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Japan: Spillover Report for the 2011 Article IV Consultation and Selected Issues

This spillover report and selected issues on Japan were prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. They are based on the information available at the time they were completed on June 29, 2011. The views expressed in these documents are those of the staff team and do not necessarily reflect the views of the government of Japan or the Executive Board of the IMF.

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INTERNATIONAL MONETARY FUND

JAPAN

SPILLOVER REPORT FOR THE 2011 ARTICLE IV CONSULTATION[1]

June 29, 2011

KEY ISSUES

Objective. Spillover reports explore the external effects of policies in systemic economies, focusing on concerns raised by key partners. In the case of Japan, these relate primarily to the dynamics of public debt, and the potential effects of delayed fiscal consolidation. More recently, interest centered on the impact of the March 2011 earthquake; particularly in light of Japan's unique role in the global production chain.

Findings. The main messages flowing from the analysis are as follows:
Although the recent earthquake has underscored Japan's role as a supplier of sophisticated technological products, neither fiscal nor monetary policies appear to have led to significant global spillovers in recent years. However, Japan remains an important source of demand in Asia, and the lack of policy space and rising public debt levels in other advanced economies suggests that developments in Japan may have a larger impact than in the past.

While fiscal consolidation in Japan may result in short-run costs for some Asian countries, the long-run effect on all regions would be positive. Speedy implementation of Japan's growth strategy would mitigate any negative short-term spillovers. By contrast, monetary policy spillovers are found to be limited.

Financial spillovers from Japan were found to be smaller than those from other systemic economies, reflecting a financial sector largely focused on the domestic economy. Nevertheless, a delay in fiscal consolidation could lead to strains in JGB markets and losses on bank balance sheets, both of which could affect Japan's trading partners. In particular, a rise in JGB yields could lead to higher interest rates elsewhere, especially in economies where government debt is already high.

The authorities agreed with the key findings of the report, but cautioned that a robust methodology for gauging financial sector spillovers effects was yet to be developed, particularly concerning cross-border confidence effects. They acknowledged that a failure to consolidate fiscal policy could lead to spillover effects, but suggested that Japanese banks would not have a large role in transmitting a shock abroad.

[1]The report does not try to capture the full extent and historical significance of Japan's influence on the world economy. Rather, it focuses on key policy-relevant issues raised by partners, and describes the reactions of the Japanese authorities. Technical chapters underlying the analysis can be found in the accompanying Spillover Issues Paper.

Approved By
Ranjit Teja and Mahmood Pradhan

The report was prepared by a staff team led by Tamim Bayoumi and Martin Mühleisen, comprising Andrea Maechler, Andrew Tiffin, Phil de Imus, Nagwa Riad, Hitoshi Sasaki, Anna Ter-Martirosyan, Sergejs Saksonovs, Tola Oni, Manju Ismael (all SPR); Pelin Berkmen, Stephan Danninger (APD); Akira Otani and Srobona Mitra (MCM).

Spillover Reports

Spillover reports examine the external effects of domestic policies in five systemic economies, i.e., the S5, comprising China, Euro Area, Japan, United Kingdom, and the United States. The mere existence of external effects does not imply that policy modifications or collective action is needed—that depends on many considerations, including the presence of economic externalities. The aim rather is to stimulate discussion, providing a global perspective for policy advice in Article IV discussions and input for the Fund's broader multilateral surveillance. In each case, key partners are asked about outward spillovers from the economy in question, on the basis of which staff choose issues for analysis. To facilitate candor, spillover reports do not cite who raises a specific issue.

For this report, the staff consulted officials and analysts from the other S5 and Korea, as well as countries visited in the context of other spillover reports. A separate forthcoming report will summarize the themes emerging from discussions with the S5.

CONTENTS

JAPAN'S ROLE IN THE WORLD ECONOMY

1. Japan's position as one of the largest and richest economies in the world owes much to its rise as an export powerhouse in the second half of the 20th century. With its sophisticated manufacturing base, Japan has enjoyed current account surpluses since the 1970s, helping the country to become the world's largest net creditor. The yen has become a key international currency, and several Japanese banks were at one time among the world's largest financial institutions. However, Japan's "lost decade" of the 1990s, the subsequent deleveraging of bank and corporate balance sheets, and adverse demographics have since contributed to a more modest pace of economic expansion.

Japanese Trade: High Value Added

2. Japan is a global supplier of high-end consumer goods and sophisticated intermediate products (Spillover Issues: Chapter I). With the United States and China as its largest trading partners, it accounts for about 5 percent of world trade. Japanese consumers have long ranked among the most important buyers of finished products from Asia. In this regard, imports from the region rank third in size behind China and the United States, although Japan's contribution to regional growth has slowed as domestic demand has stagnated in recent years.[2]

3. Japanese technology plays a key role in facilitating exports of neighboring countries. Japanese exports have the lowest share of foreign value added in the region, underscoring Japan's "upstream" position in the regional production chain.[3] As Japan has increased the sophistication of its export basket, it maintains a lead in specialized core components.[4] This has enabled Japan to maintain a bilateral trade surplus with most countries in the region, including China, and capture a significant share of value added in other Asian countries' exports (Box 1). For example, Japanese companies account for about 10 percent of value added in Chinese exports of electrical equipment.

4. The destruction caused by the March 11, 2011 earthquake has revealed Japan's importance in the global supply chain. Earthquake damage and subsequent power outages led to a halt in the production of key ingredients for car computers, integrated circuit chips, and printed electronics boards. The resulting supply disruptions, albeit temporary, were felt in factories in many countries, including Europe, the United States, and Asia (Box 2). According to market analysts, the

[2]The extent to which each country's income depends on the final demand of others can be measured by the value-added in the home country induced by foreign trading partners (Spillover Issues: Chapter II).

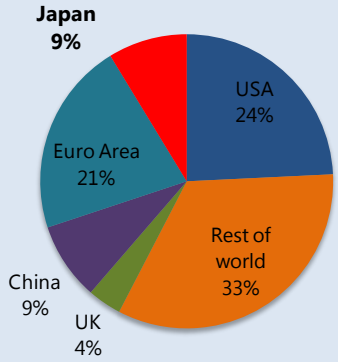
[3]Input-output tables for Asia show that the foreign component in most countries' domestic output has been rising strongly, and that a significant portion of the final assembly of Asian-made products, which used to be assembled and finished throughout the region, has shifted to China (Spillover Issues: Chapter II).

[4]Studies find that is not only how much, but also what you export that matters—countries with more 'sophisticated' export baskets enjoy faster subsequent growth. (Spillover Issues: Chapter I).

Figure 1. Japan and the World Economy

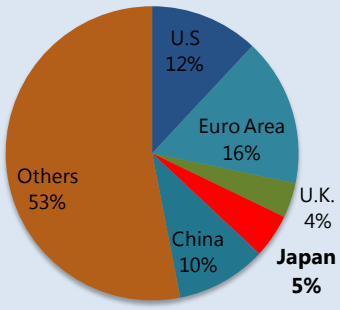
With almost one-tenth of global GDP...

Share of Global GDP



...Japan accounts for a smaller share of trade...

Share of Global Trade

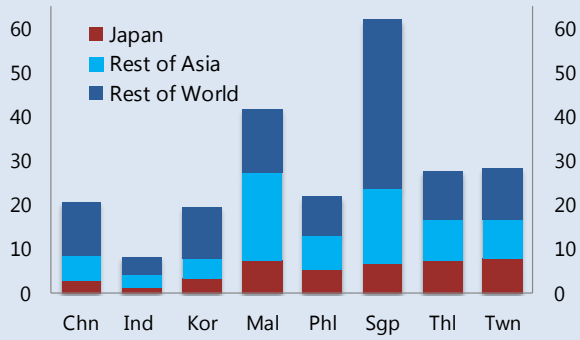


...which focuses mainly on Asia...

Trade by region (USD Billion)

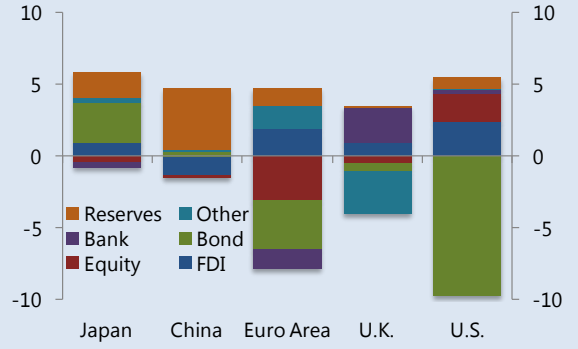
where it plays a key role in the regional trade network.

Source of Value Added in Exports (Percent of Total value Added in Exports)



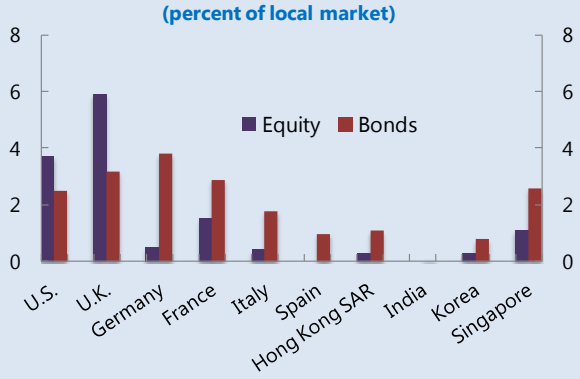
Japan is also the world's largest creditor...

Net Foreign Asset Position, 2009/2010 (percent of world GDP)



...but does not dominate any single market.

Japanese Investment in Foreign Markets (percent of local market)



Sources: DOTS, IIP, WEO and Fund staff calculations.

Box 1. A Byte of the Apple: The Distribution of Value from iPod to iPad

As an example of regional supply chains, Dedrick, and others (2010)1 suggest that, whereas the greatest value added from the production of the iPod accrues to the U.S. company (Apple), the second largest share of value added is captured by Japanese firms, which produce the high-value components of the product.

This research estimated that $163 of the iPod's $299 retail value in the United States was captured by American companies and workers, breaking it down to $75 for distribution and retail costs, $80 to Apple, and $8 to various domestic component makers. Japan contributed about $26 to the value added (mostly via the Toshiba disk drive), while Korea contributed less than $1. The unaccounted-for parts and labor costs involved in making the iPod came to about $110, of which China earned around $4.

A similar breakdown of the iPhone 3G by the research from iSuppli confirms this analysis. The phone is made in China, but Japanese components account for about $60 of production costs (flash memory, touch screen), whereas Chinese assembly adds about $6 of total costs.

A breakdown of the iPad, on the other hand, highlights the growing competitive strength of Korea. In the particular device they examined, the flash memory was provided by Samsung and the touch screen was made by LG—although iSuppli noted that, for some iPads, Apple still sources these components from Japan.

[1]Who Profits from Innovation in Global Value Chains? A Study of the iPod and Notebook PCs," Industrial and Corporate Change 19(1), pp. 81–116.

number of cars manufactured worldwide was expected to drop by up to 30 percent in the two months following the quake, and to shave as much as ⅓ to ½ a percentage point off annualized U.S. GDP growth in the second quarter. But any loss in this regard is expected to be offset in subsequent quarters, resulting in little net impact for the year.

5. Reacting to competition from low-cost producers, as well as increasing local demand, many Japanese companies have shifted production to the region. Japan accounts for almost one-quarter of total advanced-economy FDI in Asia, second only to the United States. Traditionally, factor price differentials were the key drivers for outward FDI, as labor-intensive production, such as final assembly, was moved to countries with lower costs. More recently, countries' market size has also become a significant determinant of FDI, with an increasing share of FDI aimed at servicing the growing consumer markets of Asia (Spillover Issues: Chapter III). Key FDI recipients include Thailand, Korea, and Taiwan POC, as Japan's output share in East Asia dropped from two-thirds in 1995 to one-quarter in 2008.

Financial Markets: Largely Domestic

6. Owing to its large external surpluses, Japan has accumulated the world's largest net foreign asset position. Japan's $3 trillion net international investment position reflects both official reserves (mostly held in the form of U.S. Treasuries), and a large net private position in bonds.[5] The private position (about $1½ trillion) primarily consists of the outward investments of banks, life insurers, and corporate pension funds in U.S. Treasuries and both U.S. dollar and yen-denominated corporate bonds.

[5]Japan still enjoys a current-account surplus of around 3 percent of GDP, and provides almost $200 billion of capital each year for other countries to borrow.

Box 2. The Supply-Chain Spillovers of the March 11, 2011 Earthquake

Japan is a globally important source of essential components and capital goods—representing, for example, one-fifth of the world's semiconductor production. In particular, Japan is a critical upstream supplier for many countries across the globe. In the machinery and reactors sector, for example, Japan accounts for more than a third of global exports of machinery and wafers (ISIC code 8486), providing more than 50 and 35 percent of U.S. and Chinese imports, respectively. Lengthy disruptions to exports of these components could have important spillover effects for production worldwide.

Table 1 **Japan's Share in Global Export Markets and Partner Imports, 2010**

	8486	8408	8541	8703
JPN exports (% world exports; reporting)	34.3	10.0	15.0	17.1
Imports from Japan (% 4-digit imports):				
China	35.7	37.1	19.6	23.5
Hong Kong	23.2	7.6	15.2	30.6
India	12.2	10.0	7.8	15.0
Indonesia	48.6	31.1	35.1	20.1
South Korea	40.6	34.6	25.3	18.7
United States	53.2	20.2	17.8	27.7
EU27 (Ext Trade)	27.2	25.2	6.4	33.3
Notes:				
8486: Boilers and reactors: mach & appl for mnf semiconductors				
8408: Boilers and reactors: compression-Ignition for combustion engines				
8541: electrical machinery: semiconductor devices				
8703: vehicles excl railways: autos				
Source: Global Trade Atlas.				

The earthquake has highlighted the fragility of tightly integrated global-production networks. The main issue is the specialization and concentration of upstream manufacturers— as you go further up the supply chain, volumes are lower, reducing the need for multiple factories or firms. Often one small company with a single factory can have an 80 percent global market share. It therefore takes much less damage to throw the whole supply chain into disarray.

- In addition to producing one-fifth of the world's semiconductor supply, Japan also controls 90 percent of the world's production of bismaleimide-triazine (BT) resin, which is used to manufacture substrates, the basic raw material for the production of integrated circuit chips and printed electronics boards. Production was suspended for two months at Mitsubishi Gas and Chemical, which accounts for 50 percent of the world's supply.

- In the auto sector, a particular source of concern has been the supply of microcontroller units (MCU), which are small, single-chip computers that are used in a variety of automotive applications, including engine control and safety electronics. A critical producer (Renesas), which provides MCUs for Japanese production worldwide, was hard hit by the disaster, and is operating at reduced capacity

With few immediate alternatives, and with long lead times in the construction of new supply facilities, most firms in Japan and abroad have had to simply absorb added losses until Japanese production recovers, either by drawing down their inventories or by temporarily scaling back production.

Recent equity-price developments can help assess the worldwide significance of earthquake-related disruption. Cumulative abnormal equity returns since the earthquake captures the market's assessment of firms' ability to cope with key supply-chain bottlenecks (see table below).

These data suggest that the global impact of the earthquake will be short lived. In the high-technology sectors, initial market concerns seem to have eased, and international equity prices are recovering. Market analysts generally expect worldwide semiconductor production to pick up in July-September, and to have largely normalized by the end of the year.

Box 2. The Supply-Chain Spillovers of the March 11, 2011 Earthquake (concluded)

Similarly, the immediate impact on automobile production has been notable both in Japan and abroad. But looking forward, most analysts expect a normalization of supply toward the end of 2011, so that the net impact will be to shift production from 2Q11 to subsequent quarters.

Table 2 **Firms in the Silicon Wafer Supply Chain 1/**

		Cumulative Abnormal Returns						
Upstream	Country	March 11: earthquake	March 15: peak of nuclear meltdown fears	March 22: some firms restart operations	March 31: government may widen exclusion zone around Fukushima Daiichi	April 7: 7.1 scale aftershock	April 12: nuclear alert raised to 7	April 22: present
Shin-etsu	Japan	-2%	-19%	-4%	-6%	-8%	-6%	-4%
SUMCO	Japan	-4%	-7%	4%	14%	9%	10%	6%
MEMC (potential substitute)	US	0%	13%	5%	7%	1%	-1%	-5%
Midstream foundaries								
TSMC	Taiwan PoC	1%	3%	1%	0%	3%	1%	2%
UMC	US	2%	4%	3%	0%	3%	3%	2%
SMIC	HK SAR	-2%	2%	2%	0%	1%	0%	5%
Midstream memory makers								
Elpidia	Japan	1%	-19%	-4%	-4%	-2%	1%	5%
Toshiba	Japan	-2%	-39%	-19%	-21%	-28%	-25%	-17%
Hynix (potential substitute)	Korea	0%	7%	3%	12%	13%	14%	27%
Texas Instrument (potential substitute)	US	1%	3%	1%	1%	1%	0%	2%
Upstream notebook book and tablet PC makers								
Sony	Japan	-2%	-19%	-9%	-8%	-11%	-14%	-16%
HP	US	1%	3%	3%	-2%	-2%	-1%	-3%
Acer	Taiwan PoC	-3%	-7%	-6%	-20%	-26%	-25%	-37%
Apple	US	2%	4%	1%	0%	-4%	-4%	0%
Lenovo	China	-3%	-7%	-1%	-3%	-2%	-2%	-2%

Sources: Bloomberg, various news services, and IMF staff calculations.
1/ Firms in red are those directly impacted by the earthquake.

Nonetheless, downside risks remain. A key concern in this regard is the speed of Japanese reconstruction and the reinstallation of key infrastructure. Semiconductor production, in particular, requires a stable supply of electricity and clean water. Prolonged power shortages or unexpected blackouts would continue to constrain activity—even beyond the disaster zone—and would significantly hamper the normalization of production, both in Japan and abroad.

The longer-term implications for other countries are mixed. In contrast to the short-term costs of reduced output and exports, the disaster may offer Japan's neighbors some longer-term opportunities. Most obviously, it presents regional firms with a window to step up their production of intermediate products. The medium-term impact of the crisis, therefore, may be to provide an added impetus for countries climbing up the value-added chain, especially for those with a more-advanced industrial base.

7. Japanese debt and equity markets are among the top 5 international markets in size, but are primarily geared toward domestic investors. Only 5 percent of Japanese government bonds (JGBs) are held by foreign investors, of which about one-fifth are located in Asia (Spillover Issues: Chapter IV). By comparison, more than 30 percent of U.S. Treasuries and around 55 percent

of German bunds are held abroad. However, officials indicated that foreign investors account for about 15 percent of the cash turnover in JGB bonds, and 65 percent of futures markets transactions. Participation in the equity market is larger, with one quarter of market capitalization held abroad, but less than one-half of a percent accounted for by Asian investors.[6]

8. Given its domestic focus, Tokyo as a financial market place is not a major intermediator of global capital flows. Foreign issuance of equity and debt in Japan has been negligible in recent years, and bonds placed by Japanese issuers abroad amount to only 1½ percent of global outstanding cross-border debt securities. At 14 percent of GDP, the sum of gross capital inflows and outflows in the Japanese BOP—a crude measure for financial market turnover—is considerably smaller than in other systemic economies.

9. The yen remains an important global currency, although its share in global reserve holdings has declined in the past decade. Yen holdings currently account for 2 percent of reported foreign exchange reserves, and measured by turnover, the foreign exchange market in Tokyo remains the third largest in the world—albeit well behind London and New York. In recent years, the yen has been a funding currency in foreign exchange carry trades, as well as becoming a preferred investment destination during bouts of global turmoil. This has contributed at times to relatively abrupt currency movements, in response to shifts in sentiment.[7]

Banks: Expanding Abroad Again

10. Banking links have also become less important since the 1990s, but Japanese banks are again expanding abroad. Traditionally, Japanese banks have expanded abroad to support the global expansion of Japanese corporates. This trend has recently picked up again, following the slowly improving health of Japanese banks' balance sheets, and slim margins at home. Japan's cross-border bank claims have more than doubled since 2002, from $1 trillion to more than $2½ trillion, most of which are claims on the United States and other advanced economies. The total international exposure of Japanese banks, measured relative to GDP, nevertheless remains low compared with that of European banks.

11. There is still substantial room for banks to grow their cross-border links with Asia. Claims by Japanese banks on Asia account for only 10 percent of their total foreign claims, and are concentrated in Australia and Korea. Lending to the region is rising slowly, and a considerable portion of this expansion appears to reflect, as before, loans to large Japanese firms and intra-firm transfers of Japanese conglomerates, largely in support of regional FDI and trade. Market participants have suggested that some of this expansion is driven by limited lending opportunities at home; but they have also stressed that Japanese banks tend to face stiff competition from global competitors as they expand beyond their core Japanese corporate clientele.

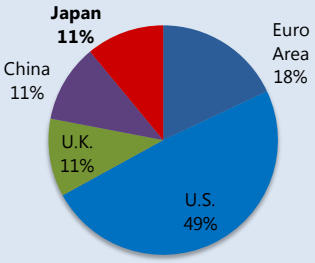
[6]Foreigners account for 42 percent of equity trading volumes.

[7]The sensitivity of the yen to exogenous shocks was revealed by the recent earthquake, when worries about a large-scale repatriation of capital initially resulted in a sharp currency appreciation. These concerns appeared to have been premature, however, and yen volatility quickly diminished after a coordinated one-off intervention by the G7.

Figure 2. Japan and Global Financial Markets

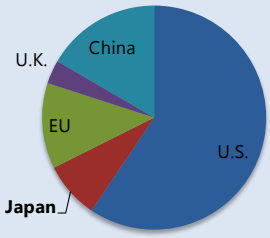
Japan has a large equity market...

Capitalization of Domestic Equity Market (Share of S5)

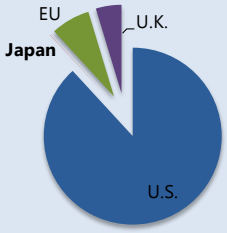


...with few foreign listings.

Value of Equity Trading (Share of S5) Domestic firms listed locally

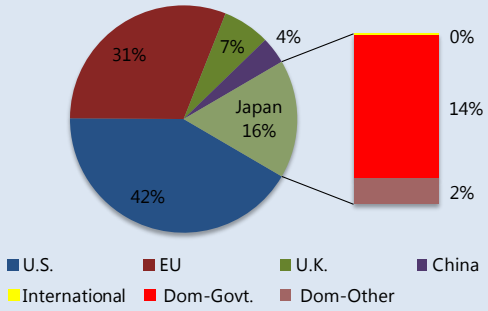


Value of Equity Trading (Share of S5) Foreign firms listed locally



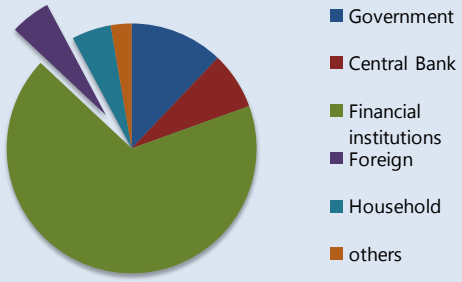
The bond market is even larger...

Debt Securities Outstanding, country of residence (Share of S5)



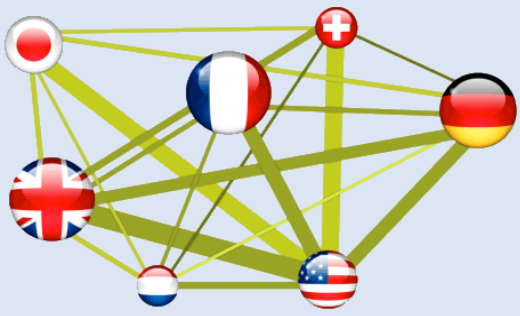
...but is dominated by domestically held JGBs.

Share of JGB Holdings (Dec 2009)



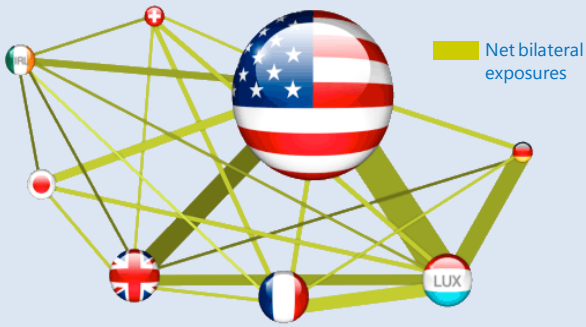
The banking system is relatively isolated...

Banking system (cross-border bank claims = $30 Trillion)



...suggesting that bank spillovers are limited.

"Shadow" Banking system 1/ (total claims = $25 Trillion)



Sources: World Federation of Exchanges, Bank of Japan, BIS, Lipper/Thomson Reuters, Fund staff calculations.
1/ Includes: Money-market funds; Mutual funds; Hedge funds; Pension funds; and Exchnage Traded Funds.

SPILLOVER ANALYSIS

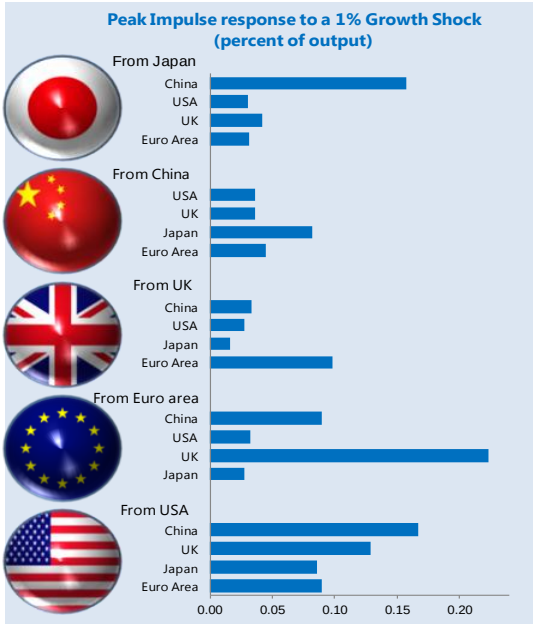
12. This section expands on the stylized facts presented above. It reports the results of empirical analysis obtained by applying exogenous "shocks" to different models of Japan's global economic and financial market relationships. These shocks are hypothetical, but provide an important yardstick for discussing the effects of policy changes in the next section.

Growth Spillovers: A Regional Story

13. In line with findings for other countries, with the exception of the United States, growth spillovers from Japan on the global economy are likely to be limited:

- A simple VAR model analyzing interactions between the United States, Europe, Japan, and the U.K. finds that the impact of a growth shock in Japan is marginally positive on the Euro area, but other effects are small and statistically insignificant.[8] This result is similar for the euro area and the United Kingdom. Indeed, only U.S. growth shocks tend to be large and persistent (Figure 3).

- Input-output analysis suggests that, for example, a 10 percent increase in Japanese import demand would generate at most a ¼ percentage point export increase from its largest non-Asian trade partners.[9]



14. However, there is sufficient evidence to suggest that Japanese growth has a noticeable impact on its key regional trading partners:

- Staff's macroeconomic model calibrated for the G-20 economies indicates that a one percent growth shock to Japan would have a noticeable impact on Chinese output (of the order of 18 basis points) and vice versa.[10] A similar regional relationship is observed between the Euro Area and the United Kingdom, whereas other spillover

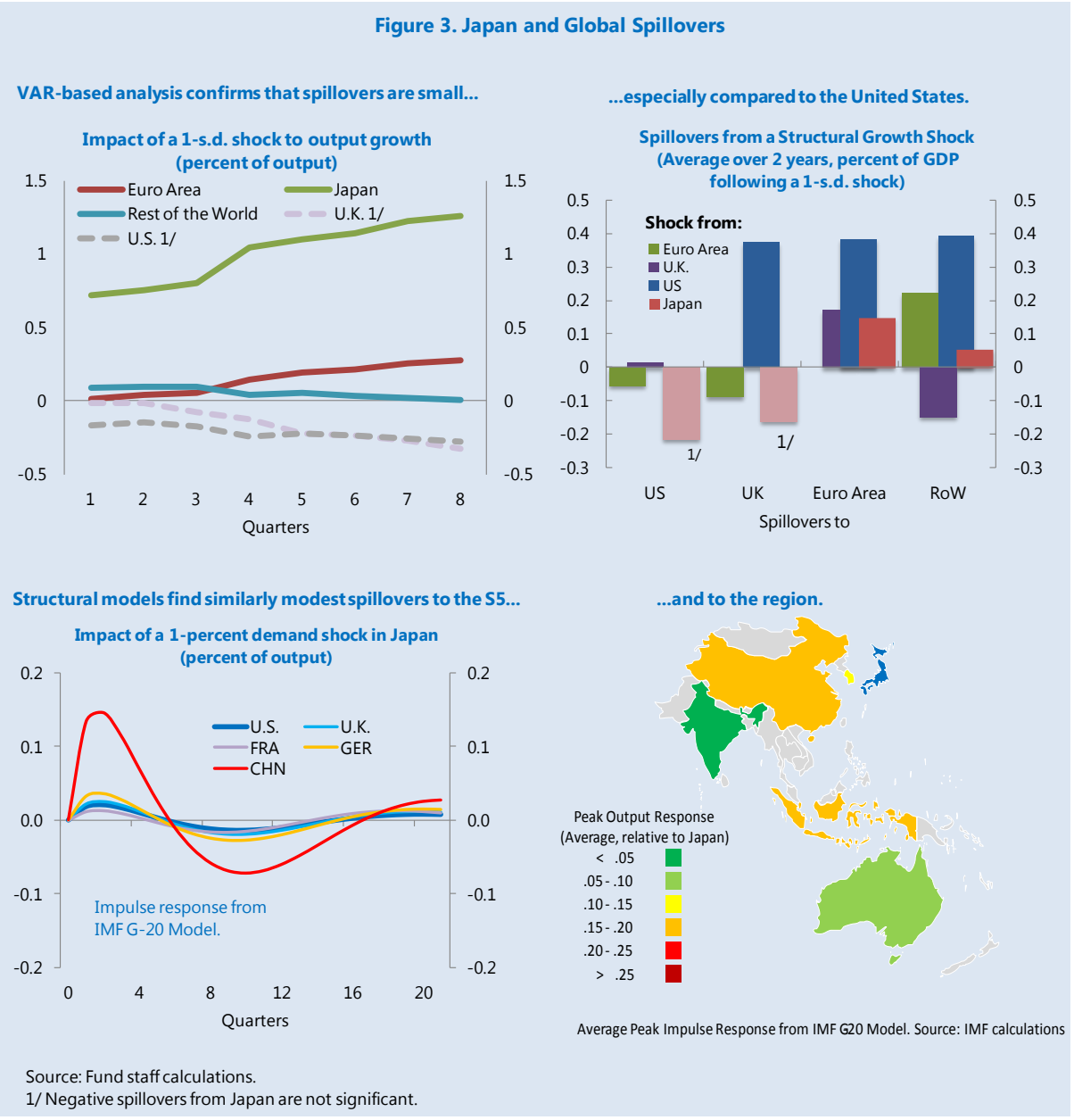
[8]The methodology follows Bayoumi and Bui (2010), "Deconstructing the International Business Cycle: Why Does A U.S. Sneeze Give The Rest Of The World A Cold?" IMF Working Paper 10/239, whose approach allows both the identification of causation of shocks and the decomposition into different spillover channels. China could not be included in the analysis because of data limitations. For Japan, a 1 percent of GDP shock is broadly equivalent to one standard deviation.

[9]See U.S. Spillover Report. Spillover Issues: Chapter 6.

[10]See Vitek, F., 2010, "Monetary Policy Analysis and Forecasting in the Group of Twenty: A Panel Unobserved Components Approach." IMF Working Paper 10/152.

coefficients are comparable to the results described in the previous paragraph. The model also indicates a tenuous growth impact from Japan on Indonesia and Korea.

Figure 3. Japan and Global Spillovers



Source: Fund staff calculations.
1/ Negative spillovers from Japan are not significant.

- The results are similar when the analysis is refined to focus on Japan's regional links. A Global Vector Autoregressive Model (GVAR)—which includes growth, inflation, and other macro variables—also finds modest regional spillovers, including for Japan's impact on equity prices and interest rates (Spillover Issues: Chapter V).

15. These findings are consistent with the projected impact of the recent earthquake. Taking into account the authorities' likely reconstruction efforts, projected domestic output growth for 2011 has been downgraded substantially by around 2 percentage points. However, the impact on the United States and Euro area is expected to be minimal, and model simulations indicate that,

ceteris paribus, the corresponding effect in Asia (including China) is unlikely to exceed 0.1–0.3 percentage points of growth.[11]

The Financial Channel: Generally Quiet

16. While Japanese growth spillovers are comparable in size to most other large economies, the impact of financial market shocks appears to be smaller. For example, staff estimates suggest that a "shock" to U.S. bond yields and stock prices would be noticeable in all global financial markets, and an impulse from Euro area equity markets would still be felt in the United Kingdom and Japan. In contrast, Japanese financial variables are not found to trigger major spillovers, consistent with the absence of strong external financial sector links.[12] Other findings point in a similar direction:

- Japanese banks score low in "market distress models". Japanese banks are more likely to be affected by distress in foreign financial institutions than the other way around. When ranked according to their estimated ability to generate distress in others, no Japanese bank scored among the global top 10.[13]

- BIS cross-border inter-bank exposures indicate that global financial institutions are fairly impervious to Japanese credit risk (Spillover Issues: Chapter VI). Furthermore, Japan is found to be among the most resilient countries to cross-border credit shocks, suggesting that it would mitigate rather than amplify the transmission of global shocks. The impact of a hypothetical credit event in a Japanese bank would be comparable, by order of magnitude, to that of an average medium-sized European economy with low interest rate spreads.

17. With a few exceptions, these results also hold within Asia:

- Network analysis tools can also help simulate the regional impact of hypothetical credit events in Japan. Under a scenario that includes a credit event and subsequent deleveraging, some Asian banking systems could experience moderate but not systemic losses (Spillover Issues: Chapter VI).

- Using another approach, staff constructed financial stress indices—statistical indicators flagging abnormal movements a country's key financial markets—for Japan and a range of emerging Asian economies to analyze their reaction to changes in stress indices in other advanced economies. The results suggest that financial stress in Japan could indeed spill over into regional markets, but the impact would be smaller than from other advanced

[11]Analytically, the demand-side implications of the shock are complicated by a shift in expenditure toward infrastructure reconstruction, and additional import demand for energy and materials.

[12]Based on the methodology in Bayoumi and Bui (2010), staff extended the VAR approach to include financial-market shocks. See the U.S. Spillover Report. Spillover Issues: Chapter 1.

[13]See "Japan and the Global Financial System: Spillovers and Systemic Linkages," IMF Staff Country Report 09/211, Ch.2.

economies, and there do not appear to be any spillovers from Japan to non-Asian emerging markets (Spillover Issues: Chapter VII).

Authorities' Views

18. The authorities broadly agreed with the staff's findings, albeit with a caveat that model-based findings would have to be interpreted carefully. They emphasized that Japan remained an important source of demand for its Asian trading partners. Officials generally felt that empirical models provided a useful guide to growth and trade-based spillovers, and suggested that spillovers into Japan were somewhat more pronounced than spillovers out of Japan. However they were generally skeptical about the capacity of current models to capture financial market spillovers, particularly concerning cross-border confidence effects. There was agreement that the absence of empirical findings on financial spillovers should not be interpreted that economic and financial developments in Japan could not have a more significant impact on global markets, in particular during times of global economic and financial uncertainty.

19. The staff noted that the current macroeconomic environment was conducive to spillovers being larger than captured by the empirical analysis. During Japan's "lost decade", buoyant economic growth in advanced economies may have helped shield the rest of the world from a sustained negative output shock in Japan. Today, the world economy is in a very different position. The growth outlook for advanced economies is more fragile, suggesting that negative developments in Japan could have a substantially stronger effect on global growth. Although this result has not been borne out by the experience of the recent earthquake, fiscal strains and near-zero policy rates in many advanced economies imply that there may be less scope for policy makers to respond to future demand shocks.

POLICY ISSUES

Views Held by Other Authorities

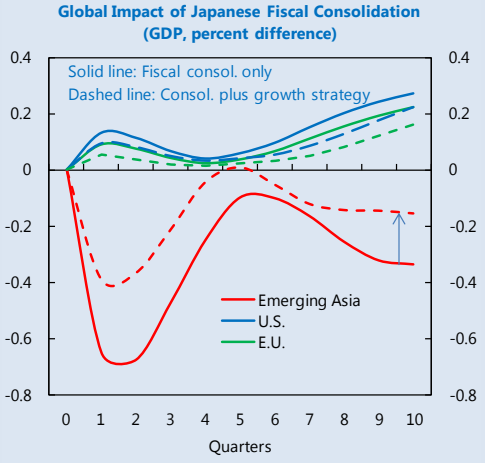
20. Japan-related discussions with other authorities (held pre-earthquake) focused on the dynamics of public debt. There was general agreement that growth and financial spillovers from Japan were limited, but also concerns about the fiscal imbalance. Although a fiscal crisis was not viewed as imminent, other authorities regarded the current path as ultimately unsustainable, and they noted that the transmission of a shock would be primarily through global financial markets rather than the standard growth channels. On the exchange rate, it was noted that the carry trade from Japan had subsided, replaced to some extent by funding out of the United States. These issues are examined further below, along with other topics discussed in the Article IV Staff Report.

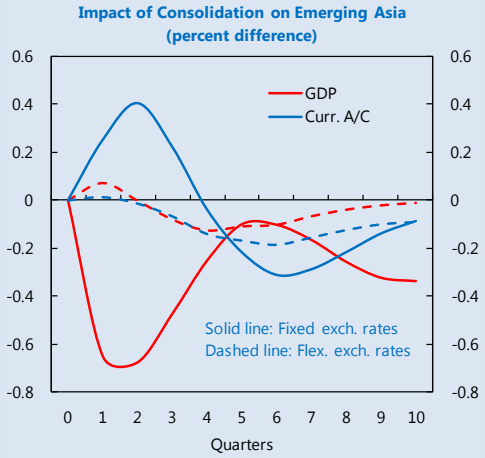
The Baseline: Fiscal Consolidation and Structural Reforms

21. Following a large reconstruction effort to repair the damage caused by the recent earthquake, fiscal policy is set to embark on a sustained consolidation effort. For the purposes of this report, the baseline case mirrors staff's policy-adjustment scenario, where a medium-term

fiscal consolidation effort will start in 2012 with a moderate tax increase to finance earthquake-related expenditures. Staff estimates that stabilizing the net debt ratio by 2016, and reducing it to around 135 percent of GDP by 2020, requires a 10 percent of GDP structural primary adjustment over the next ten years. Given the limited scope for spending cuts, fiscal adjustment would need to rely mainly on new revenue sources and limits on spending growth. Moreover, structural reforms are assumed to raise the potential growth rate to 2 percent over the next decade.

22. Policy simulations are based on the IMF's GIMF model (Spillover Issues: Chapter VIII). In the short run, fiscal adjustment will reduce domestic demand. Over the longer run, lower public dissaving will help reduce interest rates, spur investment, and boost permanent income. At the same time, the growth-strategy reforms will help spur investment and boost aggregate demand. Although productivity rises only gradually, it ultimately results in a substantial increase in future income, which increases the confidence of forward-looking households and supports current consumption.





23. Spillovers to other economies would be modest relative to the impact in Japan. The main impact of fiscal consolidation would be to release a pool of savings for other countries to borrow. For Japan, increased savings translate into a larger trade surplus and real depreciation. For other countries, Japan's trade surplus corresponds to lower net exports and reduced output. This would be offset to varying degrees by (i) accommodative monetary policies, and (ii) an increase in local permanent income owing to falling global interest rates. The average impact on other economies is a ¼ percentage-point drop in their current account balance.

- For Asian countries with pegged exchange rates, fiscal consolidation generates additional short-term costs as yen depreciation translates into a real appreciation, lowering inflation, pushing up real interest rates, and suppressing output.

- Over the long run, once fiscal consolidation is complete, all regions benefit from higher consumption and investment, owing to lower world interest rates.

Policy Simulations: Consumption (percent difference)

	Short-term (5 years)	Long-term (15 years)
USA	0.6	1.1
Euro area	0.4	0.9
Emerging Asia	0.1	0.4

24. Japan's growth strategy could help offset the decline in demand from fiscal consolidation, and so will reduce negative spillovers in the short- to medium term. By supporting Japanese consumption and investment; growth-enhancing reforms help scale back Japan's trade surplus and depreciation. Even so, Asian economies with rigid exchange rates may still face short-term output costs, albeit less than in the case of a pure fiscal consolidation.

25. Strengthening the credibility of the fiscal program can limit the demand-side costs of adjustment. The model's results suggest that the short-term costs of adjustment depend strongly on expectations of future productivity and income, and so will be shaped by the credibility of the authorities' strategy. Uncertainty over the government's long-term commitment would add to the short-term drop in demand, and hence would exacerbate the short-term negative spillovers to Japan's trading partners.

A Rise in Long-Term Interest Rates

26. As noted before, the main concerns of other country authorities focused primarily on the medium-term dynamics of public debt. The growing debt stock is making Japan's fiscal position increasingly vulnerable to upward movements in interest rates (Spillover Issues: Chapter IX). The prospect of a shock still seems remote, however, given Japan's projected current account surpluses, net creditor status, and large size of foreign exchange reserves. The authorities and staff agreed that delayed fiscal reform would increase the risk of a rise in yields, in part because private saving may decline with population aging. A protracted slump in growth resulting from disruption caused by the earthquake would exacerbate revenue shortfalls and further raise market concerns about fiscal sustainability.[14] There is also a risk of unexpected shifts in the portfolio preferences of Japanese investors (Box 3).

27. A rise in JGB yields resulting from a spike in risk premia could induce capital losses on bond holders, and possibly trigger deleveraging by Japanese banks. The direct effect on foreign investors would likely be moderate, given their relatively small overall holdings.[15] But a bond shock, particularly if accompanied by an equity price drop, could hurt balance sheets of Japanese banks, which hold over 40 percent of outstanding JGBs, accounting for one fifth of their total assets. Capital losses could raise counterparty risks and force banks to deleverage their balance sheets, including by withdrawing from their positions abroad. FSA officials recognize, in general, that a level rise in interest rates would also increase profit opportunities for banks, especially if it was the result of a strengthening economy, and that the authorities' concern was more with discrete shifts in the shape of the yield curve rather than an upward shift

[14]Over the past decade, Japan has witnessed several episodes where 10-year JGB yields picked up by 100 bps or more (e.g., the VAR shock in 2003, the 1998 Fiscal Investment and Loan Program shock). Furthermore, events in Europe have demonstrated that once confidence in fiscal sustainability erodes, authorities can face an adverse feedback loop between rising yields, a deteriorating fiscal situation, and a contracting real economy.

[15]Total foreign holdings of JGBs amount to $390 billion, which is equivalent to around 1 percent of the combined global market for sovereign bonds, and 4 percent of the U.S. market.

Box 3. The Impact of Japanese Investors on Global Interest Rates

Staff has analyzed the potential impact of a portfolio shift by domestic savers, including large institutional investors. Japan has long displayed a relatively strong degree of home bias, but the trend toward greater international diversification and the demand for higher returns is slowly gathering momentum (See Japan: Selected Issues, Country Report 07/281). Following the portfolio-balance framework of Neely (2010)[16] ,staff has therefore considered how a steady shift of investment toward foreign bonds might impact interest rates in Japan and elsewhere (see China, Spillover Issues, Annex X).

As a hypothetical example, suppose Japanese investors were to sell $500 billion of JGBs, and purchase instead $200 billion of both U.S. Treasury Bonds and German Bunds, together with another $100 billion of U.K. Gilts and other advanced-market bonds. This shift would roughly double the stock of JGBs held by foreigners, and the overall impact would be to raise Japanese interest rates by around 160 bps, while lowering yields elsewhere by around 40 bps. This is broadly comparable to the estimate by Warnock and Warnock (2009)1 which found that a $500 billion foreign purchase of U.S. Treasuries would lower U.S. yields by almost 70 bps.

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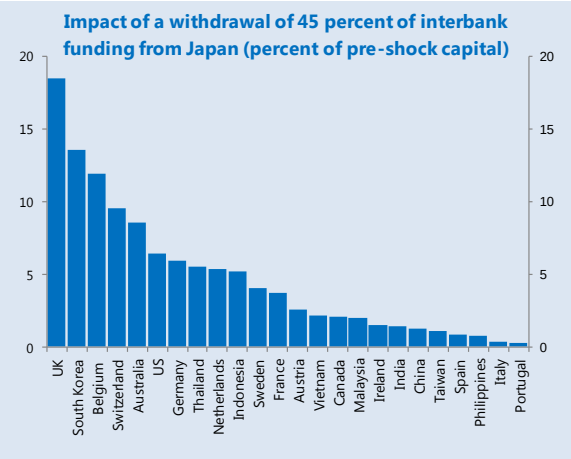
[1]"International Capital Flows and U.S. Interest Rates," Journal of International Money and Finance, V. 28, pp. 903–19.

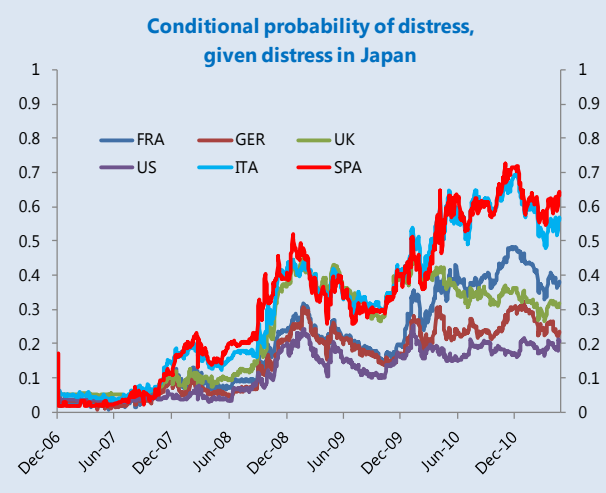
28. The results of a structural macroeconomic model suggest that significant deleveraging would only materialize in the event of a major shock (Spillover Issues: Chapter X). In a stress test, Japan's top banks were found to be able to absorb a 300 bps hike in JGB yields without breaching an (aggregate) 8 percent core Tier I capital ratio. Beyond that, banks would need to scale back their foreign lending. For example, assuming that foreign loans would be cut first, a hypothetical shock raising long-term government bond yields to the level of other large advanced economies (an increase of about 450 bps) would lead to a reduction in outward loans by 45 percent.



29. Foreign banking systems would be expected to withstand such a deleveraging, given their relatively small exposure to Japanese banks. According to network analysis based on interbank flows, banks located in the United Kingdom and South Korea would be most exposed by a loss in funding (Spillover Issues: Chapter X). The authorities cautioned that, in an extreme scenario, the combination of higher JGB yields and counterparty risk could trigger a squeeze in foreign banks' Japanese derivatives operations, possibly requiring them to sell assets in other business areas. The confidence effects of such a shock were hard to predict, but could add to tensions in other wholesale markets.

[16]The Large-Scale Asset Purchases Had Large International Effects," Federal Reserve Bank of St Louis, Working Paper 2010/18C.

30. Finally, spillovers could also be caused purely by market sentiment, translating a rise in JGB yields into higher interest rates elsewhere. An extreme value theory (EVT) framework provides only weak evidence of large movements in Japanese long-term interest rates prompting large movements in bonds and equity markets elsewhere, possibly including the United States (Spillover Issues: Chapter XI). However, history provides a limited guide, as more advanced economies have accumulated large public debt burdens in recent years. Conditional distress indicators (Spillover Issues: Chapter XII) suggest that the risk of transmission of sovereign debt shocks have increased considerably since the 2008 crisis, including from Japan to other sovereigns. Although the authorities reiterated their reservations on the methodology of projecting cross-border financial spillovers, both sides agreed that higher JGB yields could lead to higher interest rates elsewhere, especially in economies where public debt is already high.



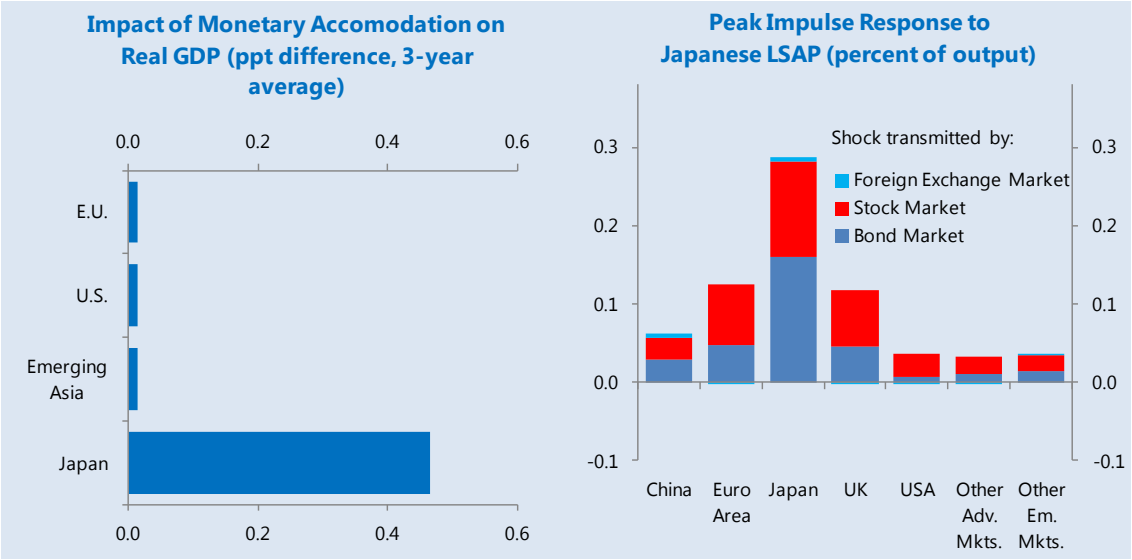
Comprehensive Monetary Easing and the Yen

31. In this scenario, the Bank of Japan is assumed to continue its comprehensive monetary easing (CME) policy for another 2 years to provide support to the economy. In the staff's GIMF model, monetary easing is expected to raise inflationary expectations, and thus support demand by lowering real interest rates. This support would be sufficient to raise growth by an average ½ percentage point over three years in Japan; yet hardly any spillovers—either positive or negative—would be seen abroad.

32. The lack of spillovers from monetary policy also extend to the exchange rate. It is conceivable that continued monetary easing could weaken the yen by lowering longer-term interest rates and widening the interest differential vis-à-vis other currencies. Empirical estimates, however, do not provide support to this hypothesis:

- An event-study analysis of the BoJ's large-scale asset purchases (LSAP) confirms that LSAPs have had a modest impact on local bond yields (around 15–25 bps) but little effect on the term premium or the exchange rate. Financial markets in the United States and Europe have remained largely unmoved.[17]

[17] See Spillover Issues: Chapter XIII, and Japan: 2011 Article IV Staff Report (Box 4).



- Drawing from these results, staff have simulated the impact of further LSAP, assuming that purchases continue up to the authorities' current allowable limit. Again, spillovers are modest, with the peak impact on other economies ranging below 0.1 percent of GDP.[18]

33. Any revival of the carry trade would depend on monetary policy abroad. Although cross-country interest differentials are at an historic low, many other economies are expected to recover somewhat faster than Japan, which implies that their monetary policies may begin to normalize somewhat earlier.

- Forward-looking measures of risk-adjusted gains are significantly lower for the Australian, New Zealand, and U.S. dollar compared to the precrisis period, reflecting much narrower interest-rate differentials against the yen and a higher level of implied volatility priced into current markets owing to the crisis.

- Position and leverage indicators also suggest lower appetite for carry trades. Prior to the crisis, noncommercial accounts held large short yen futures positions on the Chicago Mercantile Exchange. Since the last quarter of 2007, however, these accounts have mostly held net long positions.[19]

- Market observers agreed that a sudden return of the carry trade was unlikely. Nonetheless, they concurred that, as rates increase in the United States and elsewhere, there might be a growing interest in using the yen as a funding currency, putting further downward pressure

[18]This is likely to be an upper bound, as a large portion of the impact of LSAP is felt on announcement.

[19]Similarly, the call-money liabilities of foreign banks suggest that hedge funds and other speculative investors have a much more challenging time building up leverage in the post-Lehman environment.

on the exchange rate. Staff simulations suggest, however, that the marginal impact on the currency is likely to be limited (Spillover Issues: Chapter XIII).[20]

34. The impact of any CME-related depreciation would mostly occur outside Asia. Simulating the impact of even a sizeable nominal effective depreciation on regional trading patterns—using a more detailed, partial-equilibrium framework—Asian trade responds relatively sluggishly, leaving Asia's role as Japan's dominant partner largely unchanged. This likely reflects the nature of Asia's production chain, where the costs of severing a trading relationship may be higher than elsewhere, and where Japan retains significant market power. Trade with the United States and Europe, on the other hand, is more sensitive to exchange rate changes (Spillover Issues: Chapter I).

A Regional Trade Agreement

35. A key part of the authorities' growth strategy includes efforts to build a regional FTA, possibly through the Trans-Pacific Partnership Agreement (TPP). Aside from any short-term dislocation costs, the macroeconomic impact of this policy will likely center around a sustained improvement in productivity and income—officials estimated that the net gain to Japan could amount to about ½ percentage point of additional output growth. Also, the TPP could help entrench a rules-based framework for new trade areas: such as medical services, pharmaceuticals, and insurance.

Gains for TPP members from Japanese membership

(percent change)		
	Real GDP	**Export Volumes**
Vietnam	0.52	2.08
Malaysia	0.37	0.61
Australia	0.05	0.92
New Zealand	0.03	0.24
Korea	0.03	1.71
Singapore	0.00	-0.06
USA	0.00	0.65
Chile	0.00	0.07
Peru	-0.10	0.22

Source: GTAP and IMF staff calculations.

36. TPP would generate welfare gains for members and minimal losses for nonmembers. Staff has employed a computable general equilibrium (CGE) framework to assess the impact and benefits of the TPP to the region as a whole, and to isolate the marginal contribution of Japan's membership.

37. On average, without Japanese membership, the TPP would generate efficiency benefits equivalent to a one-time boost of 0.1 percent of GDP for regional members. If Japan joins the partnership, these benefits increase to 0.2 percent (Spillover Issues: Chapter XIV). These estimates only reflect static effects in the CGE model, however; the gains could be considerably larger if increased competition as well as the expansion of rules-based frameworks in TPP member countries led to additional investment and further productivity gains.

[20]Regression analysis relating movements in the currency to U.S. market developments suggest that, since early 2007, the yen has been particularly responsive to movements in the U.S. 10-year bond yield (U.S. Spillover Report: Spillover Issues, Chapter 2). However, this result may reflect the abrupt carry-trade unwinding of 2008–09, and Japan's safe-haven status during recent European turmoil, and so may not serve as a guide to the likely impact of higher U.S. yields going forward.

CONCLUSIONS

38. Notwithstanding its position among the world's largest economies, there has been little evidence of significant policy spillovers from Japan. To be sure, the recent earthquake has revealed the importance of Japanese intermediate inputs in the global supply chain, with Japanese technology a key input for industrial production in many of its trading partners. Japan also remains an important and steady source of final demand for its Asian neighbors, but neither economic nor financial policies appear to have had a significant growth impact on partner countries in recent years.

39. Nevertheless, developments in Japan matter. For one, many other advanced economies have become more vulnerable than they were during Japan's "lost decade," suggesting that the impact of Japanese outcomes may be larger than it was in the 1990s—both on the upside and the downside. Moreover, among foreign policy makers, the currently unsustainable fiscal trajectory has triggered concerns about the buildup of public debt, and there is broad agreement on the need for a credible medium-term adjustment strategy. In the staff's view, insufficient fiscal adjustment could lead to a spike in JGB yields which, even if the effects were contained, could trigger financial volatility and prove highly disruptive.

40. Apart from heading off tail risks, fiscal consolidation in Japan would have medium to long-term benefits for its partner countries. The main impact of fiscal consolidation would be to release a pool of savings for other countries to borrow, while putting downward pressure on Japan's real exchange rate. Over the short run, for Asian countries that peg their exchange rates to the dollar, this might initially translate into higher real interest rates and reduced output. Over the long run, however, all regions benefit from lower world interest rates; and speedy implementation of Japan's growth strategy would help offset negative short-term spillovers.

41. Exchange rate-related spillovers on foreign financial markets are found to be small and depend partly on policy developments abroad. Going forward, as monetary policies in other countries are likely to normalize earlier than in Japan, there could be renewed downward pressure on the exchange rate. However, the regional impact of a yen depreciation on foreign financial markets and trade is likely to be modest. Spillovers from regional trade agreements would be slightly positive for countries that joined the initiative.

INTERNATIONAL MONETARY FUND

JAPAN

2011 SPILLOVER REPORT—SELECTED ISSUES

June 29, 2011

Content	Page

CHAPTER I. JAPAN'S ROLE IN REGIONAL TRADE[1]

A. Changing Patterns in Japan's Trade

Japan's role in regional trade. Intra-regional trade has expanded rapidly since 1990, largely owing to dynamic economies such as China (Figure 1). Nonetheless, Japan's intra-regional exports as a share of global GDP have remained remarkably stable—even during the crisis—and account for more than two-thirds of industrial countries' intra-regional trade. Japan's deepening regional integration has largely been driven by the outsourcing of production by Japanese firms to neighboring countries, especially China, Hong Kong SAR, and Singapore. This integration has implications for the interpretation of changes in Japan's export structure.

Shifting export structure. The share of high-technology goods in Japan's overall exports has fallen from 34 percent in 1995 to 23 percent in 2005. This partly reflects a shift in Japan's trade structure—from the export of high-tech final products toward a focus on sophisticated *intermediate* inputs, combined with an outsourcing of the low-tech stages of production to emerging Asian countries. Japan has thus established itself as an important supplier of sophisticated manufacturing inputs at the global and regional levels, especially in the transport and electrical-machinery sectors (Table 1). Even though they may not constitute a large share in Japan's overall exports, these items account for a significant share of global exports in the semiconductor and auto subsectors, and are an important input not only for Asian countries but also for the United States and European Union.

Rising similarity with export structures of emerging Asia. Although it continues to compete with other advanced countries—based on the export similarity index (ESI)[2]—the export structures of countries such as China and Thailand are also converging with that of Japan (Figure 2). Further, competitive pressure from Korea appears to have increased recently, in part due to its ability to brand and market products in China and other Asian countries. Japan's increased outsourcing and upstream position has facilitated the shift in technology content to other Asian countries, adding to the apparent convergence in export structures. Rising similarity could thus reflect increased complementarity, as well as competition.

Position in the supply chain. Japan is clearly upstream in the Asian supply chain and is an important source of foreign value added (FVA) in the gross exports of other Asian countries (Table 2). Japan's contribution to FVA is especially high in countries engaged in assembly or processing activities, such as Singapore, Taiwan and China—particularly for high-tech exports, such as electronic equipment and motor vehicles (Table 3). Japan has thus become more integrated in Asian regional trade, implying that a disruption in production of key intermediate inputs could spill over to other countries in the supply chain.

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[1]Prepared by Nagwa Riad (SPR) based on analysis in a Board paper on *Changing Patterns in Global Trade* (forthcoming).

[2]The ESI measures the similarity of export patterns across pairs of countries, and takes a higher value for pairs with similar shares of each product category.

***Role of Japanese FDI*.** Japan's role in the Asian supply chain is strongly linked to its vertical FDI and its role in the spread of technology. Vertical FDI by Japanese multinationals has traditionally been motivated by factor-price differentials; in contrast, U.S. FDI has generally been motivated by market-access considerations. Broadly speaking, the labor-intensive stages of Japanese production, such as final assembly, have been moved to countries with lower unskilled labor costs, while activities that are relatively intensive in skilled labor—such as marketing, patenting and innovation—have been retained in headquarters. As such, even though the share of Japan's high technology exports may have declined, it has retained those aspects of production with the highest value added. Analysis of the iPod suggests that the second largest share of value added is indeed captured by Japanese firms, which produce the high-value components of the product. This also explains why Japan has consistently outperformed other G-7 countries in terms of increasing the income level of its exports (EXPY) (Figure 3).[3]

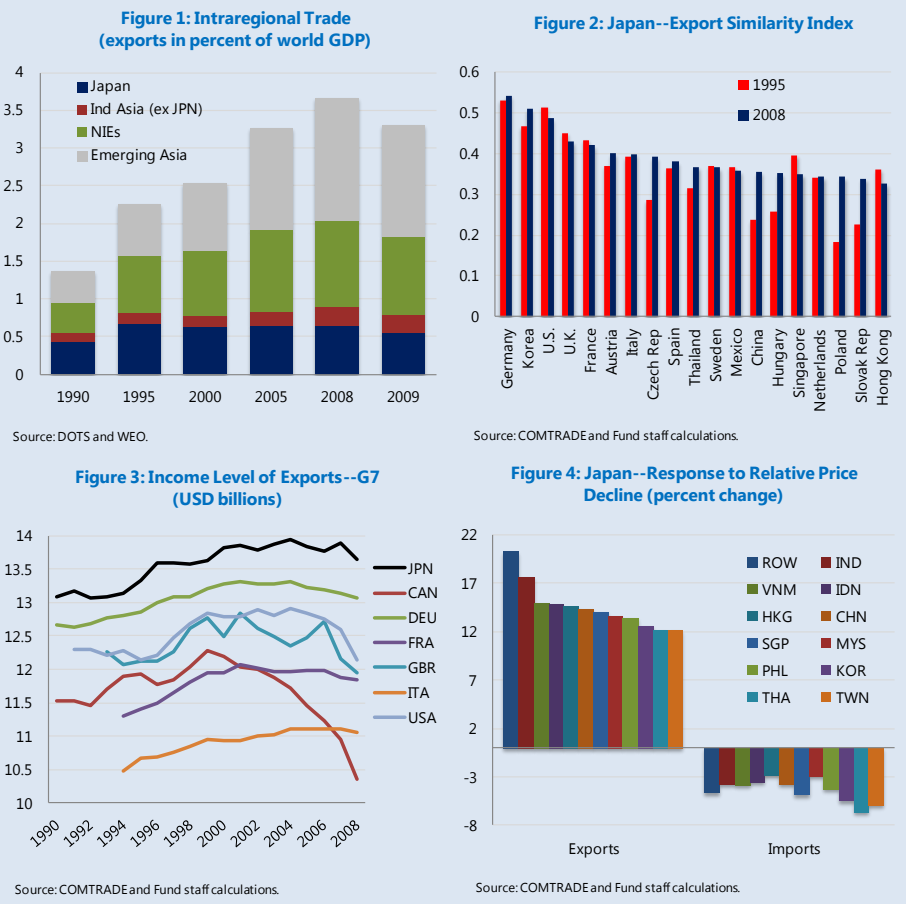
B. Estimating Spillovers: A Sectoral Trade Elasticities Approach

Analytical framework. A simple model that combines a partial equilibrium approach with input-output analysis is used to analyze the response of sectoral trade flows to changes in relative prices.[4] The simulation assumes a relative price decline that could arise from a 10 percent real depreciation; and then outlines changes in the structure of Japanese trade across sectors owing to differences in import demand and substitution elasticities, as well as in the amount of imported intermediate goods. The analysis does not model the drivers of these exchange rate changes, and does not account for indirect supply-side effects such as inter-industry reallocation of production factors.

***Aggregate effects*.** The simulation suggests that a change in relative prices results in important long-run responses on trade flows. Assuming full pass-through of exchange rate changes to import prices, the Japanese trade balance improves by more than 3 percentage points of GDP, largely driven by a strong export response. The relatively large trade response reflects Japan's upstream position in the Asian supply chain and the limited share of imported content in its exports. This likely represents an upper bound; however, as imperfect exchange rate pass-through and pricing-to-market are likely to mitigate the adjustment in trade flows to exchange rate changes. Also, adjustment is likely to be gradual, given high fixed costs in production and trade relationships.

[3]For each product category, the EXPY index notes the average income level of those countries producing the same product—capturing the fact that goods produced by industrialized countries will likely embody higher quality/value added. See Hausmann, and others (2007) "What You Export Matters" *J. of Ec. Growth*, Vol.12.

[4]See *Changing Patterns of Global Trade* (forthcoming), for a detailed description of the methodology and additional results. Data on imports at the 6-digit level is used for the full set of 162 countries for data available in COMTRADE.



***Sectoral effects*.** A depreciation results in an increase in the share of medium-high technology exports, largely driven by the auto sector. In fact, a depreciation would reinforce Japan's comparative advantage in medium-high technology exports and allow it to recover its relative specialization in the auto sector, which has been increasingly lost to countries such as Germany and France. Medium-high technology exports are generally more responsive to relative price changes, reflecting both higher domestic value added, and the discretionary consumer character of this sector, which is captured in income elasticities.

***Supply chain effects*.** Trade with Asian partners is less sensitive to relative price changes, so that trade-balance adjustment takes place mainly outside the supply chain (Figure 4). In response to a depreciation, exports to (imports from) supply-chain partners would increase (decline) by a smaller amount, compared to the rest of the world. The net result is a greater *outward* reorientation of Japanese trade beyond the region, and a rebalancing with the rest of the world. Note that this effect is symmetric i.e., in response to an appreciation, trade with Asian partners would react less, resulting in greater *regional* reorientation of trade flows.

Table 1	Japan's Share in Global Markets, 2010			
	8486	**8408**	**8541**	**8703**
JPN exports (% world exports; reporting)	34.3	10.0	15.0	17.1
Imports from Japan (% 4-digit imports):				
China	35.7	37.1	19.6	23.5
Hong Kong	23.2	7.6	15.2	30.6
India	12.2	10.0	7.8	15.0
Indonesia	48.6	31.1	35.1	20.1
South Korea	40.6	34.6	25.3	18.7
United States	53.2	20.2	17.8	27.7
EU27 (Ext Trade)	27.2	25.2	6.4	33.3
Notes: 8486: Boilers and reactors: mach & appl for mnf semiconductors, 8408: Boilers and reactors: compression-Ignition for combustion engines, 8541: electrical machinery: semiconductor devices, 8703: vehicles excl railways: autos				
Source: Global Trade Atlas.				

Table 2	Measures of Vertical Specialization across Borders: 2004		
Country	**(1) Imported contents embodied in gross exports**	**(2) Indirect exports sent to third countries[1]**	**(3) Upstream or downstream position, (2)/(1)**
Advanced economies			
EU-15	11.4	20.9	1.8
Japan	12.2	30.8	2.5
United States	12.9	26.9	2.1
Asian Newly Industrialized Countries			
Korea	33.9	23.1	0.7
Hong Kong	27.5	19.5	0.7
Taiwan	41.1	27.2	0.7
Emerging			
China	35.7	12.5	0.4
EU accession countries	30.8	11.3	0.4
Mexico	48.0	10.0	0.2
Source: Koopman and others (2010).			
[1] Includes indirect exports that return to home country.			

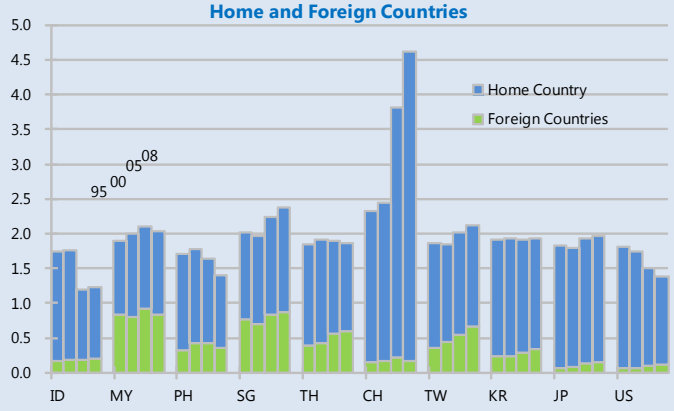
Table 3	Sources of Value-Added for Asian Countries Gross Exports, 2004							
	Electronic equipment				**Motor vehicles and parts**			
Country	**Gross exports**	**DVA**	**FVA**	**o/w JPN**	**Gross exports**	**DVA**	**FVA**	**o/w JPN**
CHN	20,405	60.5	39.5	10.1	65,002	63.4	36.6	8.8
HKG	1,156	38.6	61.4	16.9	5,734	79.7	20.3	4.2
IDN	11,174	44.1	55.9	12.3	524	74.6	25.4	6.4
IND	6,256	63.7	36.3	3.1	1,905	77.8	22.2	2.8
KOR	1,430	58.2	41.8	11.5	1,066	74.6	25.4	5.6
MYS	299	50.2	49.8	9.4	208	59.0	41.0	17.7
PHL	6,045	52.9	47.1	14.5	3,335	52.6	47.4	17.0
SGP	1,780	18.9	81.1	14.5	4,499	45.4	54.6	8.7
THA	22,573	42.1	57.9	15.0	2,621	56.0	44.0	18.3
TWN	1,147	53.8	46.2	12.2	1,656	59.3	40.7	18.6
VNM	5,921	44.6	55.4	10.0	4,866	57.4	42.6	7.0
Source: Koopman, and others (2010). Analysis is based on GTAP data for 2004.								
Note: Gross exports are in millions of U.S. dollars; DVA = domestic value added share in gross exports;								
FVA = foreign value added share in gross exports; and o/w JPN = Japanese value added share in total FVA.								

CHAPTER II. ANALYSIS OF INTERNATIONAL SPILLOVERS THROUGH THE ASIAN INPUT-OUTPUT TABLE[5]

The Asian International Input-Output Tables (Asian IO tables) provide a systematic description of intermediate- and final-goods trade flows, and allow a quantitative assessment of regional interdependence among ten economies, including the NIEs3, ASEAN4, China, United States, and Japan.[6] The analysis in this chapter covers the period from 1995-2008: actual published tables are available until 2000, whereas the 2005 and 2008 tables are extrapolated from past data (see April 2010 Asia-Pacific *Regional Economic Outlook*, Chapter III).

First, the analysis considers production-inducement coefficients (PICs), which capture the amount of production in a country that is induced by an additional unit of final demand in another country. These are based on information in the IO Table's inverse-Leontief matrix, and reflect the strength of economic linkages between economies through multiple rounds of intermediate trade. PICs attributed to foreign economies have risen in most cases, suggesting deepening interdependence.

Figure 1. Production Inducement Coefficents to Home and Foreign Countries



Sources: Asian International Input-Output Table; and IMF staff calculations.
[1] Coefficients provide quantitative information of production by countries induced by an additional unit of final demand in one country.
[2] For example, one unit increase in final demand in Indonesia in 2008 induce total 1.3 unit of production, in which 1.0 unit to home while 0.3 unit to foreign countries.

Note: The four bars represent data for respectively, 1995, 2000, 2005, and 2008.

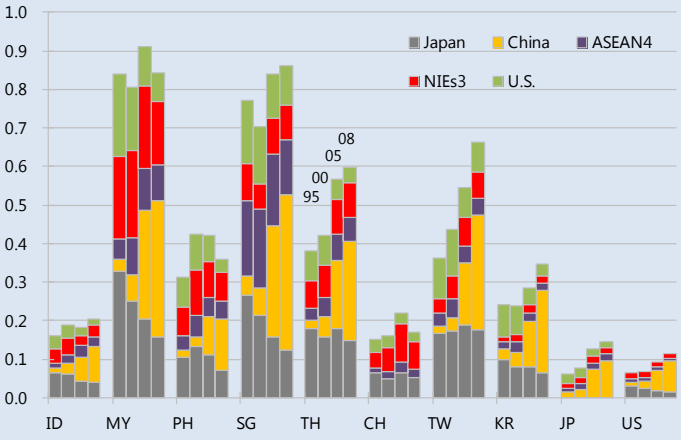
Japan plays key role as supplier of basic and capital-intensive parts/products at the upstream stage of regional production chain. Although the size and share of production induced by Japan has fallen over the past 15 years, it still remains sizeable, at around 20 percent of total foreign inducement in 2008. While the degree of production inducement to NIEs3/ASEAN4 economies has remained constant, the amount induced by China has increased dramatically through the 2000s, offering a clear contrast with Japan. This is

[5]Prepared by Hitoshi Sasaki (SPR).

[6]NIEs3 includes Korea, Taiwan, and Singapore, while ASEAN4 includes Indonesia, Malaysia, the Philippines, and Thailand.

consistent with: (i) the recent increase in overseas operations of Japan's multinational enterprises, especially in Asia; and (ii) the technological progress of other Asian economies.

Figure 2. Breakdown of Production Inducement Coefficients to Foreign Countries



[1] The coefficients to NIEs3 and ASEAN4 are calculated by excluding those to their home countries.

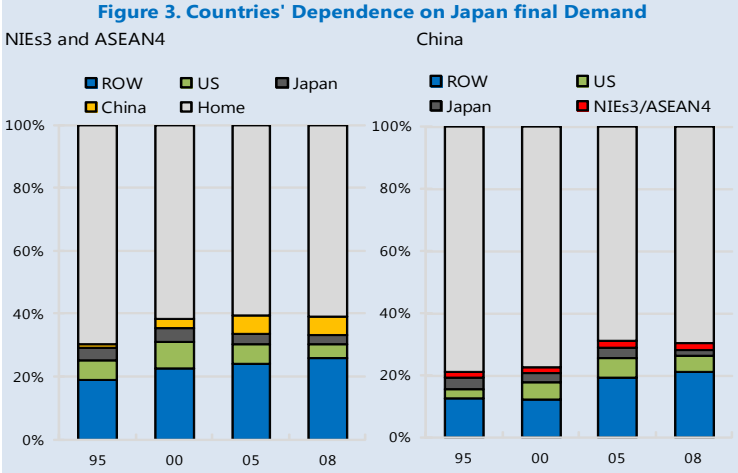
A breakdown of the value-added content of exports confirms Japan's upstream position in the production chain. The general increase in the share of foreign value-added for most countries' exports suggests a process of deepening trade integration. Countries with a higher foreign value-added share (such as China) focus more on assembly and processing and are considered ~~-d~~downstream". In contrast, Japan is considered ~~-u~~pstream" with the high *domestic* value-added share in its own exports, and the high contribution to the *foreign* value-added shares of other Asian countries' exports.

Table 1 Source of Value-added in Exports

1995	ID	MY	PH	SG	TH	CH	TW	KR	JP
Domestic	90.9%	65.8%	82.7%	46.8%	75.1%	86.0%	71.6%	80.5%	95.6%
Asia	**3.6%**	**19.5%**	**8.0%**	**29.0%**	**11.1%**	**4.4%**	**9.7%**	**6.0%**	**1.1%**
Japan	1.9%	11.1%	3.4%	13.9%	6.3%	2.3%	6.2%	3.7%	
China	0.3%	1.0%	0.6%	1.5%	0.8%		0.8%	0.9%	0.3%
US	1.1%	5.4%	3.0%	7.7%	2.9%	1.3%	4.1%	3.1%	0.8%
ROW	4.5%	9.3%	6.3%	16.5%	10.9%	8.4%	14.6%	10.3%	2.6%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%
2005	**ID**	**MY**	**PH**	**SG**	**TH**	**CH**	**TW**	**KR**	**JP**
Domestic	92.1%	58.4%	78.1%	38.1%	72.5%	79.5%	71.8%	80.6%	94.2%
Asia	**4.2%**	**27.3%**	**13.2%**	**23.7%**	**16.8%**	**8.5%**	**16.7%**	**7.7%**	**2.2%**
Japan	1.3%	7.6%	5.3%	6.7%	7.1%	2.9%	7.7%	3.3%	
China	1.0%	5.6%	2.1%	5.0%	3.1%		2.8%	2.1%	0.8%
US	0.8%	7.0%	4.3%	6.4%	2.5%	1.6%	3.5%	2.2%	0.8%
ROW	2.9%	7.3%	4.4%	31.9%	8.2%	10.3%	8.1%	9.5%	2.8%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%

Moreover, the income dependence analysis illustrates Japan's key role as one the regions' largest consumer markets, following the United States. The income dependence analysis captures the extent to which an Asian country's income depends on Japan's final demand. Japan remains important, although its share has fallen recently—in contrast, China is gaining importance as final demand destination, and has become the largest consumer market for NIEs3/ASEAN4, exceeding even the United States in 2008.

Figure 3. Countries' Dependence on Japan final Demand



Sources: Asian International Input-Output Table; and IMF staff calculations.

[1] "ROW" denotes the rest of world.

[2] "NIEs/ASEAN" of NIEs3 and ASEAN4 countries are calculated by including their income dependences on their home countries.

CHAPTER III. JAPAN'S OUTWARD FOREIGN DIRECT INVESTMENT[7]

Japan's stock of outward FDI is concentrated mainly in the United States, followed closely by Asia. Since 2000, Japan's FDI has moved progressively away from the United States towards Asia, reflecting the increased presence of Japan's corporations in the region. The Euro Area has continued to attract around one quarter of Japan's outward FDI.

[7]Prepared by Hitoshi Sasaki (SPR).

Table 1	JPN's Outward FDI by Region (billions of USD)					
	2001		2006		2009	
	Dollars	Percent	Dollars	Percent	Dollars	Percent
Total	300	100	387	100	741	100
Asia	53	18	88	23	176	24
P.R.China	10	3	25	6	55	7
North America	145	48	156	40	240	32
U.S.	140	47	150	39	231	31
Central and South America	21	7	33	9	99	13
Cayman Isl.	9	3	18	5	65	9
Middle East	1	0	2	0	4	1
Africa	1	0	1	0	6	1
EU	69	23	92	24	175	24
U.K.	33	11	24	6	31	4
Others	12	4	16	4	40	5
Oceania	8	3	13	3	36	5

Japan's outward FDI flows can be modelled by employing a gravity-model framework. The specification is as follows:[8]

$$\log(FDI)_{it} = C + \alpha_1 \log(Y)_{it} + \alpha_2 \log(|DpcY|)_{it} + \alpha_3 \log(Trade)_{it-1} + u_i + v_t + \varepsilon_{it}$$

The dependent variable is Japan's outward FDI flows to host country *i* as of year *t. Y* is the host country's GDP, which captures its market size. |*DpcY*| is absolute difference in per capita GDP between Japan and host country, which proxies for differences in labor costs or factor endowments. *Trade* is bilateral trade between Japan and the host country, lagged by one period to account for potential endogeneity. Other control variables include one-period lagged variables of host-country characteristics (GDP growth as a proxy for productivity and the ratio of private credit to GDP as a proxy for financial depth). The variable u_i is a fixed-effect (capturing host-country invariant factors, such geographical distance from Japan and domestic institutions); v_t is a time-effect (which captures factors affecting all host countries in a similar fashion); and ε_{tt} is error-term.

The model is estimated using panel OLS (two-way fixed effects), based on a panel of 129 economies over 1989-2008. To check for robustness, other estimation methods were tested (e.g., Tobit estimation), with broadly similar results.

[8]Variables are transformed using a semi-log procedure of the form, x=sign(x)log(1+|x|), in order to include entries with recorded values of zero.

Table 2	Determinants of Japanese Outward FDI																	
	(Dependent variable: log of Japanese outward FDI)																	
	1989-2008											1999-2008						
	All countries					EMs/LICs						EMs/LICs						
	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)		(9)	
GDP (host country)	-0.564		-0.678		-0.440		0.218		0.316		0.781		8.176	**	9.538	***	7.832	**
	(1.343)		(1.398)		(1.398)		(1.482)		(1.541)		(1.551)		(3.561)		(3.772)		(3.580)	
Difference in GDP per capita	2.310	**	2.323	**	2.003	**	13.580	*	13.311	*	16.430	**	38.631	***	37.511	***	39.934	***
	(0.993)		(0.993)		(1.033)		(7.479)		(7.520)		(7.842)		(14.463)		(14.665)		(14.511)	
Bilateral trade (t-1)	0.764	**	0.710	**	0.806	**	0.723	*	0.659	*	0.541		0.269		0.250		0.277	
	(0.361)		(0.363)		(0.379)		(0.388)		(0.391)		(0.420)		(0.689)		(0.695)		(0.703)	
GDP growth (host country) (t-1)			0.024						0.009						-0.082			
			(0.030)						(0.031)						(0.071)			
Private credit (host country) (t-1)					-0.005						0.028	**					0.012	
					(0.009)						(0.013)						(0.029)	
Specification	two-way fixed effect		two-way fixed effect		two-way fixed effect		two-way fixed effect		two-way fixed effect		two-way fixed effect		two-way fixed effect		two-way fixed effect		two-way fixed effect	
Number of observations	2301		2291		2239		1724		1714		1672		937		933		932	
Number of countries	129		129		129		97		97		97		97		97		97	
R^2	0.568		0.569		0.573		0.504		0.505		0.511		0.452		0.452		0.454	
Note: Standard errors are in parentheses.																		
A *, **, and *** represent statistical significance at 10, 5, and 1 percent respectively.																		

Key results include:

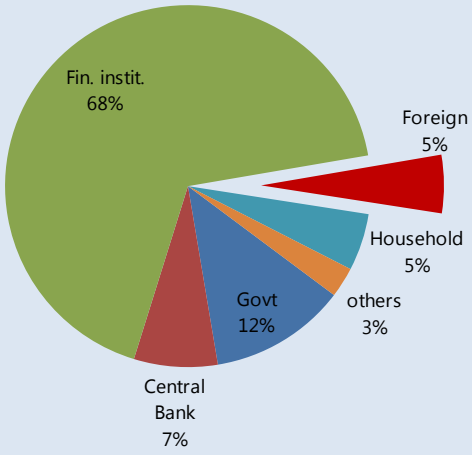
- The coefficient on income differences is positive and statistically significant in all samples (equations (1) to (9)). This suggests that labor cost differentials—vertical integration—has been main driver of Japan‘s FDI.
- The coefficient on the host country‘s GDP is significant only for developing economies after 2000 (equations (7) to (9)), suggesting that the host country‘s market size has recently become another important driving factor for Japan‘s outward FDI. This is also consistent with the expansion of Japan‘s multinational operations, especially in Asia, to develop local demand.
- There is a clear positive relationship between Japan‘s outward FDI and bilateral trade over the full sample (equations (1) to (6)), although this relationship weakens in the latter part of the sample for developing economies (equations (7) to (9)). This is consistent with the idea that originally, Japan‘s outward FDI was complementary to its trade pattern (e.g., exporting parts/capital goods to factories/subsidiaries financed by Japan‘s FDI); while since 2000 it has become increasingly aimed at servicing local markets, substituting for its exports.

CHAPTER IV. THE GLOBAL ROLE OF JAPAN'S CAPITAL MARKETS AND INVESTORS: STYLIZED FACTS[9]

Figure 1. Japan: Foreign Investors in Japanese Capital Markets

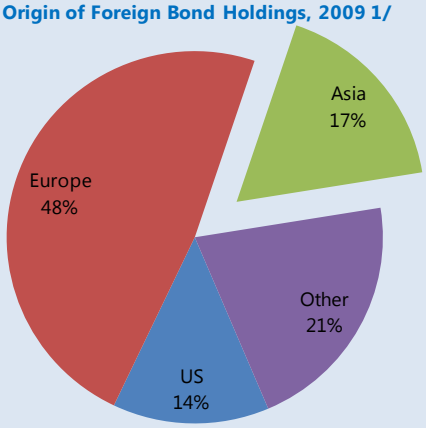
Foreign JGB holdings are small...

Share of Japan's JGB holdings , 2009



...held mostly by US and European investors.

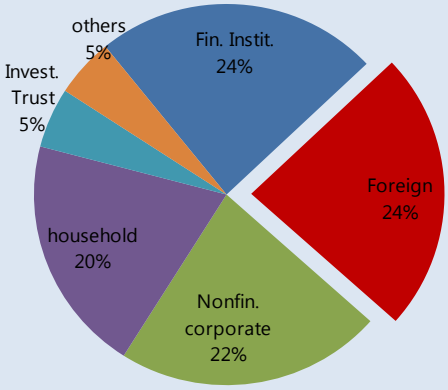
Origin of Foreign Bond Holdings, 2009 1/



1/ Includes foreign holdings of corporate bonds

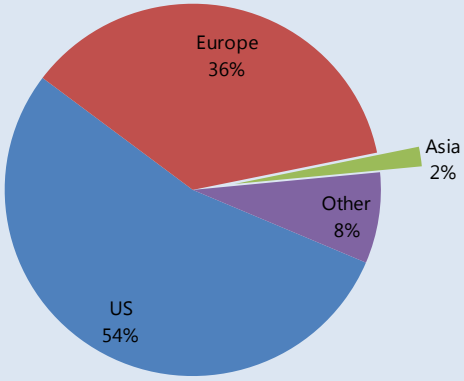
Foreign equity holdings are somewhat larger...

Share of Japan's equity holdings, 2010



...but very little is held by Asians.

Origin of Foreign Equity Holdings, 2010



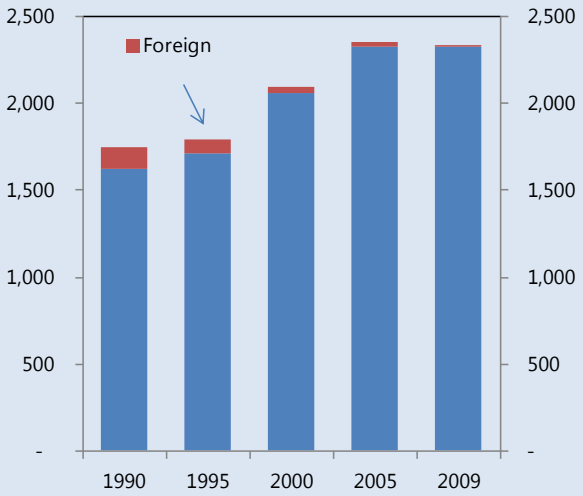
Sources: Bank of Japan, Ministry of Finance, IMF staff calculations.

[9]Prepared by Akira Otani (MCM) and Andrew Tiffin (SPR).

Figure 2. Japan: Foreign Borrowers in Japan's Capital Markets

The number of listed foreign companies is declining...

Number of listed firms in Japan's Equity Markets



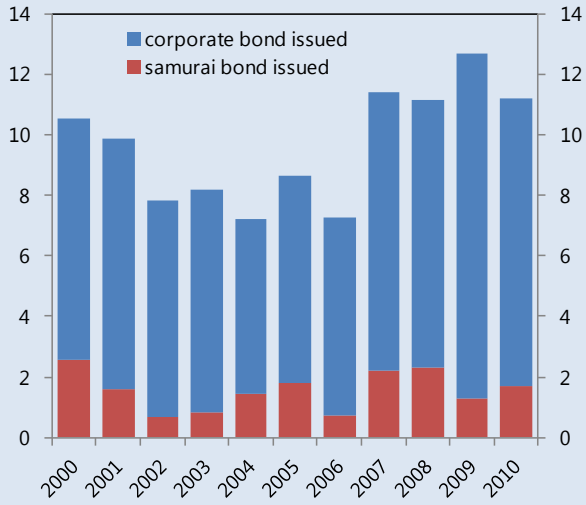
...and the remaining few are mostly from the United States.

Nationality of listed foreign companies

U.S.	6
Cayman Island	2
U.K.	1
Spain	1
Korea	1
Malaysia	1

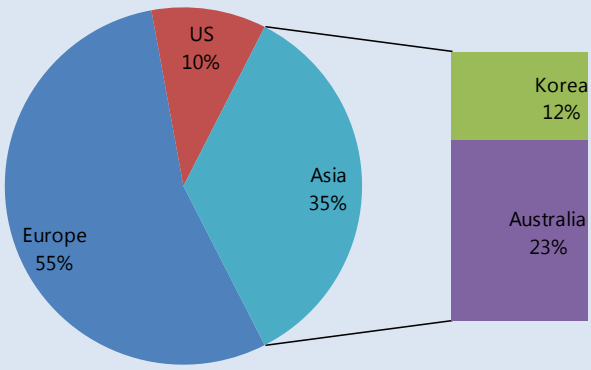
Samurai bond issuance is steady...

Bond Issuance, 2000-10 (Trill. yen)



...and is mostly from European residents.

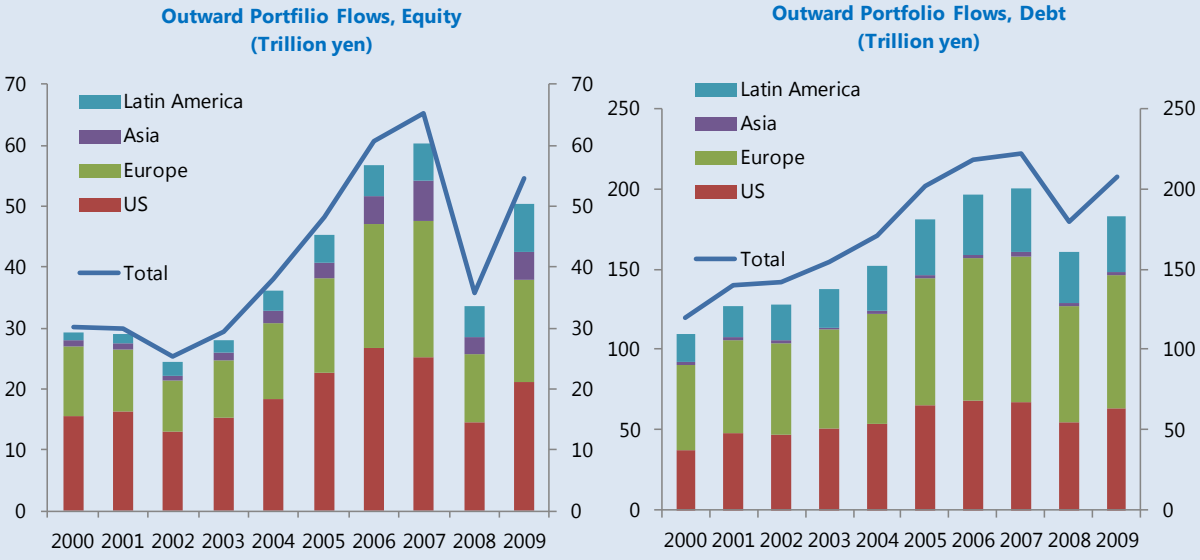
Samurai Bond Issuance, 2010



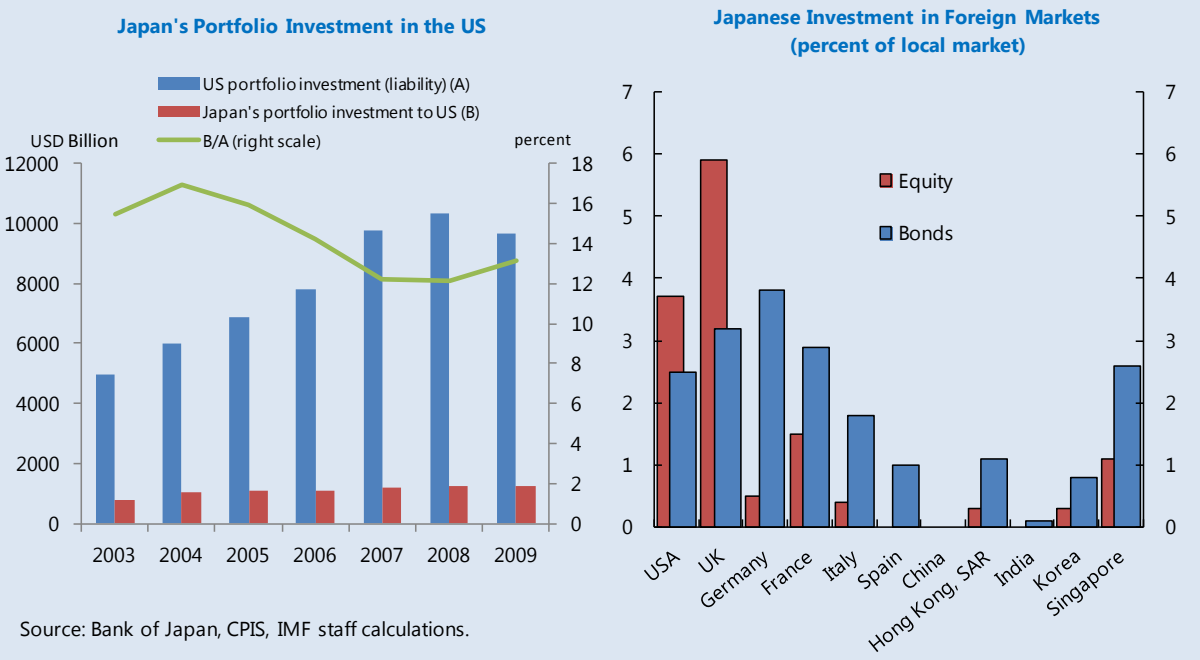
Sources: Bank of Japan, Ministry of Finance, IMF staff calculations.

Figure 3. Japanese Investors in Foreign Markets

Japan's portfolio investment flows mainly to the US and Europe



Japan finances a sizable fraction of US funding from abroad... ...but has a minimal presence in Asia.



Source: Bank of Japan, CPIS, IMF staff calculations.

CHAPTER V. EXTRACTING AGGREGATE SPILLOVER INDICES FROM THE GVAR MODEL[10]

A. The GVAR Model

The GVAR (Global Vector Autoregressive) model is designed to examine the role of unobserved global factors on country-specific variables. The model is estimated in two steps.

First, individual country-level models are constructed, with country variables such as real GDP as a function of a constant, a trend, their own lags and, finally, contemporaneous and lagged trade weighted averages of corresponding foreign variables:

$$\mathbf{x}_{it} = \boldsymbol{\alpha}_i + \boldsymbol{\beta}_i t + \boldsymbol{\gamma}'_{i1}\mathbf{x}_{i,t-1} + \ldots + \boldsymbol{\gamma}'_{ip}\mathbf{x}_{i,t-p} + \boldsymbol{\varphi}'_{i1}\mathbf{x}^{*}_{i,t-1} + \ldots + \boldsymbol{\varphi}'_{iq}\mathbf{x}^{*}_{i,t-q} + \boldsymbol{\delta}'_i\mathbf{d}_t + \boldsymbol{\varepsilon}_t, \quad (1)$$

where x is a vector of endogenous variables for country i at time t, and x^* is a vector of trade weighted averages of endogenous variables for the trading partners of country i, α is the intercept and t denotes the time trend.

Second, these individual models are combined in a consistent manner to create a global model, which can generate impulse responses or forecasts for all of the variables simultaneously. The country specific models (1) are subsequently aggregated by recognizing that the explanatory variables in equation (1) can be written as:

$$\mathbf{z}_{it} = \begin{pmatrix} \mathbf{x}_{it} \\ \mathbf{x}^{*}_{it} \end{pmatrix} = \mathbf{W}_i \times \mathbf{x}_t, \quad (2)$$

where **W** matrix contains trade weights for every country. The variables include: log of real GDP, inflation, real equity price, nominal exchange rate to the U.S. dollar, short and long-term interest rates and the oil price. The data set covers 25 countries and the Euro Area.[11] The sample period is from 1979Q4 to 2009Q4.

B. Aggregate Spillover Indices

It is possible to use the GVAR to assess the importance of a particular country as a source of spillovers.[12] One of the outputs from the GVAR model is the generalized variance decomposition matrix, which shows how much a shock to a particular variable contributes to the forecast error variance of another variable, accounting for the correlation structure. This information can be used to define an ―aggregate spillover index".

The aggregate spillover index is calculated for every variable according the following three-step procedure: (i) subtract the total contribution of the variance of domestic

[10]Prepared by Sergejs Saksonovs (SPR).

[11]Not all variables are available for all countries and some missing data is interpolated from annual levels. Euro Area variables are defined as a GDP weighted aggregate of eight countries: Austria, Belgium, Finland, France, Germany, Italy, Netherlands and Spain.

[12]See Pesaran, and others (2004), ―Modeling Regional Interdependencies Using a Global Error-Correcting Macroeconometric Model", J. *of Bus. & Ec. Statistics* 22(2) and Dees, and others, (2007) ―Exploring the International Linkages of the Euro Area: A Global VAR Analysis", *J. of Applied Econometrics*, 22.

variables from the total forecast error variance; (ii) add up the variance shares due to the variables of every particular country and divide them by the total contribution due to variance of foreign variables; and (iii) normalize the resulting scores by subtracting the mean and dividing by standard deviation.

The resulting index shows the importance of all Japanese variables to the forecast error variance of a particular variable in all other countries. When the aggregate spillover index is less (greater) than 0, Japanese variables contribute less (more) to forecast error variance than the average contribution of other trading partners. Since the index is in terms of standard deviations, a number greater than 2 can be interpreted as high.

The results can be summarized as follows:

- *When the intensity of trade linkages is averaged over the period from 1980 to 2009, Japan's importance to its trading partners is higher than the importance of the average trading partner (Chart 1*). In some variables (output, inflation and real equity prices) the average aggregate spillover index is higher only relative to the region.[13] For exchange rate, short-term and long-term interest rate the situation is reversed presumably because these variables are more linked with other advanced economies.
- *The importance of Japan to its trading partners has declined over time* (Charts 2 and 3). When focusing on the second half of the sample, Japan contributes less to the forecast error variance of its trading partners than the average country and its aggregate spillover indices are less than zero.
- *Among the S4 countries, Japan contributes mostly to the forecast error variances of inflation and exchange rate* (Chart 4). The Euro Area and the United States are by far the most important economies when compared to Japan or the United Kingdom. Japan is generally ranked third after the United States and the Euro Area.

[13]Regional countries are Australia, China, India, Indonesia, Korea, Malaysia, New Zealand, Singapore, Philippines and Thailand.

Figure 1. Aggregate Spillover Indices (1980-2009)

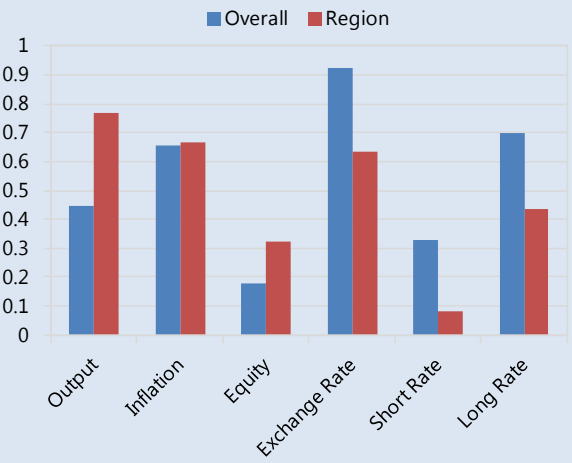


Figure 2. Average agggregate spillover Indices (1980-94)

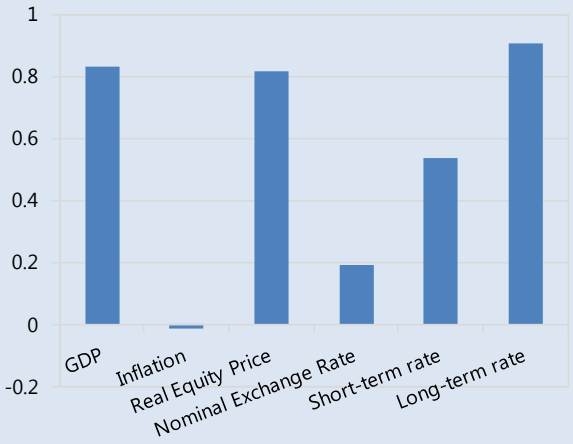


Figure 3. Average Aggregate spillover Indices (1995-2009)

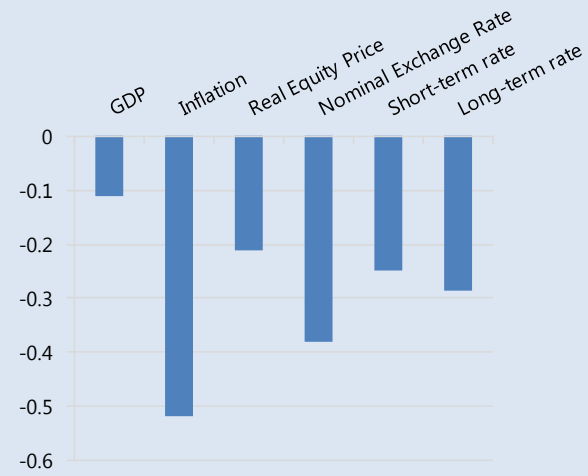
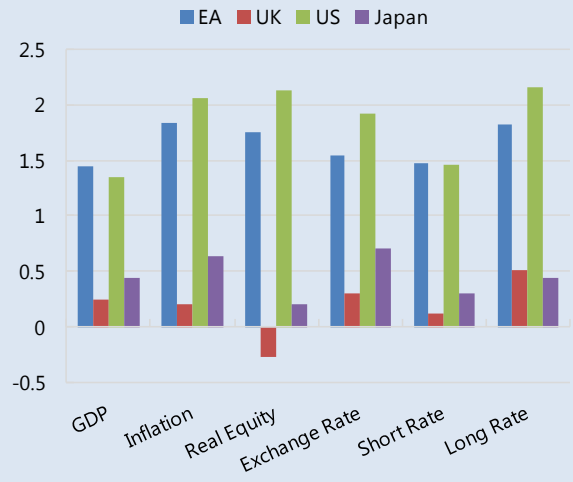


Figure 4. Average Spillover Indices for the S4 countries



CHAPTER VI. GLOBAL AND REGIONAL BANK LINKAGES[14]

This analysis traces the network spillovers resulting from hypothetical credit events to specific banking systems.[15] It is based on the methodology in Espinosa-Vega and Sole (2010) and relies on a matrix of BIS country-level bank exposure- and capital data for 26 countries.[16] Two simulations are performed: a simulation of a banking system under distress that is unable to repay interbank loans to others (a credit shock); and a simulation of a distressed banking system that is not only unable to repay its loans, but is also unable to rollover its funding to others (credit shock plus funding shock) (Figures 1a and 1b).[17]

Bilateral exposure data suggest that Japanese banks are mostly exposed to the U.S. and U.K. banking systems. Among Asian countries, Japan's largest exposures are to Australia, South Korea and China, while the remaining countries account for less than 1 percent of Japan's bank global exposures. Among Asian countries, China, Taiwan and Australia are the main funding countries, but these linkages remain small.

Network analysis results confirm that Japan is most at risk from exposures in the United States and the United Kingdom. Under the extreme scenario (λ=1, ρ=0.5, δ=2), there are eight instances in which Japan is expected to fail owing to distress in various U.S. and European banking systems. In particular, Japan's banking system is expected to lose 57.6 percent (35.8 percent) of its pre-shock capital if the U.K. (U.S.) banking system suffers a credit event (Table 1). If the event is combined with a funding shock, then the United States could trigger distress in Japan, but only in the third contagion round.

Among Asian countries, Japan is most at risk from Australia and South Korea, but the potential impairment is below 5 percent of the pre-shock capital of the Japanese banking system; the combined shock does not substantially increase the distress from these countries (Table 1).

If Japanese banks become distressed, Australia and South Korea are most at risk. Even under extreme circumstances, this is not expected to have systemic consequences in Asia, with the exception for South Korea, which could suffer a credit event owing to second-round contagion effects from European and the U.S. banks. The most affected are the European and U.S. banks. (Table 1).

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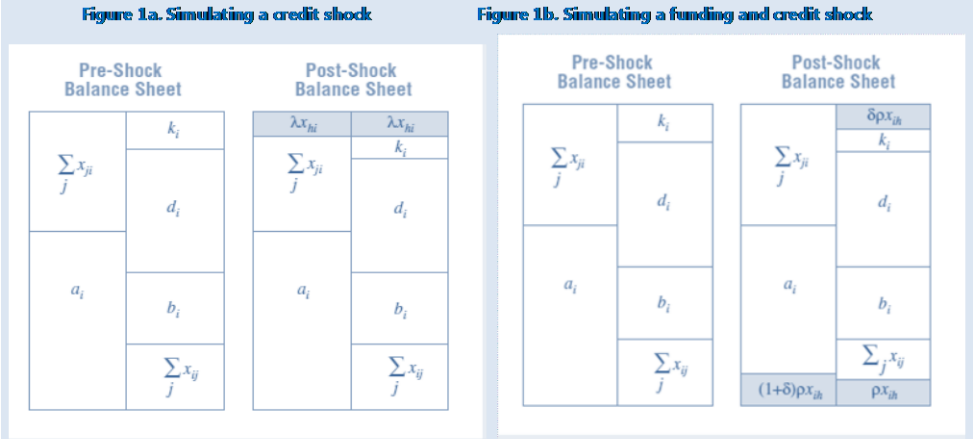
[14]Prepared by Srobona Mitra (MCM).

[15]The analysis is based on BIS locational statistics as of September 2009. This allows for a broad sectoral breakdown and rich set of Asian countries.

[16]Countries included in the analysis are Australia, Austria, Belgium, Canada, France, Germany, Ireland, Italy, Japan, Netherlands, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States, China, Taiwan, India, Indonesia, Malaysia, Philippines, South Korea, Thailand, and Vietnam. Note that global exposures of banks in China, Indonesia, Philippines, Thailand and Vietnam are extracted from data on liabilities of the countries' counterparties.

[17]Marco Espinosa-Vega and Juan Solé, 2010, "Cross-border Financial Surveillance: A Network Perspective," IMF Working Paper 10/105.



Source: April 2009 GFSR http://www.imf.org/External/Pubs/FT/GFSR/2009/01/index.htm#ch1box

Note: The assets of the banking system, i, comprise interbank loans, x_{ji}, to all j countries, plus other assets,
The liabilities comprise interbank deposits from the rest of the j banking systems, deposits and bond issuances.
Following a credit event from country h *(Figure 1a)*, country i incurs a credit loss of λ times exposure to h, which is absorbed by i's capital, k.
If capital is unable to absorb the loss, the banking system fails. Similarly, if i is unable to replace a fraction ρ of its funding from (defaulting) h (Figure 1b), it needs to fire sell its assets, which trade at a discount, and hence amounts to $(1+\delta)\rho$ times the loss in book-value terms.
The loss is absorbed by the capital; if not absorbed, the banking system fails due to the funding-shortfall. The analysis assumes $\lambda=1$, $\delta=1$, $\rho=0.35$.

Network analysis confirms the limited spillovers that Japanese banks could have on the region. Given the modest role of Japanese banks in the region (compared to the rest of the world), very few banking systems would face systemic difficulties if the Japanese banking system were to become distressed.

Table 1 Capital Impairment (in percent of pre-shock capital)

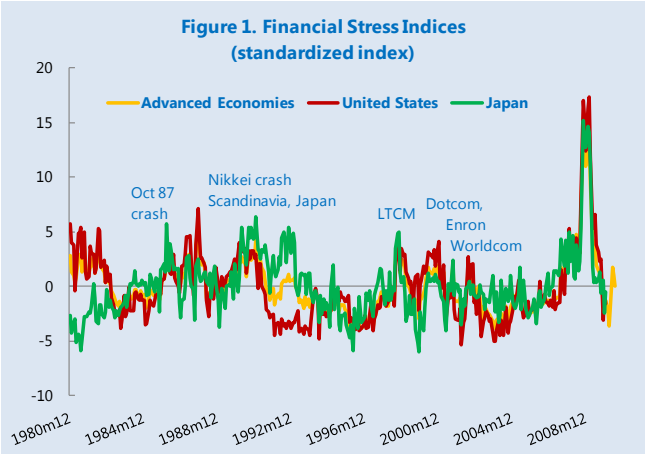
	Impact on Japan if trigger country defaults			Impact on others if Japan defaults	
Trigger country	Credit shock 1/	Credit & Funding shock 2/	Affected countries	Credit shock 1/	Credit & Funding shock 2/
Australia	-4.4	-4.5	Australia	-2.2	-8.8
France	-6.2	-72.3	France	-10.8	-13.8
Germany	-7.2	-72.3	Germany	-2.6	-7.2
Ireland	-3.1	-72.3	Ireland	-10.5	-11.7
Italy	-0.5	-72.3	Italy	-0.2	-0.5
Portugal	0.0	0.0	Portugal	0.0	-0.3
Spain	-0.6	-0.7	Spain	-0.8	-1.5
UK	-57.6	-72.3	UK	-25.3	-39.7
US	-35.8	Full	US	-9.6	-14.6
China	-1.6	-1.9	China	-1.3	-2.2
Taiwan	-0.2	-0.4	Taiwan	-5.9	-6.8
India	-0.4	-0.5	India	-0.2	-1.3
Indonesia	-0.4	-0.4	Indonesia	-1.6	-5.7
Malaysia	-0.2	-0.2	Malaysia	-1.4	-3.0
Philippines	0.0	-0.1	Philippines	-5.4	-6.0
South Korea	-3.1	-3.2	South Korea	-4.1	-14.7
Thailand	-0.6	-0.6	Thailand	-2.9	-7.2
Vietnam	-0.1	-0.1	Vietnam	-0.9	-2.6

1/ Assumes loss-given-default is 1. The figures represent the direct and indirect effects of failures.
2/ The results of this shock are highly sensitive to the choice of parameters. The benchmark assumes δ=1, ρ=0.35.

CHAPTER VII. THE TRANSMISSION OF JAPANESE FINANCIAL-SECTOR STRESS[18]

The global recession demonstrated forcefully how strains in the financial sector of one country can rapidly affect financial stability in another. Although Japan has not been at the core of the recent financial crisis, the size of its financial sector suggests that it might nonetheless be a potential source for spillovers.

This chapter explores the extent to which financial strains in Japan transmit to other financial markets, using the IMF's stress index (FSI).[19]The FSI is a market-based measure that combines information on country's securities, exchange markets, and the banking sector into a composite index. It tracks market-price movements relative to past levels or trends and defines stress as the deviation from historical norms. The index captures the most important stress episodes identified in the literature,[20] and has been compiled for 17 advanced countries and 26 emerging economies using monthly data. A detailed description of the FSI is provided in the 2009 Spring *World Economic Outlook*.



To explore the spillovers from stress in Japan to other emerging regions, staff have employed a two-step approach. In the first step, staff extract a common stress component for Asian and other emerging economies (*FSI-EM*) derived the from common time effects of an unbalanced panel of emerging-economy stress indices from 1997-2010. In the second step, the common time-component of emerging-economy stress is related to the FSI for Japan (*FSI-Japan*), as well as the FSI for other developed regions (*FSI-G6*), and a range of global control variables (*Globalfactors*).

$$FSI\text{-}EM_t = f\,(FSI\text{-}Japan_t, FSI\text{-}G6_t\,,\ Global\ factors_t)$$

Asian economies are found to share a large common stress time-component. For Asian economies, the common time-component explains about 80 percent of the time variation of the FSI across economies. This compares to about 55 percent for other non-Asian emerging economies (e.g., Turkey, Brazil, and Russia). The FSI subindices with the strongest time co-movement are security and exchange markets, while comovement in banking-sector strains are less common among emerging economies.

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[18]Prepared by Stephan Danninger (APD).

[19]Balakrishnan, and others, 2009, World Economic Outlook, Spring 2009, Chapter 4; Fall 2008, Chapter 3.

[20]Following the literature, an episode of financial stress is identified as a period when the FSI exceeds 1.5 standard deviations above its mean.

Table 1	Financial stress in Asian emerging Economies			Financial stress in Asian emerging Economies		
	Whole sample	Whole sample	1997-Pre Lehman	Whole sample	Whole sample	1997-Pre Lehman
	Asia	Asia	Asia	Other Ems	Other EMs	Other EMs
FSI_Japan	0.44***	0.15*	0.21**	0.40***	0.06	0.03
	-0.048	-0.079	-0.096	-0.031	-0.043	-0.045
FSI_G6		0.34***	0.49***		0.40***	0.52***
		-0.074	-0.089		-0.04	-0.042
Libor	0.22**	0.17**	0.12	0	-0.05	-0.14***
	-0.088	-0.083	-0.099	-0.057	-0.046	-0.046
Commodity price index (log)	1.68	1.67	0.9	-2.57***	-2.60***	-2.70***
	-1.226	-1.155	-1.239	-0.801	-0.63	-0.582
Industrial production (log)	-16.80***	-16.92***	-15.94***	0.91	0.77	0.49
	-4.098	-3.86	-3.98	-2.68	-2.107	-1.869
Constant	70.72***	71.66***	70.77***	6.83	7.94	10.16
	-14.367	-13.535	-13.815	-9.394	-7.386	-6.486
Observations	161	161	139	161	161	139
R-squared	0.515	0.572	0.591	0.559	0.729	0.747

Source: IMF staff estimates, Dependent variable: common time component of financial stress index for emerging economies. EM Asia: China, India, Indonesia, Korea, Malaysia, Philippines, and Thailand EM other: all other EMs including Brazil, Russia, Turkey, South Africa, and others.

Financial stress in Japan has measureable spillovers to financial markets in Asia. A one standard-deviation increase in Japan's FSI raises financial stress in the region by around 0.2 standard deviations. This effect is small relative to the spillovers from other G7 economies (with a coefficient of 0.3-0.5) but is robust to the exclusion of the global crisis from the sample (3rd column). Stress spillovers from Japan to other emerging economies are small and not statistically significant (last three columns).

Rapid transmission of financial stress illustrates the strength of international linkages across securities markets. Lag-structure tests (not shown) indicate that transmission of financial stress occurs within one month. And robustness tests confirm that the results are not sensitive to changes in the method for extracting the common stress component, or to the potential endogeneity of advanced-economy stress in the second-stage regression.

CHAPTER VIII. GIMF SIMULATIONS OF FISCAL CONSOLIDATION AND GROWTH STRATEGY[21]

Several scenarios are run to show spillovers from Japan's policies to other regions using IMF's Global Integrated Monetary and Fiscal model (GIMF). [22] The first set of simulations show the implications of financing earthquake-related expenditures and subsequent fiscal consolidation based on staff's debt sustainability analysis; the second set examines the spillovers from the authorities' growth strategy; and the final set presents the spillovers from their joint implementation.

Simulations show that fiscal reforms would benefit the rest of the world in the long term once the adjustment is fully completed, but may involve short-term costs. In the medium-term and during the transition, the net effects would depend on relative importance of trade linkages, permanent-income effects, exchange-rate flexibility, and monetary accommodation. Once the adjustment is fully completed, however, lower long-term real interest rates supported by higher public savings would benefit all regions. Some of the short-term negative spillovers to the other regions could be eliminated by implementation of the growth strategy and monetary accommodation in Japan. As the model focuses mainly on macro-level trade channels, spillovers could be larger if supply-chain linkages and other financial contagion channels, such as carry trades, are considered.

A. Fiscal Consolidation

The government has announced broad outlines of a medium-term fiscal strategy, but key details are not yet clear. The government's *Fiscal Management Strategy* (released in June 2010) aims to halve the primary deficit by FY2015 and put the debt-to-GDP ratio on a downward path from FY2021 onwards. On June 30, 2011, the authorities outlined their social security reform plans to support their medium-term fiscal strategy. The plan proposes to double the consumption tax to 10 percent in stages by the mid-2010s, and to use the proceeds to fund social security. The tax increase would allow the government to meet its deficit target for FY2015. The plan also proposed to raise the pension retirement age and adjust nominal pension benefits for deflation, but did not stipulate steps beyond FY2015 for meeting the final target of reducing the debt ratio starting in FY2021 at the latest.

According to staff's analysis, stabilizing the net debt ratio by 2016 and reducing it to around 135 percent of GDP by 2020 would require a 10 percent of GDP adjustment in the structural primary balance starting in 2012. While there are various possible options to achieve such adjustment, given the limited scope for cutting expenditure, fiscal adjustment would need to rely mainly on new revenue sources and constraints on spending growth.

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[21] Prepared by Pelin Berkmen (APD).

[22] The model covers five regions: Japan, the United States, Euro area, emerging Asia, and remaining countries. The calibration is slightly different from the version used for Japan 2010 Article IV, with updated monetary policy parameters and steady state debt.

The consolidation scenario assumes a gradual 10 percentage point increase in the consumption tax (Chart 1). A moderate increase in the consumption tax could start in 2012, when a cyclical recovery is underway, to limit bond issuance and strengthen the commitment to fiscal reforms. A gradual but sustained fiscal consolidation starts in 2013. Adjustment of about 2½ percent of GDP would come from the expiry of the fiscal stimulus package and modest expenditure adjustment, which are already incorporated in staff's central WEO projections. The scenario further assumes a phased increase of the consumption tax (with some frontloading) raising revenues by 5 percent of GDP, and an increase in personal income tax by ½ percent of GDP. At the same time, corporate income tax is lowered, reducing revenues by ½ percent of GDP. In addition, the scenario builds in a decline in government consumption by 1¾ percent of GDP and in public investment by ¼ percent of GDP. The rest of the adjustment comes from transfers. The simulations assume that the package is fully credible in that the entire adjustment is anticipated, so that private agents adjust their behavior starting from the initial period.

Consolidation without supporting structural reforms would lower Japanese growth in the short-run but is likely to bring long-run benefits (Chart 2)**.**

- ***In the short-run, fiscal adjustment would depress GDP growth for several years by about ½ percentage points relative to a non-adjustment scenario***. The increase in the consumption tax, personal income tax, lower government consumption and investment reduce domestic demand.
- ***Some of the negative effects in the short-run can be offset by accommodative monetary policy in Japan*** (Chart 3).[23] Keeping nominal interest rates low while inflation returns to its steady-state growth would lower the short-run real interest rates.[24]
- ***In the medium-run***, real GDP could rise above the baseline, but would depend on various factors, including the impact from lower long-run real interest rates, a fall in precautionary savings, a switch to less distortionary corporate taxes, and confidence effects.
- **Fiscal consolidation increases the trade balance.** While a decline in private savings could offset some of the increase in government savings, world real interest rates would also change. As overall savings increase, Japan's trade balance improves, requiring a real depreciation of the yen.

Relative to the impact in Japan, the spillovers into other economies are muted, with the largest impact on emerging Asia. Exports decline in all regions as a result of lower demand from Japan. The impact on imports and overall GDP, however, depends on various factors, including a) exchange rate flexibility and b) the increase in domestic demand—

[23]This scenario assumes that interest rates will stay low for the initial two years.

[24]While the decline in demand creates downward pressure on inflation, depreciation of the yen and the increase in consumption taxes pull it up.

particularly in the United States and Euro Area—arising from the impact of lower long-run interest rates on investment, supply, and permanent income.

- Over the next 5–10 years, fiscal consolidation reduces demand for imports by Japan, but the net effect on GDP in the region depends on the monetary-policy response, permanent income effects in other regions, and the flexibility of exchange rates.
- On the one extreme, if the exchange rate is fixed, tradable inflation declines for Japan's regional partners, pulling up real interest rates and reducing domestic demand and imports. As a result, real GDP declines. This negative impact on domestic demand would be lower for countries with restricted capital mobility. In such a situation, the interest rate is not forced to increase as much, limiting the negative spillovers.
- At the other extreme, if the exchange rate adjusts fully, real interest rates do not increase as much, dampening the impact on GDP (Chart 4).
- In other regions where the trade linkages are more modest, permanent income effects dominate—so that lower real interest rates result in higher investment and consumption.

Once fiscal consolidation is complete, all regions benefit from lower long-run interest rates. As a result of fiscal adjustment in Japan, world real interest rates are lower, pulling up investment and consumption in all regions.

B. Growth Strategy

The simulations also capture the impact of increasing productivity and enhanced competition in labor markets, in line with the authorities' growth strategy. The growth-strategy scenario assumes that trend growth will gradually increase by about 1 percentage point over a 10 year period, owing to productivity increases in both tradable and nontradable sectors, as well as reductions in labor market mark-ups by 2 percentage points (Chart 5). The government's growth strategy sets a target of 2 percent real growth for the coming decade, focusing on key sectors, such as environment, health, Asian integration, and tourism

A broad-based productivity increase will reduce the trade balance in Japan. With higher productivity in both tradable and nontradable sector, consumption and investment start to improve even in the short-run, and this together with the associated appreciation of the currency leads to higher imports than otherwise.

In the absence of fiscal consolidation, spillovers to other economies from the growth strategy are small relative to the impact on the Japan, with the net gains depending on the relative importance of trade and real interest rate effects.

- In the short run, all regions benefit through trade linkages with higher demand from Japan. However, the short-term impact on real GDP depends on the monetary policy reaction in the United States and the Euro Area. If monetary policy does not react to

higher inflation in other regions, real GDP increases along with the higher trade balance.

- Over the medium- to long-run, all regions benefit from higher productivity and lower real interest rates, but again the benefits are relatively small, particularly in the absence of fiscal consolidation. While the benefits to Emerging Asia accrue over the shorter horizons through trade linkages, the benefits to other regions accrue over longer horizon.

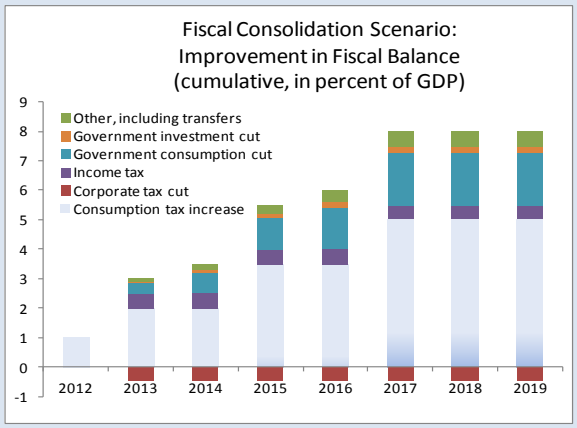
C. Combined Policy Package of Fiscal Consolidation and Growth Strategy

The short-term negative effects from fiscal consolidation would be mitigated by structural reforms. Overall, structural reforms would help Japan's GDP increase gradually, limiting the decline in imports and rise in current account surplus under the fiscal consolidation scenario, thereby reducing the negative trade spillovers to the rest of the world. The short-run growth spillovers from structural reforms in Japan would depend on exchange rate and monetary policy responses, but negative spillovers to emerging Asia could be significantly dampened through the trade channel. Other regions would benefit from lower real interest rates caused by a credible fiscal consolidation plan and higher productivity, particularly over the medium-run.[25]

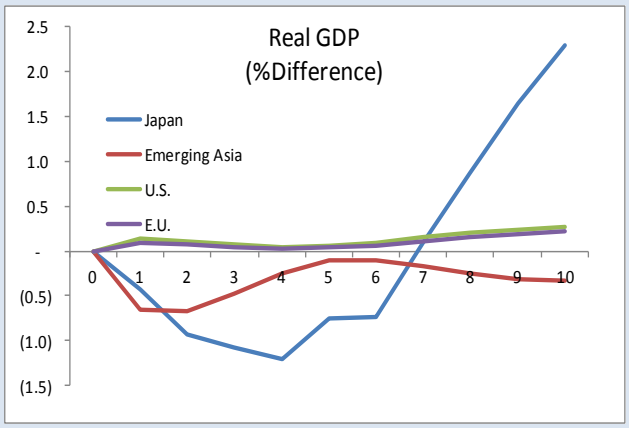
[25]The improvement in emerging Asia's current account stems from import suppression originating from the decline in demand prompted by to higher real interest rates. Similar to the fiscal consolidation scenario, with flexible exchange rates, import suppression is much less, dampening the impact on emerging Asia's trade balance.

Figure 1. Fiscal Consolidation and Growth Strategy

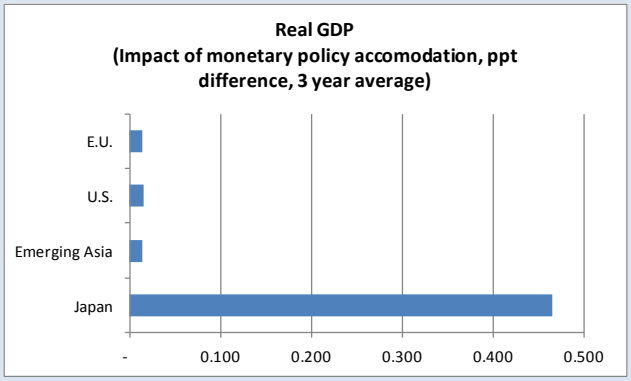
Staff's proposal for fiscal consolidation



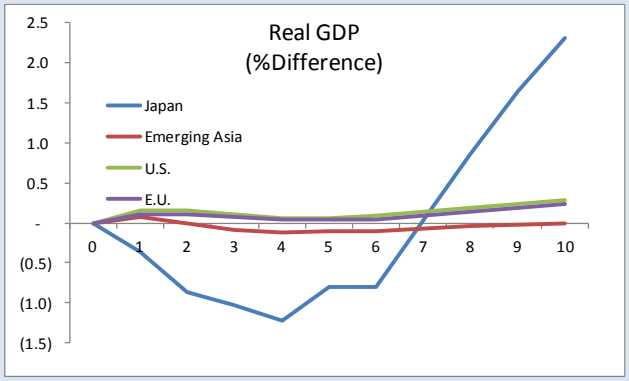
Fiscal consolidation scenario with fixed exchange rates in Emerging Asia



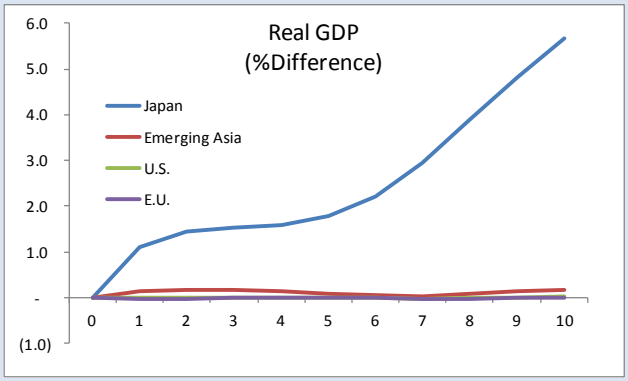
Impact of monetary policy accommodation



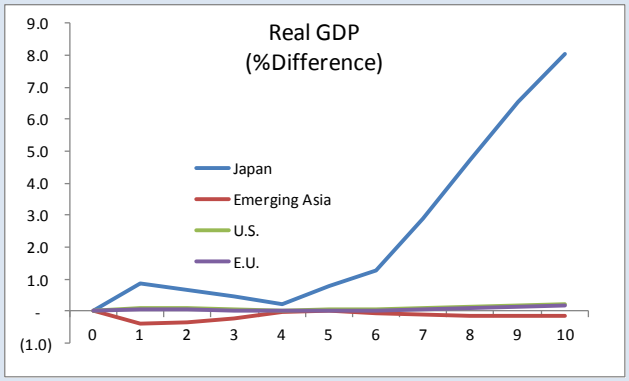
Fiscal consolidation with flexible exchange rates in Emerging Asia



Growth strategy



Fiscal consolidation and growth strategy (with fixed exchange rates in Emerging Asia)

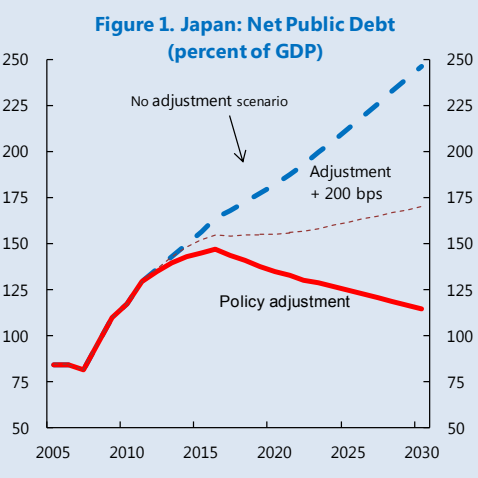


CHAPTER IX. DEBT SUSTAINABILITY, BORROWING COSTS, AND THE IMPACT OF A FISCAL CRISIS[26]

A. Context

The earthquake has interrupted Japan's nascent recovery, and has placed greater attention on the dynamics of Japan's public debt. Large fiscal deficits and sluggish activity have pushed public debt to unprecedented levels, leaving the government's financing requirements at around 50 percent of GDP, almost twice that of the United States. The fact that JGB yields remain at historic lows suggests that creditors are confident about the authorities' ability to come up with a sound stabilization plan. To stabilize debt and place it firmly on a downward path, staff have recommended a 10 percent of GDP improvement of the structural primary balance over the next 10 years.

Japan's debt-sustainability projections are particularly sensitive to assumptions on the future path of interest rates. For example, with a 200 bps increase in borrowing costs, even the staff's recommended adjustment effort would fail to stabilize the public debt ratio. This raises a concern that, even in the event of a modest hike in borrowing costs, the implied fiscal burden of adjustment may be increasingly perceived as infeasible. And as events in Europe over the past year have demonstrated, once confidence in fiscal sustainability erodes, the authorities may rapidly face an adverse feedback loop between rising yields, a deteriorating fiscal situation, falling market confidence, a more vulnerable financial system, and a contracting real economy.



B. Fiscal Crisis Scenarios

Staff have simulated a range of fiscal crisis scenarios originating in Japan, featuring different assumptions regarding the impact of the crisis on worldwide market confidence. These results are derived from a refined version of the structural macroeconometric model of the world economy documented in Vitek (2010), which features extensive linkages between the real and financial sectors, both within and across G20 economies.[27]

- **The first scenario features a fiscal crisis that is contained within Japan.** A sudden loss of confidence in fiscal sustainability is represented by a positive term-

[26]Prepared by Andrew Tiffin and Francis Vitek (SPR), and Kiichi Tokuoka (APD).

[27]Vitek, F., 2010, ~~–~~Monetary Policy Analysis and Forecasting in the Group of Twenty: A Panel Unobserved Components Approach," IMF Working Paper 10/152.

premium shock, which raises the long term nominal interest rate by 450 basis points on impact (bringing Japanese yields in line with other similarly rated sovereigns). Heightened risk aversion also hits the stock market, represented by an equity risk-premium shock which reduces equity prices by 60 percent on impact (similar to stock-market declines in many other financial crises). In addition, households and firms postpone their consumption and investment, owing to reduced confidence, decreasing domestic demand by 1 percent, while a fiscal consolidation reduces it by a further 2 percent. Finally, there is a run on the yen, represented by an exchange-rate risk premium shock which results in a 30 percent nominal effective depreciation on impact. Overall, this fiscal crisis is estimated to generate a weighted-average peak output loss of 4.4 percent in Japan, 0.1 percent in peripheral European countries, 0.2 percent in other advanced economies, and 0.4 percent in emerging economies.

- **Under the second and third scenarios, heightened risk aversion in Japan spreads progressively to bond and stock markets in the European periphery and emerging markets.** Although Japanese financial markets are relatively isolated, during periods of uncertainty global financial markets face elevated risks of falling market confidence and herd behavior. In this context, the scenarios augment the first with additional shocks to foreign long term nominal interest rates, equities, exchange rates, and demand (Table 1). Depending on the extent of spillovers to market confidence, the costs to other countries can reach as high as 3 percent of GDP.

Table 1 Output Losses arising from a Fiscal Crisis

		Japan	Peripheral Europe	Emerging Markets	Other AM
Scenario 1	LT Interest Rates	450 bps	--	--	--
	Equity Prices	60 percent drop	--	--	--
	Exchange Rate	30 percent	--	--	--
	Private Demand	1 percent of GDP	--	--	--
	Fiscal Consol.	2 percent of GDP	--	--	--
	Peak GDP Loss	4.4	0.1	0.4	0.2
Scenario 2	LT Interest Rates	450 bps	300 bps	--	--
	Equity Prices	60 percent drop	40 percent drop	--	--
	Exchange Rate	30 percent	15 percent	--	--
	Private Demand	1 percent of GDP	1 percent of GDP	--	--
	Fiscal Consol.	2 percent of GDP	1 percent of GDP	--	--
	Peak GDP Loss	4.4	2.9	0.5	0.3
Scenario 3	LT Interest Rates	450 bps	300 bps	450 bps	
	Equity Prices	60 percent drop	40 percent drop	60 percent drop	
	Exchange Rate	30 percent	15 percent	30 percent	
	Private Demand	1 percent of GDP	1 percent of GDP	1 percent of GDP	--
	Fiscal Consol.	2 percent of GDP	1 percent of GDP	--	--
	Peak GDP Loss	4.8	3.2	3.1	0.6

CHAPTER X. THE IMPACT OF A FISCAL CRISIS ON THE REGION: FINANCIAL-SECTOR SPILLOVERS[28]

Most JGBs are held by Japanese financial institutions. This suggests that a shock to JGB yields might have a direct spillover to other markets, by impacting Japan's financial-sector balance sheets and prompting a withdrawal by Japanese financial firms from foreign markets. Banks and insurance companies combined account for almost 90 percent of the financial sector's JGB holdings. They also account for the majority of the financial sector's foreign loans and investments. Therefore, this chapter looks at the impact of a JGB shock on local banks and insurance companies, focusing in particular their financial soundness and potential spillovers to Japan's regional neighbors.

Table 1 Share of Financial Institutions in JGB holdings and Foreign Securities and Loans

	JGB	Foreign Securities and Foreign loans (%)
Banks	60.8	44.5
Insurance	25.3	23.4
Pension Funds	4.7	10.8
Investment Trusts	1.9	19.6
Others	7.2	1.7
Total	100.0	100.0

Source: Bank of Japan, "Flow of Funds".

Note: Figures are the ratio of each financial institution's JGB holdings, foreign securities and loans to total financial institutions excluding the central bank at the end of 2010. JGB is the sum of treasury discount bills, government securities and Fiscal Investment and Loan Program (FILP) bonds. All foreign loans are assumed to be conducted by banks.

The effect of a JGB shock on the Japanese banking sector.

Japanese banks have strengthened their capital recently, but still hold a large amount of JGBs and Japanese equities. They have also recently started to increase loans to foreign countries, especially Asian economies. Megabanks in particular—MUFG, SMFG, and Mizuho FG—account for most of the banking sector's JGB and equity holdings, and are also responsible for most foreign loans. We therefore stress test the balance sheets of the three megabanks to gauge the effect of a JGB shock on bank stability and foreign lending.

We consider five stress scenarios: a 100bps, 200bps, 300bps, and 400bps parallel shift in the yield curve, as well as the fiscal-crisis scenario considered in Chapter IX. The Q-JEM (Quarterly Japanese Economic Model)[29] is used to estimate the follow-on impact of an interest-rate shock on stock prices and GDP growth in the first four scenarios. For the fiscal-crisis scenario, the assumed shock entails a 450bps increase in interest rates, a 60 percent decline in equity prices, and 4.4 percent decline in growth.

The stress test estimates the impact on profits, tier I capital, and foreign loans. The first step provides an estimate of the immediate losses on banks' JGB and equity holdings,

[28]Prepared by Akira Otani and Mitra Srobona (MCM).

[29]Tomiyuki, Kitamura, and others, "Hybrid Japanese Economic Model: Quarterly Japanese Economic Model (Q-JEM)", Bank of Japan Working Paper 09-J-06, Bank of Japan, 2009 (only in Japanese).

as well as expected losses in the loan portfolio.[30] The second step calculates the resulting Tier I capital ratio, assuming that risk-weighted assets remain unchanged. Finally, the drop in foreign lending is estimated by assuming that megabanks maintain the targeted Tier I ratio by reducing their foreign loans.[31]

Table 2	TOPIX and credit cost rate in each scenario				
	Scenario i	**Scenario ii**	**Scenario iii**	**Scenario iv**	**Scenario v**
	-100bps-	**-200bps-**	**-300bps-**	**-400bps-**	**-Crisis-**
TOPIX	828	722	629	549	392
Credit cost rate	50 bps	60 bps	72 bps	85 bps	101 bps
Source: Fund staff estimates.					

The results show that the megabanks are resilient to JGB shocks. Only in the extreme scenario do they reduce their foreign portfolios significantly. In the first three scenarios their Tier I ratios remain above 8 percent. In the fourth 400bps scenario, the average Tier I ratio drops to 7.8%, prompting a slight scaling back of foreign loans to bring the ratio back up to 8 percent. In the crisis scenario, the Tier I ratio drops to 6.7 percent. Although this meets the minimum requirement level of 6 percent, in order to bring capital back to 8 percent, the banks would have to reduce foreign loans by 45 percent.

Table 3	Estimation Results				
	Scenario i	**Scenario ii**	**Scenario iii**	**Scenario iv**	**Scenario v**
	-100bps-	**-200bps-**	**-300bps-**	**-400bps-**	**-Crisis-**
Tier 1 (%)	12.2	10.6	9.2	7.8	6.7
Rate of reduction in foreign loans	-	-	-	-7.2	-45.0
Source: Fund staff estimates.					
Note: Tier 1 ratio when Tier 1 capital decreases and risk-weighted assets remain unchanged.					

Table 4	Impact due to withdrawal of 45 percent of inter-bank funding from Japan
Affected countries	**Effect on capital (in percent of pre-shock capital)**
Australia	-8.6
China	-1.3
Taiwan	-1.1
India	-1.4
Indonesia	-5.2
Malaysia	-2.0
Philippines	-0.8
South Korea	-13.6
Thailand	-5.5
Vietnam	-2.2

[30]The Bank of Japan's default rate function—outlined in *Financial System Report, April, 2007*—is used to estimate GDP-related losses in the loan portfolio. In addition, the three mega banks' core operating profits are assumed to be the same as 2010.

[31]Megabanks are assumed to aim at an 8 percent Tier I ratio.

Even under the most severe scenario, the regional impact of a reduction in foreign loans is limited. Assuming that the banks reduce their foreign loans in proportion to their share of loans to each jurisdiction, the impact on local banking systems is relatively minor, ranging from 0–2 percent expressed as a fraction of total domestic credit. The key exceptions are the offshore financial centers, Hong Kong SAR and Singapore, where the impact ranges from 3–6 percent. As these centers are effectively cross-border intermediaries, the effect on the local economy will likely be limited.

Interbank network analysis confirms that a withdrawal of Japanese funding-would not be severe enough to trigger systemic distress in other countries.[32] In the event that regional banking systems experience a 45 percent withdrawal their funding from Japan,[33] the most vulnerable country is South Korea, which could experience a 14 percent decline in pre-shock bank capital. Other exposed countries are Australia, and to a limited extent, Indonesia and Thailand. In no case would a JGB-initiated shock push any of the regional banking systems to failure.

The presence of Japanese investors in regional capital markets is limited, so a withdrawal of Japanese banks will have a relatively small impact. Japan's equity holdings, as a fraction of local market capitalization, are significant in both the United States and Europe—ranging from 3–6 percent—but are much smaller in Asia (0–2 percent). A similar pattern applies to Japan's debt holdings.

The effect of JGB shock on the insurance sector

Japanese insurance companies have substantial financial buffers. The average solvency margin of the major firms is 932 percent, well above the minimum requirement of 200 percent, and representing a sizable cushion against JGB shocks**.** Applying same stress scenarios, the result shows that even in the most severe scenario, the insurance companies' solvency margin ratio remains above 300 percent. Therefore, JGB shocks would not force them to reallocate their financial assets or liquidate their foreign investment positions.

Table 5 Results of stress test on major insurance companies

	Scenario i	Scenario ii	Scenario iii	Scenario iv	Scenario v (%)
	-100bps-	-200bps-	-300bps-	-400bps-	-Crisis-
Solvency margin ratio	871.7	696.9	532.8	395/6	341.9

Source: Fund staff estimates.

Note: Major insurance companies are Dai-ichi Life Insurance, Meiji Yasuda Insurance, MS&AD Insurance, Nippon Life Insurance, NKSJ, and Tokyo Marine. In estimating the effect of interest rates on the market value of JGBs, it is assumed that the average maturity of JGBs is 10 years and the average coupon rate is 1.2 per cent.

[32]We repeat the network analysis used in Chapter VI to simulate a funding shock restricted within the region.

[33]Again, local banks will need to need sell some of their assets at fire-sale prices, and we assume a discount of 50 percent.

CHAPTER XI. CAPITAL MARKET CONTAGION AND EXTREME TAIL DEPENDENCE[34]

The size of the public debt and the potential cost of post-earthquake reconstruction raise the issue of whether investors will continue to enthusiastically buy Japanese government bonds (JGBs). While it is difficult to estimate the risk of a sudden withdrawal, past episodes of large changes in JGB yields could shed light on the potential spillover effects to G7 financial markets.

This chapter assesses the cross-border spillovers of large changes in the 10-year JGB yields and equity returns. Key stylized facts about the correlations between excessive equity returns and bond-yields include:[35]

- *Large negative equity returns and large increases in bond yields are not necessarily correlated within major countries*, such as the U.S., Germany, and Japan. This means that changes in these two market types are driven by separate events. However, greater correlations are found within some smaller countries, such as Greece and Ireland.

- *Large negative shocks in equity returns are significantly correlated across countries*, but vary in degree. For instance, correlations are <0.30 with Japan, >0.6 within Europe, and around 0.5 between U.S.-Canada and U.S.-U.K.

- *Large positive changes in 10-year bond yields are not very correlated across countries*. In fact, there are no coincident yield-spikes in Japan and the major countries at the 99th percentile tail. If the threshold is lowered to 95th percentile (where 10-year yield change>18bps counts as exceedance), then there are small but significant correlations with European countries. The correlations lie between 0.2–0.3 between U.S.-France and U.S.-Germany but are higher within Europe.

To control for common shocks, an extreme value theory (EVT) approach is used to examine the conditional-correlation between extreme returns in Japanese financial markets and those elsewhere. This is done by means of logit-regressions, in which exceedances in (say) the United States are regressed on exceedances elsewhere (including in Japan), controlling for common factors such as global equity returns, changes in global risk aversion (denoted by changes in the VIX), and extreme events in the euro-area periphery. The regressions also include lagged dependent variables to absorb other country-specific effects.

Four sets of results are presented in Tables 1–4. Spillovers from extreme increases in 10-year bond yields to similar bonds in other countries (~~b~~ond-to-bond") are presented in Table 1. The matrix shows the association (+/-, significance) between extreme increases in bond yields in ~~tr~~igger" countries (rows) to the ~~af~~fected" countries (columns). The effects are

[34]Prepared by Srobona Mitra (MCM).

[35]See Annex 1 for the definition and methodology for calculation of exceedances.

in terms of the probability of experiencing extreme movements in the affected countries, given an extreme movement in the trigger. Table 2 shows the association between the affected countries' probability of experiencing extremely negative equity returns conditional on the event that one of the triggers is also experiencing extremely negative returns (-equity-to-equity"). Tables 3 and 4 present results for cross-asset correlations across countries.

The results can be summarized as follows:

- Extremely large increases in 10-year JGB bond yields are associated with a higher likelihood of a hike in France's 10-year bond yields and, to a much smaller extent, the United States (Table 1). The equity returns of European stock indices are more likely to be adversely affected than their 10-year bond yields, especially in France and Germany (Table 2).
- Large negative equity returns in the Japanese stock index tend to be correlated with large negative returns in the United States, and to a much smaller extent, France (Table 3). There is almost no impact of large negative equity returns on large increases in bond yields in advanced countries (Table 4).
- When global equity markets (MSCI world) are doing better, chances of large negative equity returns fall for all countries, including Japan. There are some cases in which the chances of a large change in yields increase when the world equity markets are doing better, but the evidence on that is thin (mainly on Germany and the United States).

Annex 1. Methodology used in the extreme-value analysis

Step 1: We use daily (5-day week) equity returns and week-on-week changes in 10-year bond yields for France, Germany, Italy, Japan, U.K., and the United States. Other variables, used as controls, include the VIX, MSCI-World equity returns, and the equity returns and bond yields for Spain, Portugal, Greece and Ireland. The extreme value **threshold** for the data is calculated by the 5^{th} percentile tail.

Step 2: All observations exceeding the threshold are assigned a value of 1; others are 0. These series are called **exceedances***.*

Step 3: The spillover analysis is done by estimating the probability that the equity return of a country is in exceedance (takes the value of 1), conditional on Japan and other countries being in exceedance. This **coexceedance** is estimated from a logistic regression with an exceedance as the dependent variable (say country X's exceedance) and other exceedances (countries Y1, Y2…) and a lagged-dependent variable as explanatory variables. The weekly changes in MSCI-World and VIX, and the sum of exceedances in Greece, Ireland, Portugal and Spain (0-4 variable), are added as controls for common factors. A significant positive coefficient on any right-hand side variable is interpreted as: the probability of X being in exceedance is higher if Y1 is in exceedance (positive coefficient), but not so if Y2 (non-significant coefficient) is in exceedance (for instance). Then, country X and Y1 are said to coexceed with each other. Four sets of regressions are estimated for each of the large advanced countries. The first one looks at coexceedances in bond-yields; the second, coexceedances in equity-returns; the third, coexceedances from bond-yields to equity returns; and, the fourth, from equity returns to bond-yields.

Table 1. ***Bond-to-bond:*** Effect of large increases in ten-year bond yields in the trigger countries on the probability of the same in recipient

Trigger ↓	FRA	GER	JPA	UK	US
FRA		+	-	-	-
GER	+		+	+	+
JPA	+	+		+	+
UK	-	+	-		+
US	+	+	+	+	
Other					
VIX 1/	-	+	-	-	-
MSCI wrld 1/	-	+	+	-	+
Exc GIPS 2/	+	-	-	+ 3/	+

Table 3. ***Bond-to-equity:*** Effect of large changes in ten-year bond yields in the trigger countries on the probability of large changes in equity returns in recipient

Trigger ↓	FRA	GER	JPA	UK	US
FRA		-	+	+	+
GER	+		-	-	-
JPA	+	+		+	+
UK	+	-	-		+
US	-	-	+	-	
Other					
Own yield-exceedance	+	+	-	+	-
VIX 1/	+	-	+	+	+
MSCI wrld 1/	-	-	-	-	-
Exc GIPS 2/	-	-	-	-	-

Table 2. ***Equity-to-equity:*** Effect of large negative equity returns in the trigger countries on the probability of the same in recipient

Trigger ↓	FRA	GER	JPA	UK	US
FRA		+	-	+	-
GER	+		-	+	-
JPA	+	-		-	+
UK	+	-	-		+
US	+	-	-	+	
Other					
VIX 1/	-	-	-	+	+
MSCI wrld 1/	-	-	-	-	-
Exc GIPS 2/	+	-	+	-	-

Table 4. ***Equity-to-bond:*** Effect of large negative equity returns in the trigger countries on the probability of large incrases in yields in recipient

Trigger ↓	FRA	GER	JPA	UK	US
FRA		-	+	+	-
GER	+		+	-	-
JPA	+	+		+	-
UK	-	+	-		+
US	-	-	+	-	
Other					
Own equity return exceedance	-	+	-	+	+
VIX 1/	+	+	-	-	+
MSCI wrld 1/	+	+	+	+	+
Exc GIPS 2/	-	+	-	+	+

Note: The shadings denote statistical significance at different levels:

1 percent | 5 percent | 10 percent

1/ 5-day percent change

2/ Sum of exceedances in Greece, Portugal, Spain, Ireland. For instance, if all 4 are in exceedance at the same time, it takes a value of 4.

3/ Exceedance in Irish bond yields

Figure 1. Histogram of Stacked Equity Returns (week-on-week change in equity price index, %)

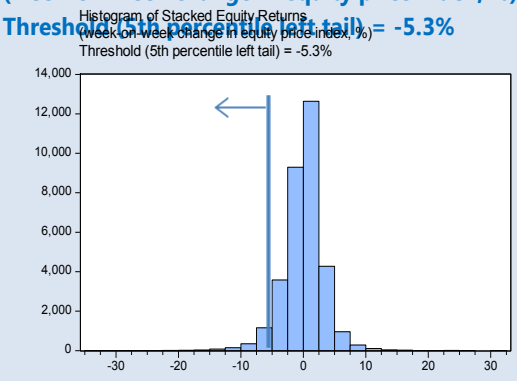
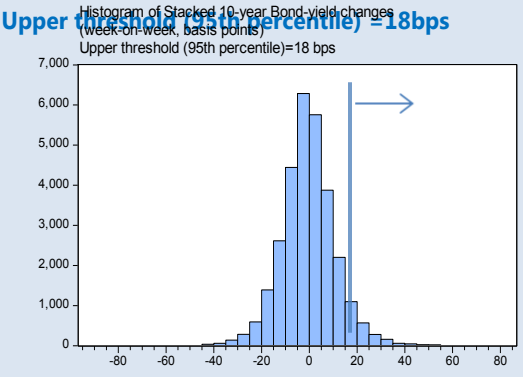


Figure 2. Histogram of Stacked 10-year Bond-yield changes (week-on-week basis points)



CHAPTER XII. ASSESSING DISTRESS DEPENDENCE AMONG SOVEREIGNS[36]

The behavior of CDS spreads over the past few years suggests that financial-market spillovers between sovereigns tend to be elevated during times of market distress. This distress dependence might be due to fundamental factors, such as trade or capital-flow linkages. It may reflect the cross-border activities of globally-active financial institutions. Or, it may instead result from psychological factors, such as herding behavior, or a global shift in risk aversion.

As a measure of these potential spillovers, it is possible to compute the probability of sovereign distress in one country given default in another.

The probability of sovereign distress in country A given a default by country B—*P(A|B)*—is obtained in three steps:

- The marginal probabilities of distress (PoD) for countries A and B, *P(A)* and *P(B)* respectively, are extracted from the individual-country CDS spreads, using data from Bloomberg.
- The joint probability of distress (JPoD) of A and B, *P(A∩B),* is obtained using the methodology developed by Segoviano.[37] This is a non-parametric approach that estimates the JPoD without imposing a (pre-determined) distributional form; subject only to the constraint that the implied PoD for each country is the same as that extracted from market data. This differs from traditional approaches, in which parametric copulas have to be chosen and calibrated explicitly—usually a difficult task.
- Finally, the conditional probability of distress (CoPod) *P(A|B)* is obtained from:

$$P(A|B) = P(A \cap B) / P(B)$$

The joint distribution is estimated for each date, providing a series of time-varying probability estimates for each country pair. Such pair-wise estimates provide insights into market views concerning the potential for confidence spillovers from one country to another. In the case of Japan, overall CoPods tend to be relatively low, but are elevated during times of global turmoil. Moreover, they appear to be currently elevated for some European countries with perceived fiscal vulnerabilities, as well as for some European banks.

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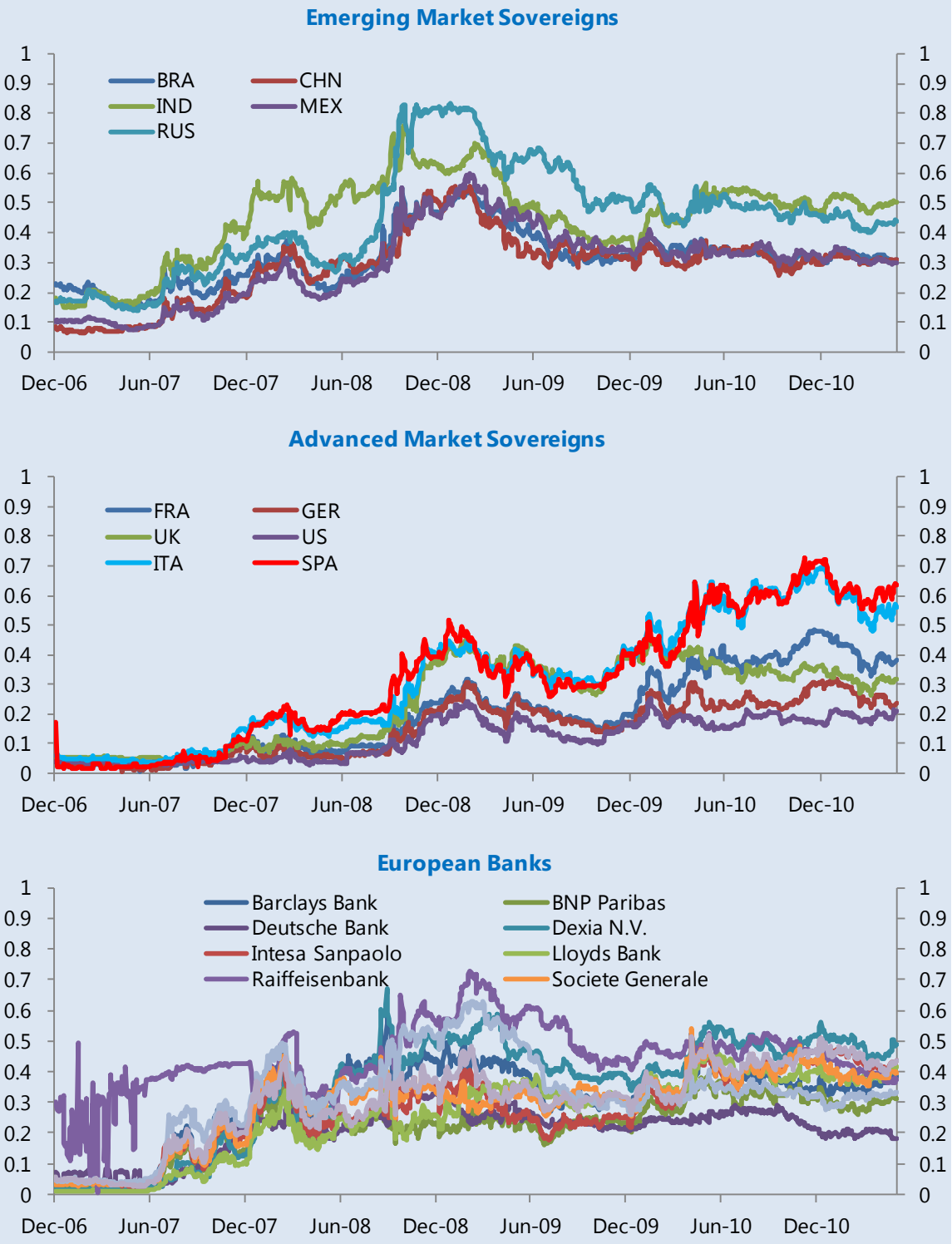
[36]Prepared by Tola Oni and Andrew Tiffin (SPR).

[37]Segoviano, M., 2006, "The Consistent Information Multivariate Density Optimizing Methodology," Financial Markets Group, London School of Economics, Discussion Paper No. 557; Segoviano, M., and C. Goodhart, 2009, "Banking Stability Measures", IMF Working Paper 09/04.

Figure 1. Japan: Conditional Probability of Distress, Given Distress in Japan



Sources: Bloomberg, Datastream, IMF Staff calculations.

CHAPTER XIII. MONETARY POLICY SPILLOVERS[38]

The Local and International Impact of Large-Scale Asset Purchases

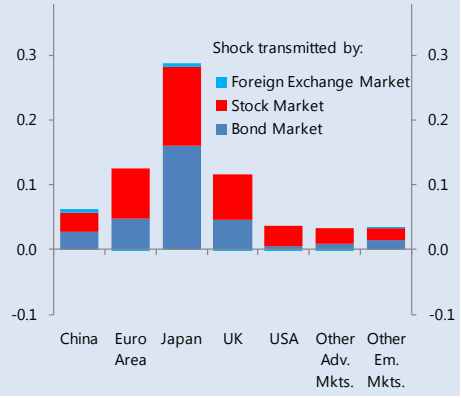
The Bank of Japan has pursued *powerful monetary easing* since Dec 2009, introducing a new fixed-rate provision of funds, an asset purchase program take involves government and corporate bonds, and equity exchange-traded funds and real estate trusts. It has also introduced new growth-focused lending.

Event-study analysis suggests that the easing has had a modest impact on local sovereign yields and equity returns (Table 1), but the impact on corporate credit and economic activity is not yet clear.[39] The impact on the exchange rate, or on foreign markets, has not been significant (Tables 2 and 3).

The Impact of Further Easing: Model Simulations

Spillovers from additional easing will likely be limited. Simulations are based on a refined version of the structural G-20 model.[40] The scenario investigates a larger easing effort, and is calibrated by scaling up the above event-study results, assuming that the authorities increase their asset purchases up to the current allowable limit. The result is a sequence of term premium shocks that reduce the long term nominal interest rate by around 50 basis points in Japan, and by 1–15 basis points in the rest of the world. Equity markets in Japan also rise by over 10 percent, matched by increases of 2–6 percent elsewhere.[41] Monetary policy is constrained by the zero lower bound on the short term nominal interest rate in the Euro Area, Japan, the United Kingdom, and the United States.

Figure 1. Peak Impulse Response to Japanese LSAP (percent of output)



[38]Prepared by Phil de Imus, Andrew Tiffin and Francis Vitek (SPR).

[39]See R, Lam (2011), "Bank of Japan's Monetary Easing Measures; Are they Comprehensive and Powerful?," Japan: Selected Issues Paper, forthcoming.

[40]Vitek, F., 2010, "Monetary Policy Analysis and Forecasting in the Group of Twenty: A Panel Unobserved Components Approach," IMF Working Paper 10/152.

[41]This is likely an upper bound, as a larger part of the impact of LSAP tends to be on announcement.

Table 1 Impact of Bank of Japan's Large-Scale Asset Purchases on Japanese Financial markets

(in basis points, unless stated otherwise)

Date	Events	Government Bonds				Short-term interest rates	Term premium (yield curve)		Inflationary expectations	Exchange rate JPY/USD		Corporate yields		Equity Market				Risk Premium
		1yr JGB	2-year JGB	10-year JGB	1-year futures	3-month futures	short end	long end	5-year break-even	Spot Rate	3-month Forward rates	AA-rated	BBB-rated	Index Futures	Nikkei Futures	Implied Volatility	J-REITs	Corporate Spreads
19-Dec-08	Liquidity and Financial Stability Measures	**-7.3****	**-7.7****	**-7.3****	-2.6	**-7.0****	0.9	0.4	0.00	0.93	0.84	**-0.06****	-0.01	0.65	0.92	**-7.05****	3.91*	5.9*
	Powerful Monetary Easing (PME)																	
1-Dec-09	Enhancement of Easy Monetary Conditions	**-4.3****	**-4.5****	**-5.8****	-3.80	**-6.5****	-0.9	-1.3	-0.03	1.12	1.12	-0.06	0	2.82	3.22	-2.53	**5.74****	5.8*
17-Mar-10	Expansion of measures to encourage	-0.10	0.50	2.70	3.40	1.50	-0.1	2.2	0.03	0.08	0.07	0.02	0	0.21	0.19	-1.45	1.19	-2.7
	decline of long-term rate																	
30-Aug-10	Enhancement of Easy Monetary Conditions	-0.30	-1.50	-3.90	-3.50	-0.50	-1.1	-2.4	-0.02	-1.20	-1.2	-0.04	-0.04	-1.86	-1.9	3.2	1.17	-0.6
5-Oct-10	Comprehensive Monetary Easing	-1.10	-0.90	**-10****	-5.4*	0.00	-0.4	**-9.1****	-0.01	-0.50	-0.5	**-0.09****	**-0.09****	3.31	3.74	-1.17	2.25	1.2
	Powerful Monetary Easing (PME)																	
	Cumulative Sum	**-13.1****	**-14.1****	**-24.3****	-11.9*	**-12.5****	-1.6	-10.2*	-0.03	0.43	0.33	**-0.23****	-0.14*	5.13	6.17	-9.00	**14.26****	9.6
	Average	**-2.62****	-2.82	-4.86*	-2.38	-2.50	-0.3	-2.0	-0.01	0.09	0.07	-0.05	-0.028	1.026	1.234	-1.8	2.852	1.92
Various	Introduction of new measures/facilities	**-13.1****	**-15.9****	**-21.8****	-12.6*	**-11.5****	-2.2*	**-5.9****	-0.03	1.29	1.2	**-0.2****	-0.1	**6.01**	**7.11**	**-14.19****	**18.5****	11.9*
	(See Table 2)																	
Various	Expansion of selected easing measures	-1.7	**-7.5**	-6.8	-6.2	7.0*	-0.3	0.7	0.04	-2.41	-2.40	-0.06	-0.09	-1	-1.53	-4.41	1.74	-2.2
	(See Table 2)																	
Various	Exits of selected measures/facilities	0.2	-2.7	-2.1	-2.8	1.0	0.1	0.6	0.03	-0.17	-0.17	-0.01	0	0	0.35	-1.9	4.06	2.1
	(See Table 2)																	
	Control Groups																	
Jul 08 - Dec 10	*Typical Trading Day*																	
	Average	-0.2	-0.2	-0.1	-0.1	-0.1	0.0	0.1	0.01	-0.07	-0.07	0.00	0.00	-0.05	-0.04	-0.01	0.00	-0.09
	s.d.	1.3	2.0	3.5	3.6	2.1	1.3	3.3	0.07	1.16	1.17	0.03	0.04	2.95	3.12	3.35	3.02	3.72
MPC releases	*MPC meeting release (excl. monetary*																	
Jul 08 - Dec 10	*easing announcements)*																	
	Average	-0.5	-0.9	-1.1	-0.7	-0.3	-0.6	-0.2	0.01	-0.12	-0.12	-0.01	0.00	-0.89	-0.90	1.41	-0.58	0.74
	s.d.	2.0	3.2	3.4	4.7	2.4	2.4	4.7	0.08	1.28	1.31	0.03	0.05	4.21	4.68	4.04	3.97	4.37

Source: Bank of Japan, Bloomberg, IMF staff calculations.

Table 2 Impact of Bank of Japan's Large-Scale Asset Purchases on US Financial markets

(In basis points, unless stated oteherwise)

Date	Events	Government Bonds				Short-term interest rates	Term premium (yield curve)		Inflationary expectations	Nominal Trade-weighted Exchange Rate		Corporate yields		Equity Market			Risk Premium
		1yr JGB	2-year JGB	10-year JGB	1-year futures	3-month futures	short end	long end	5-year break-even	Spot Rate	3-month Forward rates	AA-rated	BBB-rated	Stock Index	Index Futures	Implied Volatility	Corporate Spreads
19-Dec-08	Liquidity and Financial Stability Measures	-3.0	**15.3****	9.4	**31.4****	1.5	8.00*	-5.90	-0.14*	**1.25****	**1.20****	0.03	-0.02	-1.54	-2.69	-5.87	-9.40
	Powerful Monetary Easing (PME)																
1-Dec-09	Enhancement of Easy Monetary Conditions	1.0	7.2	13.6	8.2	-2.0	-0.10	6.40	0.01	-0.45	-0.44	0.07	0.07	1.24	1.20	-13.83*	-13.60
17-Mar-10	Expansion of measures to encourage	0.0	4.4	2.9	2.9	3.0	0.40	-1.50	-0.01	0.17	0.16	-0.01	-0.01	0.55	0.57	-6.05	-2.90
	decline of long-term rate																
30-Aug-10	Enhancement of Easy Monetary Conditions	-2.0	-6.8	-17.9*	-13.4*	-0.8	-2.20	-11.1*	-0.09	0.34	0.34	-0.14*	-0.14	-1.43	-1.45	6.54	17.9*
5-Oct-10	Comprehensive Monetary Easing	-2.0	-2.2	-8.2	-6.3	-3.0	-1.80	-6.00	0.09	-0.9*	-0.88*	-0.06	-0.06	2.02	1.84	-8.67	8.20
	Powerful Monetary Easing (PME)																
	Cumulative Sum	-6.0	17.9	-0.2	22.8	-1.3	4.30	-18.1	-0.14	0.41	0.38	-0.11	-0.16	0.84	-0.53	-27.88*	0.2
	Average	-1.2	3.6	0.0	4.6	-0.3	0.86	-3.62	-0.03	0.08	0.076	-0.022	-0.03	0.168	-0.106	-5.576	0.04
Various	Introduction of new measures/facilities	0.0	18.7	13.1	**41.4****	4.5	5.20	-5.60	0.10	0.26	0.22	0.18	0.09	0.36	-1.80	-17.05	-13.10
	(See Table 2)																
Various	Expansion of selected easing measures	-1.0	3.9	1.0	4.1	-6.3	2.80	-2.90	0.27	-1.21	-1.19	0.07	0.02	1.67	1.90	-3.02	-1.00
	(See Table 2)																
Various	Exits of selected measures/facilities	0.0	2.4	5.4	4.4	-3.0	-0.70	3.00	0.11	-1.12	-1.09	-0.01	-0.05	0.67	0.67	**30.49****	-5.40
	(See Table 2)																
	Control Groups																
Jul 08 - Dec 10	*Typical Trading Day*																
	Average	-0.6	-0.6	-0.1	-0.2	-0.8	0.10	0.50	0.00	0.02	0.02	0.00	0.00	0.03	0.03	0.33	0.11
	s.d.	6.5	8.6	11.9	9.8	8.5	5.71	8.45	0.10	0.65	0.64	0.10	0.11	2.61	2.66	9.82	11.93
MPC releases	*MPC meeting release (excl. monetary*																
Jul 08 - Dec 10	*easing announcements)*																
	Average	-0.4	0.9	1.1	1.0	-0.7	0.99	0.18	0.02	-0.07	-0.07	0.01	0.02	0.16	-0.03	-1.10	-1.11
	s.d.	13.2	11.4	11.7	11.3	11.8	10.52	8.58	0.11	0.68	0.66	0.10	0.12	3.77	3.84	9.95	11.74

Source: Bank of Japan, Bloomberg, IMF staff calculations

Table 3 Impact of Bank of Japan's Large-Scale Asset Purchases on Euro-Area Financial markets

(in basis points, unless stated otherwise)

Date	Events	Government Bonds				Short-term interest rates	Term premium (yield curve)		Inflationary expectations	Exchange rate EUR/USD		Corporate yields		Equity Market			Risk Premium
		1yr JGB	2-year JGB	10-year JGB	1-year futures	3-month futures	short end	long end	5-year break-even	Spot Rate	3-month Forward rates	AA-rated	BBB-rated	Stock Index	Index Futures	Implied Volatility	Corporate Spreads
19-Dec-08	Liquidity and Financial Stability Measures	-5.3	-3.7	-1.2	-6.1	-8.5	8.0	2.5	0.08	**-2.14****	**-2.23****	-3.60	-2.90	-2.47	-1.70	-10.96*	-1.7
	Powerful Monetary Easing (PME)																
1-Dec-09	Enhancement of Easy Monetary Conditions	-1.8	-1.5	1.2	-1.3	-1.5	-0.1	2.7	-0.06	0.27	0.28	-7.10	1.20	2.77	2.49	-10.96*	0.0
17-Mar-10	Expansion of measures to encourage	0.4	-1.4	-1.1	-1.5	-0.5	0.4	0.3	0.05	-1.13	-1.12	-1.30	-3.00	0.69	0.69	-1.82	-1.9
	decline of long-term rate																
30-Aug-10	Enhancement of Easy Monetary Conditions	-2.5	-4.5	-3.8	-6.7	-0.5	-2.2	0.7	-0.14*	-0.66	-0.62	-2.80	-2.00	-0.44	-0.76	2.46	1.8
5-Oct-10	Comprehensive Monetary Easing	-1.9	-2.8	-1.6	-1.7	-2.0	-1.8	1.2	0.01	1.78*	1.66*	-4.20	-5.30	2.23	2.03	-9.45	-3.7
	Powerful Monetary Easing (PME)																
	Cumulative Sum	-11.1	-13.9	-6.5	-17.3	-13.0	4.3	7.4	-0.06	-1.88	-2.03	-19.00	-12.00	2.78	2.75	**-30.73****	-5.5
	Average	-2.2	-2.8	-1.3	-3.5	-2.6	0.9	1.5	-0.01	-0.38	-0.41	-3.80	-2.40	0.56	0.55	-6.15	-1.1
Various	Introduction of new measures/facilities	-9.8	-9.9	25.9*	6.8	-13.5	5.2	**35.8****	0.25*	-0.79	-0.68	-12.1	**-33.9****	0.96	1.47	**-37.34****	**-59.8****
	(See Table 2)																
Various	Expansion of selected easing measures	-12.6	-5.1	28.9*	12.3	-10.5	2.8	34*	0.16	3.24	3.42	-0.50	-2.60	-0.31	0.38	-14.36	**-31.5****
	(See Table 2)																
Various	Exits of selected measures/facilities	-4.2	-6.0	-8.3	-1.6	-4.5	-0.7	-2.3	-0.10	0.95	0.98	-2.30	-7.60	0.87	0.96	6.38	0.7
	(See Table 2)																
	Control Groups																
Jul 08 - Dec 10	*Typical Trading Day*																
	Average	-0.6	-0.6	-0.1	-0.2	-0.8	0.1	0.5	0.00	0.02	0.02	0.00	0.00	0.03	0.03	0.33	0.1
	s.d.	6.5	8.6	11.9	9.8	8.5	5.7	8.5	0.10	0.65	0.64	0.10	0.11	2.61	2.66	9.82	11.9
MPC releases	*MPC meeting release (excl. monetary*																
Jul 08 - Dec 10	*easing announcements)*																
	Average	-0.4	0.9	1.1	1.0	-0.7	1.0	0.2	0.02	-0.07	-0.07	0.01	0.02	0.16	-0.03	-1.10	-1.1
	s.d.	13.2	11.4	11.7	11.3	11.8	10.5	8.6	0.11	0.68	0.66	0.10	0.12	3.77	3.84	9.95	11.7

Source: Bank of Japan, Bloomberg, IMF staff calculations

Rising Interest Differentials and the Return of the Carry Trade

Prior to the global financial crisis, persistently low interest rates and historically low volatility made the yen a favored funding currency for carry trades.[42] Moreover, the strong appetite for risk that characterized 2003–07 led to a steady build up in these positions, and rendered the carry trade a significant driver of cross-currency positioning.

Quantifying the size and destination of these positions is challenging. The range of instruments associated with the carry trade has grown over the years, including complex off-balance sheet transactions that are less easily detected in BoP and capital-flow statistics. The trade has also come to encompass a range of different investor classes, from ―Mrs. Watanabe," to more sophisticated global brokerage houses and hedge funds. *In 2007, near the peak, estimates of the yen-funded carry trade ranged from $100 billion to $2 trillion.*

Currently, the prospects for a return of the carry trade do not seem strong. Compared to the precrisis period, forward-looking measures of risk-adjusted yields are relatively low for the Australian, New Zealand, and U.S. currencies; reflecting narrow interest-rate differentials against the yen and a higher level of implied volatility. Notably, only the Brazilian *real* appears to be climbing towards the elevated levels of 2008, and market contacts indicate that Brazilian assets have become a favorite destination for Japanese retail investment trust accounts.

Position and leverage indicators suggests less capacity to hold yen-funded carry trades. On the Chicago Mercantile Exchange, noncommercial traders are currently holding net *long* positions in the yen, whereas net short positions were the norm prior to the crisis. Leverage indicators, such as the call-money liabilities of foreign banks in Japan, also suggest a significant decline in the trade's attractiveness. This is consistent with anecdotal reports that hedge funds and other speculative investors now find it more difficult building up leverage in the post-Lehman shock environment.

Forecasting the Carry Trade

Looking forward, monetary normalization in other advanced markets suggests that interest differentials will widen once more. Following the methodology of Shin (2009), we can take the net interoffice assets of foreign banks operating in Japan as an indicator of the scale of the yen-funded carry trade. Arguably this is a better guide than using foreign-bank liabilities in the Japanese cash market, as it excludes funds used to purchase Japanese securities.

These net interoffice assets can then be modeled as a function of international policy-rate differentials (JPN vs. average of AUS/US/EUR) and the VIX.

[42] A ―carry trade" exploits opportunities presented by of low borrowing costs in one market combined with higher returns in another. Its success as strategy has long been a puzzle for economists, given that it violates the hypothesis of uncovered interest parity—the so called forward premium puzzle.

Figure 2. Following the trail of leverage bets

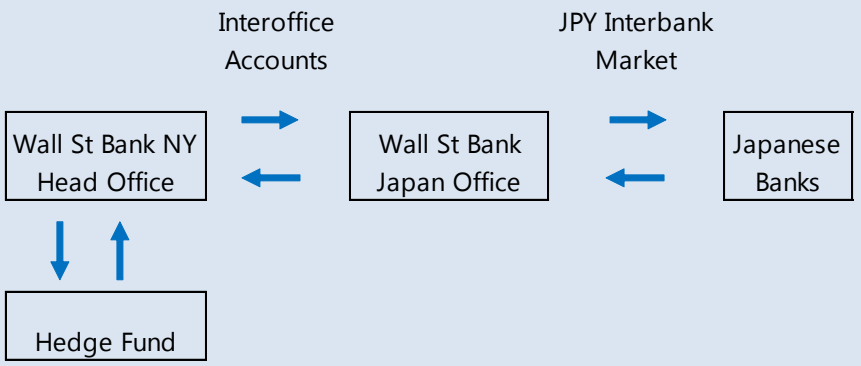


Table 4	Determinants of the Japanese Carry Trade			
Dependent Variable: Net Interoffice Assets	**OLS: Shin**	**OLS: Full Sample**	**OLS: Post-Lehman controls**	**Dynamic Specification 1/**
Interest Rate Differential	-37.281***	-22.828***	-37.499***	-36.695***
	(-10.27)	(-8.09)	(-10.74)	(-3.56)
Post-Lehman interaction			16.877	
			(-1.45)	
VIX	-3.599***	-0.871*	-3.439***	-5.425***
	(-7.44)	(-2.36)	(-7.44)	(-4.79)
Post-Lehman interaction			3.916***	2.891**
			(-5.63)	(-3.00)
Post-Lehman Dummy			-5.421	
			-0.21)	
Constant	-134.971***	-125.937***	-136.115***	-15.15
	(-7.79)	(-8.66)	(-8.18)	(-1.94)
Lagged dependent Variable				0.826***
				(-19.86)
R-sq	0.588	0.362	0.568	
No. Obs.	110	146	146	146
Parentheses contain t-statistics. * p<0.05, ** p<0.01, *** p<0.001				
1/ Long-run coefficients reported.				

Key results:

- Extending Shin's original regression to an updated dataset, the relationship with the VIX breaks down—again, this may reflect that fact that, after the Lehman shock, banks and hedge funds are more constrained in using their balance sheets for speculative purposes.
- By including a post-Lehman interaction term on the VIX, however, we recover Shin's original relationship. A similar interaction term on the interest differential, and a post-Lehman dummy, are both insignificant.
- The residuals of the OLS specification suggest substantial autocorrelation. The preferred model, therefore, includes a lagged dependent variable. (The choice of specification, however, makes little material difference to the ultimate projection of net interoffice assets).

Projections

Assuming Japanese rates remain unchanged over the next two years, we can then use the expected increase in policy rates abroad (median forecast from Bloomberg) to project the likely increase in the scale of the carry trade out of Japan. To summarize, the average interest differential is expected to widen by about 220 bps by end 2012, prompting an increase in the carry trade of around ¥4.3 Trillion ($51 billion).

The next step is to map the change in the carry trade into actual exchange rates. A good price indicator is the JPY/AUD pair. Drawing from the recent relationship between this rate and net interoffice assets, staff project the (marginal) impact on the JPY/AUD of the anticipated increase in the carry trade. Projections are based on a simple VARX framework.

Overall, the carry-trade increase is expected to prompt a 5 percent depreciation of the yen against the AUD. The impact on other rates, such as the JPY/USD is uncertain. But as a general guide, 5 percent might be considered as an upper bound against other rates.

Figure 3. Japanese Carry Trade: Net Interoffice Assets of Foreign Banks in Japan, 1999-2012

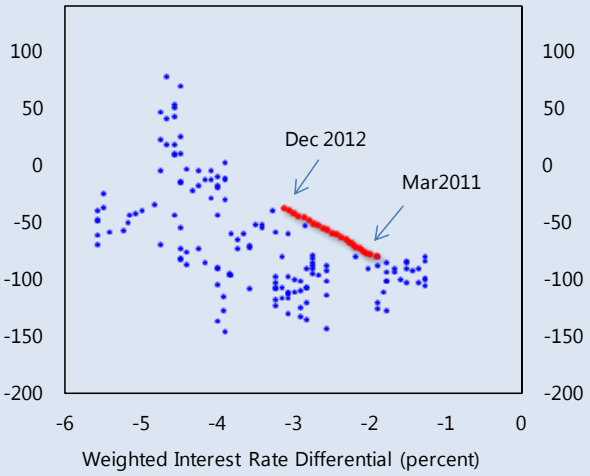
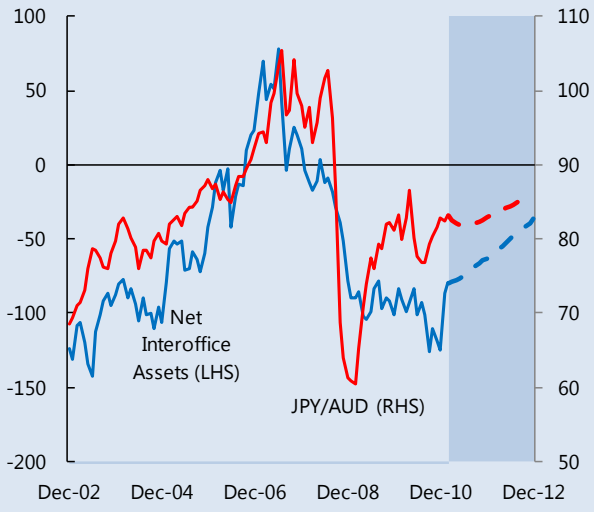


Figure 4. Japan: Carry Trade Projections



CHAPTER XIV. THE TRANSPACIFIC PARTNERSHIP AGREEMENT—IMPACT ON JAPAN AND OTHER MEMBERS[43]

***Background*.** The origin of the Trans-Pacific Partnership (TPP) is the 2006 Economic Partnership Agreement (EPA) between Brunei, Chile, New Zealand and Singapore. In 2010, an additional alliance between the United States, Australia, Malaysia, Peru, and Vietnam was announced and talks began about extending the TPP to these five countries. Japan, Korea, Thailand, Canada and Mexico have expressed interest in joining. Negotiations are progressing under U.S. leadership. The TPP is envisioned as a high-standard, 21st century trade agreement that includes commitments covering all aspects of trade and investment. The TPP is also seen as a starting point for a broader Free Trade Area of the Asia-Pacific (FTAAP). In June 2010, as part of its new growth strategy, Japan announced its intention to join TPP as a means of opening up the country and revitalizing agriculture.

***Key proposals under the TPP*.** Trade liberalization would extend to all chapters of the Harmonized System; coverage is therefore expected to include agreements on agriculture, a potentially controversial sector for both Japan and the United States. The TPP also features a strong focus on services liberalization—an area of particular interest to U.S. service suppliers. At the Sixth Round of negotiations in April 2011 in Singapore, the United States tabled proposals related to labor rights, environmental protection, and intellectual property protection—potentially contentious issues in TPP talks. Ambitious demands by the United States in these three areas may induce TPP countries to demand more in market access to the United States or to give less. At the same time, the United States also tabled a legal text on regulatory coherence; the first time this issue has featured in a trade agreement.[44] The plan is for TPP to be concluded during the APEC-leaders meeting hosted by the United States in November 2011.[45]

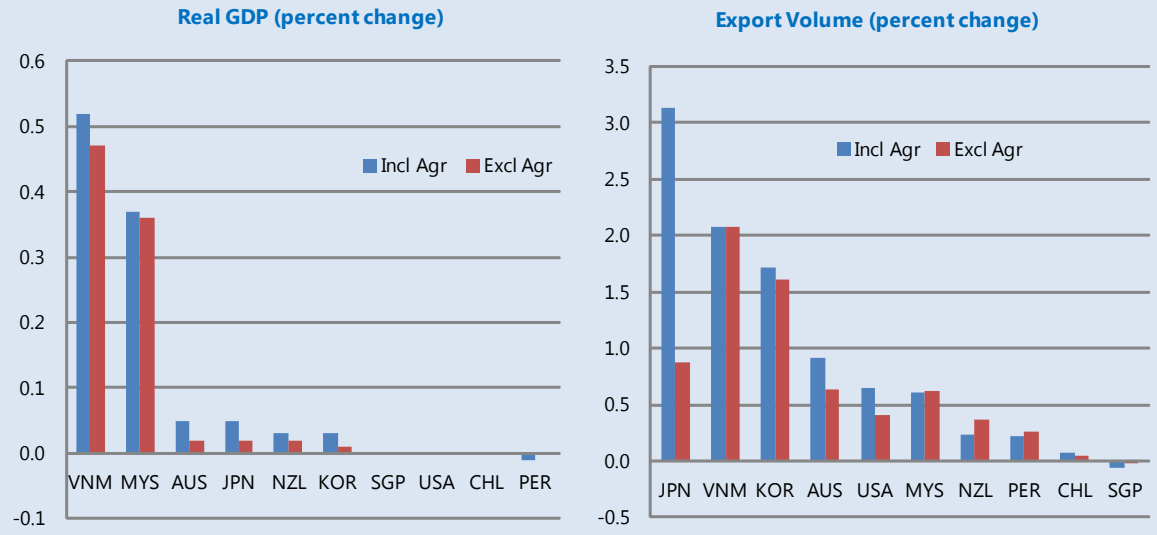
[43]Prepared by Nagwa Riad (SPR).

[44]Regulatory coherence is aimed at making the regulatory systems of the TPP countries operate more seamlessly and addressing so-called _behind-the-border' issues that pose increasing barriers to U.S. business in trying to access foreign markets. The intent would be to establish oversight regulatory bodies such as the U.S. Office of Information and Regulatory Affairs (OIRA).

[45]The next round (seventh) of negotiations on TPP will be held during the week of June 20, 2011, in Vietnam.

Potential impact of Japan's membership. The Global Trade Analysis Project (GTAP) is used to assess the impact and benefits of TPP on Japan as well as other Asian countries.[46] The analysis is ‗static' in the sense that it only captures the economic efficiency impact of a tariff removal; no allowance is made for more dynamic adjustments such as incorporating the impact of capital accumulation and productivity improvements, as in Kawasaki (2010).[47] Following Wignaraja (2011), the analysis covers 10 countries.[48] The analysis considers different scenarios regarding coverage (i.e., with and without agriculture liberalization) and membership (i.e., with and without Japan). The impact should be read as a one-time effect on GDP, exports, and utility (in the form of higher purchasing power as a result of tariff removal). The results are presented in Figure 1 (detailed data in Table 1).

Figure 1. Marginal Contribution of Japan's Membership in TPP on:



Source: GTAP and author estimates.

Key results include:

- TPP membership generates welfare gains for Japan and most other members, especially if agriculture is included. Potential losses for nonmembers are also higher when Japan is included due to higher trade diversion.

[46]The latest version of GTAP is used (version 7); the base year is 2004.

[47]Kawasaki, Kenichi (2010), ―The Macro and Sectoral Significance of an FTAAP" *ESRI Discussion Paper Series #244*.

[48]Wignaraja, Ganeshan (2011), *ASEAN or TPP? Pathways Towards East Asian FTA Consolidation*, presentation at the Fund in February 2011. His analysis assumes a TPP-11 which includes: Australia, Brunei, Chile, Korea, Malaysia, New Zealand, Peru, Singapore, the United States, and Vietnam. GTAP however does not cover Brunei, and is therefore not included in our analysis.

- For Japan, the marginal contribution of TPP membership in terms of a one-time real GDP increase is somewhat modest—about 0.05 percent (including agriculture)—but is much higher for export volume (more than 3 percent).
- For other members, projected welfare gains are highest for Vietnam and Malaysia (poorer members gain more from FTAs). The marginal contribution of Japan's membership in terms of a one-time increase in real GDP ranges from 0.5 percent for Vietnam to 0.03 percent for Korea; for export volume the gains range from 2 percent for Vietnam to about 0.07 percent for Chile.
- Our results at the aggregate level are qualitatively similar to Kawasaki (2010) but much smaller in magnitude. Again, the latter allows for the impact of dynamic aspects of capital formation and productivity improvements on economic outcomes.

In general, our results are consistent with the balance of existing literature on the impact of FTAs suggesting that: (i) FTAs in Asia generate welfare gains for members and modest losses for nonmembers (mainly through trade diversion); (ii) broadening the membership of the FTA generates more gains; (iii) results vary depending on the assumptions underlying liberalization and membership but the sign—gain or loss—is quite robust; and (iv) production of sectors with comparative advantage will increase under the FTA.

***Preliminary considerations*.** Our empirical analysis suggests a positive welfare impact from membership, both for Japan and other Asian countries. Second, Korea (Japan's key competitor in Asia) has been quite active on the FTA front and could have FTAs in place with the United States by the end of 2011 and with the European Union and China by 2012. Japanese export sectors may therefore find themselves at a competitive disadvantage if they find themselves facing a widening tariff gap. Finally, financial liberalization is a key feature of TPP. Japanese financial institutions could therefore benefit from improved access to rapidly growing emerging nations' financial markets.[49]

[49]See Goldman Sachs Global Economics, 2011, "TPP and Its Positive Impact" *Japan Economics Analyst*, Commodities and Strategy Research, Issue No.11/03.

Table 1 Marginal Impact of Japan's Membership in TPP

	TPP with JPN - % change					
	All goods except Agriculture and processed Food			All goods including Agriculture and processed Food		
	Real GDP	Export volume	Utility per capita from expenditures	Real GDP	Export volume	Utility per capita from expenditures
AUS	0.03	1.83	0.01	0.07	2.22	0.57
NZL	0.02	1	0.02	0.07	1.19	0.43
CHN	-0.04	-0.26	-0.16	-0.04	-0.28	-0.22
HKG	0	-0.05	-0.11	0	-0.09	-0.13
JPN	0.02	0.93	0.14	0.05	3.25	0.11
KOR	0.08	3.1	0.29	0.36	3.84	0.39
TWN	-0.02	-0.1	-0.22	-0.03	-0.11	-0.27
KHM	-0.11	-0.2	-0.85	-0.11	-0.19	-0.86
IDN	-0.02	-0.1	-0.11	-0.02	-0.18	-0.19
LAO	-0.02	0.15	-0.12	-0.03	0.75	-0.06
MMR	-0.01	-0.06	-0.05	0	-0.15	-0.14
MYS	0.4	1.65	1.43	0.5	1.99	1.34
PHL	-0.03	0.09	-0.18	-0.05	0.04	-0.32
SGP	-0.01	0.12	0.41	0.02	0.04	0.88
THA	-0.09	0.91	-0.61	-0.11	1.18	-0.91
VNM	1.1	9.95	2.99	1.02	11.68	5.72
IND	-0.02	0.05	-0.06	-0.02	0.17	-0.11
ROASOC	-0.03	-0.11	-0.15	-0.03	-0.13	-0.19
CAN	-0.01	-0.1	-0.07	-0.01	-0.11	-0.15
USA	0	1.21	0	0	1.63	0.04
MEX	-0.05	0.04	-0.11	-0.05	0.15	-0.17
CHL	0.02	0.29	0.11	0.02	0.37	0.18
ROAmerica	-0.02	0.03	-0.05	-0.02	0.09	-0.09
PER	-0.02	3.42	-0.11	-0.02	4.26	-0.16
EU_25	-0.01	0.05	-0.03	-0.01	0.1	-0.05
RUS	0	-0.01	-0.01	0.01	-0.1	0
RestofWorld	-0.01	0	-0.03	-0.01	-0.01	-0.04

Sources: GTAP and author estimates.

Table 2	TPP without JPN - % change					
	All goods except Agriculture and processed Food			**All goods including Agriculture and processed Food**		
	Real GDP	Export volume	Utility per capita from expenditures	Real GDP	Export volume	Utility per capita from expenditures
AUS	0.01	1.19	0.04	0.02	1.3	0.17
NZL	0	0.63	0.01	0.04	0.95	0.35
CHN	-0.03	-0.15	-0.11	-0.03	-0.16	-0.12
HKG	0	-0.05	-0.06	0	-0.05	-0.08
JPN	0	0.06	-0.03	0	0.12	-0.03
KOR	0.07	1.49	0.46	0.33	2.13	0.56
TWN	-0.01	-0.04	-0.09	-0.01	-0.04	-0.11
KHM	-0.09	-0.18	-0.74	-0.1	-0.17	-0.81
IDN	-0.01	-0.12	-0.06	-0.01	-0.14	-0.09
LAO	-0.02	0.11	-0.11	-0.03	0.58	-0.08
MMR	0	-0.04	-0.04	0	-0.03	-0.07
MYS	0.04	1.03	0.83	0.13	1.38	0.77
PHL	-0.02	0.04	-0.11	-0.04	0.05	-0.19
SGP	-0.01	0.14	0.56	0.02	0.1	0.98
THA	-0.04	0.36	-0.27	-0.04	0.48	-0.37
VNM	0.63	7.87	2.44	0.5	9.6	5.12
IND	-0.01	0.03	-0.05	-0.01	0.08	-0.07
ROASOC	-0.02	-0.14	-0.11	-0.01	-0.12	-0.12
CAN	0	-0.04	-0.04	-0.01	-0.02	-0.06
USA	0	0.8	0.02	0	0.98	0.02
MEX	-0.01	0.06	-0.05	-0.01	0.06	-0.06
CHL	0.02	0.25	0.1	0.02	0.3	0.13
ROAmerica	-0.01	-0.01	-0.03	-0.01	0.01	-0.05
PER	-0.02	3.16	-0.1	-0.01	4.04	-0.13
EU_25	-0.01	0.02	-0.02	-0.01	0.04	-0.02
RUS	0	-0.01	0	0.01	-0.04	0.01
RestofWorld	0	-0.02	-0.02	0	-0.02	-0.01

Sources: GTAP and author estimates.

Table 3	Gains from Japan joining on members (% change) [TPP with JPN - TPP without JPN]					
	All goods except Agriculture and processed Food			**All goods including Agriculture and processed Food**		
	Real GDP	Export volume	Utility per capita from expenditures	Real GDP	Export volume	Utility per capita from expenditures
AUS	0.02	0.64	-0.03	0.05	0.92	0.40
NZL	0.02	0.37	0.01	0.03	0.24	0.08
JPN	0.02	0.87	0.17	0.05	3.13	0.14
KOR	0.01	1.61	-0.17	0.03	1.71	-0.17
MYS	0.36	0.62	0.6	0.37	0.61	0.57
SGP	0.00	-0.02	-0.15	0.00	-0.06	-0.10
VNM	0.47	2.08	0.55	0.52	2.08	0.60
USA	0.00	0.41	-0.02	0.00	0.65	0.02
CHL	0.00	0.04	0.01	0.00	0.07	0.05
PER	0.00	0.26	-0.01	-0.01	0.22	-0.03

Sources: GTAP and author estimates.