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Trade War

US Unilateralism Revisited: Threat of WTO Actions Weakens Global System*

By DAVID SKILLING *

The US continues to withdraw from the rules-based system of global trade that it helped build over the last several decades. The imposition of tariffs on aluminum and steel imports on national security grounds reflects an increasingly unilateral US approach to trade policy.

The direct effect of these tariffs is unlikely to be significant. But conduct like this weakens the foundations of the international trading system. If other countries respond with legal actions in World Trade Organization tribunals, and judgments are made against the US, the risk of an existential crisis for the WTO rises.

President Donald Trump seems to be reverting to his long-standing instincts on trade. Consistent with his 1987 full-page ad in The New York Times blaming Japan (and US fecklessness) for the trade deficit, Trump tweeted in March that 'trade wars are good and easy to win' and that the European Union treats the US 'very badly on trade', although the weighted average tariff into the US is almost exactly the same as the EU's.

The probable flashpoint is the imposition of deeper trade and economic sanctions on China in retaliation for alleged intellectual property theft and a lack of reciprocity in its domestic markets. There are legitimate issues to be addressed, and recent developments in China suggest that these problems are becoming more acute. In response, the EU, Australia and others, in addition to the US, are becoming tougher on Chinese trade and investment.

The US has anchored the global economic system since the second world war by acting as the reserve currency issuer. Demand for the dollar means the US benefits from lower interest rates and seigniorage revenue, as well as reduced market discipline on its policies. However, it faces a higher exchange rate than otherwise, which constrains its export growth. Indeed, running a trade deficit is often regarded as something required of reserve currency issuers.

But there is a risk that the unilateralist US approach to trade will be reflected in a reduced willingness to support the reserve currency system where it conflicts with domestic goals. There is precedent; the US unilaterally ended the convertibility of the dollar into gold in 1971. As John Connally, then US Treasury secretary, said, 'The dollar is our currency, but it's your problem.' Steven Mnuchin, Trump's Treasury secretary, may not be as blunt but made ambivalent comments in January on the strength of the dollar. And while Larry Kudlow, the head of the president's National Economic Council, argued for a strong dollar, it is not clear that Trump agrees, particularly as Washington's fiscal stimulus plans collide with his demand for a lower trade deficit.

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* This article first appeared in OMFIF Commentary on April 4, 2018.

* David Skilling is Director of the Landfall Strategy Group, a Singapore-based economic advisory firm.

If the US is less committed to playing this role, the dollar becomes less attractive to hold – and is less compelling as a haven. Barry Eichengreen, the economic historian, notes that reserve currency status partly reflects geopolitical realities. It is possible that the 'America first' agenda on trade and other global issues is one source of current dollar weakness. Although the dollar's share in global central bank reserves has been relatively stable, and while it dominates the settlement of international transactions, concerns about the commitment to a strong dollar could accelerate the transition to a multi-reserve currency system. This would be a tumultuous process.

An increasingly 'Trumpian' administration raises other institutional risks, such as pressure on the independence of the Federal Reserve as interest rates gradually rise. It is not difficult to imagine Trump directly challenging Fed norms. Markets cannot rule out a weakening of Fed independence, with lower interest rates and higher rates of inflation than otherwise.

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Why a US-China Trade War is Self-defeating in a Connected World*

By LIU JUN*

The trade dispute between China and the US is mind-boggling. It is anachronistic to witness such a warring exchange of words between the world's two biggest economies.

Although globalisation might not be a buzzword any more after the backlash of populism and nationalism, the trend of being more global than local is still in motion, in spite of some hitches along the way. So how could a trade war take place in this era of a digital economy and the "internet of things"?

A trade war is definitely a misnomer. Here are some reasons why.

First, the world economy has become an intertwined system. The theories of comparative advantage and value chains were based on outdated experiences of the past millennium. Today, the value system has replaced the value chain and stretches to almost every corner of the globe, weaving together various industries, diverse factors of production and an enormous pool of human talent. People find it very challenging to identify the country of origin of a product or service, along with the capital and labour embedded within it.

The resources and even risks from economic activities are allocated and dispersed worldwide, and people move all over the place. To be sure, a few things are still too localised to be exported overseas, but they are very few these days, given that even traditional foodstuffs such as sushi and tofu have made it abroad.

Almost every single tradable product has both local and foreign, or national and international, elements. When a product is being manufactured in one country, some parts always come from other countries, or the manufacturer itself is a foreign or joint venture.

When a government levies heavy tariffs on certain goods, it is potentially a punishment for all the parties operating in a worldwide value system. Attacking any single part will no doubt affect the whole system through ripple and domino effects. Therefore, multilateral treaties are in fact a value-system-based arrangement and we should be encouraged to comply with them.

Second, national security issues can only be addressed internationally – not by imposing man-made obstacles on trade and investment flows, but by taking common threats seriously, in unison. So far, there is no empirical evidence suggesting even a small significant correlation between trade and security threats.

Importing or exporting equipment or goods –even hi-tech products – surely benefits people of the countries engaged in the trade. If the well-being of the people is substantially improved by trading with one another, how will that agitate security threats towards their countries?

National security risks are contingent on poverty, not social well-being. If wealth is created through production and consumption, and prosperity is achieved through distribution and sharing, national security would no doubt be self-fulfilling and self-sustained.

Therefore, restricting or blocking certain imports – in particular technological elements–does not help security; and slapping huge tariffs on goods from other counties in the global value system would fail to benefit those who started the vicious cycle.

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*This article first appeared on South China Morning Post on April 19, 2018

* Liu Jun, Member of IMI Academic Committee, Executive Vice President of China Investment Corporation

If the trade relationship improves people's well-being in China and boosts domestic consumption in the United States, national security concerns should have no place in these debates. The increase of Chinese people's personal wealth and the consumption boom that follows will benefit the world, and both parties would surely be more secure in the process, wouldn't they?

Third, technological development is a great disrupter. The theme of the new era is innovation and technological breakthrough. A sharing economy, geek economy, digital economy and the like are the new norm, and artificial intelligence, virtual reality, augmented reality, cloud computing and the internet of things are part of this new trend and will become the new normal.

These new technologies render national borders irrelevant, bit by bit. Take cloud computing and storage for example, the cloud does not belong to any single sovereign state, no matter how powerful or powerless.

These new technologies render national borders irrelevant, bit by bit

Collective efforts in technology disruption should address issues such as cybersecurity, disinformation, machine learning and reasoning, the brain-machine interface, blockchain, and so on.

These immense new tasks deserve a great deal of hard work from all human beings, not only designated nationals from the major economies. In the case of workers being replaced by AI or robotics, this is something we must all face, and we should all find solutions.

These are some of the reasons against any impulsive multilateral trade conflict. There are many more, and they all come to the same conclusion: war-war is out of the question, jaw-jaw is not so good, either. In fact, "coopetition" is the future of global trade and investment interactions.

We hold the key to the challenges in a new era.

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Reignited China-US Trade War and its Implication on Global Value Chain*

By SUMEDH DEORUKHKAR, DONG JINGYUE AND XIA LE*

Reignited trade war risk between China and the US

Fears of a trade-war between the US and China have been escalating recently as the White House announced on May 29th that it will move forward with its threat to apply an additional 25% punitive tariff rate on USD 50 billion in goods imported from China that "contain industrially significant technology". The move came on the heels of a joint statement by the US and Chinese trade delegations in which both sides agreed to put the punitive trade measures "on hold" and solve bilateral disputes via negotiation.

The capricious attitude of US administration regarding these trade issues, which might stem from deep-rooted division within President Trump's trade policy team, could intensify confrontation between the two sides in the near future. This could, in turn, cause one or both sides to launch certain punitive measures against each other.

Fortunately, China has thus far refrained from announcing any retaliation measures against the US new tariff move. At the same time, China's domestic propaganda continues to claim that it is in China's own interest to lower import tariff and further open domestic market. That being said, China still anticipates to solve the bilateral trade dispute through negotiations.

Evaluate the impact of US new punitive tariff from a perspective of global value chain

We attempt to evaluate the impact of the newly announced 25% tariff on Chinese imports of USD 50 billion from the perspective of global value chain. Indeed, deepening globalization over the past several decades has already formed a complete supply chain centering on China through which all the actions affecting Chinese exports could be quickly spilled over to other economies in the value chain.

Although Chinese enterprises have made important progress on climbing up along the global value chain, a considerable share of contents in these high-tech Chinese exports is still made outside China. For example, China is highly dependent on electronic chips produced in Japan, South Korea, Taiwan and even the US when they produce and export mobile phones and electronic home appliance to other countries.

However, the flows of goods within these global production chains are not always reflected in conventional measures of international trade. Towards this end, we use the information from the joint OECD – WTO Trade in Value-Added (TiVA) database, which decomposes the value of final goods or services into the value added by each country. By definition, "trade in value added" (TiVA) is a statistical approach that estimates the sources (by country and industry) of the value that is added in the production of goods and services for exports.

Our strategy of estimation goes in two steps. First, by applying the elasticity estimates provided by the World Bank, we estimate to what extent this 25% additional tariff will affect China's exports. Indeed, the US administration announced a list of Chinese exports (1,333 products) with a total value of around USD 50 billion on May 20th on which they threatened to

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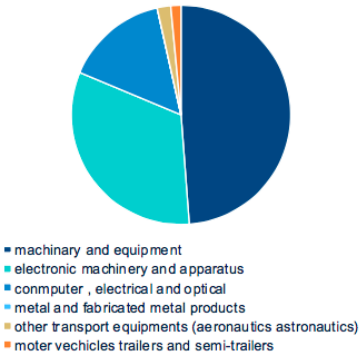
*This article appeared in BBVA Research China Economic Watch on June 6, 2017.
* Sumedh Deorukhkar, Senior Economist, BBVA. Dong Jinyue, China Economist, BBVA. Xia Le, Senior Research Fellow of IMI, Chief Economist for Asia, BBVA.

impose punitive tariff tax. But the US administration decided to put it on hold after the Chinese delegation visited the US and announced a joint statement.

After checking the details of the previous list, we expect that the new product list to be released on June 15th shouldn't make a big difference with the previous one since both of them focus on Chinese exports with high-tech contents and those related to the program of "Made in China 2025".

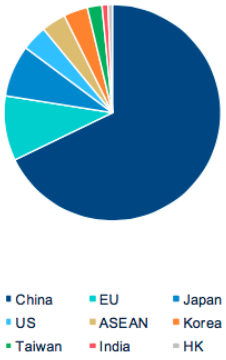
We then match these products to the HS8 categories and find their corresponding elasticity of each category from the World Bank database. As such, we estimate that an additional 25% tariff targeting on USD 50 billion Chinese imports will reduce Chinese exports to the US by USD 11.1 billion.

Figure 1 Classification of the listed China's export products



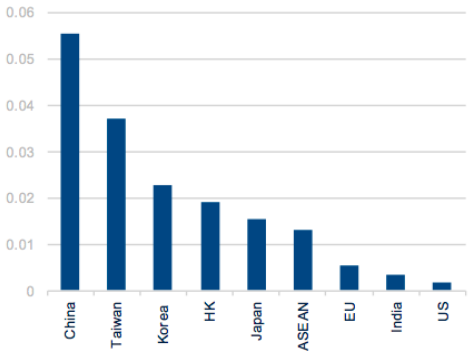
Source: BBVA Research and OECD-WTO TiVA database

Figure 2 Decomposing China's exports to the US based on value-added



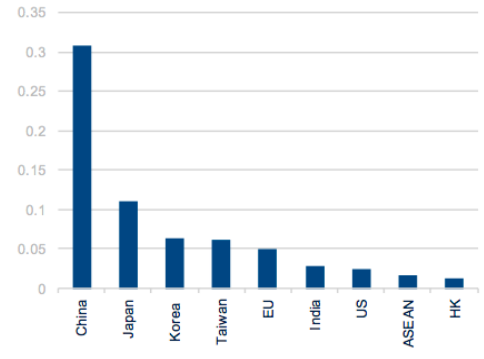
Source: BBVA Research and OECD-WTO TiVA database

Figure 3 The ratio of the affected exports to GDP of the countries on the global value chain (%)



Source: BBVA Research and OECD-WTO TiVA database

Figure 4 The ratio of affected exports to total exports of the countries on the global value chain (%)



Source: BBVA Research and OECD-WTO TiVA database

In the second step, we classified Trump's list of 1,333 products into several groups according to the classification of TiVA. We found that 48.8% of the listed products are machinery and equipment, 32.5% are electronic machinery and apparatus, 15.2% are electronic machinery and apparatus, among others. (Figure 1) Then, we calculate the percentage of each country that contributes to the final products in these categories. We finally calculated the weighted average of each country's contribution to each category of the listed final products.

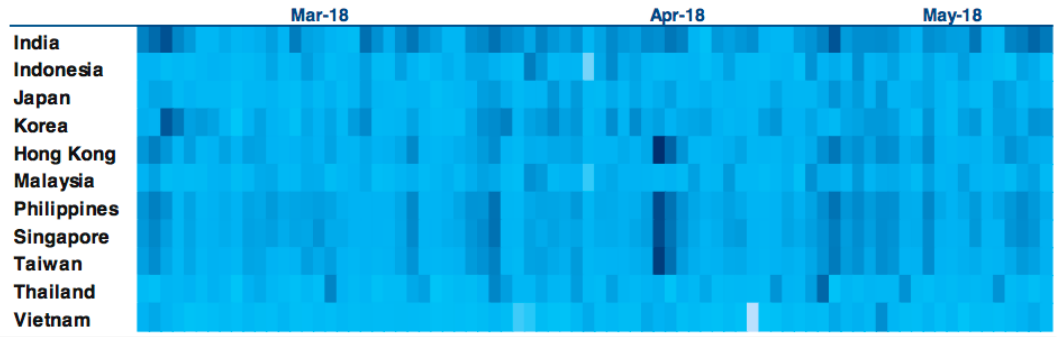
Based on our decomposition, we find that among the affected USD 11.1 billion of China's exports to the US, China actually only accounts for around 59.9% (equivalent to USD 6.65

billion) from the value-added perspective. Among the other countries in the global value chain which take around 27.7%, 8.5% (USD 0.95 billion) goes to the EU, 6.8% (USD 0.76 billion) goes to Japan, while the US itself takes around 3.4% (USD 0.37 billion). ASEAN countries and Korea account for 3.2% (USD 0.36 billion) respectively. (Figure 2)

Figure 3 and 4 further calculate the ratio of the affected exports to total exports and total GDP of these countries or regions. They show that the newly proposed punitive measure from the US side can have limited impact on China's growth and exports, even to a much less extent on other countries on the same global value chain. Relatively, a number of Asian economies including Taiwan, Korea, Hong Kong and Japan tend to have larger exposure to any shock to Chinese exports.

The limited impact of the US newly announced tariff increase also reflects on the relatively muted media sentiment across rest of Asia. In this respect, we use Big Data to gauge media sentiment in Asian economies over fears of a trade war between China and the US. Media sentiment across most Asian economies suggests that fears of a trade war have either receded or held steady at more moderate levels since their peak in mid-April (See Figure 5). Such muted reactions to reignited risks of a trade war are particularly evident in Indonesia, Japan, Malaysia, Thailand and Vietnam.

Figure 5 U.S. Media sentiment across Asian economies over fears of a trade war between China and the US



Source: BBVA Research, GDELT

A Naval Race with China Is Unnecessary and Will Likely Backfire*

By JOHN GLASER*

WASHINGTON - Policymakers increasingly perceive China's growing naval strength in Asia as an acute threat to American interests that must be met with a corresponding surge in U.S. naval power in the Pacific.

However, precisely what tangible threat a few more Chinese frigates on the other side of the planet poses to U.S. national security interests is rather difficult to identify. And exactly what objective is supposed to be achieved by boosting the U.S. Navy's presence in the region is something of a mystery.

Hawks point to Chinese territorial claims and naval activity in the South China Sea as a signal of Beijing's growing ability to undermine freedom of navigation. But capability does not equal intent. Indeed, any interruption in commercial shipping in the Pacific would be devastating for China's own economic and security interests.

China is the largest trading nation in the world and relies on the South China Sea for almost 40 percent of all its trade, valued at roughly $1.5 trillion per year. If anything, Beijing's more assertive posture suggests a determination not to close off vital sea lanes, but to keep them open.

It is notable, in addition, that the United States perceives a grave threat from China's naval expansion that China's own neighbors seem to miss.

Average defense spending as a percentage of GDP among the 11 East Asian states along China's periphery has declined by almost half over the past 30 years. Moreover, none of them have engaged in their own freedom of navigation operations to directly challenge China, despite encouragement to do so from Washington.

The Philippines had a major dispute with China over maritime and territorial claims, which led to multiple naval standoffs, but now Manila appears to be buddying up to Beijing, not balancing against it. If China's own proximate rivals don't see a major threat, why should we?

Even stipulating that Chinese naval power is a problem, one is still left to wonder what effect beefing up the U.S. Pacific Fleet is expected to have on Beijing's calculations.

Are we to believe Beijing will respond to a proliferation of U.S. warships off its shore by slashing its naval budget, decommissioning scores of ships, and eagerly forfeiting its regional ambitions?

There is a glaring logical contradiction in depicting China as a nascent peer competitor doggedly seeking to supplant America as the global juggernaut by whatever means necessary, but which will abruptly cower in response to a mild U.S. naval buildup in the Pacific Ocean.

More likely, cranking up a Sino-American naval competition will generate heightened fear and suspicion in Beijing.

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*This article appeared on Sacramento Bee on June 14, 2018.

* John Glaser is director of foreign policy studies at the Cato Institute, a leading Washington think-tank.

Combined with President Trump's threat of a trade war and his pugnacious foreign policy rhetoric, that is a recipe for inducing a more aggressive Chinese posture and locking the 21st century's two major powers into a new cold war.

The truth is that China's naval expansion threatens not so much America's security, but its prestige. China's rise is a symbolic threat to America's status as the world's sole superpower, the indispensable nation. We would be well advised to curb such pretensions.

China is most interested in continued economic growth and in gaining international status, respect, and recognition. It is far better to accommodate such benign objectives than to inflate the threat from China and ignite a bitter great power rivalry that neither country can win.

IMI International Monetary Review

War by Other Means: US Tariffs Undermine International Trade*

By DAVID SKILLING*

The tensions building between China and the US is another chapter in President Donald Trump's ill-judged trade policy. There are real issues with respect to China's trade and economic policy, but the US approach is unlikely to be effective.

Indeed, US tariffs are undermining relations with partners who would have been likely to engage on China: the European Union and Japan. The EU (among others) was given a reprieve on tariffs, but last week the Trump administration went ahead with levies on steel and aluminium from the bloc. Japan was hit by steel tariffs in March, despite Prime Minister Shinzo Abe's personal diplomacy with Trump (as was New Zealand, hardly a strategic threat to the US steel industry).

These actions are eroding the rules-based foundation of the international trading system. I have previously described the weaponisation of international trade, such as China imposing restrictions on Norwegian salmon imports, as well as South Korean tourism and companies such as Lotte, the retailer, and Hyundai, the carmaker, after bilateral political disputes.

Sanctions can be effective, although variably so. The tight economic restrictions China is imposing on North Korea are probably a significant factor in the country's change of approach. China's North Korean imports slumped to $9m in February and $12m in March, down from a monthly average of around $100m over the past few years.

But recent unilateral actions, notably by the Trump administration, take sanctions into new territory, such as those on companies linked to Russian oligarchs close to President Vladimir Putin. Companies in which Oleg Deripaska is involved were slapped with sweeping sanctions, despite limited direct exposure to the US. The share prices of Rusal, the aluminium producer, and EN+, its parent company, declined by more than 50%. Deripaska has resigned from the Rusal and EN+ boards to try and convince the US Treasury to lift the sanctions.

Trump has pulled the US out of the nuclear deal with Iran, re-imposing sanctions on the country as well as companies that do business with it. Non-US companies with US operations, or those backed by institutions with a US presence, will be greatly constrained in doing business with Iran. This is a particular problem for Europe. As the new US ambassador to Germany bluntly tweeted, 'US sanctions will target critical sectors of Iran's economy. German companies doing business in Iran should wind down operations immediately.'

Unsurprisingly perhaps, this action will have a limited effect on US companies. US goods exports to Iran were worth just $150m in the year to February, whereas the combined value of French, German and Italian exports was about $7bn. China may emerge as a winner; its exports to Iran are worth about $16bn, and it takes about 15% of Iran's oil.

Bruno Le Maire, the French finance minister, noted, 'The international reach of US sanctions makes the US the economic policeman of the planet, and that is not acceptable'. At a time when the US seems less interested in remaining the world's reserve currency issuer, these sanctions could be a new version of the 'exorbitant privilege' Valéry Giscard d'Estaing, a previous French

*This article first appeared in OMFIF Commentary on June 4, 2018.

* David Skilling, Director of the Landfall Strategy Group, a Singapore-based economic advisory firm.

finance minister, warned of in the 1960s. The centrality of the dollar in the global system gives the US options other countries don't have.

Economic sanctions are preferable to military conflict, but their unilateral application puts further pressure on an international system already stressed by protectionism and mercantilism. Large powers, particularly the US and China, are using economic instruments to advance geopolitical and strategic interests. Companies from competitor countries are being targeted outside the constraints of a rules-based structure.

This may accelerate the fragmentation of the economic system, in which China and Russia increasingly engage with each other, and Europe and the US drift apart. Some countries may weigh the costs and benefits of transacting in dollars or with US banks if that exposes them to sanctions. The behaviour of large countries may cause companies to think hard about their global footprint.

What starts with specific, targeted sanctions may lead to structural change in the functioning of the global system, and the emergence of a multipolar global economy.

IMI International Monetary Review

Global Economy

The Iranian Rial Through the Eyes of the Black-Market Premium*

By STEVE H. HANKE*

The Islamic Republic of Iran's economy suffers internal, debilitating problems. Many anti-market seeds were sown by the last Shah. These seeds have been well tended and aggressively added to by Iran's current theocratic regime. If these homemade economic problems weren't enough, Iran's foreign policy adventures have invited the imposition of economic sanctions by its foreign foes.

The combination of an inherently weak and vulnerable economy, and annoying sanctions, make for a perfect storm. This storm produces a good deal of misery.

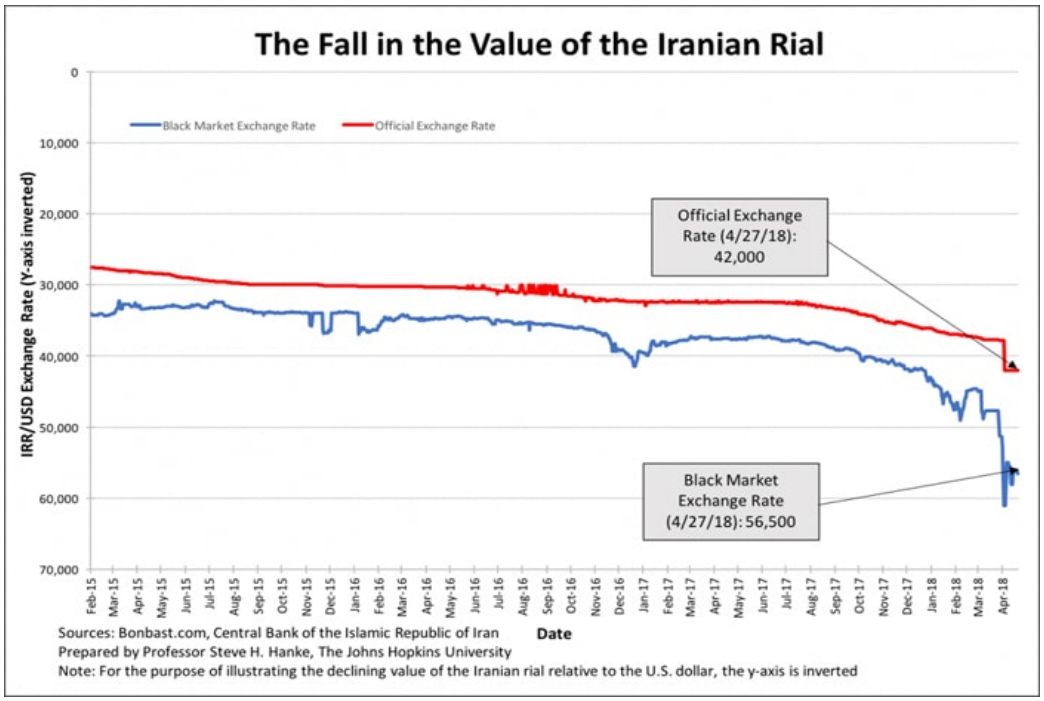
For a quick take on how miserable a country is, I construct Hanke's Annual Misery Index. My Index is the sum of the unemployment, inflation, and bank lending rates, minus the percentage change in real GDP per capita. Higher readings on the first three elements are "bad" and make people more miserable. These are offset by a "good" (GDP per capita growth), which is subtracted from the sum of the "bads." A higher Misery Index score reflects a higher level of "misery."

My 2017 Misery Index covered 98 countries. The most miserable country was Venezuela, followed by Syria, Brazil, Argentina, Egypt, Nigeria, South Africa, Bosnia and Herzegovina, Ukraine, and São Tomé and Príncipe. Then comes Iran; the 11th most miserable country in the world.

A way to take the temperature of a patient, such as Iran, on a real time basis is to observe the black-market (read: free-market) Iranian rial — U.S. dollar (IRR/USD) exchange rate. The chart below shows the course of the official and black-market IRR/USD rates.

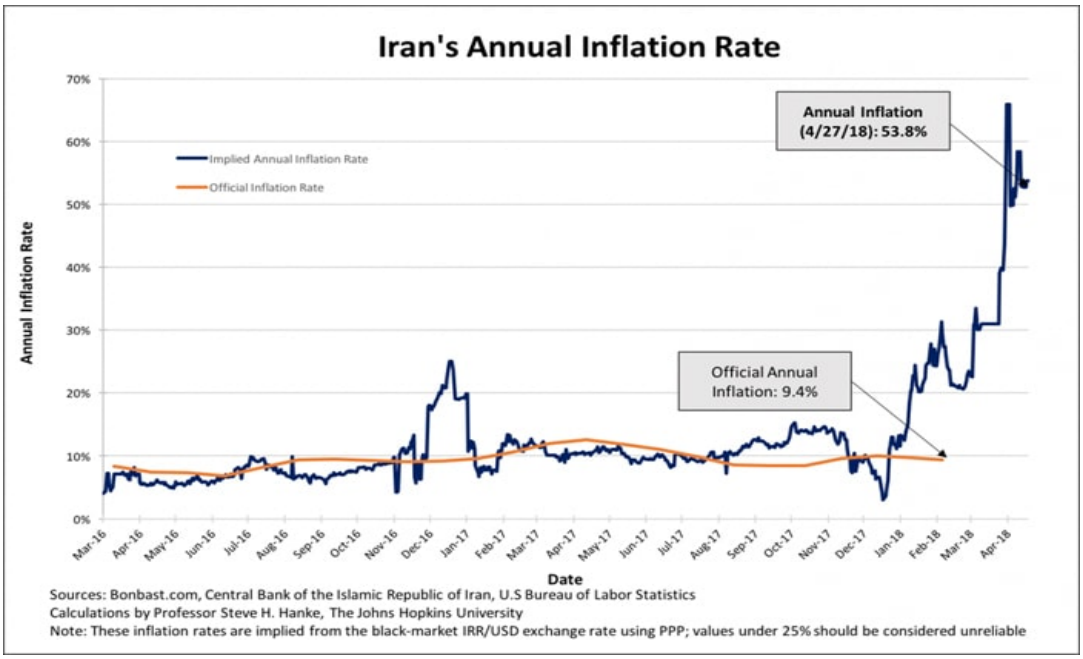
*This article appeared on Forbes.com on April 30, 2018.

* Steve H. Hanke, Member of IMI International Advisory Board, Professor of Applied Economics at the Johns Hopkins University..



The recent collapse in the value of the rial was spawned by the threat that President Trump would tear up the Joint Comprehensive Plan of Action (JCPOA) nuclear deal and lay on more primary and secondary sanctions against Iran. This sent thousands of Iranians to Tehran's Ferdowsi Street, which is populated by a beehive of exchange houses. It is there that they dumped rials for greenbacks.

By using the IRR/USD exchange rate, which represents the most important price in Iran, I estimate Iran's inflation rate. Indeed, the black-market exchange rate can be reliably transformed into accurate measurements of countrywide inflation rates. The chart below shows how Iran's implied annual inflation rate has surged to an annual rate of 53.8%, with the collapse of the rial's value against the U.S. dollar.



If we use the current annual, surging inflation rate of 53.8% to calculate a new Misery Index score, there are only two countries more miserable than Iran: Venezuela and Syria.

Another useful dimension for checking Iran's temperature on a daily (if not minute-by-minute) basis is the black-market premium. The black-market premium (BMP) is calculated by using the following formula:

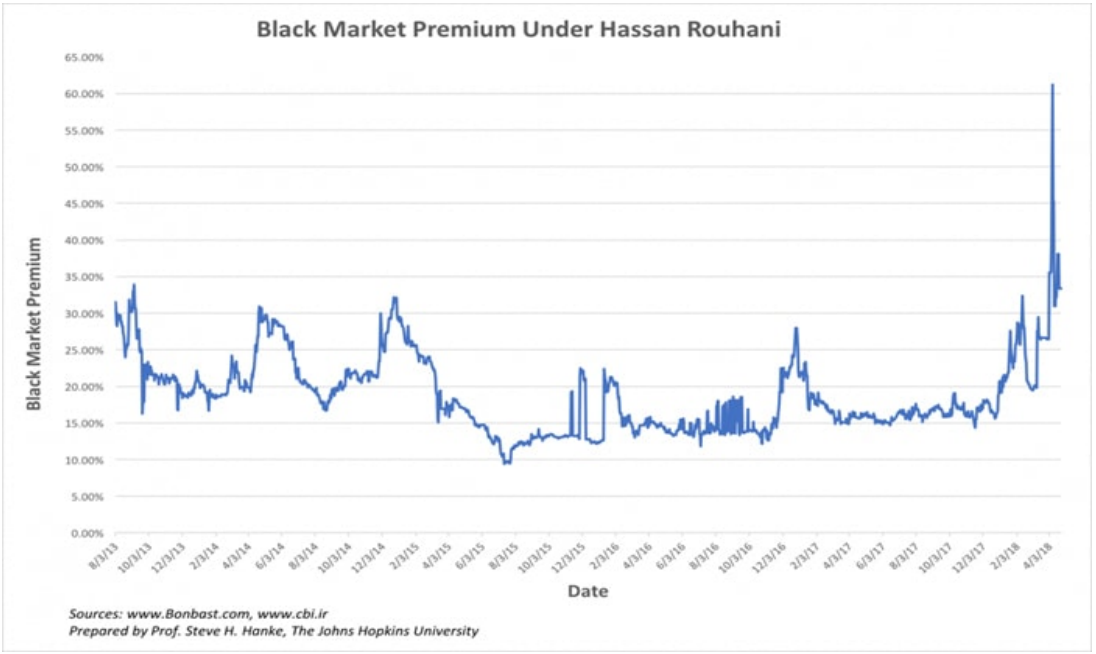
$$BMP = \frac{Black\ Market\ Exchange\ Rate - Official\ Exchange\ Rate}{Official\ Exchange\ Rate} \times 100\%$$

As of April 27, 2018, the black-market premium for Iran can be calculated as

$$\frac{56{,}500 - 42{,}000}{42{,}000} \times 100\% = 34.5\%$$

A 34.5% black-market premium indicates that Iranians were willing to pay almost 35% more for U.S. dollars in the black-market than if they were lucky enough (read: privileged enough) to obtain them at the official exchange rate.

For a fuller picture of the black-market premium, I have plotted it while President Hassan Rouhani has been in office. As we can see, the recent spikes have been associated with President Trump's attacks on the JCPOA nuclear deal, which have clearly spooked the Iranian public.



To follow how Iranians perceive both the internal and foreign zigs and zags of the state of affairs they face, there is no better, up to the minute, measure than the IRR/USD black-market premium. In short, instead of obsessing over each and every utterance of the 'talking heads,' observers should be following the black-market premium.

IMI International Monetary Review

North Korea More Stable Than Experts Say: Benefits of Kim's Underground Economy*

By STEVE H. HANKE [*]

Much ink has been spilled about how economic sanctions have crushed the North Korean economy and brought its leader Kim Jong-un to the bargaining table. Not so fast. For starters, there wasn't much to crush. And, contrary to repeated conjecture by experts in international affairs, whatever there is of a North Korean economy appears to be quite stable.

While it is difficult to obtain dependable economic figures about the Hermit Kingdom, there are reliable data on key prices that, when properly interpreted, provide insights into the performance of the economy. The most important price in any economy is the free-market exchange rate between its domestic currency and the dollar, the world's reserve currency. But is there a free market for currency in North Korea? Well, yes, there is. North Korea has an active currency black market where reliable won-dollar rates are regularly reported.

And that's not all. There's also a black market for rice, the most important staple in North Korea. Black-market rice prices are regularly reported, too. Armed with these two prices, we can lift the shroud of secrecy that covers the North Korean economy.

Before Kim assumed power in 2011, North Korea experienced severe economic problems, including hyperinflation and famine.

In 2009, the North Korean government attempted to address runaway inflation by implementing a phoney currency 'reform' programme, which it promptly bungled. The so-called reform was actually just a currency redenomination programme, which arbitrarily lopped two zeros off every won note. North Koreans were given less than two weeks to exchange all their won for new notes. And the government set limits on the quantity of won a family could exchange for new won. For those North Koreans who had saved a little bit too much, the redenomination programme was effectively a wealth tax.

Not surprisingly, Pyongyang's mishandled currency reform sparked a panic in North Korea's won black market and its underground markets for goods and services. Indeed, the value of the won against the greenback collapsed, and the price of rice skyrocketed.

With the plunge of the won, inflation surged. My studies show that a hyperinflation episode began in December 2009. It was then that the monthly inflation rate first exceeded the hyperinflation threshold of 50% per month. North Korea's hyperinflation peaked in early March 2010, when the monthly inflation rate reached 926%.

When Kim assumed power, the North Korean economy was a disaster zone. The new leader immediately pursued policies to stabilise the won, prices and the economy. Rather than attempting another disastrous currency reform, Kim followed a two-pronged monetary approach.

The North Koreans set domestic monetary policy so that the won shadowed the dollar on the black market. Won-dollar exchange rate stability became North Korea's unwritten monetary objective.

At the same time, Pyongyang allowed for the spontaneous 'dollarisation' of the economy. The renminbi and the greenback effectively became coins of the realm, replacing the won.

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*This article appeared on Forbes.com on May 2, 2018.

* Steve H. Hanke, Member of IMI International Advisory Board, Professor of Applied Economics at the Johns Hopkins University..

Furthermore, Kim looked the other way as the underground economy flourished. Indeed, he allowed large chunks of the economy to privatise themselves spontaneously.

Kim's approaches have worked much better than the press and experts in international affairs would have us believe. The won-dollar exchange rate – the most important free-market price in North Korea – has been very stable since 2012, as have rice prices. This suggests the spectre of inflation is no longer haunting North Korea.

Maybe the North Korean economy, which is largely underground, is more resilient and in better health than the press and experts assert. If so, Kim has more cards to play than the experts think.

IMI International Monetary Review

Oil Price Spike Brings Risk Back: Positive Outlook for Risk Assets Under Threat*

By SEEMA SHAH*

Oil prices have soared by about 70% since last June. At around $77 per barrel, Brent crude has been driven to its late-2014 levels. The increase was caused by a combination of greater global demand, supply cuts by the Organisation of the Petroleum Exporting Countries and geopolitical disruption, such as President Donald Trump withdrawing the US from the Iran nuclear deal.

Traditionally, if oil prices are rising on the back of strong global demand, risk assets should be supported. However, if oil price gains are caused by production constraints from geopolitical tensions – such as the US sanctions on Iran – the resulting pick-up in inflation and hit to growth will be negative for risk assets. It may be a little surprising, therefore, that the latest disruption to commodity markets has garnered minimal equity market reaction.

One convincing reason is that there are doubts that Iran's oil exports will be reduced meaningfully. Much of Iran's oil is sold to China, India and Turkey, all of which are likely to ignore US sanctions, while Germany, France, the UK and Russia have all said they will not follow the US's path. Saudi Arabia has already indicated that it will look to soften any production losses by increasing its own output, so global stock levels may not drop materially.

Another explanation is that the impact of rising oil prices on the US economy has changed in recent years. According to Bloomberg Economics, a typical rule of thumb was that each sustained $10 per barrel rise in oil prices would reduce US GDP by 0.3%. But thanks to the boom in shale oil, the US is now a significant producer and it should instead enjoy a windfall as prices rise.

The pessimist in me still sees negatives. For example, some estimates suggest the 15% rise in oil prices since the start of the year has offset around half of the boost to US growth from the corporate tax reform. If rising oil prices continue to feed into inflation expectations, the Federal Reserve may be forced to tighten policy more aggressively.

These latest developments have affected sentiment towards emerging markets negatively. Yet the higher oil price can have very different effects from country to country. Those that rely heavily on imported oil (such as India and China) will be pressured, while emerging market oil-producing nations such as Saudi Arabia, Nigeria and Colombia could be winners. The main problem for the winners is that emerging markets still tend to move together. Disruption in a commodity-importing region such as Asia threatens to drag down other emerging market regions with it.

On that basis, would I recommend shifting out of emerging markets? No. I am doubtful that oil prices will be sustained at this level. But if they do, I will be worried. I consider rising oil prices to be the most significant tail risk to the global economy and, as a result, to the positive outlook for risk assets in 2018.

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*This article first appeared on the Short and Sharp blog on June 15, 2018.

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China

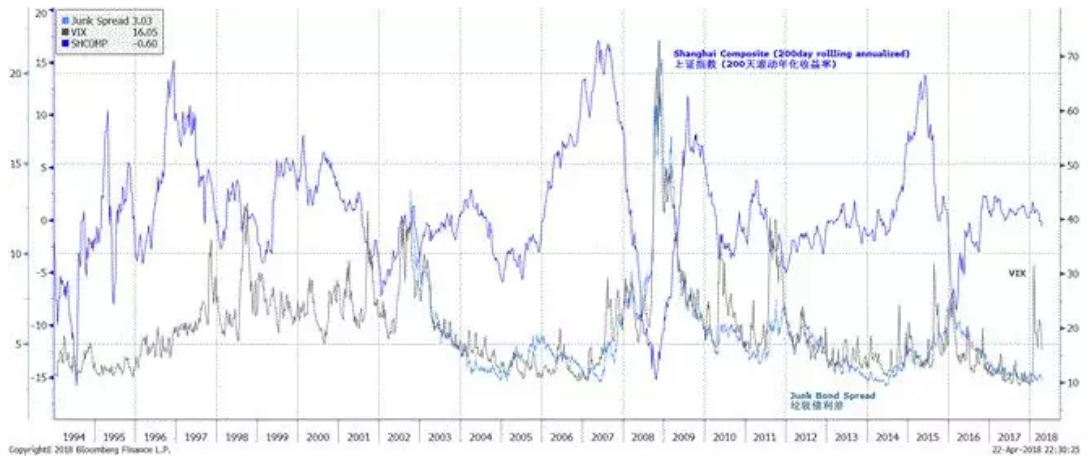
Great Powers Collide*

By HONG HAO*

The cost of free trade; trade tension escalates; USD breaking down. In the Ricardian world of comparative advantage, a country will gain from trading by producing goods at a lower relative autarky price, even if it is more efficient in producing every single good than the other countries that it is trading with. The past two decades of hyper-globalization seem to have vindicated Ricardo's most powerful yet counter-intuitive theory. Only one issue remains – China is different, with a vast pool of labor that is willing to work harder for less.

An induction of such a significant player into the global trade system has gradually eroded the US's comparative advantage in manufacturing sectors. It is not equivalent to a small country with limited labor resources that will be quickly exhausted and then the disruption to the system would stop. But the free traders are content with lower consumer costs, as well lower interest rates as a result of globalization to brood rolling asset bubbles – all at the loss of millions US manufacturing jobs. These workers are the cost of free trade. With limited scope of skill upgrade, these jobs may have been permanently lost.

Chart 1: Shanghai Composite vs. VIX and junk bond spread; volatility sets to rise further.



Meanwhile, China's is working towards the goal of autarky, especially in the top echelon of global supply chain, and is developing naval prowess that could one day threaten the global trade system that is architected by the US, with the US navy as the security guarantor. Now that WTO covers more than 90% of global trade, the US can no longer use rapid inclusion of certain country as the bargaining chip, as it did in the 1950s to South Korea and to Poland in the 1960s.

*This article appeared in the author's WeChat public account (ID: Honghaochinastrategy) on April 24, 2018.

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

As such, the trade disputes are increasingly bilateral and acrimonious, as Trump's White House emphasizes "reciprocity" in its tenets of trade policy. It has slapped on steel tariff and then allowed exemptions to quickly align Europe, Japan, South Korea, India and Australia with the US camp. And the remaining common interests between Russia and China render the situation an increasingly uncanny feeling of the Cold War. China and Russia both voted against military action in Syria, for instance.

Despite some soul searching after the fall of ZTE, one of China's bids towards global high-tech leadership, the market price actions seem to be implying some tic-for-tac retaliations in the coming months. In **Chart 1**, we have shown the almost perfect inverse correlation between the Shanghai Composite, the VIX and the junk bond spread. We previously documented this peculiar relationship in our note titled "*The Great China Bubble: Anniversary Lessons and Outlook*" (20160613). The burst of China's stock market bubble in June 2015 ("*The Great China Bubble: Lessons from 800 Years of History*" 20150616) foreshadowed the surge in global market volatility from June 2016, induced by Brexit and later by the surprising outcome of the US election.

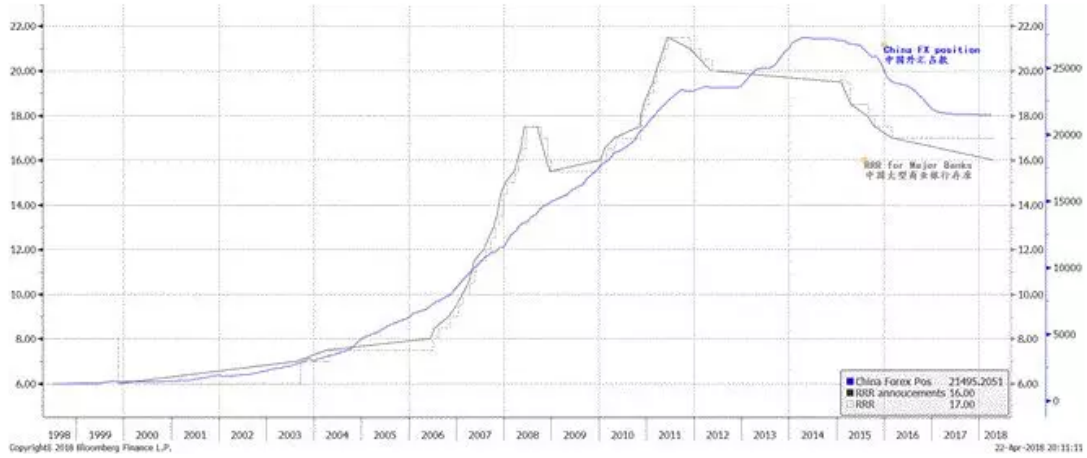
With the potential escalation of the trade disputes, the market is now rightly concerned about the dollar. The trade disputes threaten to undo the benefits from the Trump tax cut, and undermine the durability in the economy recovery. Already, leading economic indicators globally are rolling over. In history, the dollar has been highly correlated with the US fiscal deficit. When the deficit worsened, the dollar tended to weaken – as it is now (**Chart 2**). As such, a weak dollar is a sign of fundamental weakness, rather than an indication of abundant liquidity.

Chart 2: US fiscal deficit is worsening, and the dollar is breaking down.

China cutting RRR to counter the fall in FX funds position and the trade war; but rotation from stocks to bonds continues. In a relatively surprising move, the PBoC cut RRR, while maintaining that its monetary stance is prudent and neutral. The stock market's enthusiasm about the cut quickly faded, while bond yield plunged.

We note that China's funds outstanding for FX has been falling since 2014, and thus the way the PBoC creates money has gradually changed away from forex recycling. As such, holding a very high reserve requirement by commercial banks is no longer required (**Chart 3**). Any further RRR cut should not be interpreted as the PBoC loosening its monetary policy, especially at a time when the risk of property bubble is still elevated, and real interest rate is still not high.

Chart 3: The PBoC cut RRR in response to falling funds outstanding for FX.



Since late January this year, China's long bond yield has been plunging, while stocks have cheapened. Even so, stocks, especially large cap blue chips that had rallied hard in the past two years, are still expensive relative to bonds, as suggested by our EYBY model. Incidentally, the A50 large-cap index has been the worst performing major index this year. Long bond yield, as well as the relative valuation comparison between bonds and stocks, tends to move in protracted trends, as history suggests. For now, with a slowing economy and limited inflation pressure, it is likely that such trends of falling long bond yields and falling stock prices will persist – till the trends exhaust.

Recently, we observe that off-balance sheet items are gradually being brought back onto balance sheet, as evidenced by the narrowing growth gap between M2 broad money supply and credit. However, demand for loans remains weak, probably as a result of a slowing economy. Consequently, money is flowing into bonds rather than stocks. (in our previous reports titled "*Outlook 2018: View from the Peak*" on 20171206, and "*The Year of the Dog: Lessons from 2017*" on 20180131, we have discussed the likelihood of such investment style rotation in mid 1Q2018). The plunge in long bond yield has been as dramatic as its surge in the last quarter of 2017.

Chart 4: Our EYBY model suggests funds continue to rotate from stocks to bonds.

IMI International Monetary Review

China Plays the Long Chess Game: Beijing Will Adopt Measured Response Against US Tariffs*

By GARY SMITH*

There has been speculation that the trade dispute between the US and China could prompt Beijing to sell down its holdings of US Treasury debt. While Chinese leaders clearly feel compelled to retaliate against Washington's recently imposed tariffs, it is unlikely that foreign exchange reserves would be used for this purpose. Progress on some of the West's legitimate complaints about China's trade practices seems remote, but so does any Chinese response that might trigger a fully-fledged financial crisis.

Chinese officials will weigh some difficult issues as they shape their strategy. Textbooks would suggest that selling dollar-denominated assets would put downward pressure on the dollar. It is doubtful that this is an outcome China would want against the backdrop of a trade dispute that, in a wider sense, would threaten its own export performance. However, the situation might be more nuanced than it first appears. Currency movements do not always conform to theory. If retaliation were intended to trigger a US financial crisis, the experience of the 2008 crisis might be worth heeding.

A decade ago, as the US housing crisis morphed into a global crisis, the dollar benefited from a 'flight to quality'. This perverse outcome was a consequence of dollar hegemony in the financing of international trade.

Beijing began the process of establishing its own currency in the global trading network partly to ensure that China would be in a stronger position in a future crisis. Any Chinese reaction that risks triggering a flight to quality onto the dollar, and which boosts dollar hegemony, would be inconsistent with the decade-long policy of internationalising the renminbi.

Moreover, there is nothing to stop the Fed from simply mopping up any Chinese sales of US debt. China, even if it were inclined to embark on a financial market skirmish, might be wise to avoid one that US authorities could neuter with minimal effort. Moreover, in 2015-16, China liquidated around $1tn in foreign exchange reserves, of which around two-thirds were probably denominated in dollars. During that period, US bond yields actually declined.

For China, the benefits of maintaining a large and stable position in US debt instruments might be more useful than weathering the consequences of liquidating that position. In fact, doing nothing might be a winning strategy. China has been adept at filling the vacated moral high ground in international relations since the election of President Trump.

China has been keen to position itself as a defender of free trade at a time when the US is moving towards protectionism. This would also enhance China's international standing but would be consistent with the objectives of the Belt and Road initiative, which may help establish a China-centric trade network and further boost international usage of the renminbi.

The Chinese response to US tariffs will probably focus on trade and investment, including tariffs against US imports and further restrictions on US investment in China. A measured

*This article first appeared in OMFIF Commentary on May 8, 2018.
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response may encourage other nations to tone down their concerns about Chinese trade subsidies or poor protection of intellectual property.

In terms of foreign exchange reserves, the views of Fan Gang, a member of the People's Bank of China and adviser to the State Administration of Foreign Exchange, a subsidiary of the central bank, are relevant. He has said that China should not buy more US debt but should instead buy real assets. From the Chinese perspective, this could be a good time to exhibit patience and skill in playing the long chess game.

IMI International Monetary Review

China's Financial Liberalization: Time to Restart*

By DONG JINYUE AND XIA LE*

Long halted financial liberalization picks up momentum on multiple fronts

The process of China's financial liberalization ground to a halt in 2015-2017 after experiencing a cluster of episodes of financial turmoil, which includes the unexpected RMB devaluation of August 2015, two rounds of stock market crash in June 2015 and January 2016, two rounds of interbank market cash crunch in April 2016 and December 2016 etc.

The incidents caused violent volatilities in the FX, equity or bond market and substantially dampened investors' confidence in the financial stability of the world's second largest economy. As a result, the authorities had to halt the progress of financial liberalization and shift their policy priority to maintaining financial stability. In some areas, the authorities even rolled back some reforms in a bid to curb systemic risks. For example, in the face of persistent weakness in the RMB, the authorities increased their interventions into the FX market and reinstalled many restrictions under the capital account in the aftermath of the RMB devaluation in August 2015.

After a few years of adjustment, the authorities now seem to be ready to press ahead with their agenda of financial liberalization again. Moreover, the authorities' renewed interest in financial liberalization is broad-based. New liberalizing initiatives cover several areas including interest rate liberalization, exchange rate flexibility, capital account convertibility, domestic financial market opening etc.

A confluence of factors determines that the authorities reinvigorate their liberalizing agenda for the financial sector at such a juncture:

First of all, a new regulatory framework has been wrought out in China to address the long-standing problem of the lack of coordination among different regulators and the central bank. In particular, the authorities combined the previously separated regulators of banking and insurance industries. More importantly, the authorities have equipped the central bank with the real power to take lead in regulating all financial institutions;

Second, China's rebounded growth in 2017, synchronized with other major economies, has effectively strengthened investors' confidence and stabilized the countries' Balance of Payment (BOP), which, together with the new regulatory framework, has made the authorities believe it's time to push forward liberalizing reforms again. Above all, the authorities are well aware of the point that structural reforms in the financial sector are the best solution to systemic risks;

Last but not least, some increasing pressure from the external environment also prompted the authorities to make new moves on the front of financial liberalization, chief among which is the escalating trade tension between China and the US. Given the importance of the export sector to China's economy, the country's authorities are willing to voluntarily open domestic financial market in exchange for the US's concession on trade issues. Over the medium term, after successful adding the RMB into the SDR currency basket in 2016, China's authorities have strong incentives to maintain and even promote its currency's position in the SDR and the global monetary system. As such, it is imperative for China to continue to advance financial liberalization before the IMF's next periodical review of the SDR scheduled at 2021.

Interest rate liberalization completed

*This article first appeared in BBVA Research on May 17, 2018.

*Dong Jinyue, China Economist,BBVA. Xia Le, Senior Research Fellow of IMI, Chief Economist for Asia, BBVA.

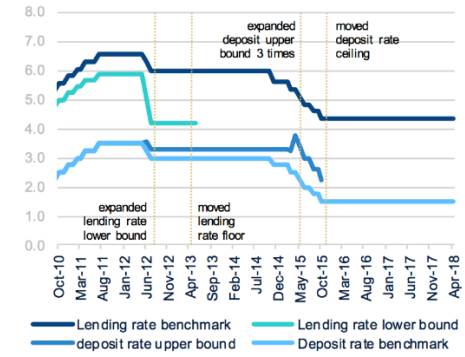
China nominally wrapped up its decades-long process of interest rate liberalization in October 2015 as the People's Bank of China (PBoC) announced the lift-off of deposit rate caps and gave banks full liberty of determining interest rates they offer to their borrowers and depositors. However, the central bank and other regulators kept the benchmark deposit rates and influence banks' rates through window guidance even after the lift of official rate cap. Afterwards deposit rates offered by banks were reportedly set no higher than 1.5 times of the benchmark deposit rates in general. (Chart 1)

In April 2018, the PBoC decided to shelve its window guidance for banks' deposit rates, allowing banks to offer deposit rates to their clients on a business basis. It marks the real completion of interest rate liberalization in China.

Meanwhile, the PBoC started to construct a new monetary policy framework- the corridor system- to replace the old policy framework featuring the adjustments of banks' benchmark lending and deposit rates. Under such a "corridor system", the movement of new policy rate target which is the pledged 7-day interbank market rate (DR007) will be confined to a specific range. In particular, the upper bound of the "corridor" are the interest rates of Standing Lending Facility (SLF) with the tenors of overnight, 7-day and 1-month, which are charged by the PBoC on short- term liquidity borrowing of qualified commercial banks. In addition to the SLF, the central bank has other liquidity injection tools with longer tenors of 3-month, 6-month and 1-year, namely the Medium-term Lending Facility (MLF). At the lower bound of the "corridor" is the interest rate which the central bank pays on banks' excessive reserves.

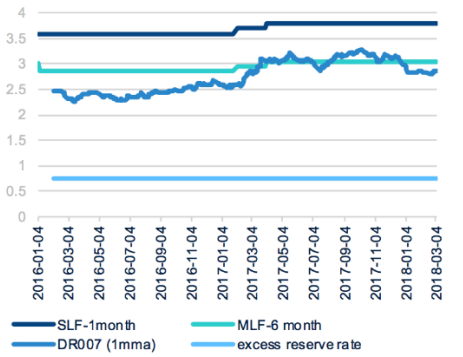
As such, banks can withdraw liquidity from the money market at the lower bound of the "corridor" when the money market interest rate falls below this level. The central bank will frequently conduct open market operation (OMO) to align the policy rate target with policymakers' desired level. Currently the main policy tools of OMO include 7-day, 14-day and 28-day repo (and reverse repo), which function to withdraw (or inject) liquidity from (into) the money market. (Chart 2)

Chart 1 China wrapped up its decades-long process of interest rate liberalization in October 2015 (%)



Source: BBVA Research and CEIC

Chart 2 The newly established monetary policy "corridor system" after interest rate liberalization (%)



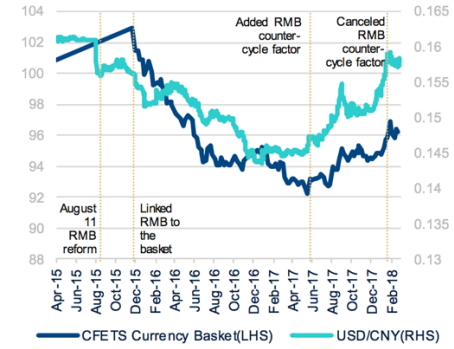
Source: BBVA Research and CEIC

RMB exchange rate reform: still missing the final jump

RMB exchange rate liberalization has been suspended for quite a while after a failed RMB exchange rate reform in August 11, 2015. Originally, the authorities planned to push forward RMB exchange rate marketization by allowing the next day's RMB fixing price equal to the previous day's closing price. However, the authorities did not expect the over-reaction of the financial market to the reform, which eventually led to a sharp RMB depreciation and a large-scale of FX market turmoil which spill-over to domestic stock market and other countries' stock and FX markets etc.

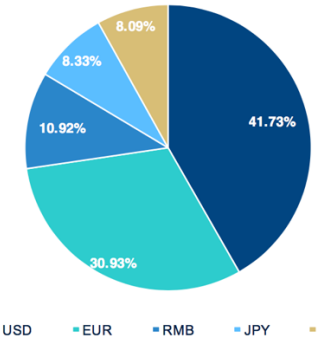
In front of the financial turmoil after August 2015, the authorities adopted a series of measures to stabilize the market and rebuild global investors' confidence on RMB exchange rate. After some market intervention to stabilize the dipping RMB exchange rate, the authorities re-linked RMB exchange rate to the RMB basket at end-2015. In addition, the authorities also introduced counter-cycle factors into the RMB pricing scheme in mid-2017, in a bid to further stabilize the RMB exchange rate.

Chart 3 The authorities' actions after the failed August 2015 RMB exchange rate reform



Source: BBVA Research and Bloomberg

Chart 4 RMB's inclusion in the IMF SDR



Source: BBVA Research and CEIC

After China's economy successfully engineered a recovery in 2017, the pressure on currency depreciation has largely alleviated if not evaporated entirely. The authorities have accordingly reduced their intervention in the FX market. The PBoC has recently stated that it hasn't intervened into the exchange rate for more than a year.

Although it's hard to prove the validity of the PBoC's statement, the central bank took out the counter-cycle factors in determining its daily mid-price of the RMB in early 2018. (Chart 3) The liberalization of the exchange rate seems to be back on the authorities' agenda.

We forecast that the final stage of the exchange rate liberalization will be the "Clean Float", which is likely to happen after China's domestic financial system completes its deleveraging and regains its healthiness. That being said, the authorities could allow the exchange rate to float before 2020. (Chart 4) In this respect, the IMF's next periodical review of the SDR, which is scheduled at 2021, will give China's authorities more incentive to make the final jump before it.

Capital account liberalization: more programs on the way

Capital account opening also achieved some new development. Regarding the stock market opening-up, thanks to the joint efforts of China and the UK, preparatory work for Shanghai-London Stock Connect is proceeding as desired, which will be launched this year. To further improve the stock market connectivity of the Chinese mainland and Hong Kong, the PBoC will increase the daily quota by three times from May 1, after which the daily quota for Shanghai-bound and Shenzhen-bound investment will be increased from RMB 13 billion to RMB 52 billion, while that for Hong Kong-bound investment from RMB 10.5 billion to RMB 42 billion.

The expansion of the daily limit in connected programs particularly caters to the demand of the Chinese A-share inclusion by MSCI, a global provider of research-based indexes and analytics announced that it will include 234 China A Large Cap shares in the MSCI Emerging Markets Index from June 1st 2018. It is expected to bring additional capital inflows to Chinese A

share market equivalent to around RMB 100bn in 2018 after many international passive investors are tracking MSCI index.

Together with the expansion of stock connect programs, the authorities have also increased the quota for Qualified Foreign Institutional Investors (QFII) Qualified Domestic Institutional Investors (QDII) and Renminbi Qualified Foreign Institutional Investors (RQFII). For instance, till end-2017, there have been 18 countries or regions received the RQFII quota, with the total amount of RMB 1.74 trillion, RMB 76.6 billion increasing from the year of 2016. In particular, both QFII and RQFII have been an important channel for overseas investors to invest in the Mainland financial markets while QDII the other way round. With the expansion of the quota of these schemes, it indicates the authorities' strategy of gradual opening capital account with cautions, which prompts the progress of financial liberalization.

In addition, China's financial center Shanghai has resumed an outbound investment scheme, called Qualified Domestic Limited Partnership (QDLP) after a two-year hiatus, granting licenses to about a dozen global money managers. It signals that the authorities are less worried about capital outflows amid an appreciating RMB exchange rate. Foreign fund managers with newly awarded quotas will be able to raise money in China for investment overseas under the QDLP plan for the first time since late 2015.This quota-based scheme was unofficially suspended when China tightened capital controls amid turmoil in its stock and currency markets since 2015. In April 2018, the State Administration of Foreign Exchange boosted the QDLP and Qualified Domestic Investment Enterprise (QDIE) trial programs in the two cities to $5 billion each. SAFE raised the quota from $2 billion for the QDLP program in Shanghai and $2.5 billion for QDIE in Shenzhen. These moves indicate that Chinese authorities have stepped up efforts to grow the two-way flow of both inbound and outbound investments in their on-going effort to further liberalize China's financial markets and open up China's capital account.

It is noted that all these above programs relating to capital account liberalization have certain quotas or limits so that the authorities can better deal with potential stress scenarios. Moreover, the authorities seem to be aggressive in pushing for the programs which are able to bring new capital inflows such as QFII, RQFII while remain very cautious about the ones that could lead to capital outflows. That being said, the authorities have taking a measured approach in reopening its capital account so as to avert the repeat of financial turmoil seen in 2015-2016.

Further opening-up of financial sector

Amid the pressure from the US trade war threat, President Xi Jinping in his speech at the 17th Boao Forum, announced plans to further open China's economy. Correspondingly, the newly appointed PBoC governor Yi Gang promulgated the details and timetable of the opening-up policies in financial sector in the Boao Forum for Asia in April 2018.

The following measures will be implemented in the following several months of this year:

· Remove the foreign ownership cap for banks and asset management companies, treating domestic and foreign capital equally; allow foreign banks to set up branches and subsidiaries at the same time.

· Lift the foreign ownership cap to 51% for securities companies, fund managers, futures companies, and life insurers, and remove the cap in three years.

· No longer require joint-funded securities companies to have at least one local securities company as a shareholder.

· Allow eligible foreign investors to provide insurance agent and loss adjuster services in China.

· Lift restrictions on the business scope of foreign-invested insurance brokerage companies, treating them as equals of domestic companies.

In addition, the PBoC will roll out the following measures within this year:

· Encourage foreign ownership in trust, financial leasing, auto finance, currency brokerage and consumer finance.

· Apply no cap to foreign ownership in financial asset investment companies and wealth management companies newly established by commercial banks.

· Substantially expand the business scope of foreign banks.

· Remove restrictions on the business scope of jointly-funded securities companies, treating domestic and foreign institutions equally.

· Foreign insurance companies will no longer need to have a representative office in China for two consecutive years prior to establishing a fully-owned institution.

Although the official list of reforms is quite long, covering items ranging from relaxing foreign ownership in financial institutions to substantially expanding the business scope of foreign banks, most of the reforms had already been announced during President Trump's visit to China last November or were scheduled to have been fulfilled after China's entry to the World Trade Organization (WTO) in 2001. That means, amid the pressure from the US, China determined to honor promises step by step to liberalize its financial sector. As described by Yi Gang, China's new central banker, it is "a prudent, cautious, gradualist move" for the financial sector opening-up reform.

Actually, right after the announcement of the above financial sector opening-up policies, some foreign investment banks have already applied the license of operation in the mainland China. Meanwhile, some other previously announced financial sector opening-up measures have been implemented smoothly. For instance, the authorities have lifted market access limit for bank card clearing institutions and non-bank payment institutions, eased restrictions on rating services provided by foreign financial service companies, and granted national treatment to foreign credit information companies.

Is this time different?

Although the restart of China's financial liberalization has sent an encouraging signal, the market still held the concern about whether the new momentum is sustainable enough. To a certain extent, such questions make sense because China has repeatedly promised financial opening and reforms over the last decade but the real progress has thus far been limited. Some people even question that the Chinese authorities have no real intention to push forward real reforms but want to pay lip service this time.

We have a more optimistic view in this respect. This time could be different because both external pressure and domestic need will force the authorities to advance financial liberalization and make the real breakthroughs. After witnessing several episodes of financial turmoil during 2015-2016, the authorities are well aware that structural reforms in the financial sector are the best solution to systemic risks in the long run. For example, only a market- determined interest rate could allure people to withdraw money from the shadow banking activities and redeposit them into the formal banking sector. Moreover, a flexible exchange rate will enhance rather than weaken the country's capacity to absorb unexpected external shocks. Of course all these reforms need to proceed with a measured approach.

Meanwhile, the authorities have also felt the urgency to honor their promise to the WTO and open China's financial market so as to create a benign external environment. Although the US is now waving a stick of "trade war" at the front, other advanced economies also have a lot of complaints against China's delayed process of opening its domestic financial market. From a strategic perspective, it is in China's own interest to accelerate financial market opening to win over more friends in defense of the US attack to the country's export sector.

Nevertheless, some domestic and external factors could also exert adverse impact on the momentum in financial liberalization and even slow its progress. Now China is pushing forward a campaign of financial deleveraging with the aim to reduce debt level of both financial and corporate sectors. If the deleveraging process goes smoothly, financial liberalization could accelerate as well. In contrast, if the deleveraging led to the escalation of domestic risks for the short run, the authorities will likely slow down the process of financial liberalization for stability consideration.

The trade war risk with the US also has its sophisticated impact on financial liberalization process. Although the threat of trade war can give the authorities more incentives to maintain the momentum of financial liberalization, a full-blown trade war, albeit not in our base scenario, will adversely affect China's economy and elevate domestic financial risks. In that case, the authorities might sacrifice financial liberalization again to maintain the stability of domestic financial sector.

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Managing China's Global Risks*

By ANDREW SHENG AND XIAO GENG*

In addition to structural and cyclical risks, China must address the "gray rhino" (highly likely, but often ignored) strategic risks arising from the intensifying Sino-American geopolitical rivalry. Here, the emerging trade war is just the tip of the iceberg.

HONG KONG – The world economy and international system are now characterized not only by deep interconnectedness, but also by intensifying geopolitical rivalries. For China, the situation is complicated further by US President Donald Trump's evident view of the country as a strategic competitor, rather than a strategic partner, not to mention massive domestic social change and rapid technological disruption. The only way to mitigate the risks that China faces is with a tough, continuous, and comprehensive reform strategy.

A key risk is financial. At least four "mismatches" lay at the root of past global financial crises, and three of them plague China today. First, with its bank-dominated financial system, China (along with Europe and many emerging economies) suffers from a maturity mismatch, owing to short-term borrowing and long-term lending. Yet, unlike many emerging economies, China does not struggle with a currency mismatch, thanks to its large foreign-exchange reserves and persistent current-account surpluses, which make it a net lender to the rest of the world.

But China has not avoided the third mismatch, between debt and equity: The credit-to-GDP ratio doubled over the last decade, from about 110% in 2008 to 220% in 2017, highlighting China's under-developed long-term capital and equity markets. Nor can policymakers afford to ignore the fourth mismatch – between ultra-low nominal interest rates and the relatively higher risk-adjusted return on equity (ROE) for investors – which has contributed to speculative investment and widening wealth and income inequality.

These structural risks are largely a result of China's transformation from an agriculture-led economy to one driven by manufacturing exports. As technology continues to progress, with robotization becoming more accessible, companies that once relied on cheap labor and manufacturing exports increasingly need to produce goods and services closer to domestic consumers in open and globally competitive markets.

In this context, China's only option is to abandon its low-cost manufacturing export model and move up global supply chains. To that end, the government has already introduced industrial strategies – "Made in China 2025" and "Internet Plus" – to support technological development, adoption, and innovation. The US, however, has taken these industrial policies as evidence of mercantilist state intervention that justifies punitive trade tariffs and other sanctions.

Complicating matters further for China, the rush to create an open, market-oriented economy has fueled corruption and rent-seeking. And, as recent European post-crisis experience has shown, it is politically very difficult to carry out structural reforms when vested interests have captured the regulatory system. That is why Chinese President Xi Jinping has been engaged in a comprehensive anti-corruption campaign – often misrepresented as a power grab – since assuming office in 2012.

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Yet China's problems extend beyond structural imbalances to two types of cyclical macroeconomic risks. The first risk stems from the business cycles in advanced, market-based economies, where interest rates, inflation rates, and growth rates rise and fall together.

The second type of risk reflects the cycle experienced in underdeveloped, non-market-based economies as they make the transition to a market-oriented economy. In this fast-moving cycle, housing and fixed-asset prices (as well as the currency's value) will increase faster than productivity growth in the tradable sector, owing to supply constraints. As households and investors borrow cheaply to invest in rapidly appreciating housing and fixed assets, bubbles form and then burst, spurring crises. Yet, because the usual response – socialization of bank losses, with a privileged few keeping the profits and bonuses they accrued while the bubble was growing – creates moral hazard, the cycle is likely to be repeated.

Abandoning the distorted and imbalanced incentive structure, and ensuring that both creditors and debtors share and manage risks, would help break the cycle. China could create a system in which broad equity stakes – held by pension, social security, or sovereign wealth funds – are professionally managed, thereby guaranteeing not only that the long-term risk-adjusted ROE is higher than the real (inflation-adjusted) GDP growth rate and the nominal interest rate, but also that the gains are shared widely among the population.

A widely shared positive real ROE would mean less financial repression and a fairer income and wealth distribution. Meanwhile, with more skin in the game, venture capital would be more accountable to investors and savers.

In addition to structural and cyclical risks, China must address the "gray rhino" (highly likely, but often ignored) strategic risks arising from the intensifying Sino-American geopolitical rivalry. Here, the emerging trade war is just the tip of the iceberg. The US and China are set to become immersed in a long-term competition for technological and strategic supremacy. To stay ahead, they will use every kind of leverage and instrument at their disposal. If this competition is left unchecked, it will surely have far-reaching spillover effects.

Risks are normally mitigated through avoidance, hedging, insurance, and diversification. But the Chinese and US economies are both too big and too interconnected to fail, making avoidance and hedging far too dangerous and costly. Insurance would also be impossible, owing to the lack of markets. Diversification may work, if both countries pursue a variety of low-cost, high-return, cooperative win-win options. These include technological innovation that addresses social problems and promotes inclusive growth; further market opening; tough measures against rent-seeking speculators and interest groups; and tax reforms to improve income and wealth distribution.

The fact that trade negotiations are being pursued in tandem with talks over North Korea's nuclear program suggests that China and the US understand that, in today's interconnected global system, cooperation is necessary for managing multiple global risks. But if China is truly to build a balanced, resilient, and anti-fragile real economy and financial system, it will need to go further, developing a comprehensive set of risk-sharing mechanisms. It is a task that can no longer be ignored or postponed.

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Signaling Western Rejection: Marx in China After 200 Years*

By HERBERT POENISCH*

China is marking the 200th anniversary of Karl Marx's birth not only by sending a statue to his hometown of Trier in Germany but also by reminding the people of the economist's work. However, over the past 40 years China has deviated from some of his guiding principles. The country has gone very far down the capitalist road, creating one of the highest levels of income and wealth inequality.

President Xi Jinping and his Communist party have stressed China's particular application of Marxism. But while the banner of Marxism flies high over China, it is perhaps flying too high for ordinary people to read the details. This is why the Communist party is organising study sessions of Marxist principles not only for party cadres, but also for university students and the population at large.

On these occasions, such as the National Financial Work Conference in July 2017, President Xi himself has spelt out Marxist principles in detail. He reminded attendees that finance should serve the real economy rather than itself. This is pure Marxist theory, which states that capitalist economies have subverted the relationship between money and the real economy. Money should function as a servant of the real economy, leading to higher growth. In capitalist economies this relationship is the other way around: growth serves to generate profits.

Emphasising the Communist manifesto, which is rather long on ambition (overthrowing the capitalist mode of production) and rather short on what a communist society is supposed to look like, serves the purposes of the Chinese Communist party. It focuses on the rejection of western ideas, such as pluralism, liberalism and democracy, in favour of guidance by the party, now that party and state have been welded together.

In Chinese philosophy, the School of Names warns that one should not judge a phenomenon by its name but focus on its contents. So it's more appropriate to see the country's guiding principle as the continuity of Chinese civilisation rather than the relatively recent (and foreign) ideology of Marxism. Chinese leaders select those elements of Marxism that echo traditional values and oppose western influence. They offer the Chinese a way to development characterised by subordination to the strategy mapped out by enlightened leaders, carried forward through social harmony. Putting a president in charge of this long-term goal by removing the term limit of the office serves this purpose.

According to this doctrine, a harmonious society, once it has overcome the struggle between competing interests, can advance material well-being for all. This contrasts with western experience and those emerging market economies where never-ending class struggle is supposed to generate progress.

This approach has important implications for China's economic development. Individual interests will be subordinated to guiding principles mapped out by the Communist party. The party decides how to interpret Marx regarding ownership of the means of production, the distribution of income, the power of the trade unions and the role of finance. Foreigners will be allowed to participate, subordinated to the will of the people.

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The revival of Marxism with Chinese characteristics entrenches the leading role of the present 'Marxist dynasty' and signals clear rejection of western values. This is crucial for the survival of the party, as well as the stability of Chinese leadership. And it underpins, too, China's increasingly assertive role on the world stage.

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From Capital Outflows to Capital Inflows in China: Role of Banks and Issuers of Debt Securities

By HERBERT POENISCH*

The years 2016 and 2017 have seen a dramatic reversal in the China's recent pattern of capital flows, from outflows to inflows. According to recent BIS statistics, both banks resident in China as well as Chinese nationals as borrowers in the international debt securities markets have been the main movers of the changing tide. The other one was a sharp decline in outward FDI.

This article will outline the broad trends as well as the breakdown into sectors, instruments and currencies. This will be followed by an attempt to explain the reasons behind this change in direction. Was it market driven or by guidance from the authorities? Finally, what does this mean for the internationalisation of RMB and China playing a bigger role in international finance?

1. The cross border banking business

The BIS and SAFE publish the cross border business of banks resident in China, including the Chinese Policy Banks and subsidiaries of foreign banks. This corresponds to the balance of payments, section other investments. It can be assumed that most cross border business is carried out by Chinese owned banks rather than by subsidiaries of foreign banks.

The total assets, expressed in USD increased from USD 931bn in 1Q17 to USD 997bn in 4Q17, an increase of 7%. Total liabilities increased from USD 1067bn in 1Q17 to 1278bn in 4Q17, an increase of 19.8%. With liabilities increasing more than assets, this represents a capital inflow. Traditionally, banks in China have been net importers of capital. This net result can be due to a decline in claims or an increase in liabilities.

The BIS statistics also capture the cross border positions of all Chinese owned banks worldwide. This does not compare with China's balance of payments. The total claims increased from USD 1767bn in 1Q17 to 1984bn in 4Q17, an increase of 12.3%. Total liabilities increased from USD 1669bn in 1Q17 to USD 1889 in 4Q17, an increase of 13.1%. As assets exceed liabilities, Chinese banks in their global activities continue to supply the world with net funds.

The constituent components of these flows, by currency breakdown into local currency, ie RMB or USD, by counterparty, banks or non banks and by instrument, loans and securities on the claims side and deposits and securities issued on the liabilities side, constitute a differentiated picture as in table 1.

Table 1 Changes in assets (A) and liabilities (L), in bn USD, during quarterly periods

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	A 4Q16	A 1Q17	A 3Q17	A 4Q17	L 4Q16	L 1Q17	L 3Q17	L 4Q17
Total	61.6	50.7	-4.5	-0.2	12.8	97.3	52.8	34.7
Of which RMB	36.7	-3.2	-4.5	-2.0	-35.3	18.8	18.8	13.4
Of which USD	16.3	51.6	-1.0	-9.2	44.5	51.8	15.2	0.8
To Banks	Na	36.3	-1.0	-31.1	Na	41.6	36.9	-5.8
To Nonbanks	Na	14.3	-3.4	30.8	Na	55.6	15.9	40.5
Loans/deposits	45.3	48.0	-11.6	-16.4	5.5	74.1	12.3	-3.9
Debt Securities	14.1	-2.7	5.8	11.7	2.6	2.76	30.1	19.3

Source: BIS locational banking statistics, table A5

Just a reminder that increases in assets constitute a capital outflow, a decrease a capital inflow, triggered by residents. The inverse is true for liabilities where an increase constitutes a capital inflow whereas a decrease is a capital outflow, both triggered by non-residents.

The following picture emerges. Massive increases in total assets turned into modest decreases by the end of 2017, ie capital inflows. Massive increases in liabilities were recorded towards the end of 2017, also recorded as capital inflows in the balance of payments. It should be noted that increases in net liabilities raise the international debt of China.

The currency shares of the outstanding claims and liabilities remained largely unchanged in the course of 2017. Foreign currencies made up 88% of all claims, the USD alone 70% and RMB 12%; as shares of liabilities foreign currencies made up 70%, USD only 37% and RMB 30%. Regarding the adjusted changes, the currency composition changed. Lending in both, RMB but mostly in USD contracted towards the end of the year. Liabilities increased mostly in RMB but also in USD. Both components together make up the capital inflows for the whole year.

Regarding counterparts, lending to banks decreased towards the end of the year, whereas deposits by banks increased, but declined in the last quarter. Lending to non banks had a mixed picture but deposits by non banks continued strongly. The same picture of capital inflows emerges.

Finally, the breakdown into instruments, China resident banks reduced their loans in the latter part of the year whereas deposits increased apart from the last quarter. The modest purchase of debt securities continued whereas new issuance surged in the latter part of the year. This again confirms the picture of massive inflows towards the end of 2017.

The breakdown shows that within the overall picture of declining claims versus massive increase in liabilities, both deposits and securities issued, there are marked changes which raise questions for analysis. Why is cross border lending declining in times when Chinese banks are supposed to support Chinese projects abroad? Why has the USD continued to play such a dominant role when the rhetoric has suggested otherwise? Has the weakness of the USD played any role? Why has lending to other banks declined, and lending to non banks only picked up recently? Why has lending in RMB declined when liabilities in RMB surged? Which non banks, Chinese or foreign have massively increased their deposits or bought banks' debt securities? Answers will be attempted in the third section.

2. Borrowing by international debt securities

China's issuing activities of debt securities in various markets have continued at a brisk pace. The BIS records net flows of debt securities issues as well as amounts outstanding. In table C3 they distinguish between resident issuers, ie those resident in China and Chinese national issuers worldwide. Residents issue domestic debt securities and international debt securities. The major sector is the domestic issues which increased y-o-y by 25% between 4Q16 and 4Q17 with a total outstanding amount of USD 11.4 tr at the end of 2017. International outstanding amounts issued by Chinese residents in RMB and foreign currencies increased y-o-y by 38% to USD 193bn,

albeit small, compared to domestic issues. International outstanding amounts issued by Chinese nationals increased equally strong y-o-y by 39% to USD 888bn at the end of 2017.

Drawing any conclusion for capital flows is difficult as the share of domestic securities bought by non residents is unknown, estimated at some 2%. International issues can be assumed to be purchased by non residents, thus posing capital inflows, provided the proceeds are repatriated in the reporting period.

The following table 2 gives a breakdown into various issuers and currencies, notably RMB and USD.

Table 2: Debt securities issued, net flows in bn USD during quarterly periods

	1Q17	2Q17	3Q17	4Q17
China Resident domestic issues	372.9	333.7	542.4	327.1
Financial	280.5	74.3	179.7	84.4
Non-financial	38.7	-21	71.3	32.1
Government	53.8	280.4	291.3	210.6
China Resident as international debt securities issuers	11.9	1.5	11.2	24.9
In RMB	-0.5	-1.7	-0.8	-0.4
In USD	5.8	3.5	12.2	20.3
China National as international debt securities issuers	55.5	52.5	53.2	75.6
In USD	46.8	50.8	50.4	68.7
Banks	21.7	25.3	13.5	26.7
Other Financial	21.8	10.6	10.1	11.2
Non-financial	12.0	18.3	29.6	35.1

Source: BIS debt securities statistics table C3

The BIS publishes in table C3 a breakdown by issuer, by currencies, by maturities and by interest type. International organisations are a separate category, not residents of any specific country. The currency breakdown does not show as explicitly, only as local currency in issues by Chinese residents, in international issues by Chinese nationals only included in other currencies. Non Chinese residents and Non Chinese nationals issuing in RMB are included under other currencies issue of their respective country, eg UK government issuing treasuries in RMB.

Regarding the issue activity in domestic debt markets, the dominant ones are the general government and financial institutions. Non-financial have issued rather modestly during 2017. In international debt markets, financial institutions are dominant, with non-financials picking up in the last quarters of 2017.

Regarding currencies, issuing in RMB by Chinese residents has declined, whereas issuing in USD has picked up markedly. In international issues by Chinese nationals the USD has been dominant as always.

The maturities of these issues are exclusively long term. Issues at fixed interest rates dominate the international issues of Chinese residents as well as Chinese nationals.

As in the cross border banking business, questions arise to explain the structural developments. What are the driving factors behind the issue activities of various issuers, market conditions, demand for funds and exchange rate expectations?

3. Factors for banks' cross border business and Chinese debt issuance in international markets

The concerns of authorities about capital outflows have turned into national pride with capital flowing in, the RMB appreciating, in particular in the run up to the 19th CPC Congress in October. This success might have been due to certain guidance by the authorities but mostly due to market developments. This matches the declaration by Chinese leaders that markets should play a bigger role.

Without having insight into the quarterly market conditions, in the domestic as well as international debt securities markets some tentative explanations based on trends can be offered. The first is the ample supply of USD in the bond markets when concerns about US debt sustainability led to a sell off of US treasuries. Emerging market USD issuers, first and foremost by good borrowers, such as Chinese nationals has been an attractive alternative for international investors searching for good credit risk.

Secondly, as Chinese domestic capital markets remain barred for most investors, the only chance to take on Chinese good credit risk is to invest in international debt securities, issued by them in USD.

Thirdly, the outlook for the dollar weakened in 2017, so borrowing in USD, even during times of tapering USD interest rates provided good prospects for Chinese international issuers.

All these arguments show that China is playing along with international financial markets, where the USD continues to play the predominant role, rather than seriously challenging the lynchpin of the western financial system, the USD. As a result, the internationalisation of RMB has been rather slow in 2017, lacking the support from banks and bond issuers.

If China were to challenge the USD and seriously push the internationalisation of RMB, both banks and international Chinese issuers would change their behaviour. Banks would increase their lending in RMB, particularly linked to the Belt and Road initiative. Increasing banks' liabilities in RMB shows that foreign investors are ready to hold RMB deposits in their portfolio. In the short run, however this means RMB flow back into China, as they are not recycled into RMB lending.

From the figures available, Chinese nationals as bond issuers have continued issuing mainly in USD. This ignores the opportunities given, countries reach financial maturity by issuing in their own currency. For the world reserve currencies until today this has given an enormous boost to the GBP and the USD when they started issuing in their own currencies. Other countries have attempted to issue in ZAR, MXP, CZK but with mixed results. China has the economic clout to support such a bold move at present, which would advance the internationalisation of RMB on an unprecedented scale.

The Japanese experience of the 1980s has shown that a timid strategy to internationalise its currency has led to the JPY playing a minor role among reserve currencies. China should grasp the opportunity of the moment, lend freely in RMB, first and foremost within the BRI and secondly, cover its international borrowing requirement by actively issuing in RMB. International investors will be following as there will be adequate trust in the Chinese globalisation strategy.

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Monetary Policy

Delayed Tightening, Poisoned Chalice

European Central Bank: Pivotal But Vulnerable*

By DAVID MARSH*

An unpleasant cocktail of monetary circumstances is starting to bubble up in the heartlands of Europe. Financial markets may be about to suffer from a repeat of previous policy upsets.

The concerns focus on the European Central Bank, the centrepiece of efforts to shore up European stability. An edifice of solidity displays symptoms of astonishing vulnerability.

Exact historical reprises are rare but there are unsettling parallels with the past. The warning signals include indications of Franco-German strains, signs that central banks on both sides of the Atlantic may be dangerously delaying necessary interest rate rises, and an incipient row over who takes over as ECB president when Mario Draghi leaves at the end of October 2019.

The main worry reflects the likelihood that President Donald Trump, enacting procyclical tax cuts when the US shows accelerating growth and full employment, will force the Federal Reserve to brake credit more sharply than expected. The result could be a US recession in two to three years when, particularly in Europe, governments and central banks will be running perilously low in downturn-beating fiscal and monetary ammunition.

The ECB, 20 years old on 1 June, forms the pivot in the fragile construct of European integration. Partly responsible for the disastrous monetary imbalances of the euro's first 10 years, the ECB stepped in to rescue the benighted southern debtor countries. It then promoted euro-bloc recovery through generous cuts in interest rates and a huge outpouring of liquidity, opposed by the Bundesbank. The measures have fuelled German growth and boosted employment but are deeply unpopular with many Germans who believe (probably rightly) they will end up paying for it all.

Moreover, the view that the ECB will somehow stand behind Italy is the single biggest factor protecting Italian bonds from sell-off following the country's Eurosceptic March election swing.

The story is unlikely to proceed benignly. French and German policy-makers are engaged in mutual cajoling bordering on blackmail.

Two not-so-subtle Parisian threats face Chancellor Angela Merkel's fractious, freshly constituted coalition. First, the Germans must reinforce the institutional structure of monetary union – by providing guarantees and funds to alleviate budgets and support banks – or otherwise face further unpalatable pressure for the ECB to bail out debtors again in the next downturn.

Second, unless Berlin helps Emmanuel Macron underpin pro-European ideals, the reformist French president will be swept away by an anti-euro rightist in the next presidential poll in 2022.

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Balancing this is still direr menace from Berlin. If France pushes Merkel too far, anti-European forces in Germany seen with the rise of the far-right Alternative for Germany, now the formal Bundestag opposition, will grow further.

The Bundesbank is in a tangle. In the last 18 months it has held back from habitual vociferousness about loose money. This is partly because Jens Weidmann, the president, is in a structural minority on the 25-strong ECB governing council. And it is no secret that he is campaigning (though with only half-hearted Berlin backing) to replace Draghi.

Weidmann is acceding to the ECB's hazardous hesitation in tightening money, even though he regards the foot-dragging as morally distasteful and economically unsafe. Yet for all Weidmann's intellectual standing and diplomatic demeanour, the Bundesbank's record may stop him winning the European backing to run and potentially quell the institution that many Germans (with some legitimacy) believe needs reining in.

Disruption will ensure when the ECB – reacting to Fed tightening – is finally forced to squeeze credit. The process may start in a small way in Draghi's final months, but his successor will bear the main burden. There are parallels with when the Bundesbank slammed on the brakes far too late in August 1991 after delaying interest rate rises during German unification. The outcome: Italy and the UK left the exchange rate mechanism in 1992. Nearly all the other countries devalued against the D-Mark, pushing Germany into recession.

Tactical power-play over the ECB raises eerie memories of January 2011. Merkel privately told Axel Weber, the Bundesbank president, that she would back him for the ECB presidency to succeed Jean-Claude Trichet, but he would complicate her European tasks. Weber withdrew his candidature, Draghi got the job and Weber became chairman of Swiss bank UBS.

Whoever becomes ECB chief in 18 months will inherit a poisoned chalice. Whatever his superficial ambitions, Weidmann must, in his heart, be hoping it won't be him.

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Keep Your Eye on Broad Money: That's What Counts*

By STEVE H. HANKE*

Ever since the U.S. Federal Reserve began raising the federal funds rate, the market has been obsessed with speculation about when and how much the Fed will raise that rate. Each time a consensus congeals around the answer to that question, all the world's markets either soar or dive.

This obsession with the interest rate story is simple, but strange. Indeed, it is misguided — wrongheaded. So, why the fixation? It is, in part, the result of a Keynesian hangover, due to the Keynesians' focus on interest rates. The mainstream macroeconomic model that is widely in use today is referred to as the "New Keynesian" model. The thrust of monetary policy contained in this model is entirely captured by changes in current and expected interest rates (the price of money). Money — that is the quantity of money — is nowhere to be found, however.

This misguided focus on interest rates not only poses a problem for those who are observing the current economic environment and formulating expectations, but also for those who are interpreting important economic and market events of the past. For example, Nobelist and Keynesian Robert Shiller, in his famous book, *Irrational Exuberance*, comes to the conclusion that the stock market crash in 1929 was caused by the Fed's excessively restrictive monetary policy. That's because Shiller focuses on interest rates and thinks that the Fed's increase in the discount rate in August 1929 signaled monetary tightening. But, as Elmus Wicker carefully documents in *Wall Street, the Federal Reserve and Stock Market Speculation: A Retrospective*, the Fed was accommodative, not restrictive, prior to the 1929 stock market crash.

The interest rate obsession is amazing, particularly since Keynes dedicates quite a few pages in *A Tract on Monetary Reform* (1923) to money and its role in national income determination. Then, in his two-volume 1930 work,*A Treatise on Money*, Keynes devotes a great deal of space to banks and their important role in creating money. In particular, Keynes separates money into two classes: state money and bank money. State money is produced by central banks, while bank money is produced by commercial banks through deposit creation.

Keynes spends many pages in the Treatise dealing with bank money. This isn't surprising because, as Keynes makes clear, bank money was much larger than state money in 1930. Well, not much has changed since then. Today, bank money accounts for almost 77% of the broad money supply (M4) in the United Kingdom. In the United States, the picture is the same, with bank money accounting for 78% of broad money (M4).

We should keep our eyes on money broadly measured (state, plus bank money), and money properly measured (when available, Divisia, not simple sum measures). A monetary approach to national income determination is what counts over the medium term. The link between the growth rate of the money supply and both nominal GDP and nominal aggregate demand growth is unambiguous and overwhelming. Never mind. There remain plenty of deniers of basic principles and centuries of clear evidence.

So, just where do things stand today in the U.S.? The growth rate in money measured (Divisia M4) is almost exactly equal to its trend rate of 4.8%, as shown in the chart below. Not bad.

*This article first appeared on Forbes.com on March 30, 2018.

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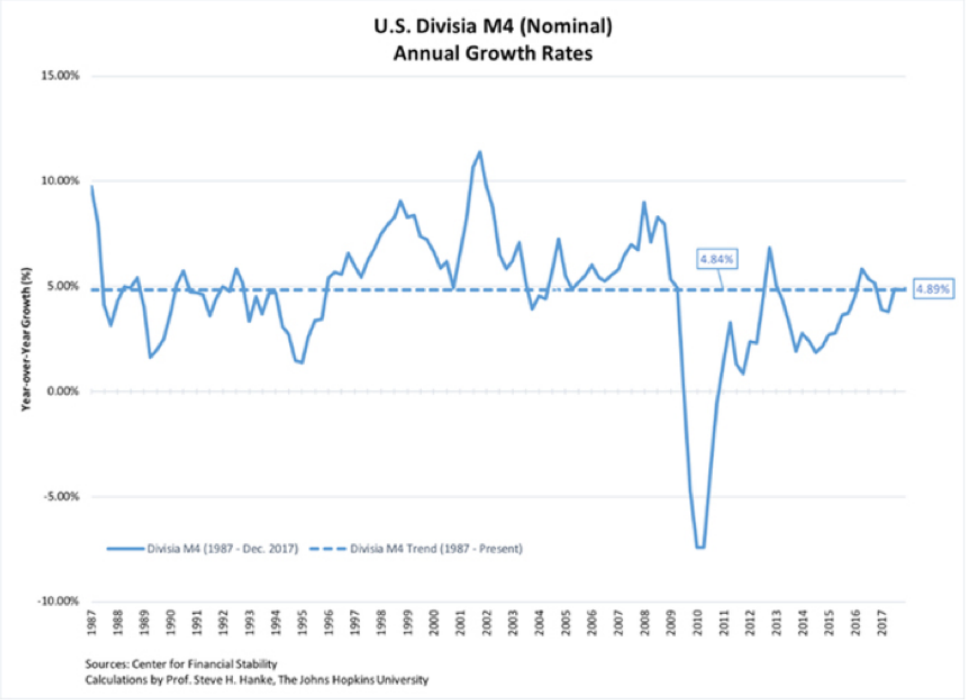
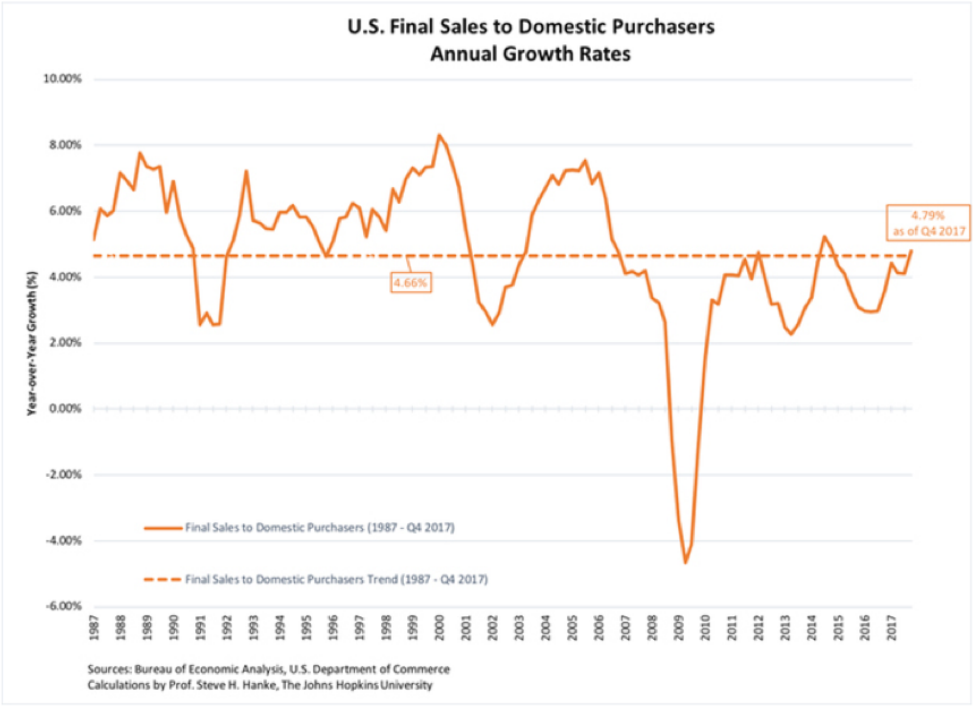


If we move to the rate of growth for the economy's nominal aggregate demand (measured by Final Sales to Domestic Purchasers, which equals GDP + Imports - Exports - Change in Inventory), it is just a tad over the trend rate of growth of 4.7% (see the chart below). Again, not bad.



So, everything is running pretty smoothly — right on the trend rates. What could go wrong? The biggest risk is that the Fed could slam on the breaks too hard, and broad money growth would decelerate. That would cause aggregate demand to slow, and everything that is so nicely balanced would, well, not be so nicely balanced. If you want to follow this saga, stop obsessing over the Fed funds rate moves, and keep your eyes on the best measure for the growth of broad money, Divisia M4.

IMI International Monetary Review

Not Time to Say Goodbye to HKD Peg*

By BETTY HUANG AND XIA LE*

Summary

The HKD depreciated from the strong end of its narrow band of 7.75 to near its weak end of 7.85 against the USD in mid-April, touching its lowest level since 2005. It has triggered a series of intervention by the HKMA, the de facto central bank of the Hong Kong, to disburse their USD reserves to purchase the HKD in support of the local currency's exchange rate

The primary culprit behind the recently weak HKD is the abundant HKD liquidity in Hong Kong's interbank market. Since US government implemented quantitative easing (QE) in 2009, a total amount of around 130 billion USD flowed to Hong Kong. Under the linked exchange rate system in Hong Kong, these capital inflows at last were transformed into the abundant HKD liquidity in the interbank bank.

Even as the US Federal Reserve started to exit its ultra-easing monetary policy and embark on a series of interest rate hikes, the interbank interest rates in Hong Kong stubbornly remain low, resulting in an ever-widening interest rate spread between the HKD and the USD. Thus investors shorted the HKD for the USD, which made the HKD exchange rate linger around its weak limit of 7.85 against the USD.

Despite some rising voices of questioning the sustainability of the linked exchange rate in the market, we firmly believe that foregoing the USD peg is an unlikely scenario in the short term for Hong Kong for a couple of reasons: (1) The HKMA has plenty of "fire power" to defend the linked exchange rate system looking forward; and (2) The political will to defend the exchange rate remains strong.

Admittedly, it is not hard for the HKMA to keep the HKD below the 7.85 level, but the authorities might pay a cost of a fast hike in interbank interest rate. Despite Hong Kong having maintained a very prudent fiscal policy, Hong Kong credit boom has made the economy's total debt levels are amongst the highest in Asia. And as the bulk of its indebtedness is accounted for by corporates, the risks in the corporate bond market are on the rise.

Moreover, rising interest rates and a stronger HKD will make it expensive for Chinese corporates to seek financing in Hong Kong. As a result of tightening mainland banking regulations, mainland companies are increasingly seeking funding in Hong Kong for their projects, especially for the real-estate sector and local government entities.

Also Hong Kong is not exempt from spill-overs from volatility in China's financial markets. Downward pressure on valuations in the mainland will inevitably have an effect on Hong Kong's equity market, further aggravating capital outflows.

In summary, whilst it is unlikely that the HKMA will abandon its decades old peg to the USD in the short term, recent developments will add to the growth headwinds of the region. The risks remain to the downside if speculative attacks on the HKD last longer than expected and trigger more capital outflows from Hong Kong.

Depreciation reignites speculations over HKD's peg against the USD

The HKD depreciated from the strong end of its narrow band of 7.75 to near its weak end of 7.85 against the USD in mid-April, touching its lowest level since 2005. It has triggered a series

*This article first appeared in BBVA Reserch on April 26, 2018.

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of intervention by the HKMA, the de facto central bank of the Hong Kong, to disburse their USD reserves to purchase the HKD in support of the local currency's exchange rate. During the period of April 12th-18th, the HKMA accumulatively bought HK$51 billion (US$6.5 billion) of its US$440 billion in foreign reserves. (Chart 1)

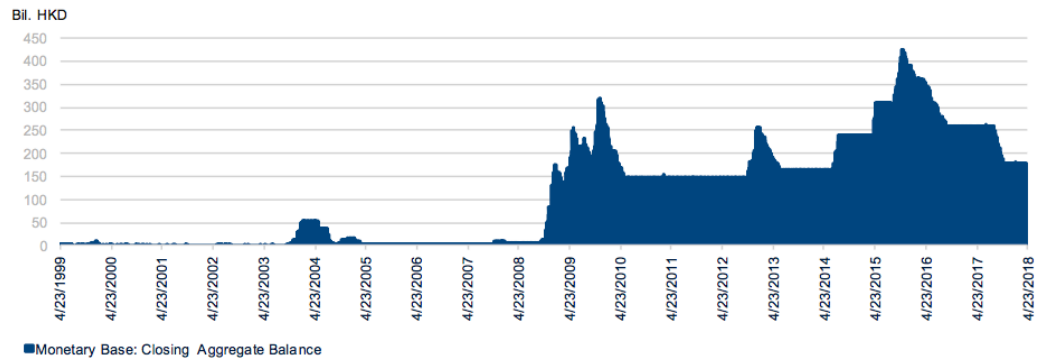
The primary culprit behind the recently weak HKD is the abundant HKD liquidity in the interbank market. Since US government implemented quantitative easing (QE) in 2009, a total amount of around 130 billion USD flowed to Hong Kong as the international financial center became a Safe Heaven during the crisis time. Under the linked exchange rate system in Hong Kong, which features full capital account convertibility and a pegged exchange rate, these capital inflows at last were transformed into the abundant HKD liquidity in the interbank bank (Chart 2).

One legacy problem from these capital inflows is the low interest rate in Hong Kong capital market, which in part led to the credit boom and asset bubbles, particularly in its local property market, over the past decade. Even as the US Federal Reserve started to exit its ultra-easing monetary policy and embark on a series of interest rate hikes, the interbank interest rates in Hong Kong stubbornly remain low, which results in an ever-widening interest rate spread between the HKD and the USD. In the face of a meaningful interest rate differential, investors shorted the HKD for the USD, which made the HKD exchange rate linger around its weak limit of 7.85 against the USD.

On top of market interventions, the monetary authority also communicated to the market to restore people's confidence in the linked exchange rate. The chief executive of HKMA, Norman Chan said that the HKMA had enough USD reserves to cushion against the 130 billion USD (equivalent to approximately HKD 1 trillion) over the last decade. In particular, Hong Kong's foreign reserves are invested in a well-diversified and high-liquid asset portfolio, which enables the authorities to convert them to the USD swiftly if needed. The HKMA can play the "super fund store" function, which can handle large amounts of capital exchange and outflow at any time.

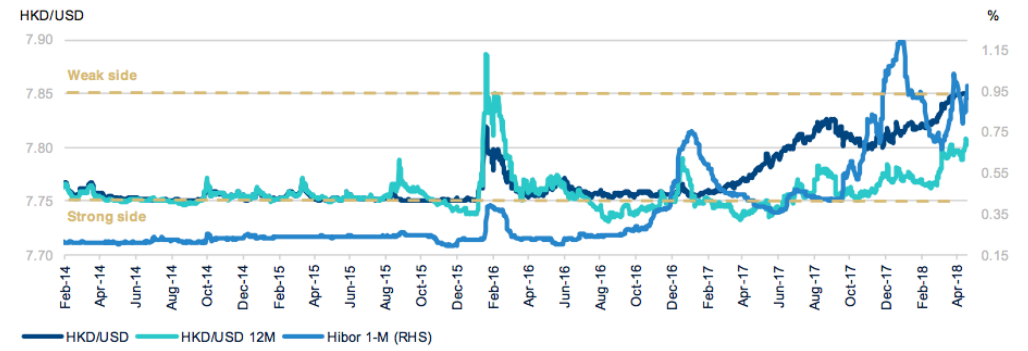
Despite some rising voices of questioning the sustainability of the linked exchange rate in the market, we firmly believe that foregoing the USD peg is an unlikely scenario in the short term for Hong Kong for a couple of reasons: (1) The HKMA has plenty of "fire power" to defend the linked exchange rate system looking forward; and (2) The political will to defend the exchange rate remains strong.

Chart 1 HKD closing aggregate balance sharply decreased in the mid of Apr 2018



Source: HKMA and BBVA Research

Chart 2 HKD depreciation causes hike in interbank rates, hinting towards higher selling pressure



Source: Bloomberg and BBVA Research

What is Hong Kong's linked exchange rate regime?

To better understand the Hong Kong's linked exchange rate regime, we need to revisit the "impossible trinity", an axiom in international economics which states that it is unmanageable for an economy to simultaneously pursue: (1) a fixed exchange rate; (2) free capital flows; and (3) an independent monetary policy.

Hong Kong has a fixed exchange rate and free capital controls, but no independent monetary policy, relying instead on the interest rates determined by the Federal Reserve of the United States (US Fed). Hong Kong's linked exchange rate regime is also technically known as a "currency board".

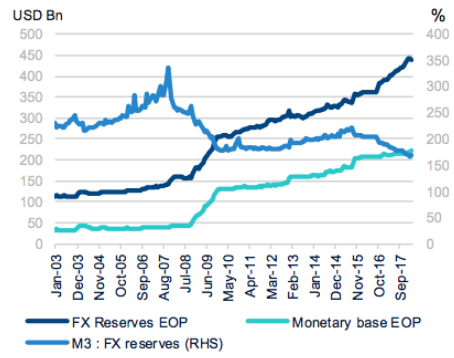
In Hong Kong, monetary policy to be rule bound and automatic, the currency board must have no discretionary monetary powers or engage in the fiduciary issue of money but to maintain the exchange rate within a narrow band currently fixed at 7.75-7.85 HKD/USD. According to the Basic Law, the "Hong Kong currency must be 100% backed by a reserve fund". In other words, FX reserves must be enough to cover 100% or more of total monetary liabilities, which in Hong Kong are comprised by certificates of indebtedness, government-issued currency in circulation and the balance of the clearing accounts of banks kept with the HKMA. (Chart 3)

A lethal threat to a credible currency board system is that FX reserves might be used for other purposes which could lead to serious liquidity problem during the period of crisis time. The quickest way is to look at the relationship between "net foreign reserves" and the "reserve pass through" (Hanke, 2008)[1]. In an orthodox currency board, net foreign reserves should be close to or above 100% of the monetary base. In addition, the "reserve pass through", defined as the change in monetary base divided by the change in net foreign reserves, should also be close to 100%, or at least fall within a range of 0-100%.

As we've already discussed, Hong Kong's net FX reserves as a percentage of the monetary base linger comfortably above the 100% mark. Moreover, the reserve pass-through has, for the most part, stayed within the 0-100% band, meaning the HKMA engages only in ordinary sterilization (Chart 4). In other words, the HKMA does not hold FX assets for reasons other than to safeguard the stability of its exchange rate, leaving the entirety of its FX reserves available to defend the currency against a potential speculative attack.

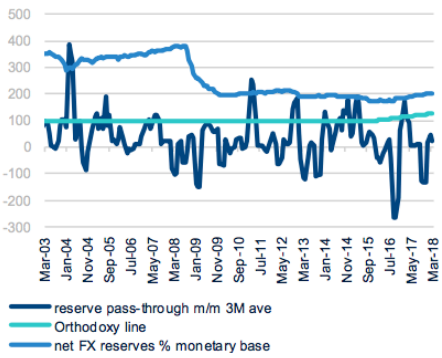
[1] Steve Hanke, "Why Argentina did not have a currency board", Central Banking Journal, Vol.18, Feb 2008.

Chart 3 FX reserves well in excess of the monetary base requirements (USD Bn)



Source: Bloomberg and BBVA Research

Chart 4 ...Meaning that currency board orthodoxy has not been a concern in Hong Kong (%)

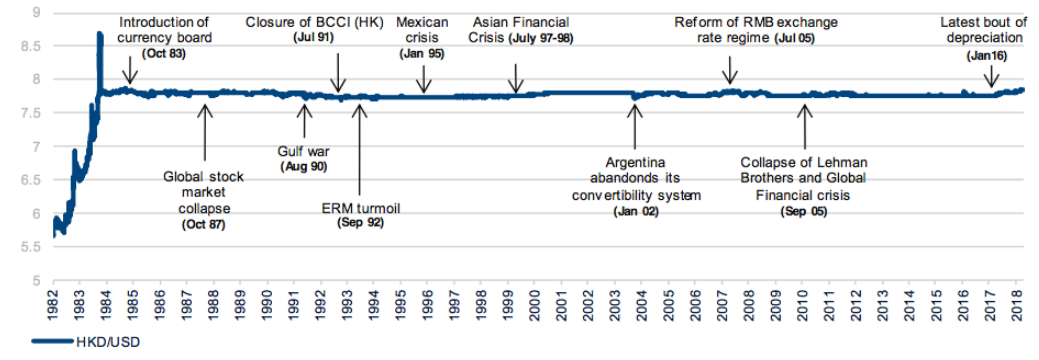


Source: Haver, Bloomberg and BBVA Research

Strong political will to defend the exchange rate

The political will to defend the linked exchange rate system is strong. Indeed, re-pegging the value of the HKD at the moment of currency weakness could be disastrous, as it would dampen the credibility of the monetary policy framework and trigger large-scale capital outflows. In history, the exchange rate has proven incredibly resilient to exogenous shocks in the past (Chart 5). This has boosted the authorities' confidence in the system's ability to undertake the necessary balance-of-payment adjustments to avert a crisis.

Chart 5 The HKD: Resilience against exogenous shocks



Source: Bloomberg and BBVA Research

The authorities' quiet confidence may be well justified. For example, during the Asian Financial crisis, there was significant pressure from speculators who believed a devaluation of the HKD was inevitable. The concern at the time was that a strengthening dollar would hurt Hong Kong's economy, which was experiencing outflows stemming from its exposure to volatile Asian markets. The HKMA's intervention was both vigorous and merciless, driving up the 3M Hibor to almost 20% and leading to a -25% fall in the Hang Seng Index. It was also effective in driving out the short-sellers.

In 2011, US based hedge fund manager Bill Ackerman lodged a speculative attack that incoming Chief Executive CY Leung would devalue the HKD in order to curb hot money inflows from the mainland, which were fueling a property bubble in the region, thereby

worsening social tensions. However, much to Ackerman's dismay, CY Leung pledged to keep the HKD's linked exchange rate mechanism untouched. Money was lost.

Stable HKD and higher interest rates pose risks to local economy

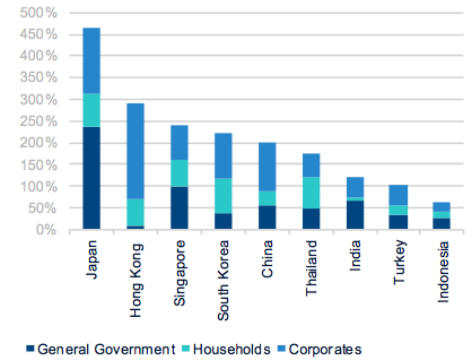
Admittedly, it is not hard for the HKMA to keep the HKD below the 7.85 level, but the authorities might pay a cost of a fast hike in interbank interest rate. Despite Hong Kong having maintained a very prudent fiscal policy, Hong Kong credit boom has made the economy's total debt levels are amongst the highest in Asia, second only to Japan (Chart 6). However, unlike Japan, the bulk of this indebtedness is accounted for by corporates (Chart 7). The risks in the corporate bond market are on the rise.

Moreover, rising interest rates and a stronger HKD will make it expensive for Chinese corporates to seek financing in Hong Kong. In fact, Hong Kong has become increasingly exposed to China's economy. For example, loans for use outside Hong Kong have rocketed on the back of falling interest rates since 2009 (Chart 8). Banks have significantly increased their exposure to China, as we have seen that as a result of tightening mainland banking regulations, mainland companies are increasingly seeking funding in Hong Kong for their projects, especially for the real-estate sector and local government entities.

Also Hong Kong is not exempt from spill-overs from volatility in China's financial markets. Downward pressure on valuations in the mainland will inevitably have an effect on Hong Kong's equity market, further aggravating capital outflows. In the worst-case scenario, steeper outflows combined with rising rates (which make mortgages more expensive) could trigger a collapse of the local property market (Chart 9).

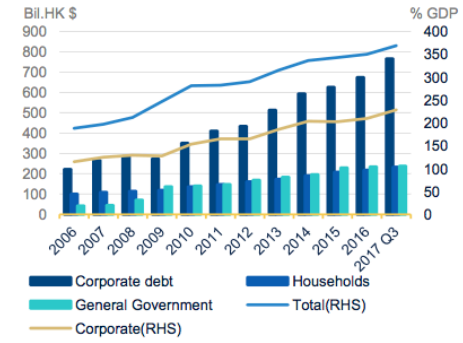
In summary, whilst it is unlikely that the HKMA will abandon its decades old peg to the USD in the short term, recent developments will add to the growth headwinds of the region. The risks remain to the downside if speculative attacks on the HKD last longer than expected and trigger more capital outflows from Hong Kong.

Chart 6 Hong Kong has one of the highest debt levels in Asia as a percentage of GDP...



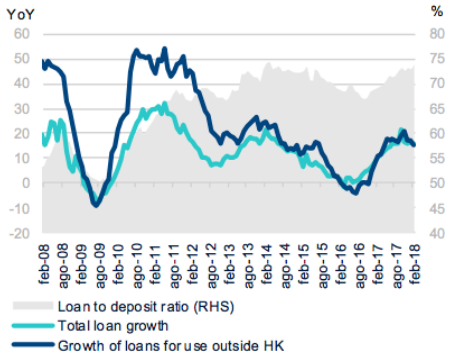
Source: Bloomberg and BBVA Research

Chart 7 Although most of this debt is owned by corporates, while government debt remains small



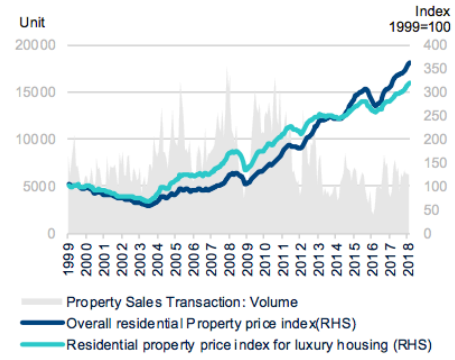
Source: Haver, Bloomberg and BBVA Research

Chart 8 …However, the pace of growth of loans for use outside Hong Kong has started to deteriorate



Source: Bloomberg and BBVA Research

Chart 9 Housing price risks remain high



Source: Haver, Bloomberg and BBVA Research

IMI International Monetary Review

Truculent View on Target-2：Greenspan Points to 'Destabilising' Euro*

By DAVID MARSH*

Rising creditor-debtor central bank balances in the euro area under the Target-2 overdraft system underline the 'destabilising potential' of the European single currency, according to Alan Greenspan, former chairman of the Federal Reserve board.

Greenspan, a sprightly yet wistful 92, used a New York dinner organised by the World Gold Council and NYU Stern Business School to repeat long-held truculence on economic and monetary union. He said the end-March figure of €923bn in non-interest-bearing advances by the Bundesbank to weaker central banks via the European Central Bank's Target-2 was a sign of 'something that's not going to work out [well] here'.

He told his audience that he watched the figures 'every day' as a sign that the architecture of the euro was 'not conceptually stable'.

Greenspan questioned who would stand behind the ECB in times of crisis. 'Where does the euro go if it's in trouble?' Greenspan's remarks were filmed and on the record, unlike earlier proceedings from a day-long WGC-NYU Stern conference entitled 'Tackling long-term global investment challenges'.

Part of Greenspan's thesis about the underlying fragility of the euro – although spelled out from a very different vantage point and for different motivations – broadly echoes the opinions of leading French and Italian policy-makers.

France has been multiplying pressure on Germany to reinforce the structure of the euro to withstand possible strains stemming from a combination of higher US interest rates and a coming European downturn that could leave some debtor states heavily exposed.

Christine Lagarde, managing director of the International Monetary Fund, Benoît Cœuré, an ECB board member, Jacques de Larosière, a former IMF managing director and former Banque de France governor, and François Villeroy de Galhau, the current French central bank chief, have all called for rectifying action. This is in line with a wider campaign launched by President Emmanuel Macron.

Both Cœuré, in January, and Villeroy de Galhau, in an OMFIF City lecture in London on 24 April, have warned that Germany should step up risk-sharing to forestall the danger that the ECB would enact more unorthodox monetary policy (anathema to many Germans) when the next international financial upset strikes.

In other comments in New York, Greenspan voiced apprehension about the ability of President Donald Trump's administration to 'come to grips' with the bloated US budget deficit and questioned whether the lull in inflation would last. 'When prices are stable, fiscal sanity is non-existent,' he said. While apologising wryly to his audience for his lack of cheer, he termed problems from US imbalances as not a short-term risk but 'scary' in the longer term.

Greenspan gave familiar support to gold as a monetary unit. A return to the gold standard was 'almost inconceivable' but central banks would not have more than $1tn in their reserves if it were 'meaningless' as a reserve asset.

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

The former Fed chairman's views did not disappoint long-term Greenspan watchers. On the euro, his message well before the 2008 financial crisis, for which some critics hold him partly responsible, was that 'I was extremely sceptical whether a central bank with the same power as the celebrated German Bundesbank could impose itself on the whole continent. Besides, I had my doubts if such an institution was necessary, since Europe already had a de facto central bank, in the shape of the Bundesbank.'

In 1997, two years before the currency was born, he forecast, 'The euro will come, but it will not be sustainable.' He appears highly unlikely to deviate from this opinion as he heads further into his 10th decade.

IMI International Monetary Review

America's Currency Confusion: Needed—More Clarity and Discipline*

By MARK SOBEL*

For more than two decades, American administrations, both Democratic and Republican, have followed the same currency playbook. They backed free floating, especially for the US, Europe and Japan, without intervention. They pressed G3 officials not to comment on currency market developments. When unavoidably pressed to do so, they stated rote support for a 'strong dollar'. And they focused on curbing excessive global imbalances, especially surpluses.

Key motivations behind bipartisan dollar policy have been US interests in avoiding excessive reliance on America as the engine for world growth and in resisting protectionist pressures.

The Trump administration is right to complain about countries seeking to weaken exchange rates, especially surplus countries that at times heavily intervene to limit appreciation. Furthermore, the administration correctly says that the health of the US economy will determine the dollar's long-run value.

Yet, in important ways, through a series of missteps, Washington has been backing away from its traditional currency playbook. This erodes US credibility and the ability to pursue its interests.

The administration's confused currency rhetoric is the most obvious symptom. There is one simple means to rectify this: restore verbal discipline. Only one person should speak on currencies – and as rarely as possible. That should be the Treasury secretary.

At present, communication comes through multiple voices. The president has interspersed comments on wanting a strong dollar with others suggesting the dollar is too strong. Presidential adviser Peter Navarro has commented on the euro's valuation. Treasury Secretary Steven Mnuchin observed this January that a weaker dollar is good for US trading opportunities. Larry Kudlow, director of the National Economic Council, has commented on the dollar as well as on gold prices.

US currency comments may appear innocent and innocuous, but that is often not so. They hurt America's ability to persuade others to practise verbal self-restraint. Japanese officials have a long history of talking down the yen. Only weeks after Mnuchin's comments, the Japanese returned to fretting about one-sided currency movements – code for an aversion to yen appreciation. Chatty Europeans, while more artful than the Japanese, have never been slouches about wishing a weaker currency to support growth or boost inflation. Euro area officials quickly chimed in earlier this year to criticiseMnuchin'scomments, seemingly worried that a lower dollar would weaken Europe's recovery.

Official open-mouth operations are a longstanding feature of currency markets. Others often try to push their currencies lower in the hope of boosting jobs at home through exports to the US. Conflicting G3 currency rhetoric can unsettle markets.

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*Mark Sobel is a former Deputy Assistant Secretary for International Monetary and Financial Policy at the US Treasury and until earlier this year US representative at the International Monetary Fund.

Following harmful discussions about 'currency wars' in the wake of the financial crisis, the US in 2013 forged G7 and G20 agreements that countries would not target their exchange rates, and more generally would refrain from talking down their currencies. Officials should do a better job of sticking to these agreements.

Another possible symptom is that something new has appeared in recent G20 currency language. Buried among long-standing refrains about not targeting exchange rates or seeking competitive devaluations is a new sentence: 'Strong fundamentals, sound policies, and a resilient international monetary system are essential to the stability of exchange rates, contributing to strong and sustainable growth and investment.' This comes from the communiqué of the meeting of the International Monetary and Financial Committee, which advises the International Monetary Fund's board of governors, in October 2017.

The first part of the sentence is uncontroversial. But the second part is confusing. That stability of exchange rates contributes to strong and sustainable growth is seemingly incontrovertible. But it can also be read as implying that 'stability of exchange rates' should be a target or objective of policy to promote strong growth and investment.

That would go against G7 language about meeting domestic objectives with domestic instruments. And it would raise large questions about policy. Is the G3 as committed as before to floating rates? Are the Federal Reserve, European Central Bank and Bank of Japan ready to alter monetary policy to help promote currency stability? Could they be prepared to intervene in currency markets to foster stability?

The Treasury and Fed, along with the rest of the G7 and G20, have signed off on the new language. When G7 finance ministers and central bank governors meet at the end of May in Canada, they should explain why there is this new sentence and what it means. If they can't tell us, they should erase it.

Confusion is exacerbated by the US policy mix. The US has long pressed surplus countries to bolster domestic demand and stop depending on export-led growth. This is part of efforts to foster a better-balanced world economy.

But we are now witnessing a procyclical US fiscal expansion, and the Fed is raising interest rates and winding down its balance sheet. Higher US growth and interest rates may sustain dollar demand and weaken foreign currencies, widening the US current account deficit. The IMF in April raised its US growth projection for 2018 and 2019 by 0.6 and 0.8 percentage points respectively compared with six months earlier, and projected similarly higher US current account shortfalls.

Other countries are poised to argue that higher US trade deficits are made in America. They will blame the US for widening global imbalances. While looking forward to increased exports to the US, they will ignore their own responsibilities for persistent excessive imbalances. Behind the scenes, they will hope that higher US trade deficits will not simply galvanise US protectionist pressure against them.

The Trump administration is rightly focusing on global imbalances, currency issues, and stronger global growth. However, its actions are weakening its ability to pursue this agenda, adding to world economic risks.

IMI International Monetary Review

Investment

Flexibility in Allocation Strategy: Build Up in Real Assets as Bond Returns Fag*

By BEN ROBINSON*

Bonds have been the worst-performing asset among habitual investment classes, after commodities and hedge funds, over five-, 10- and 20-year horizons, according to PWC data. For public pension funds, which have an average allocation to fixed income of almost 40% of the total portfolio, this has created significant pressure on their returns, forcing investors to seek alternatives.

Sovereign funds, which are dependent on oil revenues for a large part of their total assets, have struggled to preserve their value in the face of the dramatic decline in oil prices since 2014. Sovereign funds' average 25% allocation to bonds, while lower than pension funds', is still large enough to present further headaches for these investors.

This combination of forces, exacerbated by a decade of quantitative easing, low interest rates, slow productivity growth and aging populations in advanced economies, has led to heated debate over which asset classes and strategies public investors should pursue.

Recent reforms allowing great flexibility in asset allocation for European public sector investors have helped intensify the shift into alternative assets, particularly real estate and infrastructure.

From July, the Swedish pension buffer funds, which hold combined assets of more than $200bn, will be allowed to invest up to 40% in 'illiquid' assets, up from the current 5% cap on unlisted assets. The minimum allocation to top-rated fixed income products has also been reduced to 20%, from 30% of the total portfolio.

In April the Norwegian finance ministry signalled its intention to allow Norges Bank Investment Management, which has more than $1tn in assets under management, to invest in unlisted renewable infrastructure, following years of lobbying by the fund.

These developments are part of a broader trend. The value of real estate and infrastructure within sovereign fund and public pension fund portfolios has risen by 120% and 165%, respectively, since 2009. According to an OMFIF survey of public investors with around $4.6tn in AUM, more than 70% have increased or significantly increased (by up to 6%) their allocation to these assets in the last three years.

The role of real assets within the total portfolio has shifted. These are no longer viewed solely or primarily as part of a core or core-plus strategy. Value-add and opportunistic strategies are gaining in importance, affecting the types of assets investors are pursuing and the way they access them.

Some investors are targeting a higher share of private real assets, driven by factors including diversification, higher yields and lower volatility than listed public assets. This allows investors

*This article first appeared in The Bulletin published by OMFIF in May 2018.

* Ben Robinson, Senior Economist at OMFIF.

to access a wider range of projects and to specialise in non-prime real estate and other niche investments.

More complex investments

Sovereign and pension funds are pursuing larger and more complex investments and collaborating with limited partners to reach deals of sufficient scale. Interest in private equity is waning as the large build-up of 'dry power'-estimated at around $300bn in the real estate sector alone – adds to the costs.

Direct debt and equity are instead becoming more widespread as investors seek exposure to specific, carefully selected projects. They are trying to overcome the high costs of more traditional prime assets in core locations, which have been driven by strong competition from other investors.

Many institutions are bringing more of their asset management in-house. This is forcing external managers to update their value proposition by offering new fund structures, greater transparency and flexibility, and lower costs, to remain competitive. The potential rewards are substantial.

Over the next three years, sovereign and public pension funds plan to increase their investments by $334bn in infrastructure and $130bn in real estate, according to the OMFIF survey. However, matching the supply of readily available sums of cash with investment needs – estimated at more than $90tn over the next 20 years for infrastrcture alone – remains the biggest stumbling block.

In view of the long-term nature of real asset investment, political, legal and regulatory certainty is vital. Improved information, benchmarking and hedging products are also needed. The hope among investors facing low returns elsewhere is that the scale of their demand for real assets spurs on these reforms, expanding the range of investable assets.

IMI International Monetary Review

Gold Beats Untested Cryptocurrencies: Blockchain May Facilitate Digital Gold Assets*

By JOHN READE*

In 2017 the price of gold rose 13%, a creditable performance. In the same period, bitcoin delivered a 13-fold increase in value, prompting some to claim that cryptocurrencies could replace gold as an asset class.

However, though these digital assets may develop into an established part of the financial system, they are no replacement for gold, a dependable investment tool.

Gold is a highly liquid asset, and trades in an established regulatory framework. Its supply and demand dynamics are unique. These characteristics underpin gold's status as a mainstream financial asset.

Gold has appreciated by an average of 10% per year for more than 30 years, with relatively little volatility. Bitcoin is markedly different. Last December it soared to almost $20,000 per unit, though it never exceeded $1,000 before 2017, and has fallen back to around $10,000 this year. Such volatility potentially limits bitcoin's use as a transaction token and is hardly characteristic of a mainstream currency, let alone a store of value.

The cryptocurrency market is said to be worth more than $800bn. But there is no clear two-way market, sales are said to be costly and time-consuming, and trading volumes are low. Bitcoin trades $2bn, on average, each day. The gold market trades roughly $250bn per day.

With a 7,000-year history as an asset and a long-standing role as money, gold is owned by central banks as well as institutional and retail investors. As a tangible asset, gold has varied technical applications, including in the computer chips that 'mine' bitcoin.

Cryptocurrencies are designed to be used as tokens in electronic payment systems, but limited spending opportunities hamper their widespread use. Furthermore, genuine cryptocurrency transactions are usually quickly converted into fiat currencies.

The volume of bitcoins increases by around 4% per year and is engineered to decline to zero growth around the year 2140. This diminishing growth rate and finite quantity are attractive attributes, but bitcoin is not alone as a blockchain application. Given the many cryptocurrency alternatives, new and better blockchain-based coin applications may be seen as equivalent to increasing supply, not unlike fiat currency.

Trade in gold is widely authorised and regulated in many markets, while most countries have yet to approve cryptocurrencies, even if they have stopped short of banning them outright. Bitcoin and other cryptocurrencies may be subject to sudden restrictions, particularly if governments become concerned about their impact on economic policy. South Korea, for instance, in January announced increased regulatory measures, while in the UK investors face hurdles to convert cryptocurrencies.

Some commentators claim that gold prices and demand are suffering at the expense of cryptocurrencies. However, there is no quantifiable evidence to suggest this is true, and the factors that propelled the gold price in 2017 appeared little changed from the previous year's, however there are some positives aspects to cryptocurrencies.

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*This article first appeared in the April Bulletin on May 1, 2018.

* John Reade is Chief Strategist at the World Gold Council.

Blockchain, the distributed ledger technology that underpins cryptocurrencies, is genuinely innovative.

Various players in the gold market are exploring how blockchain might transform gold into a 'digital asset', tracking provenance across the supply chain and introducing efficiencies into post-trade settlement processes. Such applications are typically built on private blockchains rather than using bitcoin or other 'public blockchains'.

Unlike gold, cryptocurrencies are yet to be tested across economic cycles. The market is young and liquidity is scarce. How prices, returns and sentiment may respond if stock markets become more volatile is open to debate. Gold, however, sees demand in good times and in bad.

IMI International Monetary Review

Cryptocurrency

From Dollar to e-SDR*

By ANDREW SHENG AND XIAO GENG*

The rise of cryptocurrencies has created a unique opportunity for market forces to spearhead a shift toward a truly neutral reserve asset. With the leadership of the US – the issuer of the main international reserve currency – more unpredictable than ever, it is an opportunity that should not be missed.

As the risk of a US-China trade war mounts, creating a geopolitically neutral and fair monetary system has become increasingly urgent. The shift from a unipolar to a multipolar world order has not been particularly orderly. Instead, it has produced a kind of monetary non-system that depends on a debt-driven, dollar-based model that is too pro-cyclical, fragile, and potentially biased to support the management of trade conflict.

At the root of the problem are the structural trade and current-account imbalances that arise from the so-called Triffin dilemma: in order to meet global demand for the US dollar as a reserve currency, the United States must run persistent current-account deficits with the rest of the world. Last year, that deficit reached $474 billion, or 2.4% of US GDP.

To be sure, the guarantee that the US, as the issuer of the dominant international reserve currency, can acquire low-cost funding for its fiscal deficit and national debt amounts to what former French President Valéry Giscard d'Estaing famously called America's "exorbitant privilege." But that privilege can erode the country's fiscal discipline, as it has in recent years, resulting in high federal deficits ($833 billion, or 4.2% of GDP, in2018) and growing federal debt ($21 trillion, or 104% of GDP, as of March).

The policies favored by US President Donald Trump's administration exacerbate this tendency. Recent tax cuts and increased military spending have led the International Monetary Fund to estimate that the US international investment position will deteriorate in the coming years, with net liabilities reaching 50% of GDP by 2022.

Moreover, Trump's threats of trade and currency wars are fueling fears that the US dollar could become a weapon in geopolitical disputes. Such a step would trigger immense volatility throughout the international monetary system, throwing many economies – such as those that link their currencies to the US dollar or hold a large volume of dollar reserves – into crisis.

Of course, the Triffin dilemma can be avoided, and America's outsize influence over the monetary system reduced. All that is needed is a major reserve currency that is not issued by a national authority. Gold was once supposed to fill this role, but it couldn't meet demand for global liquidity and a store of value.

A better option is the IMF's Special Drawing Right (SDR), which the second amendment of the body's Articles of Agreement asserts should become the world's "principle reserve asset." Some – including former People's Bank of China governor Zhou Xiaochuan and former

*This article first appeared on Project Syndicate on April 27, 2018.

* 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

Colombian finance minister José Antonio Ocampo – have since advocated following through on that plan.

Yet the SDR is not used widely enough to serve as a major international reserve currency. According to a Palais Royal Initiative report, a key way to raise the SDR's global standing is through "regular allocations of SDRs under appropriate safeguards" or even allocations "in exceptional circumstances." The report also calls for the IMF to work with the private sector "to explore ways in which the SDR could be more widely used in private transactions."

A key hurdle for the SDR has always been the geopolitical interests and priorities of the reserve-issuing central banks (not just the US, but also the eurozone, China, Japan, and the United Kingdom). But the advent of cryptocurrencies may offer another way: the private sector can work directly with central banks to create a digital SDR to use as a unit of account and store of value.

Such an "e-SDR" would, in a sense, be the quintessential reserve asset, because it would be fully backed by reserve currencies, in the IMF-determined ratio. The supply of e-SDRs would be completely dependent on market demand.

Of course, to enable a gradual shift from the US dollar to an e-SDR as the dominant international reserve currency, a sufficiently large e-SDR-denominated money market would need to be created. To that end, a politically neutral body, owned by the private sector or central banks, should be established to issue the asset. Participating central banks and asset managers would then have to swap their reserve-currency holdings for e-SDRs.

Once the private sector comes to view the e-SDR as a less volatile unit of account than individual component currencies, asset managers, traders, and investors could begin to price their goods and services, and value their assets and liabilities, accordingly. For example, the Chinese government's massive Belt and Road Initiative could be conducted in e-SDRs. In the longer term, an international financial center, such as London or Hong Kong, could spearhead experimentation with e-SDRs using blockchain technology, with special swap facilities being created to make the asset more liquid.

Another imperative would be to create an e-SDR-denominated debt market, which would appeal to countries that want to avoid getting caught in the crossfire between reserve-issuing countries. Multinational firms and regional and international financial institutions should provide the needed supply of assets. On the demand side, e-SDR-denominated long-term bank debts could be used by pension funds, insurance companies, and sovereign-wealth funds.

The e-SDR-denominated debt market would even be good for all reserve currencies – except the US dollar – as their weight in determining the asset's value exceeds their current shares in foreign-exchange markets. In the longer term, the e-SDR's rise could put added pressure on the US to rein in its spending.

The rise of cryptocurrencies has created a unique opportunity for market forces to spearhead a shift toward a truly neutral reserve asset. With US leadership more unpredictable than ever, it is an opportunity that should not be missed.

IMI International Monetary Review

Regulators Face up to Cryptomania: Supporting innovation while curtailing fraudsters*

By MARK BRANSON*

The rise of cryptocurrencies has created a unique opportunity for market forces to spearhead a shift toward a truly neutral reserve asset. With the leadership of the US – the issuer of the main international reserve currency – more unpredictable than ever, it is an opportunity that should not be missed.

There is a hint of hysteria around the world of blockchain and cryptocurrencies, a heady atmosphere for financial regulators.

Regulators' goal, without compromising on the core objectives of financial supervision, should be to create an environment supportive of innovation. But they tend to have a natural conservative bias and only rarely communicate with the unproven next generation of market innovators. The system is stacked partly against innovation to the comfort of incumbents. That means regulators must be consciously self-critical when redressing the balance.

That is why FINMA, Switzerland's financial markets regulator, has cleared the way for blockchain innovation. The country's regulatory sandbox and dedicated fintechlicence were ideas proposed by FINMA.

Financial technology, undoubtedly, holds great promise. Mobile banking is broadening access to financial services. Roboadvising – online investment advice based on mathematical rules and algorithms – can reap the benefits of artificial intelligence and machine learning at low cost. Crowdfunding is opening new channels for financing. Then there is the blockchain, which many financial institutions are testing. It is conceivable that parts of the financial infrastructure will shift to this technology and render existing processes, and even some players, obsolete.

Finance has benefited greatly from technological advances. However, these improvements have not been passed on as lower costs to the consumers. And they have not halted the decline in the industry's profitability.

Cyber and market risk

For regulators, fintech cannot only be about opportunity. Some of the risks associated with it are more philosophical or societal. There are questions about consumer autonomy as processes become more algorithm-based, as well as concerns about adequate privacy protection.

The most obvious risk is cyber attacks. The financial sector is the single most attractive target. Data from Melani, the Swiss reporting and analysis centre for information assurance, show that 62 out of 94 incidents reported to it targeting critical infrastructure in 2017 occurred in the financial sector.

A second important risk is the extent of outsourcing. As traditional value chains fragment, risks migrate. Many financial institutions outsource back office functions, increasingly across borders. The economic rationale is compelling, but should not come at the cost of stability. Data needs to be instantly accessible during a crisis and confidentiality protected. Equally important is the stability of third party service providers, who are mostly non-financial institutions.

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Then there is market risk. Bitcoin's price rose 17-fold in 2017 and 64-fold in the last three years. Some see this as the biggest bubble in financial history. For others, this is merely a short stop on the march to an anonymous and free financial system. In my view, an anarchic, parallel monetary world is unlikely to grow to critical mass. The best way to exploit the potential of blockchain technology is to accept that innovation-friendly regulation and supervision is the best deal there will be.

Categorising crypto tokens

Initial coin offerings of cryptocurrencies erupted last year. Growing from a relatively unknown fundraising method used in the blockchain community, ICOs raised over $6bn in 2017 through almost 900 projects. Switzerland has become a hub for ICOs, with four of the six largest offerings in 2017 taking place there.

Cryptomania is everywhere. Last year FINMA was flooded with enquiries about the applicability of its regulation to ICOs. There were three basic options: anarchy, prohibition, or a third, more reasonable approach.

The third option is quite simple. In assessing ICOs, FINMA looks at the economic function and purpose of the issued tokens, which are categorised into three types. Payment tokens are synonymous with cryptocurrencies and have no further functions or links to other development projects. Utility tokens are tokens which are fully functioning ways of providing digital access to an application or service. And asset tokens are tokens that are issued in fundraising processes and are functionally analogous to equities, bonds or derivatives. Payment tokens like bitcoin and newer utility tokens look like means of payment and are therefore subject to anti-money laundering controls. Asset tokens look like securities and therefore fall under securities law.

There is an assortment of innovators, imitators, regulatory arbitrageurs and fraudsters in the cryptoworld. It's the job of regulators to ensure that the innovators have the chance to thrive if their idea is worth it, that the arbitrageurs have nothing to gain, and that the fraudsters end up where all fraudsters should.

IMI International Monetary Review

Hazards of Initial Coin Offerings: Regulatory Coordination Needed to Attract Institutional Investors*

By BHAVIN PATEL*

The access to distributed ledger technology that underpins ripple, ethereum, bitcoin and other cryptocurrency platforms has allowed companies to create their own digital tokens that can be offered to the public to generate funds.

These 'initial coin offerings' provide an alternative source of venture capital for start-ups and encourage innovation in how these digital tokens can be used. Between January 2017-February 2018, ICOs raised $4.5bn, outweighing venture capital investment in blockchain-related start-ups more than threefold.

In contrast to initial public offerings on stock exchanges, ICO issuers do not sacrifice equity for financing. ICOs also allow for borderless online sales with fewer points of friction. They typically bypass legal, jurisdictional and business hurdles, and investment is promoted directly to a global investor base. However, investors face major risks.

There is a lack of market security; 81% of ICOs are fraudulent, according to ICO advisory firm Satis Group. Investors buy into the promise of a digital infrastructure's utility and significant returns without having access to the underlying product. They usually can't consult business plans or accurate financial information about the issuer. These hazards are exemplified by the fact that only 8% of all cryptocurrencies make it on to exchanges.

Issuers are often anonymous and difficult to trace, making it easier for fraudsters to exit the market with investors' capital. In addition, the method of investing adds a layer of 'currency risk', as investors must buy into ICOs through existing cryptocurrencies with high price volatility. This could make cashing out into a fiat currency especially costly.

As most digital tokens are issued without being registered as securities, investors are denied a number of legal rights. There are no shareholders rights, and a lack of liquidity preference in the event that the company defaults or becomes insolvent. This means ICO holders are unlikely to reclaim their initial investment. Furthermore, the absence of antidilution protection allows issuers to release additional tokens to generate more funding, diluting the value of initial investors' holdings.

One way in which investors can find protection is to sell their tokens very soon after an ICO. This is a strategy that many venture capitalists follow to insure against devaluation. However, this only increases market volatility.

Determining what legal and supervisory framework a cryptocurrency falls under depends on how regulators classify it among asset classes. International coordination on this is lacking, and the various jurisdictions that do regulate cryptocurrencies categorize them in different ways. Others use a case-by-case approach to determine a cryptocurrency's asset class.

These inconsistencies create the risk of regulatory arbitrage. Competition between regulatory regimes, as countries try to attract innovative companies, exacerbates this divergence between markets.

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In the US and Canada, cryptocurrencies fall into legal grey areas. The European Union is yet to formalize its approach, as the European Securities and Markets Authority is assessing how to apply Mifid II rules to digital assets. The Swiss Financial Market Supervisory Authority, Bermuda Monetary Authority and Gibraltar Financial Services Commission define cryptocurrencies as a separate asset class to which new regulations should apply.

Greater regulation will have a positive effect on ICOs and the cryptocurrency market only if it provides certainty about how markets will operate globally. Strengthening investor protection by providing assurances and improving transparency during ICOs could attract institutional investors, which would generate liquidity and support market stability.

IMI International Monetary Review

Working Paper

The Impact of Internet Sales Tax in a Search Model of Money:

Some Analytical Results*

By **TIANTIAN DAI, SHENYI JIANG, XIANGBO LIU AND WEN WANG***

We use a search-theoretic model to study the impact of internet sales taxes, in both lump-sum and proportional fashions. We show that both forms of taxes, especially the lump-sum tax, have real effects on the online market if the terms of trade are negotiable, while a proportional tax distorts the economy further. We then propose a preferential tax policy and show that it together with a lump-sum internet sales tax can recover the first best. We also give some policy suggestions.

Keywords: Internet sales tax, Policy implications

JEL Classification: H25; L81

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1. Introduction

Global electronic commerce sales will increase by 18.3% to $1.298 trillion in 2013, according to the estimation by eMarketer. Although online transactions currently still make up only a very small fraction of total retail sales, the rapid growth of e-commerce and its de facto tax-free status have kindled a considerable debate surrounding the issue of internet taxation. Some researchers, making an "infant industry" argument, favor no tax or at least no tax in the short run to protect the development of e-commerce.[1] Other researchers argue that if electronic commerce were tax-free, sales tax base would be eroded and traditional retailers would become less competitive in the market.[2] If e-commerce were to be taxed, what is the impact on internet purchases

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[1] The most substantial academic work on the sensitivity of online sales to taxation is Goolsebee (2000). Using the 1997 Forrester Research survey data, he found that consumers living in the high sales tax rate states tend to purchase online and subjecting e-retailers to taxation will reduce online sales by 24%. Also see, Trandel (1992) for similar arguments for the use tax on cross-border sales.

[2] Bruce and Fox (2000) estimate the sales tax revenue losses quantitatively based on the general sales tax and predict that e-commerce may cause about 10.8 billion tax revenue losses nationwide in 2003.

and an individual's welfare, would taxation seek to be neutral and equitable between e-commerce and traditional commerce or preferential for e-commerce? Surprisingly, no one has provided theoretical answers to these important questions. To fill the gap in the literature, we use a search-theoretic model a l`a Lagos and Wright (2005) where agents trade both anonymously online (decentralized market) and in the traditional market (centralized market), to study the impact of internet sales tax, in both lump-sum and proportional fashions, and its policy implications. We show that both forms of taxes, especially the lump-sum tax, have real effects if the terms of trade are negotiable. The proportional tax distorts the economy further and can only achieve a third best. Hence, in order to recover the first best in this economy, we show that the preferential tax policy should be conducted, more precisely, subsidizing online buyers.

The online market is partially featured by anonymity and random matching. Its price mechanism includes bargain, auction and price posting. In this paper, we focus on price bargaining, since more people learned how to bargain online and this phenomenon is negligible. For example, China's biggest e-commerce player, Alibaba, provides tools for buyers and sellers to negotiate prices before trading. Even in US, there are many software online for buyers to use. Therefore, even sellers post prices online, the prices are still negotiable to some extent. We assume the trade is conducted through an intermediary, in reality, they are PayPal in U.S. or Alipay in China for example.[3] Usually, such intermediary is an online payment system which holds the payment for the buyers to avoid receiving flawed products sold by suppliers. Since every transaction record can be kept, the government actually can collect the internet sales tax through the intermediary.[4] Using the LW framework, we can show that the existence of such intermediary facilitates trades and improves the individual's welfare (see e.g. He, Huang and Wright, 2005, 2008). Therefore, our analysis is under the assumption that taxing through an intermediary is feasible.[5]

We are also interested in the optimal fiscal policy that can protect the development of e-commerce in the infant period as well as improve the social welfare. We show that granting a tax exemption is not enough to recover the first best and government can conduct a proportional subsidy policy for online buyers. The optimal amount of subsidy is not trivial, which depends on the quantity of money traded. In particular, the more money a buyer carries, the more she should be subsidized. This is because, first, the subsidy can compensate the loss in the total surplus caused by the internet sales tax. Second, since money is also subject to the inflation tax, large money holders should receive more subsidies in order to cover these losses. In general, the source of the subsidy is not limited in general, while it collected from internet sales tax in our model.

In terms of related works, Bruce, Fox and Murray (2000) argue that the optimal tax literature does not support exemption of internet sales tax in general since the optimal conditions are hard to be met in practice. McLure, Jr. (2003) proposed an economically efficient sales tax system for e-commerce in which all sales to customer would be taxed, all sales to business would be

[3] To avoid cheating associated with online transaction, Alibaba start a third warranty, Alipay, to settle payments for buyers. The intermediary grows into an indispensable tool for online transaction in China. In 2012, the total transactions through Alipay on a single bachelor's day exceeded 3 billion US dollars.

[4] The anonymity of online transactions seriously complicate both tax administration and tax compliance, if taxes are based on the destination of sales or the source of income. With proper administration and technology, the existence of internet tax intermediary can solve this problem.

[5] In the literature, an intermediary is identified with four roles: aggregation, pricing, search, and trust. The intermediary in our model aggregates all the information among suppliers, offers the platform for searching and transaction and holds money for buyers. We do not explore the role of pricing. The roles of aggregating and trust are also different from those in the previous literature (see among others, Williamson, 1975, Croson, 1995 and Buxmann, Rose, and Konig, 1997).

exempted while sales by local and remote vendors would be taxed equally. Ellison and Ellison (2009) estimate the sales of a group of small firms selling computers parts online and find that e-retail sales are very sensitive to taxes levied on traditional retail purchases. However, supporters of preferential tax treatment on e-commerce provide some compelling arguments that the e-commerce market tends to under-provide goods characterized by network externalities if treated equally (Zodrow, 2003). Similarly, Goolsbee and Zittrain (1999) note that the existence of various network externalities may imply a text"significant social cost" if computer network was inefficiently small. In this case, preferential tax treatment of e-commerce might be desirable to encourage the expansion of the network to its efficient size, at least in the short run. Network externalities thus potentially supply an defensible economic rationale for preferential tax treatment of e-commerce. Nevertheless, all these arguments are based on the changes of tax structure to compensate the revenue loss as well as protect the infant industry. Contrary to their works, we argue that a preferential tax policy can offset the negative effect of internet sales tax.

The rest of the paper is organized as follows. Section 2 describes the baseline model with taxation. Section 3 discusses the preferential tax policy. Section 4 gives out some political suggestions. Section 5 concludes.

2. Baseline Model

2.1 Environment

Time is discrete. A [0, 1] continuum of agents live forever with discount factor $\beta \in (0, 1)$. Each period is divided into two subperiods. In the first subperiod, a decentralized online market opens, agents trade special goods q anonymous online. Agents are matched randomly online with σ being the probability of single coincidence of wants, where $\sigma \in (0, 1)$. With probability $1-2\sigma$, agents are non-traders. In each match, buyers enjoy utility u(q) while sellers suffers disutility c(q). Functions u and c are twice continuously differentiable u', c'>0, u"<0, c"≥0, u(0)=c(0)=0. In order to rule out barter trades, we assume that there is no double coincidence of wants. We assume that the payment is settled through a benevolent intermediary. In particular, the intermediary holds buyers' payments before they receive the right products.[6] Therefore, this intermediary can collect internet sales taxes for the government who can also pay subsidies back to the traders through this system. Nevertheless, we do not explicitly model the intermediary here. In the baseline model, we assume that government levies both a lump-sum tax (T) and a proportional internet sales tax with td being the tax rate.

In the second subperiod, a centralized market opens where agents engage in traditional trades. They produce and consume a general good. The production technology is a one for one transformation from labor H into a general good. The utility function is quasi-linear, U(X)-H with U' > 0≥U". Both special goods and the general good are not storable. Therefore, fiat money is the only object which can be used as a medium of change in this model.

The aggregate money supply evolves according to $M_{+1} = (1 + \tau)$ M, where +1 denotes the next period. Let - be the price of money in terms of goods. Then the government budget constraint is $G = T \varphi + t_d d\varphi + \tau M\varphi$, where G is the government spending. Note here, we assume that government charges different T every period such that keeping the real lump sum tax ($T\varphi$) being constant over time. The newly printed money are injected through a lump sum transfer to each agent during the second period.

2.2 Agent's Problem

Let W (m) be the value function for an agent in the centralized market and V (m) be the value

[6] In reality, in order to avoid buyers from cheating, the intermediary sets a deadline to buyers for confirming their orders. Therefore, sellers can get the payment as long as buyers do not choose to return their orders.

function in the decentralized market, where m is an agent's money holding. Then an agent's problem in the centralized market is

$$W(m) = \max_{X,H,m_{+1}} \{U(X) - H + \beta V_{+1}(m_{+1})\}, \tag{1}$$

subject to

$$X = H + \phi(m - m_{+1}) + \tau M\phi. \tag{2}$$

As standard, we can get two first order conditions U'(X∗) = 1 and $\beta V'_{+1,m}$(m+1) = φ, which implies X∗ = X^{FB} and the money distribution is degenerate at the end of each period.

Moving to the decentralized market, agents are random matched with the payoff

$$\begin{aligned} V(m) &= \sigma[W(m - (1 + t_d)d - T) + u(q)] \\ &+ \sigma[W(m + d) - c(q)] + (1 - 2\sigma)W(m). \end{aligned} \tag{3}$$

The first term is the flow value of a matched buyer who pays (1 + t_d) d-T quantity of money for q quantity of goods.[7] The second term is the flow value of a matched seller who receives money and pays disutility of producing. Lastly, the third term is the value of being a non-trader.

The terms of trade (q, d) is determined by Nash bargaining with θ being the buyer's bargaining power. We denote the buyers' and sellers' money holding as m_b and m_s respectively. Hence, the buyer's trading surplus is u(q) ((1 + t_d)d + T) φ, and the seller's trading surplus is c(q) + dφ. As in Lagos and Wright (2005), we can show that, in equilibrium, agents would not bring unused money into the decentralized market (d = m), therefore we can get mφ=g(q) and g'(q)q'(m) = φ, where,

$$g(q) = \frac{\theta c(q)u'(q) + (1 - \theta)c'(q)[u(q) - \phi T]}{\theta u'(q) + c'(q)(1 - \theta)(1 + t_d)}, \tag{4}$$

and

$$g_q = \frac{u'c'[\theta u' + (1 - \theta)(1 + t_d)c'] + \theta(1 - \theta)[u - (1 + t_d)c - \phi T)](u'c'' - c'u'')}{[\theta u' + (1 - \theta)(1 + t_d)c']^2} > 0. \tag{5}$$

Since the total trading surplus u(q)−c(q)− t_ddφ+T φ and the seller's surplus −c(q) + dφ are all non-negative, we can show that u − (1 + t_d)c − φT ≥ 0, and, hence g_q > 0 follows. Then by using bargaining solution and repeated substitution, we can get

$$g(q) = \beta g(q_{+1})\{\sigma[\frac{u'(q_{+1})}{g'(q_{+1})} - (1 + t_d)] + 1\}. \tag{6}$$

Then, we assume there is a unique equlibrium in this model,[8] and the steady state equation is

$$\frac{u'(q)}{g'(q)} = \frac{1 - \beta}{\beta\sigma} + (1 + t_d). \tag{7}$$

2.3 The Impact of Internet Taxes

[7] Since the terms of trade are determined by the bargaining process, our results will not change qualitatively if taxes are passed forward to sellers.

[8] Actually, g'' (q) > g'(q)u''/u' is a sufficient condition for the uniqueness.

In this section, we study the impact of two types of internet taxes, namely, lump-sum tax and propotional tax. By taking the total derivatives, we can show that both types of taxes have negative effects on the quantity of goods traded in the online market. Intuitively, a higher propotional tax rate reduces buyers' real money balances, which lowers their total trading surplus. This discourages buyers' incentives from bringing money into the online market. As a result, sellers produces less, and the quantity of goods per match decreases. The more interesting result is the novel effect of lump sum tax, since it does not affect agents' decisions in a traditional model. The lump sum tax has a negative effect in this model is becuase of T φ entering the bargaining problem and m = d in equilibrium. Since buyers are constrained, a higher lump sum tax reduces buyers' real money balances, and hence buyers would bring less money into the market, which has a negative effect on the quantity of goods per match.[9] We summarize these results in the following proposition.

Proposition 1. *The quantity of good per match traded in the online market decreases in both lump sum tax and propotional tax rate.*

Proof. Differentiating the steady state equation with respect to t_d and T φ, we can get

$$\frac{dq}{dt_d} = \frac{(g'(q))^2}{u''(q)g'(q) - 2g''(q)u'(q)} < 0. \tag{8}$$

$$\frac{dq}{d(T\phi)} = \frac{g''(q)u'(q)}{u''(q)g'(q) - g''(q)u'(q)} < 0. \tag{9}$$

Note that u" (q) < 0, u'(q) > 0 and g'(q) > 0. Moreover, g"(q) > 0, because in equlibrium the money constraint is always binding (ex. m = d). Thus, the quantity of goods per match cannot achieve the efficient level, and g(q) should increase with an increasing rate.

As showed in Lagos and Wright (2005), the first-best outcome is in general not attainable and depends on the bargaining power, discount factor and the money growth rate. Here, from the bargaining solution, we have ul(q) = cl(q)(1 + td), which shows that a proportional tax distorts agents' decisions and reduces the online market's efficiency further. Now, we know that if there exists bargaining in the online market, the developement of this market can be limited by internet sales taxes, while tax exemption does hurt the traditional retailers on the other hand. Therefore, we are in a position to discuss whether a preferential tax policy can balance the two. Since a positive tax rate distorts the online market further, we will only consider the preferential tax policy with a lump-sum internet sales tax.

2. Preferential Tax Policy

The rationale for preferential taxation in the decentralized markets can be explained with network externalities[10], environmental externalities[11] and efficiency improvement[12]. Though we

[9] If buyers bring enough money in the the online market, we will get u'(q) = c'(q), and d=[θc(q) + (1-θ)u(q)]/[φ(1 + t_d)]-(1-θ)T /(1 + t_d). Therefore, φT do not have real effects on q.

[10] A network externality (sometimes called a "network effect") is the cost or benefit that incumbent users get from an additional member joining the network. Katz and Shapiro (1985; 1994) divided these benefits into two types. It can be direct (such as the benefit from having one more person to exchange information on the product) or indirect (from a larger network of users encouraging greater investment in network resources and increase the choices for customers).

[11] A physical presence requires selection of a proper location with the facilities necessary to serve consumers while an Internet server can be in a very remote location and with no physical storefront, which means less space occupation and less waste.

[12] When markets transition from a physical environment to the Internet, consumer who has a limited set of choices because of

do not explicitly model these externalities, they do affect agents' decisions in the real world. With an efficient market size, the cost of peripheral services can be much lower.[13] Therefore, we argue that preferential tax can potentially reduce the effects of those negative externalities.

The setup for the centralized market is the same as in the baseline model. The difference is that, in the online market, if a buyer matched with a seller, we assume that he will receive a subsidy B(d) which depends on the quantity of money traded. Therefore, the new value function is

$$\begin{aligned} V(m) &= \sigma[W(m-d-T+B(d))+u(q)] \\ &+ \sigma[W(m+d)-c(q)]+(1-2\sigma)W(m). \end{aligned} \tag{10}$$

We will show that B(d) is not trivial, namely, it is not a simple lump-sum transfer. The terms of trade (q, d) is determined by solving the following Nash bargaining problem

$$[u(q)+W(m_b-d-T+B(d))-W(m_b)]^{\theta}[-c(q)+W(m_s+d)-W(m_s)]^{1-\theta}. \tag{11}$$

Still, we have d = m in equlibrium, and it is easy to check that m<m*, with m* being the efficient money holding (ex. ul(q) = cl(q), if m≥m*). Therefore we can get mφ = g(q) and g'(q)q'(m) = φ, where,

$$g(q)=\frac{\theta c(q)u'(q)+(1-\theta)c'(q)[u(q)-\phi T+\phi B(m)]}{\theta u'(q)+c'(q)(1-\theta)}, \tag{12}$$

and

$$g_q=\frac{u'c'[\theta u'+(1-\theta)c']+\theta(1-\theta)[u-c-\phi T+\phi B(m)](u'c''-c'u'')}{[\theta u'+(1-\theta)c']^2}>0. \tag{13}$$

It is easy to check that u c φT + φB(m) 0. Then by using bargaining solution and repeated substitution, we can show that the slope of V (m) as m → m* is proportional to the equation below

$$-\phi+\beta\phi_{t+1}\{\sigma\Gamma+1\}, \tag{14}$$

where

$$\Gamma=u'\frac{1}{g'_{+1}}-1+B'(m). \tag{15}$$

Γ is the buyer's marginal benefit of bringing an additional dollar evaluated at q = q* and also equals

$$\Gamma=\frac{c'^2}{c'^2+\theta(1-\theta)[u-c-\phi T+\phi B(m)][c''-u'']}+B'(m)-1. \tag{16}$$

As showed in Lagos and Wright (2005), only in the extreme case where φt = βφt+1 and θ = 1,

geographical limitation and search costs can have more choices and convenience. The greater competition in the market, the greater choice of suppliers and product selection for consumers make trade easier and efficient. Another benefit in electronic commerce is the electronic player is infinitely patient and customer-led.

[13] For e-commerce, it includes fixed cost, shipping costs and storage costs, which all contribute to the benefits of economies of scale.

the first best can be achieved (ex. m = m*). Contrary to their results, we will show that the first best is achievable with B(m), with the optimal inflation, even if θ = 1. First, we can show that B'(m) > 0, B"(m) < 0, and B'(m)→0 as m→m*. These conditions imply that the more buyers spent in the online market, the more subsidies he can get; and the diminishing increase of subsidy implies that the economy is achieving the first best.[14] Therefore, if θ = 1, we can show that Bl(m) = 0 at the Friedman rule (ex. Γ = 0), which implies m = m* . This condition states that if the buyer has all the bargaining power, the government, in order to recover the first best, has to subsidize the buyer B(m*) amounts of money such that Bl(m*) = 0. Next, if θ < 1, Γ = 0 implies Bl(m) > 0, therefore, the first best is still achievable, if B(m) satisfies the following condition

$$B'(m)c'^2 + \theta(1-\theta)[u - c - \phi T + \phi B(m)][c'' - u''][B'(m) - 1] = 0. \quad (17)$$

Note that the buyers receives less subsidy in this case. The intuition is the following. The bargaining solution only depends on the buyer's money holding, and he brings less money into the online market if the seller shares the trade surplus, and, thus, the government do not need to rebate as much as in the θ = 1 case. The above analysis can be summarized in the following Lemma and Proposition.

LEMMA 1. *The subsidy function is locally concave, in particular,* $B'(m) > 0$ *and* $B''(m) \leq 0$ *as* $m \to m^{**}$ *(see Appendix for a proof).*

PROPOSITION 2. *The the first best can be recovered with a preferential tax on buyers at the Friedman rule. In particular, the first best requires* $B'(m) = 0$ *if* $\theta = 1$ *and requires* $B'(m^{**})c'^2 + \theta(1-\theta)[u - c - \phi T + \phi B(m)][c'' - u''][B'(m^{**}) - 1] = 0$ *if* $\theta < 1$, *where* $m = d$ *in equlibirum.*

4. POLICY IMPLICATIONS

Here we discuss some policy implications that implied by our results. First, we show that a lump sum internet sales tax can reduce the quantity of goods traded in the online market, if buyers can bargain the price. This implies that the lump sum tax may have real effects, and the results depends on the market structure. Of course, people do observe other price mechanisms existing in the online market, such as price posting and auction. We believe that comparing the effects of taxes under different price mechanism, both qualitatively and quantitatily, are very interesting and important, but this is beyond the scope of this paper.

Second, we show that a lump sum tax together with a preferential tax policy can recover the first best. Therefore, we suggest that the government can tax the online market as well as protect the market as a infant industry. Moreover, the subsidy is not trivial in general and depends on the quantity of money traded which is equal to the buyer's money holding in this model. Third, non-trivial subsidy depends on the buyer's bargaining power. The more bargaining power a buyer has, the more government has to subsidize. Finally, agents are heterogeneous in the real life, and, therefore large buyers should be subsidized more. Since agents are identical in our model, they get the same amount of subsidy.

5. CONCLUSION

[14] We also checked other government policies, such as the subsidies on the sellers, lump-sum subsidies on the buyers and subsidies both buyers and sellers, but none of them can recover the first best.

In this paper, we study the impact of internet sales tax on the online market, and find that the lump-sum tax has real effects on agents' decisions if buyers can bargain prices. The quantity of trade per match decreases with both forms of taxes, and the economy can be distorted further by a proportional tax. Given both forms of taxes have negative effect on agents' welfare, we propose a preferential tax and show that itself together with a lump-sum transfer can recover the first best and balance the electronic and traditional commences. Moreover, the preferential tax is not trivial and depends on the quantity of money traded. Aruoba, Boragan and Christopher (2011) use a search model with taxes to study the effect of money on capital, while they tax the activities in the centralized market and answer different questions.

In general, the source of subsidy is not limited to the internet sales tax collected from buyers. Therefore, interactions among different forms of taxes worth further investigating. What do an optimal internet taxation and optimal tax structure look like? How does the relationship between fiscal policy and monetary policy change if we take the internet sales tax into account? We leave all these open questions for future research.

APPENDIX: PROOF OF LEMMA 1

Now the value function in the decentralized market still can be reduced to equation (25), while

$$v = \sigma[u(q) + \phi B(m) - \phi d - \phi T] + \sigma[\phi d - c(q)] + U(X^*) - X^*. \quad \text{(A.1)}$$

Moreover, the first order condition and the Envelop condition becomes

$$\phi = \delta[v'_{+1} + \phi_{+1}], \quad \text{(A.2)}$$

$$v_m = \sigma[u'(q)q' - \phi d' + \phi B'(m)]. \quad \text{(A.3)}$$

Again, the slope of equation (11) as m→m* * is proportional to the equation below

$$-\frac{g}{m} + \beta\{\sigma[u'\frac{g_{+1}}{g'_{+1}m_{+1}} + \frac{g_{+1}}{m_{+1}}(B'(m) - 1)] + \frac{g_{+1}}{m_{+1}}\}, \quad \text{(A.4)}$$

where

$$\Gamma = u'\frac{1}{g'_{+1}} - 1 + B'(m). \quad \text{(A.5)}$$

Γ is the buyer's marginal benefit of bringing an additional dollar evaluated at q = q* * and also equals

$$\Gamma = \frac{c'^2}{c'^2 + \theta(1-\theta)[u - c - \phi T + \phi B(m)][c'' - u'']} + B'(m) - 1. \quad \text{(A.6)}$$

With $u' > 0$ and $g_q > 0$, it is easy to get that $B'(m^{**}) < 1$ for $B'(m^{**}) = 1 - \frac{u'}{g_{+1}'}$. We have already get that the best subsidy structure can be rewritten as $B'(m^{**})c'^2 + \theta(1-\theta)[u-c-\phi T+\phi B(m)][c''-u''][B'(m^{**})-1] = 0$ at $m = m^{**}$. It is obvious that $B'(m) > 0$ as $m \to m^{**}$.

The slope of the objective function as $m \to m^{**}$ is proportional to the equation below

$$\Gamma = u'\frac{1}{g'_{+1}} - 1 + B'(m). \quad \text{(A19)}$$

Differentiate Γ with respect to m, we can get that

$$\Gamma' = \frac{u''g'_{+1} - u'g''_{+1}}{(g'_{+1})^2} + B''(m) \qquad \text{(A20)}$$

With the assumption of unique equilibrium, Γ'⩽0 should be satisfied for m∈[0, m* *], then B"(m)⩽0 must be satisfied as m→m* *

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Regime-dependent Determinants of Euro Area Sovereign CDS Spreads

By **HANS BLOMMESTEIN, SYLVESTER EIJFFINGER AND ZONGXIN QIAN***

We study the determinants of sovereign CDS spreads of five Euro area countries (Greece, Ireland, Italy, Portugal, and Spain) after the collapse of Lehman Brothers. We find that global and/or European Monetary Union (EMU)-wide factors are the main drivers of changes in the sovereign CDS spreads in our sample. However, the impacts of those factors change with market uncertainty. There is a relatively tranquil regime where market uncertainty is low and a relatively turbulent regime where market uncertainty is high. The transition from the tranquil regime to the turbulent regime is driven by changes in the global jump risk, which suggests that contagion from the global financial market significantly affected the pricing of sovereign credit risk in our sample. Domestic economic and financial indicators have little impact on the pricing of sovereign credit risk in all sample countries except Italy. But changes in the sovereign credit risk have significant impacts on domestic economic and financial indicators. Neglecting the financial contagion and feedback effects from sovereign credit risk to domestic economic and financial developments leads to spurious results regarding the determinants of sovereign CDS spreads.

Keywords: Regime switching; Endogeneity; European debt crisis; Sovereign credit default swap spread

JEL Classification: G15; F34

1. Introduction

During the European sovereign debt crisis, sovereign credit default swap (CDS) spreads of the Euro countries drew a lot of public attention. The reason is that a country's CDS spread is usually taken as an indicator of that country's sovereign credit risk (OECD,2012). In an influential early study, Edwards (1984) links countries' probabilities of default to their sovereign credit spreads and studies the macroeconomic determinants of sovereign defaults by investigating their relationships with the sovereign credit spread. Those macroeconomic determinants are interpreted as proxies for countries' ability and willingness to pay its debt. Subsequent studies extend Edwards' research line by extending the sample period and country coverage, adding new potential determinants of sovereign credit spread to the empirical model, and estimating the model with new econometric techniques (Boehmer and Megginson, 1990; Cantor and Packer, 1996; Min, 1998; Eichengreen and Mody, 1998; Kamin and von Kleist, 1999; Arora and Cerisola,2001; Baek et al., 2005; Dailami et al., 2008; Hilscher and Nosbusch,2010; Baldacci et al., 2011; Aizenman et al., 2013; Beirne and Fratzscher, 2013).

While the literature on the macroeconomic determinants of sovereign credit spread is helpful

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for a better understanding of sovereign defaults, it is relatively silent on the nature of sovereign credit spread during a specific crisis period. This is due to the low frequency of macroeconomic data. In this paper, we study the determinants of changes in the sovereign CDS spreads of five Euro-area countries (Greece, Ireland, Italy, Portugal and Spain) in the post-Lehman-Brothers period (from September 15, 2008 to December 19, 2011). Therefore, our focus is to study the determinants of sovereign CDS spreads in a crisis period. We think this topic is interesting and important for two reasons. First, decision makers during the crisis have to understand the sources of the sovereign credit risk to correctly react to the crisis. Second, the determination process of the sovereign credit risk in a crisis is different from the process in normal times. Therefore, existing studies using data from normal times are not helpful for decision-making during the crisis.

According to the IMF (2013), the year 2008 marks a significant structural change in the trading history of sovereign CDS contracts.

The sovereign share of single-name CDS contracts remained at a low level before 2008 but starts to increase rapidly after 2008.For example, the gross notional amount outstanding of Ireland's sovereign CDS contracts was only 18 billion US dollars and ranked262nd among all traded CDS contracts by the end of 2008. The gross notional amount outstanding jumped to 51 billion US dollars and the ranking climbed to the 30th by the end of 2012. This dramatic example suggests that it is actually during the crisis period that investors are more interested in sovereign CDS contracts. Pol-icy makers are also keen to find a way to precisely identify the factors adding pressure to sovereigns which are already in trouble. Fontana and Scheicher (2010), Dieckmann and Plank (2011), and Fender et al. (2012) find that the pricing of sovereign credit risk is different between normal times and crisis times, which suggests that historical developments in the sovereign CDS market in normal times are less indicative for decision makers facing the crisis.

In order to obtain enough variations in the data for clear identification, we follow recent empirical studies (Pan and Singleton, 2008; Fontana and Scheicher, 2010; Longstaff et al., 2011; Dieckmann and Plank, 2011; Fender et al., 2012) to use financial indicators as potential determinants of sovereign CDS spread. Since data on financial indicators are available at higher frequencies than macroeconomic indicators, using financial indicators provides additional variations in the data, which helps identify the determination process of sovereign credit spreads during a relatively short time period such as a financial crisis. Moreover, a recent study by D'Agostino and Ehrmann (2014) suggests that market participants' expectations on macroeconomic developments affect sovereign credit spreads. While real-time macroeconomic data only contain information about the past, financial indicators incorporate information on agents' expectations about future macroeconomic dynamics (Collin-Dufresne et al., 2001; Dieckmann and Plank, 2011; Koop and Korobilis, 2014). Specifically, financial indicators incorporate information on macroeconomic developments which cannotbe observed by econometricians using lower-frequency real-time macroeconomic data but which is available to market participants.[1]

Although previous studies have already used financial indicators as potential determinants of sovereign CDS spreads, our paper differs from theirs in important aspects. First of all, those previous studies exclude the possibility of financial contagion. By definition, financial contagion means that spillover effects from one country to another country change across periods with

[1] D'Agostino and Ehrmann (2014) use Consensus Economics data to model expectations on macroeconomic dynamics. Their approach is an obvious alternative to modeling with financial variables. However, the data they use are at a monthly frequency. The frequency is too low to allow a long enough sample period during the financial crisis.

different level of uncertainty.[2] Previous studies, such as Longstaff et al. (2011), Dieckmann and Plank (2011) and Fontana and Scheicher (2010), find strong evidence of international spillover effects. More specifically, changes in global financial indicators appear to have a strong impact on individual sovereign CDS spreads. However, they do not consider the possibility of changes in international spillover effects when market uncertainty changes over time. Therefore, the possibility of financial contagion is excluded. In order to capture potential contagion effects, this paper introduces regime switching into the empirical model, which allows changes in international spillover effects over different regimes.

Our approach also provides a new way to look at financial contagion. Existing literature (Dungey et al., 2005) on financial contagion usually splits the sample into a non-crisis period and a crisis period, and tests whether the international spillover effects significantly differ in those two periods. This approach has a number of limitations. The splitting point, the starting time of the crisis period, is chosen according to some arbitrary criteria, for example, the unconditional variance of asset returns in the country where the crisis is originated. This practice is subject to the pretesting bias discussed by Danilov and Magnus (2004). Simply put, any error in the choice of the sample splitting criterion can bias the contagion test results. By contrast, our regime-switching approach does not require splitting of the sample. The identification of the tranquil regime and turbulent regime, and the estimation of international spillover effects under different regimes are integrated into one estimation process. Therefore, our approach is free from the pretesting bias. Moreover, the sample splitting approach requires a long enough crisis period for reliable estimation while our regime switching model does not suffer from this limitation.

Although they do not test for financial contagion, Fontana and Scheicher (2010), Dieckmann and Plank (2011), and Fender et al.(2012) do find significant changes in the determination process of sovereign credit spreads after the collapse of Lehman Brothers. Noting this structural change is important for policy makers to make the right decisions. Yet another important and frequently asked question for policy makers is whether financial contagion has changed the pricing of sovereign credit risk during the crisis. Answering this question properly is important because most decisions on crisis management have to be made during the crisis and understanding the sources of the sovereign risk at play is necessary for making the right decisions. Although important, this question is hardly asked in the existing literature due to technical difficulties. It is difficult to further split the crisis sample into a tranquil period and a turbulent period. Even if a choice of splitting point is made, the number of observations in the turbulent period might be too small for reliable estimation. As we have discussed above, our regime switching approach overcomes those problems.

Another important difference between the current paper and previous studies is that the covariates in the previous papers are assumed to be exogenous while they are allowed to be endogenous in our model. In other words, it is assumed in the previous studies that there are no feedback effects from sovereign credit spread to these covariates. However, this is a very strong assumption. The literature on sovereign defaults suggests that changes in sovereign credit spreads can affect domestic macroeconomic fundamentals. Particularly, Sandleris (2008) suggests that a sovereign default worsens investors' expectations about domestic macroeconomic indicators. Since these expectations affect domestic financial indicators, we would expect that sovereign credit spreads will have potential effects on domestic financial indicators. In addition, sovereign defaults could cause declines in domestic output by creating liquidity problems (Brutti, 2011) or preventing imports which are necessary for efficient domestic production (Mendoza

[2] There are a number of different definitions of financial contagion (Pericoli and Sbracia, 2003; Forbes, 2012). The definition we use here is one of the most popula r(Forbes and Rigobon, 2002; Dungey et al., 2005; Caporin et al., 2013).

and Yue, 2012). If changes in sovereign credit spreads contain information on the probability and extent of sovereign defaults, investors' expectations on domestic output will follow changes in the sovereign credit spreads. Such expectations can therefore affect domestic financial indicators. Moreover, changes in sovereign CDS markets are likely to influence the borrowing cost of countries (Delatte et al., 2012), which, in turn, may have a direct impact on the domestic economy. Another potential source of endogeneity is that the severity of a sovereign debt crisis (like the one faced by our sample countries) might have feedback effects on the global financial market. Consequently, the various potential sources of endogeneity need to be incorporated in models that are used for explaining the determinants of sovereign CDS spreads. Neglecting these potential sources of endogeneity could therefore cause estimation bias and, as a result, produce misleading empirical results. In this paper, we will allow for the possibility that one or more covariates are endogenous. To that end, we will use a two-step estimation technique developed by Kim (2009). More specifically, we will use this technique to estimate a regime switching model with instrumental variables and use it to formally test for the presence of endogeneity.

The rest of the paper is organized as follows: Section 2 introduces the explanatory variables and describes the data. Section 3provides estimates of OLS regression models for the determination of sovereign CDS spreads and tests for regime switching in the models. Section 4 presents estimates of a standard regime switching model, assuming covariates exogeneity. Section 5 shows estimated regime switching models with instrumental variables and tests for endogeneity. Section 6 provides evidence that the regime switching is driven by financial contagion. Section 7 concludes.

2. Variable and data description

2.1. The dependent variable: the sovereign CDS spread

The dependent variable in our empirical analysis is the sovereign CDS spread. A CDS contract can be taken as an insurance contract against the credit event specified in the contract.[3] Its spread, expressed in basis points, is the insurance premium the protection buyer has to pay. For example, a CDS spread of 20 basis points means the buyer of credit protection has to pay the seller an annual amount equal to 0.2 percent of the notional value of the reference debt obligation.[4] There are different credit events against which a sovereign CDS contract can insure. Following Dieckmann and Plank (2011), we consider only the CDS contracts on the credit event "complete restructuring", since it is the standard credit event in the European sovereign CDS contract. The contract maturity we consider is 10 years because the 10-year contract is the most liquid one for the European market. The spreads are quoted in US dollars, the standard currency for European sovereign CDS contracts. Our sample covers weekly data on 10-year government bond CDS spreads of Greece, Ireland, Italy, Portugal, and Spain from September 15,2008 to December 19, 2011. Importantly, our sample covers the period after April 2010, which is not covered in the previous studies surveyed in the introduction. Since sovereign debt problems in the sample countries become even more concerned by the public in this period, this extension is particularly interesting (OECD, 2012).

2.2. The covariates

Table 1 summarizes the covariates we use in the regression analysis. We include variables that are commonly perceived to affect the country's probability to pay its debt as covariates in the regression analysis. More specifically, we use a set of covariates which is similar to those used in recent empirical studies using high-frequency data (Pan and Singleton, 2008; Fontana and

[3] More precisely, it is a quasi-insurance instrument. See Pan and Singleton (2008) and Dieckmann and Plank (2011) for a more detailed description of the sovereign CDS contract.

[4] In our context, the reference debt is the sovereign bond.

Scheicher,2010; Longstaff et al., 2011; Dieckmann and Plank, 2011; Fenderet al., 2012).

Table 1
Variable definitions.
Note: All data are from Datastream. See the texts for detailed description on the orthogonalization of variables. The volatility risk premium is proxied by the difference between the implied volatility and the Garman-Klass realized volatility of EuroStoxx 50.

Variable	Definition
forex	Nominal Euro to US Dollar exchange rate, the amount of Euros per 100 US Dollars
stoxx	EuroStoxx 50 return (orthogonalized), percentage point
gbi	10-year benchmark German Bund interest rate, basis point
itraxx	iTraxx Europe 10-year CDS spread (orthogonalized), basis point
vp	Volatility risk premium, percentage point
fgro	MSCI World Financials index return (orthogonalized), percentage point
sdri	DJTM domestic stock market return (orthogonalized), percentage point
svol	GARCH(1,1) Domestic stock market volatility, percentage point
fdri	DJTM Financials index return (orthogonalized), percentage point

Theoretically, the state and volatility of the economy may affect a country's probability to pay its debt. Fiscal reforms necessary to honor the government's debt obligation can impose additional pressure on the already distressed economy. Therefore, when the domestic economy is weak and unstable, the policy maker will be less willing to implement the reforms. A weak economic situation can also negatively affect a country's ability to pay by reducing tax revenue. Previous studies (Fama and French, 1989; Flannery and Protopapadakis, 2002; Barro, 2006; Bjørnland and Leitemo, 2009; Gabaix, 2012; Belo et al., 2013; Wachter, 2013; Charles and Darne,2014) find that stock returns contain information on domestic macroeconomic dynamics and policy changes. Stock market investors also frequently update information on macroeconomic data (Gilbert, 2011). Therefore, we follow the literature (Collin-Dufresne et al., 2001; Ericsson et al., 2009; Fontana and Scheicher,2010; Longstaff et al., 2011; Dieckmann and Plank, 2011; Fender et al., 2012) to use the domestic stock market return and volatility to proxy the economic state and volatility, respectively. While Dieckmann and Plank (2011) use the domestic stock price index return, we follow Longstaff et al. (2011) to use the total return which also includes dividends. This choice is because changes in dividends also contains information on the performance of firms, which affect the performance of the economy.

Another domestic variable we consider is the stock market performance of domestic financial firms, the Dow Jones Total Market(DJTM) Financials index. Dieckmann and Plank (2011) argue that this variable measures the private-to-public risk transfer due to the costs of helping the distressed financial industry. The private-to-public risk transfer hypothesis states that a crisis in the financial industry might lead to a government bailout, which is a contingent debt of the government. The increase in such contingent debts reduces the probability that the government will repay its debt. Asa result, investors might require a higher return from holding the government securities to compensate for the increase in default risk. That means we should expect a higher sovereign CDS spread when the DJTM financials index is low.

Longstaff et al. (2011) suggest that changes in the global stock and bond markets can explain a large part of the variation in an individual country's sovereign CDS spread. Empirical studies on the European sovereign CDS market (Fontana and Scheicher,2010; Dieckmann and Plank, 2011) find the same result. For this reason, we also include indicators of developments in the

global stock and bond markets as covariates. More specifically, we follow Dieckmann and Plank (2011) to use the EuroStoxx 50 return and MSCI World Financials index as indicators for global stock market developments. We use 10-year German Bund rate and iTraxx Europe corporate CDS spread as indicators for global bond market developments. Dieckmann and Plank (2011) use corporate bond spreads rather than the iTraxx index to proxy European corporate credit spread. The corporate credit spread is not significant in their time series analysis. By contrast, Fontana and Scheicher (2010) find that the iTraxx index has strong explanatory power for European sovereign CDS spreads. For this reason, we use the iTraxx Europe index as the proxy for European corporate credit spread.

Theoretically, including global variables into the analysis could capture the international spillover effect (Longstaff et al., 2011; Dieckmann and Plank, 2011). The European Monetary Union(EMU)-wide stock market performance, EuroStoxx 50 return, is a proxy for the state of the Euro-area economy. Through trade linkages, the economic conditions in the other member countries can affect the home country's economy. More importantly, in a monetary union, a sovereign country's probability of default is partly affected by the willingness of the other member countries to bail it out, and the other member countries' willingness to pay will depend on their own economic conditions. In this case, a decline in the union-wide economy, proxied by the EuroStoxx 50 return, will increase the sovereign CDS spread. Similarly, a bad state of the world financial industry may affect the willingness of the international community to help an individual sovereign nation out of its debt problem.[5] Therefore, a decline in the World Financials index may increase the home country's sovereign CDS spread.

A higher German Bund rate could signal a higher rate of economic growth in Germany. This favorable outcome can in turn help improve the economic conditions of the other EMU countries and increase their willingness to help the member countries which have debt problems. Even if Germany's economic growth does not affect other member countries' economic performance, an improvement in its own economy alone can significantly affect the market expectation of defaults by the Euro-area periphery countries. This spillover effect is because Germany plays a leading role in negotiations on the bailout plans. Thus, an increase in the German Bund rate may reduce the sovereign CDS spreads of the periphery countries. Therefore, the expected sign of the German Bund rate is negative.

The European corporate CDS spread index, iTraxx, measures the corporate credit spread in Europe. It contains a proxy for the overall state of the European economy since the recovery rates of defaulted corporate bonds increase as the overall business climate improves (Collin-Dufresne et al., 2001). Because lower recovery rates lead to higher corporate CDS spreads, an increase in the iTraxx index implies a deteriorating macroeconomic condition. In this sense, we expect sovereign CDS spreads to be positively related to the iTraxx index. The iTraxx index also contains a proxy for investors' risk appetite. When investors become more risk averse, they will ask for higher credit spread for both corporate bonds and sovereign bonds. This again suggests a positive relationship between iTraxx and the sovereign CDS spreads.

If changes in the iTraxx index fully capture changes in investors' risk appetite, there is no need to include an additional proxy for the risk appetite into the analysis. Fontana and Scheicher (2010) find that the risk appetite proxy constructed from the Chicago Board Options Exchange Market Volatility Index (VIX) is not significant when the iTraxx index is included in the regression. Nevertheless, we add an additional proxy for investors' risk appetite for robustness. More specifically, we use the difference between the implied and realized volatility of

[5] We use a worldwide proxy for the performance of the financial sector rather than a Euro-area one because the latter is not available. Dieckmann and Plank (2011) use the same proxy.

EuroStoxx 50 return as the proxy for the global risk premium. This variable captures the pricing of the volatility risk, and therefore contains information on the investors' risk appetite (Longstaff et al., 2011). The implied volatility is the VSTOXX index directly available from Datastream while the realized volatility is estimated by the Garman and Klass (1980) estimator using a rolling 20-day window.

Finally, we include the nominal Euro-US Dollar exchange rate as a covariate. It is measured by the amount of Euros per 100US dollars. Thus, a higher value means a depreciation of the Euro against the US dollar. We expect a positive sign of this variable. In other words, a depreciation of the Euro increases the sovereign CDS spread. The exchange rate is taken as a global variable since the exchange rate is determined by the macroeconomic fundamentals of the EMU rather than a single member state.

2.3. Orthogonalization

Table 2
Correlation between stock market returns.
Note: Correlation coefficients are calculated using non-orthogonalized data.

	Greece				Ireland				Italy			
	stoxx	fgro	sdri	fdri	stoxx	fgro	sdri	fdri	stoxx	fgro	sdri	fdr
stoxx	1.00				1.00				1.00			
fgro	0.84	1.00			0.84	1.00			0.84	1.00		
sdri	0.68	0.59	1.00		0.77	0.77	1.00		0.95	0.81	1.00	
fdri	0.61	0.53	0.95	1.00	0.59	0.63	0.74	1.00	0.89	0.78	0.96	1.00

	Portugal				Spain			
	stoxx	fgro	sdri	fdri	stoxx	fgro	sdri	fdri
stoxx	1.00				1.00			
fgro	0.84	1.00			0.84	1.00		
sdri	0.78	0.64	1.00		0.92	0.77	1.00	
fdri	0.58	0.51	0.73	1.00	0.88	0.78	0.97	1.00

Financial asset returns are highly correlated to each other (see Table 2). That means including different asset returns into the regression can cause a multicollinearity problem which affects identification. Therefore, it is better to orthogonalize the variables before using them as covariates in the regression. We follow Dieckmann and Plank (2011) to construct the orthogonalized value of a variable as the sum of the estimated intercept and residuals of a regression of that variable on other covariates correlated to it. More specifically, domestic Financials index returns are regressed on the domestic stock market returns and the World financials index return; the World Financials index return is regressed on the global stock market return. Dieckmann and Plank (2011) do not orthogonalize the domestic stock market returns and the European corporate credit spread. Fontana and Scheicher (2010) suggest that orthogonalizing the domestic stock market returns also helps improve identification. Therefore, we orthogonalize the domestic stock market returns by regressing them on the global stock market return and construct the domestic stock market volatility indicators using the orthogonalized series. Alexander and Kaeck (2008) find that changes in the iTraxx index can be explained by changes inVSTOXX and changes in global stock and bond market conditions. Thus, to facilitate identification, we orthogonalize the change in the iTraxx index by regressing it on the change in the VSTOXX index, the global stock market return, the World Financials index and the10-year German Bund rate.

3. OLS regression analysis

As discussed in the introduction, previous studies usually use OLS models to study the determinants of sovereign CDS spreads. This approach assumes no financial contagion and no feedback effects from changes in the sovereign credit risk to domestic economic and financial developments. Our regime switching model with endogenous variables relaxes those assumptions. To see the impacts of those assumptions on the estimation results, we need to compare the results of different models. To facilitate the comparison, this section presents the

results from the OLS model.

Table 4 summarizes the estimation results of the following linear OLS regression model.

$$\Delta CDS_t = \Delta x_t' \beta + \epsilon_t, \quad (1)$$

where CDS_t is the sovereign CDS spread, x_t is the vector of covariates listed in Table 1, ϵt is the i.i.d. error term and Δ is a first difference operator. The OLS regressions assume that ϵt is independent of x_t. We follow the previous studies to run the regression withfirst differenced data (see Table 3 for descriptive statistics of first differenced data).

Consistent with previous studies, our OLS results suggest that changes in the global bond market conditions have strong explanatory power to changes in sovereign CDS spreads. More specifically, increases in the 10-year German Bund rate significantly reduces the sovereign CDS spreads of Ireland, Italy and Spain; increases in the European corporate credit spreads significantly increase the sovereign CDS spreads of Greece, Ireland, Italy and Spain; better Euro-area economic performance (a higher EuroStoxx 50 return) significantly reduces the sovereign CDS spreads of Italy and Spain. Consistent with the private-to-public risk transfer hypothesis, improvement in local financial firms' performance can reduce the sovereign CDS spread. This reduction effect is statistically significant in Italy and Portugal. Signs of the estimated coefficients of the World Financials index are positive, which is not only different from the finding of Dieckmann and Plank (2011),[6] but also different from the theoretically expected sign we discussed in the last section. However, due to the econometric deficiency of Eq. (1), both the point estimates and the inference based on it are not reliable. Serial independence test results in Table 4 suggest that even if there is just one regime, inference based on standard errors reported in Table 4 will be distorted. If the single-regime assumption holds, the serial correlation problem can be corrected by using the serial-correlation robust standard errors for inference. However, if the single-regime assumption fails, even the serial independence test results in Table 4 will be unreliable.

Testing for regime switching is quite tricky because there are nuisance parameters that are only identifiable under the alternative hypothesis of two regimes but not under the null hypothesis of one regime. More specifically, a single-regime model can be represented in three different ways. First, it can be taken as a model with two regimes with the same regression coefficients. In this case, the probability associated with each regime is not identifiable. In the other two ways, the single-regime model can be taken as a model with two regimes under which the regression coefficients differ but one of the regime happens with zero probability. In such ways of representation, the regression coefficients of the regime which happen with zero probability are not identifiable. In addition, because probabilities cannot be larger than one, there is a boundary condition imposed in the estimation of the regime-switching model. Due to those facts, the typical likelihood ratio test statistics do not follow the usual λ^2 limiting distribution. Cho and White (2007) propose a quasi-likelihood ratio test for regime switching and tabulated critical values at the 5 percent level. Carter and Steigerwald (2011) point out that critical values reported by Cho and White (2007) are based on 10,000 replications, but fewer than 100,000 replications do not produce stable critical values. They provide 5 percent critical values based on 100,000 replications. Table 5 reports the quasi-likelihood ratio test statistics for the null of one regime against an alternative of two regimes. Those values are far larger than the critical values tabulated in Carter and Steigerwald (2011). Therefore, the null hypothesis of a single regime is

[6] Although we use the same estimation approach as Dieckmann and Plank (2011), we have modified their specifications based on findings of other papers (see discussion in Section 2.2) This is why our results are not completely the same as those in the paper of Dieckmann and Plank (2011)

clearly rejected, and we should not make inference based on the OLS model.

Table 4
OLS results.
Note: Standard errors in parentheses. ***, ** denote significance at one and five percent level, respectively. Serial independence is the Lagrange Multiplier (LM) test *p* value for serial correlation up to two orders.

	Greece	Ireland	Italy	Portugal	Spain
constant	0.40	0.02	0.02	0.07	0.02
	(0.30)	(0.04)	(0.02)	(0.04)	(0.01)
forex	−2.70	3.99	2.98**	1.23	2.43**
	(26.43)	(3.29)	(1.32)	(3.16)	(1.28)
stoxx	−10.07	−0.35	−0.69**	−1.28	−0.80**
	(7.26)	(0.87)	(0.36)	(0.87)	(0.34)
gbi	−0.46	−0.75**	−0.55***	−0.63	−0.40***
	(2.81)	(0.35)	(0.14)	(0.34)	(0.13)
itraxx	10.01**	1.18**	0.77***	0.55	1.01***
	(4.49)	(0.55)	(0.24)	(0.55)	(0.21)
vp	2.05	1.75	0.60	1.56	0.57
	(8.16)	(0.99)	(0.40)	(0.97)	(0.39)
fgro	4.24	1.43	0.48	2.71***	0.74
	(8.27)	(1.07)	(0.42)	(0.99)	(0.40)
sdri	−8.04	−0.27	−2.41***	−5.76***	−2.45***
	(4.52)	(0.83)	(0.92)	(1.20)	(0.67)
svol	−0.00	0.06	0.18	1.74***	0.53**
	(0.66)	(0.36))	(0.10)	(0.66)	(0.23)
fdri	−4.19	−0.24	−1.64***	−2.12***	−0.85
	(8.06)	(0.23)	(0.61)	(0.63)	(0.76)
Adjusted *R*-squared	0.29	0.16	0.43	0.32	0.42
Serial independence	0.56	0.00	0.00	0.13	0.03

Table 5
Tests for regime switching.
Note: Test statistics are Cho and White (2007) Quasi-Likelihood Ratio test statistics. Null hypothesis: one regime.

	Greece	Ireland	Italy	Portugal	Spain
Test statistics	462.6	115.1	75.96	157.8	75.48

4. Regime switching model analysis assuming no endogeneity

We have identified regime switching in the determination process of sovereign CDS spreads in our sample. In this section, we keep the covariates exogeneity assumption and estimate the following standard regime switching model

$$\Delta CDS_t = \Delta x_t' \beta_{S_{0t}} + u_t, \quad S_{0t} = 1, 2 \tag{2}$$

where S_{0t} is an unobservable state variable, u_t is the error term with a regime-dependent variance $\sigma^2_{u,S_{0t}}$. Eq. (2) is similar to Eq. (1) but now the parameters in β change with the unobservable statevariable S_{0t}. As discussed in the introduction, the switching acrossstates might be caused by financial contagion. In this paper, we set the number of states to two, which corresponds to the two regimes (turbulent/crisis regime and tranquil/non-crisis regime) typically assumed in the contagion literature (Dungey et al., 2005). From the small number of states, we

also benefit from a significant efficiency gain due to the reduction of dimensionality.[7] In this section, we still keep the assumption that there are no feedback effects from changes in the sovereign credit risk to domestic economic and financial developments.

Table 6
Regime switching model results.
Note: Standard errors in parentheses. ***, ** denote significance at one and five percent level respectively. p_{ii} denotes the probability of staying under regime i next period if i is the current regime.

	Greece		Ireland		Italy		Portugal		Spain	
constant	0.06	2.38	0.01	0.00	0.00	0.02	0.01	0.06	0.01	0
	(0.04)	(3.54)	(0.02)	(0.16)	(0.01)	(0.03)	(0.01)	(0.07)	(0.01)	(0.02)
forex	5.57	−71.02	4.13***	−0.52	2.96***	0.83	2.62***	−4.54	2.84***	1.38
	(3.61)	(391.1)	(1.53)	(21.61)	(0.7)	(3.18)	(0.69)	(8.48)	(0.76)	(2.55)
stoxx	−1.44	−57.27	−0.93**	2.74	−0.05	0	−0.01	−0.19	0.05	−0.89
	(1.08)	(85.44)	(0.41)	(6.35)	(0.27)	(0.68)	(0.23)	(1.86)	(0.26)	(0.68)
gbi	−0.67	12.32	−0.22	−1.72	−0.21**	−1.13***	−0.2**	−1.34	−0.21**	−0.84***
	(0.35)	(42.35)	(0.17)	(1.91)	(0.09)	(0.28)	(0.10)	(0.73)	(0.1)	(0.26)
itraxx	0.89	27.56	1.08***	1.94	0.32	2.46***	0.2	2.21	0.27	2.19***
	(0.71)	(33.75)	(0.26)	(3.77)	(0.18)	(0.47)	(0.12)	(1.23)	(0.14)	(0.32)
vp	−0.44	31.49	−0.09	5.6	−0.1	1.80***	−0.18	3.11	−0.15	0.85
	(1.06)	(78.79)	(0.45)	(4.79)	(0.33)	(0.53)	(0.27)	(2.05)	(0.29)	(0.68)
fgro	−0.10	−17.01	−0.06	7.14	−0.96***	2.33**	−0.51**	5.08**	−0.5	1.39
	(1.13)	(86.49)	(0.48)	(8.12)	(0.22)	(1.06)	(0.24)	(2.43)	(0.32)	(0.93)
sdri	−1.37**	−40.86	−0.06	1.33	−0.83	−6.67***	−0.31	−10.25***	−0.86	−2.6**
	(0.6)	(46.31)	(0.38)	(10.32)	(0.62)	(1.32)	(0.27)	(2.36)	(0.58)	(1.19)
svol	0.24	0	−0.13	9.98	−0.01	0.83***	0.06	1.05	0.09	0.42
	(0.15)	(5.56)	(0.16)	(22.72)	(0.06)	(0.29)	(0.19)	(1.11)	(0.2)	(0.29)
fdri	0.49	−4.41	−0.29***	−0.06	−0.34	0.07	−0.09	−2.02	−0.25	1.67
	(1.5)	(52.46)	(0.12)	(1.16)	(0.36)	(1.09)	(0.16)	(1.39)	(0.55)	(2.07)
p_{ii}	0.97	0.90	0.98	0.96	0.94	0.93	0.99	1	0.99	1
σ_u	0.27	5.12	0.14	0.53	0.06	0.13	0.05	0.36	0.06	0.13

Table 6 summarizes the estimation results of the standard regime switching model. The estimates for market volatility $\sigma_{u,S_{0t}}$ differ across regimes. In each sample country, there is one regime with a lower volatility, and one regime with a higher volatility. We shall call the regime with low volatility the "tranquil regime" and the regime with high volatility the "turbulent regime". Notably, the candidate determinants considered by previous literature are not significant in the turbulent regime in Greece and Ireland. In the tranquil regime, no global variable is significant in Greece, contrasting with results from previous studies (Fontana and Scheicher,2010; Dieckmann and Plank, 2011). Local stock market return is the only significant explanatory variable for Greece. More specifically, a higher stock market return in Greece reduces sovereign CDS spread in Greece. Depreciation of the Euro against US dollar increases sovereign CDS spread in all sample countries except Greece in the tranquil regime, but has no impact in the turbulent regime. An increase in the global stock market return reduces sovereign CDS spread in Ireland in the tranquil regime but has no significant impact in the other regime and other countries. Recall that in the OLS model, the global stock market return is significant with a negative sign in Italy and Spain. An increase in the German Bund rate significantly reduces sovereign CDS spread in Italy, Portugal and Spain in the tranquil regime. The impact remains in Italy and Spain in the turbulent regime while it becomes less significant in Portugal. The iTraxx index is not significant in either regime in Greece, contrasting with the OLS result. It is also not significant in Portugal in either regime but significant in at least one regime in Ireland, Italy, and Spain. Its sign is positive when significant, consistent with our theoretical expectation and results in Fontana and Scheicher(2010). The World Financials Index *fgro* has a negative sign in the tranquil regime in Italy and Portugal, which is consistent with the finding by Dieckmann and Plank (2011). However, the sign turns positive in the turbulent regime in those two countries, contrasting with results in Dieckmann and Plank (2011). In each country, the sovereign CDS spread is significantly affected by domestic factors in at least one of the two regimes. The estimated signs of those significant domestic indicators are also consistent with our theoretical

[7] Increasing the number of possible states from two to three increases the dimension of the transition matrix from 12 to 72 in our regime switching model with endogenous variables.

expectations. However, the coefficients of all those domestic financial indicators also exhibit strong regime-dependence, questioning the reliability of the OLS results.

5. Regime switching model analysis with instrumental variables

Like the OLS model, the standard regime switching models also assume that the error term is independent of the covariates. However, in our context, this assumption may not be plausible. It is possible that the insurance premium of sovereign borrowing affects the borrowing cost and therefore affect the domestic economy (Delatte et al., 2012). Changes in the expectations on sovereign risk implied by changes in the CDS spread can also feedback to the domestic economy through various channels (Sandleris, 2008; Brutti, 2011; Mendoza and Yue, 2012). In these cases, the local variables are not exogenous and the standard maximum likelihood estimation of a regime switching model will give us biased results. Kim (2009) proposes a two-step maximum likelihood estimator with instrumental variables to solve this problem. Formally, the model can be written as follows:

$$\Delta CDS_t = \Delta x_t' \beta_{S_{1t}} + e_t, \quad S_{1t} = 1, 2, \ldots, J_1, \tag{3}$$

$$\Delta x_t = Z_t' \gamma_{S_{2t}} + \Sigma_{v, S_{2t}}^{1/2} v_t, \quad S_{2t} = 1, 2, \ldots, J_2, \tag{4}$$

where S_{1t} and S_{2t} are unobservable state variables; $Z_t = I_k \otimes z_t$, I_k is a k × k identity matrix with k being the dimension of x_t, $\otimes$ denotes the Kronecker product,[8] and z_t is a q × 1 vector of instrumental variables; $\Sigma_{v,S_{2t}}$ is a k × k matrix; J_1 and J_2 denote the number ofstates; the joint distribution of e_t and v_t is

$$\begin{pmatrix} v_t \\ e_t \end{pmatrix} \sim i.i.d.N \left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} I_q & \rho_{S_{1t}} \sigma_{e,S_{1t}} \\ \rho_{S_{1t}}' \sigma_{e,S_{1t}} & \sigma_{e,S_{1t}}^2 \end{pmatrix} \right),$$

$\rho_{S_{1t}}$ is a vector of correlation coefficients, and $\sigma_{e,S_{1t}}$ is the standard deviation of e_t. The Lucas (1976) critique suggests that a regime shiftin the policy process governing Eq. (3) can lead to a regime shift inthe dynamics of the CDS spread determinants. Therefore, we allowregime shifts in Eq. (4) as well. The unobservable state variable S2tis correlated to S1taccording to the Lucas critique. One way to estimate the system composed of Eqs. (3) and (4) is to specify the joint process of S1tand S2tand estimate the model by a joint maximum likelihood method. However, as pointed out by Kim (2009), such a joint estimation typically has too many parameters to estimate and suffers from the "curse of dimensionality". Furthermore, S2twill be correlated to but different from S1tif there is no perfect policy credibility and the agents have to learn to respond to the policy. Kim (2009) suggests that a two-step estimation approach which ignores the correlation between the state variables suffers less from the "curse of dimensionality". It has better finite sample performance than the joint maximum likelihood estimation when the correlation between S1tand S2tis not perfect. Moreover, it is more robust when the instrument variables are weak. The two-step approach of Kim (2009) first estimates Eq. (4) as a standard regime switching model. This procedure will give consistent estimates for $\gamma_{S_{2t}}$ and $\Sigma_{v,S_{2t}}$ since there are no endogenous covariates in Eq. (4). The elements of the residual vector $\hat{v}_t$ are used as control variables in the second-step estimation of Eq. (3).[9] Kim (2009)

[8] Let a_{ij} be the element on the *i*th row and the *j*th column of a m × n matrix A. A⊗B is defined as

$$\begin{pmatrix} a_{11}B & \ldots & a_{1n}B \\ \vdots & & \vdots \\ a_{m1}B & \ldots & a_{mn}B \end{pmatrix}$$

[9] See Appendix for a brief description of major steps of the second-step estimation..

proves that this two-step approach will give us consistent estimates for the parameters in Eq. (3).[10]

To save degrees of freedom, we restrict the number of possible states for both S_{1t} and S_{2t} to two. Two is also the number of possible states usually considered in the contagion literature (Dungey et al.,2005). We instrument the local determinants of the CDS spread ($\Delta sdri_t$, $\Delta svol_t$, and $\Delta fdri_t$) by the second and third lags of those local variables and the lagged dependent variable ΔCDS_{t-2} and ΔCDS_{t-3}.

Table 7
Regime switching model results-local variables instrumented.
Note: Standard errors in parentheses. ***, ** denote significance at one and five percent level respectively. p_{ii} denotes the probability of staying under regime i next period if i is the current regime.

	Greece		Ireland		Italy		Portugal		Spain	
	1	2	1	2	1	2	1	2	1	2
constant	0.06	2.01	0.01	0.38	−0.01	0.03	0.04	0.22	0.01	0.00
	(0.04)	(3.64)	(0.03)	(6.05)	(0.01)	(0.06)	(0.02)	(1.31)	(0.02)	(0.03)
forex	5.47	−38.25	3.93	3.82	2.47***	2.19	1.63	12.94	2.67**	2.26
	(4.25)	(395.50)	(2.20)	(653.70)	(0.88)	(7.08)	(2.04)	(99.84)	(1.31)	(3.19)
stoxx	−1.23	−58.30	−0.56	(−6.67)	−0.17	−0.05	−0.58	−10.46	0.02	−1.10
	(1.20)	(89.51)	(0.51)	(195.20)	(0.35)	(1.51)	(0.61)	(25.06)	(0.50)	(0.83)
gbi	−0.84**	13.08	−0.34	−2.39	−0.27**	−0.95	−0.62***	(3.27)	−0.28	−0.74**
	(0.41)	(36.99)	(0.23)	(68.41)	(0.13)	(0.53)	(0.19)	(10.20)	(0.25)	(0.34)
itraxx	0.94	30.43	1.23***	−3.70	0.64***	1.79	0.72**	4.51	0.39	1.94***
	(0.79)	(33.88)	(0.32)	(199.50)	(0.23)	(0.96)	(0.36)	(10.29)	(0.27)	(0.47)
vp	−0.30	16.76	0.05	2.14	−0.16	1.67	0.29	2.36	0.10	0.87
	(1.20)	(140.90)	(0.54)	(267.00)	(0.44)	(1.13)	(0.58)	(36.34)	(0.59)	(0.87)
fgro	0.25	6.18	0.18	5.10	−0.97***	1.30	0.84	−1.61	−0.45	1.34
	(1.25)	(104.10)	(0.65)	(192.00)	(0.32)	(2.15)	(0.70)	(28.37)	(0.54)	(1.12)
sdri	0.02	−36.01	−1.89	21.13	1.04	−16.78**	−2.17	2.76	1.06	1.49
	(1.93)	(74.62)	(1.08)	(746.50)	(1.48)	(8.61)	(1.64)	(84.37)	(1.61)	(3.36)
svol	0.24	−0.69	−0.22	101.60	−0.06	1.21	0.65	−11.70	0.15	0.02
	(0.25)	(6.99)	(0.28)	(781.00)	(0.09)	(1.11)	(0.70)	(39.40)	(0.51)	(0.67)
fdri	0.76	−6.64	0.26	−16.33	0.18	2.98	−0.99	−3.00	−0.21	−0.98
	(4.82)	(64.09)	(0.34)	(102.80)	(1.02)	(5.22)	(0.76)	(45.02)	(1.44)	(5.74)
p_{ii}	0.97	0.91	0.97	0.89	0.93	0.94	0.97	0.87	0.98	1.00
σ_ω	0.39	7.00	0.22	0.55	0.08	0.16	0.20	0.49	0.08	0.18

Table 7 summarizes our two-step estimation results of Eq. (3). Changes in the global bond market conditions (*gbi* and/or *itraxx*) are significant explanatory variables for changes in country-specific sovereign CDS spreads under at least one regime. Moreover, the estimated signs of *gb*i and *itraxx* are consistent with our theoretical expectations. More specifically, the 10-year German Bund rate (*gbi*)has a negative sign when significant. Consistent with our theoretical discussions, this means that investors expect a lower sovereign credit risk in the European periphery countries when Germany has a better economic performance since the German bund rate is an indicator of economic performance in Germany. On the one hand, a better economic performance in Germany could increase the probability of bailout from the EMU because Germany plays a leading role in negotiations on the bailout plans. On the other hand, the better economic conditions in Germany might spill over to other EMU countries and increase their willingness to help the member countries in debt crisis. The iTraxx index has a positive sign when significant. As we discussed above, both a worse business climate in the European countries and a higher degree of risk aversion can lead to a higher iTraxx index. Therefore, both a worse economic state of EU and a higher degree of risk aversion can increase the prices of insurance on the sovereign bonds. Similar to the finding by Fontana and Scheicher (2010), the other proxy for investors' risk appetite, *vp*, is not significant when the iTraxx index is included as a regressor. The World Financials index is significantly negative under the tranquil regime in Italy. This suggests that there is a private-to-public risk transfer in Italy. Under the specific regime, a worse performance of the global financial sector increases the possibility that foreign countries have to spend money to bail out their own financial firms and hence are less

[10] The second-step standard errors are biased due to the generated regressor problem. The standard errors in the tables are corrected using the method provided by Kim (2009).

willing to help the home country. As a result, the sovereign CDS spread increases. Note that it is the performance of the global rather than local financial industry that matters. This finding suggests that compared to the possibility that the Italian government has to bail out its domestic financial firms, the market is more concerned about whether there will be international financial assistance if Italy is in trouble. Under the turbulent regime, $\Delta fgro_t$ turns insignificant while the proxy for domestic economic performance turns significant in Italy. This suggests that under this regime, investors care more about the Italian economy than contingent government debt for bailing out the financial sector. Note that the signs of the estimated coefficients of the World Financials index are positive in some sample countries in some regimes. However, those coefficients are not statistically significant. Hence, it is better to be interpreted as no effect rather than a positive effect. Interestingly, except in Italy, country-specific factors have little impact on the sovereign CDS spread. This result suggests that global factors and/or EMU-wide factors are the main drivers of the changes in sovereign risk during the European debt crisis.

5.1. Tests for endogeneity and serial independence

Kim (2009) suggests that endogeneity of the explanatory variables can be tested by the standard Wald test using the second-step estimation outputs. More specifically, in the two-step estimation, endogeneity is captured by the first-step regression residuals of the endogenous variables on the instrumental variables. These residuals are used in the second-step regression as control variables to eliminate the endogeneity. Therefore, we can test for endogeneity by testing the statistical significance of the first-step residuals in the second-step regression. Formally, the second-step estimation equation can be written as

$$\Delta CDS_t = \Delta x_t' \beta_{S_{1t}} + \hat{v}_t' \theta_{S_{1t}} + \omega_t, \quad S_{1t} = 1, 2, \ldots, J_1, \tag{5}$$

where $\theta_{S_{1t}}$ is a vector of regime-dependent coefficients, $\hat{v}_t$ is the first-step estimate for v_t, and ω_t is an i.i.d. normal random variable given a specific value of S_{1t}. The variance of ω_t changes across regimes. We denote it by $\sigma_{\omega,S_{1t}}$.[11] No endogeneity means $\theta_1 = \theta_2 = \cdots = \theta_{J_1} = 0$. Under the null hypothesis of no endogeneity, the asymptotic distribution of the Wald statistics $\hat{\theta}' \hat{cov}(\hat{\theta})^{-1} \hat{\theta}$ is $\chi^2(h)$, where *cov* denotes the covariance; $\hat{\theta} = [\hat{\theta}_1' = \hat{\theta}_2' = \cdots = \hat{\theta}_{J_1}']'$ is the vector of estimated values for $\theta_{S_{1t}}$, $S_{1t} = 1, 2, \ldots, J_1$; h is the dimension of $\hat{\theta}$.

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Table 8
Endogeneity tests (local variables only).
Note: Testing for endogeneity of the local variables, taking the global variables as exogenous.

	Greece	Ireland	Italy	Portugal	Spain
Wald statistics	1.36	20.39	14.25	13.98	16.97
p value	0.97	0.00	0.03	0.03	0.01

Table 8 summarizes the Wald test results. The null hypothesis of variable exogeneity is rejected in all sample countries, except Greece. This verifies the importance of controlling for potential endogeneity. More specifically, both changes in domestic stock market volatility *svol* and changes in domestic Financials index *fdri* are not significant in any country if we control for endogeneity. By contrast, *svol* is significant in Portugal and Spain in the OLS model, in Italy in

[11] See Kim (2009) for details.

the turbulent regime in the regime switching model without any control for endogeneity; *fdri* is significant in Italy and Portugal in the OLS model, in Ireland in the tranquil regime in the regime switching model without any control for endogeneity. Domestic stock market return in Greece is found to be the only significant covariate in the tranquil regime in Greece when it is assumed to be exogenous. It turns insignificant once the endogeneity bias is eliminated. Domestic stock market return is also spuriously significant in the turbulent regime in Portugal and Spain when assumed to be exogenous. In a word, the importance of domestic economic and financial indicators in determining sovereign CDS spreads is over-estimated when there is endogeneity bias. As discussed above, results from Table 7 suggest that except in Italy, economic developments within the European periphery countries have little impact on the development of their sovereign credit risk. However, the existence of endogeneity suggests that rising sovereign credit risk does affect domestic economic developments. Contrary to the findings of previous studies which focus on pre-crisis periods, the causality runs from sovereign credit risk to domestic macroeconomic fundamentals rather than the other way around.

Since we cannot directly apply the Hamilton (1996) test for autoregression to our regime-switching model with endogenous variables, we test for autoregression by adding the lagged dependent variable, $\Delta \mathrm{CDS}_{t-1}$, to the second-step equation and test the statistical significance of the autoregressive term. In order to avoid correlation between higher-order lags of $\Delta \mathrm{CDS}_t$ and $\Delta \mathrm{CDS}_{t-1}$, weexclude them from the original instrument variable set. That is, we only use lags of the local variables as instrument variables. Table 9 summarizes the estimated coefficients of $\Delta \mathrm{CDS}_{t-1}$ and their standard errors. The lagged dependent variable is not significant in any sample country under either regime, which suggests no serial correlation in the original model.

Table 9
Serial correlation tests for the regime switching model.
Note: Estimated coefficients of ΔCDS_{t-1} with standard errors in parentheses. ***, ** denote significance at one and five percent level, respectively.

	Greece	Ireland	Italy	Portugal	Spain
Regime 1	0.01	−0.03	0.08	0.07	0.09
	(0.05)	(0.09)	(0.10)	(0.06)	(0.12)
Regime 2	−0.21	1.40	−0.33	0.35	−0.02
	(0.73)	(27.4)	(0.27)	(0.22)	(0.34)

Table 10
Tests for the endogeneity of *fgro*.
Note: Standard errors in parentheses. ***, ** denote significance at one and five percent level, respectively.

	Greece	Ireland	Italy	Portugal	Spain
Regime 1	−0.11	−0.01	0.00	0.07**	−0.01
	(0.14)	(0.04)	(0.02)	(0.03)	(0.02)
Regime 2	−2.14	1.18**	0.00	0.09	−0.06
	(8.08)	(0.06)	(0.06)	(0.34)	(0.05)

5.2. Endogeneity of the performance of the global financial sector

In the econometric analysis above, we considered only the potential endogeneity of the local variables. Now we consider the potential endogeneity of a global variable: the change in the performance of the global financial sector, $\Delta fgro_t$. Such endogeneity can arise if financial firms outside the home country are highly involved in the trading of the specific country's sovereign CDS contracts (OECD, 2012).

Taking *fgro* as an additional endogenous variable, we re-estimate the regime switching model. We use the second and third lags of $\Delta sdri_t$, $\Delta svol_t$, $\Delta fdri_t$ $\Delta fgro_t$ and the lagged dependent variable $\Delta \mathrm{CDS}_{t-2}$ and $\Delta \mathrm{CDS}_{t-3}$ to instrument the potentially endogenous variables ($\Delta sdri_t$, $\Delta svol_t$, $\Delta fdri_t$ $\Delta fgro_t$ a). We test the endogeneity of *fgro* based on the new estimation results. As we mentioned in the last subsection, the test for endogeneity is equivalent to the test for the statistical significance of the corresponding first-stage residuals. Table 10 summarizes the test results. Those results suggest that changes in the Irish and Portuguese sovereign CDS spreads have significantly affected changes in the performance of financial firms outside those two countries at least under one regime.

Table 11 reports the estimation results for Ireland the Portugal, taking *fgro* as an endogenous variable. As in Table 7, we find that changes in the candidate determinants do not explain changes in the Irish or Portuguese sovereign CDS spreads under the turbulent regime. Changes

in the Euro-Dollar rate and the iTraxx index significantly affect changes in the Irish sovereign CDS spread under the tranquil regime. More specifically, a depreciation of the Euro relative to the US Dollar and an increase in the European corporate CDS spread lead to an increase in the Irish sovereign CDS spread. The significant positive sign of the iTraxx index suggests that either a worse business climate increases the sovereign credit risk or a higher degree of risk aversion increases the insurance premium for the sovereign borrowing. In Portugal, under the tranquil regime, the 10-year German Bund rate appears to be the only significant fundamental driver of the sovereign CDS spread. The negative sign of *gbi* is again consistent with our theoretical expectation.

6. Contagion and regime switching

We have identified regime switching in the determination process of sovereign CDS spreads in our sample Euro countries. A natural next question is where does regime switching come from. In this section, we show that financial contagion is an important driver of regime switching. To see this, we run two different type of regressions. First, we run the following logit model:

$$\tilde{p}_t = \frac{1}{1+\exp(-\alpha_0 - X'_{t-1}\alpha_1)}, \tag{6}$$

where $\tilde{p}_t$ is the filtered probability of being in the turbulent regime conditional on information up to time t, $X_{t-1} = \{\Delta CDS^2_{t-1}, JR_{t-1}\}$ is

Table 11
Regime switching model results-local variables and *fgro* instrumented.
Note: Standard errors in parentheses. ***, ** denote significance at one and five percent level respectively. p_{ii} denotes the probability of staying under regime i in the next period if i is the current regime.

	Ireland		Portugal	
	Regime 1	Regime 2	Regime 1	Regime 2
constant	0.01	0.02	0.02	0.11
	(0.02)	(1.11)	(0.02)	(0.43)
forex	4.38***	−0.86	3.22	−5.26
	(1.68)	(122.8)	(1.79)	(35.73)
stoxx	−0.71	1.40	−0.37	−4.36
	(0.48)	(34.61)	(0.54)	(12.61)
gbi	−0.34	−1.67	−0.49**	−0.91
	(0.18)	(10.85)	(0.20)	(4.02)
itraxx	1.07***	0.74	0.59	4.85
	(0.29)	(21.62)	(0.32)	(6.75)
vp	−0.10	4.51	0.24	3.57
	(0.48)	(27.53)	(0.56)	(13.63)
fgro	−0.87	25.38	−1.14	7.25
	(0.79)	(201.3)	(1.51)	(25.01)
sdri	−0.16	−1.00	0.57	−3.35
	(0.20)	(132.1)	(0.61)	(11.37)
svol	−0.30	5.39	−0.91	−1.37
	(0.21)	(51.48)	(0.96)	(33.96)
fdri	0.16	−40.80	−0.60	1.55
	(0.94)	(188.7)	(1.02)	(39.63)
p_{ii}	0.98	0.95	0.96	0.92
σ_ω	0.20	0.65	0.15	0.55

Table 12
Global jump risk and the regime switching.
Note: Standard errors in parentheses. ***, ** denote significance at one and five percent level, respectively.

		Logit	Quantile								
			0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Greece	constant	1.92***	0.01	0.21**	0.95***	1.00***	1.00***	1.00***	1.00**	1.00***	1.00***
		(0.44)	(0.05)	(0.09)	(0.02)	(0.00)	(0.01)	(0.01)	(0.01)	(0.00)	(0.07)
	DCDSsq(−1)	−1.12***	0.00	−0.00	−0.01***	−0.01***	−0.004***	−0.004***	−0.004***	−0.004***	0.00
		(0.38)	(0.00)	(0.00)	(0.00)	(0.00)	(0.000)	(0.000)	(0.000)	(0.000)	(0.18)
	jr(−1)	0.23**	0.04***	0.04***	0.003**	0.00	0.00	0.00	0.00	0.00	0.00
		(0.09)	(0.01)	(0.01)	(0.001)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Ireland	constant	1.11***	0.01	0.07	0.23**	0.87***	0.99***	1.00***	1.00***	1.00***	1.00***
		(0.39)	(0.04)	(0.05)	(0.12)	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)	(0.02)
	DCDSsq(−1)	−4.57***	0.00	−0.02	−0.11	−0.24	−0.12***	−0.12***	−0.11***	−0.11***	−0.11***
		(1.20)	(0.02)	(0.03)	(0.21)	(0.24)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)
	jr(−1)	0.12**	0.04***	0.05***	0.05***	0.01**	0.00	0.00	0.00	0.00	0.00
		(0.06)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Italy	constant	0.68**	0.02	0.09	0.28***	0.64***	0.85***	0.94***	0.99***	0.99	1.00***
		(0.34)	(0.04)	(0.06)	(0.11)	(0.11)	(0.06)	0.04	(0.04)	(0.03)	(0.04)
	DCDSsq(−1)	−12.39***	−0.22	−0.42	−0.99	−1.92	−1.56	−1.16***	−0.95***	−0.92***	−0.28
		(3.45)	(0.21)	(0.39)	(0.93)	(1.10)	(1.81)	(0.29)	(0.15)	(0.13)	(2.43)
	jr(−1)	0.17***	0.04***	0.04***	0.04***	0.02***	0.01***	0.01	0.00	0.002	0.00
		(0.07)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Table 13
Global jump risk and the regime switching (continued).
Note: Standard errors in parentheses. ***, ** denote significance at one and five percent level, respectively.

		Logit	Quantile								
			0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Portugal	constant	2.19***	0.34	0.96**	0.99***	0.99***	0.99***	1.00***	1.00***	1.00***	1.00***
		(0.40)	(0.30)	(0.03)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
	DCDSsq(−1)	−3.25***	−0.25	−0.40***	−0.31	−0.25***	−0.12***	−0.12***	−0.08***	−0.08***	−0.08***
		(0.69)	(0.52)	(0.05)	(0.34)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
	jr(−1)	0.13**	0.02***	0.00	0.00	0.00	0.00	0.00	0.00	0.00	−0.00
		(0.07)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Spain	constant	0.14	0.00	0.03	0.09	0.22***	0.51***	0.78***	0.93***	0.99***	1.00***
		(0.33)	(0.03)	(0.04)	(0.05)	(0.07)	(0.12)	(0.07)	(0.05)	(0.04)	(0.03)
	DCDSsq(−1)	−16.60***	−0.11	−0.17	−0.27	−0.64	−1.52**	−2.11***	−1.62**	−0.86***	−0.86***
		(5.26)	(0.13)	(0.21)	(0.36)	(0.47)	(0.75)	(0.65)	(0.71)	(0.20)	(0.16)
	jr(−1)	0.23***	0.04***	0.04***	0.05***	0.05***	0.04***	0.02***	0.01	0.00	0.00
		(0.08)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)

a vector of lagged explanatory variables,[12] ΔCDS_t^2 is the squared change in the sovereign CDS spread, JR_t a measure of global(US) jump risk. The jump risk is associated with the probabilityof downward jumps in the equity price, and serves as a market-based indicator of financial distress. To measure the jump risk in the US stock market, we use the difference between 30-day VIX and 3-month VIX. This is motivated by the fact that a decrease in short-term volatility compared with long-term volatility indicates a lower likelihood of downward jumps in equity prices over the short-term than over the longer term (Alexander and Kaeck, 2008).

The estimation results are given in column (logit) of Tables 12 and 13. The standard deviations we report are Newey-West estimates[13] because preliminary LM tests for serial correlation reject the null hypothesis of no serial correlation with a p-value0.000 in all sample countries. An increase in the jump risk of the US stock market significantly increases the probability of entering the turbulent regime in all of our sample countries. This result suggests that changes in the global jump risk changes the uncertainty in the sovereign CDS market of the periphery Euro area countries. As we have shown in the last section, changes in the uncertainty of the sovereign CDS market lead to changes in the international spillover effects. This is evidence of contagion from the global financial crisis to the European sovereign credit market.

[12] Alexander and Kaeck (2008) use a similar approach to study the drivers of regime switching in the corporate CDS market. They also include the candidate determinants of the CDS spreads as potential drivers of regime switching. We experiment with a similar setup but find no candidate determinants of our sovereign CDS spreads significant.
[13] Corrected for heteroscedasticity and autocorrelation.

An increase in the size of the CDS spread in the last period leads to a reduction of the probability of entering the turbulent regime. This result suggests that the increase in the uncertainty in the sovereign CDS market is still bounded, despite the severity of the sovereign debt crisis.

The existence of contagion implies that the impact of the global financial crisis on the European sovereign credit market might differ across quantiles (Caporin et al., 2013). Columns (quantile0.1–0.9) reports quantile regression results of $\tilde{p}_t$ on X_{t-1} for each deciles. Interestingly, changes in the global jump risk are significant only in lower quantiles in all the sample countries. On the contrary, changes in the CDS spread in the last period are significant only in higher quantiles. These results suggest that an increase in the jump risk in the global financial market drives up uncertainty in the European sovereign credit market when the uncertainty is still low. When uncertainty in the European sovereign credit market is already high, contagion from the global financial market adds little to the uncertainty in the sovereign credit market. When the uncertainty in the sovereign credit market is low, there is no reverting force to drive down the uncertainty. However, there are correcting forces driving down market uncertainty when uncertainty is already very high.

7. Conclusion

In this paper, we study the determinants of sovereign CDS spreads in five Euro area countries (Greece, Ireland, Italy, Portugal and Spain) after the collapse of Lehman Brothers. Existing literature has found that the pricing of sovereign credit risk differs in crisis periods from normal times. We focus on crisis periods because policy makers facing crisis have to understand the sources of the sovereign risk during crisis for successful crisis management.

We find that contagion from the global financial market is an important factor affecting the pricing of sovereign credit risk in our sample Euro countries. There is a notable switching from a tranquil regime to a turbulent regime in the sovereign CDS market of periphery EMU countries. In addition, international spillover effects change across regimes. This regime switching is partly driven by increasing risk of distress in the global financial market. This finding provides evidence for contagion from the global financial market to the European sovereign credit market.

Another interesting finding is that developments of sovereign risk during the sample period are mainly driven by global and/or EMU-wide factors. Domestic economic and financial developments have little impact on sovereign credit risk in Greece, Ireland, Portugal and Spain during the crisis. In contrast to previous studies which focus on pre-crisis periods, we find the causality runs from the other way around. Sovereign credit risk significantly affects domestic economic and financial developments during crisis according to our endogeneity tests.

A general lesson from this paper is that regime switching and endogeneity should be seriously considered when studying the pricing of sovereign credit risk. Assuming no regime switching excludes financial contagion as an important driver of sovereign risk while assuming no endogeneity ignores important feedback effects from sovereign credit risk to domestic economic and financial developments. More importantly, neglecting the potential regime switching and endogeneity leads to biased estimates and wrong decisions. For example, both the OLS and standard regime switching model assuming covariates exogeneity identify domes-tic economic and financial indicators as important drivers for sovereign credit risk in European periphery countries. However, this inference is wrong as the correct model suggests that domestic factors have little impact.

Appendix A. Major steps of the second-step estimation

In this appendix, we show the major steps of the second-step estimation for our two-state model. Our purpose is to estimate $\beta_{S_{1t}}$, $\theta_{S_{1t}}$, $\sigma_{e,S_{1t}}$ and p_{ij}, the transition probability from state *i* to state j. From Eq.(4), we have

$$\hat{v}_t = inv(\hat{\Sigma}^{1/2}_{v,S_{2t}})(\Delta x_t - Z_t'\hat{\gamma}_{S_{2t}}), \tag{7}$$

where $inv(\cdot)$ denotes the inverse, and $\hat{\Sigma}^{1/2}_{v,S_{2t}}$ and $\hat{\gamma}_{S_{2t}}$ denote the first-step estimates for $\Sigma^{1/2}_{v,S_{2t}}$ and $\gamma_{S_{2t}}$, respectively.

Using Eqs. (5) and (7), we can derive the conditional density function of ΔCDS_t for given values of S_{1t} and S_{2t}. More specifically, for $j_1 = 1$, 2 and $j_2 = 1$, 2, the density functions can be represented as: $f(\Delta CDS_t|\Delta Z_t, \Delta x_t, S_{1t} = j_1, S_{2t} = j_2; \lambda_1, \hat{\lambda}_2) = \frac{1}{\sqrt{2\pi\sigma^2_{\omega,j_1}}}$ $\exp\{-\frac{1}{2\sigma^2_{\omega,j_1}}\{\Delta CDS_t - x_t'\beta_{j_1} - [inv(\hat{\Sigma}^{1/2}_{v,j_2})(\Delta x_t - Z_t'\hat{\gamma}_{j_2})]'\theta_{j_1}\}^2\}$, where λ_1 denotes the vector of parameters to be estimated in the second step, and $\hat{\lambda}_2$ denotes the vector of estimated parameters in the first step.

Using the standard smoother for the regime switching model, we can get, from the first-step estimation, $Prob(S_{2t} = 1|\Delta\tilde{x}_T)$ and $Prob(S_{2t} = 2|\Delta\tilde{x}_T)$, where $\Delta\tilde{x}_t$ denotes the historical information on Δx until time t, T is the end of the sample period.[14] We can calculate the conditional densities for $j_1 = 1$, 2: $f(\Delta CDS_t|\Delta Z_t, \Delta x_t, S_{1t} = j_1; \lambda_1, \hat{\lambda}_2) = f(\Delta CDS_t|\Delta Z_t, \Delta x_t, S_{1t} = j_1, S_{2t} = 1; \lambda_1, \hat{\lambda}_2) \times Prob(S_{2t} = 1|\Delta\tilde{x}_T) + f(\Delta CDS_t|\Delta Z_t, \Delta x_t, S_{1t} = j_1, S_{2t} = 2; \lambda_1, \hat{\lambda}_2) \times Prob(S_{2t} = 2|\Delta\tilde{x}_T)$.

Denote the historical information on ΔCDS_t until period $t-1$ by $\Delta\widetilde{CDS}_{t-1}$. If $Prob(S_{1t} = j_1|\Delta\widetilde{CDS}_{t-1}, \Delta\tilde{x}_T)$ is known, we can calculate the predictive density of ΔCDS_t by the following equation:

$f(\Delta CDS_t|\Delta\widetilde{CDS}_{t-1}, \Delta x_t; \lambda_1, \hat{\lambda}_2) = f(\Delta CDS_t|\Delta Z_t, \Delta x_t, S_{1t} = 1; \lambda_1,$
$\hat{\lambda}_2) \times Prob(S_{1t} = 1|\Delta\widetilde{CDS}_{t-1}, \Delta\tilde{x}_T) + f(\Delta CDS_t|\Delta Z_t, \Delta x_t, S_{1t} = 2; \lambda_1,$
$\hat{\lambda}_2) \times Prob(S_{1t} = 2|\Delta\widetilde{CDS}_{t-1}, \Delta\tilde{x}_T)$.[15]

However, we do not know $Prob(S_{1t} = j_1|\Delta\widetilde{CDS}_{t-1}, \Delta\tilde{x}_T)$. Given initial values $Prob(S_{10} = j_1|\Delta\widetilde{CDS}_0, \Delta\tilde{x}_T)$, we can calculate the filtered probabilities as follows: $Prob(S_{1t} = 1|\Delta\tilde{CDS}_{t-1}, \Delta\tilde{x}_T) = p_{11}Prob(S_{1,t-1} = 1|\Delta\widetilde{CDS}_{t-1}, \Delta\tilde{x}_T) + p_{21}Prob(S_{1,t-1} = 2|\Delta\widetilde{CDS}_{t-1}, \Delta\tilde{x}_T)$.

Similarly, $Prob(S_{1t} = 2|\Delta\tilde{CDS}_{t-1}, \Delta\tilde{x}_T) = p_{12}Prob(S_{1,t-1} = 1|\Delta\widetilde{CDS}_{t-1}, \Delta\tilde{x}_T) + p_{22}Prob(S_{1,t-1} = 2|\Delta\widetilde{CDS}_{t-1}, \Delta\tilde{x}_T)$.

The probabilities can be updated using the following equation:

$$Prob(S_{1t} = j_1|\Delta\widetilde{CDS}_t, \Delta\tilde{x}_T) = \frac{f(\Delta CDS_t|\Delta Z_t, \Delta x_t, S_{1t} = j_1; \lambda_1, \hat{\lambda}_2) \times Prob(S_{1t} = j_1|\Delta\widetilde{CDS}_{t-1}, \Delta\tilde{x}_T)}{f(\Delta CDS_t|\Delta\widetilde{CDS}_{t-1}, \Delta x_t; \lambda_1, \hat{\lambda}_2)},$$

1415

[14] See Hamilton (1994) for details on the standard regime switching model.

[15] Note that in our model, Z_t includes past values of CDS_t and x_t.

where j_1=1,2

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Iterating the procedure listed above, we can get the log likelihood function to be maximized.

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IMI News

- On April 1, the 1st Quarter Summit of China New Supply Economics 50 Forum and Roundtable on Money and Finance Spring 2018 co-sponsored by the School of Finance of Renmin University of China, the Academy of Huaxia New Supply Economics, IMI and China New Supply Economics 50 Forum was successfully held at the Yifu Hall of Renmin University. The conference interpreted the reports of the government work of the NPC and CPPCC Sessions and discussed issues of financial supervision, macro-control, fiscal reform, and macroeconomic and financial situation, etc.
- On April 1, the External Review Meeting of RMB Internationalization Report 2018 was successfully held in Conference Room 602 of Culture Square, Renmin University of China. Chen Yulu, Deputy Governor of PBoC, Pan Hongsheng, Deputy Secretary-General of Monetary Policy Committee of PBoC, Yan Xiandong, Deputy Director-General of Investigation and Statistics Division of PBoC, Wei Benhua, former Deputy Administrator-in-Bureau of SAFE, Guo Song, Director-General of Capital Account Management Department of SAFE, Zhuang Yumin, Dean of School of Finance, Renmin University, Ben Shenglin, Executive Director of IMI, Chen Weidong, Director of the International Finance Institute, Bank of China, Han Hongmei, Chairman of the China-Africa Fund for Industrial Cooperation Co., Ltd., and Qu Fengjie, Director of Department of China-US Economic Relations, Institute of International Economic Research, NDRC, attended the meeting and made valuable suggestions on the report.
- On April 17th, the Private Salon of FinTech and Prospects of Its Applications was successfully held in Renmin University of China. This private salon was co-hosted by International Monetary Institute (IMI) of Renmin University of China and Rushi Advanced Institute of Finance, and undertaken by Rushi FinTech Research Center. This salon was aimed at discussing the development of FinTech in recent years and its application scenarios in the future.
- On May 8, the Macro-Finance Salon (No.93) was successfully held at Renmin University of China. Marja Nykänen, Member of the Board of the Bank of Finland, was invited to deliver a keynote speech with the theme of "European Banking Sector-Back to Health?".
- On May 10, the Launch of the IMF Regional Economic Outlook of Asia was held at Financial Street International Hotel in Beijing. The meeting was co-organized by IMF Resident Representative Office in China, IMI and Research Institute of Guotai Junan Securities.
- On May 23, Macro-Finance Salon (No.94), jointly organized by IMI and the School of Finance of Renmin University of China was successfully held in conference room 801 in Mingde Main Building. Liu Qingsong, member of IMI Academic Committee, delivered a speech.
- On June 9th, Macro-Finance Salon (No.96) organized by IMI was successfully held in conference room 701 in Mingde Main Building. The Investment Director and Chief Economist of the Deepwater Capital Sun Mingchun delivered a speech entitled "A Decade After the Global Financial Crisis: What's the Next Crisis?"

Call for Papers

International Monetary Review

International Monetary Review is an internal academic magazine sponsored by International Monetary Institute. Following the principle of including both Chinese and western merits with precise and practical academic spirit, International Monetary Review focuses on the cutting-edge theoretical researches in internationalization of RMB, reform of international monetary system, regional monetary and financial cooperation, China's international financial strategies, and other macro-financial theories and policies.
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