact, with the results of those experiments informing national policy. Regional competition not only fuels overall economic growth; it also ensures that the particular needs of each area, from megacities like Beijing to the tiny villages that dot China's countryside, are met. As the situation on the ground changes, with new solutions often creating new and unforeseeable problems, continual adaptation at every level is vital.

Of course, the predominance of the state does not mean that markets do not have an important role to play. But that role is often misunderstood. In recent decades, China used state-owned enterprises (SOEs) to build key infrastructure, in order to support the development of China's markets.

Today, SOEs still play an important role in social engineering and research and development, but their business models are under pressure from globalization and disruptive technologies. That is why Xi has included in his plan measures to support the continued opening of markets, including the use of competition law to enable markets to dictate prices, improve resource allocation, and boost productivity.

But market liberalization, in a context of globalization and rapid technological change, has also given rise to another potentially damaging trend: the emergence of a few ultra-dominant tech giants. Moreover, market liberalization has often outpaced progress in regulation and enforcement, allowing for abuses like speculation and tax avoidance.

Given this, China's government has, in recent years, strengthened regulation and enforcement in virtually all sectors. It is this apparent contradiction – between the stated objective of liberalizing markets and the reality of tightened regulations – that seems to confuse outsiders. But the fact is that rising social imbalances can be addressed only by effective government intervention that avoids state capture or the kind of paralysis that can arise from excessive political competition.

Another seemingly contradictory element of Xi's plan is its insistence on party leadership in all national affairs, alongside a pledge to strengthen the rule of law. But, again, a closer look reveals a straightforward logic: the transition to a future in which the rule of law is paramount will require China to overcome its legacy of bureaucratic silos that entrench resistance to reform from vested interests. Doing so will demand strong leadership.

In a world comprising a diverse array of countries, each with its own complex, dynamic, and evolving system, there can be no one-size-fits-all development path. Though countries may all aspire toward similar lifestyles, business environments, and social systems, they will get there in their own way, determined according to their particular needs, preferences, structures, and legacies. For China, that way has now been mapped, with the understanding that the map can and will be revised as needed.

IMI International Monetary Review

Financial Sector Reforms Get a Shot in the Arm*

By SUN CHAO*

Two recent but separate developments show the Chinese authorities' resolve to expedite measures to curb financial risks after the 19th National Congress of the Communist Party of China.

Last week, securities regulators barred billionaire actress Zhao Wei and her husband from trading in the mainland stock market and also imposed fines on them, because there were irregularities in the disclosure they made in their bid to take over a company. And on 8 November, the Financial Stability and Development Committee of the State Council, established in July, held its first meeting.

The two moves reflect that curbing risks in China's $40 trillion financial sector is high on the priority agenda of the authorities amid the increasingly intertwined business among banks, securities, brokerages, asset managers and insurers.

Since the 18th Party Congress in 2012, the Chinese leadership has led the historic transformation of the financial market, marked by its rapid growth, diversified financial products, more inclusive financial services, orderly advancing of financial reform, a more comprehensive financial system, progress in the yuan's internationalization and the plugging of regulatory loopholes.

In recent years, direct financing has been playing a bigger role in the financial sector: it has optimized the structure of indirect financing, and thus lowered the financing cost of the real economy. An inclusive financial system has been established to provide more tailored services for small and micro-sized businesses, farmers and rural areas, and help poverty alleviation and green development. The People's Bank of China, the central bank, has reduced the targeted reserve requirement ratio to encourage inclusive financing by commercial banks, such as credit support for small and micro-sized enterprises.

Following the principle of serving the real economy, the construction of multi-level capital market has advanced progressively to facilitate the transformation and upgrading of the economic structure.

Containing financial risks, especially systemic risks, is another core task the central leadership has undertaken in the past five years, and they have implemented a series of measures to strengthen regulation coordination and plug the regulatory loopholes.

Also, of late, the public has become more familiar with the concept of "gray rhinos"—obvious dangers, including in the financial sector, which are often ignored. Experts once said the real estate bubble and local government debt are potential future "gray rhinos". But the continuity and stability of the policies have been improved with the establishment of a long-term mechanism for curbing the property bubble and local government debt risks.

The central bank has continued with its prudent monetary policy with timely adjustments for the past five years, facilitating economic growth and supply-side structural reform. By adopting appropriate measures like open market operations and medium-term lending facilities, it has sustained the steady and healthy development of the banking industry.

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* This article was published by China Daily on November 14, 2017.

* Sun Chao, Research Fellow of IMI, Deputy General Manager of Fixed Income Department, Changjiang Securties.

Deepening reforms will accelerate the financial sector's development, and the optimization of the financial institution system and modern financial corporations will increase its vitality. Also, the opening up of the financial sector has accelerated since the 18th Party Congress. And the exchange rate mechanism has gradually advanced, pushing forward the yuan's internationalization.

The China-proposed Belt and Road Initiative, which would help further open up China's financial sector, is already yielding results. The increasing acceptability of the yuan in the international market has further promoted the internationalizing of China's currency, not only reducing the country's foreign exchange risks but also deepening regional financial cooperation. The use of the yuan to calculate more cross-border financing products can help provide comprehensive services, and promote pricing, liquidation and financing, which in turn could help it become an international reserve currency.

By helping to establish the Asian Infrastructure Investment Bank and the Silk Road Fund, China can now play an increasingly important role in the international financial sector and thus improve global economic governance to ensure that emerging markets get their rightful say in both international and regional financial sectors.

IMI International Monetary Review

Trump's Tax Cut

Is the US Tax Reform another Beggar-My-Neighbor Policy

By HERBERT POENISCH*

The US House of Representatives and the Senate passed the tax reform bill recently. It has three pillars: first is the reduction of the main tax rate on profits of C-corporations from 35% to 21%. The second change is the replacement of the current system of depreciation allowances for new equipment with immediate 100% expensing. Third, the recovery period for most non-residential business structures is to be shortened from 39 to 25 years[1]. In addition it would move to a territorial tax system to encourage US companies to return their offshore profits and earnings home. Under the territorial tax system, offshore profits in the form of dividends are tax-free to encourage the repatriation of capital back to the home country[2].

While these measures might be beneficial for the USA[3], other countries, notably China will experience a negative backlash. Mme Lagarde of the IMF called this 'overly aggressive tax competition among countries is a form of beggar-my-neighbor policy which hurts everybody'[4]. The main concern in China is the impact on Chinese investors who might relocate to the USA to benefit from lower tax rates than currently up to 40% in China. It is not only Chinese companies who are affected, but first and foremost US companies which now have a real incentive to repatriate their offshore profits and earnings. This may lessen the availability of US corporate capital to invest overseas, which China still needs[5].

Different from the impact on corporations, this article will focus on the macroeconomic implications, first in the USA and the world economy. The US tax reforms will have an impact on aggregate demand and supply, on inflation, on debt and capital flows. Countries facing a backlash from the US tax reform should voice their concerns in international organizations, such as the IMF and the WTO. US authorities should respect international agreements and consult and coordinate policies to prevent a relapse into beggar-my-neighbor state of affairs.

1. The present US macroeconomic scenario

The US administration is trying to solve a macroeconomic problem, ie inadequate domestic growth with a redistribution of income from labour income to capital income while incurring increasing fiscal deficits.

This is not the first time in recent history that this medicine has been prescribed, first in the Kennedy tax cuts of 1964 and then the Reagan tax cuts of 1981. However, the national savings

* Herbert Poenisch, Member of IMI International Committee, Former Senior Economist of BIS.

[1] Barro, Robert J (2017): How US Corporate Tax Reform Will Boost Growth. In: Project syndicate 13 December www.project-syndicate.org

[2] Tang, Frank and Zhang, Maggie (2017): US reform bill puts pressure on China to tweak its tax code to avert fund flight, lure investment. In SCMP, 6 December www.scmp.com

[3] Furman, Jason and Summers Lawrence H (2017): Response to Robert Barro's Tax Reform Advocacy. In: Project syndicate, 13 December www.project-syndicate.org

[4] Lagarde, Christine (2017): Speech in the UAE, 22 February www.imf.org/speeches

[5] South China Morning Post editorial (2017): Trump tax reform a challenge for China. 9 December www.scmp.com

rate was 10.1% then and is 1.8% now. Economies short in savings cannot go on deficit spending binges without borrowing surplus savings from abroad, such as from China. While China was willing to invest in US treasuries in the 1980s, the world has changed and China, leading other current account surplus countries, will not be willing to finance US excess demand for an uncertain future.

Secondly, the US current account was in slight surplus during the 1964 and 1981 tax cuts. Presently, the current account deficit of 2.6% of GDP is likely to increase sharply due to fiscal deficits in a low savings environment.

Thirdly, the budget deficit was 0.2% in 1965 compared with 2.5% in 2017[6]. Assuming that the tax cuts will not be compensated by expenditure cuts in other areas, the government debt is expected to add USD 1.5trillion over the next ten years, increasing from 77% to close to 100% of GDP[7]. In addition, the tapering of US interest rates will mean a higher debt service burden, adding some USD50 billion annually.

2. Financial impact of tax reforms

The mantra of the supply siders is that the tax cuts will be self-financing, because they will spur economic growth, causing revenues to surge and thus correct the financial imbalances of the first round. This is where the tale goes from facts to fiction[8].

There is a clash of two ways to stimulate the economy, the supply siders who like to see the corporate sector as major transmission mechanism of stimuli and demand siders, Keynesians and Marxists who blame the demand deficit as main culprit for lack of growth. This again is linked to the rising profit rate, with a low multiplier effect as compared to a rising wage rate with a high multiplier effect. Inequality of income and wealth is seen as one of the determinants of unsustainable growth[9].

Assuming that the fiscal stimulus will preserve or even raise the present meager US real growth of 2%, which is expected to taper off in the next years[10], the financial implications for the US and the world will be formidable.

First of all, the budget deficit will have to be financed[11]. There will be a surge in the issue of treasury securities from USD15tr to USD 16.5 tr, an increase of 10%, which in an environment of rising interest rates will have to be sold below par[12]. Who will be ready to buy these additional debt instruments? The US banks, institutional investors and corporates will be busy investing in the real sector. However, even they will be weighing the real earnings prospects against higher returns from treasury securities. Corporations ever since the 1980s have turned into financial intermediaries rather than facing the real economy risks.

The US current account balances might be improved as dividends and earnings from abroad might flow back to the USA. The additional growth in the US might increase the demand for inputs, such as intermediary goods, but also more exports are envisaged, leading to a better current account balance in the best case. This will lift the national savings rate and reduce the need for import of surplus savings from abroad.

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[6] Office of Management and Budget (2016): Historical tables of the US Government, February www.whitehouse.gov/omb/budget

[7] Feldstein, Martin (2017): Cutting US Corporate Tax is Worth the Costs. In: Project-syndicate 27 November www.project-syndicate.org

[8] Roach, Stephen S (2017): America's supply side scam, In: Project syndicate 24 November www.project-syndicate.org

[9] Even the IMF turned its attention to the income and wealth inequality affecting growth. Inequality and unsustainable growth: two sides of the same coin. In: IMF Staff Discussion notes (2011) www.imf.org/publications

[10] See IMF and IBRD forecasts autumn 2017.

[11] The market reaction to Japan's recent fiscal stimulus packet was a drop in bond prices and a hike in yields. Oh, Sunny (2017): Japan stimulus send shivers through its bond market. Marketwatch, 28 September www.marketwatch.com

[12] The Japanese experience with the JGB rising yield are a case in point.

Secondly, on the financial account, however, capital will continue to flow into the USA driven by the following factors. US based banks, the US stock and bond markets will attract funds from abroad thanks to the improved growth environment as well as higher expect returns.

Foreign investors, first and foremost China and Japan, who presently own 45% of US government securities will be tempted to invest in these securities offering increasingly attractive returns. This will lead to capital outflows from emerging markets and downward pressure on their exchange rates. Some foreign investors, such as China and Russia are in process of diversifying their forex portfolio away from US government securities into FDI and other projects linked to the Belt and Road Initiative.

Chinese corporations may even undertake to channel some FDI into the USA to take advantage of the lower tax environment. In addition to the Belt and Road investments this will lead to further capital outflows from China and a downward pressure on the RMB. It might also hamper the RMB internationalization strategy as these investments will be nominated mostly in USD.

3. Possible global and Chinese reactions

The world has arrived at this juncture once before, when Japan adopted various fiscal stimuli to boost growth and to avoid the deflationary trap. At that time Germany condemned the Japanese programme as a species of beggar-my-neighbor policy[13].

This time round it was the Europeans again who issued a warning to the Trump administration over its planned tax reform, saying it would 'be at odds' with free-trade international rules because it risked being discriminatory towards foreign companies. They claim that some of the bill's measures would 'contravene' the rules of the WTO's principles as well as double taxation resolutions. Some measures 'may risk having a major distortive impact on international trade'[14].

China will be well advised to play a similar role as Germany and EU, make its voice heard in the G20and prepare its reaction against this fiscal 'beggar-my-neighbor policy'. As there is no international body, such as the IMF which addresses exchange rate distortions, or the WTO which mediates in trade disputes, there is no arbitration mechanism for fiscal competition. This has plagued the EU countries where different fiscal regimes have distorted competition among member states, such as Ireland offering the lowest corporate tax rate.

Even more so in the world at large it is left to individual countries to defend themselves against fiscal competition, in this case from the USA. In particular, the US administration argues that its tax reform is targeted at domestic players, but it has a huge impact on the outside world as it triggers various capital flows. Economies after all are mutually interconnected.

As the USA administration has ignored the basic pillars of global economic policy since World War 2, ieinternational agreements, consultation and coordination, other countries need to make their voices heard, such as the EU in a protest to the US administration or just pursue its own policies.

China might adopt counter fiscal measures and/or reinforce its capital controls. Restricting capital outflows through enterprises can be targeted first. Priority should be given to outward investments linked to the Belt and Road initiative. If Chinese companies increase their FDI in the USA some capital controls could be enforced.

Secondly banks, Chinese based banks have been part of the export surpluses scenario as their cross-border USD assets exceed their USD liabilities. It will be impossible to stop them lending

[13] Brittan, Samuel (2013): The folly of beggar-my-neighbor policy. IN: Financial Times 1 February www.ft.com

[14] Chassany, Anne-Sylvaine (2017): EU finance ministers warn US administration over tax bill. In: Financial Times, 11 December www.ft.com

to the US interbank market or even to US non-bank corporations.

The PBOC, SAFE, CIC could divest from investing foreign exchange reserve in US debt securities to USD denominated securities issued by non-US governments, or even start buying local currency instruments issued by BRICS countries[15].

Finally, individuals are still barred from investing massive amounts overseas due to the prevailing foreign exchange controls.

There is still hope for international mediation. In the IMF Press Briefing on 14 December, the IMF spokesman Murray replied to a question on this issue that the Article IV consultations with the US, which will be conducted during the first few weeks of 2018 will address the US tax reforms and the results will be published in July 2018[16].

China should play its role within the G20, reminding the world of the adverse effects of aggressive fiscal measures in one country on the rest without consultation and coordination. After all, the G20 claims to be the world government, however without a permanent secretariat.

[15]Poenisch, Herbert (2017): Building not replacing. BRICS role in global finance. IN: OMFIF October www.omfif.org
[16]IMF Press Briefing 14 December 2017 www.imf.org/press

IMI International Monetary Review

Trump's Muted Tax Cut*

By BEN ROBINSON*

In OMFIF's January 2017 report, 'Trump – The search for an improbable balance', on the US economy under Donald Trump, we focused on the possible impact of the president's tax proposals. The report highlighted that many companies, particularly large tech firms, already pay less than half the statutory corporate tax rate of 35% as a result of loopholes, deductions, and profits being booked offshore.

We predicted that Trump's tax proposals would 'create a divergence between domestically operating firms which lack the option of booking profits offshore and pay close to the statutory rate, and multinationals which take advantage of lower rates… The outsized impact of a corporate tax cut on domestic companies rather than multinationals helps to explain why domestically-focused US stock indices have strengthened more than the internationally-focused S&P 500 on news of Trump's fiscal plan.'

We anticipated that 'cutting the corporate tax rate is unlikely to have a stimulatory effect for those large companies already paying below the statutory rate, and may instead lead to loss of revenue from domestic firms, lowering the already weak contribution of corporate taxes to federal income.' Indeed, corporate tax revenue fell to 1.6% of GDP in 2016 from 5.9% in 1952, contributing just 9% of government revenue last year. The effect on US debt could therefore be substantial, with extensive implications for monetary policy under Jerome Powell, the incoming chair of the Federal Reserve.

In vindication of these forecasts, the S&P 500 fell on the first trading day after Trump's tax plan passed a key vote in the Senate on 2 December, closing 0.1% down. Falling share prices for the largest technology companies, including Google, Amazon and Microsoft, contributed to the drop. These movements reflect the pressures highlighted in OMFIF's report.

The reality for growth might be worse than was anticipated at the start of 2017, as other elements of Trump's proposed fiscal boost, including a large infrastructure spending programme, have not materialised. While the Russell 2000 and other domestic indices were bolstered by Trump's election, in anticipation of the improved growth prospects for domestic companies, those hopes have receded. The Russell 2000 fell around 0.3% on the first trading day after the vote.

It is becoming increasingly clear that Trump's plan will not be as stimulatory as his supporters claim. Added strain on US debt and the deficit will further complicate policy-makers' already difficult task. With monetary policy tightening, labour markets near full capacity and the post-crisis recovery entering the later stages of the business cycle, the effect of Trump's tax cuts will be muted.

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* This article appeared in OMFIF Commentary on December 6, 2017.
* Ben Robinson is Senior Economist at OMFIF.

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Vol. 5, No. 1

Yellen Gives Cover to Trump Tax Cuts *

By DARRELL DELAMAIDE*

In her final press conference on monetary policy, Federal Reserve Chair Janet Yellen gave substantial cover to President Donald Trump and Republicans in Congress for their ambitious tax reform. She characterised the effect of the fiscal stimulus as 'modest', providing at best 'some lift' to the economy in coming years. Most notably, it doesn't change the Fed's plans for a gradual increase in interest rates.

Her remarks came after the Federal Open Market Committee raised rates by another 25 basis points, the third such increase this year and the fifth since Yellen took over in 2014. They came, too, as Republicans moved to reconcile differences between the tax reform bills in the House and Senate, resurrecting the ancient concept of compromise, at least within the party. They pledged to have the bill passed and on the president's desk to sign into law before Christmas.

Fed policy-makers revised their growth forecasts upwards, to 2.5% from 2.4% for this year, and to 2.5% from 2.1% for next year. But they did not accede to the administration's projection of a substantial boost from the tax cuts. The main feature of the reform – cutting the corporate tax rate to 21% from 35% – is intended to spur investment and growth to recover lost revenue through increased economic activity. Most other forecasts expect the cuts to add at least $1tn to the federal deficit over 10 years, even if growth does increase.

But the Fed's famous dot-plot graph forecasting interest rates still sees most policy-makers expecting a maximum of three rate increases next year, unchanged from September. Forecasts still look for rates to top out at 3% in the 'longer run'. Two regional bank chiefs – Charles Evans of Chicago and Neel Kashkari of Minneapolis – dissented from the consensus at the meeting, voting to keep rates steady as inflation remains below the Fed's 2% target.

When asked about Trump's prediction that the cuts would propel growth to 4% and higher, Yellen, who will leave the Fed when her term as chair expires in February, quietly responded, 'I wouldn't want to rule anything out. It is challenging, however, to achieve growth of the levels that you mentioned.'

After dithering over the reform for months, congressional Republicans, perhaps spurred by the loss of a Senate seat in Alabama's special election, reconciled their differences with surprising speed. They also responded to a political backlash against the proposal in both houses to eliminate the deduction of state and local taxes, instead extending the cap of $10,000 originally proposed for property tax deductions to state and local income tax as well. At the same time, they lowered the top marginal rate to 37% from 39.6% – lower than in either bill – to compensate for the partial loss of the deduction. Then to compensate for that, they nudged up the corporate rate to 21% from the 20% in the original text. Responding to an outcry from business interests, the compromise bill will eliminate the alternative minimum tax for corporations, which would have blocked many from benefiting from a tax credit for research and development and other tax breaks.

To the extent the tax reform does provide some fiscal stimulus, it may absolve the Fed for the puzzling failure of inflation to rise even as employment strengthens. Core inflation in November,

* This article first appeared in OMFIF Commentary on December 15, 2017.

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as measured by the consumer price index, fell to 1.7% annual increase from 1.8% in October, one of the factors prompting the dissent from Evans and Kashkari.

For Yellen, however, any stimulus effect in an environment of 'disturbingly low productivity growth' would be 'welcome', spurring growth without requiring the Fed to tighten monetary policy immediately.

Global Economy

Reforms Key to Sustainable Growth*

By ALFRED SCHIPKE AND ZHANG LONGMEI*

The IMF's recent World Economic Outlook and China's strong economic performance suggest that now is the time to advance reforms.

Global economic upswing

The last IMF World Economic Outlook highlights that the global recovery is gaining momentum, with growth now projected to reach 3.6 percent in 2017 and 3.7 percent in 2018. This is well above the 3.2 percent of 2016, when world growth was still faltering and financial markets were turbulent, and calls for policy action now to secure the recovery.

The good news is that global acceleration is more broad-based than at any time since the start of this decade, as cyclical upswings accelerate in Europe, China, Japan, and emerging Asia. The United States is also growing above trend. This synchronized recovery offers a global window of opportunity for ambitious policies that will support growth and raise economic resilience.

Headwinds exist nonetheless and the recovery remains incomplete. Inflation and wage growth remain low in many countries, while some, especially commodity exporters and those beset by civil or political unrest, still face more complex challenges. In addition, the medium-term outlook in the advanced economies remains subdued, reflecting long-term productivity and demographic trends.

Closing the gaps in the recovery, therefore, requires policy action now. Policies will differ across countries, yet all have ample room for structural reforms that can raise economic resilience and potential output. Fiscally, for countries that have returned to full employment, it is time to think about gradual consolidation and building buffers. In countries with fiscal space, higher infrastructure and educational spending can boost future productivity and offset fiscal consolidation elsewhere. And all countries will benefit significantly from investment in human capital, especially for the youth, that is crucial to sustaining economic development.

Acting in concert

Global challenges require global solutions. And the synchronized global recovery likewise opens a new window for multilateral cooperation. Yet, existing multilateral systems need to adapt to the changing global environment and promote mutually beneficial cooperation. Priorities include strengthening the global trading system, improving financial regulation, enhancing the global financial safety net, reducing international tax avoidance, and fighting famine, infectious diseases, and climate change.

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* This article is published by People's Daily on October 25, 2017.

* Alfred Schipke, Senior Representative in China of IMF. Zhang Longmei, Representative in China of IMF.

Staying the course

Against this favorable backdrop, China's economy is looking stronger in 2017. In particular, industrial growth, after decelerating since 2012, has stabilized, while the service sector remains robust. Strong, near-term growth arises in part out of recovering exports, as well as domestic policy support and supply-side reform. Producer price inflation has surged after years of deflation, boosting corporate profits and improving firms' capacity to service debt. Strong economic growth and tighter enforcement of capital controls have also dampened capital outflow pressures, which had been mounting in the past two years. Reflecting the strong momentum, the IMF has raised its projection of China's growth to 6.8 percent in 2017 and to 6.5 percent in 2018.

The medium-term growth projection has also been revised up, to an average of 6.4 percent until 2020, mostly reflecting the government's target of doubling 2010 GDP by 2020. However, this comes at the cost of higher medium-term debt levels and increasing vulnerabilities. China truly has the potential to sustain strong growth over the medium term, but to do so safely requires reforms to make growth less reliant on debt and investment.

China has made substantial progress in rebalancing its economy in recent years. The current account surplus has come down from a peak of 10 percent in 2007 to below 2 percent now. And consumption and services are gaining a larger share of the economy.

Yet rapid credit expansion and debt overhang remain risks to the sustainability of the economy. Recent strong growth provides a good environment to intensify deleveraging, particularly to speed up the exits of zombie firms and the clean-up of associated non-performing debt. Such reforms, unavoidably, would entail short-term costs. But this can be mitigated by on-budget fiscal support for labor-reallocation and settlement, and the best time to do so is when growth is strong and the overall labor market remains resilient.

To facilitate economic rebalancing, China has room to boost consumption by increasing social spending and making the tax system more progressive. Increasing the role of market forces, meanwhile, by reducing implicit subsidies to state-owned enterprises and opening up to the private sector will improve allocation of resources. And deleveraging the private sector by maintaining the recent regulatory tightening and focusing more on quality of growth and less on quantitative targets will reduce vulnerabilities.

The Chinese government has already taken important initial steps to facilitate private sector deleveraging and credit growth is slowing. Financial deleveraging, by curbing interbank borrowing and shadow banking, have also made significant progress. In addition, the government has made efforts to curb borrowing by local government financing vehicles. These efforts should be maintained and some areas intensified. By pursuing its reforms, China can look forward to a bright future with sustainable, greener, and more inclusive growth.

January 2018
Vol. 5, No. 1

Decoding Disinflation: Principal Contradiction, Social Progress and Market Fragility*

By HONG HAO*

Summary- Imagine an economy where the bottom 90% splits the national income evenly with the top 10%, and income gain perennially lags productivity gain for the bottom 90%. Such an economy must be in constant surplus, as slow income gain would fail to spur sufficient demand for supply driven by rapid productivity improvement. Consequently, prices will be depressed. As such, severe and worsening inequality is the reason why the global economy is still beset by the constant threat of deflation almost 10 years into recovery.

While wage gain has started to outpace productivity gain since 2014, and inflation has crept up since, aggravated inequality has worked to slow the momentum of inflation, giving central bankers leeway to experiment with quantitative easing. Such disinflation and lax monetary policy have made wealth even more concentrated than income, and in turn made market more prone to bubble and economies more vulnerable to small changes in interest rates.

Inequality in the US is now similar to the level seen just before the two wars and the Great Depression. It would appear that dramatic social disruption is looming on the horizon, if history is a guide. But inequality had remained high and steady for a long period before these catastrophic happenings. Without a proactive initiation of social system reform, inequality can stay in this status quo for some time still.

Some are taking heed of these social extremes that breed fragility. President Xi redefines Chinese society's principal contradiction as "unbalanced and inadequate development and the people's ever-growing needs for a better life". He is calling for fairer income distribution and more inclusive growth. One should not doubt the government's resolve to achieve these social aims. The feats in the past few years are the strongest evidence.

Joseph Needham once observed that China, a country that had invented so much in antiquity, by the 18th and 19th century had turned into a "booby nation" as Emerson labeled it. But now China is changing right before our eyes. It is energetic, enigmatic, rich, freewheeling and awesome. The era of intense movements and entrepreneurial creativity has dawned. As such, Chinese consumption should continue with its ascendance, technology and financial innovation and credit culture will thrive, and inflation will eventually come back. And as the secular bond bubble unravels, stocks will continue to outperform.

China's New Principal Contradiction

Unbalanced and inadequate development. In his inspiring speech delivered at China's 19th CPC National Congress, President Xi redefined China's principal contradiction for the new era: "the contradiction between unbalanced and inadequate development and the people's ever-growing needs for a better life". Despite significant progress of China's overall production capacity, China's development is "unbalanced and inadequate". And this uneven development

* This article appeared in the author's WeChat public account (ID: Honghaochinastrategy) on November 14, 2017.

* Hong Hao, Senior Research Fellow of IMI, Managing Director and Head of Research, BOCOM International

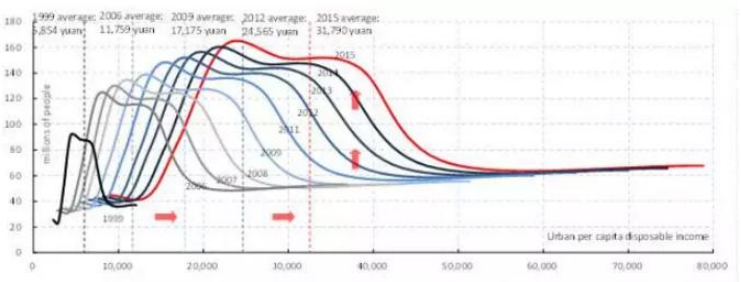
has become "the main constraining factor in meeting the people's increasing needs for a better life".

Fairer and orderly income redistribution. Further, President Xi envisioned the realization of socialist modernization by 2035. During the development process, middle-income group will grow considerably, disparities between urban and rural development, in development between regions and in living standards are significantly reduced. He called on the Party to continue to follow the principle of "distribution according to one's work while improving our institutions and mechanisms for distribution based on factors of production, so as to make income distribution fairer and more orderly …. (So that) incomes grow in step with economic development, and pay rises in tandem with increases in labor productivity". (Quoted from "Xi Jinping's report at 19th CPC National Congress", translated by China Daily)

In essence, President Xi sees that income distribution in China has become uneven, and he has set out to correct it. Judging from his achievements in the past few years, especially the resolve to fight corruption, we believe that the new mantra will succeed, and will usher in significant social changes that have implications for consumption, inflation, fiscal and monetary policy and asset prices.

China's income inequality has worsened. Our analysis of the NBS household survey data confirms President Xi's observation. In **Exhibit 1**, we show the distribution of Chinese urban income. The distribution of income resembles a bell curve, with an increasingly fat tail on the right end. While the rapid shift of the bell curves towards the right suggests strong income growth, and the expanding area under the bell curve suggests growing income earned by a larger population, the widening span of the bell curve alludes to worsening income disparity over time。

Exhibit 1: Both average income and income inequality are growing rapidly in China

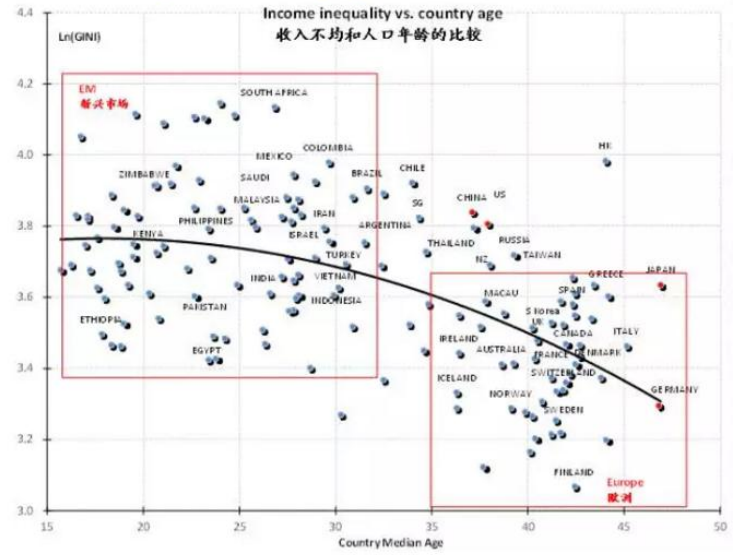


Source: NBS, BOCOM Int'l

Note: Income distribution curve based on actual NBS household survey data for urban residents before 2012. Distribution is estimated from 2013 to 2015. For rural residents, the distribution is very similar.

Income inequality driven in part by demographics. Nobel Laureate Simon Kuznets posited that, as an economy grows, market forces first increase and then decrease economic inequality. This is because workers tend to be most productive when they are in their middle age, and less so when they are younger and still learning, or older when ready to retire. As such, the Kuznets curve, which depicts how the productivity-induced income inequality evolves across time, resembles an inverted U-shaped curve.

Exhibit 2: The life cycle of income inequality



Source: Bloomberg, Federal Reserve, BLS, BEA, BOCOM Int'l

Note: Strictly speaking, the X axis of the original Kuznets curve should be income. We substitute income with age in our chart.

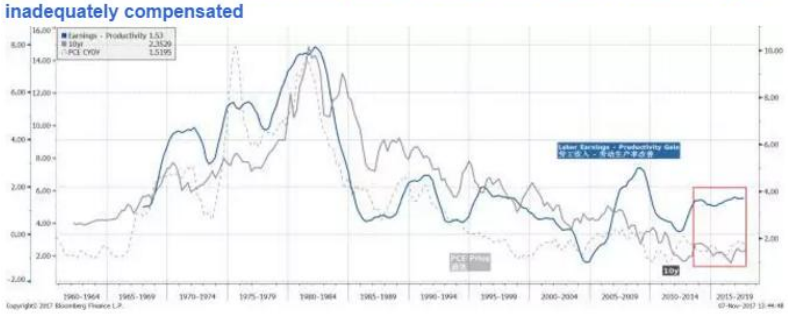
In **Exhibit 2**, we plot the Gini coefficient against its corresponding country's average population age. The chart shows older countries have lower Gini, or lower inequality, while middle-aged countries tend to have higher Gini. The shape of the line of best fit resembles what Kuznets foresaw, albeit somehow flatter than expected.

The "natural" degree of inequality. Given that population age affects productivity and hence income distribution, a certain level of inequality must always be innate in an economy. Or simply put, there must be an inherent "natural degree of inequality". What needs to be explained is the level of inequality beyond this natural degree. That is, there are other factors beyond simple demographic that are driving the inequality President Xi vowed to change. Given the similarities in social systems between the US and China, we believe an investigation into the inequality and its cause in the US will shed light on the principal contradictions that China is facing.

Inflation Starting to Rise - Finally

The 10-year yield is a history of surplus value exploitation. In our special report titled "A Price Revolution: On Global Asset Allocation" on November 14, 2016, we postulated that inadequate labor compensation relative to productivity gain, or the exploitation of labor's surplus value, has been depressing inflation and hence bond yield for over three decades (**Exhibit 3**). It has been the driver for the secular bond bull market.

Exhibit 3: The 10-year yield is a history of surplus value exploitation; productivity gain inadequately compensated



Source: Bloomberg, Federal Reserve, BLS, BEA, BOCOM Int'l

The fact that bonds have substantially outperformed equities for the same period also suggests that capitalists at the top of the value chain have taken it all, exploiting both business owners who borrow start-up capital, and business employees. The falling inflation and bond yield for over 30 years say much about the relationship of production, and how gains have been unevenly accrued to different socioeconomics groups.

Exhibit 4: Inflation has indeed risen since late 2014

Source: Bloomberg, BOCOM Int'l

Once labor compensation started to rise faster than productivity gain, as it has been since late 2014, inflation should follow. As such, we concluded that bond yield should rise, the secular bond bull market should end, and stocks should outperform bonds. Those were our conjectures from one year ago.

Inflation has risen globally since 2014. Since our last year's special report, stocks have so far massively outperformed bonds. The 10-year yield has seen its low in 2016, and had an epic surge in the weeks following Trump's win. Contrary to consensual perception, inflation across the globe has been rising (**Exhibit 4**). The start of this inflation upswing was in around late 2014, coinciding with the inception when wage gain started to outpace productivity gain. The dramatic recovery of commodities has sent PPI surging, and the inflation pressure from upstream will likely be passed onto downstream in the near future. But for now, the absolute level of inflation

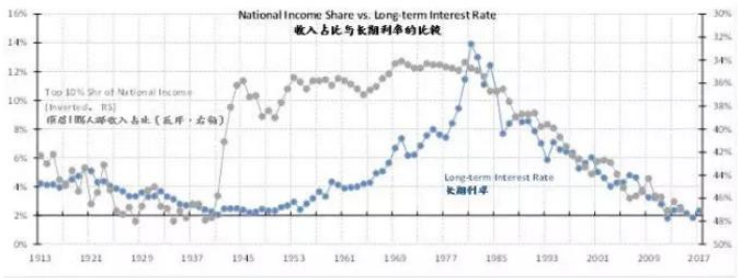
is still low.

The Secret of Disinflation

Inequality suppresses inflation. The secret of disinflation lies in how labor income gain is allocated towards different socio-economic groups within the working population, and its effect on final demand – not just the relationship between productivity and wage gain. We compare top 10% earners' national income share in the US with the historical trend of US long-term interest rate in **Exhibit 5**.

The history of inequality in the US. The timing of when income concentration in the US rose and fell is interesting. During the two wars and the Great Depression, capital income had been severely destroyed for the elites, and probably never been able to fully recover because of progressive estate taxation. Further, the fall in income concentration can be explained by wage controls of the war economy. The National War Labor Board, established in January 1942 and dissolved in 1945, was responsible for approving all wage changes. Exceptions to wage controls were more frequently granted to low-wage earners, while executive salaries were frozen in nominal terms from 1941 to 1945.

Exhibit 5: Income gain accrued more towards top earners, further depressing wage gain relative to productivity



Source: Bloomberg, Federal Reserve, Thomas Piketty, Gabriel Zucman, NBER, BOCOM Int'l

Note: Long-term yield for recent years estimated from annual average of US long-term treasury yield.

This phenomenon is shown in the precipitous fall in the income concentration (reverse scale in **Exhibit 5**) from the late 1930s to 1940s. After that, income concentration continued to grind lower from the mid-1940s till early 1970s.

Then, income concentration started to increase again since the early 1980's, while inflation and long-term interest rate had been falling. This secular change coincided with a series of tax reform initiated by the Reagan government to cut taxes across the board, simplify tax codes, broaden the tax base, and eliminate tax shelters.

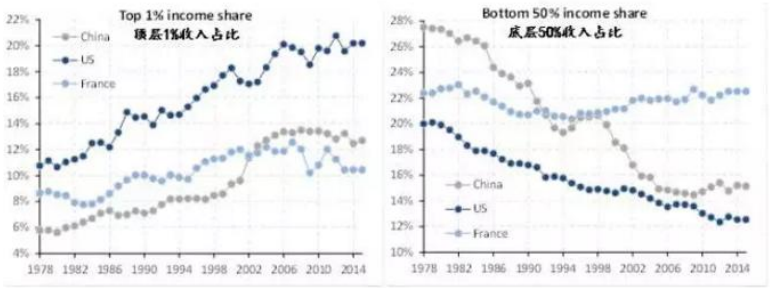
The effect of US Tax Reform. In 2012, the Library of Congress issued a report analyzing the effects of tax rates from 1945 to 2010. The report concluded that the reduction of top tax rate did increase income inequality. That is, tax cuts for the top appear to be associated with the increasing income concentration. In the Economic Recovery Tax Act of 1981 (ERTA), transfer payments were made to people in the lower tax brackets. Unfortunately, this Act put the US government in deficit, while failing to increase income and thus consumption at the bottom.

By the summer of 1982, the double dip recession, return of high interest rates, and ballooning deficit convinced the Congress that the ERTA had failed. Afterwards, most of the personal tax cuts were backed out in September 1982. When Reagan left the office, the national debt had

tripled. The ERTA is an example of how a tax reform without deficit neutrality, as the one that Trump's administration is undertaking, will not succeed.

Labor income is the main income source for both the top and the bottom. Income concentration is even more pronounced as you move up the income concentration percentile (**Exhibit 6**). **Alarmingly, income inequality is now at a similar level to the period preceding the Great Crash of 1929, as well as just before WWII.**

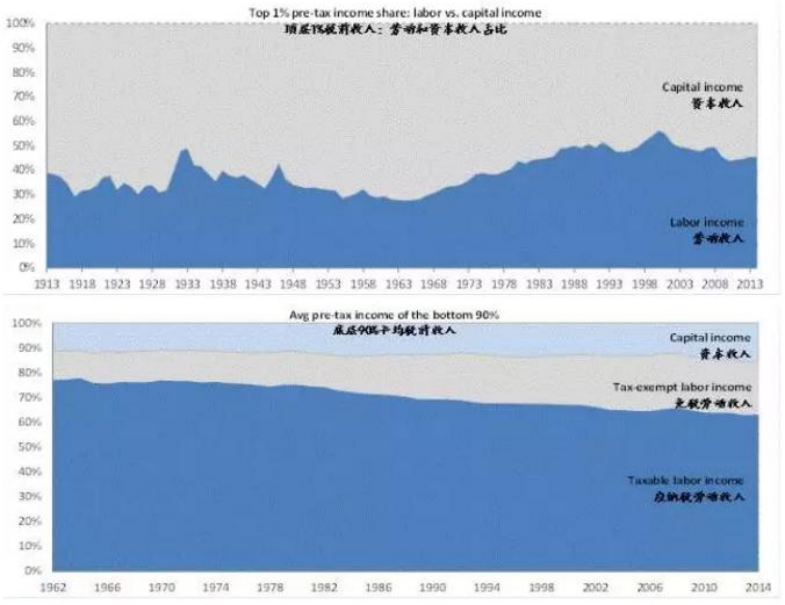
Exhibit 6: Top 1% income share vs. bottom 50% has been widening globally.



Source: Bloomberg, Thomas Piketty, Gabriel Zucman, Facundo Alvaredo, Lucas Chancel, NBER, BOCOM Int'l

A glimpse at the top and bottom income earners' pre-tax income composition reveals that it is the surge of labor income amongst the top earners that has aggravated social inequality since the 1970s. The percentage of top earners' income coming from labor income has surged since the 1970s. If the bottom earners' income had not been increasingly tax-exempt, inequality would have been much worse. Further, the percentage of bottom earners' income coming from capital has been rising. And so has that of top earners since the 2000s (**Exhibit 7**).

Exhibit 7: Labor income rises much faster for top earners than for bottom ones.



Source: Bloomberg, Thomas Piketty, Gabriel Zucman, NBER, BOCOM Int'l

The secret of disinflation. Note that inflation is being depressed because wage gain is slower relative to productivity gain for the bottom masses. Such an economy must be a surplus economy where supply (productivity driven) is far greater than demand (wage driven). And oversupply exerts downward pressure on prices.

Some may point out that top earners are indeed more senior than bottom earners, and thus the more productive are likely to earn more. But even if allowing for the Kuznets effect aforementioned, for a country at the age group of the US, age difference alone between top and bottom income earners cannot fully account for the significant difference in income inequality.

After all, between 1980 and 2014, annual real growth in top 1%'s income was four times as much as that of bottom 90%. And for the top 10%, it was three times as fast as the bottom 90%. Productivity difference as a result of age, education and technology innovation cannot fully explain such a dramatic difference in growth rates. As such, if the top 10% is substantially overcompensated relative to this group's productivity gain, then the bottom 90%, the majority of the society who takes slightly more than 50% of national income, must be substantially undercompensated (**Exhibit 8**).

If so, the significant lag in labor income gain behind productivity gain in the bottom 90% must have been a significant drag on final consumption. As far as we know, the CPI basket tracks an average person's consumption habits, rather than the top echelon. ***As inequality worsens, this drag will be even more significant, depressing final demand and hence inflation even further. And this, we believe, is the secret of disinflation*** (**Exhibit 9**).

Exhibit 8: Top earners' annual income grew four times as fast as that of bottom earners' between 2009 and 2014

Decomposition of real growth rates of pre-tax national income
各收入群体税前收入实际增长比较

	All	Bottom 90%	Bottom 50%	Next 40%	Top 10%	Top 5%	Top 1%	Top 0.5%	Top 0.1%	Top 0.01%
Average yearly growth rates of pre-tax income per adult 人均税前收入实际平均增长率										
1913-2014	1.7%	1.6%			1.8%	1.8%	1.8%	1.7%	1.8%	2.1%
1913-1946	1.7%	2.0%			1.3%	1.4%	0.9%	0.4%	-0.2%	-0.5%
1913-1929	1.3%	0.8%			1.9%	2.2%	2.0%	1.6%	1.9%	3.3%
1929-1946	2.2%	3.2%			0.8%	0.6%	-0.2%	-0.7%	-2.1%	-3.9%
1946-2014	1.7%	1.4%			2.0%	2.1%	2.2%	2.4%	2.8%	3.4%
1946-1980	2.0%	2.1%			1.7%	1.5%	1.1%	1.1%	1.3%	1.7%
1980-2014	1.4%	0.8%	0.0%	1.0%	2.4%	2.6%	3.3%	3.6%	4.3%	5.2%
2009-2014	1.7%	0.7%	0.1%	0.9%	2.9%	3.2%	3.5%	3.5%	3.5%	2.6%
Fraction of pre-tax income growth accruing to each group 税前收入增长中获得于各收入群体的份额										
1913-2014	100%						20%	16%	9%	5%
1913-1946	100%						8%	3%	-1%	-1%
1913-1929	100%						32%	20%	13%	9%
1929-1946	100%	84%			16%	9%	-2%	-4%	-7%	-4%
1946-2014	100%	49%			52%	40%	23%	19%	12%	6%
1946-1980	100%	68%			31%	19%	7%	5%	3%	1%
1980-2014	100%	34%	0%	32%	68%	56%	36%	30%	19%	9%
2009-2014	100%	37%	1%	22%	77%	65%	39%	31%	18%	6%

Source: Bloomberg, Thomas Piketty, Gabriel Zucman, Tony Atkinson, NBER, BOCOM Int'l

Inequality is a global phenomenon, and it is worsening (**Exhibit 6**). Such dramatic disparity has occurred before, in 16th century Spain, 17th century Holland, the Gilded Age and the Roaring 20s in the US. These eras were all weaved with disruptive productivity gains from technology breakthrough, creative financial innovation, cooperative governments, and an influx of immigrants and conquests of rich lands overseas. The trend was best exploited by the rich and the educated of the time. What we are witnessing is really the rhymes of history.

Explaining the exception to our thesis – continental Europe and Japan. But here is the rub: our thesis is that the inequality between different income groups, or wage gain well below

productivity gain for the bottom masses, is the cause of disinflation for the past three decades (**Exhibit 3**). If so, why the more developed, more egalitarian European countries and Japan are perceived to be facing more severe deflationary threats?

Exhibit 9: Inequality and inflation strongly and inversely correlated

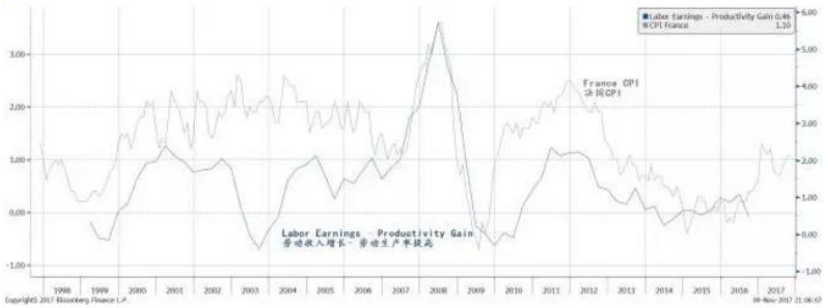
Source: Bloomberg, Thomas Piketty, Tony Atkinson, Journal of Economic Literature, BOCOM Int'l

In **Exhibit 4**, we have shown that inflation globally has been on an upswing since late 2014, coinciding with the inception when wage gain started to exceed productivity gain. That is, inflation has been rising, even in the egalitarian Europe and Japan. However, the extent to which these egalitarian countries' inflation has risen may be less than that of the US, a poster child of social inequality. Therefore, these countries may appear not entirely consistent with our thesis.

While we believe social inequality is the dominant cause of disinflation (but has begun to mean revert **Exhibit 9**), idiosyncratic factors in various countries must have affected inflation. For instance, we note that these countries are in general older (**Exhibit 2**), have different social norms towards inequality, and have more progressive tax regimes that re-distribute gains between different socioeconomic groups.

Between the US and France, the composition of top income is very different. The French top income still primarily consists of dividend income, although wealth concentration has lessened significantly since WWII, as capital has been severely destroyed by the wars and has never been able to recover. In the US, the coupon-clipping rentiers have been overtaken by the ascendance of the working rich whose wage gain significantly outpaced productivity gain.

Exhibit 10: French labor earnings gain relative to productivity gain, and compared with CPI



Source: Bloomberg, BOCOM Int'l

Further, the egalitarian countries are experiencing slow productivity gain due to advanced age (**Exhibit 2**); wage may be increasing at an even slower pace due to rigid employment regulations (**Exhibit 10**). Even so, inflation in France has begun to pick up.

Implications and Outlook

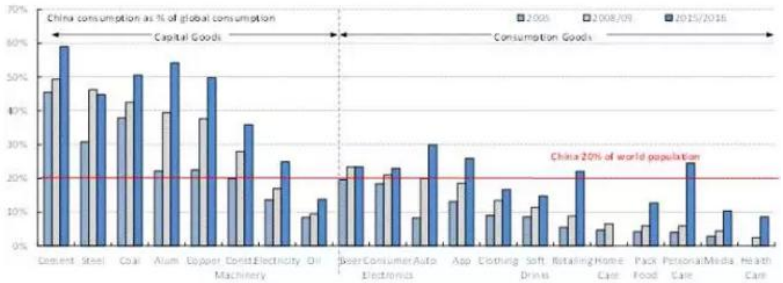
Some inequality is inherent and is good for growth. Given that a natural degree of income inequality exists in an economy due to demographics, inequality cannot be completely eradicated even if China "improves institutions and mechanisms for distribution based on factors of production". That said, if disparity in income is due to difference in productivity, then such disparity will indeed spur productivity growth.

Financial innovation, market deepening and the boom in consumer finance in China. Further, given the diverse consumption propensity inherent in various income groups with different levels of productivity, younger generations will find it difficult to consume before its productivity matures. Also, without a well-functioning financial market, the group with peak productivity would find it difficult to save and invest for its future retirement.

With rising income inequality, financial reform and financial innovation will thrive. And with policy guidance, it will likely accelerate in the coming years. Already, we have seen a flourishing consumer credit market and relaxation of foreign ownership of China's financial sector, as well as financial innovations such as market index options and futures.

China's consumption is under-represented globally compared with the size of its population; consumption will continue to grow with income. Globally, Chinese consumption of various discretionary consumer goods such as healthcare, education and media, home care, etc is still significantly lower than the international average relative to Chinese population as a percentage of the world population (**Exhibit 11**).

Exhibit 11: China's demand for consumption goods is depressed relative to demand for capital goods

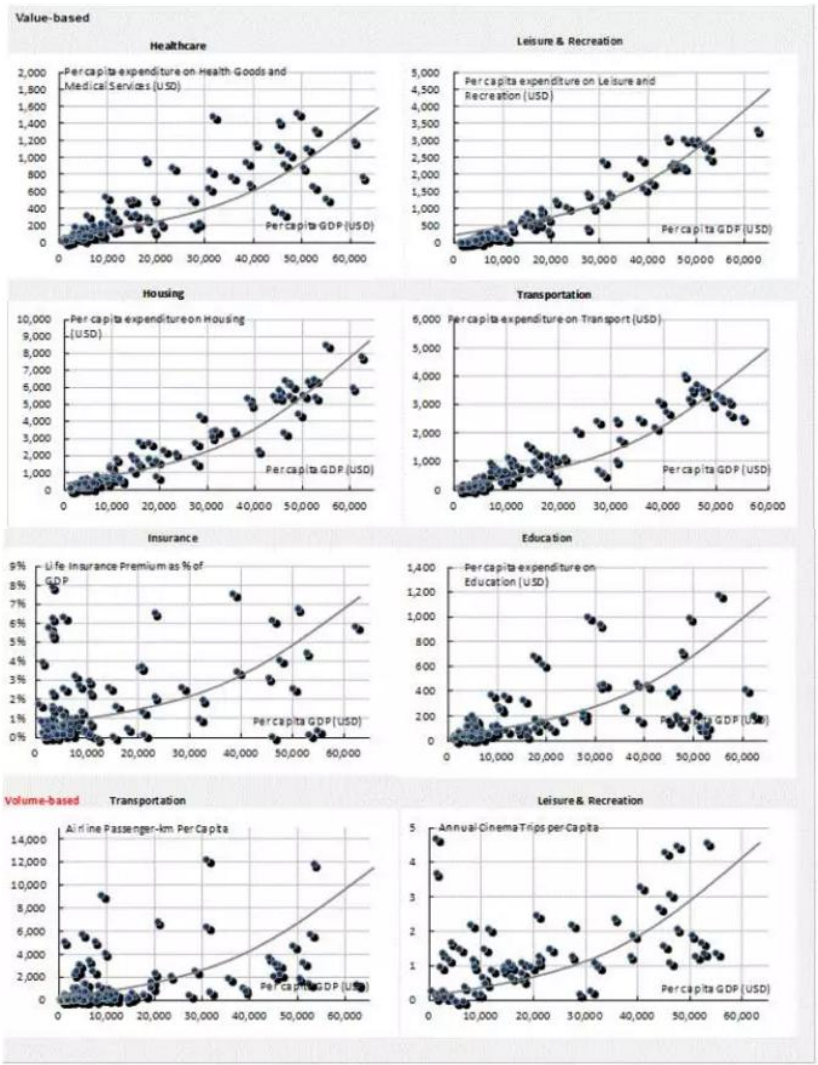


Source: USGS, WSA, Brook Hunt, BP, Euromonitor, WHO, PWC, BOCOM Int'l

Note: Cement, steel, coal, aluminum, copper, electricity, oil and auto are calculated in volume, all the other categories are calculated in value.

In the past, Chinese consumption has been heavy on capital goods such as cement, steel, coal and copper, etc. for development purpose. In recent years, we have seen a dramatic surge in Chinese consumption in auto, consumer electronics, appliances and education. The Singles Day sale single-handedly created by Alibaba is now the biggest global shopping event. Not surprisingly, these sectors have been the best-performing sectors this year. Discretionary consumption tends to accelerate with income growth (**Exhibit 12**), and the golden era of consumption has dawned on China.

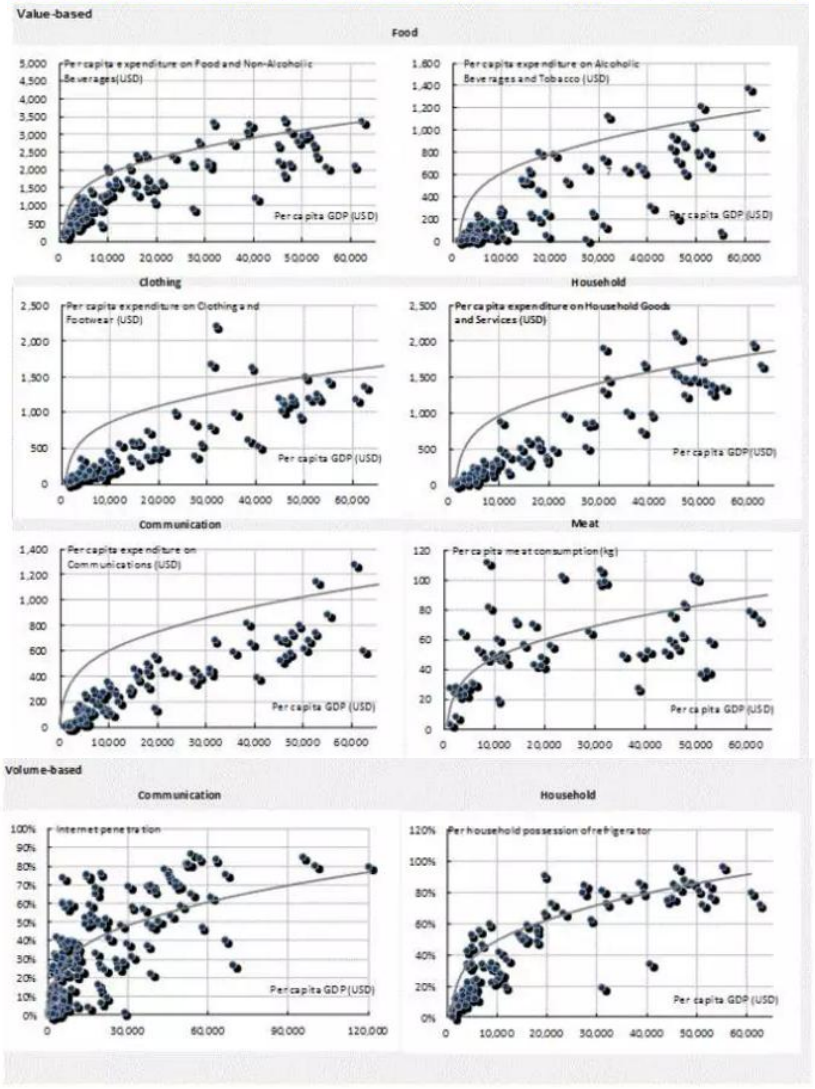
Exhibit 12: Convex consumption curve indicates strong income sensitivity of the discretionary consumption items



Source: USGS, WSA, Brook Hunt, BP, Euromonitor, WHO, PWC, BOCOM Int'l

Note : Each dot denotes one country. Per-cap GDP on x-axis, and consumption for each commodity on y-axis. The convex curves are fitted from the dots.

Exhibit 13: Concave consumption curves for staples indicate weaker income sensitivity



Source: USGS, WSA, Brook Hunt, BP, Euromonitor, WHO, PWC, BOCOM Int'l

Note : Each dot denotes one country. Per-cap GDP on x-axis, and consumption for each commodity on y-axis. The concave curves are fitted from the dots.

Inflation likely to creep up. With wage gain starting to outpace productivity gain, inflation pressure will start to rise, as it has been since late 2014. But as discussed in depth before, productivity gain is being accrued to top income earners, while the bottom masses' labor income growth lags significantly. This income concentration will mean that demand is suppressed for the bottom masses constituting 90% of the population but only earning 50% of total income. As such, the structure of a surplus economy remains intact where oversupply exerts downward pressure on prices.

We note that the severity of income inequality in the US is similar to that just before the Great Depression, and just before the WWII. It is alarming, as history would suggest looming disruptive social changes on the horizon. But we also note that pre-WWII, income inequality

remained high and steady for well over a decade – until the wars severely destroyed capital base.

That is, secular changes take time. At first, such changes are almost imperceptible, before they can gather enough momentum to accelerate. It takes well over 10 years for Piketty's seminal paper "Income Inequality in the United States, 1913-1998" to culminate in his magnum opus "Capital in the 21th Century". Such persistent income inequality will help ease rising inflation pressure.

Interest rates will rise; social system more fragile. Should income inequality persist, its effect on uneven productivity accrual and hence inflation would mean that central banks can afford to raise interest rates at a measured pace. Consistent low rates will encourage further aggressive risk taking, and will lead to further wealth concentration that is already substantially more severe than income inequality. However, such social system with extremes is brittle, and is sensitive to small changes in fiscal and monetary policies. Eventually, it will lead to a sudden collapse of the financial market. Investors should heed warning.

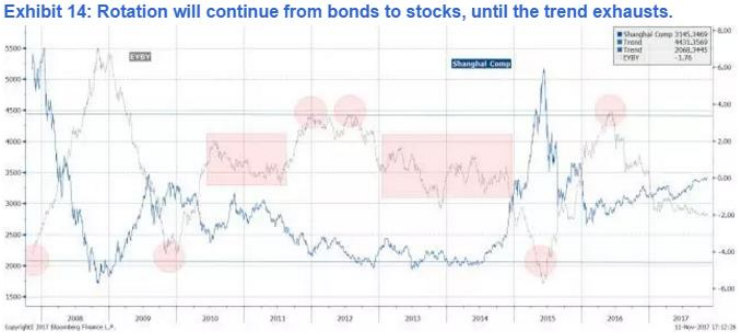
Rotation from bonds to equities should continue, stocks continue to outperform. Our bond yield vs. earnings yield model (EYBY model hereafter), which has helped us pinpoint the bottom of China's stock market after mid-2014, as well as the peak of the bubble in June 2015. The model has also helped us negotiate the rough waters after the bubble burst.

In December 2014 when we were preparing the 2015 outlook, the model forecasted the looming market bubble, but the year of 2015 should finish at not much higher than 3,400. The Shanghai Composite finished at ~3,300 one trading day after the last trading day in 2015. In December 2015 when we were preparing the 2016 outlook, the model forecasted the trading range for 2016 should be 2,500-3,300, versus the actual range of 2,638-3,301; in December 2016 when preparing for the 2017 outlook, the model forecasted in 2017 the Shanghai Composite should spend at least eight months below 3,300. And the index didn't break 3,400 until Oct 9, the first trading day in October after the Golden Week.

Our EYBY model continues to show relative value of equities relative to bonds since June 2016 (**Exhibit 14**). As equities' relative value continues to improve, the trend of rotation from bonds to stocks should persist – till this trend exhausts after it has reached the extreme defined by the lower bound in **Exhibit 14**.

The pace of how fast equity valuation can expand relative to the rise in bonds' yield determines how far the stock indices can rise, as funds rotate from bonds to equities. As liquidity conditions should tighten on the margin, and bond yield should continue to rise, it is likely that the market will be increasingly unwilling to ascribe a higher valuation multiple for each unit of earnings. But as inflation continues to tick up, nominal earnings growth should continue into the late economic cycle, and should more than compensate the pressure on valuation from rising bond yields.

Exhibit 14: Rotation will continue from bonds to stocks, until the trend exhausts.



Source: Bloomberg, BOCOM Int'l

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Path to the Next Financial Crisis *

By MIROSLAV SINGER*

The Czech National Bank in August became the first European Union central bank to tighten monetary conditions since the onset of the 2008 financial crisis and subsequent recession. The CNB raised interest rates to 0.25%, and likewise lifted the repo rate from zero.

Contrary to expectations, the koruna did not appreciate following the rate increase, but is marginally weaker. This seems to confirm that markets are in a period in which the uncovered interest rate parity – the rule implying a currency should strengthen after an interest rate increase – may not work at all. The causes of this phenomenon have serious ramifications for the likelihood of another global financial sector crisis. Dangers are mounting of activity moving into unregulated areas, which could give rise to serious upsets.

There are clear reasons for the koruna to weaken, as most analysts forecast early in the year. The koruna was overbought before the CNB ended its intervention policies. The Bank had, since 2013, imposed a Swiss-style policy of market intervention to maintain a suitable exchange rate with the euro. It may take several years for the effect of these measures to reverse.

The koruna exchange rate is like a piece of wood floating down a narrow stream, at the bottom end of which is a large and constantly leaking inflatable balloon of water that creates a counter-stream. The unconventional policies of many central banks have created 'inflatable balloons of liquidity' which now impede, among other things, the movement of exchange rates.

Excess liquidity in the financial system has created a situation in which the most binding rules are those which regulate capital requirements, rather than those which create floors for unused liquidity. But this means that, despite their apparent attractiveness, many arbitrage opportunities normally exploited by the financial sector remain unused. Subsequently, potential returns on many trades are meagre compared to the costs implied by regulatory capital requirements.

One of the negative consequences of this is the disappearance of mechanisms which normally work, such as the uncovered interest rate parity. However, a more positive implication is the relative stability of the financial sector. Generally, over-liquid and well capitalised financial institutions are less prone to collapse. Even if negative developments occur in some segment of the financial sector, the ample presence of liquidity may enable the relaxation of capital roles to stabilise the system. This can be achieved more efficiently than was possible at the onset of the great recession, when banks had little liquidity and seemingly ample capital.

But the long-term impact of these conditions on financial system developments is unsettling, even if the size of any impending crisis is unlikely to approach the scale of 2008. Unregulated actors will increasingly take advantage of arbitrage opportunities that regulated financial institutions appear unwilling to exploit. This means a greater number of profitable activities will move outside the boundaries of the regulated sector. As a result, the next disturbance could emanate from a sector that few regulators either oversee or understand.

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* This article first appeared in OMFIF Commentary on September 26, 2017.

* Miroslav Singer is former Governor of the Czech National Bank and a Member of the OMFIF Advisory Board. He is Director of Institutional Affairs and Chief Economist at Generali CEE Holding.

IMI International Monetary Review

Real Dangers for International Trade*

By DAVID SKILLING*

For 30 years, US President Donald Trump has held conspicuous views on international trade. In 1987 he took out a full-page ad in The New York Times arguing that 'for decades, Japan and other nations have been taking advantage of the US' by running a weak yen policy that caused 'vast deficits'.

Under Trump's leadership, the US has withdrawn from the Trans-Pacific Partnership and is renegotiating the North American Free Trade Agreement (in a way that some believe suggests he isn't serious about reaching a deal). He has threatened to renegotiate the US-Korea Free Trade Agreement (Korus), and complained bitterly about trade partners' allegedly unfair treatment of the US.

However, despite early fears, Trump's rhetoric is yet to lead to trade and currency wars. Since the fourth quarter of 2016, world trade growth has strengthened in line with the coordinated global economic recovery. But Trump's tour of Asia, between 5-14 November, the longest such trip by a US president in more than 25 years, raised questions about whether this can be expected to continue.

The tour included bilateral meetings in Japan, South Korea and China, and then the Asia-Pacific Economic Co-operation meetings in Vietnam. On trade policy, nothing consequential occurred. In a visit which was well-choreographed by Japan, Prime Minister Shinzo Abe was able to sidestep US requests for bilateral trade talks. In South Korea, the Korus renegotiation was not mentioned publicly.

The Trump administration's preferred approach of bilateral deal-making is not making progress. Lee Hsien Loong, prime minister of Singapore, noted the flaw in the US approach during his visit to Washington in October. Speaking on the US belief that it can use its negotiating power to extract a better deal, he said, 'I think not that many partners will be keen to deal with you bilaterally.' US Commerce Secretary Wilbur Ross reminded partners in the UK of this earlier in November when he spoke of the need for Britain to align its trade and regulatory approaches with the US.

Beijing rolled out the red carpet for Trump's 'state visit-plus', and succeeded in postponing any meaningful discussion about bilateral trade. A purported $250bn of commercial deals were announced, but there was less on policy. Trump promised 'practical steps' to reduce the trade deficit, but there is little on the agenda. This may be sustainable as long as the North Korean issue requires co-operation, but probably not for much longer.

In spite of the president's generally positive remarks about China, strategic competition between the two countries is likely to increase. There are fundamental tensions between Beijing's deeply mercantilist 'Made in China 2025' plan and Western interests. Both China and the US seem increasingly unwilling to be constrained by the World Trade Organisation. This relationship will become much more difficult to manage.

At least for the moment, the consequential trade policy discussions in the Asia Pacific are happening without the US. The key platform was the meeting of TPP ministers at the Apec summit in Vietnam. The 11 countries involved agreed the central elements of a new iteration of

* This article first appeared in OMFIF Commentary on November 17, 2017.

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the TPP, which will be called the Comprehensive and Progressive Agreement for Trans-Pacific Partnership.

There is room, therefore, for some confidence. But there are real dangers. A worsening in the relationship between China and the US could quickly lead to problems for trade and the global economy. The spectre of military conflict – in North Korea and, increasingly, the Middle East – is another risk.

To date the global trading system has survived the abdication of the US. But more forward momentum is required.

IMI International Monetary Review

China

China Moves on Global Safety Net *

By DAVID MARSH*

China appears to be preparing for an increasing role in an expanded 'global safety net' to assist countries that run into balance of payments difficulties, in concert with the International Monetary Fund.

This policy line, which could gain momentum after the quinquennial Communist party congress that convened in Beijing in October, emphasises China's wish for a multilateral approach on the world stage in pronounced contrast to the unilateralism of the US administration under President Donald Trump.

The Chinese moves, which could include wider currency swap arrangements among central banks and other official financial institutions, form part of several years of manoeuvrings aimed at overcoming many countries' reluctance to seek financial help from the Fund. The stigma attached to IMF borrowing stems in large part from the bitter legacy of the Fund's Asia policies – widely criticised as over-harsh – during the Asian financial crisis in 1997-98.

By backing IMF-strengthening multilateral action while at the same time showing it can advance with its own initiatives if needed, China is following multiple aims. First, it wishes to build behind-the-scenes influence on international financial organisations. Second, it is keen to assure that potentially vulnerable emerging economies can withstand possible liquidity shortages flowing from higher US interest rates. Third, it wants to protect its own position as one of the world's largest creditors in case of payments difficulties among debtor countries troubled by US monetary 'normalisation'.

Fourth, Beijing aims to buttress the renminbi's international role without questioning the dollar's current primacy. Reinforcing a network of international swap arrangements under which renminbi can be exchanged for local currencies can serve the purpose of strengthening countries' reserve positions. It can also provide back-up renminbi liquidity needed in coming years to help settle foreign nations' trade, investment and capital market obligations denominated in the Chinese currency.

Fifth, China needs to adapt its planning to a possible sharpening of anti-Beijing action from the US in both trade and investment. Such moves, which would heighten fears of world protectionism, would reflect Washington's perception that China is gaining unfair advantages from international trading and financial arrangements. As well as castigating China's large bilateral surplus on US trade, Washington is intensely suspicious of China's policies on the Belt and Road initiative financing Eurasian trade and transport links, alleging that these discriminate against US companies and interests.

As another prime example, news emerged last week that the Trump administration is demanding the World Bank reconfigures lending to China as the condition for a capital rise. Washington claims China undercuts western policies and gains undue influence by using US-backed World Bank money to expand its own lending to diverse emerging market

* This article first appeared in OMFIF Commentary on October 19, 2017.

* David Marsh is Member of IMI International Committee and Chairman of OMFIF.

economies. Chinese officials reject the charge, saying it shows the US does not understand how the World Bank works.

In its overarching policies, China is demonstrating that it is pursuing a variety of compatible options. Washington habitually claims that China is trying to circumvent multilateral financial organisations by building alternatives outside the Bretton Woods institutions – the Fund and Bank set up at the seminal 1944 conference. Alongside its backing for the Beijing-domiciled Asian Infrastructure Investment Bank and the Shanghai-based New Development Bank – where the US has no shareholding in either bank – China wants to demonstrate that it is one of several countries trying to make the IMF more relevant in international finance.

The IMF executive board has been discussing for more than a year plans for a short-term liquidity facility through the Fund's own swap lines under which the organisation could provide hard currency back-up to reinforce countries' foreign exchange reserves in case of possible externally generated monetary shocks. The 'short-term liquidity swap' would be a more flexible credit line than the Fund's existing panoply of lending instruments and would aim to meet the needs of generally well-run countries facing continuous low-level liquidity pressures rather than sudden outflows for internal or external reasons.

Five key members of the Association of Southeast Asian Nations – Indonesia, Malaysia, the Philippines, Singapore and Thailand – have been targeted as potentially participating in the IMF swap arrangements. The relatively large number and the presence of well-off Singapore are intended to overcome debtor countries' reservations over stigmatisation.

Preparations for the swap line activation have been put on hold, partly because of a cooling of interest from both the US and Asean side. However, this could be revived for important symbolic reasons ahead of the next IMF-World Bank annual meeting, in Asia for the first time for six years, in Bali in October 2018.

Speaking in Washington at a G30 seminar at the close of this year's IMF-World Bank meetings, Zhou Xiaochuan, governor of the People's Bank of China, highlighted Beijing's role in international economic governance, although he said the domestic agenda took precedence. He termed renminbi swap agreements an unexpected outcome of the 2008 financial crisis. He added: 'China supports the further development of a global safety net. In our view, the global safety net may be more efficient than bilateral arrangements.'

IMI International Monetary Review

Early Fruits of Corporate Deleveraging Add to Growth Resilience*

By BETTY HUANG AND XIA LE*

Summary

The total debt level of China's corporate sector and its fast growth pace remain a great concern for investors. However, some firm-level indicators have shown early signals of improvement in the indebtedness of non-SOEs.

The diverging trend between the macro indicator (Credit-to-GDP ratio) and those firm-level indicators could lie in the fact that rampant shadow banking activities have lengthened the chain of financial intermediation and inflated the aggregate credit figure relative to GDP.

To reduce their leverage, Chinese listed firms, in particular non-SOEs, have been through a series of painful but imperative adjustments including (i) delay their investment, (ii) cut dividend payment to their shareholders and (iii) shed jobs on a large scale.

Looking ahead, the main battle field of China's corporate deleveraging will be among SOEs. The authorities are well aware of it and seeking to withdraw governments' implicit guarantees for SOEs as well as the clean-up of zombie companies. The deepening of deleveraging campaign should proceed with a broader SOE reform.

The early fruits of corporate deleveraging have reinforced our confidence in China's economic prospect as the strengthened balance sheets of firms, in particular non-SOEs, can effectively cushion the headwinds from external shocks and the downturn of domestic business cycle.

Nevertheless, there is a long way to cover before declaring a decisive victory of the deleveraging campaign. Complacency could slow the pace of deeper reforms and prolong the adjustment process. A highly uncertain macro-environment could make non-SOEs reluctant to re-leverage and thereby weigh on aggregate demand.

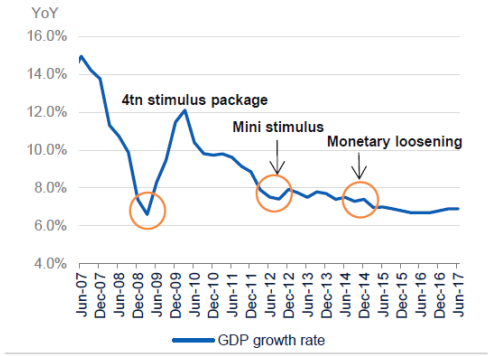
Indebtedness remains while some encouraging changes emerged at the firm-level

China's corporate debt has witnessed a rapid rise in the aftermath of 2008-2009 Global Financial Crisis (GFC) thanks to a series of stimulus packages enacted by the authorities to counter external shocks and sustain domestic growth. (Figure 1) The most unpalatable side effect of massive stimulus is that the Chinese economy has grown addicted to the credit-fuelled growth model. The total debt level of China's corporate sector, gauged by the total credit extended to non-financial corporates as percentage of GDP, stands as one of the highest among important economies. (Figure 2) Many investors worry that the country's corporate sector will eventually crash by the unbearable debt burden and hurl the entire economy to a serious debt crisis.

* This article appeared in BBVA Research China Ecnomic Watch on September 13, 2017.

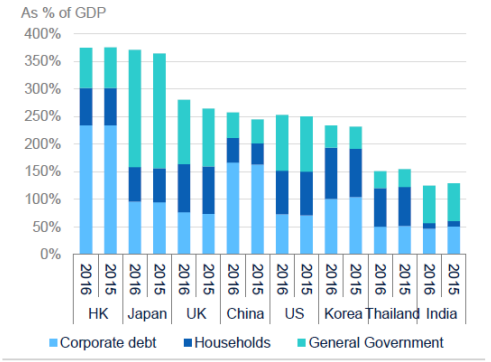
* Betty Huang, Economist, BBVA. Xia Le, Senior Research Fellow of IMI, Chief Economist for Asia, BBVA.

Figure 1 Stimulus packages in the aftermath of GFC



Source: Wind and BBVA Research

Figure 2 China has a high corporate debt level among peers



Source: BIS and BBVA Research

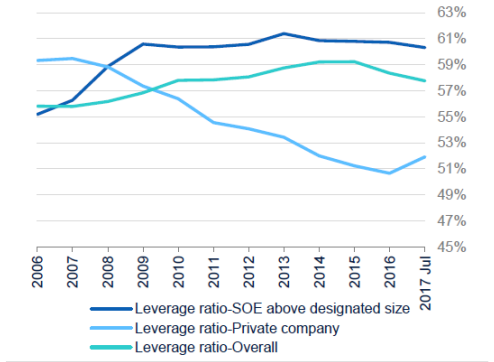
Encouragingly, some firm-level financial indicators have shown early signals of improvement in firms' debt problem in particular for those non-SOEs. For example, the leverage ratio of Chinese companies, which is defined as the ratio of firms' total liabilities to their total assets, has slightly declined since 2014. (Figure 3) Such a trend is even more pronounced for non-SOEs, which have been painstakingly lowering their leverage ratio over the past decade. It is only recently that non-SOEs started to raise the leverage ratio again in tandem with the strong economic recovery.

Similar evidence could be found on listed firms. Based on the information contained in their financial statements, we construct two indicators to measure their indebtedness. One is the ratio of Debt-to-EBITDA, which is a proxy of a firm's debt level relative to its cash flow. The other is the ratio of EBITDA-to-Interest Expense, which could measure a firm's capacity to service its interest-bearing debt. A natural threshold of this ratio is 1. A firm with its ratio of EBITDA-to-Interest Expense below that could have difficulty in servicing its debt.

We in particular distinguish listed SOEs and non-SOEs in calculating their ratios. (Figure 4) It is noted that the median of Debt-to-EBITDA ratio among all listed non-SOEs didn't change much over the past decade while the median of SOEs rose in 2016 from the previous year. Listed non-SOEs seemed to have a better record of limiting their debt level. More importantly, the share of listed firms with an EBITDA-to-Interest Expense ratio below 1 decreased in 2016, for both SOEs and non-SOEs, pointing to a general improvement in listed firms' capacity of debt servicing.

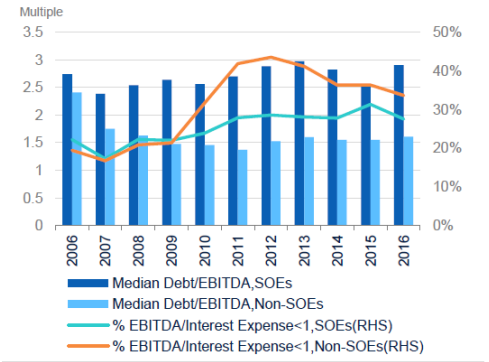
Before drawing any conclusion from the above evidence, we need to understand the discrepancy between the macro indicator (Credit-to-GDP ratio) and those firm-level indicators. We suspect that the rampant shadow banking activities have led to a bifurcating trend between macro and firm-level indicators. As detailed in our thematic note "Taming China's shadow banking", the shadow banking sector has significantly lengthened the chain of financial intermediation between the depositors and final fund users. A loan could pass through the hands of several middlemen before it reached its final user. As a consequence, the aggregate credit figure is inflated relative to GDP.

Figure 3 Diverging leverage ratio between SOEs and non-SOEs



Source: NBS and BBVA Research

Figure 4 Listed firms' capacity of debt servicing seems to have improved

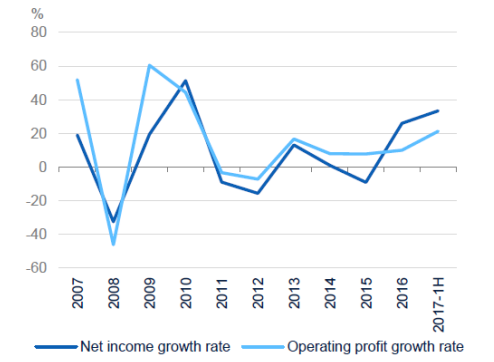


Source: Wind and BBVA Research

How have Chinese firms managed to reduce their leverage?

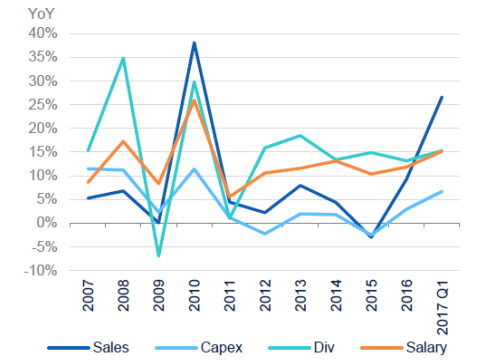
Some people attribute the lower leverage ratio to the authorities' recent supply-side reform, which is featured by the government-led elimination of overcapacity in some sectors such as iron & steel as well as coal, and its resultant profit pickup of firms (Figure 5). Indeed, non-SOEs' own efforts to correcting their debt problem started long before the current wave of profit pickup and their influence is much broader in terms of sector coverage. In our last year's note "Private Investment Slowdown Marks the Start of China's Long-awaited Deleveraging" we point out that a firm has to go through painful but necessary adjustment if it wants to reduce overburdened debt and restore financial healthiness. These painful efforts include (i) delay their investment, (ii) cut dividend payment to their shareholders and (iii) shed jobs on a large scale. China's listed firms have been through all these. (Figure 6)

Figure 5 Firms' Profits are rebounding



Source: Wind and BBVA Research

Figure 6 Firms' painful deleveraging adjustments



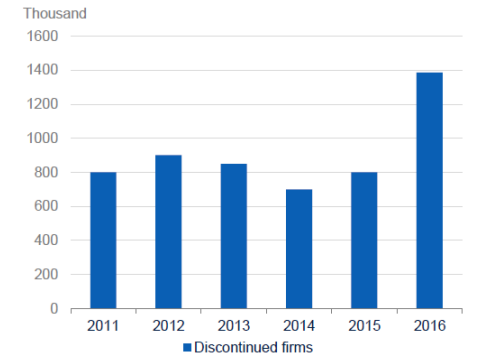
Source: NBS and BBVA Research

Apparently, not every firm is able to survive through such a process, which has led to an increasing number of liquidation cases of non-SOEs over the past several years. (Figure 7) To a certain degree, it also contributes to the deleveraging of the corporate sector as liquidation could eliminate "bad" debt in the economy.

There are other approaches to facilitate firms' deleveraging. For those listed firms, their efforts of deleveraging can also benefit from additional capital replenishment. (Figure 8) The

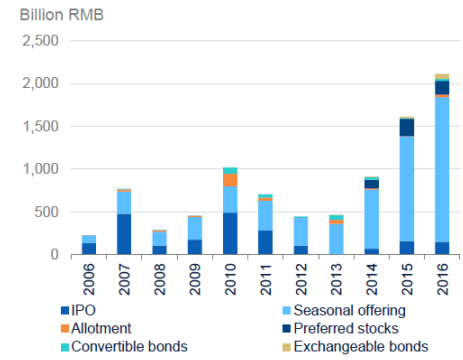
authorities also introduced the bond-to-equity swap (DES) program in 2016 to alleviate debt burden of distressed SOEs. However the size of this program (to date RMB 776 billion) and its influence remain limited thus far.

Figure 7 Liquidation cases are on the rise



Source: SAIC and BBVA Research

Figure 8 Equity issuance contributes to the deleveraging



Source: Wind and BBVA Research

The battle field for corporate deleveraging is among SOEs

Despite the relatively better performance of non-SOEs in reducing their leverage, the leverage of SOEs remains at a worrying high level. On average, the leverage of SOEs exceeds 60%, approximately 10 ppts higher than their non-SOE peers. We also find that the average leverage ratio of an industry tends to have a positive relation with the proportion of government ownership in the industry.

The high debt level of SOEs stems from the "soft budget" problem. It was prevalent in many emerging economies where the government plays a pivotal role in economic development and favours national champions. Many Chinese SOEs, although suffering losses over consecutive years, are still able to borrow from banks or the shadow banking sector thanks to the implicit guarantees provided by the central or local governments. As a consequence, many SOEs have become typical zombie companies which maintain unproductive operations by snowballing colossal debt that can no longer be paid.

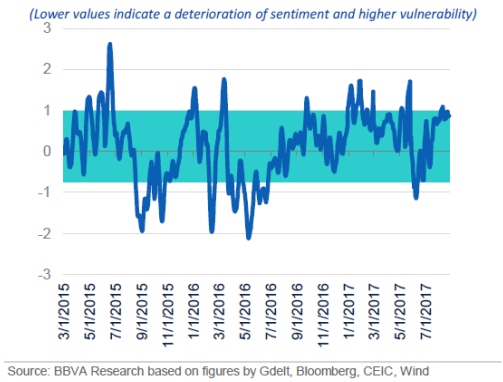
The authorities have become aware of the adverse consequence of the "soft budget" and set out to address it. In 2016, the government successfully cleaned up 4,977 zombie companies, involving total assets of RMB 412 billion. More importantly, at the once-in-five-year national financial working conference, President Xi Jinping pledged to put the task of deleveraging SOEs on the top of its reform agenda along with tackling China's shadow banking sector.

Looking ahead, the authorities are likely to reduce SOEs' leverage by gradually withdrawing the implicit guarantees for them and eliminating zombie companies. Regarding large-size SOEs, the authorities prefer pushing forward more M&As between SOEs to directly liquidating them on concerns of causing massive unemployment. Such a process should proceed with the overall SOE reforms which aim to improve their corporate governance and enhance their efficiency. The authorities might have not been ready to press ahead with massive privatization program yet. Instead, the authorities plan to diversify the ownership of SOEs by introducing private minor investors, namely "mixed ownership reform". Such efforts could help to further reduce the leverage ratio of these SOEs as new investors will inject capital into these target SOEs.

Moreover, the on-going efforts to curb shadow banking activities will be crucial to containing SOEs' leverage in terms of cutting off funding channels in grey areas. As far as we know, the shadow banking sector has become one of important funding channels to zombie SOEs since

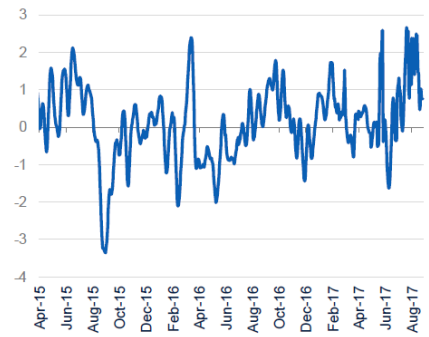
their asset quality has made most of banks' reluctance to lend even with governments guarantees. The authorities have indicated that the monetary prudence and regulatory tightening will remain in place until the shadow banking activities are being tamed. In this respect, the authorities' efforts have already born some early fruits as evidenced by the improved market sentiments towards China's vulnerabilities. (The methods of constructing these indicators are inour working paper: "Tracking Chinese Vulnerability in Real Time Using Big Data")

Figure 9. China Vulnerability Sentiment Index (CVSI)



Source: BBVA Research based on figures by Gdelt, Bloomberg, CEIC, Wind

Figure 10. SOE Vulnerability Index



Source: BBVA Research based on figures by Gdelt, Bloomberg, CEIC, Wind

Implications for China's growth

The progress of corporate deleveraging has important implications for China's growth. As shown in the previous section, the deleveraging of non-SOEs seems to come to a halt after several years of painful balance sheet adjustment. In the first half of the year, some non-SOEs even intentionally increase their leverage in a bid to increase investment and expand their production. In the meantime, although the deleveraging of SOEs significantly lags behind their non-SOEs peers, the authorities are now gearing up to accelerate this process as their policy priority has shifted to maintain financial stability.

All in all, the progress of corporate deleveraging has reinforced our confidence in China's economic outlook. It partially explained why the on-going economic recovery in China has showed better-than-expected strength and sustainability. Although the combination of regulatory tightening and monetary prudence is set to moderate the economy in the coming months, the relative healthy situation of firms' balance sheets, in particular for non-SOEs, will make the economy more resilient to the cyclical adjustment and external shocks. It also helps to diminish the tail risk of hard-landing and provide more policy room for the authorities to push ahead important structural reforms.

Such a benign scenario is subject to two caveats. First, complacency could sow the seeds of failure. Some early success could make the authorities slow their pace and even avoid painful but necessary reforms. As such, the process of deleveraging and reforming SOEs could be adversely postponed. Second, if non-SOEs don't have confidence in long-term growth prospect, the deleveraging process among non-SOEs could prompt them to increase their cash hoarding while avoid making new investments. (Figure 11 and 12) As such, the economy could fall into a trap of "balance sheet recession", in which even firms with good profitability decline to expand their production capacity while using their proceeds to pay off their debt. Collectively, such behaviour could lead to diminished investment demand and years of economic sluggishness as we have seen in the past two decades in Japan.

Financial Opening in China Inevitable *

By ELLIOT HENTOV*

Some market watchers believe the renminbi's slowing internationalisation trend of the last 12 months reflects the Chinese government's unwillingness to relinquish control to market forces. They argue greater currency liberalisation is unlikely to materialise. But doubts about the inevitability of China's financial opening ignore long-term forces.

Many governments can withstand controls on capital account flows because they do not lead to obvious costs. However, China is a net creditor to the rest of the world, which should produce higher net income. In China's case the costs to its domestic economy ensue not so much because of capital controls, but because the funds it channels abroad are invested suboptimally. The former reflects the disproportionate share of low-yielding foreign reserves as a share of foreign assets. The latter is explained by the cheap lending practices of Chinese state-owned companies. These policy choices lead to high national costs, which would be lower if Beijing were to allow partial liberalisation of the capital account and promoted the renminbi as an international currency.

Over the last 12 months, a substantial portion of foreign reserves has been converted into foreign assets of Chinese banks and corporations, which should raise investment income in the future. Similarly, if China wishes to project geopolitical power through its lending capacity, its ability would be enhanced by adopting the renminbi for these operations, rather than foreign currencies.

The renminbi's inclusion in the International Monetary Fund's special drawing right, the Fund's composite currency unit, strengthened its reserve currency status. But China can enjoy neither the tangible financial nor geopolitical benefits without increased convertibility and internationalisation of the renminbi.

Another macrofinancial cost to China's capital account policies is the domestic effect of financial repression. As most financial products will offer only a zero-real rate of return and investment abroad is not permitted on a large scale, Chinese savers stock up unduly with domestic assets. This invariably creates financial bubbles. Problems in parts of China's property markets, the equity market in 2015 and the flourishing of wealth management products are examples of the risks that can stem from these financial imbalances.

In response, in July the Beijing national financial work conference endorsed a tighter regulatory and institutional approach to containing financial risks. Such measures are welcome and necessary in the short term. Loosening the capital account to permit the greater influence of market forces would be a complementary long-term step. This would help remove some of the excess savings from China's financial markets.

The inefficiencies of credit allocation raise further problems. A state-owned banking system combined with the political economy of local governments generates an institutional bias towards channelling credit to state-owned enterprises. This leads to declining overall productivity, as state-owned businesses are less productive than the private sector, weakening long-term growth.

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* This article appeared in OMFIF Commentary on October 3, 2017.

* Elliot Hentov is Head of Policy & Research, Official Institutions Group, at State Street Global Advisors, and a Member of the OMFIF Advisory Board.

The entry of foreign capital would help alleviate this problem by compelling state-owned enterprises to compete more fairly for credit and allocate funds more efficiently. This would reduce China's overhang of industrial capacity, and would probably accelerate state-owned enterprise reform. Likewise, capital account liberalisation would promote faster growth in services at the expense of manufacturing. These trends would help rebalance the economy away from state-directed manufacturing enterprises, and lower the investment rate and the size of export capacity. This would lower the current account surplus over the longer-term.

Excess savings pose systemic risks to China's domestic financial system. Such circumstances are unsustainable. Since imbalances grow year by year, further market opening will, inevitably, proceed sooner rather than later. The internationalisation of the renminbi may have stalled over the last 12 months, but the long-term trajectory shows it taking its rightful place as a major global currency.

View from the Peak*

By HONG HAO*

Summary

A year of liquidity constraints: 2018 will be another year of coping with liquidity constraints for the Chinese traders. Shadow banking growth is curtailed, and the new regulations are targeted at the stock of off-balance-sheet leverage that has been accumulating with increasing layers of complexity to evade regulatory supervision and capital requirements in the past few years. Some small/mid-sized banks' off-balance-sheet asset size has grown to equal that on balance sheet.

As off-balance-sheet deleveraging proceeds, credit growth will continue to decelerate, and market interest rates will stay elevated. Meanwhile, corresponding assets will have to be liquidated. As such, it is still difficult to see a raging bull market ahead.

Shanghai tepid, with bouts of volatility: Indeed, our bond yield vs. earnings yield model (EYBY model), with an excellent track record of forecasting the general market trends for the past few years, suggests a likely trading range for the Shanghai Composite for the next twelve months to be between 2,800 and 3,900, with a median level of just above 3,200 – similar to the trading range in 2017. Further, our model suggests that roughly more than half of the time in 2018 the composite will be trading at below its current level of ~3,300. In short, the market will be tepid in 2018, with bouts of brief volatility surges due to changes in liquidity conditions.

Structural opportunities in small caps: Given the liquidity constraints, structural opportunities in small caps will emerge. Large caps have run hard in 2017, and their relative outperformance is approaching extreme. As inflation pressure builds in the coming months and credit growth weakens, bonds will stay cheap till around 1Q2018. Large caps, with their steady bond-like earnings but increasingly expensive valuation, have started to lose its appeal, especially relative to bonds.

The rotation from large caps back to small caps will zigzag - before the trend becomes apparent for most. Some large caps will continue to perform, but the strength will unlikely be ubiquitous. With the time lag in reflecting the changes in growth and inflation, bonds, stocks and commodities will each see "small bears" at various stages during 2018.

A measured slowdown: In the near term, China's three-year economic cycle, as well as the concurrent cycles in earnings, estimates and commodities, will continue to weaken. This is consistent with a potential technical rotation into some late-cycle cyclical sectors such as materials and energy in the near term, before the baton of market leadership will be passed onto defensive sectors such as staples, healthcare and utilities. And the strength in the late-cycle sectors during the technical rotation can make many misconstrue that growth is reborn.

With the economic growth less reliant on property but more on consumption, the slowdown will likely be measured, with bullish consensus gradually coming to terms with reality. China's supply-side reform and property de-stocking have unambiguously contributed to the subsequent global upswing since late 2015. The downturn in China's economic cycle will once again be felt by the world, albeit more benign than feared. (For long term views, please see our recent special

* This article appeared in the author's WeChat public account (ID: Honghaochinastrategy) on December 4, 2017.

* Hong Hao, Senior Research Fellow of IMI, Managing Director and Head of Research, BOCOM International

report "Decoding Disinflation: Principal Contradiction, Social Progress and Market Fragility" on November 14, 2017)

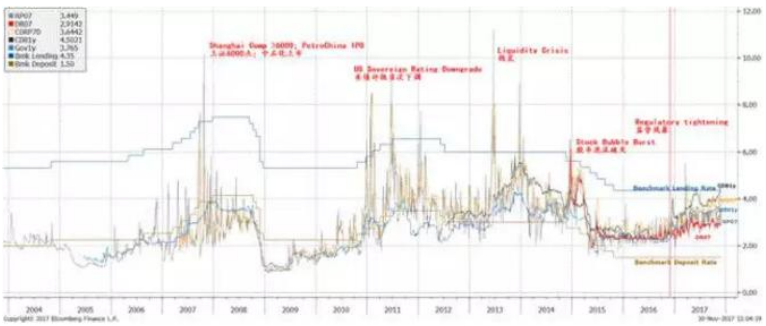
New highs outside mainland China; potential dichotomy of market before and after 1Q2018: As China deleverages delicately, global central banks appear ready to hike rates. For now, the market considers this a confirmation of the strength in the current cycle. While the jury is still out, the bullish technical setup in global markets outside Shanghai hints at further new highs ahead. Near term, market sentiment is extremely buoyant, and is susceptible to downside volatility. The market before the first quarter of 2018 can be very different from the rest of the year. There is likely to be a dichotomy in market performance before and after.

China's Shadow Banking Growth Curtailed.

China's interest rate surge induces cross-asset volatility. Just as the world is content with widely-suppressed volatility, the Chinese bond market and commodity futures are roiled with epic volatility. Chinese stocks have also taken a hit, with China's beloved "Nifty-Fifty" stocks suffering the worst single-day plunge in more than a year. In recent years, such changes in volatility tend to occur whenever the funding costs in the country's financial industry surge, induced by regulatory changes.

And Chinese financial market volatility tends to lead that of the global markets by up to one year, just as it presaged the volatility surge spurred by Brexit in June 2016 - one year after the 2015 bubble burst (please see our report "The Great China Bubble: Anniversary Lessons and Outlook" on June 15, 2016).

Exhibit 1: Funding costs surging after new regulation proposed for the asset management industry



Source: Bloomberg, BOCOM Int'l

The liquidity crisis in June 2013 was induced by tightening regulations regarding non-standard credit assets (NCAs hereafter; please see our report just before the liquidity crisis "Auguries of Turbulence" on June 10, 2013). The surge in funding costs during the stock bubble collapse in June 2015 was spurred by the deleveraging policies targeted at margin loans, umbrella trusts and stock index futures (please see our report prior to the collapse "The Great China Bubble: Lessons from 800 Years of History" on June 16, 2015).

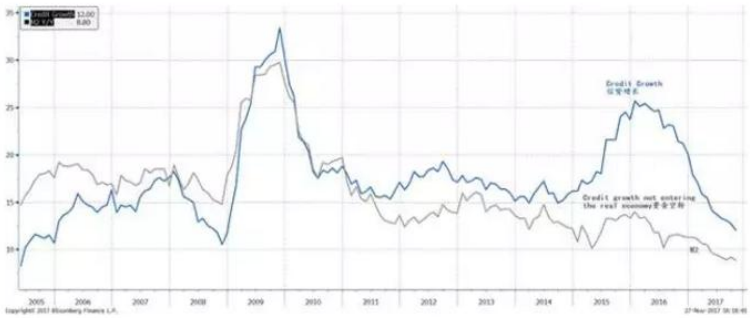
Besides funding shortage induced by tightening regulation, the PetroChina IPO frenzy in October 2007 drained RMB3.3tn of liquidity through IPO deposits. And the downgrade of US sovereign rating in August 2011 triggered interest rates soaring simultaneously across the world (**Exhibit 1**). The Chinese interest rates were not spared.

Curbs on China's shadow banks is balance-sheet deleverage. Since late 2016 when the macro prudential assessment (MPA) framework was first proposed, funding costs across the board began to rise, as evidenced in the rises in both levels and volatility across key benchmark interest rates such as DR07, RP07, as well as the yields of corporate bonds, government bonds and CDB bonds. During the recent surge, the CDB bond yield has for the first time surpassed the benchmark lending rate, suggesting some financial institutions funding costs have in nominal terms exceeded their interest income (**Exhibit 1**).

The various episodes of interest rate surge represent the authorities' efforts to regulate banks' activities off-balance-sheet. After all, there are tight restrictions on capital reserve requirements and various ratio requirements to meet for banks to lend. But each time, banks, especially smaller ones, have managed to skirt the regulations by increasing layers of complexity, by such means as wealth management products (WMPs), interbank certificate of deposits, passageway investments and entrusted investments. These structures hide off-balance-sheet leverage further and further away from the authorities.

In an effort to stabilize the market after the bubble burst in 2015, the PBoC managed to keep market interest rates steady. While stock market volatility finally subsided, low and stable interest rates have been conducive to adding leverage (**Exhibit 1**). Consequently, for some small/medium-sized banks, the off-balance-sheet items have grown to equal those on balance sheet, and increasingly represent systemic risks and regulatory challenges.

Exhibit 2: Domestic credit growth slowing, converging with M2; Shadow banking is curbed



Source: Bloomberg, BOCOM Int'l

As regulations tighten on shadow banks, China's credit growth has plunged and started to converge with M2 growth since 2016. Such developments suggest the growth in the size of shadow banks has been curtailed (**Exhibit 2**). The new regulations are now targeting the stock of off-balance-sheet credits.

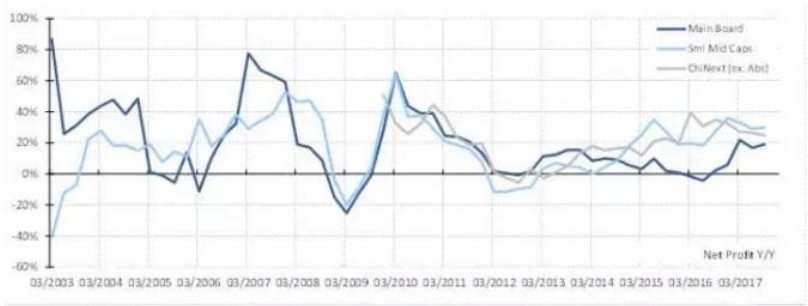
As credit growth slows, its drag on economic growth will gradually emerge, as suggested by recent softening economic data. And the reduction in off-balance-sheet leverage will inevitably induce forced sales of some of the corresponding underlying assets, pressuring both bond and equity prices. The recent epic surge in bond yields offers a glimpse of what looms. We have until June 2019 to clean up. The effects of tightening regulations will be more apparent in the coming 18 months.

Rotation from Large to Small Caps

Large has outperformed small in 2017. One of our key calls throughout 2017 has been buying large caps while avoiding smaller caps. Our logic is that during the mid- to late-stage economic expansion, large caps tend to outperform, as they have steady earnings growth and more reasonable valuation relative to small caps. Indeed, the earnings growth of large caps on the main board has recovered faster than that of small caps and the ChiNext, mostly driven by the strength in large upstream commodity producers (**Exhibit 3**).

This call has worked well in 2017, with large caps outperforming small caps in China, Hong Kong and in the US. And the HSI and HSCEI, dominated by large caps, are among the best-performing major stock indices globally.

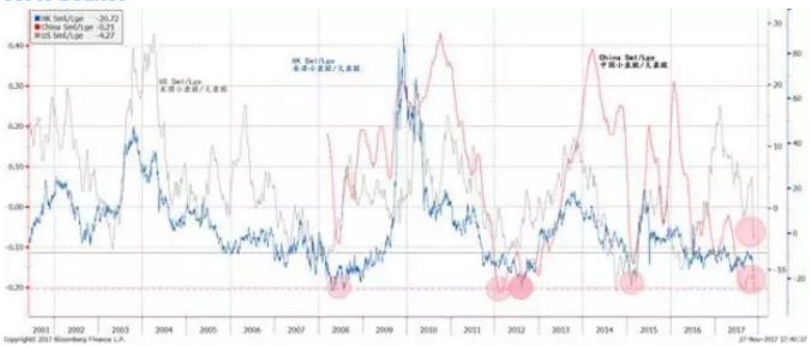
Exhibit 3: Earnings recovery on the main board has been faster than that of small/mid caps and ChiNext. But the relative improvement has started to stall.



Source: Bloomberg, BOCOM Int'l

Large caps' relative return is approaching extreme. As large has been beating small throughout 2017 globally, large caps' relative strength is now stretched into extremes in China and Hong Kong, while rapidly approaching extreme in the US market. Small caps' relative underperformance in China is similar to the level that initiated the bull market in small caps in 2012 (**Exhibit 4**).

Exhibit 4: Large caps' relative outperformance reaching extreme globally; small caps set to bounce

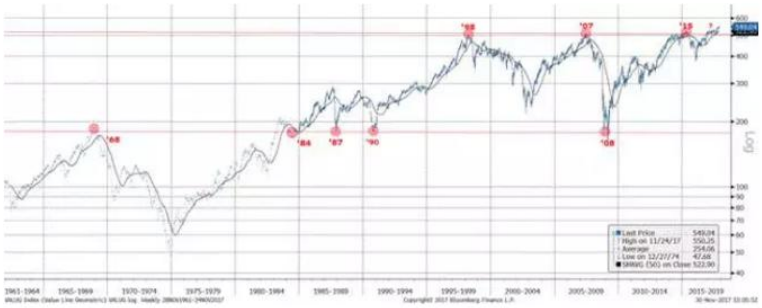


Source: Bloomberg, Federal Reserve, BLS, BEA, BOCOM Int'l

Meanwhile, the index of an equal-weighted portfolio in the US is breaking into new highs for over five decades. Such a phenomenon suggests that smaller caps have started to perform (**Exhibit 5**). Together with the large caps, they are propelling the US indices to new highs.

While recent US economic releases have been strong, it is bewildering that such broad-based market strength is emerging at a late stage of economic expansion. Besides the current strength in the US economy, the market appears to be very optimistic on Trump's tax reform. If such price momentum persists, it will push markets even further to new highs.

Exhibit 5: Equal-weighted broad market index breaks new high, suggesting strengthening small caps

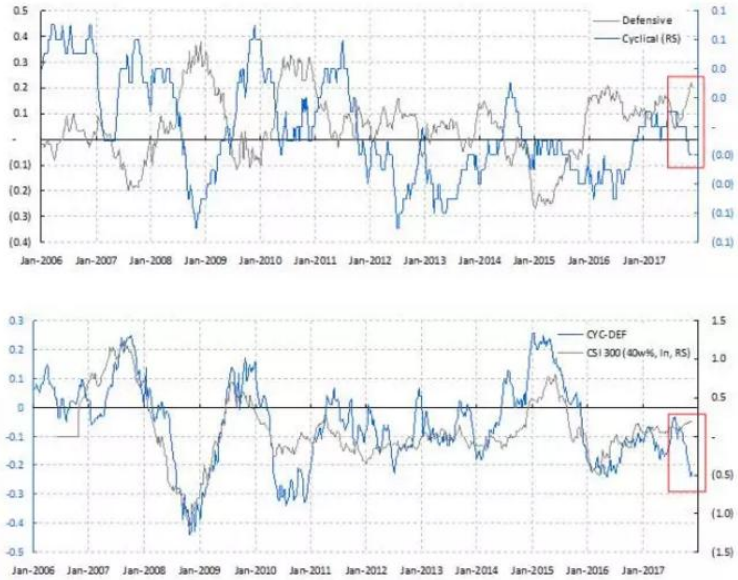


Source: Bloomberg, BOCOM Int'l

Late Cycle and Technical Cyclical Rotation

Technical cyclical rotation is set to begin. Meanwhile, our cyclical defensive sector rotation model is showing defensive sectors have been outperforming cyclicals recently. The magnitude of defensive sectors' relative performance suggests a technical sector rotation from defensive to cyclical ones in the short term. And the current underperformance of the cyclicals suggests caution in the near term (**Exhibit 6**).

Exhibit 6: Growth moves into late cycle; Late cyclicals, such as energy and materials, set to outperform



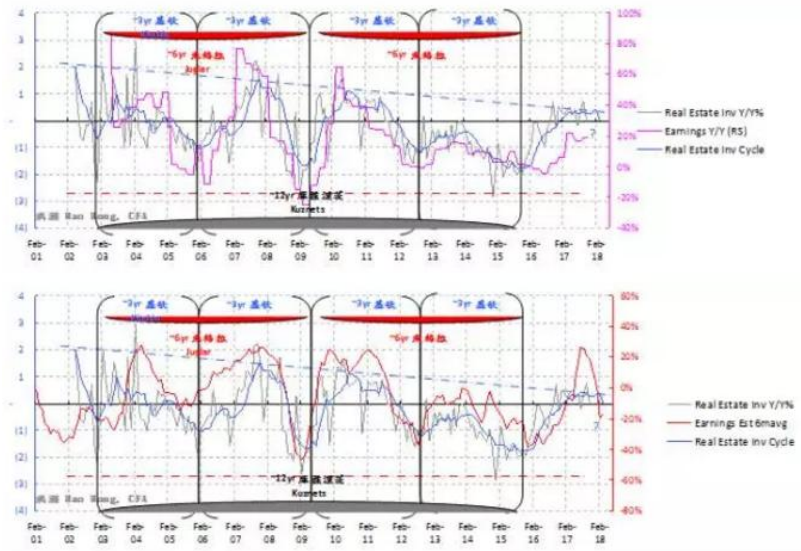
Source: Bloomberg, BOCOM Int'l

Note: Cyclicals are equal-weighted industrials, materials, energy, consumer discretionary and financials; Defensives are healthcare, utilities and consumer staples

China's three-year economic cycle is waning. In our report titled "A Definitive Guide to China's Economic Cycles" (I and II, on March 24 and August 28, 2017), we demonstrated the relatively regular three-year cycle inherent in China's economy. This economic cycle is driven by the property inventory investment cycle, which tends to take three years from land auction to completion for delivery.

This cycle is consistent with the Kitchin inventory cycle – the shortest variation of economic cycles. We then applied this three-year cycle to explain the variance in basically all key Chinese economic variables, such as economic growth, money supply, bond and commodity prices and stock markets, etc. We demonstrated that all these key variables show three-year cyclicality consistent with our theory of China's economic cycle.

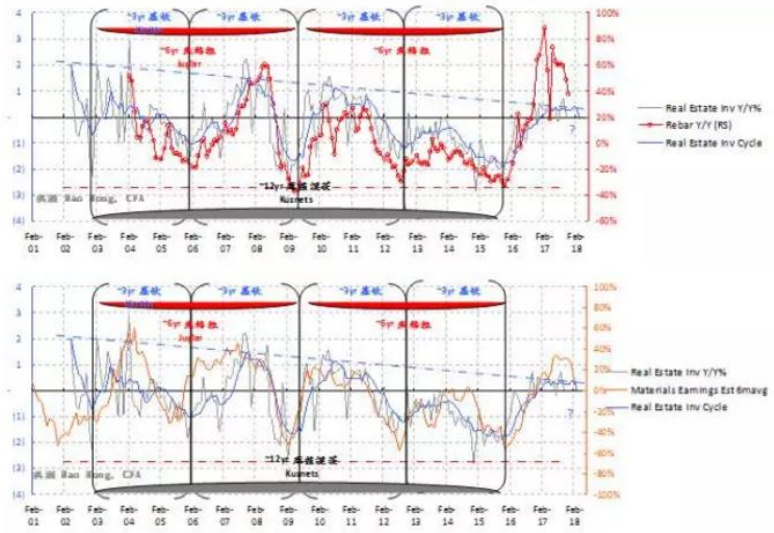
Exhibit 7: The earning cycle is waning, so are earnings estimates



Source: Bloomberg, Factset, NBS, BOCOM Int'l

The concurrent three-year cycle in earnings and earnings estimates is turning, too. In this report, we again apply our three-year cycle to Chinese market's earnings growth, changes in earnings estimates, the earnings estimates of materials and the price of rebar. Unsurprisingly, we find regular three-year cyclicality in these important economic variables. More importantly, our economic cycle model shows that the momentum in all these variables has turned, and is about to wane (**Exhibits 7** and **8**).

Exhibit 8: Materials earnings growth and rebar price momentum are waning

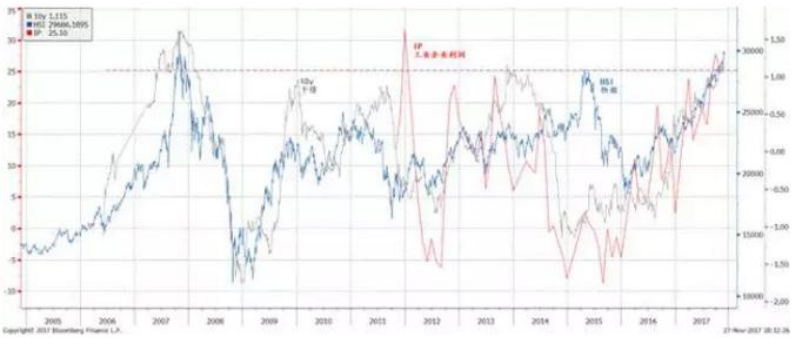


Source: Bloomberg, NBS, BOCOM Int'l

That is, the Chinese economy is at its late stage of expansion, and growth is about to moderate. Depending on the conditions of credit growth, the growth deceleration can be more severe than expected. But the deceleration can also be more benign than feared, as now China's economy is less reliant on the property sector, and consumption has contributed more than half of the country's GDP growth in recent quarters.

Recent economic releases are showing sequentially-weaker money supply and credit growth, property investment growth and industrial profit growth, among the others (**Exhibit 9**). And the fading momentum in the current economic cycle will likely become more apparent in the coming months. So far, it has been an orderly slowdown.

Exhibit 9: China's industrial profit growth will soon wane, as the economic cycle slows



Source: Bloomberg, BOCOM Int'l

Late cyclicals' strength is likely to be brief. Given the looming change of gears in economic growth, although a technical rotation from defensive names to cyclicals is likely in the near term, such rotation will likely be transient. More importantly, the underperformance of cyclicals indeed is hinting at near-term market vulnerability (**Exhibit 6**), which is unfolding as we write.

The potential technical strength in cyclicals is coming from late cyclicals such as energy and materials, consistent with the observation of late-stage expansion.

If so, defensive sectors such as utilities, healthcare and consumer staples will likely outperform, after the technical strength in late cyclicals exhausts – probably during the first quarter of 2018. The decelerating Chinese property investment cycle aforementioned, and our cycle of investment return in the US that historically correlated with cyclicals' relative performance (**Exhibit 10**), are also hinting that late cyclical strength is likely to be brief.

Exhibit 10: The US history of investment return also suggests that strength in late cyclicals won't last.

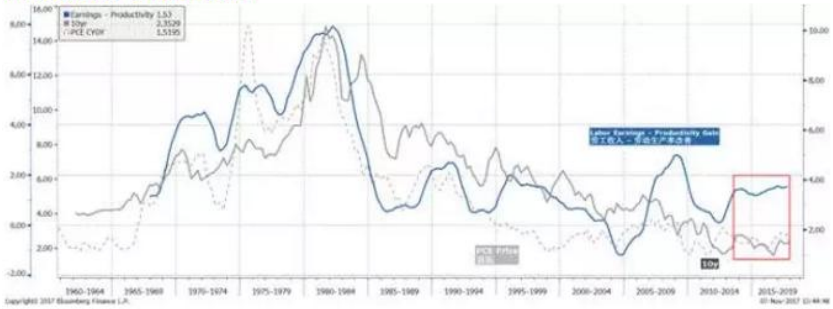
Source: Bloomberg, Federal Reserve, BLS, BEA, BOCOM Int'l

Note: Blue-shaded areas are US recessionary periods.

Monetary Policy Outlook

The ten-year yield is a history of surplus value exploitation. In our special report titled "A Price Revolution: On Global Asset Allocation" on November14, 2016, we postulated that inadequate labor compensation relative to productivity gain, or the exploitation of labor's surplus value, has been depressing inflation and hence bond yields for over three decades (**Exhibit 11**). It has been the driver for the secular bond bull market.

Exhibit 11: The 10-year is a history of surplus value exploitation; productivity gain inadequately compensated



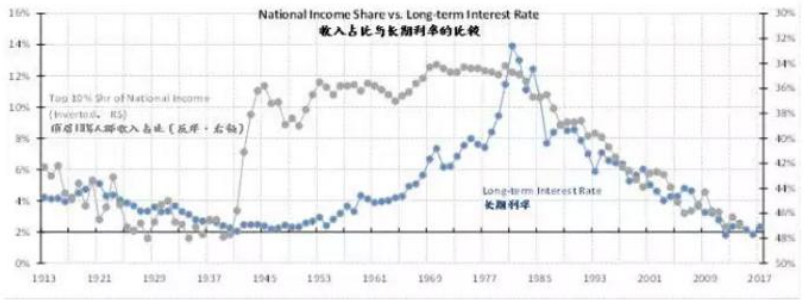
Source: Bloomberg, Federal Reserve, BLS, BEA, BOCOM Int'l

The fact that bonds have substantially outperformed equities for the same period suggests that capitalists at the top of the value chain have taken it all, exploiting both business owners who borrow start-up capital, and business employees. The falling inflation and bond yield for over

thirty years say much about the relationship of production, and how gains have been unevenly accrued to different socioeconomic groups.

The secret of disinflation. In our recent special report (reprinted in this volume) titled "Decoding Disinflation: Principal Contradiction, Social Progress and Market Fragility" (November 14, 2017), we study an economy where the bottom 90% splits the national income evenly with the top 10%, and income gain perennially lags productivity gain for the bottom 90%. Such an economy must be in constant surplus, as slow income gain would fail to spur sufficient demand for supply driven by rapid productivity improvement. Consequently, prices will be depressed. As such, severe and worsening inequality is the reason why the global economy is still beset by the constant threat of deflation almost ten years into recovery.

Exhibit 12: Income gain accrued more towards top earners, further depressing wage gain relative to productivity



Source: Bloomberg, Federal Reserve, Thomas Piketty, Gabriel Zucman, NBER, BOCOM Int'l

Note: Long-term yield for recent years estimated from annual average of US long-term treasury yield.

Inflationary pressure is rising, but inequality is likely to keep such pressure checked: While wage gain has started to outpace productivity gain since 2014, and inflation has crept up (**Exhibit 11**), aggravated inequality has worked to slow the momentum of inflation, giving central bankers leeway to experiment with quantitative easing up (**Exhibit 12**). Such disinflation and lax monetary policy have made wealth even more concentrated than income, and in turn made market more prone to bubble and economies vulnerable to small changes in interest rates.

2018 will see global central banks raising their interest rates. Money supply growth in Hong Kong, an economy that is sensitive to external environment, has started to turn, while the market and sentiment continue to soar (**Exhibit 13**).

Exhibit 13: HK M2 and overseas retail sentiment, historically highly correlated with HSI, have started to turn

Source: Bloomberg, BOCOM Int'l

Inequality in the US is now similar to the level seen just before the two wars and the Great Depression (**Exhibit 12**). It would appear that dramatic social disruption is looming on the horizon, if history is a guide. But inequality had remained high and steady for a long period before these catastrophic happenings. Without a proactive initiation of social system reform, inequality can stay in this status quo for some time still.

Market Outlook

Bond yields should calm down around 1Q2018; the Shanghai Composite continues to be stuck in a range. Our bond yield vs. earnings yield model (EYBY model hereafter) has helped us pinpoint the bottom of China's stock market after mid-2014, as well as the peak of the bubble in June 2015. The model has also helped us negotiate the rough waters after the bubble burst.

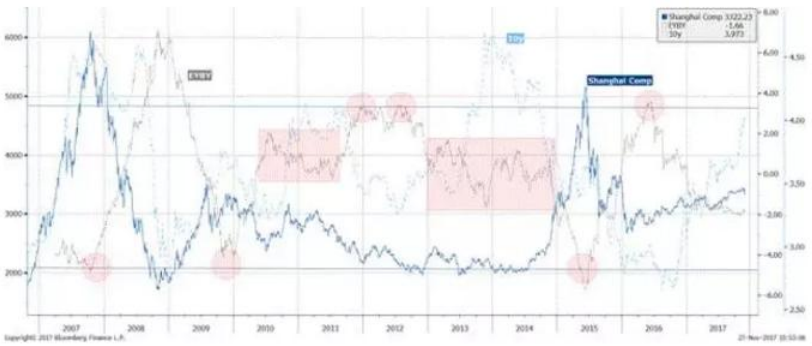
In December 2014 when we were preparing the 2015 outlook, the model forecasted that a market bubble was looming, but the year of 2015 should finish at not much higher than 3,400. The Shanghai Composite finished at ~3,300 one trading day after the last trading day in 2015; in December 2015 when we were preparing the 2016 outlook, the model forecasted that the trading range for 2016 should be 2500-3300, versus the final actual range of 2638 – 3301; in December 2016 when we prepared for the 2017 outlook, the model forecasted in 2017 the Shanghai Composite should spend at least eight months below 3,300. And the composite didn't first close above 3,300 until August 25 – slightly more than eight months after our original forecast in early December 2016.

In the longer term, our EYBY model continues to show the value of equities relative to bonds since June 2016 (**Exhibit 14**). As equities' relative value continues to improve beyond the short term, the trend of rotation from bonds to stocks should persist – till this trend exhausts after it has reached the extreme defined by the lower bound in **Exhibit 14**.

The pace of how fast equity valuation can expand relative to the rise in bond yield determines how far the stock indices can rise, as funds rotate from bonds to equities. As liquidity conditions should tighten on the margin, bond yield should rise first towards its historical highs before declining – probably in 1Q18.

If so, the market will increasingly unlikely ascribe a higher valuation multiple to each unit of earnings. But as inflation continues to tick up, nominal earnings should continue to grow into the late economic cycle, and should somewhat compensate the pressure on valuation from rising bond yields and create structural opportunities in some segments of the market, but not overall.

Exhibit 14: Rotation will continue from bonds to stocks, as bond yield surges higher



Source: Bloomberg, BOCOM Int'l

Shanghai will likely trade between 2,800 and 3,900; median just >3,200 in the next 12 months. That said, our further sensitivity analysis suggests that the likely trading range for the Shanghai Composite in the next twelve months according to our forecast will be 2,800 to 3,900, with a core trading level of just above 3,200. Moreover, the sensitivity analysis suggests that the win ratio for the composite to trade above its current level of 3,300 is only ~40%.

This new trading range for the next twelve months is not significantly different from the range that we forecasted for the Shanghai Composite to be trading in 2017, which is eight months below 3,300 (win ratio of 33%) and a core trading level of 3,300. Such model forecast results suggest again a tepid market in the next twelve months. These results are once again contrary to the current bullish consensus.

Given the declining liquidity on the margin, 2018 will once again prove to be a structurally diverging market, and traders will once again have to work within the constraints of limited liquidity. Contrary to the experiences in 2017, small caps will likely be back in favor. And selective large caps should continue to do well, but the difficulty of picking the right stocks within this group will be increasing.

Exhibit 15: Next twelve months' potential trading range = 2,800 to 3,900, median>3,200; slightly skewed to the downside

	1.40%	1.20%	1.00%	0.80%	0.60%	0.40%	0.20%	0.00%	-0.20%	-0.40%	-0.60%
3.00%	3.091	3.168	3.254	3.408	3.542	3.687	3.844	4.015	4.203	4.408	4.635
3.05%	3.035	3.141	3.254	3.376	3.507	3.649	3.804	3.971	4.154	4.355	4.576
3.10%	3.010	3.114	3.225	3.346	3.474	3.613	3.764	3.928	4.107	4.303	4.519
3.15%	2.985	3.087	3.196	3.314	3.440	3.577	3.725	3.886	4.061	4.253	4.463
3.20%	2.960	3.061	3.168	3.284	3.408	3.542	3.687	3.844	4.015	4.203	4.406
3.25%	2.936	3.035	3.141	3.254	3.376	3.507	3.649	3.804	3.971	4.154	4.355
3.30%	2.912	3.010	3.114	3.225	3.346	3.474	3.613	3.764	3.928	4.107	4.303
3.35%	2.889	2.985	3.087	3.196	3.314	3.440	3.577	3.725	3.886	4.061	4.252
3.40%	2.866	2.960	3.061	3.168	3.284	3.408	3.542	3.687	3.844	4.015	4.203
3.45%	2.843	2.936	3.035	3.141	3.254	3.376	3.507	3.649	3.804	3.971	4.154
3.50%	2.821	2.912	3.010	3.114	3.225	3.345	3.474	3.613	3.764	3.928	4.107
3.55%	2.799	2.889	2.985	3.087	3.196	3.314	3.440	3.577	3.725	3.886	4.061
3.60%	2.778	2.866	2.960	3.061	3.168	3.284	3.408	3.542	3.687	3.844	4.015
3.65%	2.756	2.843	2.936	3.035	3.141	3.254	3.376	3.507	3.649	3.804	3.971
3.70%	2.736	2.821	2.912	3.010	3.114	3.225	3.345	3.474	3.613	3.764	3.928
3.75%	2.715	2.799	2.889	2.985	3.087	3.196	3.314	3.440	3.577	3.725	3.886
3.80%	2.695	2.778	2.866	2.960	3.061	3.168	3.284	3.408	3.542	3.687	3.844
3.85%	2.675	2.756	2.843	2.936	3.035	3.141	3.254	3.376	3.507	3.649	3.804
3.90%	2.656	2.736	2.821	2.912	3.010	3.114	3.225	3.345	3.474	3.613	3.764
3.95%	2.636	2.715	2.799	2.889	2.985	3.087	3.196	3.314	3.440	3.577	3.725
4.00%	2.616	2.695	2.778	2.866	2.960	3.061	3.168	3.284	3.408	3.542	3.687
4.05%	2.596	2.675	2.756	2.843	2.936	3.035	3.141	3.254	3.376	3.507	3.649
4.10%	2.579	2.655	2.736	2.821	2.912	3.010	3.114	3.225	3.345	3.474	3.613
4.15%	2.561	2.636	2.715	2.799	2.889	2.985	3.087	3.196	3.314	3.440	3.577
4.20%	2.543	2.616	2.695	2.778	2.866	2.960	3.061	3.168	3.284	3.408	3.542
4.25%	2.525	2.596	2.675	2.756	2.843	2.936	3.035	3.141	3.254	3.376	3.507
4.30%	2.507	2.579	2.655	2.736	2.821	2.912	3.010	3.114	3.225	3.345	3.474

Source: BOCOM Int'l

Note: Blue highlight denotes most likely trading range for the next 12 months.

IMI International Monetary Review

Belt and Road Initiative

One Belt and One Road: Progress and Prospects*

By SUMEDH DEORUKHKAR AND XIA LE*

Summary

The One Belt One Road (OBOR) initiative announced in 2013 has provided an overarching framework for China to achieve its global ambitions, both at the economic as well as strategic level. As China's President Xi Jinping's signature move, OBOR aims to strengthen China's economic leverage by spearheading infrastructure construction and enhancing connectivity across nearly 70 countries accounting for 33% of global GDP along the overland Silk Road Economic Belt and the Maritime Silk Road across Eurasia.

Strategically, OBOR as a 'brand' provides the right platform for China to push its 'soft' power across Eurasia while underplaying 'hard' power tactics, which often spark geopolitical tensions, with China perceived as a rising threat.

China's large industrial overcapacity in the wake of on-going economic rebalancing, tested expertise in infrastructure, capital account surplus and efforts to secure food and energy resources are well complemented by the need to address infrastructure and funding constraints in most recipient countries of OBOR.

Turkey's location as a passage between Europe and Asia is pivotal for OBOR's success. For Turkey, the initiative presents both strategic as well as economic opportunities. It enables Turkey to lead development initiatives across the region while achieving closer and more balanced trade integration with China and other participating countries

For Latin America, OBOR provides an opportunity to enhance bilateral financing from China while providing opportunity to reduce the region's commodity dependence while focusing on boosting productivity and value added to sustain stable growth.

Strong geopolitical and economic linkages achieved through OBOR could enhance internationalization of RMB through trade, construction and manufacturing, mergers and acquisitions, and bilateral currency swaps.

Nonetheless, the challenges faced by OBOR initiative are significant. Excluding Singapore, nearly 54% of OBOR investments have flowed to countries with speculative grade sovereign rating. This raises implementation and credit risk concerns for Chinese stakeholders. Recipient countries risk being exposed to less stable and move expensive funding amid increased dependence on Chinese lending.

All said, OBOR is rapidly expanding in scale, scope and ambition. China has emphasized on open participation and that OBOR is not intended to become a China-led bloc. As such, leaving OBOR less structured and open- ended seems a deliberate attempt by China to tackle international scepticism over China's global ambitions.

OBOR provides an overarching framework for China to achieve its economic and strategic goals

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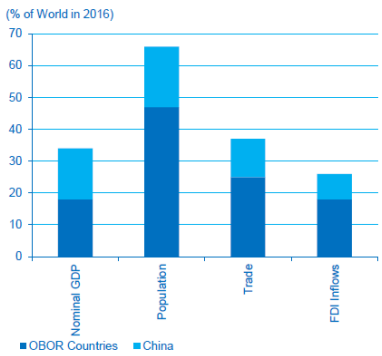
The One Belt One Road (OBOR) initiative announced in 2013 marks a key turning point in China's foreign policy. As President Xi Jinping's signature move, OBOR essentially characterises Chinese outbound investment aimed at strengthening intra-regional integration between China and countries in Eurasia and beyond. Covering close to 70 countries across Asia, Africa, Middle East, Europe and Oceania, OBOR countries account for about 33% of global GDP, 66% of global population, and 25% of global foreign investment flows (see Figure – 1). As such, it aims to strengthen China's economic leverage by underpinning demand for domestic goods, services and capital.

At the 19th China Communist Party Congress last month, President Xi set three milestones for China in the immediate future – 1) Moderately prosperous society by 2020, 2) Basically modernized nation by 2035 and 3) Rich and power socialist nation by 2050. The period upto 2050 coincides with the official Chinese timeline for OBOR – 1) Phase 1, from 2013 to 2016, was "mobilization", 2) Phase 2, from 2016 to 2021 is "Planning", and 3) Phase 3, from 2021 upto 2049 is "Implementation". OBOR will thus play an integral role in enabling China achieve its set milestones as it positions China as a top provider (mostly to the global south) of connectivity, infrastructure financing, construction hardware and expertise, among other trappings of modernization.

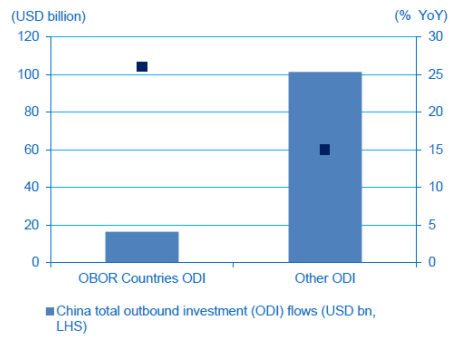
Driven from the top, China's focus on boosting overseas direct investments (ODI) in OBOR countries is already evident. Between 2013 and 2015, China's total ODI to OBOR countries grew 26% yoy as compared to 15% increase in China's ODI to non-OBOR countries (See Figure – 2). Furthermore, in 2016, China obtained $126 bn of new infrastructure contracts from OBOR countries, which accounted for 52% of China's total Engineering Procurement and Construction (EPC) contracts globally. China's rising industrial overcapacity in the wake of economic rebalancing, tested expertise in infrastructure, capital account surplus and efforts to secure food and energy resources are complemented by the need to address infrastructure and funding constraints in recipient countries of OBOR.

Figure 1 OBOR countries account for close to 33% of world GDP, 25% of global foreign investment flows



Source: Haver, IMF, BBVA Research

Figure 2 China's total outbound direct investment in OBOR countries grew 26% between 2013-15



Source: Wind, China Outbound Investment & Cooperation Development Report 2016, BBVA Research

Not surprisingly, between 2005-2016, China's foreign direct investments in OBOR countries has mainly concentrated in energy (50%), transportation (18%), property construction (11%), metals mining (8%) and the agriculture (3%) sectors. Such capital allocation, as steered by China's national policy, has gained traction under OBOR. Chinese M&A deals with OBOR countries in 2015 were 17% of China's total M&A (at $9.2 bn), a significant jump from just 4%

in 2014. So far in 2017, Chinese acquisitions in OBOR countries amount to $33 billion, as compared to $31 billion invested during the whole of 2016 despite a 42% yy drop in overall outbound M&A from China so far in 2017. This, in turn, reflects the relative immunity of China's recent capital control measures on OBOR related investment flows.

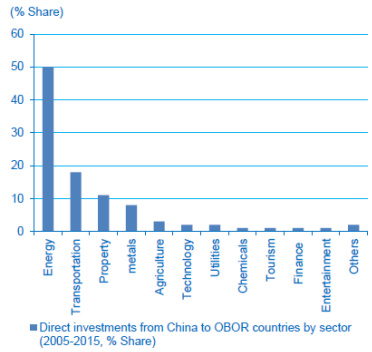
Strategically, OBOR as a 'brand' provides the right platform for China to push its 'soft' power across Eurasia while underplaying 'hard' power tactics. The latter have often sparked geopolitical tensions in the region, particularly those related to the South China Sea, and in turn deepening suspicions and unease amongst other major economies, especially the US and its regional allies. If implemented effectively, the OBOR initiative would strengthen geopolitical and economic linkages between China and recipient countries in commercial trade, capital flows and construction deals. This should help somewhat mitigate China's perception as a rising threat in the region. The OBOR initiative enables China to project power and naval presence at increasing distances from its shores. For instance, as part of the China-Pakistan Economic Corridor under OBOR, the development of the port of Gwadar in Pakistan will act as a key naval base in providing security for China's maritime trade in the region. Elsewhere, the Straits of Mallaca, to the southwest of South China Sea, facilitates the transit of 84% of all waterborne crude oil and 30% of natural gas imports to China. At its 19th Chinese Communist party Congress, President Xi highlighted the importance of securing China's sovereignty. In this context, securing the vital maritime trade lifeline through OBOR is a key to ensure national security.

Charting China's One Belt One Road Initiative

OBOR benefits recipient countries although not without caveats

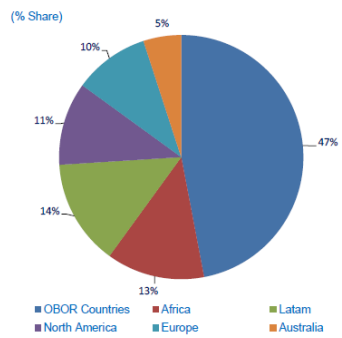
OBOR has opened new opportunities for cooperation and competition for the countries involved, most of which are infrastructure constrained with the lack of public goods undermining growth. Funding constraint is the other related concern with many running current account deficits. While Singapore was the highest recipient of OBOR investments from China, at 31% of total OBOR investments between 2013 to 2015, developing Asian economies such as Indonesia (9%), Laos (5%),Thailand (4%), Pakistan (3% share), , Vietnam (3%), Cambodia (3%) and Malaysia (3%) follow at the top of the list. China's large industrial overcapacity in the wake of on-going economic rebalancing, tested expertise in infrastructure, capital account surplus and efforts to secure food and energy resources are well complemented by the need to address infrastructure and funding constraints in most OBOR countries (See Figures – 3 & 4).

Figure 3 Direct investments from China to OBOR countries by sectors



Source: NBS, BBVA Research

Figure 4 Energy sector investments by China between 2005-2016



Source: Wind, American Enterprise Institute, BBVA Research

As per the Asian Development Bank, OBOR countries will need to invest $22.6 tn, or $1.5 tn annually in infrastructure from 2016 to 2030, mainly across electricity generation, transportation and telecommunication sectors. OBOR thus has the potential to deliver infrastructure and in turn higher growth for OBOR countries, particularly where older financial institutions, such as the Asian Development Bank (ADB) in Asia, have fallen short.

Despite having nearly jumped 4-fold to $126 tn by end 2015, the stock of Chinese investmentsin OBOR countries as share of total foreign investment stock is still relatively low at less than 3% when compared to investments by the US (10%) and Europe (50%). Scope to boost Chinese investments is thus huge. The key to plug this gap is for China and the recipient OBOR countries to meet on agreeable terms.

Notwithstanding its long- term economic benefits, in the near term, OBOR recipient countries face potential debt sustainability concerns from a pickup in OBOR related inbound investment flows through foreign direct investment and RMB bilateral currency swap agreements. The past three years have seen an increase in indebtedness of OBOR countries, although, so far, the rise in their external debt is much more modest compared to that of domestic debt.

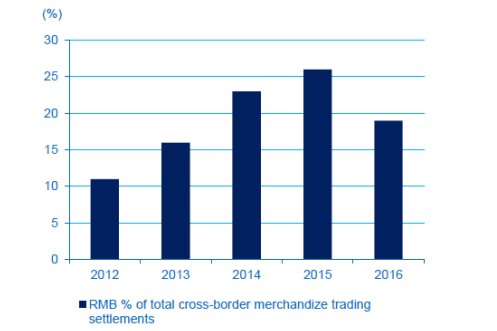
That said, the external debt structure has already seen a shift for economies such as Pakistan, where financing by external non-government entities has risen from 7% of total external debt in 2010 to 14% in 2016. The long gestation period of such investments raises the need for OBOR economies to generate high and sustainable growth for sustaining future debt-servicing capacity. In addition, recipient countries also risk being exposed to less stable and more expensive funding due to increased dependence on Chinese lending while moving away from funding by international financial institutions such as the World Bank and ADB. So far, OBOR funding is mainly reliant on China based institutions. These include Chinese policy banks, China Export and Credit Insurance Corporation, Commercial banks, local financial institutions and local governments. These together have committed around 80% of the total funding (at more than $750 bn) until 2016. The rest includes funds, loan guarantees and grants provided to China by international financial institutions such as the Asia Infrastructure Investment Bank (AIIB), Silk Road fund, New Development Bank for BRICS, Shanghai Cooperation Organization Development Bank, the ADB and World Bank.

OBOR could play a key role in enhancing internationalization of RMB

Despite RMB's inclusion in IMF's SDR basket in September 2016, prospects of RMB internationalization have taken a hit over the past year as Chinese policymakers tightened capital controls and exercised greater discretion on the daily Yuan fixing aimed at defending the

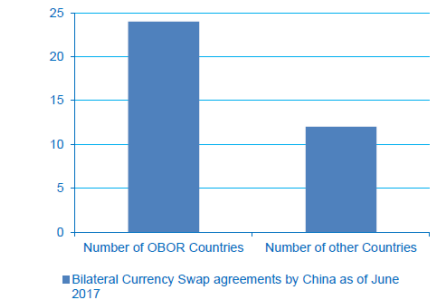
currency against depreciation pressures (Figure – 5). Such capital controls are unlikely to be eased anytime soon given the backdrop of rising global interest rates. However, strong geopolitical and economic linkages achieved through OBOR present ample room for China to expand RMB usage in cross-border trading settlements. The use of RMB in OBOR transactions accounted for about 14% of total cross border trading settlements since 2015, as compared to an average 23% of total RMB trading settlements over the past two years. In addition, China has scope to further expand bilateral local currency swap agreements across OBOR countries. Currently, China has swap agreements with 36 countries (at RMB 3.3 trillion), of which 24 are OBOR countries (Figure– 6).

Figure 5 RMB share in total China cross-border goods and services trading settlements



Source: SAFE and BBVA Research

Figure 6 Bilateral currency swap agreements by China



Source: Wind and BBVA Research

Hong Kong plays a key role in developing OBOR

At the 19th Party Congress, President Xi noted that Communist Party will continue to support Hong Kong and Macau in integrating their own development into the overall development of the country. Xi's commitment underscores Hong Kong's role as a major OBOR financing hub. As an already established business facilitator between China and rest of the world, Hong Kong has what it takes in its new role within the OBOR framework, namely the rule of law, total capital mobility, currency convertibility, no tax on interest, dividends and capital gains, access to China's capital markets and, most importantly, the support of Beijing. In this context, policy efforts are underway to interlink Hong Kong's offering as an international financial centre – venture capital, private equity, IPOs, bond issuances, investment banking, M&A's and reinsurance – with the Mainland's Greater Bay Area that includes 11 cities (including Guangzhou and Shenzen) of the Pearl River Delta, known for its modern engineering technologies, hi-tech venture capitalists, start-ups and top research universities. Such integration is bound to have a significant influence on OBOR projects going forward.

The strategic position of Turkey as a passage between Europe and Asia is pivotal for OBOR's success

For Turkey, which received 2% of total OBOR investments from China between 2013 to 2015, the initiative presents both strategic as well as economic opportunities. OBOR related railroad linkages would facilitate regional interdependence, in turn fostering geopolitical stability between Turkey and its neighbouring countries. The region is marked by militarized and terminally closed borders (e.g. the Turkish-Armenian border). From a power balance perspective, an enhanced role in OBOR would enable Turkey to lead development initiatives across the region, which includes weaker economies such as Iraq, Syria, Lebanon, Georgia and Azerbaijan. On the economic front, while China is currently Turkey's second largest trade partner after

Germany, its trade deficit with China has increased notably over the past 5 years to $23 bn in 2016 from $18.5 bn in 2012. OBOR would enable Turkey to establish proper legal infrastructure, lift trade barriers, develop effective cooperation across customs and standards and develop closer participation in trade fairs in China.

Seen as an extension of the OBOR initiative, the 525-mile-Baku-Tbilisi-Kars project will halve the time taken to move goods from China to Turkey. As a part of this project, a railway line connecting Turkey and Azerbaijan was opened last month. Once complete, the route would facilitate transport of EU and Turkey produced food products to China, in turn bypassing Russia's ban on food imports and transit. Turkey aims to realize "Trans Hazar- Middle Corridor" Project, complementing the North Line from China to Europe and opening a new connecting corridor between China and Europe. To align OBOR with "Middle Corridor" Project of Turkey, a Memorandum of Understanding was signed on 1st of July, 2016 before the G20 Hangzhou Summit. All this would lead to closer and more balanced trade integration with China and other participating countries.

China-Latin America trade and investment links and the role of OBOR

While Latin American (LatAm) countries are currently not members of the OBOR initiative, China's impact on LatAm's regional development has been significant over the past decade. The region's trade growth with China has outstripped that with rest of the world since 2000. Natural resources account for largest share of China's imports as well as direct investments into LatAm. Its exports to China are mainly characterized by primary products, such as crude oil, iron/steel, copper, solid fuels, scrap aluminium, precious metals, meat etc. With regards to Chinese investments, between 2015-2016,LatAm accounted for 14% share in direct investments in energy sector from China while its share in transportation and metals was 8%. However, heavy dependence on commodity exports has made LatAm vulnerable to a slowdown in China's economic growth and its rebalancing efforts. In this context, LatAm's involvement in the OBOR initiative can provide several benefits for the region. OBOR's contours have been left flexible by design with investments ranging from infrastructure, to satellite, to sports industry. This presents an opportunity for LatAm to 1) sustain its commodity export demand along OBOR, 2) reduce its commodity dependency, boost productivity and move up the export value chain and 3) increase opportunities for bilateral financing from China.

Closing the gap between China's investment promise and actual implementation

Host country circumstances play an important role in determining the success rate of China's foreign investments along the OBOR. Excluding Singapore, nearly 55% of Chinese OBOR investments since 2013 have taken place in countries with weak economic, fiscal, and institutional strength and a high susceptibility to event risks. Under such circumstances, preferential credit and research subsidies offered by Chinese government to direct investments to OBOR countries may not be enough to overcome investor confidence. OBOR's strategic and economic objectives can compete with each other, directing Chinese investments into unviable projects driven by political objectives. Politically influenced non-profitable investments by Chinese state-owned enterprises along OBOR further exacerbate its failure rate. Chinese enterprises often follow the political wind in Beijing, such as the OBOR initiative, to secure capital overseas, without a clear investment strategy.

As a key source of funding for OBOR, Chinese financial institutions thus have a credit risk exposure from implementation risks in OBOR countries, which could erode banks' asset quality and increase contingent liabilities for Chinese government. To address this issue, authorities have tightened controls for outward investments by SOE's, mandating comprehensive and advanced risk assessment. Further, policy efforts to educate and offer a networking platform for Chinese investors, banks and law firms aimed at facilitating OBOR investments have been

stepped up. Such efforts, however, would do little to enhance profitability of OBOR projects or enhance their completion rate given that the bottlenecks to investments in such countries are primarily beyond China's control.

All said, OBOR is rapidly expanding in scale, scope and ambition. China has emphasized on open participation and that OBOR is not intended to become a China-led bloc. As such, leaving OBOR less structured and open-ended seems a deliberate attempt by China to tackle international scepticism over China's global ambitions. As a brain child of President Xi, OBOR will continue to receive strong backing as long as Xi remains in power. 19th Chinese Communist Party Congress almost confirmed him China's core leader beyond 2022.

Belt and Road Key is in Governance*

By QU FENGJIE*

China needs to pay close attention to a number of issues in order to reap the benefits of this huge international initiative

The Belt and Road Initiative was mentioned many times in the key report of the 19th National Congress of the Communist Party of China, which further demonstrated its importance for China's opening-up and global regional cooperation.

The Belt and Road Initiative could play an important role in global governance, including the economic, financial and social sectors, especially in reform of the international monetary system.

China's economy faces a situation of being unbalanced, both at home and abroad. At home, investment has been growing but consumption is not strong enough. Abroad, there is an international payment imbalance, and the country's foreign exchange reserves have been constantly accumulating.

The Belt and Road Initiative could be an important platform for countries involved to build economic cooperation and coordinate their macro policies.

To better use the Belt and Road Initiative as a measure for the innovation of a regional cooperation mechanism and to tackle global economic imbalance, there are six aspects that need attention.

The first is that development financing, policy-based financing and commercial banking should be given equal importance. So far, China has been pushing forward quickly with development financing and policy-based financing, but the development of commercial banking has been relatively slow. An important factor for many Chinese companies that have withdrawn from overseas markets is that they cannot get enough loans from commercial banks. Belt and Road is a huge initiative. It is important that China Development Bank should be supportive of big projects, but it is also important that more private companies and small and medium-sized companies are able to participate in the initiative and make profits. At the moment, small companies don't have enough specific financial services, and commercial banks are better than development banks or policy-based banks at providing precise financial services.

Second is that cooperation in both the infrastructure sector and the science, education and culture sectors should be given equal importance. At present, there is a lot of emphasis on infrastructure projects, but we should also strengthen China's cooperation with other countries in science, education and culture. Third is that China has confidence in its development achievements. When Chinese companies are involved in projects overseas, we should also emphasize social responsibility, and also share our development experiences and good practice with other countries.

Fourth is that China should expand the ratio of RMB use in the trade and investment cooperation with overseas countries. China has signed currency swap agreements with 21 countries involved in the Belt and Road Initiative, but only 14 percent of settlements are made by RMB, which is relatively low. China should do systematic research and plan to increase the demand for using RMB in global trade and investment.

Fifth is the ratio of State-owned companies to private ones. At present, if we calculate by the volume of investment in countries involved in the Belt and Road Initiative, private companies

* This article first appeared in China Daily on December 1, 2017.

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account for less than 30 percent. It is still difficult and expensive for private companies to get finance for overseas investment.

The Belt and Road Initiative is an innovative project for China to push forward regional cooperation, not only in the trade, investment, industrial and infrastructure sectors, but also to a great extent in the financial sector. RMB internationalization is an important aim in which the financial sector might be able to achieve a breakthrough with the development of the initiative.

So far, RMB internationalization has been pushed forward steadily. China's is the world's sixth-largest payment currency, accounting for about 1.68 percent in the global market. But this is still at early stage and RMB internationalization still has a long way to go.

To seek a breakthrough under the Belt and Road Initiative, China should make efforts in many areas. Chinese banks, fintech companies and internet financial enterprises should speed up entering the countries involved, so that they can offer the financial services needed by companies and customers.

China could also develop the regional bond market in countries and regions involved in the Belt and Road Initiative, expand the size of RMB-denominated bonds and offer more varied types of bond, which would also help to increase the liquidity of RMB.

China should also strengthen the financial and currency cooperation mechanism with countries and regions involved in the initiative. Currently there are many currency swap agreements, but they are not yet frequently used and should be strengthened in the future. China should also speed up the building of offshore markets and strengthen the regulation of them.

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Monetary Policy

Regime Uncertainty Continues to Hold down Loan Growth and the Economy*

By STEVE H. HANKE*

With the election of President Trump, all the crystal-ball gazers opined that the economy would witness a "Trump Bump." Well, it hasn't happened. Why not? In two words, "regime uncertainty" is holding back credit and broad money growth, which drive nominal economic growth.

Just what is regime uncertainty? The first chapter in Robert Higgs' anthology *Depression, War and Cold War: Studies in Political Economy* is titled "Regime Uncertainty: Why the Great Depression Lasted So Long and Why Prosperity Resumed After the War." This is a fitting title for a piece penned by the scholar who first nailed down the idea of regime uncertainty. According to Higgs:

Regime uncertainty pertains above all to a pervasive uncertainty about the property-rights regime — about what private owners can reliably expect the government to do in its actions that affect private owners' ability to control the use of their property, to reap the income it yields, and to transfer it to others on voluntarily acceptable terms. Will the government simply take over private property? Will it leave titles in private hands, but strip the owners of real control and profitable use of their properties? These questions fall under the rubric of regime uncertainty.

Who creates regime uncertainty? It falls on the doorstep of politicians (read: Washington, D.C.). Their zigs and zags have enormous effects on free cash flows, the certainty of those cash flows and the interest rates used to discount them to present values. So regime uncertainty will affect the way bankers, who produce credit, size up prospective loans. Indeed, as regime uncertainty rises, bankers will, other things being equal, tighten their purse strings.

Higgs's diagnosis is best summarized in his own words from *Against Leviathan: Government Power and a Free Society*. According to him, here is how it works:

Roosevelt and Congress, especially during the congressional sessions of 1933 and 1935, embraced interventionist policies on a wide front. With its bewildering, incoherent mass of new expenditures taxes, subsidies, regulations and direct government participation in productive activities, the New Deal created so much confusion, fear, uncertainty and hostility among businessmen and investors that private investment and hence overall private economic activity

* This article appeared on Forbes.com on October 27, 2017.

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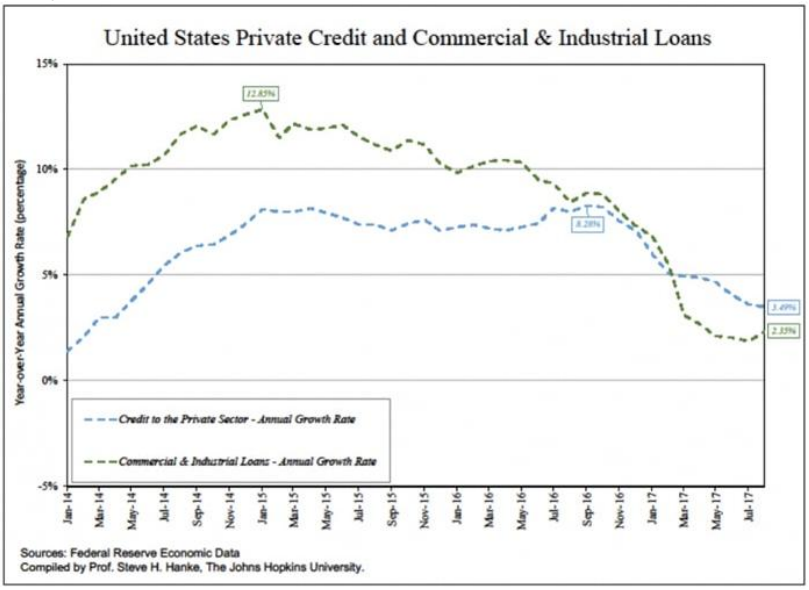
never recovered enough to restore the high levels of production and employment enjoyed during the 1920s.

In the face of the interventionist onslaught, the U.S. economy between 1930 and 1940 failed to add anything to its capital stock: Net private investment for that 11-year period totaled minus $3.1 billion. Without ongoing capital accumulation, no economy can grow. …

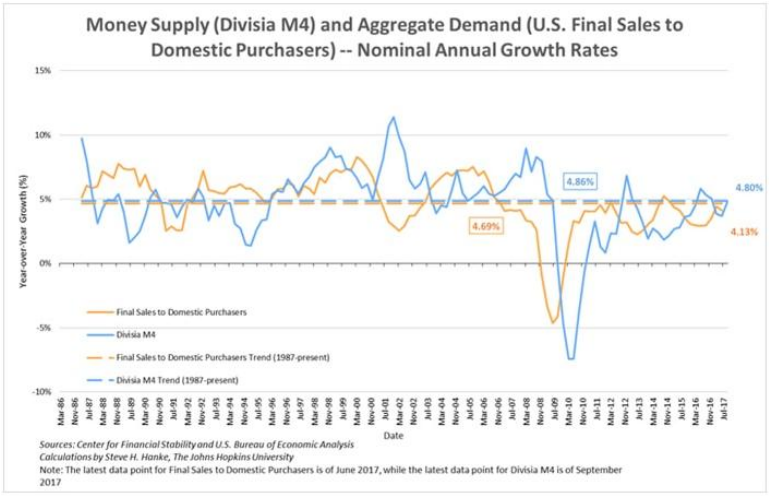
The government's own greatly enlarged economic activity did not compensate for the private shortfall. Apart from the mere insufficiency of dollars spent, the government's spending tended, as contemporary critics aptly noted, to purchase a high proportion of sheer boondoggle.

The current state of affairs in Washington, D.C., is one of great regime uncertainty — a great many zigs and zags. In consequence, bankers have reined in lending. Moreover, they have explicitly stated that their caution is a result of regime uncertainty. The following chart of the annual growth rate for private credit and commercial and industrial loans shows the fall off in those metrics. Total credit growth to the private sector has fallen from a recent high of 12.85% annually to only 3.49%, while commercial and industrial loans have slumped from a recent high of 8.28% annually to 2.35%.



United States Private Credit and Commercial & Industrial Loans

Related to those credit metrics is the annual growth in the money supply, broadly measured. That metric is growing at an annual rate of 4.8%, which is a hair shy of its annual trend rate of 4.86% (see chart below). Not surprisingly, aggregate demand (measured by final sales to domestic purchasers) is growing at a annual rate of 4.13%, which is below its trend rate of 4.69%. Thanks to Washington, D.C., the U.S. is in the grips of regime uncertainty trap, and a "Trump Bump" is nowhere to be found.



Money Supply (Divisia M4) and Aggregate Demand (U.S. Final Sales to Domestic Purchasers) — Nominal Annual Growth Rates

IMI International Monetary Review

To Tighten or Not to Tighten*

By JOHN PLENDER*

The US Federal Reserve has followed a predictable line on rate rises this year, unlike in 2015 and 2016 when hawkish rhetoric was not followed by action. Janet Yellen, the Fed chair, has emphasised the dangers of moving too gradually, despite inflation running at below the Federal Open Market Committee's 2% target.

She appears confident that markets will have no difficulty absorbing $10bn per month of Treasuries and agency securities as the Fed slims down its $4.5tn balance sheet, starting this month.

On the other hand, Yellen has shown too that the Fed will not be averse to restarting unconventional policies if circumstances become more adverse. With the estimated neutral rate of the fed funds rate at a historically low level, 'There will typically be less scope for the FOMC to reduce short-term interest rates in response to an economic downturn, raising the possibility that we may need to resort again to enhanced forward rate guidance and asset purchases to provide needed accommodation,' Yellen said on 20 October in Washington.

The scope for market upsets is considerable. Judgements about where the Fed goes from here are complicated by Yellen's departure in February and the gaps that already exist on the Fed's board. President Donald Trump has the power to turn the central bank either hawkish or dovish – underlying that central banking independence always needs to be qualified.

The other complicating factor is the extraordinary mildness of inflationary pressures in the advanced economies and the docility of labour in the face of stagnant or falling real incomes. Globalisation appears to have weakened the relationship between domestic slack and domestic inflation. The entry of emerging market workers into the global labour market has exerted a restraining influence on the workforce in the tradeable sector of advanced economies.

If the central bank hawks are right that the world is about to become a more inflationary place, political tensions could arise. It took heroism on the part of Paul Volcker, the then Fed chairman, to turn the inflationary tide during his tenure at the Fed between 1979-87. But independent central banking could not have enjoyed a more benign operating environment than in the period of disinflationary globalisation that followed.

Today the background is less helpful. The financial crisis has damaged central bank credibility. The distributional implications of the central bankers' response to the crisis through their asset purchase programmes has lent strength to populist politicians. They observe that unconventional central banking has delivered big capital gains to the asset-rich elite, while doing less for ordinary people.

At the same time, because of the debt build-up, borrowers are hostage to potential interest rate spikes as policy normalises. Central bankers may be torn between the politically unpopular and financially destabilising rate rises that might be required to curb inflation and the more quiescent approach needed to preserve independence. The second outcome would, in effect, usher in a new world of perpetual quantitative easing.

QE has been a controversial issue in Europe, particularly in Germany, where many policy-makers would like to see the European Central Bank end its programme of asset

* This article appears in OMFIF Commentary on October 25, 2017.

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purchases. The landmark ECB policy-meeting on 26 October – which will have to tread a delicate line between too much and too little tightening – will deliver some important signals. The consequences are likely to spread well beyond Europe's borders.

IMI International Monetary Review

Balancing Security with Returns*

By RICARDO ADROGUE*

Emerging market economies have resumed modestly accumulating international reserves after the three-year hiatus which followed the 'taper tantrum' of May 2013, when the US Federal Reserve implied it would slow its rate of bond purchases.

Overall international reserves – roughly 80% of which are held by emerging market economies - reached a two-year high of $11.2tn at end-June, up from $10.9tn at end-2015. This resumption underlines emerging markets' resilience, as well as the success of self-insurance policies based on floating currencies and high stocks of international reserves.

In fact, a small fraction of international reserves has been used to protect these economies from the global shocks of the last 10 years. So emerging markets as a whole are over-insured. Existing stocks of international reserves far exceed the levels necessary to meet their main practical benefit - the ability to smooth domestic economic adjustment in response to sudden stops of financing.

In the light of the renewed rise in international reserves, currency diversification has become an important allocation decision for policy-makers. While security is paramount, more central banks are including return objectives in their reserve management procedures. Managing the trade-off between security and returns is a difficult task. Moving international reserve holdings away from the dollar could lead to large declines in returns that prove difficult to recover.

An optimal portfolio for a central bank should provide maximum returns in times of crisis. Currency diversification is key to achieving an optimal allocation. However, in times of stress or sudden stops, the cumulative return of an optimal portfolio of currencies tends to underperform significantly one that is predominantly dollar-based.

The result of these different factors is that, over time, central banks which hold an optimal currency-diversified portfolio tend to outperform purely dollar-based portfolios, but at the expense of experiencing greater volatility during periods of market stress.

Moreover, it could take more than a decade for an optimally currency-diversified portfolio to recover from the negative effects of a sudden stop. This is a clear disadvantage which, in some cases, could prove to be politically untenable. In the long term, however, the positive attributes of a diversified portfolio should prevail.

Adding emerging market inflation-linked currencies to central bank reserve allocations may improve the return potential of portfolios without causing a sizeable deterioration in their safety characteristics. These securities can provide insurance against nominal currency depreciations, thus reducing the large decline in returns which are typical of global currency markets. Emerging market inflation-linked bonds can, too, represent a superior investment to a set of liquid emerging markets currencies.

The varied impact of global shocks on different countries makes it necessary for central banks to implement differentiated optimal allocations for international reserves.

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One policy target which they should perhaps all share is to include more inflation-linked securities to enhance optimal portfolio returns without meaningfully increasing underlying investment risks.

IMI International Monetary Review

Digital Economy

Transforming from Imitators to Innovators*

By BEN SHENGLIN*

E-commerce and e-payment, two of the "four new inventions of China", reached a new peak this year as the Singles Day sales on Nov 11 reached 253.97 billion yuan ($38.2 billion). China's "new inventions" can be more accurately described as "innovations", because there have been similar inventions in foreign countries before.

E-commerce emerged in the United States in the 1990s, but Amazon and other e-companies didn't develop as fast as their Chinese counterparts such as Alibaba and jd.com. And e-payment, for example, through PayPal was founded in the US in 1998, five years before its Chinese imitator Alipay.

In his report to the 19th National Congress of the Communist Party of China, General Secretary Xi Jinping mentioned "innovation" 59 times, which highlights how important innovation-driven growth will be for every aspect of China's development.

Innovations or inventions aside, China's prominence in these areas and their profound impact on the lives of ordinary Chinese people, business community and society as a whole have been universally acknowledged.

However, there is much less consensus on why China has leapfrogged the rest of the world in these new areas. Business leaders' answers would most likely be entrepreneurship, which is indeed vibrant in China. Tech companies will confidently and rightly assert the power and progress of China's technology sector as the enabler. Policymakers can claim that they have provided the right policy environment, by taking a remarkably tolerant, if not encouraging, approach toward some of the inventions. And ordinary citizens can proudly say that it is their collective enthusiasm of embracing new products and services, and in some cases their sacrifice of privacy that has made the business models commercially viable.

Besides, many foreign competitors have attributed China's success to its ability as a great "imitator" to innovator.

In the academia, the views are no less diverse, with some observers questioning the very fact of China's inventions and new ideas while others have not been able to properly analyze the inventions as they have grown so fast that many of them defy conventional theories.

Even without rigorous scholarly analysis, it is probably still safe to say that each and every one of the above factors has contributed, in one way or another, to China's prominence in the age of "new economy". But it is also equally safe to say that each or a combination of them is not sufficient to explain what China has witnessed — the unfathomable magnitude and breathtaking pace of China's rise in these sectors — nor does it explain the timing of all these changes.

In fact, it is the combination of the sweeping changes in political, economic, social, cultural, and technological areas that has created a politically stable environment and powerful innovation

* This article is published by China Daily on November 13, 2017.

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ecosystem with Chinese characteristics, which paves way for the fast development in “new economy”.

IMI International Monetary Review

The Challenges Confronting China's Digital Economy*

By ANDREW SHENG AND XIAO GENG*

If China is to ensure the continued development of its digital economy, while containing the risks associated with disruption, its leaders will need to implement smart regulations. And that will require careful consideration of the factors that have contributed to – and impeded – its progress so far.

China's digital economy is a force to be reckoned with. The country now accounts for 42% of global e-commerce, boasts one-third of the world's most successful tech startups, and conducts 11 times more mobile payments than the United States per year. But there are major challenges ahead.

To be sure, China is on track for continued progress, thanks to its rich ecosystem of innovators, a tech-friendly attitude among regulators and government, and its massive consumer market. China's 731 million Internet users outnumber those in the European Union and the US combined.

These factors underpin projections of rapid growth in China's FinTech market. From 2016 to 2020, Goldman Sachs expects consumption-related third-party payment value to grow from $1.9 trillion to $4.6 trillion, with lending by non-traditional players soaring from $156 billion to $764 billion and new online-oriented asset management increasing from $8.3 trillion to $11.9 trillion.

Moreover, China is accelerating investment in artificial intelligence. In its report *Artificial Intelligence: Implications for China*, McKinsey estimates that AI technology in China could add 0.8 to 1.4 percentage points to China's annual GDP growth, depending on the speed of adoption. Early this month, Google AI China was launched in Beijing by the company's Chinese-born chief scientist for cloud computing, Fei-Fei Li.

Yet China still has a long way to go. As another recent McKinsey study, *Digital China: Powering the Economy to Global Competitiveness*, points out, the US remains 4.9 times more digitized than China. And, within China, there are large variations in various sectors' level of digitization.

China will confront serious risks as it closes these gaps. As McKinsey notes, digitization promises to shift and create value equivalent to anywhere from 10% to 45% of total industry revenues in four key sectors (consumer and retail, automotive and mobility, health care, and freight and logistics) by 2030. This implies significant disruptions to value chains and uncertainty about jobs, consumption, and the socio-political context.

If China is to ensure the continued development of its digital economy, while containing the risks associated with disruption, its leaders will need to implement smart regulations. And that will require careful consideration of the factors that have contributed to – and impeded – its progress so far.

As recently as a decade ago, few expected China's remarkable digital breakthrough. In fact, both of the country's key Internet pioneers, Jack Ma of Alibaba and Pony Ma of Tencent, experienced early failures. But thanks to the Chinese leadership's willingness to experiment,

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allowing access to foreign capital and technology, these pioneers were able to pursue initial public offerings elsewhere – Tencent in Hong Kong and Alibaba in New York.

As they took advantage of emerging digital technology – not to mention China's high-quality public infrastructure – to leverage and build services, these pioneers spearheaded rapid progress in China's digital economy. Alibaba's e-commerce platform expanded market access and reduced transaction costs, crowding out traditional middleman who undermined productivity. Tencent's WeChat reduced the costs of communication, interaction, coordination, and socialization among individuals, stimulating innovation across industries. Both broke down barriers among manufacturing, distribution, media, and finance, thereby achieving scale, expanding scope, and increasing speed.

These achievements – which produced major productivity, income, and wealth gains – are a testament to private-sector ingenuity. But they were facilitated by the state, which pursued a policy of flexible non-enforcement of functional rules and regulations that enabled not only the expansion of private markets in China, but also the integration of those markets into the global economy.

Yet market-based innovations are intrinsically unpredictable, and expectations regarding innovations often overshoot. In the case of China's digital economy, imperfect and lagging regulations and enforcement exacerbated the effects of imbalances in the business environment, which enabled the emergence of severe vulnerabilities, from financial and debt risk to pollution and inequality.

Under China's current system, it is up to the government to deal with these problems. And, over the last five years, it has attempted to do just that, often using old, imperfect, but already-available administrative tools. Over the last year alone, China's authorities have steadily tightened regulations governing the crypto-currency Bitcoin, B2C financing platforms, shadow banking, cross-border capital flows, and debt and securities markets.

But such changes do not address the underlying weaknesses that allow risk to proliferate. For that, China must build more effective institutions to deal with business failures, absorb losses, and manage risks and uncertainty. In particular, China needs improved bankruptcy procedures, multilevel capital markets, an effective social-security system, reliable public housing, and a progressive tax regime that aims to reduce inequality. At the same time, to counter market abuses, China should introduce more robust competition laws, anti-corruption mechanisms, and stronger environmental regulations.

The digital economy is naturally pro-market, pro-productivity, and pro-globalization. Yet, without effective management, it can generate significant economic imbalances that foster political and social instability. This is all the more true at a time of large-scale disruptions, owing to rapid technological progress, demographic shifts, and climate change.

The only way to harness the digital economy's potential while avoiding downside risks is to build fair and inclusive social institutions that protect property rights and ensure efficient markets. In other words, it all comes down to delineating clearly, appropriately, and effectively the roles of the state and the market.

IMI International Monetary Review

Bridging the Digital Divide: Measuring Digital Literacy*

By KRISH CHETTY, LIU QIGUI, LI WENWEI, JAYA JOSIE, NOZIBELE GCORA AND BEN SHENGLIN*

Abstract

To promote digital transformation, equal emphasis needs to be allocated to digital skills development as is to infrastructure development. To ensure digital training programmes are adequately managed, a standardized data collection strategy is required to measure an internationally accepted Digital Literacy Index. This index must be defined by a dynamic definition of Digital Literacy responsive to the fluid needs of the digital economy. This requires the introduction of a G20 standard-setting body informing a nationally representative data collection strategy. Furthermore, the adopted standards which inform the data collection process must be cognizant of the evolving demands of employers.

Challenge

Recent G20 communiques of 2015 and 2016 have made pronouncements on addressing the digital divide but have largely focused on infrastructure development, financial inclusion or digital trade. Insufficient attention has been paid to the need for digital skills, partly due to the difficulties in defining and measuring Digital Literacy. Digital Literacy, as with general literacy, provides an individual with the capability to achieve other valued outputs in life, especially in the modern digital economy. Unlike literacy, the definition of Digital Literacy is contested, leading to the development of different and inconsistent sets of indicators for measuring Digital Literacy. A consistent, standardised definition of Digital Literacy is required across G20 countries for the purposes of data collection, analyses and measurement.

A Digital Literacy measurement offers policy makers a means to monitor the diffusion of digital skills across countries. For effective alignment in measuring Digital Literacy policy makers should guard against emphasising a one dimensional approach and focus on the multi-dimensional nature of Digital Literacy instead of a narrow focus on technical usage.

Amongst emerging and developing economies specifically, whilst there is an emphasis on infrastructure development, these countries will not be able to leverage the full potential of such investments, without a comprehensive skilling programme which educates the currently disadvantaged and disconnected population about the benefits of digital tools. Furthermore, without consistent and comparative measurement indicators to identify the location of the digitally illiterate sectors of the population, policy makers are disempowered to pursue digital transformation objectives.

Proposal

G20 policy makers urgently require an indicator measuring the uptake of Digital Literacy across countries to ensure that policies are targeted to the areas of most need. To ensure this

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becomes a reality, the following proposals for the G20 are made: (1) adopt a standardized, multi-dimensional definition of digital literacy, (2) produce a standardized multi-dimensional Digital Literacy Index and (3) align of the demand and supply of digital skills required by all role players.

The G20 should adopt a standardized definition to measure Digital Literacy

Digital Literacy provides an individual with core capabilities to achieve valued outputs in life. It is a critical enabler for digital transformation as it enables employment opportunities, the ability to access digital content (the medium for the digital economy) and online services. Crucially, there is no universal accepted definition for Digital Literacy. The G20 needs a commonly accepted definition for Digital Literacy, supported by a standards-setting body. Academics, the public sector and the business sector have not reached consensus of what specifically constitutes Digital Literacy. Consequently, there are no comparable measurements of Digital Literacy to measure the progress in attaining such skills, particularly in emerging and developing economies combating the effects of the digital divide.

Drawing on recent literature from UNESCO (2011), the SCONUL Working Group on Information Literacy (2011), Lankshear and Knobel (2008), Greene, Yu and Copeland (2014), SIEMENS (2017), Covello (2010), McKinsey & Company (2014), Ridsdale et al. (2015), and various other contributers to the Digital Literacy it is clear that Digital Literacy is a muliti-dimensional concept. However, the authors differ over the specific set of dimensions which constitute Digital Literacy. Our study identifies five dimensions, viz., Information Literacy, Computer Literacy, Media Literacy, Communication Literacy and Technology Literacy. Each dimension is further influenced in terms of three perspectives, viz., Cognitive, Technical and Ethical (See Table 1). These five dimensions and three perspectives broadly refer to all the conceptual components of Digital Literacy, and should underpin how Digital Literacy is defined, measured and taught.

UNESCO (2011) describes Digital Literacy as a set of basic skills required for working with digital media, information processing and retrieval. It also enables one's participation in social networks for the creation and sharing of knowledge, and the ability supports a wide range of professional computing skills. However, focusing uniquely on technical aspects of digital literacy such as accessing and using tools to the exclusion of an awareness of the cognitive and ethical concerns of digital technologies poses a long-term risk for users. Cognitively, a user is constantly processing content, evaluating, critisizing and synthesising multiple sources of information. Concurrently, the user must also be cogniscant of what constitutes the appropriate use of such tools. Knowing how to discern what is appropriate and how to derive meaning whilst using digital technologies is equally important as using the technology itself.

Table 1: Simplified representation of the Digital Literacy dimensions and perspectives

	Perspective		
Dimension	**Cognitive**	**Technical**	**Ethical**
Information *(Digital Content)*	Synthesis	Access, Usage	Appropriate Usage
Computer *(Hardware and software)*	Evaluate	Usage	Appropriate Usage
Media *(Text, sound, image, video, social)*	Critique, Create	Navigation	Assess truthfulness
Communication *(non-linear interaction)*	Critique, Create	Develop and use content	Appropriate Usage
Technology *(Tools for life situations)*	Invent, evaluate tools	Usage	Appropriate usage

A key point raised by UNESCO, is that Digital Literacy improves one's employability because it is considered a 'gate' skill required by employers. It is a catalyst for individuals to acquire other valued outcomes.

Benefits of measuring digital literacy

Appropriately measuring digital literacy and consistently ensuring that policies are agile enough to react to the dynamic nature of digital skills, will lead to productivity gains across a country. Bunker (2010) attributes this productivity gain to a greater share of both employers and employees that meet the basic needs of digital literacy and those that attain a greater level of mastery of such digital technologies. With a greater number of employees, with an internationally competitive skills level, operating in the product and services sectors, there is an expected benefit to both employers and the national economies.

Through a quantitative understanding of the location, dimensions and nature of a population's collective state of literacy, policy makers are better prepared to make the necessary choices to ensure digital transformation. A Digital Literacy indicator and data collection strategy informed by the broad dimensions of Digital Literacy, as identified in Table 1, will enable the policy maker to specify goals, set targets and plan appropriately (Oxenham, 2008). If one assumes that progress to a completely digitally literate population will be progressively realized over time, one must keep track of the rates of Digital Literacy attainment.

Weaknesses of the current definitions of Digital Literacy

To attain the holistic view of Digital Literacy required by policy makers, an inclusive composite measurement or index is needed. However, the current measurements of digital literacy suffer in the following respects:

- Private agencies have adopted a narrow conceptual view of Digital Literacy. Measurements tend to focus only on the technical perspective of the various dimensions of Digital Literacy highlighted in Table 1.
- The sampling strategies adopted in current data collection instruments are not suitably representative of the country leading to invalid conclusions.
- Digital Literacy measurement instruments are only accessible online, thus excluding vast portions of the workforce without access to such facilities.
- The proxies of Digital Literacy as adopted by private agencies are not suitably representative of the complexities of digital literacy. E.g. Facebook usage or access does not infer Digital Literacy.
- Digital Literacy assessments will need to evolve with the ever-developing modes of creativity and educational methods (UNESCO, 2011).

G20 nations should produce a standardized multi-dimensional Digital Literacy Index

A well-executed Digital Literacy measurement strategy will allow countries to track their trajectories to attaining full Digital Literacy and international competitivity. There is an ever-increasing need to understand the fluid nature of what constitutes Digital Literacy in the modern economy. Current skills considered to be of a superior level of mastery may well become the future expected skills norm. To be prepared for such eventualities the G20 requires (a) a Digital Literacy standard setting body, (b) a Digital Literacy assessment data collection instrument informed by a representative sampling strategies, and (c) should base the assessment instrument on the multi-dimensional nature of Digital Literacy.

Standardisation of Digital Literacy across the G20

This study recommends that the G20 institutes a Digital Literacy standard-setting body as a further progression of the existing G20 Skills Strategy (G20 Leaders, 2015b). As Digital Literacy will remain a dynamic concept, this body will be responsible for maintaining its

definition, its underlying set of dimensions and identifying the most appropriate means for performing a Digital Literacy assessment.

The PIRLS assessment framework (used for Literacy) follows the guidelines of the International Standard Classification of Education (ISCED) and is managed by the International Association for the Evaluation of Educational Achievement (IEA). It is preferable that a similar organisation carries out this function to inform how an internationally consistent assessment should be conducted. The body should also ensure that similar internationally accepted standards are adopted which informs each dimension of Digital Literacy. Furthermore, the body will oversee the appropriate data collection agencies within the G20 and guide their data collection efforts.

The standards setting body must pay particular attention to the dynamic requirements of business entities. In doing so, the body will inform the G20's digital skills training agencies of the minimum requirements needed in the business sector. For example the USA's Northstar (Northstar, n.d.) training programmes may be used as a benchmark model. In these programmes in which satisfactory performing learners are awarded an appropriate certification, recognised by the business sector. Such certification and recognition will enable a through-put of new entrants into formal employment. With greater employment opportunities deriving from such a certification process, there will be greater incentives for learners to enroll in Digital Literacy training programmes.

Data collection strategy informed by a representative sampling

To develop a comprehensive composite Digital Literacy indicator to measure the degree of competence amongst the population, it is suggested that a multi-dimensional data collection instrument is designed and administered by the G20's national research or data collection bodies (informed by the G20 standard-setting body). In order to produce nationally representative results, and considering the low levels of internet and mobile access in emerging economies together with the high costs of internet access (McKinsey&Company, 2014), a regular survey informed by a representative sampling exercise of the national population, could be conducted. Joncas and Foy (2012) discuss the process followed in measuring international literacy via the Trends in International Mathematics and Science Study (TIMSS) and Progress in International Reading Literacy Study (PIRLS) data collection instruments and in essence highlighting that rigorous sampling exercises are needed across countries, to ensure their target population is estimated correctly. This sample must be age group appropriate targeting all individuals comprising the countries' work-force. Depending on the country, this may range from 15 to 65 years.

The literacy assessment includes a written test of comprehension and additional questions which target the various factors associated with the development of reading literacy (Anand et al., n.d.). A similar but more complex process is required to measure the multi-dimensional nature of Digital Literacy, whereby, the data collection must include a pure literacy assessment based on ability, whilst also capturing the ancillary factors in support of the various dimensions of Digital Literacy.

Develop a multi-dimensional Digital Literacy Index

The structure of the Digital Literacy assessment should be informed by the broad understanding of Digital Literacy, inclusive of Information, Computer, Media, Communication and Technology Literacies, whilst addressing the cognitive, technological and ethical considerations, and as adopted by the proposed G20 Digital Literacy standard-setting body.

It is also crucial to be able to disaggregate the composite Digital Literacy Index by dimension and perspective. For example, business place greater significance on the technical perspective of each dimension of Digital Literacy. Therefore, as discussed in the OECD (2001) study, a Digital

Literacy (Technical Perspective) composite index measurement is equally important as the overall Digital Literacy composite index measurement for planning purposes. The same presentation of the Digital Literacy indicator is equally valid for each dimension and perspective discussed in Table 1.

Ultimately the overall Digital Literacy index that is produced per country, must equally balance each dimension and perspective. Through the introduction of such an index, it is envisioned that policy makers will be empowered to target policy to the most-affected and disadvantaged portions of the population lacking the core sets of skills valued by employers.

Alignment of the Demand and Supply of Digital Skills in the G20

It is critical to understand the connection between the demand for digital skills amongst the employer's and higher education institution's requirements, and the supply of digital skills through school based digital skills training programmes or vocational training programmes. To this end, policy makers in Education departments across the G20 must be suitably informed by the proposed G20 standard-setting body of the minimum requirements for Digital Literacy certification. Furthermore, higher education institutions also need to be agile enough to adapt to this fluid set of requirements. Although alignment is complex, considering the need to change curricula based on the changing set of standards, countries must make an effort to adapt.

Employers actively engaged in the digital economy, require a varied collection of digital skills to compete in the dynamic modern economy. Learners that leave the school system must be adequately prepared to compete in this fast-paced job market. To this end, a measurement which scores the abilities of its exiting learners from schools and the existing workforce, must assess per person, what collection of skills they possess. The OECD (2001) recognized the changing minimum set of educative requirements needed for the modern knowledge economy and noted it is possible for an individual to have a high level of digital literacy and weak level of education. The core elements valued by employers tended to be those with basic technology/ICT knowledge. However, employees in more knowledge intensive positions require a greater depth of knowledge pertaining to the interpretation, analysis and evaluation of data.

This scaling of digital skills requirements points to a job trajectory informed by the literacy, fluency and mastery scale as discussed by Ridsdale et al. (2015) where a data scientist would fall in the master level, whilst analysts would generally attain fluency and low-level employees or new entrants to the job market would possess basic literacy. The crucial point is that a digitally literate employee is the minimum requirement to enter such organisations. Without attaining such knowledge and skills, an individual does not possess the necessary capabilities to contribute to the modern economy.

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IMI International Monetary Review

BRICS

Building not Replacing*

By HERBERT POENISCH*

The Chinese name for the emerging Brics economies – Brazil, Russia, India, China and South Africa – means 'golden brick'. As there is no translation of 'Brics', the Chinese chose this pleasant-sounding approximation, as they do for many western terms. The moniker is a suitable metaphor for how these countries want to operate in the world's financial architecture, by building new elements for, rather than replacing, the present structure.

During the 2017 annual Brics summit hosted in the Chinese city Xiamen, leaders reiterated their willingness to work with the existing global framework. They paid close attention to improving global economic governance, making mention of institutions including the International Monetary Fund, World Trade Organisation and the G20. The summit's official communiqué raised issues with each organisation, foremost the IMF.

The Brics called for a review of their IMF quotas, which affect countries' financial commitments to the Fund, their voting powers and access to financing. They put forward the 2019 Spring meetings of the IMF and World Bank as a strict deadline. They will no doubt have ideas about promoting Brics' figures to senior posts at the top of these institutions.

They stress, too, closer co-operation between the IMF and the Brics' contingent reserve arrangement, designed to provide liquidity in case of balance of payments pressures. The arrangement is seen by some as an alternative to the IMF, with its own and newly established system of exchange in macroeconomic information. In the short term, however, this is likely to rely heavily on support from Fund surveillance mechanisms. Emerging markets have had the same experience with initiatives such as the Chiang Mai safeguard and Asean+3 macroeconomic and research office, both of which are intended to complement, rather than supplant, IMF support in Asia.

Complementarity with existing structures is a strong feature of Brics leaders' precepts for dealing with destabilising capital flows. The Xiamen communique highlighted the need to strengthen bond market connectivity between Brics, local currency settlement systems and interbank credit lines, but these are not novel proposals; the Bank for International Settlements propagated wider local currency bond markets a decade ago. The reality is that these Brics-led ideas have not flourished in mainstream market finance, and it will take more than political declarations for them to grow.

With regard to the WTO, the Brics support the full enforcement of existing rules and continue firmly to oppose trade protectionism. Given the importance of their relations with non-Brics economies, especially the US and Europe, they have a vested interest in promoting WTO principles, rather than setting up their own preferential trading system. The Brics' support for greater financial regulatory reforms such as the finalisation of the Basel III accords, a key

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element of the G20 summits in Hangzhou and Hamburg, again highlights their wish to integrate with the present international framework.

Lobbying together for change to the existing framework is important, but falls a long way short of attempting to supplant the western-dominated international hierarchy. This will remain the case for as long as the Brics countries continue to value their relationships outside the group more than their internal ties.

IMI International Monetary Review

Working Paper

Why Does the World Need a Reserve Asset with a Hard Anchor*

By **DI DONGSHENG, WARREN COATS AND ZHAO YUXUAN***

From the 1970s, the global currency system has two features: the use of one or a few sovereign currencies as the global reserve asset and the floating exchange rate regime between major currencies. This paper points out that the costs of the dollar's use as an international reserve currency exceed the benefits for both the US and the rest of the world. These costs include the exporting of American manufacturing as a byproduct of its current account deficit needed to supply its currency to the rest of the world. In addition to the detriment to trade from unpredictable exchange rate fluctuations, the termination of the U.S. obligation to redeem its currency for gold also removed an important restraint on deficit financing for the US and many other countries in the short-run, thus promoting excessive leverage that was a major contributor to the 2008 financial crisis. The paper suggests replacing several main countries' currencies in international reserves with a real Special Drawing Right (SDR) issued according to currency board rules.

Keywords: reserve currency, exchange rate volatility, exorbitant privilege, fiscal discipline, hard anchor, balance of payments, real SDR

JEL Classification: E42, F02, F33

"Earlier the international use of the U.S. dollar benefited the United States. Now the costs and benefits of the dollar's reserve currency role are more balanced." Said Ben Bernanke at the 16th Jacques Polak Annual Research Conference at the International Monetary Fund (IMF), November 5, 2015

1. Introduction

The paper endeavors to establish that the costs of the U.S. dollar's use as an international reserve currency exceed the benefits for both the US and the rest of the World. Some American economists such as Jared Bernstein, Kenneth Austin and Michael Pettis expressed concerns about the growing burden of the U.S. dollar's status as the world's reserve currency.

Dr. Jared Bernstein, a senior fellow at the Center on Budget and Policy Priorities, argued in a New York Times opinion editorial (op-ed) article that "what was once a privilege is now a burden, undermining job growth, pumping up budget and trade deficits and inflating financial

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bubbles." "To get the American economy on track, the government needs to drop its commitment to maintaining the dollar's reserve-currency status." He boldly claimed that the dollar's reserve currency status had cost America 6 million jobs (Bernstein, 2014).

Kenneth Austin (2014), an international economist with the U.S. Treasury Department, claimed convincingly that the correct metric for estimating the cost in jobs was the dollar value of reserve sales to foreign buyers. By his estimation which amounted to six million jobs in 2008, and these would tend to be the sort of high-wage manufacturing jobs that were most vulnerable to changes in exports.

Michael Pettis (2011), a nonresident senior fellow in the Carnegie Asia Program based in Beijing, stated "The SDR should indeed replace the dollar as the dominant reserve currency if we want to eliminate the tremendous global trade and capital imbalances that have characterized the world for much of the past 100 years. This will not happen; however, until the United States forces the issue— which it seems unwilling to do, perhaps for fear that it would signal a relative decline in the power of the U.S. economy. But the United States should, in fact, support doing away with the dollar."

Ending the dollar's reserve-currency role will increase the cost of deficit financing in the US, increase net national savings, and increase the demand for and return on resources used by export and import substitution industries (manufacturing).

In 2009, Zhou Xiaochuan, Governor of the People's Bank of China, called for the ultimate replacement of the U.S. dollar as the world's reserve currency with one issued by the IMF—the SDR. "The acceptance of credit-based national currencies as major international reserve currencies, as is the case in the current system, is a rare special case in history. The crisis again calls for creative reform of the existing international monetary system towards an international reserve currency with a stable value, rule-based issuance and manageable supply, so as to achieve the objective of safeguarding global economic and financial stability."

Governor Zhou's prescient call for reform has largely fallen on deaf ears, yet the weaknesses of the existing non-system remain. The use of a national currency for pricing and settling cross-border transactions continues to suffer from a number of deficiencies: a) the asymmetry between the market pressure for countries with a balance of payments deficit (other than reserve currency countries) to adjust and the lack of such pressure for surplus countries; b) the Triffin dilemma like risk of foreign exchange reserve growth producing an increasingly large foreign holding of reserve currency countries' debt relative to the size of their own economies; c) the weakened financial discipline on the reserve currency's domestic monetary and fiscal policies of the exorbitant privilege of being able to pay for its international purchases with its own currency (a privilege now enjoyed by a growing number of countries); d) and from the lack of attention or concern by the central bank that issues the reserve currency for the needs of the international users of its currency when setting monetary policy. However, the weaknesses of the floating exchange rates that replaced the gold standard have also become clearer: increased cost of trade from volatile exchange rates (e.g., an over 40% swing in the Euro/USD rate since the introduction of Euro), political tensions from currency manipulations/wars, and prolonged and distorted balance of payments imbalances from lack of clear and enforced rules.

To address the weaknesses of a nationally issued reserve currency, the member countries of the IMF revised its Articles of Agreement to obligate central banks to make the SDR to be the principal reserve asset in the international monetary system (IMF Article, XXII). However, several weaknesses in the design of the SDR—such as their method of allocation, and limited uses— undermined the interest of the US and other developed countries. Moreover, the US may have been reluctant to give up its benefits from issuing the reserve currency (seigniorage from the wider holdings of its currency and the exorbitant privilege of borrowing abroad in its own

currency) while downplaying the costs to the international monetary system (asymmetric adjustment pressures, and Triffin dilemma risks) and to itself (offshoring of manufacturing).

More recent proposals to address these problems, very much in line with Governor Zhou's recommendations, have been presented by one of us in earlier articles, which are summarized in our conclusion (Real SDR Currency Board, 2011, 2014). Broadening the demand for and supply of privately issued SDRs for invoicing and settling cross boarder payments will be an important part of expanding the use of IMF issued SDRs ("The SDR as a Means of Payment", 1982). The question addressed here is why the United States has not embraced these or similar reforms. We offer two reasons for the lack of U.S. support. While enjoying the benefit of seigniorage from dollars held abroad, the US seems to have underestimated its deindustrialization resulting from the trade deficits by which it supplied its currency to international holders. In addition to the detriment to trade from unpredictable exchange rate fluctuations, the termination of the U.S. obligation to redeem its currency for gold removed an important restraint on deficit financing for the US and many other countries (politically desirable in the short-run) thus promoting the excessive leverage that was a major contributor to the recent global financial crisis. These themes are developed more fully in the following sections.

2. **The Cost of Supplying Dollars**

Spared the devastation of war on its own territory during the World War II, the United States rapidly expanded its industrial capacity to become the primary supplier of military equipment to the allied forces. It accepted the resulting huge current account surplus as a necessary but temporary burden of the war.

After the World War II, the U.S. economy experienced an enduring decline in employment in manufacturing (Figure 1). It changed from a self-reliant industrial economy to a trading economy. The relative decline in manufacturing reflected a large expansion of finance as a share of the U.S. economy such that Wall Street now enjoys 47% of the profits of all U.S. companies (Johnson, 2009). Though employment in manufacturing declined over the whole period, manufacturing output did not. Nonetheless, as the world demanded larger reserves of dollars, a larger share of the U.S. demand for manufactured goods was satisfied by foreign producers.

It is widely believed that the decline of job creating capacity in the U.S. manufacturing sector is due to technological improvements (increase on labor productivity). Figure 1 shows that besides the technology factor, there were also substantial job transfers from the US to Asian countries accompanying the extension of global supply chains. Almost all the major Asian economies accumulated huge dollar reserves during their export-oriented industrialization.

The world's demand for dollar reserves dramatically accelerated with the collapse of the gold exchange standard of the Bretton Woods system and the growth in foreign exchange reserves held by central banks.

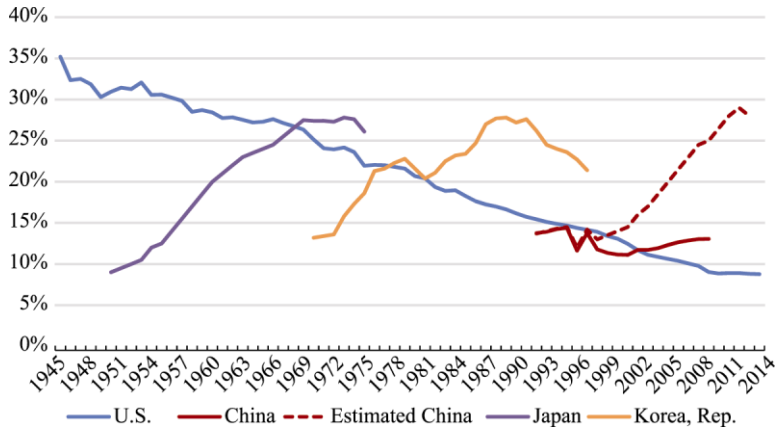


Figure 1 Manufacturing Jobs as Percent of Overall Employment

Source: U.S. Bureau of Labor Statistics; National Bureau of Statistics of China; International Financial Statistics (IFS), IMF.
Note: As the Chinese government only counted employment of registered residents in cities, the data for immigrant workers from the countryside who were employed in cities is estimated by the authors and reflected with a dotted line.

Over the past several decades the output of the U.S. manufacturing sector declined relative to the overall economy, and even former President Barack Obama's high profile policy of "reindustrialization" did not make any meaningful changes to this trend.

From 1975, following the formal termination of the U.S. obligation to redeem its currency held by other central banks for gold, to the end of 2014, the international reserves of central banks increased dramatically from USD 33 billion at the beginning of 1970 to almost 12 trillion in mid-2014. Over 60% of these reserves were held in U.S. dollar denominated assets. Thus, over this period the US had supplied the world with over USD 7 trillion in central bank reserves (Figure 2), the required current account and capital account deficits summing to that amount.

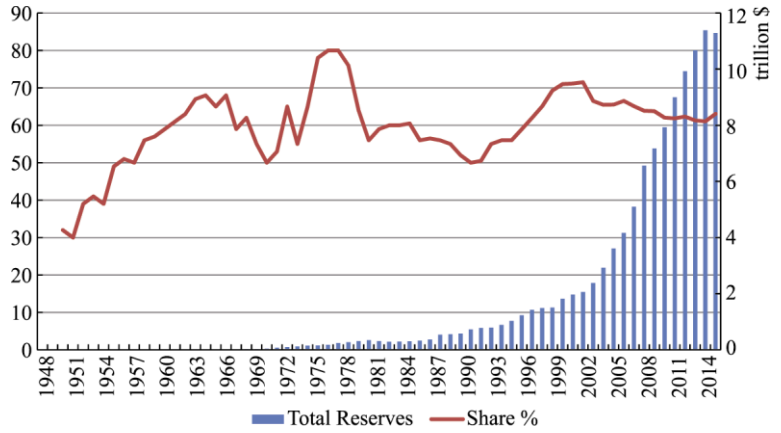


Figure 2 World Total Reserves (right) and Shares of U.S. Dollars (left) (1948–2014)

Source: IFS and Currency Composition of Official Foreign Exchange Reserves, IMF

Note: "World" here includes 192 countries and regions without the US; "Total Reserves" refers to foreign exchange of US$, excluding Gold.

Over this period most of the growth in the U.S. money supply occurred through its current account deficits (Figure 3). The correlation coefficient between changes in world reserves (around 60% of which are in dollars) and the U.S. current account deficit is 0.85.

Thus the supply of dollars to the world's central banks required a stronger dollar than would otherwise be the case. Supplying the world's demand of dollar reserves required fewer exports and more imports than would otherwise have been the case in the US. IPhones that should have been produced in the US and sold to American and global consumers were instead produced in China and other low wage countries whose manufacturing costs were lower than in the US at the more appreciated exchange rate of the dollar required to supply dollar reserves. Many U.S. manufacturing companies established additional, or relocated existing, factories abroad. While U.S. manufacturing output did not decline in absolute quantity, it did decline in relative terms as other sectors of the economy grew. In addition, with continued improvements in manufacturing labor productivity the number of workers in that sector declined. American consumers cheered the flood of inexpensive imports while manufacturing workers complained of unfair competition from cheap foreign laborers.

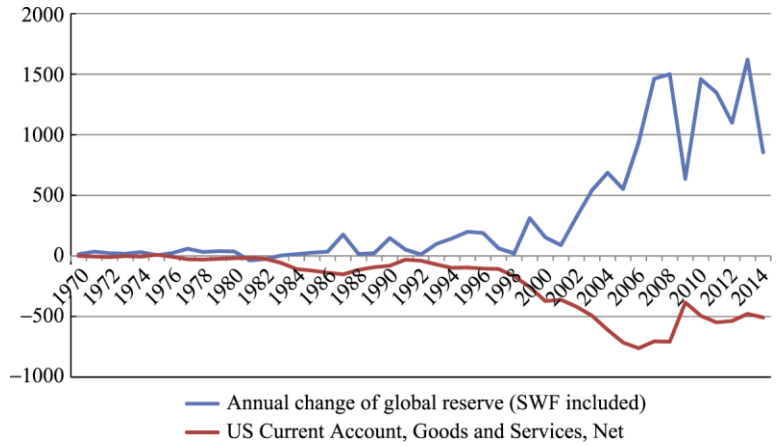


Figure 3 Global Imbalance: Relation between Global Reserve and the U.S. Current Account Deficit (billion $)

Source: IMF and Sovereign Wealth Fund Institute.
Note: The changes of world reserves also include the changes of recent sovereign wealth fund.

Inescapably, if the US must maintain a current account deficit in order to supply the world with its currency, a larger share of its income/output will be produced abroad. To the extent that higher cost labor in the US can be replaced by lower cost labor aboard (translated through the exchange rate), such production will move abroad. Manufacturing workers are higher paid on average than other non-professional workers and thus manufacturing jobs have "suffered" more than others (Figure 4). While this equalization of the return to labor globally reflects greater economic efficiency globally when trade is balanced, it is inefficient when trade is unbalanced.

The strong U.S. dollar or weak U.S. dollar debate in the US has waxed and waned largely along with increases or decreases to the U.S. trade deficit with China and less conspicuously

with Germany. At the end of the day, the strength of the dollar relative to the currencies of its trading partners was left to the exchange rate targets and interventions of those countries. This outcome seems to rely on the fact that U.S. politicians and society have been more willing than other developed countries to tolerate its perpetual trade deficits. As we have noted, these deficits are a requirement of the international reserve currency role of the dollar and the frequent American claim that some countries have been accumulating international reserves beyond reasonable needs, is a judgment difficult to prove. It seems that those who benefit from a strong dollar are better able to defend their interests than are those who are hurt by the trade deficit and resulting de-industrialization. Wall Street, the U.S. governments and U.S. consumers play more important roles in defining the dollar policy than the manufacturers and labor unions.

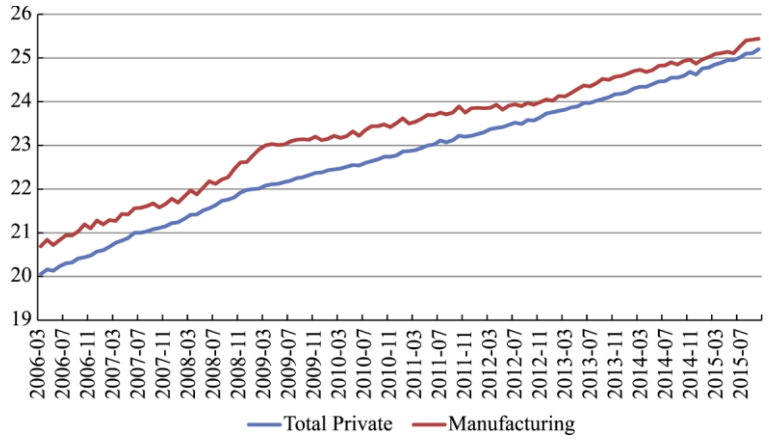


Figure 4 U.S. Average Hourly Wages (USD)

Source: US Bureau of Labor Statistics, retrieved from FRED (2015.11.15), Federal Reserve Bank of St. Louis.

As pointed out by Fred Bergsten, senior fellow and director emeritus in Peterson Institute for International Economics: "Historically, the dollar-based system evolved as a grand bargain, under which other countries could determine their exchange rates against the US and would finance whatever deficits it ran as a result. Surplus countries, from Germany to Japan to China, have periodically grumbled about their "excessive" build-up of dollars, but have generally kept their part of the deal." (Bergsten, 2011)

The de-industrialization of the US has also been caused by high and poorly designed business profits taxes and increasing regulatory costs of doing business in the US. The loss of potential manufacturing jobs has deprived the American middle class's jobs that have traditionally paid above the average non-professional wages (see Figure 4) and contributes to the stagnation of middle class income. Pensioners and other middle class savers have also experienced lower returns on their savings as foreigners have financed a significant share of the U.S. government's debt, thus lowering the government's borrowing costs. The risks to the credit worthiness of U.S. government's debt (106%) of GDP at the end of 2016 and projected by the U.S. congressional budget office to become unsustainable over the next 30–40 years: "Under current law, the deficit is projected to hold steady as a percentage of GDP through 2018, but rise thereafter") will be explained in detail in the next section.[1]

[1] "Congressional Budget Office estimates the deficit will get to 2.7 percent of GDP in 2015, drop to roughly 2.4 percent for the

"When a country wants to boost its exports by making them cheaper using the aforementioned process (artificially keeping their own currencies at a low level against the U.S. dollar), its central bank accumulates currency from countries that issue reserves. To support this process, these countries suppress their consumption and boost their national savings. Since global accounts must balance, when 'currency accumulators' save more and consume less than they produce, other countries—'currency issuers,' like the United States—must save less and consume more than they produce (i.e., run trade deficits). This means that Americans alone do not determine their rates of savings and consumption." (Bernstein, 2014)

There are obvious correlations among the three lines in Figure 5 and Figure 6. As the world increased its net exports to US and it is holding on U.S. financial assets after the mid-1980s, U.S. interest rates declined systematically along with its inflation rate. Regressing the U.S. personal savings rate on world reserves as a percent of GDP, we found a significant (alpha = 0.05) negative correlation (r = –0.8) between them from 1970 to 2008 (annual observations). While manufacturing jobs kept leaving US in absolute terms after 1970s, its pace increased after 2001, when China entered the World Trade Organization (WTO).

Back in the 1980s and 1990s, after the successful industrialization, Japan was also interested in promoting the internationalization of the *yen*. This goal was undercut by the bursting of Japan's real estate and stock market bubbles and the two decades of economic stagnation that followed. Thus, after 30 years the *yen*'s share of global reserves is around 4% after a peak near 10% in the 1990s. A key factor to this result may be the reluctance of Japanese society to give up its reliance on exports as a source of growth. On the part of the US, the absence of the gold standard's discipline of its fiscal policy led it to finance the Vietnam War with debt. The resulting inflation appreciated its real effective exchange rate against the currencies of its major trading partners (Japan, Germany, UK and France). The Plaza Accord by these countries for correcting this imbalance led to a 50% depreciation of the dollar relative to the *yen*. But Japanese trade restrictions limited the increase in the U.S. exports to Japan, which continued to run a trade surplus. This was incompatible with an increase holding of *yen* in international reserves.

It is our hope that as the U.S. government evaluates its position on the reform of the international monetary system and in particular the use of its currency in international reserve, the negative consequences of de-industrialization will be given greater weight. The return to a hard anchor for the system as we propose in our conclusion would also greatly reduce the finger-pointing at the US by surplus countries of its exploitation of its exorbitant privilege and disregard of the global consequences of its monetary policies and finger-pointing at the surplus countries by the US of their manipulation of their exchange rates to promote their exports at the cost of deficit countries.

following three years, and then begin to rise. By 2025, debt held by the public is projected to reach 77 percent of GDP." Congressional Budget Office March 9, 2015.

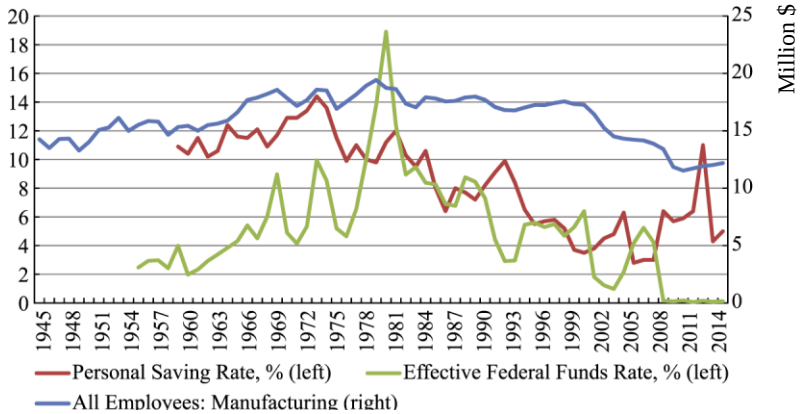


Figure 5 U.S. Saving Rate, FFR, and Manufacturing Employees

Source: US Bureau of Labor Statistics, retrieved from FRED (2015.11.15), Federal Reserve Bank of St. Louis Board of Governors of the Federal Reserve System (US), retrieved from FRED, Federal Reserve Bank of St. Louis; Bureau of Economic Analysis, retrieved from FRED, Federal Reserve Bank of St. Louis.

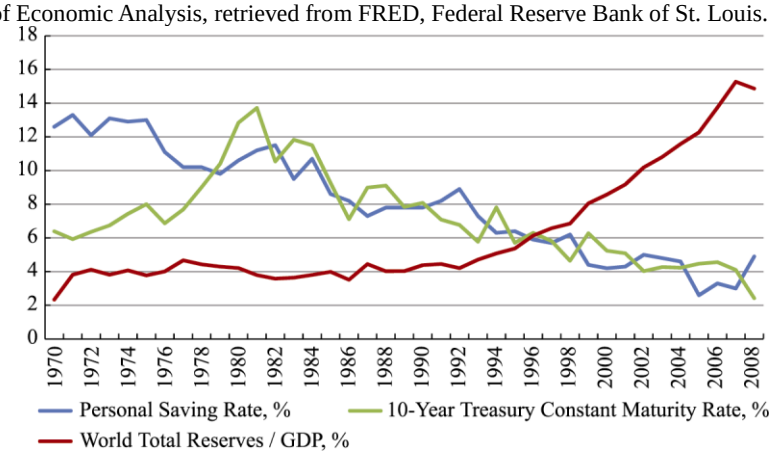


Figure 6 U.S. Saving Rate, 10-year Treasury Rate, and World Reserves as Share of GDP

Source: IFS, IMF; Board of Governors of the Federal Reserve System (US), retrieved from FRED (2015.11.15), Federal Reserve Bank of St. Louis.

3. The Costs of Floating Rates

Sometime after the establishment of the Bretton Woods system, Belgium Economist Robert Triffin drew attention to a logical dilemma in such a system. If the U.S. dollar, exchangeable for gold at a fixed price (the gold exchange standard), is going to provide liquidity for the whole world, the US must run a balance of payments deficit that will grow over time relatively to the more limited stock of gold. At some point the ratio of dollars to gold would grow so large that foreign holders of dollars, this would come to doubt the American ability to honor its commitment to redeem them for gold. To protect themselves from this risk, some central banks in the 1960s (e.g. Banque de France) began to convert their dollars into gold, which led President Richard Nixon to close the gold window in August 1971. This unilateral suspension of the U.S. obligation of convertibility under the Articles of Agreement of the International

Monetary Fund was formally endorsed when "In March 1973, the Group of Ten (G10) approved an arrangement wherein six members of the European Community tied their currencies together and jointly floated against the U.S. dollar, a decision that effectively signaled the abandonment of the Bretton Woods fixed exchange rate system in favor of the current system of floating exchange rates."[2]

This introduced the second feature of the ongoing global currency system: the prices of anchorless currencies float against each other. "Since the dollar no longer had to be backed by gold, the end of the Bretton Woods fixed exchange rate system increased the freedom of the U.S. Federal Reserve to engage in counter-cyclical monetary policy."[3] It became more difficult for firms to anticipate the terms of trade. Fiscal policy was no longer constrained by the need to defend the external value of the dollar (or any other currency).

After more than forty years of floating, we have enough experience to evaluate the new "non-system", as it was called by former IMF Managing Director, Jacques de Larosière. In this section, we examine the shortcomings of floating for monetary and fiscal policy from three aspects. The first is that the anchorless system provided the monetary authorities too much space and power to influence the domestic and global economy in ways that have not always been easy to predict. While this was sometimes used to offset external shocks, it also often contributed to the imbalances that caused them, caused wide swings in exchange rates unrelated to fundamentals, and gave rise to exchange rate manipulation as an additional policy tool or the suspicion of such manipulation. Second, the anchorless system is pro-cyclical and brought huge shocks or even crisis to the developing world, which prompted the latter to accumulate large foreign exchange reserves, and hence contributed to the global imbalance problem. Finally, it reduced the financial pressure on fiscal policy to limit deficits, especially in the US, which has the "privilege" of issuing a global reserve currency.

4. Exchange Rates and Trade

Initially the case for market determined exchange rates, free floating, was that it was a natural extension of market logic to the sphere of currency, i.e., the competition between supply and demand will maximize the efficiency of resource distribution and the price will stabilize at the appropriate equilibrium level. But, from the point of view of global trade, volatile and difficult to predict terms of trade resulting from unpredictable currency exchange rates is inefficient. For an efficient and open global market, floating exchange rates add a seemingly unnecessary cost and risk to cross border trade.

A currency contributes most to the expansion and efficiency of trade when it provides a trustworthy medium of exchange with a stable and predictable value. These desirable qualities remain important as the domain of trade is expanded beyond national borders. The global currency system should provide a stable, trustworthy and neutral monetary environment so that the global market can find and exploit true comparative advantage. With floating we now have a system of national currencies that change relative values in unpredictable, sometimes arbitrary and sometimes deliberately manipulated ways. Moreover, U.S. monetary policy pursues domestic objectives without much regard for its impact on exchange rates or capital flows in the rest of the world despite the dollar's role as the primary international reserve asset.

As monetary authorities, and especially the Federal Reserve, are taking more and more active roles in their domestic financial markets, the spill over into international markets and exchange rates are becoming more difficult to predict and thus more costly for international trade and

[2] https://history.state.gov/milestones/1969-1976/nixon-shock visited on May 20, 2015.

[3] http://bancroft.berkeley.edu/ROHO/projects/debt/terminationgolddollar.html visited on May 20, 2015.

investment. Global players must adjust to survive. Therefore, we have witnessed a shift in focus of investment technology from the evaluation of the value (competitiveness) of trade contracts to the prediction of the direction that the monetary authorities and thus interest rate differentials and exchange rates may take. As shown by the Figures 7 and 8, the exchange rates of the world major economies, both developed and developing, are very volatile against U.S. dollar. Generally speaking, the currency of a typical developing country may depreciate periodically against the dollar, which makes the annual growth of these economies meaningless for the improvement of the living standard of their people because measured by dollar standard, their income per capital stagnates or even decreases due to the devaluation of currency.

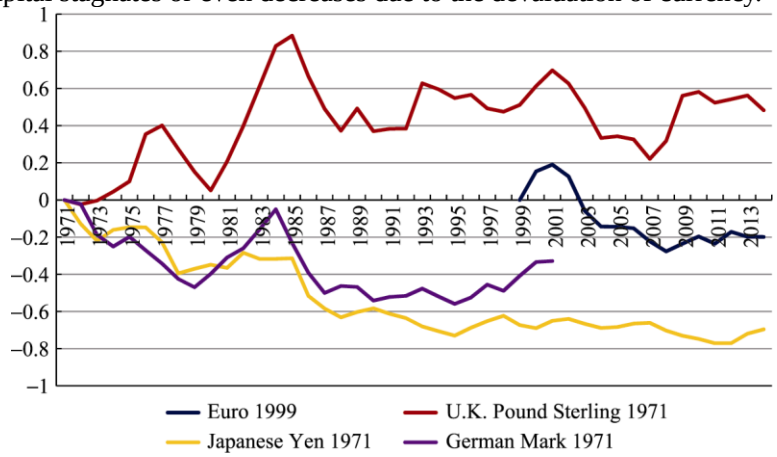
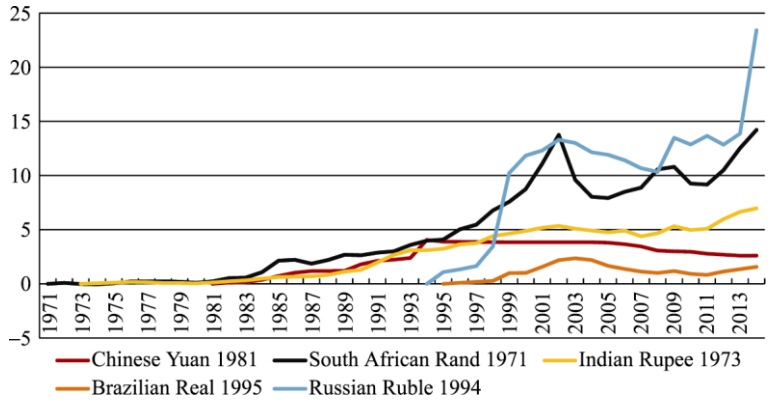


Figure 7 USD Exchange Rates Movement Relative to Developed Economies from Each Base Year

Source: Federal Reserve Bank of St. Louis, retrieved from FRED (2015.11.15), Federal Reserve Bank of St. Louis.



Figures 8 USD Exchange Rates Movement Relative to Currencies of Developing Economies from Each Base Year

Source: Federal Reserve Bank of St. Louis, retrieved from FRED (2015.11.15), Federal Reserve Bank of St. Louis.

Floating exchange rates increase the risk of international trade and the otherwise unnecessary cost of hedging against it. This cost could be perceived as an extra tax on the real economy. Success in international trade depends on the capacity to understand and predict the currency policy intentions of major monetary authorities as much as producing a better product. Knowledge of politics may be more important than that of economics and business, because the behavior of the monetary authorities is often more the result of political than of economic considerations. Thus in floating exchange rate environments, companies trading internationally must buy insurance for their financial exposure to currency risks. So this behavior increases the costs of trade. The huge growth in financial services in Wall Street, London and Hong Kong, etc., derives largely from this need for spot and forward currency transactions and exchange rate hedges of one sort or another.

Many central banks have sought to keep limited international exchange rate stability by pegging their currencies to the U.S. dollar or some other major trading partner currency. Pegging their currencies to an international one, especially the dollar, can help their own exporters and manufacturers by reducing their business uncertainties, thus encouraging their expansion. However, this strategy increases the risks of sudden, large exchange rate changes. Moreover, pegging to one currency cannot mitigate the exchange risk of the wide swings in other currencies that might also be important. To avoid being caught in a financial crisis like that of 1997–1998, Asian nations adopted ways to control portfolio capital flows and accumulated larger foreign exchange reserves. One of the costs of such policies is undervaluing their currencies enough to build foreign exchange reserve holdings sufficient to defend the value of their currency in international currency markets.

The increased demand for foreign exchange reserves to defend exchange rates has been augmented by the lower cost of holding such reserves. The current system has reduced the cost of holding foreign exchange reserves by replacing gold with U.S. Treasury bonds or similar assets. A portfolio of U.S. Treasury bonds of different terms provides better liquidity, better returns and almost similar safety as holding gold under the former system. This further increases the demand for foreign exchange reserves. World reserve holdings have tripled from USD 1.2 trillion at the beginning of 1995 to USD 4 trillion at the end of 2005 only to triple again to USD 12 trillion in mid-2014.[4] Figure 9 indicates that over one third of these were held by the central banks of China and Japan. This astounding growth in international reserves began at the beginning of the 1970s as the Bretton Woods system collapsed. At the end of 1969 the total world reserve was a mere USD 33 billion.

As noted in the previous section, holdings of foreign exchange reserves by one nation equal the balance of payments debt in US and other international currency issuers. Such cross boarder financing is highly correlated with overall debt, both public and private sector, in reserve currency countries.

Floating exchange rates have also brought big differences to international trade negotiation. Historically, trade negotiations focused on tariffs and their reduction. After decades of such negotiations, tariffs have been significantly reduced. However, along with non-tariff barriers, floating exchange rates introduced currency manipulation as a new tool for seeking trade advantages. By deliberately keeping their own currency's exchange rate low, those governments pursuing a mercantilism growth policy could help their own exporters and restrain imports, thus taking a relatively lager share in the trade deficit that the US provides to the whole world in

[4] Barry Eichengreen, Ricardo Hausmann, Ugo Panizza, August 2013, http://eml.berkeley.edu/~eichengr/research/ospainaug21-03.pdf and ECB *The Accumulation of Foreign Reserves,* Occasional Paper No 43, February 2006.

order to supply its currency to international reserves. Competitive devaluation is a strategy often adopted by developing nations facing international systematic crisis, though the result is often higher inflation and painful adjustments.

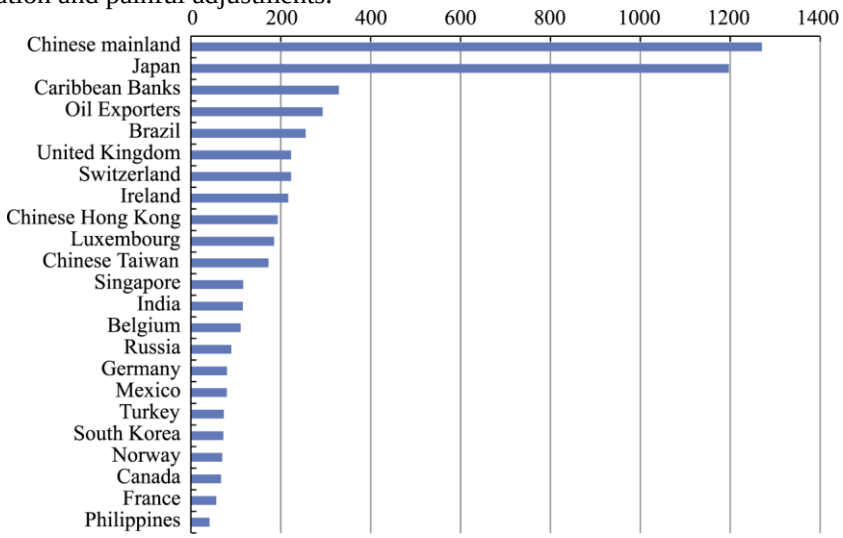


Figure 9 Major Foreign Holders of Treasury Securities (in billions of dollars, as of August 2015)

Source: U.S. Treasury Department, https://www.treasury.gov/resource-center/data-chart-center/tic/Pages/ticsec2.aspx

The most important change to the global business environment since the 1970s is that monetary and financial policies were added to the factors important for determining winners and losers in international markets. An enterprise, even if its managers work very hard on the quality of their products, on the reduction of costs, and on exploring potential markets, still has a significant chance of going bankrupt in the face of unexpected exchange rate developments or sudden reversals of monetary induced temporary bubbles of demand. During 2008–2009, there were plenty of real cases of this in every corner of the world and every industry.

In the search for counterbalances to the inflationary bias of anchorless monetary policies, the independence of central banks with price stability objectives or inflation targets gained popularity. Indeed, amendments to central banking legislation increasingly established, at least *de jure*, such independence in the 1980s and 1990s, and with its relative success in keeping inflation moderate. With the financial crisis of 2008 and the broadening of the responsibilities of the central banks from preventing inflation and liquidity crisis to more and more ambitious, quasi-fiscal tasks, the anchor of the system is again in doubt.

In our view the anchorless and free floating currency system is not a natural extension of free markets, but rather a hindrance.

5. Floating Is Pro-Cyclical, Especially for Developing Economies

Floating exchange rates have had a pro-cyclical impact on global balances, increased cyclical shocks to the developing world, and as discussed above encouraged the latter to accumulate large foreign exchange reserves. The gold standard world and the gold exchange standard of Bretton Woods also had cycles due to a changing pace of gold mine extraction, technical/productivity shocks and all of the other shocks market economies are always adjusting

to. However, the hard anchor limited the magnitudes of cyclical swings because of the stronger monetary and fiscal discipline that accompanied it.

The discovery, development, and subsequent export of oil, for example, would attract foreign capital to help finance the increased investment spending, and thus moderate the increase in domestic interest rates that the investment boom would cause. With fixed exchange rates the capital inflow would increase the domestic money supply and price level, which would increase imports. With floating exchange rates the foreign capital would appreciate the recipient country's exchange rate thus increasing imports. In both cases, the real exchange rate would adjust, in one via price level adjustments and in the other via nominal exchange rate adjustments.

However, several features of the floating exchange rate system promote overshooting. To understand this mechanism, we could contrast the reactions to an increase in investment demand in country B between a hard exchange rate peg and floating rates. In the former case the increase in interest rates in country B increases the flow of capital from country A to B. This tightens monetary conditions in A and eases them in B, reducing prices in A and increasing them in B until the balance of payments between them rebalances with an appreciated real exchange rate in B. With floating exchange rates the real appreciation takes the form of an appreciation of the nominal exchange rate. With perfect foresight the two adjustments should be equivalent. However, if the appreciation of the nominal exchange rate creates expectations of further (continued) appreciations, additional capital will be attracted causing overshooting. If country B's central bank resists the increase in interest rates with an easy money policy, which it is free to do with floating exchange rates, it may fuel asset bubbles of the sort experienced in the US in the mid-2000s.

The carry trade of recent years provided examples of this phenomenon. When the U.S. dollar interest rates (sometimes *yen* or Euro) are relatively low, many speculators borrow cheap dollars and exchange them into high return assets in some developing nations. Two aspects of the existing arrangement promote this speculation. One is the higher interest rates on developing or emerging market investments, i.e., the low price of funding in the US and high return on emerging markets investments. The other, which is not present with hard exchange rate pegs, is the expectation of an appreciation of the currency invested in, which reflects the fact that the currency of the economy in which they invest is under appreciation pressure as more and more capital flows in.

Moreover, actual experience has often been that the equilibrating increase in interest rates in country A (the US) is prevented by a loosening monetary policy in country A. This tends to perpetuate the capital outflow. In the case of the United States, monetary easing with floating exchange rates, whether to dampen the interest rate increase from an investment boom or excessive fiscal deficit or to prevent an exchange rate appreciation, tends to be transmitted to the rest of the world as other central banks ease their own monetary conditions in order to avoid an exchange rate effect. Relatively large capital flows into and then out of the emerging market economies have resulted in recent years from such fluctuations in U.S. monetary policy. When the US needs to expand its monetary base, for example, as happened in 2009, the increase tends to get exported to many countries that do not need such an increase. As the Federal Reserve at long last begins to tighten, the emerging markets experience the reverse capital flow. In October 2015, the emerging market countries experienced a net outflow (for the first time in 27 years) of over USD 0.5 trillion, the largest share of which was from China.

These two aspects of cross border capital flows under floating exchange rates are very different as the interest rate gap will narrow when money flows in while the expectation of an exchange rate appreciation will increase. Such a self-fulfilling prophecy and self-reinforcing mechanism creates market bubbles instead of bringing the market to equilibrium. When this

tendency reaches its tipping point, often triggered by the raise of interest in the US, these carry traders scramble to unwind their positions, deflating the bubble, collapsing both the capital market and the exchange rate. Obviously, under the hard anchor of a fixed exchange rate regime, the profit of carry trade will be limited to the interest rate differential, which will balance itself automatically and is much less likely to trigger a boom/burst cycle. As we could see from Figure 10, since the 1970s, every time the dollar went into a cycle of rising interest rates, there were always some financial and currency crisis in developing nations.

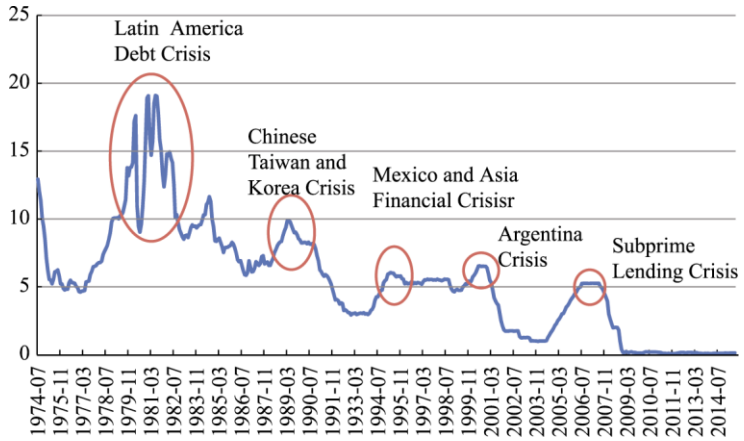


Figure 10 U.S. FFR Hikes and Crises in Developing World

Source: Board of Governors of the Federal Reserve System, retrieved from FRED (2015.11.15), Federal Reserve Bank of St. Louis.

6. Excessive Debt from Loss of Hard Monetary Anchor

Floating exchange rate regimes provide governments with more policy maneuver space. Central banks (or their governments) that want to stimulate employment or lower the cost of the government's deficit financing are no longer constrained by the dictates of defending an exchange rate. In the long run, excessive monetary stimulus produces higher inflation, and redistributes wealth among savers, investors and labors. Many governments in the 1980s chose monetary expansion to solve their fiscal and debt problems when they promised and spent too much, and we can find fresh examples in the case of some leftist governments in Latin America whose currencies have depreciated dramatically recently.

The anchorless currency system relaxed fiscal discipline in the US as well. As shown by Figure 11, since the 1970s, when dollar financial assets replaced gold in international reserves, the U.S. national debt as a percentage of its GDP rose substantially as its external balance of payments deficit needed to supply the growth in the rest of the world's demand for its currency lowered the U.S. government's cost of borrowing.

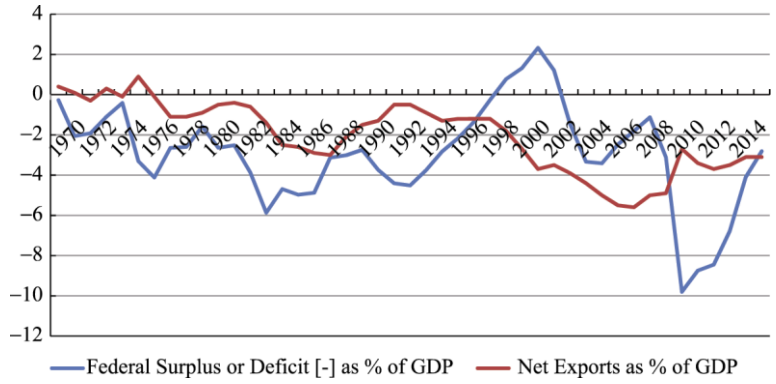


Figure 11 U.S. Trade Deficit and Fiscal Deficit as Share of U.S. GDP (1970–2015)

Source: Federal Reserve Bank of St. Louis and U.S. Office of Management and Budget, retrieved from FRED (2015.11.15), Federal Reserve Bank of St. Louis.

The reserve role of the dollar combined with floating exchange rates led to the infamous twin deficits—trade deficits and fiscal deficits. Fiscal deficits are not an inevitable consequence of being the reserve currency, but the lack of a hard exchange rate anchor removed a fiscal discipline that the US found hard to replace. The U.S. debt grew both because its interest rates were lower and because it no longer needed to defend its exchange rate (or the price of gold). One study estimated that the interest rate on ten-year (US) Treasury bonds was 0.8% lower in 2005 as a result of purchases of the U.S. Treasury bonds by foreigners (Warnock and Warnock, 2009). The European Central Bank's study found that foreign holdings of long-term European Union country bonds during the 2000s reduced their yield by about 1.5% (Carvalho and Fidora, 2015).

As noted by Michael Pettis, for countries like China to accumulate dollars as their reserve currency, they needed to depreciate their own currency (or resist its tendency to appreciate), which hurt the competitiveness of the U.S. exporting enterprises. So the only way to avoid higher unemployment in the US was to increase the domestic demand in non-tradable sectors (Pettis, 2011). The dollar financial assets that foreign governments hold largely consist of the U.S. treasury bonds, but they could also include private sector debt and ownership of the US-based companies and real estate. This foreign financing lowered interest rates in the US, but a large share of it was absorbed by government deficit financing rather than financing private sector investment and consumption.

The rapid growth of China and Japan's international reserves raised several political controversies. Was China over accumulating reserves as a by-product of its export led growth strategy (and an artificially low exchange rate) or was it a by-product of U.S. deficits pushing out dollars in exchange for foreign financing of its excessive fiscal deficits? Some scholars, for example, Professor Daron Acemoglu in his speech in the spring meeting of IMF on April 19, 2015 stated that excessive U.S. deficits reflected a time inconsistency problem in which two groups of stake holders who do not vote, foreigners and future generations are underrepresented in government spending decisions. That is why the politicians prefer to borrow and spend as much as possible and leave the debt burden to the decedents and leave the risks to the foreigners. The gold standard and gold exchange standard had effectively disciplined monetary and fiscal policy and reduced the time inconsistency problem.

Figure 12 indicates that the debt ratio was steadily declining before 1974. Prior to that

government borrowing would have increased interest rates. With the closing of the gold window, the money base could be expanded without limitation and interest rates could be kept artificially low until expectations of inflation began to drive them up. Debt could be repaid endlessly with more new debt, and for a while (until inflationary expectations kicked in) the central bank could keep interest rates low by buying it.

The new policy with free hand, however, proved to be an illusion. As the Federal Reserve continued to stimulate via its printing machine, the tradeoff between inflation and unemployment (the Phillips curve) vanished leaving only higher inflation and with higher (nominal) interest rates. Paul Volcker finally stepped on the monetary breaks and restored monetary discipline in the US in 1979–1980.[5]

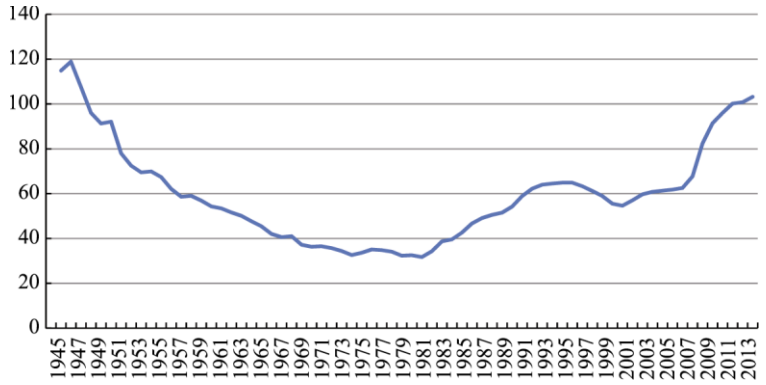


Figure 12 U.S. Gross Federal Debt as % of GDP

Source: Office of Management and Budget, the White House.

In the 1980s, a global consensus emerged that monetary policy discipline and fiscal discipline should be restored in a more fundamental way. On the fiscal side the US has tried, with limited success, tools like a congressionally established debt ceiling. On the monetary side, establishing central bank legal independence with a price stability mandate reduced the ease with which governments could borrow from their central banks. The widespread adoption of central bank independence has significantly reduced inflation in much of the world. However, the financial crisis of 2008 and the continued disruptive volatility of exchange rates dramatically demonstrate the weaknesses of the currency system. To rectify this system, we must go back to a hard anchor and fixed exchange rate currency system.

The following two figures (Figures 13a and 13b) show very clearly how the 1971–1974 reform of the global currency system, i.e., the disappearance of a hard anchor and advent of floating exchange rates, made substantial differences in the long run inflation rate tendencies in even the developed economies.

[5] Allan H. Meltzer, A History of the Federal Reserve, Vol 2, Book 2, Chapter 8.

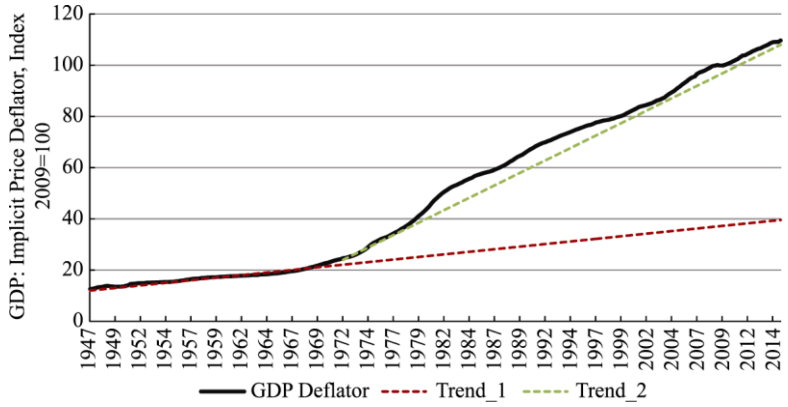


Figure 13a U.S. Inflation Trends before and after 1972

Source: US. Bureau of Economic Analysis, Gross Domestic Product: Implicit Price Deflator [GDPDEF], retrieved from FRED (2015.11.15), Federal Reserve Bank of St. Louis.

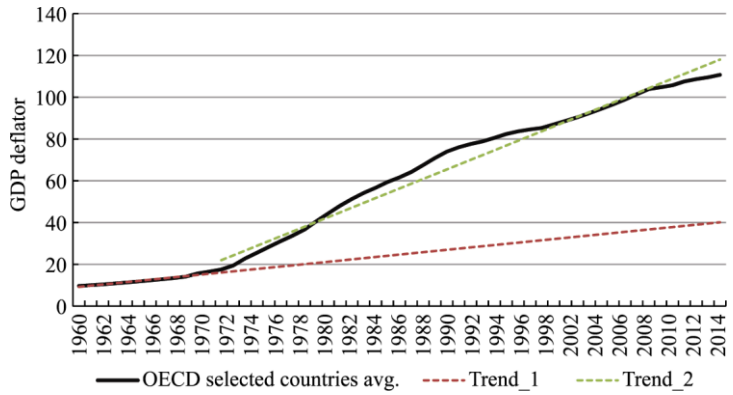


Figure 13b OECD Selected Countries Average Inflation Trends before and after 1972

Source: World Development Indicators, World Bank Note: Based on availability of data, selected countries here include Australia, Canada, Spain, France, UK, Italy and Japan.

7. Conclusion

Since the collapse of the Bretton Woods/Gold standard system, the impressive growth of cross-border trade and finance has been restrained by costly exchange rate volatility. An expensive industry has developed to hedge the related risks. Exchange rate manipulation, if not outright currency war, has created political tensions and produced large international payments imbalances. Given the size of the U.S. economy and the depth and breadth of its financial markets, the use of the dollar has remained and even grown as the world's primary reserve asset. But the continued failure of the U.S. government to address its unfunded liabilities, the traditional lack of concern by the Federal Reserve for the monetary needs of foreign users of the dollar, and faltering American leadership after the World War II world order have increased discontent with and reduced confidence in the current arrangements. While gaining the exorbitant privilege of borrowing abroad in its own currency and the seigniorage from foreign holdings of its currency, the US incurs the cost of deindustrialization caused by the chronic

balance of payments deficits needed to supply the world's demand for its currency, and the entire world incurs the cost of weakened monetary and fiscal discipline and hard to predict exchange rates.

A much better system would replace national currencies for pricing and settling cross border transactions with an internationally issued currency, whose value was anchored to a small basket of real goods, and to which the exchange rates of all or most national currencies where firmly fixed. In 1969 the IMF created the SDR to supplement or replace the U.S. dollar in international reserves. Initially its value was fixed to gold but after the closing of the U.S. gold window, its valuation was fixed to a basket of key currencies. The Second Amendment to its Articles of Agreement obligated Fund members to make the SDR "the principal reserve asset in the international monetary system" (IMF Article XXII).

However, the SDR suffered from several deficiencies and never caught on. The initial failure (since corrected) to charge interest for using SDRs (and to pay interest for holding them) tainted the SDR as a development aid instrument rather than a reserve asset. More importantly, the regulation of the supply of SDRs via the approval of periodic allocations to all members in proportion to their IMF quotas made it very unlikely that their supply would match their demand at their officially fixed value (based on a basket of key currencies). This necessitated administrative rules for their use, which seriously undercut their attractiveness as a reserve asset.

While many simple and practical means can and should be taken to promote the use of the existing SDR as proposed by one of us in many earlier articles and by Governor Zhou in his speech in 2009, we believe (along with Governor Zhou) that the SDR could be made a much better (and less political) unit of account by replacing its valuation basket of currencies with a basket of goods. All of this could be done under the IMF's existing Articles of Agreement. However, with an amendment to the Articles of Agreement that replaced the allocation of SDRs with issuing them under currency board rules, the attractiveness of SDRs could be dramatically increased. Rather than buying and selling SDRs for the items in its valuation basket (as with the gold or other traditional commodity standards), the IMF would sell and redeem these "real SDRs" for the basket indirectly (against government or other AAA-rated financial assets of equivalent value). Such an SDR, with a relatively constant real value, is likely to be adopted as the anchor currency for fixing the exchange rates of many if not most national currencies and to augment or replace the U.S. dollar and Euro in other countries' foreign exchange reserves. The entire existing stock of central bank foreign exchange reserves could be swapped (substituted) for real SDR in one go.

So why have such reforms not been embraced? The US is thought to want to hang on to the seigniorage it earns from supplying its currency to foreign holders while indulging in its exorbitant privilege despite the instability of its exchange rate as capital flows in and out in response to Federal Reserve monetary policy and world developments plus the growing risk a Triffin Dilemma like loss of confidence. We argue here that the US has not given enough weight to the cost of supplying its currency in the form of deindustrialization nor the cost in the form of global financial instability from excess leverage encouraged by unanchored monetary policies.

Borio and Disyatat (2011) argued that the fundamental weaknesses in the international monetary and financial system stemmed from the problem of "excess elasticity": The system lacks sufficiently strong anchors to prevent the build-up of unsustainable booms in credit and asset prices (financial imbalances) which can eventually lead to serious financial strains and derail the world economy. Reducing this elasticity requires that anchors be put in place in the financial and monetary regimes, underpinned by prudent fiscal policies. Our real SDR currency board proposals could remedy this excess elasticity.

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Do Speculative Bubbles Migrate in the Chinese Stock Market?*

By **HE QING, QIAN ZONGXIN, FEI ZHE AND TERENCE TAI LEUNG CHONG***

In this paper, a duration dependence test for speculative bubbles in the Chinese stock market is developed. It is found that bubbles in the aggregate stock price existed before the split share reform. After the reform, we observe the phenomenon of bubble migration across industries. In particular, bubbles migrate from the telecommunications industry to the health care industry. Moreover, we find that monetary policy used to have a significant impact on the bubble size before the reform but the impact diminished after the reform.

Keywords: Survival analysis; Speculative bubbles; Non-tradable shares reform

JEL Classification: G12

1. Introduction

The 2008 financial crisis triggered by the burst of the subprime mortgage market bubble has had a profound impact on the global economy (Brueckner et al., 2012). The Chinese stock market experiences similar boom and bust cycles. The market rose by approximately 400% from 2001to 2007, but experienced a bust in 2008 in which the Shanghai composite index dropped by more than 75.74%. Whether this is a normal market cycle or a burst of bubbles has not yet been fully addressed. Given China's crucial role as a global economic power, the understanding of equity bubbles and the boom and bust cycle of this market therefore becomes increasingly important for international investors and policy makers.

A number of studies in the literature have attempted to detect bubbles in equity markets(Hamilton, 1986; West, 1988; Fukuta, 2002).A strand of literature regards equity bubble as the deviation of actual price from the fundamentals, and develops a variance bounds testto detect the bubbles, e.g., Shiller (1981) and LeRoy and Porter (1981).However, the variance bounds test relies on linearity assumption that relates all the observations to the value of prior observations. Gurkaynak (2008) suggests that bubbles demonstrate nonlinear patterns in return, and one cannot attribute the violation of the variance bound in data to the existence of a bubble. Another strand of the literature examines the statistical attributes of equity bubbles. For example, Blanchard and Watson (1983) develop autocorrelation and kurtosis tests for equity bubbles. Evans (1987) detects bubbles in the foreign exchange market using a skewness test. Diba and Grossman (1988) implement both unit root and co-integration tests to detect equity bubbles. However, these statistical features can also be driven by fundamental values and made them difficult to conclusively test equity bubbles. To incorporate the nonlinearity patterns on equity

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return, McQueen and Thorley (1994) develop a duration dependence test for bubbles, by allowing the probability of ending a bubble to depend on the length of positive or negative abnormal returns. The duration dependence test is more closely related to bubbles than other measures such as autocorrelation and skewness (McQueen and Thorley, 1994; Lunde and Timmermann, 2004). This method has been widely used to detect rational speculative bubbles in both developed and developing countries, such as, Asian countries (Chan et al., 1998), Malaysia (Mokhtar and Hassan, 2006), Thailand (Jirasakuldech et al., 2008) and more recently US (Wan and Wong, 2015).

In this paper, we apply the duration dependence test to examine bubbles in the Chinese stock market. Zhang (2008) also applies the duration dependence test in the Chinese stock market for a sample period of 1991-2001. However, he does not consider the important link between structural changes at the industry level and dynamic changes in bubbles at the aggregate level. Moreover, the relationship between monetary policy and bubbles is yet to be studied. Our study addresses the above issues by investigating bubbles in stock prices at the industry level, and the impact of the split share reform on the dynamics of bubbles. Thus, our study has valuable policy implications on both capital market and monetary policy in an emerging market economy such as China.

One of the most important capital market reforms in China has been the alleged "split share reform" of listed enterprises. From the beginning, a so-called "split share structure" was established to maintain the State's dominant role in corporate operation in the Chinese stock market. Most government-owned shares, together with shares issued to other investors before IPOs (legal person shares), were strictly prohibited from trading in the secondary markets. Before 2005, only approximately one-third of the shares in listed firms were freely tradable. There were a plenty of speculative transactions, as stock prices are not driven by their fundamental values (He et al., 2017). In addition, corporate managers have less incentive to improve firms' value as they do not benefit from an increase in share prices. In April 2005, the China Securities Regulatory Commission (CSRC) published Guidance Notes on the split share reform of Listed Companies. The reform was aimed to convert all non-tradable shares into legitimate tradable shares in the secondary market. It improves market liquidity and overall operational efficiency of listed firms, since all shares are priced at market values. Thus, the split share reform provides us a unique opportunity to examine the relationship between trading restrictions and speculative bubbles.

Consistent with Zhang (2008), our results show that bubbles exist in China's stock market. However, the contribution of a bubble to the overall stock price is moderate after the split share reform. This suggests that the release of trading restrictions help mitigate speculative bubbles. Looking at the speculative bubbles at the industry level, we find a migration of bubbles from the telecommunications sector to the health care sector after the reform. In addition, we find that monetary policy tools are effective in suppressing bubbles in particular for the period prior to the split share reform.

Harman and Zuehlke (2004) suggest that duration dependence tests for speculative bubbles are sensitive to model specifications. To check the robustness, we repeat our empirical studies across various specifications. Our empirical results remain robust to the method correcting for discrete observation, the use of equally-weighted and value-weighted portfolios, and the use of weekly versus monthly stock returns.

The rest of the paper proceeds as follows. Section 2 briefly introduces the duration dependence test. Section 3 reports the empirical results. The impact of monetary policy on bubbles is discussed. We also conduct a variety of specifications to examine the robustness of our results. The conclusion is presented in Section 4.

2. The Duration Dependence Test

Following McQueen and Thorley (1994), we assume that the price of an asset is equal to its intrinsic value plus a bubble, i.e.:

$$p_t = p_t^* + b_t \tag{1}$$

where b_t is the bubble, $E_t[b_{t+1}] = (1+r_{t+1})b_t$, and $p_t^* = \sum_{i=1}^{\infty}\left\{E_t[d_{t+i}] / \prod_{j=1}^{i}(1+r_{t+j})\right\}$ is the fundamental value, d_{t+i} is the dividend, r_{t+1} is the required rate of return.

Bubbles can grow and burst; more specifically, we define

$$b_{t+1} = \begin{cases} (1+r_{t+1})b_t / \pi - (1-\pi)a_0 / \pi, & with\ probability\ \pi \\ a_0, & with\ probability\ 1-\pi \end{cases} \tag{2}$$

Bubbles grow with probability π, which compensates the loss of the investors when bubbles burst (with probability $1-\pi$). When bubbles burst, the price reverts to the initial price with a small initial bubble value, a_0 .McQueen and Thorley (1994) show that, for a bubble to exist, the probability of a negative abnormal return conditional on a sequence of prior positive abnormal returns decreases with the duration of the prior period with positive abnormal returns. The duration dependence test is based on the logistic transformation of the log of the length of the prior run of positive abnormal returns:

$$h_i = \frac{1}{1+e^{-(\alpha+\beta \ln i)}} \tag{3}$$

where h_i is the conditional probability of a negative abnormal return, and *i* is the length of the prior run of positive abnormal returns (hazard function). The log likelihood of the hazard function is $L(\theta \mid S_T) = \sum_{i=1}^{N} N_i ln h_i + M_i ln(1-h_i)$, where N is the total number of runs, $\theta = (\alpha, \beta)'$, S_T is the data set. N_i is the count of complete runs of length i, while M_i are the count of runs with a length greater than i. A likelihood ratio test is conducted to test for the null hypothesis of no bubble by testing $\beta = 0$. The test statistic $L = \frac{\sup_{\theta} L(\theta \mid S_T)}{\sup_{\theta} L(\theta \mid S_T, \beta = 0)}$ follows $\chi^2(1)$ under the null hypothesis.

3. Empirical Results

3.1. Main results

For the aggregate analysis, the weekly value-weighted A-share returns of the Shanghai and Shenzhen stock exchanges from June 1, 1992 to December 31, 2013are used. For the industry level analysis, weekly industry returns from January 4, 2002 to December 31, 2013 are drawn from the 10 China Securities Index Company Limited (CSI) sector indices. CSI uses an industry

classification system that classifies firms into 10 categories according to their primary business activity, including energy, material, industry, consumer, daily consumer, health care, finance, IT, telecom services and utilities.[6]As China implemented the split share reform in April, 2005, we split the sample into the prior and post-reform period, with the first week of April 2005 as the cut-off point. All data are retrieved from the CSMAR database.

Figure 1 shows the weekly continuously compounded nominal returns for the Chinese comprehensive A-share stock market from June 1992 to December 2013. It shows that the Chinese stock market is quite volatile over the past two decades. The compounded stock returns vary with a range from 0.5 to 1.5 over the period 1992-2005. The stock returns increased almost fivefold from 2005 to 2007. During the global financial crisis around 2008, stock market fell by more than 60%. Even though China implemented a number of stimulus policies, e.g. a lower interest rate and bank reserve ratio[7], the stock market did not recover by the end of 2013.

Figure1.Weekly continuously compounded nominal returns (Equally-weighted)

To conduct the duration dependence test, we first calculate the abnormal returns and divide them into two states (positive versus negative). McQueen and Thorley (1994) estimate a multi-factor model and use the residuals as abnormal returns. The factors in their model include the term spread between AAA bonds and government bonds, yield and dividend. As the dividend distribution system in China is under-developed, it is inappropriate to use the dividend to measure the fundamentals of the Chinese stock market (He and Rui, 2016). Lunde and Timmermann (2004) discuss the impact of inflation on the drift of nominal stock prices. Thus, we also include a proxy of inflation in our regression model. Note that the volatility of weekly stock returns is serially correlated, which will affect the duration distribution. To account for the effect of volatility clustering, we employ Engle and Lee (1999)'s generalized autoregressive conditional heteroscedasticity model with an ARCH-in-mean effect (C-GARCH)[8]. Following Mcqueen and Thorley (1994), we allow the C-GARCH model with lagged returns of up to three orders[9]. More specifically, we use the following model to calculate the abnormal returns in the

[6]The China Securities Index (CSI) Company Limited is a joint venture between the Shanghai Stock Exchanges and the Shenzhen Stock Exchange. It provides the creation and management of indices and index-related services. To measure the stock performance of different industries, the company launched10 industry indices on January 4, 2002.

[7] To offset adverse global economic conditions, the Chinese government launched a CNY 4-trillion stimulus plan on Nov. 9, 2008, to boost domestic demand by providing extra liquidity.

[8] In unreported results, we conduct an ARCH test and find conditional heteroscedasticity in weekly stock return series.

[9] We obtain similar results by using a GARCH-in-mean model with lag returns up to three orders.

Chinese stock market:

$$\begin{aligned} R_t &= \alpha + \beta_1 IFLA_{t-1} + \gamma_1 R_{t-1} + \gamma_2 R_{t-2} + \gamma_3 R_{t-3} + \rho\sigma_t + \varepsilon_t, \quad \varepsilon_t \square N(0, \sigma_t^2), \\ \sigma_t^2 &= q_t + \alpha(\varepsilon_{t-1}^2 - q_{t-1}) + \beta(\sigma_{t-1}^2 - q_{t-1}), \\ q_t &= \omega + \rho(q_{t-1} - \omega) + \phi(\varepsilon_{t-1}^2 - \sigma_{t-1}^2) \end{aligned} \tag{4}$$

where R_t is the compounded weekly returns on the equally-weighted portfolios.[10]IFLA is the consumer price index(CPI)inflation rate. The weekly inflation rate is calculated in the same way as Lunde and Timmermann(2004)[11]. σ_t is the conditional standard deviation, q_t is the temporary component of σ_t and ω is the permanent component of σ_t.

Table 1 summarizes the duration statistics of aggregate and industrial abnormal returns and the duration dependence tests of equation (3) for full sample[12]. The result from Panel A of Table 1 suggests that there is a bubble in the aggregate stock price. The results of the industrial-level analysis in Panel B suggest that the bubble originates from the health care sector. This result is consistent with market expectations. By 2013, the price-earnings ratio of the health care sector has exceeded 36, nearly 4 times the price-earnings ratio of the market. It reflects that the risk of innovations, such as new medicine and new medical apparatus, in this sector is underestimated.

[10]Engle and Lee (1999) show that under mild assumptions, the variance equation of model (4) can be rewritten as an equation with five coefficients, which identifies the five underlying parameters.

[11]The monthly CPI is converted into weekly inflation rates by solving the weekly inflation rate such that the weekly price index grows smoothly and at the same rate between subsequent values of the monthly CPI.

[12]It should be noted that h_i in equation (3) refers to population probability, whereas the h(i) refers to the sample probability used in the likelihood tests.

Table 1 Summary Statistics of duration

Panel A Summary Statistics of durations foraggregate market

Run Length	Positive			Negative		
	Death Total 238	Survival	Hazard Rate	Death Total 239	Survival	Hazard Rate
1	133	105	0.5588	108	131	0.4519
2	41	64	0.3905	61	70	0.4656
3	23	41	0.3594	19	51	0.2714
4	17	24	0.4146	20	31	0.3922
5	10	14	0.4167	12	19	0.3871
6	1	13	0.0714	5	14	0.2632
7	6	7	0.4615	8	6	0.5714
8	3	4	0.4286	3	3	0.5000
9	2	2	0.5000	2	1	0.6667
10	1	1	0.5000	0	1	0.0000
11	1	0	1.0000	1	0	1.0000
Log-Logistic Test						
α	-0.1400	(0.3402)		0.2045	(0.4625)	
β	0.4651	(0.0901)		0.1667	(0.4962)	
$\chi^2(1)$	2.7250	(0.0901)		0.4631	(0.4962)	

Panel B Summary Statistics of durations for industrial returns

Run	Energy	Material	Industry	Consumer	Daily-C	Health	Finance	Info.	Telecom	Utility
1	0.508	0.465	0.503	0.516	0.536	0.519	0.522	0.485	0.475	0.514
2	0.424	0.400	0.473	0.495	0.592	0.568	0.535	0.460	0.495	0.528
3	0.434	0.350	0.449	0.435	0.655	0.632	0.550	0.444	0.521	0.524
4	0.467	0.333	0.407	0.500	0.600	0.500	0.556	0.633	0.522	0.450
5	0.563	0.423	0.563	0.615	0.750	0.571	0.625	0.727	0.636	0.545
6	0.286	0.533	0.571	0.600	1.000	1.000	0.333	0.667	0.750	1.000
7	0.400	0.429	0.333	1.000			0.500	1.000	1.000	
8	0.333	0.500	0.500				1.000			
9	0.500	0.500	1.000							
10	1.000	1.000								
Log-Logistic Test										
β	0.206	0.163	0.099	0.038	-0.373	**0.680**	-0.071	-0.229	-0.259	-0.120
	(0.80)	(0.52)	(0.88)	(0.95)	(0.90)	**(0.01)**	(0.98)	(0.36)	(0.67)	(0.86)
Obs.	187	187	187	188	153	183	180	194	181	183

The run length i represents that the number of weeks for which a series of abnormal returns lasts. The abnormal returns are errors estimated by the C-GARCH model in equation (4). The sample hazard rate is calculated by $h(i) = \frac{N_i}{M_i + N_i}$, where N_i represents the number of death, and M_i represents the number of survival. The parameter of α, β is estimatedby $L(\theta|S_T) = \sum_{i=0}^{\infty} N_i \, lnh_i + M_i ln(1 - h_i)$, where S_T is the data set, $h_i = 1/1 + e^{-(\alpha+\beta \ln i)}$. P-values are in the parentheses.

The split share reform started in April 2005. To account for the potential market structural

change caused by this reform, we estimate the model and conduct duration test of equation (3) for subsample periods. The results are summarized in Table 2.

Table2. Summary Statistics of durations for subperiods

Run Length	Positive			Negative		
	Death Total 152	Survival	Hazard Rate	Death Total 152	Survival	Hazard Rate
Panel A: Pre-reform period						
1	89	63	0.5855	67	85	0.4408
2	28	35	0.4444	38	47	0.4471
3	13	22	0.3714	10	37	0.2128
4	11	11	0.5	16	21	0.4324
5	5	6	0.4545	7	14	0.3333
6	0	6	0	5	9	0.3571
7	4	2	0.6667	7	2	0.7778
9	1	1	0.5	1	1	0.5
11	1	0	1	1	0	1
Log-Logistic Test						
α	-0.2812	(0.4007)		0.2810	(0.3777)	
β	0.4692	(0.0828)		0.1172	(0.6559)	
$\chi^2(1)$	3.0094	(0.0828)		0.1986	(0.6559)	
Panel B: Post-reform period						
1	44	42	0.5116	41	46	0.4713
2	13	29	0.3095	23	23	0.5000
3	10	19	0.3448	9	14	0.3913
4	6	13	0.3158	4	10	0.2857
5	5	8	0.3846	5	5	0.5000
6	1	7	0.1250	0	5	0
7	2	5	0.2857	1	4	0.2000
8	3	2	0.6000	3	1	0.7500
9	1	1	0.5000	1	0	1
10	1	0	1			
Log-Logistic Test						
α	0.0903	(0.7411)			0.0604	(0.8994)
β	0.4374	(0.1153)			0.2747	(0.4374)
$\chi^2(1)$	2.4805	(0.1153)			0.6030	(0.4374)

The run length i represents that the number of weeks for which a series of abnormal returns lasts. The abnormal returns are errors estimated by the C-GARCH model in equation (4). The sample hazard rate is calculated by $h(i) = \frac{N_i}{M_i + N_i}$, where N_i represents the number of death, and M_i represents the number of survival. The parameters α, β are estimated by maximizing the log-likelihood $L(\theta|S_T) = \sum_{i=0}^{\infty} N_i \, lnh_i + M_i ln(1 - h_i)$. P-values are in the parentheses.

Before the reform, there were 152 duration spells for both positive and negative abnormal returns. After the reform, there are 86 observations of duration spells for positive abnormal returns and 87 observations of duration spells for negative abnormal returns. Statistics for the hazard rate are also reported. Note that the hazard rate of durations drops initially and rises thereafter. It is evident that beyond a certain duration, the existence of bubbles is highly dependent on the length of the duration. After nine spells, a bubble bursts. The results of the LR tests are reported in the last three rows of Table 2. Before the split share reform, the null of

$\beta = 0$ conditional on positive abnormal returns is rejected at the 10% level, which shows the presence of bubbles and their dependence on durations; after the reform, the p-value for the null of $\beta = 0$ conditional on positive abnormal returns is 0.1153. The "no bubble" hypothesis cannot be rejected at the conventional confidence level. Thus, the aggregate analysis suggests that the reform was effective in eliminating the bubble.

Figure 1 shows that Chinese stock market index increased fourfold and dropped at the same extent from 2006 to 2008. Someone may suspect that there is a bubble in the post-split share reform period. A possible explanation is thatsplit share reform is effective in mitigating the conflicts between tradable and non-tradable shareholders, and improves the corporate operation efficiency. A large number of studies have shown that the reform has a strong positive influence on the corporate performance. (Firth et al., 2010; Liao et al., 2014, He et al., 2017). Corporate managers are more willing to serve for the benefits of shareholders so as to increase firm's operating and market performance. The rise of stock market index is more likely to be driven by better economic fundamentals rather than speculative bubbles. The financial crisis around 2008 led to a global economic recession. Stock market fell by more than 60%, as investors expected a slowing down of Chinese economy due to this adverse external shock.

Figure2.a Survival Function and confidence intervals for aggregate market

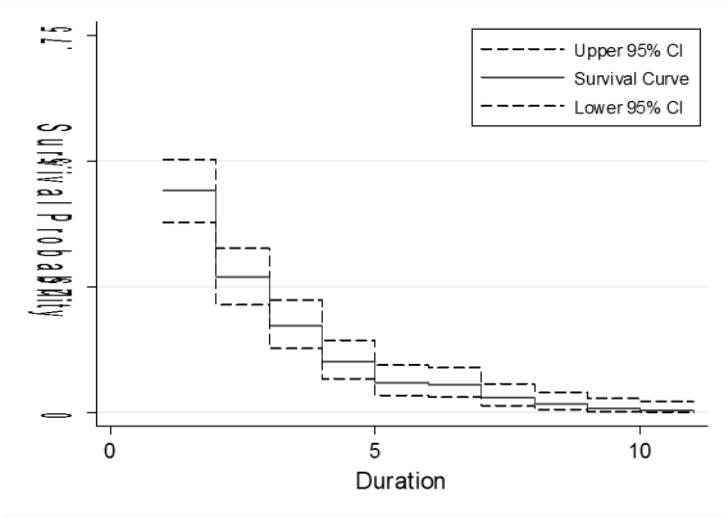


Figure 2.b Survival Function and confidence intervals before the reform

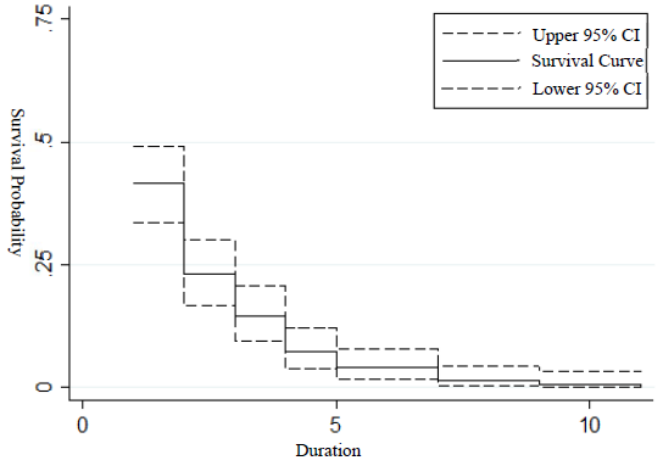


Figure 2.c Survival Function and confidence intervals after the reform

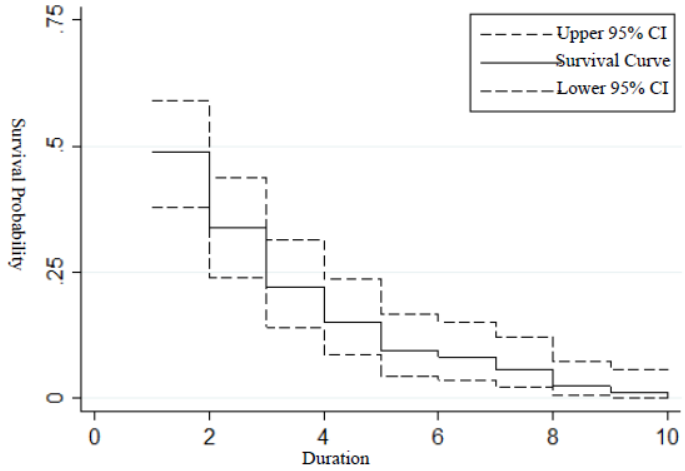


Figure3.a Cumulative Hazard Rate and confidence intervals for aggregate market

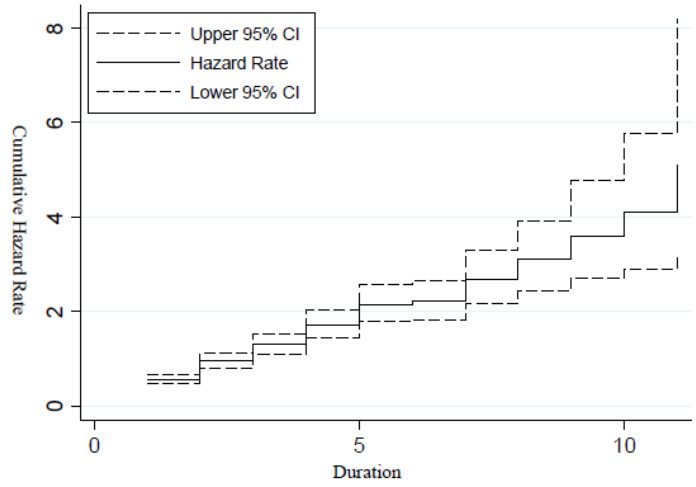


Figure 3.b Cumulative Hazard Rate and confidence intervals before the reform

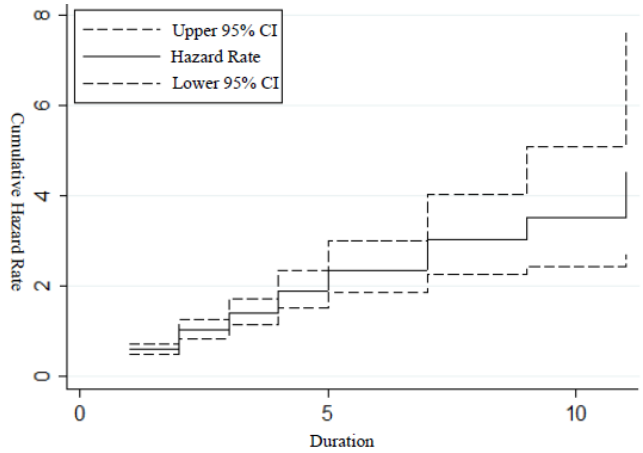
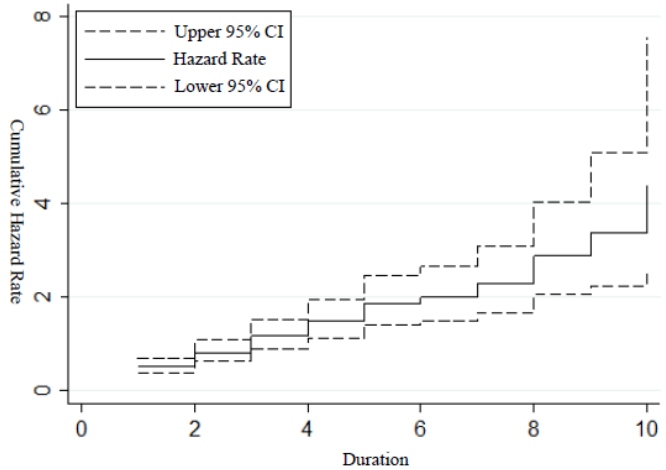


Figure 3.c Cumulative Hazard Rate and confidence intervals after the reform



Figures 2a, 2b and 2c depict the survival function and its 95% confidence intervals. Figures 3a, 3b and 3c depict the cumulative hazard rate function and its 95% confidence intervals. All confidence intervals are calculated using a likelihood ratio test.

Table 3.Summary Statistics of durations for industrial returns in sub-periods

Run	Energy	Material	Industry	Consumer	Daily-C	Health	Finance	Info.	Telecom	Utility
Panel A: Pre-reform period										
1	0.522	0.443	0.514	0.554	0.694	0.594	0.576	0.529	0.624	0.524
2	0.438	0.359	0.500	0.552	0.727	0.577	0.571	0.545	0.467	0.467
3	0.500	0.320	0.471	0.462	1.000	0.455	0.583	0.467	0.515	0.375
4	0.444	0.176	0.444	0.571		0.333	0.600	0.500	0.700	0.300
5	0.600	0.257	0.800	0.333		0.500	1.000	0.500	1.000	0.571
6	0.500	0.444	1.000	0.500		1.000		0.500		1.000
7	1.000	0.500		1.000				1.000		
8		0.333								
9		0.500								
10		1.000								
Log-Logistic Test										
β	0.028	0.213	-0.113	0.101	-0.820	0.240	-0.186	0.018	**-0.420**	0.125
	(0.17)	(0.28)	(0.88)	(0.96)	(0.53)	(0.87)	(0.89)	(0.99)	**(0.09)**	(0.82)
Obs.	67	70	70	65	36	64	66	70	63	63
Panel B: Post-reform period										
1	0.500	0.479	0.496	0.496	0.487	0.579	0.491	0.460	0.449	0.508
2	0.417	0.426	0.458	0.468	0.567	0.565	0.517	0.418	0.462	0.559
3	0.400	0.371	0.438	0.424	0.615	0.400	0.536	0.436	0.486	0.615
4	0.476	0.455	0.389	0.474	0.600	0.625	0.538	0.682	0.500	0.600
5	0.545	0.500	0.455	0.700	0.750	0.667	0.500	0.857	0.556	0.500
6	0.200	0.667	0.500	0.667	1.000	1.000	0.333	1.000	0.750	1.000
7	0.250	0.500	0.333	1.000			0.500		1.000	
8	0.333	1.000	0.500				1.000			
9	0.500		1.000							
10	1.000									
Log-Logistic Test										
β	0.198	0.013	0.134	-0.078	-0.499	**-0.657**	-0.108	-0.374	-0.256	-0.354
	(0.34)	(0.97)	(0.87)	(0.85)	(0.83)	**(0.05)**	(0.95)	(0.14)	(0.71)	(0.84)
Obs.	120	117	117	123	117	119	114	124	118	120

The run length i represents that the number of weeks for which a series of abnormal returns lasts. The abnormal returns are errors estimated by the C-GARCH model in equation (4). The sample hazard rate is calculated by $h(i) = \frac{N_i}{M_i + N_i}$, where N_i represents the number of death, and M_i represents the number of survival. The parameter of the log-logistic test is estimated by $L(\theta|S_T) = \sum_{i=0}^{\infty} N_i \, lnh_i + M_i ln(1 - h_i)$. P-values are in the parentheses.

Note from Table 3 that there is duration dependence in the telecommunications industry (p-value = 0.09) prior to the reform; Thereafter, the health care industry shows significant duration dependence (p-value = 0.05). Therefore, our findings suggest that the bubble does not completely disappear after the reform. Instead, it migrates from the telecommunications industry to the health care industry.

3.2. Tests for Differences in Duration

McQueen and Thorley (1994) suggest that duration dependence should only exist in runs of positive abnormal returns when there are bubbles. In this section, two basic models suggested by

Lunde and Timmermann (2004)are introduced for testing the differences in samples of duration spells. As there is no closed-form solution for any of the duration models, we apply non-parametric two-sample tests to compare the duration dependence between the subsamples (Hollander and Wolfe, 1999). Three assumptions are made:

1) the number of duration spells is $N = M_i + N_i$, N_i represents the number of deaths, and M_i represents the number of survival;

2) the two sample spaces are $\{X_1, X_2, ..., X_P\}$ and $\{Y_1, Y_2, ..., Y_P\}$;

3) X and Y are mutually independent and respectively subject to the continuous distribution functions F and G.

We first apply the Wilcoxon, Mann and Whitney test for the following null hypothesis:

$$H_0: E(X) - E(Y) = 0$$

Let s_i be the rank of Y_i in ascending order. The rank sum of Ycan be written as$W = \sum_{j=1}^{n} s_j$. Under the null hypothesis, the standardized rank sum is:

$$W^* = \frac{W - E_0(W)}{\sqrt{Var_0(W)}} \sim N(0,\ 1) \tag{5}$$

where

$$E_0(W) = n(N+1)/2 \tag{6}$$

and

$$Var_0(W) = \frac{nm}{2}\left[N + 1 - \frac{\sum_{j=1}^{S}(t_j - 1)t_j(t_j + 1)}{N(N-1)}\right] \tag{7}$$

To test the differences between two population samples, we implement the Kolmogorov-Smirnov Test. The null hypothesis is $H_0: F(t) = G(t)$ for t∈ R. The statistic is defined as follows:

$$J = \frac{mn}{d} max_{-\infty \le t \le \infty}\{|F_m(t) - G_n(t)|\} \tag{8}$$

where $F_m(t)$ and $G_n(t)$ are empirical distribution functions of X and Y; d is the greatest common divisor of *m* and *n*.(Critical values of the sample distribution are provided by Hollander and Wolfe, 1999)). Table 4summarizesthe results for the two-sample tests and the numbers are p-values.

Table 4.Two-Sample Test

	Wilcoxon	Kolmogorov-Smirnov
	Positive-Negative	Positive-Negative
Before	**0.0102**	**0.065**
After	0.8708	0.964
	Before-After	Before-After
Positive	0.1189	0.494
Negative	0.4593	0.806

This table reports the two-sample test results (p-values) by comparing the sample of duration spells of positive abnormal returns with the sample of duration spells of negative abnormal returns (Equation 8). The tests are carried out for both periods before and after the reform. P-values<0.1 are highlighted in boldface.

Based on the two-sample test of positive and negative abnormal returns in the prior reform

period, noticeable differences can be observed between the positive abnormal return rate and the negative abnormal return rate; after the reform, we find insignificant difference between these two samples. This result is consistent with our previous finding that the contribution of bubbles to the aggregate stock index has significantly been reduced after the reform. It is evident that the split share reform has suppressed the speculative bubbles.

3.3. The Impact of the Interest Rate on Bubbles

While the increase of interest rate generally has a negative impact on stock returns, there is little analysis of its influence on bubbles in the Chinese stock market. To examine this, the influences of interest rate (I) and its change (ΔI) on bubbles are analyzed under four distributional assumptions, namely, the exponential distribution, the Weibull distribution, the Gompertz distribution and the Cox proportional model. The weekly risk-free interest rate is collected from CSMAR, which is the one-year deposit rate announced by the central bank[13]. Table 5reports the regression results for the hazard rate under the four distributional assumptions.

Table 5. Regression for Interest Rate

	(1)	(2)	(3)	(4)
COEFFICIENT	Exponential	Weibull	Gompertz	Cox
Whole				
I	0.0112*	0.0163	0.0124	0.0086
	(0.006)	(0.010)	(0.008)	(0.054)
ΔI	0.368***	0.547***	0.438***	0.318**
	(0.140)	(0.177)	(0.167)	(0.142)
Cons.	-0.892***	-1.400***	-1.071***	
	(0.090)	(0.158)	(0.136)	
Obs.	236	236	236	236
Before				
I	0.0134	0.0218	0.0169	0.0123
	(0.01)	(0.02)	(0.01)	(0.01)
ΔI	0.265***	0.373***	0.304***	0.247***
	(0.08)	(0.11)	(0.10)	(0.08)
Cons.	-0.853***	-1.408***	-1.080***	
	(0.12)	(0.19)	(0.15)	
Obs.	141	141	141	141
After				
I	0.0285	0.049	0.0421	0.0323
	(0.077)	(0.12)	(0.098)	(0.07)
ΔI	-1.415	-2.448	-1.744	-1.106
	(1.06)	(1.6)	(1.28)	(0.91)
Cons.	-0.937**	-1.532**	-1.238**	
	(0.44)	(0.66)	(0.55)	
Obs.	95	95	95	95

The exponential regression is$h(i) = \exp(\beta_0 + \beta_1 I + \beta_2 \Delta I)$, the Weibull regression is$h(i) = \alpha i^{\alpha} * \exp(\beta_0 + \beta_1 I + \beta_2 \Delta I)$, the Gompertz regression is $h(i) = \alpha * \exp[-\exp(\beta_0 - \beta_1 I - \beta_2 \Delta I)]$, the cox regression is$h(i) = h(0) * \exp(\beta_1 I + \beta_2 \Delta I)$, where h is the hazard rate. Robust Standard Deviations are in the parentheses and *** denotes p value <0.01, ** denotes p value <0.05 * denotes p value <0.1.

For the whole period, an increase in the interest rate leads to a significant increase in the hazard rate and a decrease in bubble duration. This indicates that the interest rate policy played a role in suppressing bubbles. This result is robust under four different specifications.

[13]We also use the repo rate as alternative measure of risk-free interest rate. It turns out that our results remain qualitatively unchanged.

Looking at the periods prior to and after the split share reform, we find a significant difference. Before the reform, an increase in the interest rate leads to a significant increase in the hazard rate and a decrease in bubble duration. These indicate that the interest rate policy was effective in suppressing bubbles. In contrast, this effect no longer exists in the post-reform period. A possible explanation is that in the post-reform period, there were expectations of RMB appreciation. These expectations, together with an inflexible exchange rate regime, led to a huge stock of foreign reserve. The accumulation of foreign reserve led to excess liquidity supply, which added pressure to asset price appreciation. Much of the monetary tightening in this period was to offset the impact of the excess liquidity supply. Therefore, its impact could be weaker than the prior-reform periods in which the foreign reserve-led excess liquidity problem was not a major concern.

3.4. Robustness tests

Thus far, our primary results are based on weekly returns on the equally-weighted portfolios from June 1992 to December 2013, with the abnormal return estimated from equation (4). To check if our duration test is sensitive to the estimation method and the use of the weekly or monthly returns (Harman and Zuehlke, 2004), we repeat the test on a variety of specifications. For each specification, we report the results for both equally- and value- weighted portfolios.

In case I-IV, alternative methods are used to estimate positive and negative abnormal returns. In Case I-III, we use continuous interval and discrete Weibull models, respectively, to examine the sensitivity of our results to the method of correcting for discrete observation of continuous duration. The runs of positive abnormal returns still show a significant duration dependence, and the no-bubble hypothesis is rejected at the traditional level of significance. The runs of negative abnormal returns still fail to reject the no-bubble hypothesis. These results are robust to the use of equally-weighted or value-weighted portfolio series.

When a GARCH model with an ARCH-in-mean effect is used (Case IV), and the equally-weighted rejection of the hypothesis has a p-value of 0.0859. Similarly, the non-bubble hypothesis using value-weighted portfolio is rejected at the 0.0885 level. In the last case (Case V), monthly stock returns are used to estimate positive and negative abnormal returns. The equally-weighted (value-weighted) rejection of the no-bubble hypothesis has a p-value of 0.0749 (0.0664). We still find an insignificant duration dependence on the runs of negative excess returns.

Overall, the evidence of Table 6 suggests that for both equal-weighted and value-weighted portfolios, the rejection of the no-bubble hypothesis for the runs of positive excess return is robust to all specifications.[14] Consistent with the bubble model, there is no significant duration dependence on the runs of negative excess returns.

[14]We also repeat various specifications of duration dependence tests on industry level and subsample period (pre-reform verses post-reform). Our results remain qualitatively unchanged. For brevity, these results are not reported, but available upon request.

Table 6.Sensitivity Analysis for Duration dependence test

		Equally-Weighted			Value-Weighted	
		Positive	Negative		Positive	Negative
I.ContinuousWeibull	α	-0.159	0.317	α	-0.279	0.238
	β	0.403	0.135	β	0.323	0.462
	p	**(0.0867)**	(0.474)	P	**(0.0893)**	(0.619)
II.IntervalWeibull	α	-0.391	0.227	α	-0.594	0.365
	β	0.437	0.367	β	0.573	0.201
	p	**(0.0811)**	(0.315)	P	**(0.0994)**	(0.524)
III.Discrete Weibull	α	-0.282	0.498	α	-0.259	0.133
	β	0.776	0.127	β	0.727	0.505
	p	**(0.0831)**	(0.259)	P	**(0.0853)**	(0.578)
IV.GARCH	α	-0.487	0.269	α	-0.443	0.254
	β	0.200	0.199	β	0.130	0.219
	p	**(0.0859)**	(0.248)	P	**(0.0885)**	(0.571)
V.Monthly return	α	-0.198	-0.180	α	-0.484	-0.221
	β	0.628	0.780	β	0.494	0.758
	p	**(0.0749)**	(0.442)	P	**(0.0664)**	(0.783)

Notes: In Case I-III, The parameter of α, β is estimated by continuous, interval and discrete Weibull models as specified in Harman and Zuehlke, 2004. In Case IV, GARCH model with an ARCH-in-mean effect instead of CGARCH is used to estimate the abnormal return. In Case V, monthly return instead of weekly return is used. All cases include both equal-weighted and value-weighted portfolios. P-values are in the parentheses.

4. Conclusion

The rising role of China as a major economic power has sparked the interest of investors and researchers worldwide in understanding the behavior of its stock market. In this paper, we implement a duration model to examine empirically the existence of speculative bubbles in China's stock market. Evidence of the presence of bubbles is found. Before the split share reform, the probability of bursting a bubble is shown to have increased with the bubble duration. After the reform, the contribution of the bubble component to the aggregate stock price is reduced. Our result suggests that this was caused by a structural change of the market at the industry level. Specifically, bubbles existed in the telecommunications industry before the reform, but migrated to the health care industry afterwards. Prior to the reform, there was segmentation of tradable shares and non-tradable shares in the primary market. In the secondary market, the non-payment of dividends also turns the market into a site for pursuing highly speculative returns rather than value investments. As a result, it was difficult to eliminate bubbles before the reform. Finally, our finding suggests that monetary policy tools were effective in suppressing bubbles prior to the split shares reform, but the effectiveness has dropped off significantly after the reform.

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Trade Openness and the Phillips Curve: The Neglected Heterogeneity and Robustness of Empirical Evidence*

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A cross-country parameter homogeneity assumption is usually imposed in the literature to test the effect of trade openness on the slope of the Phillips curve. A conclusion from this literature is that trade openness has no significant effect in advanced industrial countries. In this paper, we argue that the validity of the parameter homogeneity assumption is not guaranteed from a theoretical perspective, and we find that this assumption is not valid for advanced industrial countries. Trade openness has significant effects on the slope of the Phillips curve in several industrial countries but the signs of the effects vary across countries.

Keywords: Openness, Phillips Curve, Heterogeneity

JEL classification: E31, E52, F41

1. Introduction

Due to differences in modeling strategies and behavioral assumptions, previous theoretical models on the trade openness-Phillips curve correlation give different predictions on the effect of trade openness on the slope of the Phillips curve. Models of Romer (1993) and Lane (1997) predict that an increase in trade openness steepens the Phillips curve, while models of Razin and Loungani (2005) and Daniels and VanHoose (2006) predict that an increase in trade openness flattens the Phillips curve. As a consequence, previous cross-country empirical studies (Badinger, 2009; Daniels, Nourzad, & Vanhoose, 2005; Daniels & VanHoose, 2009; Temple, 2002) use the sign and statistical significance of estimated trade openness-Phillips curve correlation to test the empirical relevance of various theoretical models. In those cross-country studies, parameters of the regression equation are assumed to be homogeneous across countries. Other authors (Ball, 2006; Ihrig, Kamin, Lindner, & Marquez, 2010; IMF, 2006) who use panel data methods to test the trade openness-Phillips curve correlation make the the same assumption. With the parameter homogeneity assumption, those studies find that trade openness has no significant impact on the slope of the Phillips curve in industrial countries.

However, a recent theoretical study by Sbordone (2007) finds that the net effect of a change in the degree of trade openness on the slope of the Phillips curve is ambiguous, depending on the relative changes in the steady-state price elasticity of demand, elasticity of the representative firm's desired markup to its market share, elasticity of the firm's marginal cost to its own output after a change in trade openness. The net effects of trade openness on the slope of the Phillips curve will differ in size and/or sign across countries if those relative changes after a change in trade openness differ across countries, which implies that a parameter homogeneity restriction in the econometric analysis is potentially problematic.

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In this paper, we test the parameter homogeneity assumption in a panel data setting. Our results show that the parameter homogeneity assumption does not hold. Allowing parameters to be heterogeneous across countries, we find that trade openness has significant impacts on the slope of the Phillips curve in several major industrial countries (Canada, France, Italy, Sweden and the United States), but the impacts vary in sign across countries.

The paper proceeds as follows. Section 2 introduces the empirical model and the data. Section 3 tests the parameter homogeneity assumption in a panel data setting. Section 4 studies the slope of the Phillips curve in the sample countries using country-specific time series analysis. Section 5 concludes.

2. The empirical model and data description

As surveyed by Gordon (2011), there is a debate on the empirical modeling of inflation expectations. Some economists assume that agents are backward-looking while others use a forward-looking assumption. We adopt the backward-looking assumption because the estimation of the forward-looking model involves instrumental variables and the results are subject to weak instrument problems (Kleibergen & Mavroeidis, 2009; Nason & Smith, 2008). The focus of this paper is on the validity of the parameter homogeneity assumption in the previous empirical models. Hence, it is better to separate the focus issue from the instrument quality issue. Moreover, previous studies (Ball, 2006; Ihrig et al., 2010; IMF, 2006) on the openness-Phillips curve correlation typically adopt the backward-looking assumption. Therefore, it is easier to compare the results if we use the same assumption. More specifically, our econometric analysis is based on the following backward-looking Phillips curve model:

$$\pi^{c}_{i,t} = \delta_{0i} + \delta_{1i}\pi^{c}_{i,t-1} + \delta_{2i}\hat{y}_{i,t} + \delta_{3i}\alpha_{i,t}\hat{y}_{i,t} + \tau'_{i1}X_{i,t} + \tau'_{2i}W_{i,t} + \varepsilon_{it}, \quad (1)$$

where i is the index for country i=1,.. .,N, t=1,.. .,T is the index for time, $\pi^{c}_{i,t}$ is the core consumer price index (CPI) inflation rate; $\alpha_{i,t}$ is the trade openness measured as total imports and exports divided by GDP; $\hat{y}_{i,t}$ is the output gap; δ_{0i}, δ_{1i}, δ_{2i} and δ_{3i} are parameters; τ_{i1} and τ_{i2} are vectors of parameters; the vector $X_{i,t}$ contains the cost-push terms, $W_{i,t}$ contains the control variables and ε_t is the error term.

We consider three cost push terms, $p^{e}_{it}, p^{f}_{it}, p^{m}_{it}$, which are the deviations of energy, food, import price changes from the last-period core CPI inflation rate, respectively. Following Ihrig et al. (2010), we also add the interaction term $p^{m}_{it} * Mshare_{it}$ as an additional indicator for the cost push. $Mshare_t$ is import as a share of GDP. There is also debate on whether or not one should include the cost push terms into the empirical model. Ball (2006) argues that those terms should not be included in the Phillips curve estimation. This argument is rooted in the theoretical model of Ball and Mankiw (1995) in which smooth relative price changes, such as smooth changes in the price of energy, food and import goods relative to the general price level, do not affect the general price level. The empirical validity of that model, however, is challenged by Bryan and Cecchetti (1999). Gordon (2011) justifies the role of relative price changes by price rigidity in sectors which are not subject to the relative price shocks. Monacelli (2005) suggests that in an open economy with incomplete exchange rate pass-through, additional cost-push terms must be added to the Phillips curve if the output gap is used to measure the log deviation of real marginal cost. Batini, Jackson, and Nickell (2005) suggest that the signs of the cost-push terms in the Phillips curve can be either positive or negative, depending on the elasticity of material inputs with respect to gross output. Due to the theoretical ambiguity, we do not impose any sign or size restriction on the cost-push terms and will apply the general-to-specific model selection strategy to eliminate redundant variables when estimating the slope of the Phillips curve.

Our set of control variables include financial openness*output gap, log GDP*output gap, log population*output gap, trend inflation*output gap and global inflation. Theoretical models of Loungani, Razin, and Yuen (2001); Razin and Yuen (2002),and Razin and Loungani (2005) suggest that besides trade openness, financial openness could also affect the slope of the Phillips curve. Badinger (2009) shows that omitting the interaction between the degree of financial openness and the output gap in the regression can cause an endogeneity problem. More specifically, trade and financial openness are highly correlated. If both have significant effects on the slope of the Phillips curve, omitting one of them will cause an omitted variable bias.

Previous literature, for example, Lane (1997), argues that country size could affect the slope of the Phillips curve. Because openness is correlated to country size (Lane, 1997), omitting country size could lead to an estimation bias. While Lane (1997) uses a country's GDP as a proxy for the country size, Badinger (2009) uses population as an alternative proxy. We use both as candidate proxies for the country size and use the general-to-specific model selection strategy to decide whether those control variables should stay in the model. The state-dependent pricing model of Bakhshi, Khan, and Rudolf (2007)) suggests that trend inflation affects the slope of the Phillips curve. An early empirical study of Ball, Mankiw, and Romer (1988) made a similar argument. Therefore, we follow them to control for the impact of trend inflation (which is measured as the HP-filtered trend of core inflation rate). Our last control variable is the "global inflation" variable defined by Ciccarelli and Mojon (2010). These authors find that there is a common factor in the OECD countries' national inflation rates and they call this common factor "global inflation". Ciccarelli and Mojon (2010) suggest that a simple cross-country average of 22 OECD countries[1] fits the "global inflation" well, so we follow them and proxy global inflation by the simple cross-country average of the 22 OECD countries.

We use similar data source as Ihrig et al. (2010). However, the frequency of our model is annual rather than quarterly because one important control variable, financial openness, is sampled at the annual frequency. As we shall see, financial openness has significant impacts on the slope of Phillips curve in some sample countries. Since it is highly correlated with trade openness, omitting it will cause estimation bias. It can be shown that the differences in results between our model and the model of Ihrig et al.(2010) do not come from the difference in sampling frequency but come from the differences in model specifications.[2]

The sample period is 1977-2007, which covers the sample period of Ihrig et al. (2010), 1977-2005. The Ihrig et al. (2010) sample consists of eleven OECD countries. Our sample takes nine out of these eleven countries. Ihrig et al. (2010) measure the output gap of the sample countries by the OECD output gap estimates. When the OECD output gap estimates are missing, as is the case for Switzerland, they use the Hodrick and Prescott (HP) filtered output gap instead. We only include countries with the OECD output gap estimates in our sample for consistency reasons.[3]

Data on core CPI inflation, total import, output gap, energy price, food price and import price are taken from the OECD main economic indicators No. 87. Data on trade openness is taken from the Penn World Table. Nominal GDP, real GDP and population data are retrieved from the World Development Indicators database. Following Badinger (2009), we define the degree of financial openness as total foreign assets and liabilities divided by GDP. The data used to construct the financial openness measure are from the updated and extended version of the

[1] The 22 OECD countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, New Zealand, Norway, Portugal, Sweden, Switzerland, Spain, United Kingdom, United States, and the Netherlands.
[2] Using the same specification as Ihrig et al. (2010), we obtain the same qualitative results as theirs. The results are available upon request.
[3] Our key results are robust if we use the HP filtered output gap to replace the OECD output gap. The results are available upon request.

External Wealth of Nations Mark II database developed by Lane and Milesi-Ferretti (2007).

3. Test the parameter homogeneity restriction in a panel data setting

It is well-known that panel data analysis may be potentially efficiency-improving since it imposes a structure, which is extra information, on the regression. However, one has to be aware that the estimates will be biased if a false structure is imposed. Ihrig et al. (2010) and Ball (2006) estimate the effect of trade openness on the slope of the Phillips curve in panel data models. Their panel data models are estimated with the assumption that the coefficients of the explanatory variables are the same across countries. This assumption is also imposed in cross-country studies on the same topic. In this section, we formally test this assumption.

To see this, consider the panel data model in Eq. (1). This model nests the panel data models of Ihrig et al. (2010) and Ball (2006) as special cases. More specifically, Ihrig et al. (2010) estimate a model with $\tau 2=0$, and Ball (2006) estimates a model with $\tau 1=\tau 2=0$. We perform the Roy-Zellner poolability test (Baltagi, 2005) for Eq. (1). The null hypothesis of the Roy-Zellner test is that the cross-section units can be pooled. The test statistics follow an F-distribution with $((N-1)K',N(T-K'))$ degrees of freedom, where N is the number of cross-section units, T is the number of time periods, $K'=K+1,K$ is the number of explanatory variables. The test statistics is 188.47, the p value is 0.00. Therefore, the null assumption of poolability is clearly rejected. We further test the assumption that the coefficients of the interaction term between openness and the output gap are homogeneous across countries, allowing other parameters to be heterogeneous. Again the assumption is rejected at the 5% level (the test statistics is 17.89 and the p value is 0.02).

In sum, the parameter homogeneity assumption on the parameter of interest is rejected by our panel data model, which suggests that results from previous empirical studies with the parameter homogeneity assumption are not robust. A typical fixed effects model controls for the heterogeneity in the intercepts, but still omits the heterogeneity in the slopes. Therefore, it will generate biased results when trade openness has heterogeneous effects across countries. Note that controlling for the potential omitted variable bias is important for the poolability test. If we omit the vector $W_{i,t}$ from Eq. (1), the null of parameter homogeneity cannot be rejected (the p value is 0.68). However, variables in $W_{i,t}$ are jointly significant at the 1% level (the Wald test statistics is 155.06 and the p value is 0.00). This result suggests that it is important to include the additional control variables.

4. Country-specific time series analysis

In the previous section, we find that our sample countries are not poolable as a homogenous panel. Therefore, we estimate the slope of the Phillips curve using country-specific time series analysis.[4]

Benati (2008) argues that the impact of past inflation on current inflation may have changed over time due to institutional changes. We use the Andrews (1993) test to check for potential structural breaks in the impact of past inflation on current inflation of the sample countries. Even if we have prior expectations that some events may change the process of inflation, how long does it take for the effects of the events to be fully absorbed is uncertain. The advantage of the Andrews (1993) test over the standard Chow test is that it does not require us to specify an arbitrary year for the structural break.[5] Therefore, it avoids the bias from a misspecified break point. Compared to a Chow test with correctly specified structural breaks, the Andrews (1993)

[4] Our main results are robust if we estimate the model with all sample countries using seemingly unrelated regression. The estimation results are available upon request.

[5] An alternative to the Andrews test is the Chow forecast test of stability.

test is less efficient. To test the robustness of results, we perform the Chow test with break points detected by the Andrews (1993) test. The results are consistent with the Andrews (1993) test results. In six out of nine countries, i.e., Australia, Canada, France, The Netherlands, Sweden, United States, we find a significant structural break. This suggests that we need to model the potential structural break to get the right inference.

Our modeling strategy is as follows: we always include a constant term, lagged core inflation rate, the output gap and the interaction term between trade openness and the output gap in the model as our focus variables. Other variables are taken as control variables in the model. We remove them from the model if they are detected to be redundant by the F-test. We introduce an interaction term between a break dummy and the lagged dependent variable into the model whenever a structural break is identified by the Andrews (1993) test. Moreover, we eliminate outliers from the model by adding dummy variables which take the value one in the outlier year and zero otherwise.[6]

Table 1
Estimation results (without control for financial openness).

Explanatory variable	Australia	Canada	France	Italy	Japan	Netherlands	Sweden	UK	US
Constant	2.62**	0.63	−0.29	−0.17	0.18	0.44	−0.98	−1.35**	0.50**
	(0.62)	(0.37)	(0.17)	(0.46)	(0.18)	(0.23)	(0.53)	(0.47)	(0.15)
Lagged core inflation	0.64**	0.46**	0.68**	0.44**	0.75**	0.58**	0.34*	0.09	0.67**
	(0.08)	(0.16)	(0.09)	(0.18)	(0.05)	(0.10)	(0.15)	(0.14)	(0.06)
Lagged core inflation*break dummy	−0.57**	−0.26*							−0.14**
	(0.16)	(0.10)							(0.03)
Output gap	2.12*	1.24**	310.76**	203.43*	−0.21	0.21	1.46**	−0.89	−85.53
	(0.03)	(0.29)	(53.01)	(85.89)	(0.43)	(0.30)	(0.51)	(1.67)	(73.94)
Trade openness*output gap	−5.37	−1.59**	10.24**	11.64	1.63	0.11	−1.41	1.11	−8.55
	(3.43)	(0.56)	(2.30)	(6.92)	(2.33)	(0.32)	(0.81)	(3.67)	(7.86)
Energy price			−0.03*						
			(0.02)						
Food price			0.12*				−0.27**		
			(0.05)				(0.08)		
Import price							0.23**		
							(0.07)		
Import price*import share									
Log population*output gap			−28.63**						−13.27**
			(4.90)						(3.58)
Log GDP*output gap				−7.57*					8.47**
				(3.22)					(2.11)
Trend inflation*output gap								0.23**	0.41**
								(0.06)	(0.12)
Global inflation		0.42**	0.27**	0.71*		0.12*	0.79**	1.20**	0.22**
		(0.14)	(0.09)	(0.32)		(0.06)	(0.18)	(0.19)	(0.05)
Outlier dummy				5.57**	2.34**			−5.03**	2.81**
				(0.78)	(0.68)			(1.27)	(0.43)
Adjusted R-squared	0.80	0.94	0.99	0.98	0.92	0.84	0.88	0.94	0.99
Normality	0.97	0.82	0.22	0.69	0.31	0.25	0.50	0.93	0.77
Serial correlation	0.29	0.09	0.80	0.22	0.66	0.84	0.54	0.31	0.39
Arch	0.59	0.07	0.34	0.16	0.89	0.60	0.84	0.68	0.43
Redundancy	0.58	0.76	0.25	0.87	0.19	0.08	0.35	0.74	0.30

Notes: The dependent variable is the core inflation rate of the respective country. Standard errors in parentheses. *, ** denotes statistical significance at 5% and 1% level. Energy price, food price and import price stand for the deviations of the change of these prices from last period's core CPI inflation rate. Normality: Jarque-Bera test *p* values. Serial correlation: LM test *p* values for serial correlation up to two orders. Arch: test *p* values for Arch(1). Redundancy: F test *p* values for redundancy. Outlier years: Italy (1979–1980), Japan (1980), the UK (1978), and the US (1984).

Most previous studies on openness and the slope of the Phillips curve consider only trade openness while Badinger (2009) argues that financial openness is also important and omitting it in the regression analysis biases the estimated coefficient of trade openness. In this paper, we present two versions of model specifications. One does not consider the impact of financial openness, and the other includes an interaction term between financial openness and the output

[6] See the table notes for the detected outlier years.

gap. As noted by Badinger (2009), trade and financial openness are highly correlated. This can cause a collinearity problem in the estimation. Following Badinger (2009), we estimate the model with the restriction that the coefficient of trade openness*output gap is the same as financial openness*output gap. Formal statistical tests (Table 2) support the restriction in seven out of the nine sample countries. The restriction is rejected in France and Sweden. For those two countries, we report the estimation results without the restriction (in Table 2).

The results of those two alternative specifications are reported in Tables 1 and 2 respectively. From those two tables, we see that the estimated coefficients of our variable of interest, the interaction term between trade openness and the output gap, differ in sign across countries. Without a control for the impact of financial openness, the interaction term between trade openness and the output gap is statistically significant in two of the major industrialized countries, that is, Canada and France. More specifically, the estimated coefficient of the interaction term between trade openness and the output gap is negative in Canada, suggesting that trade openness flattens the Phillips curve. By contrast, there is a steepening effect of trade openness in France. Controlling for financial openness makes trade openness significant in more sample countries. More specifically, according to the results in Table 2, trade openness has significantly affected the slope of the Phillips curve in Canada, France, Italy, Sweden and the US.[7] The qualitative findings on the trade openness-Phillips curve correlations remain the same for Canada and France whether or not financial openness is controlled for. Moreover, in the model with financial openness, trade openness has a significant flattening effect on the Phillips curve in Sweden and the US while it has a significant steepening effect in Italy.

[7] Note that for the United States, the restriction that the coefficients of log GDP*output gap and log Population*output gap are the same in magnitude but different in sign cannot be rejected (the p value of the test is 0.69). Therefore, the US model reported in Table 2 is estimated with this restriction.

Table 2
Estimation results (with control for financial openness).

Explanatory variable	Australia	Canada	France	Italy	Japan	Netherlands	Sweden	UK	US
Constant	2.71**	0.64	−0.26	−0.25	0.21	0.54**	−1.04	−1.36**	0.50**
	(0.61)	(0.37)	(0.14)	(0.38)	(0.15)	(0.20)	(0.50)	(0.49)	(0.15)
Lagged core inflation	0.63**	0.41**	0.63**	0.45**	0.69**	0.72**	0.40**	0.08	0.68**
	(0.08)	(0.15)	(0.07)	(0.16)	(0.06)	(0.06)	(0.15)	(0.14)	(0.06)
Lagged core inflation*break dummy	−0.58**	−0.24*							−0.13**
	(0.16)	(0.10)							(0.03)
Output gap	1.45**	1.21**	255.29**	604.71**	−0.46	0.10	5.10*	−0.59	−130.45**
	(0.49)	(0.28)	(49.11)	(158.96)	(0.31)	(0.14)	(1.99)	(0.94)	(21.87)
Trade/financial openness*output gap	−0.72	−0.43**		1.66**	0.47	0.03		0.04	−0.89**
	(0.43)	(0.15)		(0.48)	(0.26)	(0.03)		(0.16)	(0.22)
Trade openness*output gap			14.35**				−10.76*		
			(4.68)				(5.02)		
Financial openness*output gap			−0.51				1.10		
			(0.32)				(0.59)		
Energy price			−0.03*						
			(0.01)						
Food price			0.15**				−0.30**		
			(0.04)				(0.08)		
Import price							0.28**		
							(0.08)		
Import price*import share									
(Log GDP-Log population)*output gap									7.55**
									(1.27)
Log population*output gap			−23.64**						
			(4.56)						
Log GDP*output gap				−23.23**					
				(5.76)					
Trend inflation*output gap				−0.44**				0.22**	0.53**
				(0.13)				(0.06)	(0.08)
Global inflation		0.45**	0.30**	0.74**			0.75**	1.21**	0.21**
		(0.14)	(0.08)	(0.27)			(0.17)	(0.20)	(0.05)
Outlier dummy			1.50**	5.45**	2.94**	2.33**		−5.01**	2.54**
			(0.46)	(0.64)	(0.74)	(0.59)		(1.27)	(0.37)
Adjusted R-squared	0.80	0.94	0.99	0.98	0.92	0.88	0.89	0.94	0.99
Normality	0.98	0.86	0.68	0.41	0.13	0.62	0.85	0.92	0.77
Serial correlation	0.38	0.15	0.32	0.28	0.60	0.99	0.78	0.35	0.93
Arch	0.47	0.07	0.23	0.35	0.94	0.96	0.91	0.76	0.48
Redundancy	0.59	0.74	0.10	0.86	0.27	0.50	0.31	0.71	0.20
Restriction	0.67	0.65	0.01**	0.70	0.30	0.79	0.05*	0.81	0.10

Notes: The dependent variable is the core inflation rate of the respective country. Standard errors in parentheses. *, ** denotes statistical significance at 5% and 1% level. Energy price, food price and import price stand for the deviations of the change of these prices from last period's core CPI inflation rate. Normality: Jarque-Bera test *p* values. Serial correlation: LM test *p* values for serial correlation up to two orders. Arch: test *p* values for Arch(1). Redundancy: F test *p* values for redundancy. Restriction: F test *p* values for the parameter restriction on financial openness*output gap. Outlier years: France (1980), Italy (1979–1980), Japan (1980), the Netherlands (1980), the UK (1978), and the US (1984).

5. Conclusion

In this paper, we argue that the typical assumption of parameter homogeneity used in the empirical studies of the trade openness-Phillips curve correlation is not guaranteed to be valid from an ex ante theoretical perspective. We test this assumption with both panel data and time series analysis. Our results suggest that the validity of the parameter homogeneity assumption is highly questionable. When the parameter homogeneity assumption does not hold, reporting an average effect of trade openness on the slope of the Phillips curve can be very misleading. Significant effects with different signs can be averaged out while trade openness has indeed played a role in all sample countries. Relaxing the parameter homogeneity assumption, we find that trade openness has significantly changed the slope of the Phillips curve in several major industrial countries. In our model with both trade and financial openness, a significant effect of trade openness is found in Canada, France, Italy, Sweden and the United States.

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Equilibrium-Informed Trading with Relative Performance Measurement *

By QIU ZHIGANG*

This article analyzes the informative trading of professional money managers within a rational-expectations equilibrium model in which managers care about their performance relative to their peer group. I find that the existence of uninformed managers causes informed managers with relative performance concerns to trade less informatively, engendering less informative prices. When managers are differentially informed, they need to forecast the average performance based on private signals, and each manager may place more weight on the private signal if the signal provides good information about the average performance. The price aggregates those signals and thus becomes more informative.

1. Introduction

In modern financial markets, institutional investors such as mutual funds, pension funds, and investment banks actively trade a large portion of assets.[1] Thus, it is important to understand how professional money managers' behavior affects asset prices. Individual investors delegate their money to fund managers and pay the managers for their superior skills or information. Thus, the pay structure affects fund managers' trading behavior. Money managers are normally remunerated on the basis of their performance relative to the chosen benchmark, which is generally the average level of the entire industry. Hence, fund managers care about their position relative to their peer group.

Relative performance compensation affects money managers' portfolio decisions in diverse ways; however, to date, the theoretical literature has focused primarily on risk sharing. By contrast, few studies have investigated the effects of relative performance compensation on money managers' other trading motivations. Given the extensive literature on information trading and price information efficiency, the trading behaviors of informed fund managers should not be ignored. Market efficiency (with respect to information) is one of the most important issues in modern finance theory, and with the substantial changes in the financial market structure, the effect of institutional investors on price information efficiency should be analyzed. Moreover, money managers are likely to hold private information because individuals delegate portfolio management to money managers. Thus, it is important to understand informational trading if the agents are professional money managers. This article proposes a

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1 According to Allen (2001), by 2000, less than 40% of U.S. corporate equities were directly owned by individuals, with even lower rates of individual ownership in France (24%) and the United Kingdom (21%).

rational-expectations equilibrium (REE) model of delegated portfolio management to study the informative trading of fund managers and examine the informational efficiency of asset prices.

My model has two dates, 0 and 1, and two assets, one risky and one risk-free, are traded in the market. Risk-averse money managers maximize their utility over their remuneration in period 1 by optimally choosing their portfolios. Moreover, there are two types of managers, informed and uninformed. Informed managers receive different but correlated signals and thus trade conditionally with regard to their private information. By contrast, uninformed managers observe only the price and extract information from it. At equilibrium, the price aggregates in-formed managers' information and partially reveals this information because of the presence of noise.

The managers' remuneration takes a linear form with regard to both absolute and relative performance. Relative performance is defined as the difference between the fund performance and the average level, and fund managers earn a bonus if their performance is above the average performance and incur a penalty if their performance is below the average performance. Compensation takes a linear form for the relative performance evaluation, providing symmetric payoffs when managers' performance is below or above the benchmark. Such a payoff structure is also called "fulcrum" compensation, which was proposed by the U.S. Congress in 1970 as the amended Investment Advisors Act.

Relative performance remuneration links managers' payoff to the average performance of all managers, which is uncertain because managers have different information sets. In my model, each mean–variance manager needs to hedge the additional uncertainty from the relative performance compensation. In other words, each manager wants to reduce the tracking errors relative to the bench-mark. Thus, the main mechanism of price determination examined in the model is hedging, and the hedging component in the optimal demand takes the form of the conditional covariance of the risky-asset payoff and the average performance of managers. For the purpose of hedging, uninformed managers effectively change their trading aggressiveness, whereas informed managers forecast the conditional covariance based on the private signals and the price. These behaviors change the weights that informed and uninformed managers place on their signals, which affects the price informativeness.

In the model, I show that uninformed managers' hedging behavior induces them to trade more aggressively as a result of their use of the price to forecast the average performance. Informed managers always trade less aggressively on their private information if the benchmark for the compensation is exogenous because they tilt the portfolio toward the benchmark. In my model, however, the benchmark is endogenously determined and uncertain to each manager. Each informed manager's hedging behavior can induce the manager to weigh the signal more heavily if the price is a relatively bad predictor of the benchmark. If the percentage of informed managers is relatively high, I can determine the conditions under which the price can become more informative. I show that when noise traders are very noisy or when managers are relatively risk averse, the price is likely to be more informative.

To determine the exact channels that affect price informativeness, I consider three simplified information structures. First, I consider a baseline model with symmetric information, in which all managers receive a common signal. This analysis provides a baseline case in which no manager needs to hedge. Second, I examine a model that incorporates asymmetric information, in which only some managers observe a common signal, whereas others do not, and I analyze the interaction between informed and uninformed managers. Third, I analyze a model in which all managers receive "equally accurate" but independent signals, which enables me to discuss informed managers' hedging.

Regarding the first information structure, the results show that relative performance does not

matter in a symmetric-information setting, which is not surprising because, given the same information set, all managers submit the same demand and thus achieve the same level of performance. This economy is the same as the benchmark without relative performance.

Under the second information structure, asymmetric information (Grossman and Stiglitz (1980)), uninformed managers need to hedge against the uncertainty generated by the performance of informed managers, which causes uninformed managers to trade more aggressively on information extracted from the price. Informed managers, however, must account for uninformed managers' trading behavior because of the relative performance concerns. Hence, they trade less aggressively on their signals, which results in a less informative price.

For the third information structure, differential information, all managers are "equally" informed with independent signals. In this economy, each manager has an incentive to reduce the tracking error between his or her performance and the benchmark. To do so, the manager needs to forecast the conditional covariance of the risky-asset payoff and the average performance of all managers based on two pieces of information: the private signal and the price. When the signal is a more precise predictor than the price, managers place more weight on the private signal and less weight on the price. The price thus aggregates more information and becomes more informative. When the price is more precise than the private signal, the opposite is true.

In the differential information model, the price not only represents public information but also performs the role of aggregating information. To separate the two effects, I extend the model by adding an exogenous public signal that is observable to all managers. I show that relative performance leads managers to place more weight on the common signal than on private signals. Compared with the differential information setting, where the price is the public signal, if managers place less weight on private signals but more weight on public signals, the price aggregates less information and becomes less informative. As a result, managers place more weight on private signals.

In the context of the mutual fund industry, managers may have relative performance concerns because of fund flows. If fund managers' compensation is a fixed proportion of the assets they manage, relatively good performance leads to a large fund size because it attracts new fund inflows. In this context, relative performance matters even if relative performance is not explicitly set in the contract. However, empirical evidence shows that the flow–performance relationship is convex (Chevalier and Ellison (1997)). For the purpose of comparison, I also analyze the case with convex compensation. In particular, I consider a special convex contract, the option contract, and analyze its effect on the information-inference problem under the asymmetric-information structure (Grossman and Stiglitz (1980)).

When the option embedded in the manager's compensation is out of the money, managers do not have relative performance concerns and thus trade based on their own information. When the option is in the money, informed managers trade less informatively, as in the case with the linear contract. Due to the non-linearity of the option contract, the inference problem for uninformed managers becomes complicated because they may be confused regarding when the informed manager's option compensation is in the money. In any circumstance, I show that uninformed managers effectively change their trading aggressiveness.

My article relates to two research strands in the literature. The first strand concerns research using the REE model to study the information content of asset prices. The second strand concerns research on delegated portfolio management to study the role of financial institutions in financial markets and the effects of agency frictions on asset prices. My article builds on the static REE model (e.g., Grossman (1976), Grossman and Stiglitz (1980), and Diamond and Verrecchia (1981)) and analyzes the informative trading of fund managers.

In the literature, certain theories focus on models with a single representative fund manager. If only one manager exists, his or her performance relative to a peer group does not matter. Articles using such a model include those by Vayanos and Woolley (2013) and He and Krishnamurthy (2011), (2013). My article, in contrast, considers heterogeneous managers who care about their performance relative to a peer group.

Among models with multiple traders, some consider an economy with both investors and fund managers in which fund managers care about their performance relative to a passive benchmark (e.g., Standard & Poor's (S&P) 500). Such articles include those by Basak and Pavlova (2013), Cuoco and Kaniel (2011), and Kaniel and Kondor (2013). Other articles with multiple managers, such as my article, consider an endogenous benchmark, which is defined as the average performance of all managers. For example, Kapur and Timmermann (2005) and Basak and Makarov (2012) consider fund managers' performance relative to a peer group. All of these articles consider symmetric information and thus focus on risk sharing, whereas my article considers an REE model and studies informative trading.

Certain articles in the literature use an asset pricing model that incorporates both asymmetric information and career concerns. Dasgupta and Prat (2006) demonstrate that career concerns can cause more uninformative trading. In a sense, relative performance concerns are close to reputation concerns. However, my model differs from these previous models in many respects. For instance, Dasgupta and Prat present a game theoretical model with asymmetric information, whereas my model is a more standard asset pricing model that allows for richer information structures. A common result of these articles and mine is that prices can be less informative when career or relative performance concerns exist; however, I also show that prices can be more informative, which is a novel finding in this strand of the literature.

In general, my article is also related to the literature on relative wealth concerns. In this literature stream, Bakshi and Chen (1996) examine the effect of concerns regarding social status on portfolio and consumption choices. In their article, the average wealth level of the society is exogenously given, whereas it is endogenous in my model. Furthermore, DeMarzo, Kaniel, and Kremer (2007), (2008) show that endogenous relative wealth concerns lead to overinvestment and bubbles; however, their analysis does not consider information asymmetry.

Garcia and Strobl (2011) present an article close to mine that examines how relative wealth concerns affect information acquisition within a rational-expectations paradigm. Although Garcia and Strobl propose a modeling motivation and framework that are similar to those of my article, their article is different from mine in many aspects. For instance, Garcia and Strobl adopt a "catching up with the Joneses" type of utility function and focus on the information acquisition of agents. My article, instead of being utility driven, begins with explicit compensation and focuses on managers' behavior in hedging the additional uncertainty generated by the endogenous benchmark. The price informativeness with different information structures is the core concept of my analysis. Thus, my article analyzes a different problem in a different context and hence complements Garcia and Strobl's article.

The rest of the article is organized as follows: I first introduce the model in Section II and then solve the model in Section III. Section IV considers specific information structures, namely, symmetric, asymmetric, and differential in-formation structures. Section V presents a model with convex compensation. Finally, I conclude in Section VI. All lengthy proofs and figures are provided in the Appendix.

2. Model

There are two dates, t =0, 1, and two assets, a risky asset and a risk-free asset, are traded in the market. The risky asset pays the liquidating dividend d at t =1, whereas the risk-free asset has a

constant return r between t =0 and 1. I normalize r =0 for simplicity. d has a normal distribution with mean $\overline{d}$ and variance σ_d^2. The price of the risky asset, P, is determined in equilibrium at t =0, and the supply of the risky asset is S +u, where u is normally distributed with mean 0 and variance σ_u^2.

A. Fund Managers and Compensation

I consider a competitive market that is populated by many fund managers, who form a continuum of measure 1. Each manager is endowed with an initial wealth W_0 (the initial fund under management). Moreover, the individual investors (households) do not have access to the market, so they can only delegate the management of their money to fund managers. Therefore, fund managers construct portfolios by investing their initial wealth W_0 between the risky and risk-free assets.

Fund managers are remunerated by compensation for both absolute and relative performance. To be specific, the remuneration for fund manager i is linear

$$F_{1,i} = I + aW_{1,i} + b(W_{1,i} - \overline{W}), \tag{1}$$

where $W_{1,i}$ is the final fund size at period 1 for manager i, and $\overline{W}$ is the average final fund size (or performance) of all managers:

$$\overline{W} = \int_0^1 W_{1,i}di. \tag{2}$$

In equation (1), I is a fixed component,[2] a >0 is the parameter associated with the fund's absolute performance, and b >0 is the coefficient of the fund's performance relative to the average level. Equation (1) links managers' payoff to the performance of their peers, which engenders relative performance concerns among the managers. Because all managers have the same initial fund W_0 at t =0, the fund size at t =1, $W_{1,i}$, represents the performance of each manager.

Equation (1) takes a linear form with respect to the relative performance evaluation, providing symmetric payoffs when managers' performance is below or above the benchmark. Proposed by the U.S. Congress in 1970 as the amended Investment Advisors Act, this fulcrum compensation payoff structure motivates me to choose a linear compensation contract. Moreover, Kapur and Timmermann (2005) show that a linear contract form is optimal under certain information structures, which also justifies my modeling choice of linear compensation.

Fund managers' preference is given by a simple mean–variance utility:

$$U(w) = \mathrm{E}(F_1) - \frac{\tau}{2}\mathrm{var}(F_1),_3 \tag{3}$$

where τ measures the degree of risk aversion. Therefore, fund managers maximize the utility of their compensation at t =1 by optimally choosing a portfolio at t =0.

B. Information Structure

Fund managers are heterogeneously informed. Among all managers, a portion λ of managers are informed, and 1−λ are uninformed. Each informed manager i observes a signal $s_i = d + \varepsilon_i$, in which ε_i is independent of d and is normally distributed with a mean of 0 and a variance of σ_ε^2. For any ε_i and ε_j, the two variables have a constant correlation coefficient ρ. There are some noise traders u, who are assumed to be on the supply side. Adding noise to the economy,

[2] It could be any constant, as it will not affect my result.

[3] An alternative would be the constant absolute risk aversion (CARA) utility function, which may yield a slightly different result. However, using CARA utility, I cannot explicitly calculate the conditional covariance between the asset payoff and the average performance, which is the key driver of the model. Moreover, when I examine a convex contract, I cannot use CARA for the calculation. Thus, I use the mean–variance utility function instead of CARA.

which is a standard practice in the literature, prevents the price from fully revealing information.

All random variables are described as follows:

$$\begin{pmatrix} d \\ u \\ \varepsilon_i \\ \varepsilon_j \end{pmatrix} \sim \mathrm{N}\left\{ \begin{pmatrix} \overline{d} \\ 0 \\ 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_d^2 & 0 & 0 & 0 \\ 0 & \sigma_u^2 & 0 & 0 \\ 0 & 0 & \sigma_\varepsilon^2 & \rho\sigma_\varepsilon^2 \\ 0 & 0 & \rho\sigma_\varepsilon^2 & \sigma_\varepsilon^2 \end{pmatrix} \right\}.$$

Because the correlation coefficient ρ for any ε_i and ε_j is constant, I apply the Vasicek (2002) 1-factor structure to model the signal noise. Thus, ε_i has the structure of the 1-factor model:

$$\frac{\varepsilon_i}{\sigma_\varepsilon} = \sqrt{\rho}Y + \sqrt{1-\rho}X_i,[4] \tag{4}$$

where Y is the common factor, and X_i is the specific factor. Y and all X_i values follow the standard normal distribution, and X_i, X_j, Y , and d are independent.

Kapur and Timmermann (2005) consider a model with the same type of compensation as mine. However, their information structure is significantly different from mine. In their article, fund managers receive a common signal, which is the same as my assumption of ρ =1. However, they also assume that investors receive different signals, which are less precise than those of fund managers. This assumption is imposed to rationalize the delegation relationship between investors and managers. In my article, investors do not play any role in the model, and I focus on the interactions of different managers. Moreover, I consider managers' inference problem arising from the equilibrium price, which is not considered by Kapur and Timmermann.

3. Solving the Model

In this section, I solve the model presented in Section II. The informed managers' information set, F_I, consists of a private signal and the price. That is, $F_I = \{s_i, P\}$. Uninformed managers can observe only the price, P; hence, they have the information set $F_u = \{P\}$. With this information structure, the equilibrium in this economy is defined in the following definition:

Definition 1. Subject to the compensation defined by equation (1), the noisy REE is defined as follows:

1. Each informed manager i maximizes his or her utility conditional on F_I:

$$\max_{x_i^I} \mathrm{E}(F_{1,i}^I \mid s_i, P) - \frac{\tau}{2}\mathrm{var}(F_{1,i}^I \mid s_i, P).$$

2. Each uninformed manager i maximizes his or her utility conditional on F_u:

$$\max_{x_i^u} \mathrm{E}(F_{1,i}^u \mid P) - \frac{\tau}{2}\mathrm{var}(F_{1,i}^u \mid P).$$

3. The market clears:

$$\int_0^\lambda x_i^I(p)di + \int_0^{1-\lambda} x_i^u(p)di = S + u.$$

The key difference between this equilibrium and the standard REE is the compensation fee. To better understand the model, I analyze the compensation before I solve the equilibrium. The most important component of the fee is the benchmark, which is given in equation (2). With some simple manipulation, I express the benchmark as follows:

$$\overline{W} = W_0 + (d-P)\left(\int_0^\lambda x_j^I dj + \int_0^{1-\lambda} x_j^u dj\right),[5] \tag{3}$$

[4] I apply this structure because it can simplify the notations, and it is easy to see that $\mathrm{corr}[\varepsilon_i, \varepsilon_j] = \rho$

[5] The terminal fund size can be expressed as $W_{1,i} = W_0 + x_i(d-P)$, and I further denote $W_{1,j}^I$ and $W_{1,j}^u$ as the fund sizes for informed and uninformed managers, respectively. By inputting $W_{1,i}$ into the expression $\overline{W} = \int_{\cdots} W_{1\ i}^I dj + \int_{1-\cdots} W_{1\ i}^u dj$, I have equation (3).

where x_j^I and x_j^u are the optimal demands of the informed and uninformed managers for the risky asset. Given the benchmark specified as in equation (3), the compensation defined by equation (1) can be written as

$$F_1^i = I + aW_0 + \left[(a+b)x_i - b\left(\int_0^{\lambda} x_j^I dj + \int_0^{1-\lambda} x_j^u dj\right)\right](d-P), \tag{4}$$

where x_i denotes the demand of either an informed or an uninformed manager i.

From equation (4), I can show that the compensation of any manager is linked to the demands of all other managers, which increases the uncertainty of managers' payoff because managers have different information. Thus, managers need to adjust their demands to hedge the new uncertainty. Lemma 1 shows the results.

Lemma 1. The optimal demands of both the informed and the uninformed managers are as follows:

$$x_i^I = \frac{a}{a+b}\underbrace{\frac{\mathrm{E}(d\,|\,s_i,P)-P}{a\tau\sigma^2_{d|s_i,P}}}_{\text{Demand without relative performance}} + \frac{b}{a+b}\underbrace{\left\{\int_0^{1-\lambda} x_j^u dj + \frac{\mathrm{cov}\left[d-P,(d-P)\int_0^{\lambda} x_j^I dj\,|\,s_i,P\right]}{\sigma^2_{d|s_i,P}}\right\}}_{\text{Hedging component}}, \tag{5}$$

$$x_u = \frac{a}{a+b\lambda}\underbrace{\frac{\mathrm{E}(d\,|\,P)-P}{a\tau\sigma^2_{d|P}}}_{\text{Demand without relative performance}} + \frac{b}{a+b\lambda}\underbrace{\frac{\mathrm{cov}\left[d-P,(d-P)\int_0^{\lambda} x_j^I dj\,|\,P\right]}{\sigma^2_{d|P}}}_{\text{Hedging component}}. \tag{6}$$

Proof. The proof is in the Appendix.

Lemma 1 shows the intermediate steps of the optimal demands from which the hedging behavior of each type of manager is observed. The optimal demands for both types of managers are the weighted averages of the demand without relative performance[6] and the hedging component. With partial equilibrium, the hedging component is the conditional covariance, and the sign of the covariance determines the trading aggressiveness of the managers. To understand the hedging component, I use the informed demand as an example, and similar logic can be applied to the uninformed demand.

I examine the conditional variance of the compensation of informed manager i. If I calculate the conditional variance of the compensation (equation (4)), I can obtain

$$\mathrm{var}(F_1^i\,|\,s_i,P) = \mathrm{var}\left\{\underbrace{\left[(a+b)x_i^I - b\int_0^{1-\lambda} x_j^u dj\right](d-P)}_{\mathrm{RV}_1} - \underbrace{b\int_0^{\lambda} x_j^I dj(d-P)}_{\mathrm{RV}_2}\,|\,s_i,P\right\}. \tag{7}$$

Conditional on s_i and P, expression (7) can be observed as the conditional variance of the sum

[6] I call $[\mathrm{E}(d\,|\,s_i,P)-P]/a\tau\sigma^2_{d|s_i,P}$ the demand without relative performance because it takes the same form as the demand if there is no relative performance (NRP) (by setting $b=0$). However, $\sigma^2_{d|s_i,P}$ in equation (5) is also affected by b in the equilibrium.

of two random variables, RV_1 and RV_2. For RV_1, only d is random because x_i^I and x_j^u are in the information set of the informed manager i. For RV_2, however, $\int_0^\lambda x_j^I dj(d-P)$is random. Thus, what matters is the covariance between the asset payoff and the average performance of the informed managers.[7] If manager i perceives both the asset payoff and the average performance of all informed managers to be very good (bad), it is optimal for the manager to increase his or her demand. With negative conditional covariance, however, manager i decreases his or her demand because the manager does not want to deviate too much from the average. In other words, with mean–variance utility, the conditional variance $\text{var}(F_1^i \mid s_i, P)$ induces managers to reduce the tracking errors. To fully understand managers' hedging behavior, I need to derive the optimal trading strategies and equilibrium, which are shown in the next subsection.

A. Optimal Trading Strategies and Equilibrium

To solve the equilibrium, I need to derive the explicit forms of the demands for both types of managers, which are shown in Lemma 2.

Lemma 2. The explicit expressions of the optimal demands are

$$x_i^I = \frac{\text{E}(d \mid s_i, P) - P}{[a + b(1-\lambda)]\tau\sigma^2_{d \mid s_i, P}} + \frac{b(1-\lambda)x_u}{a + b(1-\lambda)} + W \times \frac{b\lambda[2\text{E}(d \mid s_i, P) + \sigma_\varepsilon\sqrt{\rho}\text{E}(Y \mid s_i, P) - P - s_i]}{a + b(1-\lambda)}, \tag{8}$$

$$x_u = K\frac{\text{E}(d \mid P) - P}{\tau\sigma^2_{d \mid P}} \tag{9}$$

where

$$K = \frac{a + b(1-\lambda)}{a(a+b)} + \frac{b\lambda}{a(a+b)}\frac{2\sigma^2_{d \mid P} - \sigma^2_{d \mid s_i, P}}{\sigma^2_{d \mid s_i, P}} + W \times \frac{2b^2\lambda^2(\sigma^2_{d \mid P} - \sigma^2_{d \mid s_i, P})\tau}{a(a+b)} \quad \text{and}$$

$$W = \frac{\beta_s}{[a + b(1 - 2\lambda\beta_s - \lambda\sigma_\varepsilon\sqrt{\rho}\beta_s^Y)]\tau\sigma^2_{d \mid s_i, P}}.$$ [8]

Proof. The proof is in the Appendix.

The demand of informed managers comprises three terms. The first two are the demand affected by the average demand of uninformed managers, and the third is the hedging demand for the average demand of all informed managers. If I set ρ =1 (as in Section IV.B), indicating that all informed managers have the same signal, the last term disappears. When all informed managers have the same signal, the average informed demand is a function of the signal and thus is in the informed manager's information set. For this reason, informed managers do not need to hedge the average demand of informed managers, so the third term disappears when ρ =1. If I set λ=1 (as in Section IV.C), the first two terms become $[\text{E}(d \mid s_i, P) - P]/a\tau\sigma^2_{d \mid s_i, P}$, so the effect of uninformed managers disappears. I interpret the term $\text{E}(Y \mid s_i, P)$ in the hedging demand as a learning effect because informed managers can learn something about the average demand of the

[7] Note that $\text{cov}[d, (d-P)\int_0^\lambda x_j^I dj \mid s_i, P] = \text{cov}[d, \lambda W_0 + (d-P)\int_0^\lambda x_j^I dj \mid s_i, P]$, and $\lambda W_0 + (d-P)\int_0^\lambda x_i^I dj$ is the average performance of all informed managers.

[8] For informed managers, the expressions of the conditional expectations $\text{E}(Y \mid s_i, P)$ and $\text{E}(d \mid s_i, P)$ are shown by equations (A-2) and (A-3) in the Appendix. For uninformed managers, $\text{E}(d \mid P) = \bar{d} + \beta_p^u(P - A)$. Moreover, β_s, β_s^Y, $\sigma^2_{d \mid s_i, P}$, and $\sigma^2_{d \mid P}$ are quantities from the projection theorem, which can also be found in the Appendix.

informed managers[9] when $\rho \neq 0$ ($\neq 1$ as well). Note that Y is independent of the risky asset payoff d, so it only provides information about the average performance.

The uninformed demand is a constant K multiplied by [E(d | P)− P]/ $[\tau\sigma^2_{d|P}]$. Therefore, the consequence of uninformed hedging is only that trading aggressiveness changes, and the degree is measured by K . If all informed managers have the same signal (when ρ =1, as shown in Section IV.B), $W2b^2 \lambda^2(\sigma^2_{d|P} - \sigma^2_{d|s_i,P})\tau/a(a+b)$ disappears. Thus, $W2b^2\lambda^2(\sigma^2_{d|P} - \sigma^2_{d|s_i,P})\tau/a(a+b)$ measures how uninformed managers react to informed managers' hedging behavior for the average demand of informed managers. As shown in the Appendix, W >0, so informed managers' hedging behavior leads uninformed managers to trade more aggressively.

In equilibrium, the conjectured price has the following form:

$$P = A + B\left[\left(\int_0^\lambda s_i di - \lambda\bar{d}\right) - Cu\right], \tag{10}$$

where A, B, and C are three constants determined in equilibrium. In the Appendix, I show that A and B are functions of C and that B is a positive constant if C is positive. Moreover, I derive a fifth-degree polynomial in C (defined by equation (A-11) in the Appendix). If I define the polynomial as F(C), the equilibrium exists if and only if a positive C exists for F(C)=0. The existence of the equilibrium can be proven; however, I cannot show the uniqueness of the equilibrium. Instead, I characterize the conditions for the uniqueness of the equilibrium. The following proposition summarizes the results:

Proposition 1. Given the optimal demands in Lemma 2 and the conjectured price in equation (10), an equilibrium defined in Definition 1 exists. Define Q =[a +b(1−2λ)]σ_d^2+[a +b(1−λρ)] σ_ε^2, and the equilibrium is unique if

$$Q < \frac{\lambda}{\sigma_\varepsilon\sigma_u}\sqrt{\frac{5}{2}\frac{(1-\rho)(\sigma_\varepsilon^2+\sigma_d^2)(\sigma_d^2+\rho\sigma_\varepsilon^2)}{\tau}}, \tag{11}$$

or

$$\frac{\lambda^2(1-\rho)(\sigma_d^2+\rho\sigma_\varepsilon^2)^2}{(a+b)(\sigma_d^2+\rho\sigma_\varepsilon^2)Q+\rho Q^2} < 2\sigma_u^2\sigma_\varepsilon^2\tau^2. \tag{12}$$

Proof. The proof is in the Appendix.

Proposition 1 shows that the equilibrium exists and is unique when certain conditions are satisfied. When either inequality (11) or (12) holds, the fifth-degree polynomial has a unique positive root of C. Accordingly, the sufficient condition for inequality (11) is

$$\sigma_\varepsilon\sigma_u(a+b) < \frac{\sigma_d^2\lambda}{\sigma_d^2+\sigma_\varepsilon^2}\left[\sqrt{\frac{5}{2}\frac{(1-\rho)}{\tau}}\right], \tag{13}$$

and the sufficient condition for inequality (12) is

$$\sigma_\varepsilon\sigma_u(a+b) > \left[\frac{1}{5}-(1-\rho)\rho\right]\lambda\sqrt{\frac{5}{2}\frac{(1-\rho)}{\tau}}. \tag{14}$$

Given inequalities (13) and (14), I identify some simple sufficient conditions for the

[9] As shown in the Appendix and the next subsection, if I conjecture the demand of informed manager i as $x_i^I = Gs_i + HP + F$ for three constants G, H, and F, I have $\int_0^\lambda x_j^I dj = \lambda[G(d+\sigma_\varepsilon\sqrt{\rho}Y)+HP+F]$. Thus, $E(Y \mid s_i, P)$ helps manager i learn $\int_0^\lambda x_j^I dj$.

uniqueness of the equilibrium. Note that when $(1-\rho)\rho > 1/5$, inequality (14) always holds, implying that for sufficiently high correlation, the equilibrium is unique. When $(1-\rho)\rho < 1/5$, the equilibrium is unique if $\sigma_d^2/(\sigma_d^2+\sigma_\varepsilon^2) > 1/5$, thus implying that the signal should be sufficiently precise.

B. Price Informativeness

In the literature, some analyses of relative performance contracts are based on passive benchmarks (e.g., Admati and Pfleiderer (1997)). For such contracts, managers tilt their portfolios toward the passive benchmark, which decreases the informativeness of prices. In my article, however, the benchmark is stochastic, and managers must rely on their private signals when they hedge the risk from the benchmark. Managers' hedging behavior may increase the weight they place on private signals, leading to more informative prices. For the analysis, consistent with the literature, I define the price informativeness as

$$I = \frac{1}{\sigma_{d|P}^2} = \frac{1}{\sigma_d^2} + \frac{\lambda^2}{\lambda^2\rho\sigma_\varepsilon^2 + C^2\sigma_u^2}, \tag{15}$$

and I derive the results about price informativeness in the following proposition: Proposition 2. In equilibrium, the price is more informative in the presence of relative performance if the conditions

$$(2\lambda-1)\sigma_d^2 - (1-\lambda\rho)\sigma_\varepsilon^2 > 0, \tag{16}$$

and

$$\sqrt{\frac{(1-\rho)(\sigma_d^2+\rho\sigma_\varepsilon^2)}{[(2\lambda-1)\sigma_d^2-(1-\lambda\rho)\sigma_\varepsilon^2]}} < \frac{a\tau\sigma_u\sigma_\varepsilon\{\lambda\rho^2\sigma_\varepsilon^2+\sigma_d^2[1+(2\lambda-1)\rho]\}}{(\sigma_d^2+\rho\sigma_\varepsilon^2)\lambda} \tag{17}$$

hold, and it is less informative otherwise.

Proof. The proof is in the Appendix.

Proposition 2 shows that prices can be either more or less informative in the presence of relative performance. Note that for a more informative price, I need the conditions in inequality (16) to hold, which at least means that $\lambda > 1/2$. Thus, if relative performance causes the price to be more informative, a sufficient number of informed managers should exist in the market. Otherwise, the price is less informative. Moreover, with a sufficient number of informed managers (inequality (16) holds), the price is more informative when inequality (17) holds, and less informative otherwise. This finding of a less informative price is consistent with the literature; however, I show that benchmarking a portfolio can lead to a more informative price.

To understand the results, I assume that informed manager i submits an optimal demand with the form $x_i^I = Gs_i + HP + F$, in which G, H, and F are three constants that are unrelated to s_i and P. By some calculation, I can show $\int_0^\lambda x_j^I dj = \lambda[G(d+\sigma_\varepsilon\sqrt{\rho}Y) + HP + F]$. Through some manipulation, I can calculate the conditional covariance as

$$\begin{aligned}\operatorname{cov}[d,(d-P)\int_0^\lambda x_j^I dj \mid s_i, P] &= \lambda G[2\mathrm{E}(d\mid s_i,P) + \sigma_\varepsilon\sqrt{\rho}\mathrm{E}(Y\mid s_i,P) - P]\sigma_{d|s_i,P}^2 \\ &\quad + \lambda(HP+K)\sigma_{d|s_i,P}^2.\end{aligned} \tag{18}$$

Note that informed managers essentially use the signal s_i and the price P to forecast two measures to determine the covariance. First, they forecast the expected return, which is $\mathrm{E}(d-P\mid s_i,P)$. Second, they forecast an uncertain part of the benchmark, which is

$\mathrm{E}(d \mid s_i, P) + \sigma_\varepsilon \sqrt{\rho}\mathrm{E}(Y \mid s_i, P)$. In addition to the standard mean variance problem, managers use their signals to forecast the covariance.

From the projection theorem, I show that

$$\mathrm{E}(d \mid s_i, P) = \overline{d} + \beta_s(s_i - \overline{d}) + \beta_p(P - A),$$

and

$$\mathrm{E}(Y \mid s_i, P) = \beta_s^Y(s_i - \overline{d}) + \beta_p^Y(P - A).$$

Thus, I sum all of the coefficients of si and set the sum equal to G. Then, I can derive

$$G = \frac{\beta_s}{\tau\sigma^2_{d|s_i,P}[a + b(1 - 2\lambda\beta_s - \sigma_\varepsilon\lambda\sqrt{\rho}\beta_s^Y)]},$$

which is the weight that each informed manager places on his or her signal.[10] If I consider a passive benchmark such as that of Admati and Pfleiderer (1997), it is easy to show that the weight on the signal is $G = \beta_s/(\tau\sigma^2_{d|s_i,P}(a+b))$. Thus, each manager places less weight on the private signal if I compare it with the baseline case with b =0, which decreases the informativeness of the price. However, in the case with a stochastic benchmark, additional terms $b(1 - 2\lambda\beta_s - \sigma_\varepsilon\lambda\sqrt{\rho}\beta_s^Y)$ appear in the denominator because managers√ use their information to forecast the conditional covariance. If $1 - 2\lambda\beta_s - \sigma_\varepsilon\lambda\sqrt{\rho}\beta_s^Y < 0$, each manager places more weight on the private signal. Because all of the information comes from informed managers, I conjecture that the price is more informative if each manager places more weight on the private signal. I denote I_{NRP} as the price informativeness in the economy without relative performance for comparison purposes. Applying the projection theorem to $1 - 2\lambda\beta_s - \sigma_\varepsilon\lambda\sqrt{\rho}\beta_s^Y$, I can conjecture as follows:

$$\text{If} \quad \lambda^2(1-\rho)\sigma_\varepsilon^2(\sigma_d^2 + \rho\sigma_\varepsilon^2) + C^2[(1-2\lambda)\sigma_d^2 + (1-\lambda\rho)\sigma_\varepsilon^2]\sigma_u^2 < 0, \quad I > I_{\mathrm{NRP}}, \tag{19}$$

$$\text{If} \quad \lambda^2(1-\rho)\sigma_\varepsilon^2(\sigma_d^2 + \rho\sigma_\varepsilon^2) + C^2[(1-2\lambda)\sigma_d^2 + (1-\lambda\rho)\sigma_\varepsilon^2]\sigma_u^2 > 0, \quad I < I_{\mathrm{NRP}}.[11] \tag{20}$$

Intuitively, a relative performance contract induces a manager to reduce the tracking errors between his or her performance and the benchmark. However, the benchmark is the average performance of all informed managers, which is uncertain. Thus, each manager needs to predict the conditional covariance based on his or her private signal and the price. Consequently, the effect of hedging depends on which piece of information, the manager's private signal or the price, is the best predictor. When the price is a more precise predictor of the average performance than the manager's private signal, managers place more weight on the price and less weight on the signal. As a result, the price aggregates less information and becomes less informative. By contrast, when the manager's private signal is a more precise predictor than the price, managers place less weight on the signal. In this case, the price aggregates more information and becomes more informative.

My article thus differs from the previous literature by showing that prices can actually be more informative. For this reason, I more closely examine the case with a more informative price. Going back to the condition in inequality (17), it is more likely to be true when $a\tau\sigma_u$ is large. A large value of aτ essentially means that the managers are very risk averse and that they

[10] Note that G =1/C, so G is always positive for C >0.

[11] Those conjectures are rigorously confirmed in Proposition 3.

trade very conservatively by using private signals. In this case, the price aggregates less information and is likely to be a bad predictor of the covariance. Thus, managers are more likely to weigh their signals more heavily. A large value of σ_u means the price is very noisy and that it therefore is likely a poor predictor of the covariance. Thus, managers are more likely to weigh their signals more heavily.

Moreover, when ρ =1, the condition in inequality (17) never holds. Because this condition arises when informed managers observe a common signal, I can conclude that the increased informativeness of the price is caused by informed managers' behavior aimed at hedging the additional uncertainty.[12] When ρ =0, the condition in inequality (17) crucially depends on the relative values of σ_d^2 and σ_ε^2, which determine the informativeness of the signal. For a general ρ (0<ρ <1), its effect on the condition in inequality (17) is not monotonic. On the one hand, informed managers can better forecast the average performance based on higher ρ, which can make the condition in inequality (17) hold more easily. On the other hand, higher ρ decreases the weight that each manager places on the signal directly,[13] which has the opposite effect on the condition in inequality (17). When relative performance concerns exist, d I /dρ is not necessarily negative because a higher ρ can cause managers to better forecast the average performance.

The effect of λ on the condition in inequality (17) is also not monotonic. Increasing λ causes the price to aggregate more information and to become more informative, which induces informed managers to weigh the signal less heavily. On the one hand, the condition in inequality (17) is easier to satisfy if the price is more informative. On the other hand, this condition is more difficult to satisfy if informed managers place less weight on their signal. Thus, the overall effect depends on the interaction between the two effects. For the purpose of illustration, I examine a numerical example.

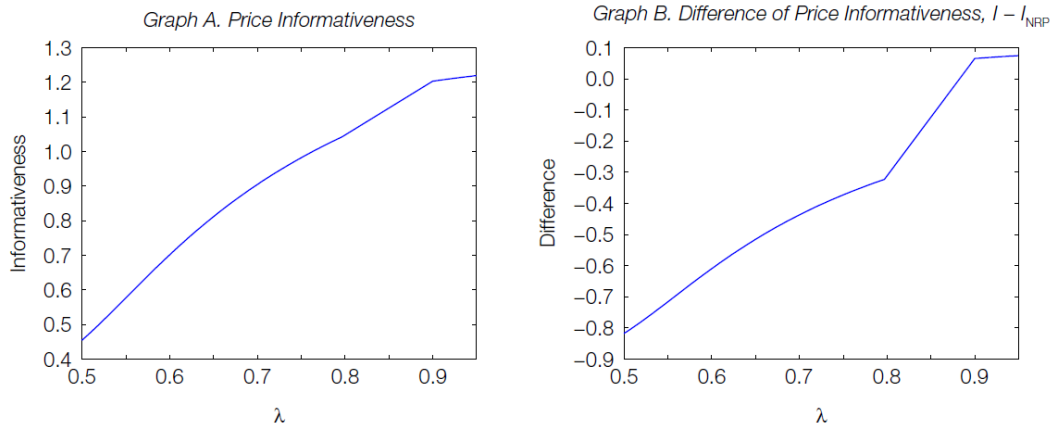
Figure 1 shows the numerical example. Graph A shows how the price in-formativeness I changes with the fraction of informed managers, and Graph B shows the difference in price informativeness between the cases with and without relative performance (I − I_{NRP}). For Graph B, when the difference is negative, it indicates that relative performance leads the price to be less informative; when the difference is positive, it indicates a more informative price with the presence of relative performance.

[12] Note that when ρ =1, the benchmark is not stochastic with respect to the informed managers. I discuss this situation in Section IV.B.

[13] When $b=0$, each manager places the weight $\beta_s/(\tau\sigma^2_{d|s_i,P})$ on the signal. From the projection theorem, $\beta_s/(\tau\sigma^2_{d|s_i,P})=C^2\sigma_u^2/(a\tau[\lambda^2(1+\rho)\rho\sigma_\varepsilon^4+C^2\sigma_\varepsilon^2\sigma_u^2])$. Thus, the weight decreases with ρ.

FIGURE 1
Price Informativeness

Graphs A and B in Figure 1 present the price informativeness I in equilibrium. Graph A plots I as a function of λ. Graph B plots the difference in price informativeness between the cases with and without relative performance ($I - I_{NRP}$). Parameter values are as follows: $a=0.01$, $b=1$, $\sigma_d=2$, $\sigma_u=1$, $\sigma_\varepsilon=1$, $\tau=5$. I choose the values of λ and ρ such that the values in the Graph B can be both positive ($I > I_{NRP}$) and negative ($I < I_{NRP}$). When the values of the difference in Graph B are negative, the parameter values are $\lambda \in [0.5, 0.8]$ and $\rho=0.7$. When the values of the difference in Graph B are positive, the parameter values are $\lambda \in [0.9, 0.95]$ and $\rho=0.9$.



C. Comparative Statics

In this subsection, I generate comparative statics regarding the price informativeness for the different model parameters. For the purpose of comparison, I first present the comparative statics results in a benchmark economy without relative performance (b =0). The following lemma shows the comparative statics on the price informativeness I_{NRP} for the benchmark economy without relative performance:

Lemma 3. For the economy without relative performance, I show that $dI_{NRP}/d\lambda > 0$, $dI_{NRP}/d\sigma_\varepsilon^2 < 0$, $dI_{NRP}/d\sigma_u^2 < 0$, and $dI_{NRP}/d\rho < 0$.

Proof. The proof is in the Appendix.

For the comparative statics analysis in the benchmark economy, I consider how the price informativeness changes with respect to λ, σ_ε^2, σ_u^2 and ρ. Intuitively, more informative managers and more precise signals lead the price to be more informative, such that the price informativeness increases with λ and decreases with σ_ε^2. The price informativeness decreases with ρ because a higher ρ decreases the weight that each manager places on his or her signal. σ_u^2 has two effects on price informativeness. First, a higher σ_u^2 causes the price to be noisier, which causes managers to place more weight on the signal. Second, although the price aggregates more information, a higher σ_u^2 causes the price to be noisy. However, because the second effect is dominant, the price informativeness decreases with σ_u^2.

In addition to the parameters analyzed in Lemma 3, I also conduct a comparative statics analysis on the contract parameters a and b for the economy with relative performance. The following proposition summarizes the main results:

Proposition 3. For the equilibrium in Proposition 1, $dI/d\lambda > 0$, $dI/d\sigma_\varepsilon^2 < 0$, $dI/d\sigma_u^2 < 0$, $dI/da < 0$, $dI/db > 0$ if the condition in inequality (19) is true, and d I /db <0 if the condition in inequality (20) is true.

Proof. The proof is in the Appendix.

Compared with the benchmark economy, I have the same qualitative comparative statics results for λ, σ_ε^2, and σ_u^2 change the manner in which each manager forecasts the average performance; however, in general, a higher λ, a lower σ_ε^2, and a lower σ_u^2 cause the price to be more informative. Furthermore, although I do not present any comparative statics results for ρ in the proposition, the Appendix shows that the price informativeness can increase or decrease with ρ, which differs from the benchmark economy. The difference arises from the weight that each manager places on his or her private signal. When b =0, a higher ρ increases $\sigma^2_{d|s_i,P}$, which causes managers to place less weight on their signals. Given the concerns regarding relative performance, a higher ρ can cause managers to better forecast average performance, which causes each manager to place greater weight on his or her signal. As a result, d I /dρ is not necessarily negative.

I also analyze the effect that contract parameters a and b have on price informativeness. The sign of d I /db depends on the conditions in inequalities (19) and (20), which verifies my conjecture from the previous subsection. In the model, parameter a is always associated with the risk-aversion parameter τ , such that in-creasing a effectively induces managers to be more risk averse and to trade less aggressively on their information. As a result, the price informativeness decreases with a.

4. Special Information Structures

To thoroughly understand the model, I consider three special but familiar information structures in this section. First, I consider a baseline model with symmetric information, in which all managers receive a common signal (or identical signals). I regard this model as the baseline case. Second, I solve a model with asymmetric information, in which only some managers observe a common signal, and some do not. Third, I consider a model in which all managers receive "equally accurate" but independent signals.

A. The Baseline Case: The Model with Symmetric Information

This subsection presents the baseline model with symmetric information. In contrast to the general model, λ=1 and ρ =1 in this case. Solving the model, I find that each manager's optimal demand is $x_i = [\mathrm{E}(d \mid s) - P]/(a\tau\sigma^2_{d|s})$, [14] which has nothing to do with the relative performance parameter b. Given the same information set, all managers submit the same demand and thus achieve the same performance, so this economy is the same as the benchmark economy without relative performance.

This part of the analysis is very similar to that in Kapur and Timmermann (2005); however, the setting is simpler. In addition to symmetric information, the compensation in my model is linear. Note that in Kaniel and Kondor (2013), the incentive contract matters even when all managers have the same information. However, the incentive contract in their article is convex, which is motivated by fund flows. The compensation in my article is motivated by the "fulcrum" compensation and is hence linear.

B. Asymmetric Information

This subsection analyzes the special case when ρ =1, indicating that all informed managers observe a common signal (or identical signals). Therefore, the information set is F_I ={s}.[15] Uninformed managers observe the price and have the information set F_u={P}. Because there is only one signal, the price performs the role of transmitting information.[16]

[14] The model is almost the same as the standard mean–variance problem and is easy to solve.

[15] Informed managers can also observe the price. However, the price is merely the sum of the noise and the signal and is therefore redundant to the signal.

[16] The mechanism is the same as that in the Grossman and Stiglitz (1980) model.

1. Optimal Trading Strategies and Equilibrium

The equilibrium definition is the same as Definition 1 but with different information sets. The following corollary outlines the results:

Corollary 1. The optimal demands of both informed and uninformed managers are as follows:

$$x_I = \frac{a}{a+b(1-\lambda)} \underbrace{\frac{\mathrm{E}(d\,|\,s)-P}{a\tau\sigma^2_{d|s}}}_{\text{Demand without relative performance}} + \frac{b(1-\lambda)}{a+b(1-\lambda)}x_u, \tag{21}$$

$$x_u = K_1\frac{\mathrm{E}(d\,|\,P)-P}{\tau\sigma^2_{d|P}}, \tag{22}$$

where $K_1=[a+b(1-\lambda)]/[a(a+b)]+[b\lambda/a(a+b)][(2\sigma^2_{d|P}-\sigma^2_{d|s})/\sigma^2_{d|s}]$. Given the optimal demands, there exists a noisy REE with the equilibrium price

$$P = A+B[(s-\bar{d})-Cu], \tag{23}$$

for three constants A, B, and C.

Proof. The proof is in the Appendix.

In this economy, informed managers have no additional uncertainty in their compensation, but their demand is affected by the existence of relative performance. Consequently, the informed demand is a weighted average of the demand without relative performance and the uninformed demand. Informed managers place some weight on the uninformed demand and less weight on the signal. That is, the informed demand depends less on private information without relative performance than with relative performance. Note that even without any additional uncertainty, relative performance causes informed managers to trade less aggressively on their signals. This result holds as long as there are some uninformed managers.

Uninformed managers need to hedge the uncertainty generated by informed managers' performance, and this hedging behavior induces them to change their level of trading aggressiveness. It is easy to see that K1 >[[a +b(1−λ)]/a(a +b)]+[bλ/a(a +b)]=1/a. Because $(1/a)[\mathrm{E}(d\,|\,P)-P]/(\tau\sigma^2_{d|P})$ is the demand without relative performance, the uninformed managers trade more aggressively. Similar to the results in Lemma 1, the uninformed managers forecast the average performance based on the price, and they submit a hedging demand, which takes the form of the conditional covariance $\mathrm{cov}[d,(d-P)\lambda x_I\,|\,P]$. From equation (21), the uncertain part for uninformed managers is the conditional expectation E(d |s), so I am effectively calculating $\mathrm{cov}\{d,(d-P)[[\mathrm{E}(d\,|\,s)-P]/\sigma^2_{d|s}]\,|\,P\}$, which can be simplified as $[(2\sigma^2_{d|P}-\sigma^2_{d|s})/\sigma^2_{d|s}][\mathrm{E}(d\,|\,P)-P]$. Thus, I obtain the more aggressive coefficient K_1 for the optimal demand.

Intuitively, when the price increases, uninformed managers interpret this increase as good news and speculate that informed managers will buy some assets. However, they also know that informed managers have better information than they do, such that, on average, uninformed managers lose in terms of relative performance if the good news is actually realized. To minimize their losses, uninformed managers buy more assets than they would without relative performance. Similar logic applies when the price decreases.

When informed managers observe a good signal, they submit a buying order. When noise traders[18] submit a buying order or a small selling order (smaller than that of informed managers), uninformed managers have to sell the asset to clear the market. In this case, uninformed

[17] With a little abuse of notations, I use the same parameters A, B, and C for all of the information structures.

[18] Here, I interpret the negative noise supply as the demand of noise traders.

managers trade against information. For this reason, uninformed managers trade "correctly" with the information only when noise traders submit a large selling order. Suppose that uninformed managers submit a buying order when the signal is good. Informed managers trade less aggressively on their information in the presence of relative performance, which means that their buying order is smaller. Consequently, uninformed managers have to submit a larger buying order to clear the market, indicating that they trade more aggressively on the information extracted from the price.

Although informative trading is amplified by relative performance, uninformed managers cannot learn much because the price contains less information. Therefore, the Walrasian effect still dominates the information effect, engendering a more price-elastic demand. Moreover, as the uninformed managers trade more aggressively, the informed managers provide less informative trading signals.

2. Price Informativeness

To understand the effects on the price, I analyze the price informativeness by conducting a comparative statics analysis. I first study how different parameters change with respect to the relative performance parameter, b. Corollary 2 summarizes the results as follows:

Corollary 2. For the case with asymmetric information where ρ =1, I show that $\partial B/\partial b<0$, $\partial C/\partial b>0$, and $\partial K_1/\partial b>0$.

Proof. The proof is in the Appendix.

Inequality ∂ B/∂b <0 shows that as the importance of relative performance increases, the price becomes less responsive to information. Inequality ∂C/∂b >0 shows that as the importance of relative performance increases, the significance of the effect of noise shocks on the price relative to information increases. Moreover, inequality ∂ K_1/∂b >0 shows that when relative performance is more important, uninformed managers trade more aggressively.

The model without relative performance solves the problem when b =0. The information structure in this section is the same as that in Grossman and Stiglitz (1980), in which managers maximize their utility over aW_1. Corollary 1 shows how B and C change with respect to b. If I denote B_{NRP} and C_{NRP} as the price parameters when there is no relative performance, I can immediately obtain B < B_{NRP}, C > C_{NRP}. B measures the responsiveness of the price to information, and C measures the relative effect of information and noise shocks on the price. Thus, the price is less sensitive to managers' private signal and more affected by noise in an economy with relative performance than in the benchmark economy without relative performance. This result is observed because relative performance causes informed managers to trade less aggressively on their private information.

From the projection theorem, I can obtain the informativeness of the price

$$I = \frac{1}{\sigma^2_{d|P}} = \frac{\sigma_d^2+\sigma_\varepsilon^2+C^2\sigma_u^2}{\sigma_d^2(\sigma_\varepsilon^2+C^2\sigma_u^2)}, \tag{24}$$

which has a negative relationship with C. For this reason, the informativeness of the price is lower with relative performance than without relative performance. From the inequality ∂C/∂b >0, I show that the price informativeness decreases with b.

C. Differential Information

This section examines the differential information model,[19] in which all managers are equally informed with independent signals. In contrast to the full model, λ=1 and ρ =0 in this section. Because there are no uninformed managers, the informed demand is not affected by uninformed

[19] In the literature, this type of model is used to study how prices aggregate information (e.g., Grossman (1976), Diamond and Verrecchia (1981)).

managers. Because ρ =0, a fund manager cannot learn anything from the signals of other managers. Therefore, the existence of relative performance affects the hedging behavior of only informed managers.

1. Optimal Trading Strategies and Equilibrium

The expression of the optimal demand in terms of the conditional covariance is almost the same as equation (5) except λ=1, and there exists a noisy REE with the equilibrium price

$$P = A + B[(d - \bar{d}) - Cu], \tag{25}$$

where A, B, and C are three constants. In the Appendix, I show that A and B are functions of C, and C is the positive root of the cubic equation. Using a procedure similar to that in Section III, I summarize the results in the following corollary:

Corollary 3. The optimal demand is

$$x_i = \underbrace{\frac{\mathrm{E}(d \mid s_i, P) - P}{a\tau\sigma^2_{d|s_i,P}}}_{\text{Demand without relative performance}} + \underbrace{\frac{b\beta_s}{a[a+b(1-2\beta_s)]}\frac{2\mathrm{E}(d \mid s_i, P) - P - s_i}{\tau\sigma^2_{d|s_i,P}}}_{\text{Hedging demand}}. \tag{26}$$

Given the optimal demand in equation (26), the equilibrium exists. Define $Q_1 = a(\sigma_\varepsilon^2 + \sigma_d^2) + b(\sigma_\varepsilon^2 - \sigma_d^2)$, and the equilibrium is unique if $Q_1 < (\sigma_d/(\sigma_u\sigma_\varepsilon\tau))\sqrt{3(\sigma_\varepsilon^2 + \sigma_d^2)}$ or $Q_1 > \sigma_d^2/[3(a+b)\tau^2\sigma_\varepsilon^2\sigma_u^2]$.

Proof. The proof is in the Appendix.

The optimal demand is the sum of the demand without relative performance and the hedging demand. Comparing this equation with equation (8) in Lemma 2, I show that there is no effect from hedging by uninformed managers. Therefore, the first term is simply the demand without relative performance, and the second term is the hedging demand for the average performance of all informed managers.

Note that I decompose the optimal demand in equation (26) into the "demand without relative performance" and the "hedging demand." Using the projection theorem, I show that the weight on the signal for the "demand without relative performance" is $\beta_s/(a\tau\sigma^2_{d|s_i,P})$ and is $b\beta_s(2\beta_s - 1)/(a\tau\sigma^2_{d|s_i,P}[a+b(1-2\beta_s)])$ for the hedging demand. From the expression of β_s and $\sigma^2_{d|s_i,P}$, I show that $\beta_s/(a\tau\sigma^2_{d|s_i,P}) = 1/(a\tau\sigma_\varepsilon^2)$, which is unrelated to relative performance. Thus, the effect on the price informativeness arises solely from the hedging demand. To be specific, it depends on $(2\beta_s - 1)/(a+b(1-2\beta_s))$. I can show that $a+b(1-2\beta_s)$ is greater than 0, so whether hedging demand increases or decreases, the price informativeness depends on whether $\beta_s > ½$.

The equilibrium is unique when either $Q_1 < (\sigma_d/\sigma_u\sigma_\varepsilon\tau)\sqrt{3(\sigma_\varepsilon^2 + \sigma_d^2)}$ or $Q_1 > \sigma_d^2/(3(a+b)\tau^2\sigma_\varepsilon^2\sigma_u^2)$holds. Similar to the analysis of the full model, the simple sufficient condition is identified as $\sigma_d^2/(\sigma_\varepsilon^2 + \sigma_d^2) > (a+b)/(9(a-b))$.[20] Accordingly, the equilibrium is unique when b >a, implying that relative performance is somewhat important.

[20] It is determined that the sufficient condition for $Q_1 < (\sigma_d/\sigma_u\sigma_\varepsilon\tau)\sqrt{3(\sigma_\varepsilon^2 + \sigma_d^2)}$ is $\sigma_u\sigma_\varepsilon < (\sqrt{3}/\tau(a+b))\sqrt{\sigma_d^2/(\sigma_\varepsilon^2 + \sigma_d^2)}$, and the sufficient condition for $Q_1 > \sigma_d^2/(3(a+b)\tau^2\sigma_\varepsilon^2\sigma_u^2)$ is $\sigma_\varepsilon\sigma_u > (1/\tau)\sqrt{1/3(a^2-b^2)}$. Thus, the simple sufficient condition can then be derived.

When b <a, the equilibrium is unique when the signal is sufficiently precise.

2. Price Informativeness

As in the analysis in Section III, the optimal demand takes the form $x_i^I = Gs_i + HP + F$, and I can derive

$$G = \frac{\beta_s}{\tau\sigma^2_{d|s_i,P}[a + b(1-2\beta_s)]}.$$

Compared with the baseline case with b =0, in this case, each manager places more weight on his or her private signal when $1-2\beta_s < 0$, which is a special case of inequality (19), and β_s is a function of C. By implicitly differentiating the cubic equation (equation (A-13) in the Appendix) with respect to C, I can derive the following corollary:

Corollary 4. In equilibrium, the price is more informative in the presence of relative performance if

$$\sigma_d^2 > \sigma_\varepsilon^2 \quad \text{and} \quad a\tau\sigma_u\frac{\sigma_\varepsilon}{\sigma_d}\sqrt{\sigma_d^2-\sigma_\varepsilon^2} > 1,$$

and is less informative otherwise.

If I set λ=1 and ρ =0, inequality (17) in Proposition 2 becomes

$$a\tau\sigma_u\frac{\sigma_\varepsilon}{\sigma_d}\sqrt{\sigma_d^2-\sigma_\varepsilon^2} > 1$$

in Corollary 4. Thus, the price informativeness can be analyzed in a simplified information structure. Note that relative performance causes the price to be more informative only if the signal is not too noisy $(\sigma_d^2 > \sigma_\varepsilon^2)$. With such a signal, the condition $a\tau\sigma_u(\sigma_\varepsilon/\sigma_d)\sqrt{\sigma_d^2-\sigma_\varepsilon^2} > 1$ is equivalent to $((1/\sigma_\varepsilon^2)-(1/\sigma_d^2))\sigma_u^2C^2 > 1$. Thus, the condition is likely to be true when $\sigma_u^2C^2$ is large or when $(1/\sigma_\varepsilon^2)-(1/\sigma_d^2)$ is large. $\sigma_u^2C^2$ measures the noisiness of the price; hence, a large $\sigma_u^2C^2$ indicates that the price is not very precise. When $(1/\sigma_\varepsilon^2)-(1/\sigma_d^2)$ is large, the signal is relatively good. Thus, the condition indicates that each manager places more weight on the signal when the price is less precise or when the signal is relatively good. As a consequence, the price aggregates more information and therefore provides more information.

The intuition of the term $a\tau\sigma_u$ is similar to the full model; however, I now need to analyze $(\sigma_\varepsilon/\sigma_d)\sqrt{\sigma_d^2-\sigma_\varepsilon^2}$. If $\sqrt{\sigma_d^2-\sigma_\varepsilon^2}$ is very large, the signal is very precise. Then, each manager weighs his or her signal more heavily, so the price aggregates more information and becomes more precise. However, as the precision of the price increases, the price may become a more precise predictor than the managers' signals, and the managers weigh the price more heavily instead. For this reason, a large value of $(\sigma_\varepsilon/\sigma_d)\sqrt{\sigma_d^2-\sigma_\varepsilon^2}$ indicates that the signal should be relatively precise but not "too good."

I also calculate the parameter B for the equilibrium price, which measures the sensitivity of the price to the aggregated information. B is a function of C, and it is easy to show that d B/dC <0. If I denote B_{NRP} as the parameter B in the economy without relative performance, I can easily obtain the following results:

- If $a\tau\sigma_u(\sigma_\varepsilon/\sigma_d)\sqrt{\sigma_d^2-\sigma_\varepsilon^2} > 1$, $B > B_{\text{NRP}}$.
- If $a\tau\sigma_u(\sigma_\varepsilon/\sigma_d)\sqrt{\sigma_d^2-\sigma_\varepsilon^2} < 1$ or $\sigma_d^2 < \sigma_\varepsilon^2$, $B < B_{\text{NRP}}$.

Thus, when relative performance causes managers to weigh their signals more heavily, the price is more sensitive to aggregate information and vice versa. Moreover, $d\sigma^2_{d|s_i,P}/C>0$, so $\sigma^2_{d|s_i,P}$ can be analyzed directly by following the analysis of C.

D. Public and Private Signals

This subsection extends the framework of Section IV.C by allowing managers to observe two signals, $s_i=d+\varepsilon_i$ and $s_c=d+\varepsilon_c$, where S_c is the public signal that is observable to all managers, and s_i is the private signal, which is observable to manager i only. $\varepsilon_i\sim \mathrm{N}(0,\sigma_\varepsilon^2)$; and $\varepsilon_c\sim \mathrm{N}(0,\sigma_c^2)$, ε_i and ε_c are independent.

In Section IV.C, the public information is represented by the price, which is endogenously determined. The price plays two roles: It i) signals the average performance of all managers and ii) aggregates information. Therefore, the effect of relative performance on public information is unclear. To separate the two roles, I introduce an additional exogenous public signal and study the effect of relative performance on the public signal. The following corollary presents the optimal demand and the price:

Corollary 5. The optimal demand is

$$x_i = \frac{1}{a}\frac{\mathrm{E}(d\,|\,s_i,s_c,P)-P}{\tau\sigma^2_{d|s_i,s_c,P}} + \frac{b\beta_s}{a[a+b(1-2\beta_s)]}\frac{2\mathrm{E}(d\,|\,s_i,s_c,P)-P-s_i}{\tau\sigma^2_{d|s_i,s_c,P}}. \tag{27}$$

The equilibrium price has the following form:

$$P = A+B[(d-\bar{d})+D(s_c-\bar{d})-Cu], \tag{28}$$

where A, B, and C have the same expressions as in Corollary 3, and D =(1+ $(b/a))(\beta_c/\beta_s)$.[21]

Proof. Given this expression of the optimal demand, the market-clearing condition $\int_0^1 x_i=S+u$ becomes an affine function of d, $(s_c-\bar{d})$ and u. By plugging the expression of price into the previous equation, I can find the parameters A, B, C, and D. A, B, and C have the same forms as in the case of differential information. Setting the coefficient of $(s_c-\bar{d})$ to 0, I have $D=-\beta_c(a+b)/\left((a+b)\beta_p B-[a+b(1-\beta_s)]B\right)$. Because $B=(a\beta_s+(a+b)\beta_p B)/[a+b(1-\beta_s)]$, I have $D=(1+b/a)(\beta_c/\beta_s)$.

The price continues to perform the role of aggregating information, and the effects of hedging are the same as those in Section IV.C. There is a new parameter, D, which measures the relative effects of the public information and the aggregated private information on the price. If I consider a special case where $\sigma_c^2=\sigma_\varepsilon^2$, I have $\beta_c/\beta_s=1$.[22] Thus, from the optimal demand in equation (27), it is easy to see that relative performance increases the sensitivity of the price to the public signal, and when b/a increases, the price becomes more responsive to public information.

Using the projection theorem, $\mathrm{E}(d\,|\,s_i,s_c,P)=\bar{d}+\beta_s(s_i-\bar{d})+\beta_c(s_c-\bar{d})+\beta_p(P-A)$, and the optimal demand in equation (27), I show that each manager weighs the public signal

21 β_c and β_s are parameters from the projection theorem.

22 I consider this special case because it has the special property that $\beta_c/\beta_s=1$. With this property, I do not have to calculate the entire equilibrium. Otherwise, β_c and β_s are functions of the equilibrium price parameters that need to be solved. Moreover, with this assumption, managers place the same weight on the private and public signals, which serves as a natural benchmark.

more than the private signal. Thus, on the aggregate level, the price is more sensitive to public information than to private information. Intuitively, placing more weight on the private signal makes the price aggregate more information, enabling other managers to learn more private information from the price. Without relative performance, the public signal and the aggregated private signals have the same effect on the price (when $\sigma_c^2 = \sigma_\varepsilon^2$). With relative performance, however, the price is more responsive to the public signal than to the private signal.

Generally, if the public signal does not play the role of aggregating information, relative performance causes managers to place more weight on the public signal and less weight on the private signals. However, if the public signal (price) aggregates information, placing less weight on the private signals decreases the information aggregation. For this reason, if the information content of the public signal (price) is endogenous in the economy, relative performance does not necessarily cause managers to place more weight on the public signal.

E. Discussion of Equilibrium

Although this article focuses on price informativeness, it is nonetheless interesting to examine the implications of relative performance on other equilibrium quantities, such as the expected return and price volatility. In the literature, when studies consider relative performance with a passive benchmark or an index (e.g., Basak and Pavlova (2013), Cuoco and Kaniel (2011)), a common result is that managers tend to increase the demand of assets within the benchmark and thus increase asset prices and volatilities. Kapur and Timmermann (2005) find that relative performance may lower the equity premium. In my model, the most important information structures are asymmetric information in Section IV.B and differential information in Section IV.C. Therefore, I discuss the effects on the equilibrium for each information structure. To analyze the equilibrium, I first define the expected returns and the asset volatility as $\mathrm{E}(r) = \overline{d} - \mathrm{E}(P)$ and $\sigma_P^2 = \mathrm{var}(P)$. For ease of comparison, I use the case without relative performance (b =0) as the baseline case for each information structure.

Section IV.B analyzes the case in the presence of the uninformed managers, and the price takes the form in equation (23), so I have $\mathrm{E}(r) = \overline{d} - A$ and $\sigma_P^2 = B^2[(\sigma_d^2 + \sigma_\varepsilon^2) + C^2\sigma_u^2]$. In this case, the expected return is likely to be lower than that in the baseline case when σ_ε^2 and σ_u^2 are high. On the one hand, the informed managers trade less informatively in the presence of relative performance concerns, which diminishes the informativeness of the price. For uninformed managers, a less informative price carries more uncertainty, so they will accept a lower price or require a higher risk premium. On the other hand, uninformed managers trade more aggressively, which increases the price. If I examine the expression of A, the first effect is illustrated primarily by a higher $\sigma_{d|P}^2$ in comparison with the baseline case, and the second effect is illustrated primarily by a higher K_1. Although the way in which the expected return changes depends on the interaction of the two effects, the second effect likely dominates the first when σ_ε^2 and σ_u^2 are high. Relative performance has two effects on volatility: The first arises from the signal, and the second arises from the noise. Because the price is less sensitive to the signal, the volatility that arises from the signal is lower. Effectively, the effect of informed managers in this economy is lower in the presence of relative performance; thus, the effect of the noise on the price is stronger, and the volatility from the noise is larger. When σ_ε^2 and σ_u^2 are high, the first effect is likely to be strong, and the second effect is likely to be strong when σ_u^2 is high.

From the results in Section IV.C, I have $\mathrm{E}(r)=\overline{d}-A$ and $\sigma_P^2=B^2\sigma_d^2+B^2C^2\sigma_u^2$, and the baseline case is the economy without uninformed managers (λ=1) and relative performance (b =0). The expected return is lower when dC/db <0 or when the price is more informative. On the one hand, a more informative price decreases the conditional volatility $\sigma^2_{d|s_i,P}$, which decreases the risk premium and increases the price. On the other hand, if I do not consider any information effect, I can show, from the optimal demand in equation (26), that the managers' hedging behavior effectively increases the total demand,[23] which also increases the price. Thus, the two effects together lead to a higher price and a lower expected return. When dC/db >0 or when the price is less informative, the two effects are opposite;[24] hence, the way in which expected return changes depends on which effect is dominant. The volatility also consists of two parts, arising from the aggregate signals and the noise supply. The effects of relative performance on the aggregate signals (B) and the noise supply (C) are opposite. When σ_d^2 is high, the effect on aggregate signals is likely to be strong, whereas when σ_u^2 is high, the effect on the noise supply is likely to be strong. The overall effect also depends on whether relative performance increases or decreases the informativeness of the price.

5. Convex Compensation

In the context of the mutual fund industry, the compensation in equation (1) may have a different interpretation. I can conceptualize $aW_{1,i}$ as the fixed proportion of assets under management and $b(W_{1,i}-\overline{W})$ as the fund inflows or outflows depending on the fund performance. Therefore, even when the fee structure is flat (a fixed proportion of assets under management), relative performance concerns can still stem from fund flows. Moreover, empirical evidence shows that the flow–performance relationship is actually convex (Chevalier and Ellison (1997)). Thus, it would be interesting to analyze the implications of the convex contract under the REE framework.

To consider a convex contract, I follow a payoff structure similar to that of Cuoco and Kaniel (2011) and rewrite the compensation (1) as

$$\begin{aligned} F_{1,i} &= I+aW_{1,i}+b_1(W_{1,i}-\overline{W})\mathbf{1}_{\{\text{good market}\}} \\ &\quad +b_2(W_{1,i}-\overline{W})\mathbf{1}_{\{\text{bad market}\}}, \end{aligned} \tag{29}$$

where $b_1>b_2$, and $\mathbf{1}_{\{\text{condition}\}}$ is the indicator function, which takes the value 1 if the condition is true. Thus, the compensation in equation (29) captures the idea that the fund inflows are very high in a good market but that the fund outflows are not so high in bad times.

Solving the full REE model with the convex payoff requires the inference of a truncated, multidimensional normal distribution, which makes the solution messy. Instead, I will consider the special information structure and conduct the numerical analysis based on some simplified assumptions. For comparison purposes, I set $b_1=b$ and $b_2=0$. Thus, the convex contract that I am considering here is an option contract. When the market is good, the option part (or relative performance) of the contract pays off. When the market is bad, however, the option part is 0. Moreover, I consider an asymmetric-information setting (Grossman and Stiglitz (1980)) and analyze informed and uninformed managers' behavior. In other words, I consider an information structure where all informed managers observe a common signal (ρ =1).

[23] Note that $b\beta_s/(a[a+b(1-2\beta_s)])$ is positive, so the total demand is actually increased if I do not consider any information effect.

[24] When d B/db >(<) 0, dC/db <(>) 0.

For this information structure, with a convex contract, the informed managers submit an optimal demand conditional on the private signal s. For simplicity, I consider d − P >0 as a good market and d − P <0 as a bad market. Thus, informed managers need to know whether E(d |s)− P is greater than 0 based on their private signals. I solve the optimal demand in the following proposition:

Proposition 4. Consider a special information structure where ρ =1. With a convex compensation, informed manager demand is

$$X_I = x_{I1}\mathbf{1}_{\{s>k\}} + x_{I2}\mathbf{1}_{\{s<k\}}, \tag{30}$$

where

$$x_{I1} = \frac{[\mathrm{E}(d\,|\,s)-P]}{[a+b(1-\lambda)]\tau\sigma^2_{d|s}} + \frac{b(1-\lambda)x_u}{[a+b(1-\lambda)]},$$

$$x_{I2} = \frac{[\mathrm{E}(d\,|\,s)-P]}{a\tau\sigma^2_{d|s}}, \quad \text{and}$$

$$k = \frac{(\sigma_d^2+\sigma_\varepsilon^2)P}{\sigma_d^2} - \frac{\sigma_\varepsilon^2\overline{d}}{\sigma_d^2}.$$

Moreover, if I consider a fictitious economy with only informed managers, and the asset supply is $S^* = S + u - (1-\lambda)x_u$, there exists a unique equilibrium price

$$P^* = P_1\mathbf{1}_{\{s>k\}} + P_2\mathbf{1}_{\{s<k\}}, \tag{31}$$

where P1 and P2 are shown in the Appendix.

Proof. The proof is in the Appendix.

In this economy, informed managers submit different demands, which are conditional on the realizations of their signals. When the relative performance is above a certain threshold, the contract is effectively linear, and the demand x_{I1} is the same as that in Section III. When the relative performance is below the benchmark, it is 0, and the demand is x_{I2}, which is the same as that without relative performance.

From equation (30), I show that informed managers place weight on the demand of uninformed managers only when the signal is good. If the signal is bad, they focus on their private information. Thus, in the case with a convex contract, informed managers trade more informatively than in the case with a linear relative performance contract but less informatively than in the case without relative performance. Uninformed managers effectively make an inference from a truncated normal distribution. I follow the procedure of Yuan (2005) and assume a fictitious economy in which only informed managers trade. In this economy, the market-clearing condition is $\lambda[x_{I1}\mathbf{1}_{\{s>k\}} + x_{I2}\mathbf{1}_{\{s<k\}}] = S^*$, and then I can derive the fictitious equilibrium price in equation (31).

Note that P∗ and the true equilibrium price P are equivalent sufficient statistics for d in the Blackwell sense (Yuan (2005)). Thus, uninformed managers must infer d from P∗, and the conditional moments are

$$\mathrm{E}(d\,|\,P,x_u) = \Pr(s>k)E_1 + \Pr(s<k)E_2,$$

$$\mathrm{var}(d\,|\,P,x_u) = \Pr(s>k)V_1 + \Pr(s<k)V_2,$$

where E_1, E_2, V_1, and V_2 are conditional moments of d from the truncated normal distribution, which are shown in the Appendix.

In addition to the standard inference problem presented by Yuan (2005), the uninformed managers are also subject to a convex contract. If E(d | P)− P is smaller than 0, there is no relative performance for the contract, and the problem is similar to that of Yuan (2005). However, if E(d | P)− P >0, the uninformed managers have relative performance concerns and must

therefore adjust their demand. They need to extract information about informed managers' signal and determine when the informed managers' option contract is in the money. In other words, they need to infer when s >k. I further denote ES_1 and ES_2 as conditional means of the signal s from the truncated normal distribution, which are defined in the Appendix. Then, the inference condition for s >k is $\Pr(s>k)\mathrm{ES}_1+\Pr(s<k)\mathrm{ES}_2>k$.

Furthermore, I need to determine the demand of uninformed managers $x_u = x_u^*$, and optimal demand becomes a fixed-point problem, which is shown in the following proposition:

Proposition 5. The demand for uninformed managers is a unique fixed point of the following equation:

$$x_u = K_2 \frac{\Pr(s>k)E_1+\Pr(s<k)E_2-P}{\tau[\Pr(s>k)V_1+\Pr(s<k)V_2]}, \tag{32}$$

where

$$K_2=\left\{\begin{array}{c}[k_1\mathbf{1}_{\{\Pr(s>k)\mathrm{ES}_1+\Pr(s<k)\mathrm{ES}_2<k\}}+k_2\mathbf{1}_{\{\Pr(s>k)\mathrm{ES}_1+\Pr(s<k)\mathrm{ES}_2>k\}}]\mathbf{1}_{\{\Pr(s>k)E_1+\Pr(s<k)E_2>P\}} \\ +\frac{1}{a}\mathbf{1}_{\{\Pr(s>k)E_1+\Pr(s<k)E_2<P\}}\end{array}\right\}.$$

k_1 and k_2 are two constants and are shown in the Appendix.

Proof. The proof is in the Appendix.

The result in the proposition is very similar to that of Yuan (2005), in which $K_2=1$. For this reason, uninformed managers change their trading aggressiveness in the presence of relative performance. Define $g(x_u)=K_2[\Pr(s>k)E_1+\Pr(s<k)E_2-P]/[\tau[\Pr(s>k)V_1+\Pr(s<k)V_2]]-x_u$, and x_u is a unique real root for $g(x_u)=0$. The equilibrium price can be obtained by the market-clearing condition. However, because x_u is not a linear form of the equilibrium price, multiple equilibria exist.[25] In general, the expressions of the solutions are complicated, and for expositional purposes, I conduct a numerical analysis for uninformed managers' demand and compare it with the solution from a linear contract.

Figure 2 provides an example of uninformed managers' demand with a convex contract. I show that the uninformed managers' demand has a nonlinear relationship with the price, reflecting the "confusion" effect, consistent with Yuan (2005). When the price is very low, the option part is likely to pay off, inducing the managers to trade more aggressively under a convex contract than under a linear contract. By contrast, when the price is high, the option part is likely to pay 0, so uninformed managers trade less aggressively under a convex contract than under a linear contract.

A convex contract affects uninformed managers in two ways. First, when uninformed managers make an inference on the basis of the fictitious price, they may confuse whether the option part of informed managers pays off. I show the first effect from the conditional moments. Second, based on the realization of the price, uninformed managers need to determine when the options embedded in their contracts have a positive value. If the option value is positive, they have relative performance concerns, and they need to predict the performance of informed managers. However, the option compensation of informed managers may or may not be in the money. Thus, uninformed managers need to conjecture whether the option compensation of informed managers is in the money. In any circumstance, uninformed managers change their trading aggressiveness. Consequently, this effect is captured by the parameter K2, which is a

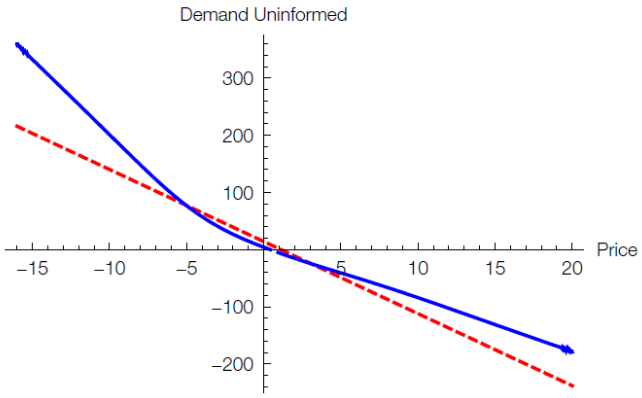
[25] For more details, please see Yuan (2005).

combination of several indicator functions.

FIGURE 2

Uninformed Managers' Optimal Demands

Figure 2 presents how the optimal demands of the uninformed managers change with respect to the equilibrium price. The solid line corresponds to the optimal demand with a convex contract, and the dashed line corresponds to a linear contract. Parameter values are as follows: $a=0.01$, $b=b_1=2$, $S=2$, $\overline{d}=1$, $\sigma_d=2$, $\sigma_u=5$, $\sigma_\varepsilon=1$, $\lambda=0.7$, $\tau=3$.



6. Concluding Remarks

In this article, I develop a noisy REE for delegated portfolio management in the presence of relative performance incentives. I focus on the informative trading of fund managers and price informativeness when both informed and uninformed managers have an incentive to reduce tracking errors with respect to a certain benchmark. The benchmark is the average performance of all managers, which is endogenously given in the model. Thus, individual managers have concerns about their performance relative to their peer group.

In the presence of relative performance, the existence of uninformed managers causes informed managers to trade less informatively, diminishing the informativeness of the price. Uninformed managers trade more aggressively to hedge the additional uncertainty regarding the average performance of informed managers. Moreover, each informed manager uses his or her private signal and the price to forecast the benchmark because it contains other managers' information. When an informed manager's private signal is a better predictor of the benchmark relative to the price, the manager weighs the price more heavily, causing the price to be more informative.

My article contributes to the literature by analyzing price informativeness within a delegated portfolio management framework when fund managers' compensation is linked to certain benchmarks. In the literature, fund managers normally tilt their portfolios toward the benchmark and thus trade less informatively. The result holds as long as the benchmark is exogenous. When the benchmark is endogenous and uncertain, the way in which each manager uses his or her information changes. When a manager uses his or her signal more than the price, the equilibrium price is more informative.

My finding of a more informative price is new to the literature, and it provides new empirical implications. In the previous literature, the price informativeness is always reduced by benchmarking, so a more informative price would be regarded as an anomaly. However, my article shows that the price informativeness depends on the nature of the benchmark and that the price can be more informative with an endogenous benchmark. Moreover, my article also predicts the equilibrium behavior of different types of fund managers. For example, when relative performance concerns become stronger, the managers who trade increasingly more

aggressively are likely to be uninformed managers. To separate the roles of the price in providing a public signal and in aggregating information, I introduce an exogenous public signal to the model. I show that in the presence of relative performance, managers place more weight on the public signal, so the price becomes more sensitive to public information. These results are also suitable for empirical tests.

Finally, for the purpose of comparison, I consider an option-like incentive contract for managers. In particular, I consider a special case with the Grossman and Stiglitz (1980) information structure and show that informed managers trade more aggressively on their signals under an option contract than under a linear contract. Moreover, uninformed managers trade less aggressively under an option contract than under a linear contract if they expect the option to be out of the money. By contrast, if they expect the option to be in the money, they trade more aggressively.

Appendix. Proofs and Figures

1. Proof of Lemma 1

Given the informed managers' information structure, the conditional mean and variance of the compensation are as follows:

$$\begin{aligned}
\mathrm{E}(F\mid s_i,P) &= I+aW_0+\left[(a+b)x_i-b\int_0^{1-\lambda}x_j^u dj\right][\mathrm{E}(d\mid s_i,P)-P]\\
&\quad -b\mathrm{E}\left[(d-P)\int_0^{\lambda}x_j^I dj\mid s_i,P\right],\\
\mathrm{var}(F\mid s_i,P) &= \left[(a+b)x_i-b\int_0^{1-\lambda}x_j^u dj\right]^2\mathrm{var}(d\mid s_i,P)\\
&\quad -2\left[(a+b)x_i-b\int_0^{1-\lambda}x_j^u dj\right]b\,\mathrm{cov}\left[(d-P),(d-P)\int_0^{\lambda}x_j^I dj\mid s_i,P\right]\\
&\quad +f(o),
\end{aligned}$$

where f (o) is the function that is unrelated to x_i. By the first-order condition (FOC), I can obtain equation (5) in Lemma 1. Similarly, I can derive equation (6) for uninformed managers.

2. Proof of Lemma 2

I assume the informed manager demand has the form $x_i^I = Gs_i + HP + K$ for three constants, G, H, and K . Then, $\int_0^{\lambda}x_j^I dj = \lambda(Gd+HP+K)+\int_0^{\lambda}\varepsilon_j dj$ and then the conditional covariance is

$$\begin{aligned}
\text{(A-1)}\quad x_i^I &= \frac{1}{a+b}\frac{\mathrm{E}(d\mid s_i,P)-P}{\tau\sigma^2_{d\mid s_i,P}}+\frac{b}{a+b}\int_0^{1-\lambda}x_j^u dj\\
&\quad +\frac{\lambda bG[2\mathrm{E}(d\mid s_i,P)+\sigma_\varepsilon\sqrt{\rho}\mathrm{E}(Y\mid s_i,P)-P]+\lambda b(HP+K)}{a+b}.
\end{aligned}$$

By some manipulation, I show that $\mathrm{cov}(d,d^2\mid s_i,P)=2\mathrm{E}(d\mid s_i,P)\sigma^2_{d\mid s_i,P}$.[26] Because Y and d are independent, it can be shown that

$$\mathrm{cov}(d,dY\mid s_i,P) = \mathrm{E}(d^2Y\mid s_i,P)-\mathrm{E}(d\mid s_i,P)\mathrm{E}(dY\mid s_i,P) = \mathrm{E}(Y\mid s_i,P)\sigma^2_{d\mid s_i,P}$$

Then I rewrite equation (5) in Lemma 1 as

[26] I use the fact that if $X\sim\mathrm{N}(\mu,\sigma_X^2)$, $\mathrm{E}(X^3)-\mu\mathrm{E}(X^2)=2\mu\mathrm{E}(X^2)-2\mu^3$. Then $\mathrm{cov}(d,d^2\mid s_i,P)=\mathrm{E}(d^3\mid s_i,P)-\mathrm{E}(d\mid s_i,P)\mathrm{E}(d^2\mid s_i,P)=2\mathrm{E}(d\mid s_i,P)\mathrm{E}(d^2\mid s_i,P)-\mathrm{E}(d\mid s_i,P)^3=2\mathrm{E}(d\mid s_i,P)\sigma^2_{d\mid s_i,P}$.

$$\text{(A-2)} \qquad \mathrm{E}(d \mid s_i, P) = \overline{d} + \beta_s(s_i - \overline{d}) + \beta_p(P - A).$$

$$\text{(A-3)} \qquad \mathrm{E}(Y \mid s_i, P) = \beta_s^Y(s_i - \overline{d}) + \beta_p^Y(P - A).$$

Plugging the conditional expectations into equation (A-1) and matching each term with $x_i^I = Gs_i + HP + K$, I derive three equations with three unknowns. Solving the system of equations, I obtain

$$G = \frac{\beta_s}{\tau\sigma^2_{d|s_i,P}[a + b(1 - 2\lambda\beta_s - \sigma_\varepsilon\lambda\sqrt{\rho}\beta_s^Y)]},$$

$$H = \frac{\beta_p - 1}{[a + b(1-\lambda)]\tau\sigma^2_{d|s_i,P}} + \frac{b\lambda G(2\beta_p - 1 + \sigma_\varepsilon\sqrt{\rho}\beta_p^Y)}{a + b(1-\lambda)},$$

$$K = \frac{\overline{d} - \beta_s\overline{d} - \beta_p A}{[a + b(1-\lambda)]\tau\sigma^2_{d|s_i,P}} + \frac{b(1-\lambda)x_u}{a + b(1-\lambda)} + \frac{b\lambda G[2\overline{d} - 2\beta_s\overline{d} - 2\beta_p A - \sigma_\varepsilon\sqrt{\rho}(\beta_s^Y\overline{d} + \beta_p^Y A)]}{a + b(1-\lambda)}.$$

Rearranging the expression $x_i^I = Gs_i + HP + K$, I obtain expression (8) in Lemma 2.

For uninformed managers, the conditional covariance in expression (6) is

$$\mathrm{cov}\left[d, (d-P)\int_0^\lambda x_j^I dj \mid P\right] = \int_0^\lambda \mathrm{cov}[d, (d-P)x_j^I \mid P]dj,$$

so I need to use expression (8). By some calculation, I have following results:

$$\text{(A-4)} \qquad \mathrm{cov}\{d, (d-P)[\mathrm{E}(d \mid s_i, P) - P] \mid P\} = [\mathrm{E}(d \mid P) - P](2\sigma^2_{d|P} - \sigma^2_{d|s_i,P}),$$

$$\text{(A-5)} \qquad \mathrm{cov}[d, (d-P)\mathrm{E}(Y \mid s_i, P) \mid P] = \mathrm{E}(Y \mid P)\sigma^2_{d|P},$$

$$\text{(A-6)} \qquad \mathrm{cov}\{d, (d-P)[2\mathrm{E}(d \mid s_i, P) - P] \mid P\} = 2\mathrm{E}(d \mid P)(2\sigma^2_{d|P} - \sigma^2_{d|s_i,P}) - P(3\sigma^2_{d|P} - 2\sigma^2_{d|s_i,P}),$$

$$\text{(A-7)} \qquad \mathrm{cov}\{d, (d-P)s_i \mid P\} = [2\mathrm{E}(d \mid P) - P]\sigma^2_{d|P} + \sigma_\varepsilon\sqrt{\rho}\mathrm{E}(Y \mid P)\sigma^2_{d|P}.$$

By plugging expression (8) into the conditional covariance and combining equations (A-4),(A-5), (A-6), and (A-7), I derive equation (9) in Lemma 2.

3. Proof of Proposition 1

The market-clearing condition $\int_0^\lambda x_j^I dj + (1-\lambda)x_u = S + u$ can be written as an affine function of $\int_0^\lambda s_i di - \lambda\overline{d}$ and u, so the constant term and all coefficients of random variables should be 0. When the constant term is 0, I derive A as

$$\text{(A-8)} \qquad A = \overline{d} - \frac{S}{\Pi_1\lambda + \Pi_2\lambda + \Pi_3 K},$$

where $\Pi_1 = 1/([a + b(1-\lambda)]\tau\sigma^2_{d|s_i,P})$, $\Pi_2 = b\beta_s\lambda/([a + b(1-\lambda)][a + b(1 - 2\lambda\beta_s - \lambda\sigma_\varepsilon\sqrt{\rho}\beta_s^Y)]\tau\sigma^2_{d|s_i,P})$, $\Pi_3 = (a+b)(1-\lambda)/([a + b(1-\lambda)]\tau\sigma^2_{d|P})$. A is the function of β_s, β_s^Y, $\sigma^2_{d|s_i,P}$, and $\sigma^2_{d|P}$. β_s and β_s^Y are from the projection theorem, equations (A-2) and (A-3), and $\sigma^2_{d|s_i,P}$ and $\sigma^2_{d|P}$ are conditional variances. When the coefficient of $(\int_0^\lambda s_i di - \lambda\overline{d})$ is 0, I solve B as

$$\text{(A-9)} \qquad B = \frac{\begin{bmatrix} \Pi_1(\beta_s + \lambda\beta_p B) \\ + \Pi_2(2\beta_s + 2\lambda\beta_p B + \sigma_\varepsilon\sqrt{\rho}(\beta_s^Y + \lambda\beta_p^Y B) - 1) \\ + \Pi_3 K\beta_p^u B \end{bmatrix}}{\Pi_1\lambda + \Pi_2\lambda + \Pi_3 K}.$$

B is the function of β_s, β_s^Y, $\sigma^2_{d|s_i,P}$, $\sigma^2_{d|P}$, $\beta_p B$, $\beta_p^Y B$, and $\beta_p^u B$, which are quantities from the projection theorem. When the coefficient of u is 0, I solve C as

$$C = \frac{\tau\sigma^2_{d|s_i,P}}{\beta_s}[a+b(1-2\lambda\beta_s-\lambda\sigma_\varepsilon\sqrt{\rho}\beta_s^Y)]. \tag{A-10}$$

In particular, β_s, β_s^Y, $\sigma^2_{d|s_i,P}$, $\sigma^2_{d|P}$, $\beta_p B$, $\beta_p^Y B$, and $\beta_p^u B$ are functions of parameter C, which indicates that A and B are functions of C. For this reason, the equilibrium is fully solved if C is determined.

By the projection theorem, I have $\beta_s=(C^2\sigma_d^2\sigma_u^2)/[\lambda^2(1-\rho)\sigma_\varepsilon^2(\sigma_d^2+\rho\sigma_\varepsilon^2)+C^2(\sigma_\varepsilon^2+\sigma_d^2)\sigma_u^2]$, $\beta_s^Y=C^2\sigma_u^2\sigma_\varepsilon\sqrt{\rho}/[\lambda^2(1-\rho)\sigma_\varepsilon^2(\sigma_d^2+\rho\sigma_\varepsilon^2)+C^2(\sigma_\varepsilon^2+\sigma_d^2)\sigma_u^2]$, and $\sigma^2_{d|s_i,P}=\sigma_d^2[\lambda^2(1-\rho)\rho\sigma_\varepsilon^4+C^2\sigma_\varepsilon^2\sigma_u^2]/[\lambda^2(1-\rho)\sigma_\varepsilon^2(\sigma_d^2+\rho\sigma_\varepsilon^2)+C^2(\sigma_\varepsilon^2+\sigma_d^2)\sigma_u^2]$. Plugging the expressions of β_s, β_s^Y, and $\sigma^2_{d|s_i,P}$ into equation (A-10) and by some manipulation, I can derive

$$N_1C^5-N_2C^4+N_3C^3-N_4C^2-N_5 = 0, \tag{A-11}$$

where

$$\begin{aligned}
N_1 &= (\sigma_\varepsilon^2+\sigma_d^2)\sigma_u^4,\\
N_2 &= \tau\sigma_\varepsilon^2\sigma_u^4\{[a+b(1-2\lambda)]\sigma_d^2+[a+b(1-\lambda\rho)]\sigma_\varepsilon^2\},\\
N_3 &= \lambda^2(1-\rho)\sigma_\varepsilon^2(\sigma_d^2+\rho\sigma_\varepsilon^2)\sigma_u^2,\\
N_4 &= \{(a+b)(\sigma_d^2+\rho\sigma_\varepsilon^2)+[a+b(1-2\lambda)]\sigma_d^2\rho+[a+b(1-\lambda\rho)]\sigma_\varepsilon^2\rho\}\\
&\quad\times\sigma_u^2\lambda^2(1-\rho)\sigma_\varepsilon^4\tau,\\
N_5 &= (a+b)\tau\lambda^4(1-\rho)^2\rho\sigma_\varepsilon^6(\sigma_d^2+\rho\sigma_\varepsilon^2).
\end{aligned}$$

Note that N_1, N_3, N_4, and N_5 are all positive. To determine the equilibrium, I set $F(C)=N_1C^5-N_2C^4+N_3C^3-N_4C^2-N_5$ and find that $F(\infty)=\infty$ and $F(0)<0$. By the intermediate value theorem, there exists at least one solution for $F(C)=0$. This proves the existence of the equilibrium. For uniqueness, I define $Q=[a+b(1-2\lambda)]\sigma_d^2+[a+b(1-\lambda\rho)]\sigma_\varepsilon^2$ and identify the following sufficient conditions:

1. First, $F'(C)=5N_1C^4-4N_2C^3+3N_3C^2-2N_4C$ and $F''(C)=20N_1C^3-12N_2C^2+6N_3C-2N_4$. It is observed that $F'(0)=0$ and $F''(0)<0$. Therefore, for positive C, if $F''(C)$ is an increasing function, $F'(C)$ is first negative and then positive. Consequently, $F(C)=0$ has a unique positive root if $F'''(C)=60N_1C^2-24N_2C+6N_3>0$. $F'''(C)$ is a convex function and meets its minimum value at $C^*=N_2/5N_1$. Solving $F'''(C^*)>0$, I find that $Q<\lambda\sqrt{5(1-\rho)(\sigma_\varepsilon^2+\sigma_d^2)(\sigma_d^2+\rho\sigma_\varepsilon^2)/2\tau}/(\sigma_\varepsilon\sigma_u)$.
2. When $Q>\lambda\sqrt{5(1-\rho)(\sigma_\varepsilon^2+\sigma_d^2)(\sigma_d^2+\rho\sigma_\varepsilon^2)/5\tau}/(\sigma_\varepsilon\sigma_u)$, it is possible for $F'''(C)<0$ and for $F''(C)$ to not be an increasing function for positive C. However, if $F''(C)$ is first negative and then positive, $F(C)=0$ still has a unique positive root. If the value of $F''(C)$ is negative when $F'''(C)=0$, $F''(C)$ is first negative and then positive for $C>0$. Defining C^* as the root for $F'''(C)=0$, I rewrite $F''(C^*)=-4N_2^2(C^*)^2+4N_3C^*-2N_4$, which achieves its global maximum at $C^*=N_3/2N_2$. Thus, the sufficient condition for $F''(C^*)<0$ is to show that $-4N_2^2(N_3/2N_2)^2+4N_3(N_3/2N_2)-2N_4<0$, which can be simplified as $\lambda^2(1-\rho)(\sigma_d^2+\rho\sigma_\varepsilon^2)^2/[(a+b)(\sigma_d^2+\rho\sigma_\varepsilon^2)Q+\rho Q^2]<2\sigma_u^2\sigma_\varepsilon^2\tau^2$.

Moreover, $\lambda^2(1-\rho)(\sigma_d^2+\rho\sigma_\varepsilon^2)^2/[(a+b)(\sigma_d^2+\rho\sigma_\varepsilon^2)Q+\rho Q^2]<2\sigma_u^2\sigma_\varepsilon^2\tau^2$ can be rewritten as

(A-12) $2\sigma_u^2\sigma_\varepsilon^2\tau^2\rho Q^2+2\sigma_u^2\sigma_\varepsilon^2\tau^2(a+b)(\sigma_d^2+\rho\sigma_\varepsilon^2)Q-\lambda^2(1-\rho)(\sigma_d^2+\rho\sigma_\varepsilon^2)^2 > 0.$

Note that the left-hand side of inequality (A-12) increases with Q, so if inequality (A-12) holds for $Q=\lambda\sqrt{5(1-\rho)(\sigma_\varepsilon^2+\sigma_d^2)(\sigma_d^2+\rho\sigma_\varepsilon^2)/5\tau}/(\sigma_\varepsilon\sigma_u)$, it holds for all $Q>\lambda\sqrt{5(1-\rho)(\sigma_\varepsilon^2+\sigma_d^2)(\sigma_d^2+\rho\sigma_\varepsilon^2)/5\tau}/(\sigma_\varepsilon\sigma_u)$. The sufficient condition for inequality (A-12) for $Q=\lambda\sqrt{5(1-\rho)(\sigma_\varepsilon^2+\sigma_d^2)(\sigma_d^2+\rho\sigma_\varepsilon^2)/5\tau}/(\sigma_\varepsilon\sigma_u)$ to hold is

$$\lambda\tau(\sigma_d^2+\rho\sigma_\varepsilon^2)^2\{5\lambda(1-\rho)^2\rho+\sigma_u\sigma_\varepsilon(a+b)\sqrt{10(1-\rho)\tau}-\lambda(1-\rho)\} > 0,$$

which can be simplified as inequality (14). This concludes the proof.

4. Proofs of Proposition 2, Proposition 3, and Lemma 3

Proof for dC/db: Differentiating F(C)=0 implicitly with respect to b, I obtain

$$\frac{dC}{db}=\frac{\left[\begin{array}{l}\lambda^4(1-\rho)^2\rho\sigma_\varepsilon^6(\sigma_d^2+\rho\sigma_\varepsilon^2)\tau+\sigma_u^4[(1-2\lambda)\sigma_d^2+(1-\lambda\rho)\sigma_\varepsilon^2]C^4\sigma_\varepsilon^2\tau\\+\{(\sigma_d^2+\rho\sigma_\varepsilon^2)+[(1-2\lambda)\rho]\sigma_d^2+(1-\lambda\rho)\sigma_\varepsilon^2\rho\}\sigma_u^2\lambda^2(1-\rho)\sigma_\varepsilon^4C^2\tau\end{array}\right]}{5N_1C^4-4N_2C^3+3N_3C^2-2N_4C}.$$

The denominator of dC/db is positive, so the sign of dC/db depends on the sign of the numerator. By some manipulation, I show that the sign of the numerator depends on

$$G(C) = \lambda^2(1-\rho)\sigma_\varepsilon^2(\sigma_d^2+\rho\sigma_\varepsilon^2)+[(1-2\lambda)\sigma_d^2+(1-\lambda\rho)\sigma_\varepsilon^2]\sigma_u^2C^2.$$

Thus, the condition for dC/db <(or>)0 is the same as inequality (19) (or inequality (20)).

Proof for Proposition 2. From the expression of $G(C)$, it is easy to see that when $(1-2\lambda)\sigma_d^2+(1-\lambda\rho)\sigma_\varepsilon^2>0$, the price is always less informative. Define C' such that $G(C')=0$, which means

$$C' = \frac{\lambda\sigma_\varepsilon}{\sigma_u}\sqrt{\frac{(1-\rho)(\sigma_d^2+\rho\sigma_\varepsilon^2)}{[(2\lambda-1)\sigma_d^2-(1-\lambda\rho)\sigma_\varepsilon^2]}}.$$

If $dC/db<0$, I need $C>C'$, which also means $F(C')<0$. If I plug C' in $F(C')<0$, I can derive inequality (17). Similarly, I can also derive the condition for $dC/db>0$.

Proof for dC/da: Differentiating F(C)=0 implicitly with respect to a, I have

$$\frac{dC}{da}=\frac{\left[\begin{array}{c}\sigma_\varepsilon^2\{\lambda^4(1-\rho)^2\rho\sigma_\varepsilon^4(\sigma_d^2+\rho\sigma_\varepsilon^2)\\+C^2\lambda^2(1-\rho)\sigma_\varepsilon^2[(1+\rho)\sigma_d^2+2\rho\sigma_\varepsilon^2]\sigma_u^2\\+C^4(\sigma_d^2+\sigma_\varepsilon^2)\sigma_u^4\}\tau\end{array}\right]}{5N_1C^4-4N_2C^3+3N_3C^2-2N_4C},$$

which is greater than 0. Given the expression of I , I can obtain the results in the proposition.

Proof for $dI/d\lambda$, $dI/d\rho$, $dI/d\sigma_u^2$, *and* $dI/d\sigma_\varepsilon^2$: Given the expression of price informativeness I, it is easy to derive $dI/d\lambda=2\lambda[C^2-C\lambda(dC/d\lambda)]\sigma_u^2/(\lambda^2\rho\sigma_\varepsilon^2+C^2\sigma_u^2)^2$, $dI/d\sigma_\varepsilon^2=-[\lambda^4\rho+2\lambda^2\sigma_u^2C(dC/d\sigma_\varepsilon^2)]/(\lambda^2\rho\sigma_\varepsilon^2+C^2\sigma_u^2)^2$, $dI/d\sigma_u^2=-[\lambda^2C^2+2\lambda^2\sigma_u^2C(dC/d\sigma_u^2)]/(\lambda^2\rho\sigma_\varepsilon^2+C^2\sigma_u^2)^2$, and $dI/d\rho=-[\lambda^4\sigma_\varepsilon^2+2\lambda^2\sigma_u^2C(dC/d\rho)]/(\lambda^2\rho\sigma_\varepsilon^2+C^2\sigma_u^2)^2$. Differentiating $F(C)=0$ implicitly with respect to λ, I have

$$\frac{dC}{d\lambda}=\frac{\left[\begin{array}{c}4(a+b)(1-\rho)^2\rho\sigma_\varepsilon^6(\sigma_d^2+\rho\sigma_\varepsilon^2)\tau\lambda^3-3bC^2(1-\rho)\rho\sigma_\varepsilon^4(2\sigma_d^2+\rho\sigma_\varepsilon^2)\sigma_u^2\tau\lambda^2\\-2C^2(1-\rho)\sigma_\varepsilon^2\sigma_u^2\{(\sigma_d^2+\rho\sigma_\varepsilon^2)C-(a+b)\sigma_\varepsilon^2[(1+\rho)\sigma_d^2+2\rho\sigma_\varepsilon^2]\tau\}\lambda\\-b\sigma_\varepsilon^2(2\sigma_d^2+\rho\sigma_\varepsilon^2)\sigma_u^4\tau C^4\end{array}\right]}{5N_1C^4-4N_2C^3+3N_3C^2-2N_4C}.$$

Given the expression of $dI/d\lambda$, the sign of $dI/d\lambda$ depends on the sign of $C^2-\lambda dC/d\lambda$. By the fact that $F(C)=0$, I show that $C^2-\lambda dC/d\lambda>0$, so $dI/d\lambda>0$. Differentiating $F(C)=0$ implicitly with respect to σ_ε^2 and with the fact that $F(C)=0$, I obtain

$$\frac{dC}{d\sigma_\varepsilon^2}=\frac{\begin{bmatrix}(\sigma_d^2\sigma_u^4/\sigma_\varepsilon^2)C^5\\+\lambda^2(1-\rho)\sigma_\varepsilon^2\sigma_u^2\tau\{[a+b+(a+b-2b\lambda)\rho]\sigma_d^2+2\rho[2(a+b)-b\lambda\rho]\sigma_\varepsilon^2\}C^2\\+(a+b)\tau\lambda^4\rho\sigma_\varepsilon^4(1-\rho)^2(2\sigma_d^2+3\rho\sigma_\varepsilon^2)\end{bmatrix}}{5N_1C^4-4N_2C^3+3N_3C^2-2N_4C}.$$

It is easy to see that $dC/d\sigma_\varepsilon^2>0$, so I have $dI/d\sigma_\varepsilon^2<0$. Differentiating $F(C)=0$ implicitly with respect to σ_u^2, I obtain

$$\begin{aligned}\frac{dC}{d\sigma_u^2}&=\frac{-2N_1C^5+2N_2C^4-N_3C^3+N_4C^2}{(5N_1C^4-4N_2C^3+3N_3C^2-2N_4C)\sigma_u^2}\\&=\frac{-N_1C^5+N_2C^4-N_5}{(5N_1C^4-4N_2C^3+3N_3C^2-2N_4C)\sigma_u^2}.\end{aligned}$$ [27]

Defining $f_1(C)=-N_1C^5+N_2C^4$, I have $f_1(C'')=0$ at $C''=N_2/N_1$ and $f_1(C)<0$ for $C>N_2/N_1$. It is easy to check $F(C'')<0$, so I know $C^*>C'$ for $F(C^*)=0$. Thus, I have $f_1(C^*)<0$ for $F(C^*)=0$ and can conclude that $dC/d\sigma_u^2<0$. Differentiating $F(C)=0$ implicitly with respect to ρ, I have

$$\frac{dC}{d\rho}=\frac{\begin{bmatrix}4(a+b)\lambda^4\sigma_\varepsilon^8\tau\rho^3+3\lambda^3\sigma_\varepsilon^6[(a+b)\lambda(\sigma_d^2-2\sigma_\varepsilon^2)+bC^2\sigma_u^2]\tau\rho^2\\-2\lambda^2\sigma_\varepsilon^4\{(a+b)\lambda^2\sigma_\varepsilon^2(2\sigma_d^2-\sigma_\varepsilon^2)\tau\\+C^2\sigma_u^2[(a+b-2b\lambda)\sigma_d^2+(2a+b(2+\lambda))\sigma_\varepsilon^2\tau]-\sigma_u^2C^3\}\rho\\+\lambda\sigma_\varepsilon^2\{\lambda(\sigma_d^2-\sigma_\varepsilon^2\sigma_u^2)\sigma_u^2C^3+\tau(a+b)\lambda^3\sigma_d^2\sigma_\varepsilon^4\\+2\sigma_\varepsilon^2\tau\lambda((a+b)\sigma_\varepsilon^2-b\lambda\sigma_d^2)\sigma_u^2C^2-b\sigma_\varepsilon^2\sigma_u^4\tau C^4\}\end{bmatrix}}{5N_1C^4-4N_2C^3+3N_3C^2-2N_4C},$$

which could be either positive or negative.

Proof of Lemma 3. If $b=0$, $C=a\tau\sigma_{d|s_i,P}^2/\beta_s$. From the projection theorem, I have a cubic equation, $\sigma_u^2C^3-a\tau\sigma_\varepsilon^2\sigma_u^2C^2-a\tau\lambda^2(1-\rho)\rho\sigma_\varepsilon^4=0$, for C. This equation has a unique positive root. Following the procedure for the calculation of $dI/d\lambda$, $dI/d\rho$, $dI/d\sigma_u^2$, and $dI/d\sigma_\varepsilon^2$, I can easily derive the comparative statics results for I_{NRP}.

5. Proof of Corollary 1

The optimization problem is similar to the proof of Lemma 2, so I can derive the results of the optimal demands. Similar to the proof of Proposition 1, the price can be obtained by the market-clearing condition $\lambda x_I+(1-\lambda)x_u=S+u$. It is easy to show

[27] The second step comes from the fact that F(C)=0.

$$A = \bar{d} - \frac{S\tau\sigma_{d|s}^2[a+b(1-\lambda)]}{\left[\lambda+(1-\lambda)(a+b)K_1\left(\frac{\sigma_{d|s}^2}{\sigma_{d|P}^2}\right)\right]},$$

$$B = \frac{\left[\lambda\beta_s+(1-\lambda)(a+b)K_1\left(\frac{\sigma_{d|s}^2}{\sigma_{d|P}^2}\right)\beta_P B\right]}{\left[\lambda+(1-\lambda)(a+b)K_1\left(\frac{\sigma_{d|s}^2}{\sigma_{d|P}^2}\right)\right]}, \quad \text{and}$$

$$C = \tau\sigma_\varepsilon^2\frac{[a+b(1-\lambda)]}{\lambda},$$

where $\sigma_{d|P}^2$ and $\beta_P B$ are functions of C by the projection theorem.

6. Proof of Corollary 2

$\partial C/\partial b>0$ is obvious from the expression of C, and it is easy to see that $\partial\sigma_{d|P}^2/\partial b=[2C\sigma_u^2\sigma_d^2\sigma_d^2/(\sigma_d^2+\sigma_\varepsilon^2+C^2\sigma_u^2)^2](\partial C/\partial b)>0$. Combining those results, I can show that $\partial K_1/\partial b>0$. For simplicity, I differentiate $(a+b)K_1$ with respect to b instead of K_1. Given $(a+b)K_1=1+b(1-\lambda)/a+[b(1-\lambda)/a][(2\sigma_{d|P}^2-\sigma_{d|s}^2)/\sigma_{d|s}^2]$, it is easy to show that $(a+b)\partial K_1/\partial b=[\lambda a/a(a+b)][((2\sigma_{d|P}^2-\sigma_{d|s}^2)/\sigma_{d|s}^2)-1]+(2b\lambda/(a\sigma_{d|s}^2))(\partial\sigma_{d|P}^2/\partial b)>0$. By the fact that $((2\sigma_{d|P}^2-\sigma_{d|s}^2)/\sigma_{d|s}^2)-1>0$, I have $\partial K_1/\partial b>0$. By some manipulation, the parameter B can be written as $B=[\lambda\beta_s(\sigma_\varepsilon^2+C^2\sigma_u^2)+(1-\lambda)\sigma_{d|s}^2(a+b)K_1]/[\lambda(\sigma_\varepsilon^2+C^2\sigma_u^2)+(1/\sigma_d^2)(1-\lambda)\sigma_{d|s}^2(a+b)K_1(\sigma_d^2+\sigma_\varepsilon^2+C^2\sigma_u^2)]$. Plugging the expressions of K_1 and C into B, and taking the derivative with respect to b, I find $\partial B/\partial b<0$.

7. Proof of Corollary 3

The optimization problem is similar to the proof of Lemma 2. Given the conjectured price, the market-clearing condition $\int_0^1 x_i=S+u$ becomes an affine function of d and u. Following the same procedure as the proof of Proposition 1, I have $A=\bar{d}-Sa\tau\sigma_{d|s_i,P}^2[a+b(1-2\beta_s)]/[a+b(1-\beta_s)]$, $B=[b\beta_s-(a+b)(\beta_s+\beta_p B)]/[b\beta_s-(a+b)]$, and $C=\tau\sigma_{d|s_i,P}^2[a+b(1-2\beta_s)]/\beta_s$. By the projection theorem, I have $\beta_s=\sigma_d^2C^2\sigma_u^2/[\sigma_d^2\sigma_\varepsilon^2+C^2(\sigma_\varepsilon^2+\sigma_d^2)\sigma_u^2]$ and $\sigma_{d|s_i,P}^2=\sigma_d^2\sigma_\varepsilon^2C^2\sigma_u^2/[\sigma_d^2\sigma_\varepsilon^2+(\sigma_d^2+\sigma_\varepsilon^2)C^2\sigma_u^2]$. Then C becomes the root of the following cubic equation:

$$a_1C^3-a_2C^2+a_3C-a_4 = 0, \tag{A-13}$$

where $a_1=(\sigma_\varepsilon^2+\sigma_d^2)\sigma_u^2$, $a_2=[a(\sigma_\varepsilon^2+\sigma_d^2)+b(\sigma_\varepsilon^2-\sigma_d^2)]\tau\sigma_\varepsilon^2\sigma_u^2$, $a_3=\sigma_d^2\sigma_\varepsilon^2$, and $a_4=(a+b)\sigma_d^2\sigma_\varepsilon^4\tau$. By defining $f(C)=a_1C^3-a_2C^2+a_3C-a_4$, I can show that $f(0)<0$ and $f(\infty)=\infty$. By the intermediate value theorem, there exists at least one solution for $f(C)=0$. For the uniqueness, I need to look at the property of $f'(C)$ and $f''(C)$, and the procedure is similar to the proof of Proposition 1.

8. Proofs of Propositions 4 and 5

Informed managers observe the signal, so the option pays off when $\mathrm{E}(d\,|\,s)>P$. Because $\mathrm{E}(d\,|\,s)=\overline{d}+\beta_s(s-\overline{d})$, informed managers effectively expect the option contract to be in the money when the signal is sufficiently good, or $s>k$.[28] When the option contract is in the money, the optimal demand is $x_{I1}=[\mathrm{E}(d\,|\,s)-P]/[a+b(1-\lambda)](\tau\sigma^2_{d|s})+[b(1-\lambda)x_u/(a+b(1-\lambda))]$. When $\mathrm{E}(d\,|\,s)<P$ or $s<k$, informed managers expect that the option contract is out of money. For this reason, the compensation is linear, so informed managers submit an optimal demand $x_{I2}=(\mathrm{E}(d\,|\,s)-P)/(a\tau\sigma^2_{d|s})$. This concludes the proof of Proposition 4.

[28] I solve the price P^* by the market-clearing condition $\lambda x_{I1}\mathbf{1}_{\{s>k\}}+\lambda x_{I2}\mathbf{1}_{\{s_i<k\}}=S+u-(1-\lambda)x_u$. Depending on the realizations of the indicator functions and the expressions of x_{I1} and x_{I2}, I have the following prices:

$$P_1 = \overline{d}+\frac{\sigma_d^2}{\sigma_d^2+\sigma_\varepsilon^2}(s-\overline{d})-\left[\frac{[a+b_1(1-\lambda)]S^*}{\lambda}-b_1(1-\lambda)x_u\right]\frac{\sigma_d^2\sigma_\varepsilon^2\tau}{\sigma_d^2+\sigma_\varepsilon^2},$$

$$P_2 = \overline{d}+\frac{\sigma_d^2}{\sigma_d^2+\sigma_\varepsilon^2}(s-\overline{d})-\frac{a\tau}{\lambda}\frac{\sigma_d^2\sigma_\varepsilon^2}{\sigma_d^2+\sigma_\varepsilon^2}S^*.$$

Uninformed managers need to make an inference about d from the price. Following Yuan (2005), I have following conditional moments:

$$\mathrm{E}(d\,|\,P,x_u) = \Pr(s>k)E_1+\Pr(s<k)E_2,$$

$$\mathrm{var}(d\,|\,P,x_u) = \Pr(s>k)V_1+\Pr(s<k)V_2,$$

where $\Pr(s>k)=1-\Pr(s_i<k)=\Phi[(1/\sigma_d^2)(P-\overline{d})]$, and

$$E_1 = \mathrm{E}(d\,|\,P=P_1,x_u=x_u^*,s<k),\quad E_2 = \mathrm{E}(d\,|\,P=P_2,x_u=x_u^*,s>k),$$

$$V_1 = \mathrm{var}(d\,|\,P=P_1,x_u=x_u^*,s<k),\quad V_2 = \mathrm{var}(d\,|\,P=P_2,x_u=x_u^*,s>k).$$

I can easily get the closed-form expressions following the formulas from Greene ((1990), pp. 707–708).

For the compensation of the uninformed managers, the option pays 0 if $\Pr(s>k)E_1+\Pr(s<k)E_2-P<0$. Because there is no relative performance, the optimal demand is $x_u=[\Pr(s>k)E_1+\Pr(s<k)E_2-P]/(a\tau[\Pr(s>k)V_1+\Pr(s<k)V_2])$.

When $\Pr(s>k)E_1+\Pr(s<k)E_2-P<0$, uninformed managers have concerns about relative performance because the option contract is expected to be in the money. However, the option contract of informed managers may or may not be in the money, so uninformed managers need to infer when the option contract of informed managers pays off. Define the conditional mean of the signal s as

$$\mathrm{ES}_1 = \mathrm{E}(s\,|\,P=P_1,x_u=x_u^*,s<k),\quad \mathrm{ES}_2 = \mathrm{E}(s\,|\,P=P_2,x_u=x_u^*,s>k).$$

When $\Pr(s>k)\mathrm{ES}_1+\Pr(s<k)\mathrm{ES}_2>k$, the demand for the informed managers is x_{I1}. The optimization problem of the uninformed managers is similar to that in Section IV.B, and I have $x_u=k_1[\Pr(s>k)E_1+\Pr(s<k)E_2-P]/[a\tau[\Pr(s>k)V_1+\Pr(s<k)V_2]]$, where $k_1=[a+b(1-\lambda)]/[a(a+b)]+[b\lambda/a(a+b)][(2\sigma^2_{d|P}-\sigma^2_{d|s_i,P})/\sigma^2_{d|s_i,P}]$.

[28] By the projection theorem, I can show that $k=((\sigma_d^2+\sigma_\varepsilon^2)P/\sigma_d^2)-(\overline{d}\sigma_\varepsilon^2/\sigma_d^2)$.

When $\Pr(s_i > k)\mathrm{ES}_1 + \Pr(s_i < k)\mathrm{ES}_2 < k$, the demand for the informed managers is x_{I2}. Following a procedure similar to that in Section IV.B, I have $x_u = k_2[\Pr(s > k)E_1 + \Pr(s < k)E_2 - P]/[a\tau[\Pr(s > k)V_1 + \Pr(s < k)V_2]]$, where $k_2 = [a + b\lambda(2\sigma^2_{d|P} - \sigma^2_{d|s})/\sigma^2_{d|s}]/[a(a + b\lambda)]$.

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IMI News

- On October 11, Prof. Zhang Jie, Director of IMI, in the context of the Belt and Road Initiative, shared his thoughts on reading "The Geographical Pivot of History" by the British geographer Halford MacKinder in his speech titled "A Reexamination of the Heartland" at Macro-Finance Salon (No. 70). Luo Yu, associate professor of School of Finance, RUC, chaired the event.
- On October 15, Dr. Yan Xiandong, Deputy Director General of Statistics Department of PBoC, delivered a keynote speech on "Current Economic Operation and Policies" at Macro-Finance Salon (No. 71). Other participants include Zhao Xijun, Associate Dean of School of Finance at RUC, Wu Ge, Chief Economist of Huarong Securities Corporation, Chen Qiqing, Director of Macroeconomic Department, Party School of the CPC Central Committee, Zhou Yinggang, Associate Dean, Wang Yanan Institute for Studies in Economics.
- On October 21, IMI and Modern Bankers Magazine jointly held the first closed-door seminar of CBF50 and the Macro-Finance Salon (No. 72) themed "Belt and Road Initiatives and Foreign Investments". Ou Xiaoli, inspector of the Western Development Division of the National Development and Reform Commission (NDRC), Lin Dajian, former deputy director of the International Cooperation Department of NDRC, Qu Fengjie, senior research fellow of IMI and member of CBF50.
- On October 22, the Global Fintech Lab, an innovation-driven international institution co-established by IMI, Shenzhen HANDE Sharing Technology Lab and Shenzhen Advanced Finance Institute of the Chinese University of Hong Kong, held an annual round-table conference of Global Fintech Lab in Shenzhen. It is the first domestic professional setup that focuses on front academic researches of Fintech. Prof. Edward C. Prescott, the 2004 Nobel Economics Laureate, serves as the Chief Advisor of Global Fintech Lab.
- On October 31, the Launch of IMF World and China Economic Outlook was held at Beijing Financial Street, co-organized by IMI and IMF Representative Office in China, sponsored by Minsheng Securities Academy. Among the attendees are Wu Xiaoqiu, Vice President of RUC, Zhuang Yumin, Dean of the School of Finance at RUC, Alfred Schipke, Senior Representative of IMF China, Zhang Longmei, Deputy Representative of IMF China, Zhou Xiaoquan, President of Minsheng Securities, Qiu Xiaohua, Chief Economist of Minsheng Securities, Marcos Caramuru de Paiva, the Brazilian Ambassador to China, Danny Alexander, Vice President of the Asian Infrastructure Investment Bank (AIIB), Er-Cheng Hwa, Chief Economist of Baoshang Bank and a former economist of the IMF, Wei Benhua, Former Deputy Administrator-in-Bureau of the State Administration of Foreign Exchange and Former IMF Executive Director for China, Zhang Zhixiang, Former Director General of the International Department of PBoC and former IMF Executive Director for China.
- On November 9, 2017, Renmin University of China held a Press Conference of China Wealth Management Development Index in Jinjialing Financial District, Qingdao City. Produced by the School of Finance and the Wealth Management Research Center of RUC,

and supported by IMI, the Report of China Wealth Management Development Index is a comprehensive, systematic analysis from the index perspective for the first time.

- Mr. Wang Yongli, member of IMI Academic Committee and former vice president of Bank of China, addressed a keynote speech on "the Essence of Currency and Virtual Currency" at Macro-Finance Salon (No. 73) and Fintech Open Classes (No. 10).
- The Guangdong provincial government has recently established the Financial Advisory Board. Chen Yunxian, Member of the Party group at Guangdong provincial government and Member of IMI Advisory Board, serves as the Chairman of Board. Li Yang, Member of IMI Advisory Board, Chairman of National Finance and Development Laboratory, Cao Tong, Co-director of IMI, Chairman of Shenzhen Hande Financial Holdings Limited, Ben Shenglin, Executive Director of IMI, Founding Dean of Zhejiang University Academy of Internet Finance, are appointed as the Board members.
- On November 17, the delegation from Uganda government visited IMI and joined the Fintech closed-door seminar organized by IMI and Rushi Fintech Institute. The participants discussed about the development and application of Fintech.
- On November 18, Mr. Guan Tao, senior fellow at CF40, former director general of the international payments department of SAFE, was invited to deliver a keynote speech titled "The reasons, implications and outlooks of RMB appreciation in 2017". Wei Benhua, Former Deputy Administrator-in-Bureau of SAFE, chaired this salon at Macro-Finance Salon (No. 74) Series of the 19th CPC National Congress (No. 1).
- On November 24, 2017 Tianfu Financial Forum—Press Conference of Tianfu Financial Index (TFFI) and Measures for Facilitating Civil-Military Integration through Finance was held in Chengdu. This forum was jointly organized by IMI, the National Defense Science and Technology Industry Office of Sichuan Province, and PBoC Chengdu Branch. TFFI was compiled by IMI with the support of the School of Finance of RUC, featuring the combination of theory, policy and practice. TFFI is based on the theory of financial center, with full consideration of national macroeconomic policies and financial development experience in terms of standard and empowerment.
- On November 25, China Financial Risk Management Summit Forum 2017 was held at the International Conference Center of Beijing National Accounting Institute, co-hosted by IMI, Beijing National Accounting Institute, Finance World magazine, Beijing Branch of China Economic News Service and Modern Bankers magazine. The forum focused on regional financial risk management during the supply-side reform with four sub-themes: shift from virtuality to reality and financial regulation, bad asset management in the supply-side reform, local financial risk management, and risk management in Fintech and innovation.
- On November 25, Zhong Zhengsheng, director of board and chief economist of Moneta Research and managing director of Caixin Think Tank, delivered a speech titled "Deleveraging from Financial Sector to Real Economy" at Macro-Finance Salon (No. 75) Series of the 19th CPC National Congress (No. 2). The salon is presided over by Xu Yisheng, CEO of New Momentum Asset Management Company and senior researcher of IMI.
- On November 26, Yang Dong, Associate Dean of Law School, Renmin University of China, Director of Fintech and Internet Security Research Center and Executive Director of the Internet and Information Law Institute, delivered a speech on the development and regulation of China's cash loans and internet small-loan industry at Macro-Finance Salon (No. 76) and Fintech Open Classes (No. 11).

- On December 2, at Macro-Finance Salon (No. 77) and Fintech Open Classes (No.12), Cao Feng, China's first blockchain international patent inventor, one of the co-founders of China Ledger, a senior researcher of the China Blockchain Research Alliance and the chief scientist of the Blockchain Association of China Federation of Logistics & Purchasing, delivered a keynote speech on Blockchain Finance Practices and Technology Trends.
- On December 6, Luo Ping, doctoral supervisor of the Institute of Computing Technology Chinese Academy of Sciences and research fellow of Shanghai Key Laboratory of Intelligent Information Processing, gave a lecture on "AI+" driving the new generation of financial innovation at Macro-Finance Salon (No. 79) and Fintech Open Classes (No. 13).
- On December 9, at Macro-Finance Salon (No. 80) Series of the 19th CPC National Congress (No. 4), Wei Gejun, president of the China Financial Publishing House delivered a speech on "reviewing the regulatory reform in the framework of the financial industry". The salon was attended by Zhang Jie, director of IMI; Song Wei, associate professor of the School of Finance of RUC; Lin Nan, researcher of IMI. Song Ke, deputy director of IMI, chaired the salon.
- On December 9, Tao Xiang International Finance Lectures (No. 10) was held in Renmin University of China. Dr. Geng Qun, Research Chief of Chengtong Fund, gave a lecture on "the past and present of domestic and foreign private equity." The lecture was presided over by Hu Bo, IMI researcher and associate professor of the School of Finance of RUC.
- On December 10, at Macro-Finance Salon (No. 81) Series of the 19th CPC National Congress (No. 5), Ding Zhijie, Member of IMI Academic Committee, Assistant President of University of International Business and Economics, delivered a keynote speech on "The Impossible Trinity—Reflections on China's International Financial Policies from 2009 to 2014". Wei Benhua, member of IMI Academic Committee, former deputy administrator-in-bureau of SAFE, and Jiang Nan, Lin Nan and Zhu Yugeng, researchers of IMI, attended the Salon. The Salon was hosted by Chen Weidong, member of IMI Academic Committee, director of the Institute of International Finance at Bank of China.
- On December 15, Tao Xiang International Finance Lectures (No. 11) was held in Renmin University of China. Mr. Liu Zhuoshi, Chief Analyst of Fixed Income and Deputy Head of Asset Allocation at Ping An Annuity, gave a speech on the topic of "Indication of the Long Term Financial Data to the Domestic and International Markets". The lecture was hosted by Gang Jianhua, IMI Researcher and Associate Professor of the School of Finance at RUC.
- On December 16, Zhang Ming, Senior Research Fellow of IMI, Director of International Investment of Institute of World Economics and Politics at CASS, delivered a keynote speech titled "A Full Perspective on the Decline of China's Foreign Exchange Reserves" at Macro-Finance Salon (No. 82) Series of the 19th CPC National Congress (No. 6).
- On December 17, Wang Wei, Senior Research Fellow of IMI, Managing Director and Deputy Head of Research at BOCI, delivered a speech titled "Chinese Enterprises Ride with the Bond Market in Going Global" at Macro-Finance Salon (No. 83) Series of the 19th CPC National Congress (No. 7).
- On December 17, Macro-Finance Salon (No. 84) and Appointment Ceremony for Honorary Chairman of IMI Academic Committee was held jointly by the School of Finance and IMI of Renmin University of China and the Global FinTech Lab (GFL). Wu Xiaoqiu, Vice President of Renmin University of China and Edward Prescott, the 2004 Nobel Laureate in Economics and Professor of Arizona State University attended the salon and both gave keynote speech on "Global and China Economy". Prof. Edward Prescott was appointed as the Honorary Chairman of IMI Academic Committee.

- On December 20, Xia Le, Senior Research Fellow of IMI, Chief Asia Economist at the Banco Bilbao Vizcaya Argentaria (BBVA) Research delivered a keynote speech on "Experience and Prospect of RMB Internationalization" at Macro-Finance Salon (No. 85) Series of the 19th CPC National Congress (No. 8).
- On December 23, at Macro-Finance Salon (No. 86) Series of the 19th CPC National Congress (No. 9), Wang Guogang, Professor of School of Finance at RUC and Former Director of Institute of Finance at CASS, delivered a keynote speech on the definition, effects and countermeasures of finance's shifting from reality to virtuality.
- On December 23, Macro-Finance Salon (No. 87) and Fireside Chat on Money and Finance (No.1) co-organized by the School of Finance and IMI of Renmin University of China was successfully held. Huang Da, the 93-year-old professor, gave a keynote speech titled "Bases Cannot Be Overemphasized". Over 100 guests participated in the event and joined discussions. Among the attendees are Wang Guangqian, former president of Central University of Finance and Economics, Wei Benhua, former deputy administrator-in-bureau of the State Administration of Foreign Exchange, Wang Yongli, vice chairman of CIFCO, Sun Guofeng, director of Research Institute of Finance of the PBoC, Li Bin, deputy director general of the Monetary Policy Department of the PBoC, Chen Weidong, director of the Institute of International Finance at Bank of China, Wu Ge, chief economist at Huarong Securities, Chen Qiqing, director of Division of Macroeconomics of the Department of Economics of Party School of the Central Committee of CPC, and professors from RUC: Zhuang Yumin, Dean of the School of Finance, Zhao Xijun and Tan Songtao, Associate Deans of the School, Professor Ren Huaixiu, Chen Zhongyang, Dai Wensheng, Ma Yong, Deputy Director of IMI Song Ke, Researcher Zhang Wenchun, Wang Jian, Yuan Jiang, Zhao Xueqing, Xiong Yuan, and Jiang Nan. The salon was moderated by Zhang Jie, Director of IMI.
- On December 24, Macro-Finance Salon (No. 88) and Fintech Open Classes (No. 14) was held at Renmin University of China. Mr. Wang Liren, Senior Researcher of China Blockchain Research Alliance, expert in Network Engineering and Safety Technology, Deputy Secretary General of Zhongguancun Blockchain Industry Alliance, co-founder of the Energy Blockchain Laboratory, co-founder of the Agricultural Blockchain Laboratory, delivered a keynote speech on Bitcoin's Past, Present, and Future.

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