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Portfolio Rebalancing in Japan: Constraints and Implications for Quantitative Easing

by Serkan Arslanalp and Dennis Botman

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I N T E R N A T I O N A L M O N E T A R Y F U N D

IMF Working Paper

Monetary and Capital Markets Department and Asia and Pacific Department

Portfolio Rebalancing in Japan: Constraints and Implications for Quantitative Easing

Prepared by Serkan Arslanalp and Dennis Botman

Authorized for distribution by Luc Everaert and Matthew Jones

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Abstract

Portfolio rebalancing is a key transmission channel of quantitative easing in Japan. We construct a realistic rebalancing scenario, which suggests that the BoJ may need to taper its JGB purchases in 2017 or 2018, given collateral needs of banks, asset-liability management constraints of insurers, and announced asset allocation targets of major pension funds. Nonetheless, the BoJ could deliver continued monetary stimulus by extending the maturity of its JGB purchases or by scaling up private asset purchases. We quantify the impact of rebalancing on capital outflows and discuss JGB market signals that can be indicative of limits being within reach.

JEL Classification Numbers: E5, F32, G11, G15

Keywords: quantitative easing, portfolio rebalancing, capital outflows, speed limits.

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Contents

Page

I. Introduction3

II. QQE Transmission Mechanism in Japan4

III. Evidence of Portfolio Rebalancing Under QQE15

IV. Potential Portfolio Rebalancing Scenario under QQE2.....9

V. Implications for Capital Outflows and the JGB Market16

VI. Conclusions and Options for the BoJ19

Tables

1A. Asset Allocation of Pension Funds13

1B. Asset Allocation of Insurance Companies13

2A. Baseline Rebalancing Scenario under QQE2, 2015–18.....15

2B. Baseline Rebalancing Scenario under QQE2, 2015–18.....15

3. Potential Portfolio Outflows by Japanese Institutional Investors, 2015–1716

Figures

1. Evidence of Portfolio Rebalancing in Japan.....6

2. Potential Portfolio Rebalancing Under QQE210

3. Are There Limits to QQE?.....12

4. Projected JGB Holdings under the Baseline Rebalancing Scenario, 2015–18.....15

5. Portfolio Outflows by Destination, 2015–1717

6. Indicators to Watch for Signs of Stress in the JGB Market.....18

References.....21

I. INTRODUCTION

Japan has to solve four, closely related, economic problems: ending deflation, raising growth, securing fiscal sustainability, and maintaining financial stability. With the commencement of Abenomics in early 2013, Japan embarked on a comprehensive and coordinated set of policies to address these challenges, comprising aggressive monetary easing, flexible fiscal policies, and ambitious structural reforms—the so called three arrows of Abenomics.

The adoption of the quantitative and qualitative monetary easing (QQE) framework in April 2013, together with the higher inflation target and stronger coordination with fiscal and structural policies marked a clean break from previous, more incremental attempts to end deflation and revive growth. The Bank of Japan (BoJ) embarked on an unprecedented asset-purchase program, targeting a doubling of the monetary base—its new operational target—by end-2014 to around 54 percent of GDP. It also changed the composition of asset purchases, with greater emphasis on longer-dated government securities and larger purchases of risk assets such as commercial paper, corporate bonds, exchange-traded funds (ETFs), and Japanese real investment trusts (J-REITs).

On October 31 2014, the BoJ further expanded its QQE program. The BoJ decided to accelerate its purchases of Japanese Government Bonds (JGBs) to an annual pace of ¥80 trillion (from ¥50 trillion before), extend the average remaining maturity of JGB purchases to around 7–10 years (from 7 years before), and triple its purchases of EFTs and J-REITs. The BoJ’s move was aimed at maintaining momentum in raising inflation expectations. The BoJ has said that it will maintain its QQE program for “as long as it is necessary” to maintain its 2 percent inflation target in “a stable manner.” The BoJ now expects to reach the 2 percent target “around the first half of fiscal 2016” (i.e. April to September of 2016).

As trend inflation is only slowly nudging up and effects on the real economy have been modest so far, quantitative easing will likely have to be maintained for an extended period of time. This raises the question how long the current unprecedented pace of JGB purchases, equivalent to about 1 percent of GDP every month, or near 10 percent of the market on an annual basis, can continue before the BoJ runs into speed limits.

Limits to QE could arise from potential risks to central bank balance sheets upon exit, financial stability risks from an extended period of monetary easing, risks that monetary easing leads to complacency on fiscal and structural reforms, and concerns about debt monetization. However, in this paper we focus on the risk that there are quantitative limits to portfolio rebalancing among financial institutions and what this may imply for monetary easing in Japan.

Specifically, as noted in IMF (2012), financial institutions need “safe assets” as a reliable store of value, for collateral in repurchase and derivatives markets, and for asset-liability management and prudential purposes. Safe assets provide near-full protection from credit, market, currency, and idiosyncratic risks and they are highly liquid, permitting investors to liquidate positions easily. They also play an important role as benchmarks to judge relative performance and to assign pricing, hedging, and valuation to a broad range of risky assets as well as an indicator of monetary and financial conditions.

In Japan, with limited securitization, safe assets mainly comprise JGBs. With large JGB purchases by the BoJ, a supply-demand imbalance can emerge, which could limit the central bank's ability to achieve its monetary base targets. Such limits may already be reflected in exceptionally low (and sometimes negative) yields on JGBs, amid a large negative term premium, and signs of reduced JGB market liquidity.¹ To the extent markets anticipate limits, the rise in inflation expectations could be contained, which may mitigate incentives for portfolio rebalancing and create a self-fulfilling cycle that undermines the BoJ's objectives.

Having said that, the BoJ has tools to provide additional stimulus, if needed. It could extend the maturity of its purchases to longer-dated bonds, in a manner similar to the U.S. Federal Reserve's Operation Twist in 2011. Another option would be to change the composition of purchases, extending them to local government debt or buying more private debt securities, although the size of those markets is relatively small in Japan.

In section II, we first take stock of the monetary easing transmission mechanism in Japan. In section III, we provide evidence on portfolio rebalancing under the first wave of quantitative easing and how this compares to the experience in the U.K., the U.S., and, more recently, the euro area. We also discuss its effect on inflation and the real economy. In section IV, we discuss the enhanced monetary easing launched in October 2014 and derive the potential limits to the BoJ's purchases consistent with financial institutions' likely demand for JGBs. Section V discusses implications for capital outflows and potential JGB market signals that would indicate that limits are in sight. Section VI concludes and discusses alternative policy options for the BoJ to provide additional stimulus, if needed, once these limits are in sight.

II. QQE TRANSMISSION MECHANISM IN JAPAN

The QQE transmission mechanism is intended to work through three interconnected channels (Kuroda, 2013):

- **Interest rate channel.** QQE has the potential to lower the term premium through purchases of long-dated government securities and risk premiums through purchases of risk assets. In turn, these would contribute to higher business investment, durable goods consumption and residential investment, by reducing the funding cost of firms and households and improving their balance sheets through wealth effects.
- **Portfolio rebalancing channel.** As a result of the BoJ's large purchases of JGBs—exceeding their net issuance—investors and financial institutions would shift from JGBs to higher-yielding assets such as foreign bonds, stocks and loans.
- **Expectations channel.** Rising inflation expectations, including through improved BoJ communication and forward guidance, would lower long-term real interest rates and stimulate near-term activity. It would also push up the Philips curve, which is essential in Japan given that the Philips curve has been relatively flat, suggesting a limited impact on inflation dynamics from stronger aggregate demand.

¹ According to a recent BoJ study, the 10-year JGB term premium has been compressed by about 80 basis points under QQE from March 2013 to December 2014 (Sato, 2015).

These channels would transmit to the real economy through their effects on asset prices, the exchange rate, and bank lending. Wealth effects and a lower cost of borrowing could then lead to higher incomes and spending, raising growth and inflation. Lower bond yields would decrease the threshold for risk-returns of new loans.

Similar channels were expected to operate for other countries that introduced quantitative easing. For example, for the U.K., there is a broad range of evidence that suggests that QE did reduce gilt yields and boosted other asset prices. Such expansionary monetary policy may also lead to a shift in banks' willingness to lend, via a 'bank lending channel,' although this will depend critically on economic conditions, both on the take-up side of new loans as well as the extent to which banks need to deleverage. Nonetheless, Butt et al. (2014) find no evidence to suggest that QE operated via a traditional bank lending channel in the U.K. Their evidence is consistent with other studies that suggest that QE boosts aggregate demand and inflation mainly via portfolio rebalancing, but not through bank lending channels.

For Japan, Bowman et al. (2011) examine the effectiveness of the BoJ's quantitative easing policy (QEP) from 2001 to 2006, specifically injections of liquidity into the interbank market, in promoting bank lending. Although they find a robust, positive, and statistically significant effect of bank liquidity positions on lending, suggesting that the expansion of reserves associated with QEP likely boosted the flow of credit, the overall size of that boost was probably quite small. They find that much of the effect of the BoJ's reserve injections on bank liquidity was offset as banks reduced their lending to each other. Furthermore, the effect of liquidity on lending appears to have materialized only during the initial years of QEP, when the banking system was at its weakest; by 2005, even before QEP was abandoned, the relationship between liquidity and lending had evaporated.

III. EVIDENCE OF PORTFOLIO REBALANCING UNDER QQE1

In terms of the **interest rate channel**, Japan's QQE has achieved the desired results. JGB bond yields have declined and remained relatively stable, despite at times volatile bond market movements in other advanced economies (Figure 1, panel 1). The term premium implied in 10-year JGB yields remains compressed based on historical norms and compared to term premiums in other advanced economies (Figure 1, panel 2). These developments have been passed through to the real lending rate (text chart).

Japan: Real Lending Rate ^{1/}



Long Term Inflation Expectations

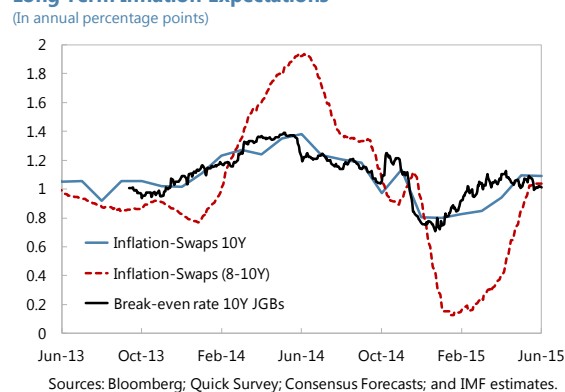
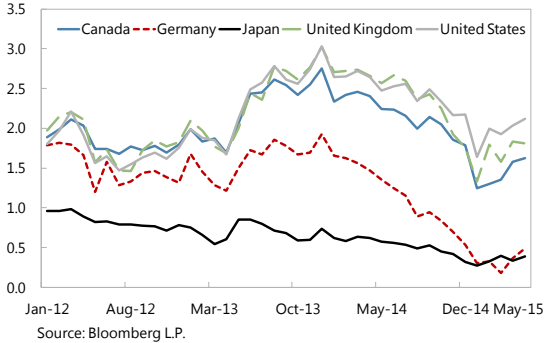


Figure 1. Evidence of Portfolio Rebalancing in Japan

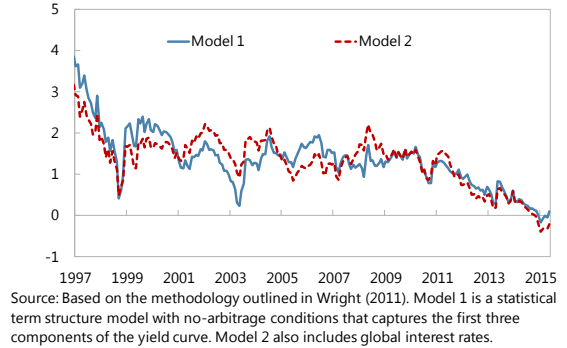
JGB yields have remained low despite large movements in bond yields in the other advanced economies...

10-Year Government Bond Nominal Yields
(In percent)



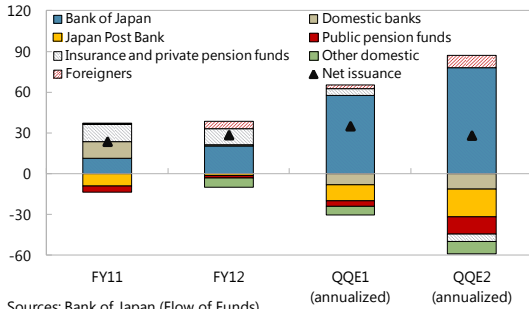
... as the term premium in Japanese bond yields remain compressed based on historical norms.

Japan: 10-Year Term Premium
(Percent)



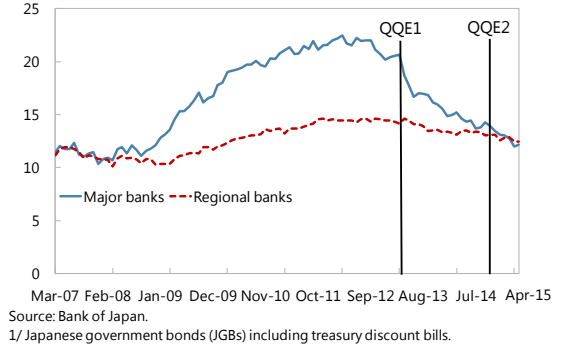
Japanese banks have become net sellers of JGBs, as the BoJ has purchased more than net issuance of JGBs...

Net Purchases of Japanese Government Bonds 1/
(In trillions of yen)



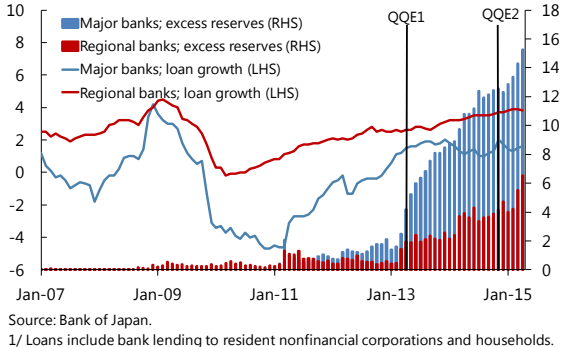
... reducing bank holdings of government debt and weakening sovereign-bank linkages.

Japanese Bank Holdings of Government Bonds 1/
(Percent of total assets)



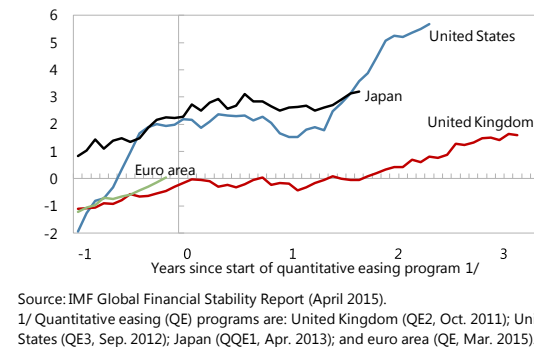
Meanwhile, banks are accumulating significant excess reserves...

Japanese Banks: Excess Reserves and Domestic Lending 1/
(Excess reserves as a percent of bank assets; year-over-year percent changes in loans)



... as bank lending is picking up only gradually, in line with past QE episodes.

Bank Credit Growth to the Nonfinancial Private Sector
(In percent)



In terms of the **expectations channel**, progress has been mixed. Different measures of inflation expectations, which steadily rose until mid-2014, have fallen recently and converged to about 1 percent, remaining well below the BoJ's 2 percent inflation target. Market-based measures of inflation expectations in Japan can be distorted by limited liquidity (for example, for the inflation-indexed bonds), whereas survey-based measures have in the past suffered from upward bias and wide dispersion of views among respondents.² Nonetheless, there appears to be substantial persistence in the process for inflation expectations, suggesting that they lag rather than lead actual inflation (see IMF, 2015).

Progress on **portfolio rebalancing** remains modest. Under QQE1, domestic banks—in particular Japan Post Bank—have been the main sellers of JGBs to the central bank (Figure 1, panel 3). All together, Japanese banks sold about ¥30 trillion of JGBs between March 2013 and September 2014, covering almost all the BoJ's net JGB purchases from the market above the net issuance of JGBs during the same period. All of Japan's top three banks reduced their JGB portfolios during this period. The resulting decline in holdings of government debt by the major banks weakened bank-sovereign linkages, as envisaged in Arslanalp and Lam (2013) (Figure 1, panel 4).³

At the same time, domestic bank lending has accelerated only modestly since the launch of QQE, rising by 2 percent for major banks and 4 percent for regional banks by end-2014.⁴ If lending picks up further, this should gradually reduce excess reserves of the banking system at the BoJ (Figure 1, panel 5). However, as in other episodes of QE, bank credit will likely take time to fully recover (Figure 1, panel 6). Even in the United States, where credit is now growing quickly, it took at least a year after the launch of its third QE program before lending started to pick up.

Meanwhile, Japanese banks continued to expand their overseas loan portfolios, which now exceed \$500 billion for the first time in more than 15 years. Most of the rise in overseas loans reflects expansion into Association of Southeast Asian Nations (ASEAN) countries, including Indonesia and Thailand. About 60 percent of external loans are financed through external deposits; the rest are financed through foreign-currency-denominated bonds and short-term lending instruments, such as foreign exchange swaps, to hedge exchange rate risk.

In contrast, insurance companies maintained a strong appetite for JGBs during QQE1. Outward portfolio investment by insurance companies was relatively limited during this period. However, they have risen for public and private pension funds, spurred by the shifts

² See Kamada and Nakajima (2013) for a discussion of the reliability of market-based indicators and the potential merits of using a purchasing power parity based measure. Nishiguchi, Nakajima, and Imakubo (2014) discuss the dispersion of survey-based measures and how this has changed under the new QQE framework.

³ The amount of interest rate risk associated with Japanese bank's domestic bond holdings fell from ¥8.6 trillion at end-March 2013 to ¥7.5 trillion at end-2014, a drop of 13 percent (BoJ, 2015). By type of bank, interest rate risk was ¥2.7 trillion for major banks, ¥2.8 trillion for regional banks, and ¥2.0 trillion for shinkin banks.

⁴ However, this does not imply that QQE has not affected bank lending. For example, Saito and Hogen (2014) find that the decline in the interest rate risk of major Japanese banks as a result of QQE has been associated with higher bank lending, after controlling for loan demand, interest rate spreads, and the nonperforming loan ratio.

in the asset allocation targets of the largest pension fund—the Government Pension Investment Fund (GPIF)—from JGBs to foreign securities.⁵

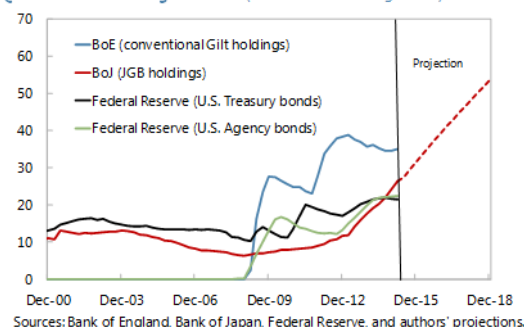
Finally, QQE1 has contributed to the weakening of the yen and supported confidence, helping to reverse the large output gap that existed at end-2012 and the overvaluation of the real exchange rate prior to Abenomics. At the same time, transmission to the real economy and inflation has been weaker than expected for a variety of reasons. First, exports did not respond strongly to the weaker yen, including as a result of production offshoring, supply-chain dynamics, and subdued global growth that became less investment intensive. Second, credit demand remained tepid despite record low real lending rates and corporate bond yields, reflecting weak investment in Japan in turn related to the uncertain outlook for domestic demand. Also, large manufacturing firms continued to have ample cash holdings implying a limited need for borrowing, while household borrowing remained broadly flat. Weak credit assessment capacity by banks may have also hindered loan provision. Finally, stock prices have more than doubled since the launch of QQE, driven by increased profitability of large corporations on the back of yen depreciation, lower corporate income tax rates, recent corporate governance reforms, and increased buybacks by companies. The portfolio allocation shift by the GPIF towards equities and other riskier assets and the BoJ's additional purchases of ETFs may have also contributed to this outcome. However, the positive wealth effects from the stock price rally contribute in a limited way given the relatively small share of equity holdings by households.

⁵ In late 2013, the GPIF with more than \$1 trillion in assets under management changed the portfolio weight of foreign securities from 17 percent to 23 percent.

IV. POTENTIAL PORTFOLIO REBALANCING SCENARIO UNDER QQE2

So far, the BoJ's share of the government bond market is similar to those of the Federal Reserve and still below the Bank of England (BOE) at the height of their QE programs. Indeed, the BoE held close to 40 percent of the conventional gilt market at one point without causing significant market impairment. Japan is not there yet, as the BoJ held about a quarter of the market at end-2014. But, at the current pace, it will hold about 40 percent of the market by end-2016 and close to 60 percent by end-2018. In other words, beyond 2016, the BoJ's dominant position in the government bond market will be unprecedented among major advanced economies.

Central Bank Holdings of Bonds in Countries with Quantitative Easing Policies (Percent of outstanding market)



Under QQE2, portfolio rebalancing in the Japan is likely to accelerate and deepen through greater involvement of Japanese institutional investors, for at least three reasons:

- Domestic bank holdings of JGBs have already declined by a considerable amount and private banks are starting to taper their JGB sales, citing concerns about collateral needs (major banks) and lack of alternative domestic bonds as a source of interest income (regional banks). As a result, most of the JGB sales by banks have recently come from Japan Post Bank.
- The maturity extension of JGB purchases under QQE2 should lead to more JGB sales by Japanese insurance companies and pension funds that predominantly hold long-term JGBs. Since, unlike banks, these institutional investors cannot hold excess reserves at the central bank, they should provide fresh liquidity to new parts of the financial system, such as real estate, corporate bonds, and equities. As QQE1 worked mainly through bank balance sheets, unlike the quantitative easing programs in the U.K. and the U.S. where portfolio rebalancing worked through nonbanks (Figure 2, panels 1 and 2), the maturity extension should bring BoJ's asset purchases closer to those of the Bank of England and the U.S. Federal Reserve (Figure 2, panel 3) and stimulate more portfolio outflows by institutional investors (Figure 2, panels 4-6).
- Recent pension fund reforms are leading the GPIF and other pension funds to reallocate from JGBs into higher-yielding securities.

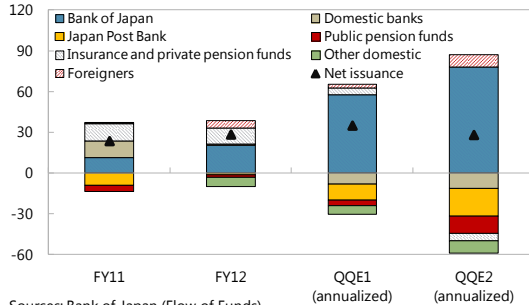
Indeed, under QQE1, only around 5 percent of BoJ's net JGB purchases from the market came from institutional investors. In contrast, under QQE2, close to 40 percent of net purchases have come from institutional investors between October 2014 and March 2015.

Figure 2. Potential Portfolio Rebalancing Under QQE2

Under QQE1, Japan's portfolio rebalancing worked mainly through banks...

...in contrast to the experience in the U.K and the U.S.

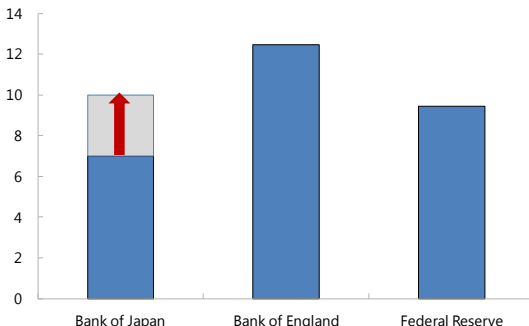
Net Purchases of Japanese Government Bonds 1/
(In trillions of yen)



Sources: Bank of Japan (Flow of Funds).
1/ Fiscal year ends at end-March of following year. QQE1 = April 2013-September 2014; QQE2= October 2014-March 2015.

Under QQE2 the BoJ extended the maturity of its purchases, shifting rebalancing toward nonbanks...

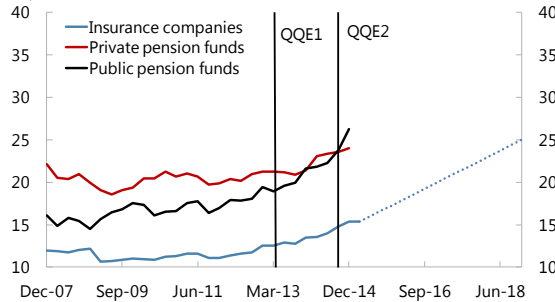
Average Maturity of Central Bank Asset Purchases 1/
(Years, end-2014)



Source: National central banks.

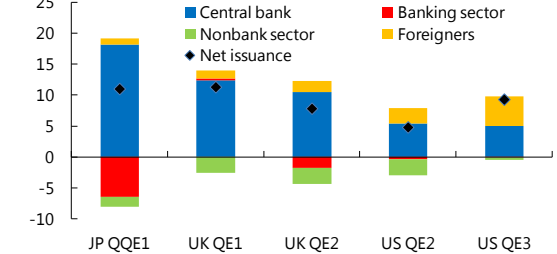
... helping reduce their home bias...

Japanese Institutional Investors' Foreign Security Holdings
(In percent of total assets)



Sources: Bank of Japan; and authors' projections.
Note: The dotted lines are the authors' projections under the baseline scenario.

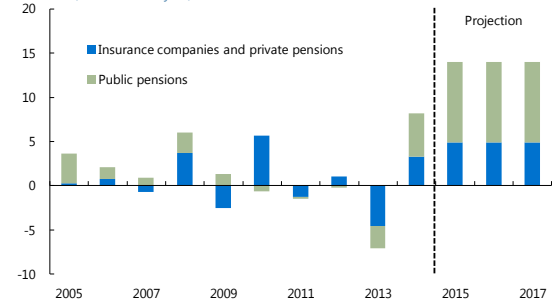
Change in Government Bond Holdings during QE Episodes
(In percent of GDP) 1/



Source: National central banks.
1/ For Japan, QQE1 covers the period from 2013Q1 to 2014Q3. For the U.K., QE1 and QE2 cover the periods from 2009Q1 to 2009Q4 and 2011Q3 to 2012Q3, respectively. For the U.S., QE2 and QE3 cover the periods from 2010Q3 to 2011Q2 and 2012Q3 to 2014Q3, respectively.

... which could lead to higher portfolio outflows from Japanese institutional investors...

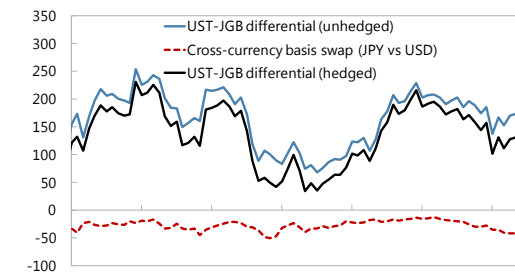
Portfolio Outflows of Japanese Insurance and Pension Funds
(In trillions of yen)



Sources: Bank of Japan; and authors' projections.

...especially if the yield differential between U.S. Treasuries and JGBs remain high

U.S. Treasury Value to Japanese Investors 1/
(Basis points)

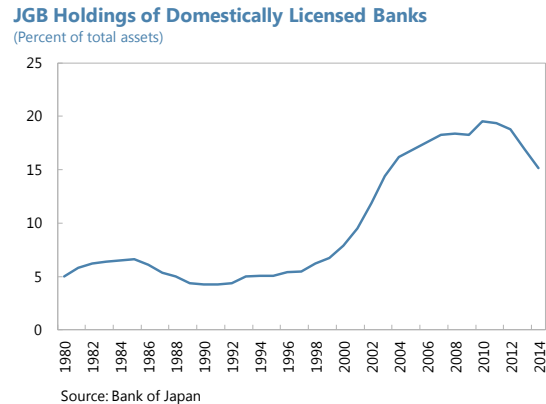


Sources: Bloomberg L.P.
1/: UST-JGB differential = 10-year U.S. Treasury yield - 10-year Japanese government bond yield. Hedging costs are captured by the one-year cross-currency basis swap.

At the same time, there is likely to be a “minimum” level of demand for JGBs from banks, pension funds, and insurance companies due to collateral needs, asset allocation targets, and asset-liability management (ALM) requirements. As such, the sustainability of the BoJ's current pace of JGB purchases may become an issue. To explore these potential limits and to assess the potential room for rebalancing under QQE2, we consider the following rebalancing scenario for domestic banks, insurance companies, and pension funds, which collectively own more than 80 percent of the JGB market excluding the part held by the BoJ:⁶

- **Banks** continue to reduce their JGB holdings until they reach 5 percent of total assets.

We consider this level to be a minimum amount to satisfy their collateral needs, given the size of repo and derivative markets in Japan.⁷ It is also on the lower end of the range of sovereign bond holdings by banks in other G7 economies (Figure 3, panel 3) and the minimum level of JGBs held by Japanese banks historically since 1980s (text chart).



- **Pension funds** continue to be net sellers of JGBs, led by the largest pension fund in Japan, the GPIF.⁸ The new portfolio benchmarks of the GPIF are in line with targets used in other countries (Table 1A). The rationale for the reallocation was to prepare the GPIF for higher inflation (reducing the portfolio of JGBs limits capital losses once nominal interest rates rise while increasing returns on assets) and to provide more risk capital to the economy by infusing funds into private assets. Japan's smaller public pension funds announced that they will follow suit and are on track to match the GPIF in terms of their allocations to domestic bonds.⁹

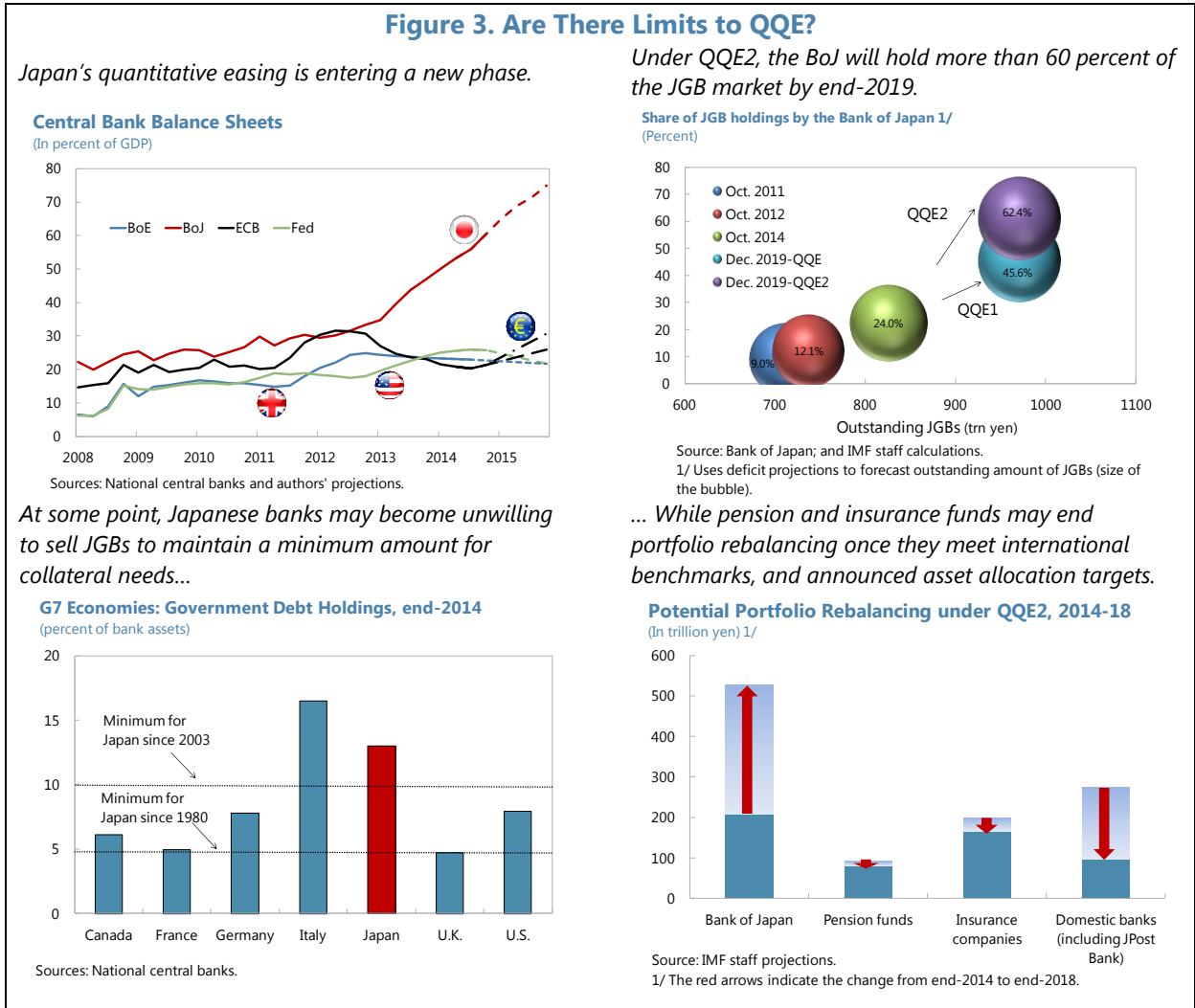
⁶ Remaining holders of JGBs mainly include households and foreigners. Household holdings of retail bonds are not eligible for BoJ purchases. JGB holdings by foreigners have recently been rising. International estimates, such as those in Arslanalp and Tsuda (2014), suggest that a large portion of foreign purchases of JGBs come from foreign central banks, whose demand is likely to be driven by long-term currency diversification needs.

⁷ The outstanding amount of repo transactions in Japan has been increasing significantly, in contrast to that in the U.S. Repo transactions on the Gensaki market increased from ¥12 trillion at end-2010 to ¥35 trillion at end-2014. Similarly, from end-2010 to end-2014, the net market values of OTC derivatives, after taking account of bilateral netting agreements, increased by 21 percent to about US\$ 200 billion, or to ¥25 trillion.

⁸ In October 2014, the GPIF announced its new assets allocation ratios. The new ratios were 35 percent (± 10 percent) for domestic bonds; 25 percent (± 9 percent) for domestic stocks; 15 percent (± 4 percent) for international bonds; and 25 percent (± 8 percent) for international equities. As of March 2015, the GPIF's asset were 39 percent in domestic bonds, 22 percent in domestic stocks; 13 percent in international bonds; and 21 percent in international equities (5 percent was invested in short-term assets).

⁹ The GPIF is the largest but not the only public pension fund in Japan. There are seven other public pension funds that manage about ¥50 trillion (\$400 billion) of assets as of end-March 2015. Some of these funds will be integrated into the GPIF's asset management scheme by October 2015, based on the legislation passed in 2012

- Insurance companies** continue to shift out of JGBs into foreign bonds.¹⁰ We project that insurance companies continue to gradually raise their foreign holdings from 15 to 25 percent of assets, in line with international practices (Table 1B) and consistent with their asset-liability management (ALM) constraints that make them likely to maintain a strong bias towards holdings long-term domestic-currency bonds.



to integrate public pension schemes. In March 2015, three of these funds with combined assets of ¥30 trillion announced that they will model the GPIF's new asset allocation starting in October 2015.

¹⁰ Japanese life-insurance companies prefer to invest in domestic bonds because their liabilities are mostly yen-denominated. But continued declines in JGB yields due to QQE are making it more difficult for insurers to secure the yields they have promised to pay customers. Hence they are increasing foreign security purchases, while hedging foreign exchange risks. In 2014, insurance companies reduced their JGB holdings for the first time in more than a decade, while accelerating foreign security purchases. Furthermore, there are two regulatory changes that may have encouraged Japanese insurers to increase foreign security holding, especially after 2012, when solvency requirements for insurers were revised and the capital charge for foreign bonds was reduced from 2 to 1 percent and the investment limit on foreign security holdings was removed.

Table 1A. Asset Allocation of Pension Funds 1/

	Domestic Stocks	International Stocks	Domestic Bonds 2/	International Bonds	Other
Australia	27	25	9	6	34
Denmark	3	20	41	9	27
France	17	12	55	4	12
Germany	4	7	59	5	25
Netherlands	5	18	43	6	28
Switzerland	13	18	20	26	23
UK	14	25	37	3	21
Chile	18	25	18	20	20
Hong Kong	35	30	9	10	16
Average 3/	15	20	32	10	23
Japan old	12	12	60	11	5
Japan new	25	25	35	15	0

Source: Mercer, 2014.

1/ Data as of end-2014 or latest available.

2/ Government and corporate.

3/ Average of all countries shown above, excluding Japan.

Table 1B. Asset Allocations of Insurance Companies 1/

	Domestic Stocks	Domestic Bonds	Foreign Securities	Other
Australia	50.0	23.7	9.1	17.2
France	27.5	32.6	31.8	8.1
Germany	38.5	5.6	13.1	42.7
Italy	7.5	45.3	19.8	27.4
Korea	7.4	59.4	27.3	5.9
Norway	28.7	27.6	29.4	14.3
Sweden	29.6	26.9	34.8	8.7
UK	11.6	28.1	24.9	35.4
US	...	36.4	...	63.6
Average 2/	25.1	31.7	23.8	19.4
Japan	7.4	61.1	15.4	16.1

Sources: Bank of Japan; Federal Reserve; OECD Institutional Investors Statistics.

1/ Data as of end-2014 or latest available.

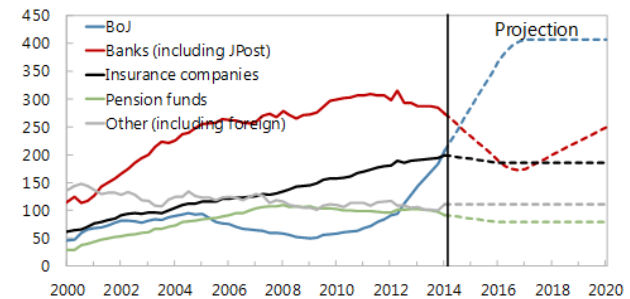
2/ Average of all countries shown above, excluding Japan.

Under these assumptions, and given the pace of BoJ purchases under QQE2 and projected debt issuance by the government (based on April 2015 IMF WEO projections of the fiscal deficit), we estimate that Japanese investors could shed some ¥220 trillion of JGBs until end-2018 (Table 2, Figure 4). In particular, Japanese insurance companies and pension funds could reduce their government bond holdings by ¥44 trillion, while banks could sell another ¥176 trillion by end-2018, which would bring their JGB holdings down to 5 percent of total assets. At that point, the BoJ may have to taper its JGB purchases.

To illustrate the sensitivity of this result to the assumptions made, suppose that banks reduce their JGB holdings only to 10 percent of assets. This is on the higher end of the range of sovereign bond holdings by other G7 economies (Figure 3, panel 3), but could be motivated by higher demand for safe assets than historic norms as a result of Basle III regulations or because of population aging in Japan and its implications for portfolio preferences. In addition, this could happen if banks collateral constraints become binding faster than anticipated or if the absence of sufficiently high-yielding domestic assets is a constraint on banks reducing their JGB holdings. Indeed, regional banks' JGB holdings have been little changed since the launch of QQE at around ¥40 trillion yen, or 12 percent of assets. In that case, the BoJ may have to taper its purchases earlier than illustrated in our baseline scenario, reaching speed limits by end-2016 (see text chart).

In sum, there is a broad range of outcomes which depend critically on banks' willingness to reduce their JGB holdings and shift into alternative assets. However, under plausible assumption, limits will be reached sometime in 2017 or 2018 under current policies. When these limits are approached, one could argue that the BoJ's easing policies become more effective as it is able to maintain low long-term interest rates and term premiums without significant purchases. At the same time, it implies that the BoJ would have to change its monetary base target, or, move to an alternative intermediate objective, such as interest rate targeting. In addition, these limits could complicate the eventual exit strategy for the BoJ as one would move from a situation of excess JGB demand to one of excess supply if (i) the central bank balance sheet is reduced in size; and (ii) the fiscal deficit remains high. Such a change in market conditions could trigger the potential for abrupt jumps in yields.

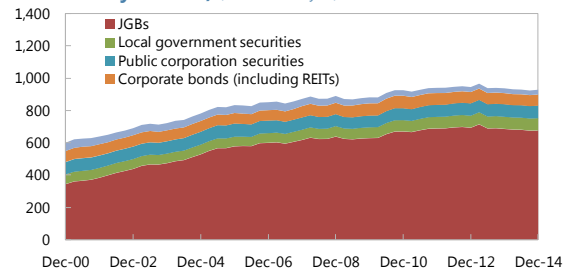
Downside Scenario: Projected JGB Holdings 1/
(In trillions of yen)



Sources: Authors' projections.

1/ Under the downside scenario, banks reduce their JGB holdings to 10 percent of assets and insurance companies switch 5 percent of assets from JGBs to foreign securities. Pension funds follow GPIF's new asset allocation targets.

Japan: Amount of Outstanding Domestic Bonds (excluding those held by the BoJ) (In trillions of yen) 1/

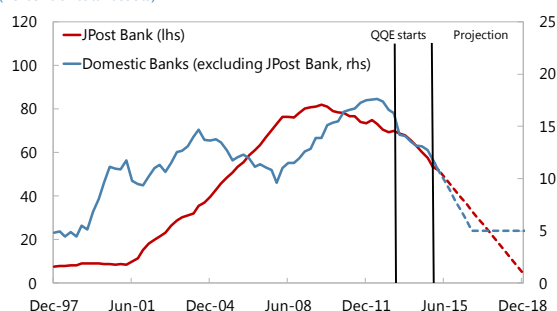


Sources: Bank of Japan, Flow of Funds.

1/ Structured products include trust beneficiary rights, structured-financing instruments, and mortgage securities.

Figure 4. Projected JGB Holdings under the Baseline Rebalancing Scenario, 2015–18
(Trillions of yen)

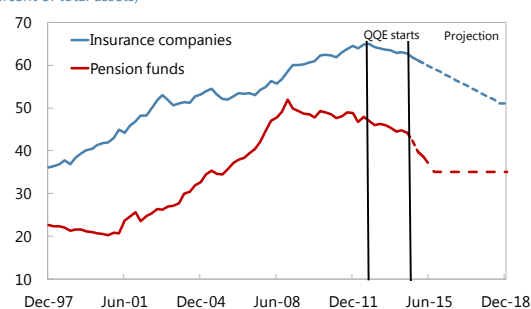
JGB Holdings by Banks 1/
(Percent of total assets)



Sources: Bank of Japan and authors' projections.

1/ JGB holdings including Treasury Discount Bills. In both projections, JGB holdings fall to 5 percent of total assets.

Domestic Bond Holdings by Institutional Investors 1/
(Percent of total assets)



Sources: Bank of Japan and authors' projections.

1/ Domestic bond holdings fall to 35 percent of total assets for pension funds, in line with GPIF's new asset allocation.

Table 2A. Japan: Baseline Rebalancing Scenario under QQE2, 2015–18
(In trillions of yen)

	end-2014	end-2018	Change
BOJ's JGB Holdings	207	527	320
Other Financial Institutions' JGB Holdings	564	344	-220
Pension Funds (public and private)	92	81	-11
Insurance Companies	199	166	-33
Banks	274	98	-176
o/w Domestically-licensed Banks	106	55	-51
o/w Japan Post Bank	110	10	-100
Memo items: Outstanding Stock of JGBs	883	983	100

Sources: Bank of Japan, Japan Post Bank, Ministry of Finance, and authors' projections.

Table 2B. Japan: Baseline Rebalancing Scenario under QQE2, 2015–18
(In trillions of yen)

	Banks			Insurance Companies			Pensions Funds		
	end-2014	end-2018	Change	end-2014	end-2018	Change	end-2014	end-2018	Change
Domestic Stocks	3	3	0	7	7	0	14	25	11
Domestic Bonds	25	15	-10	61	51	-10	40	35	-5
o/w JGBs	15	5	-10	44	34	-10	27	22	-5
Foreign Securities	6	6	0	15	25	10	25	40	15
Other	66	76	10	16	16	0
Assets (in tn yen)	1,806	1,928	...	452	482	...	344	368	...
JGB holdings (in tn yen)	274	98	-176	199	166	-33	92	81	-11

Source: Bank of Japan, World Economic Outlook, and authors' calculations

Note: Figures in red are the announced new asset allocation targets of the GPIF. Figures in blue are author's projections. Assets rise in line with GDP, as projected in the April 2015 WEO.

V. IMPLICATIONS FOR CAPITAL OUTFLOWS AND THE JGB MARKET¹¹

We next consider the potential spillover effects abroad from the illustrative portfolio rebalancing scenario in the previous section. The exercise is partial in nature and does not incorporate exchange rate effects. Insurance companies and pension funds could invest as much as ¥44 trillion (\$350 billion), or 8 percent of GDP, in foreign assets (Table 3). This scenario is in line with the pace of their portfolio rebalancing abroad over the last year and the GPIF's new target allocation announced in late 2014. If insurance companies and pension funds maintain their current international allocation ratios, 80 percent of the outflows would go into bonds of other advanced economies, 14 percent into emerging market bonds, and 6 percent into global equities (Figure 5).

This baseline scenario assumes a significant but partial implementation of the other two arrows of Abenomics (fiscal and structural reforms). If announced policies are fully implemented and work to their fullest extent across the three reform arrows (the “complete policies” scenario), portfolio outflows could be as high as \$550 billion, as insurance and private pension funds accelerate their portfolio rebalancing abroad in light of rising inflation in Japan, while nominal bond yields remain compressed on the back of BoJ buying (Table 3).

Alternatively, if the other two reform arrows are not effectively deployed and efforts at pulling the economy out of deflation are not successful (“incomplete” scenario), portfolio outflow could be less than anticipated, as private financial institutions continue to demand JGBs as a hedge against deflation. This would imply a partial return to the status quo before Abenomics when home bias of Japanese institutional investors was strong and portfolio outflows were limited. In this case, portfolio outflows could be limited to \$225 billion.

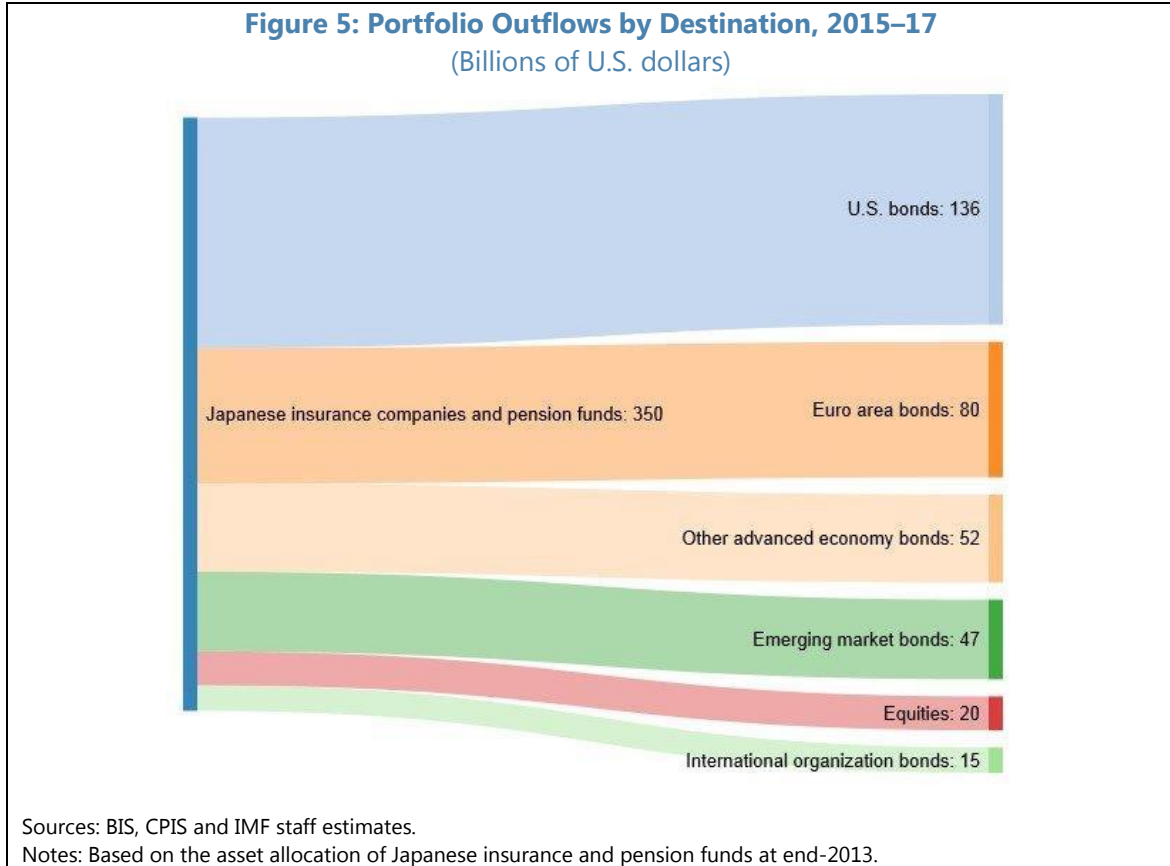
Table 3. Potential Portfolio Outflows by Japanese Institutional Investors, 2015–17
(Billions of U.S. dollars)

	Baseline	Complete policies	Incomplete policies
Total	350	559	225
Insurance Companies	100	275	0
Private Pensions	25	58	0
Public Pensions	225	225	225

Source: IMF staff projections.

Note: All figures are expressed at end-2014 exchange rates. Under the baseline scenario, insurance companies and private pension funds continue their portfolio rebalancing abroad broadly in line their pace in 2014. Under the complete policies scenario, they accelerate their portfolio rebalancing abroad at twice the pace as baseline. Under the incomplete scenario, they stop their portfolio rebalancing abroad. In all scenarios, public pension funds attain the new target allocation of the Government Pension Investment Fund to foreign securities (40 percent of asset) by end-2017.

¹¹ These spillover scenarios were presented in the April 2015 GFSR (Annex 1.1).

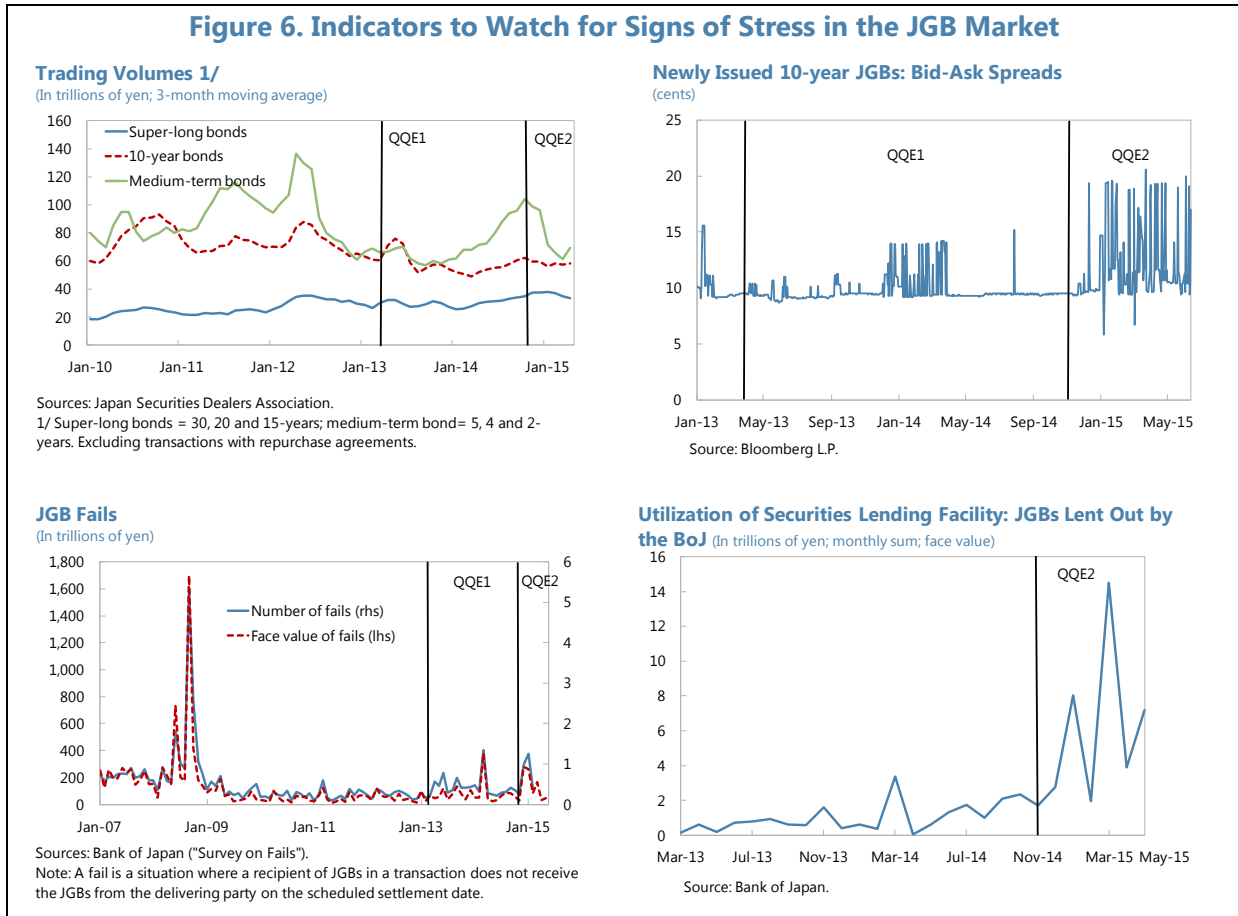


As the BoJ ascends to being a dominant player in the JGB market, liquidity is likely to be affected, implying that economic surprises may trigger larger volatility in JGB yields with potential financial stability implications. As noted in IMF (2012), demand-supply imbalances in safe assets could lead to deteriorating collateral quality in funding markets, more short-term volatility jumps, herding, and cliff effects. In an environment of persistent low interest rates and heightened financial market uncertainty, these imbalances can raise the frequency of volatility spikes and potentially lead to large swings in asset prices.

Various indicators that can provide clues for assessing signs of stress in the JGB market have, so far, remained broadly stable. Trading volumes have fallen by about 20 percent for 10-year JGBs since the launch of QQE, but they remain broadly unchanged or slightly higher for medium-term and super-long JGBs (Figure 6, panel 1). The bid-ask spreads for newly issued 10-year JGBs have continued to remain tight, although exhibiting more short-term volatility after the launch of QQE2 (Figure 6, panel 2). Similarly, the number of fails, in which a recipient of JGBs in a transaction does not receive the JGBs from the delivering party on settlement date, has increased somewhat, but remained well below the peak levels of 2008 (Figure 6, panel 3). The amount of JGBs lent by the BoJ to market participants through the Securities Lending Facility has remained below ¥15 trillion per month, although demand has risen since the launch of QQE2 and after the facility has been expanded by the authorities

in March 2015 (Figure 6, panel 4).¹² Finally, trade size appears normal and inter-dealer transaction volumes have remained broadly stable (IMF, 2015).

Likewise, Kurosaki et al. (2015) examined liquidity in the JGB futures market from four angles: trading volume, tightness (bid-ask spread), depth, and resiliency of the market. The authors find that volume and tightness of transaction in the JGB futures market have remained broadly unchanged, although market depth and resiliency have declined slightly over the course of the QQE program.



¹² Through the Securities Lending Facility, the BoJ lends back to dealers the bonds it is acquiring under its QQE program to ensure smooth functioning of the JGB market and avert temporary collateral shortages. In March 2015, the authorities raised the upper limit of the amount of sales per issue from ¥200 to ¥400 billion, and extended the number of days permitted for consecutive sales transactions per issue from 5 to 15 business days.

VI. CONCLUSIONS AND OPTIONS FOR THE BOJ

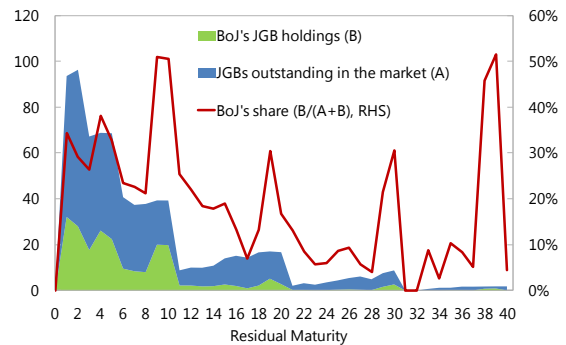
Under QQE, the BoJ is currently buying nearly 10 percent of the government bond market on an annual basis, a purchase plan that is much more rapid than seen in other QE-implementing countries. Even though it seems technically possible to continue such purchases for some time, our flow of funds analysis suggest that the BoJ may need to taper its purchases sometime in 2017 or 2018 under current policies and historical trends. As this limit approaches and once the BoJ starts to exit, the market could move from a situation of shortage to one with excess supply. The term premium could jump depending on whether the BoJ shrinks its balance sheet and on the fiscal deficit over the medium term.

At the same time, when these limits are approached, one could argue that the BoJ's easing policies become more effective as it is able to maintain low long-term interest rates and term premiums without significant purchases. For example, the BoJ could change its monetary base target, or move to an alternative intermediate objective, such as interest rate targeting. It is important to note that the BoJ is not out of options, even when limits to JGB purchases are reached. Specifically, the BoJ has at least three options to provide continued monetary easing, if needed:

- First, the BoJ could provide further stimulus through QQE by shifting the composition of its purchases even more towards longer-dated securities, in particular those with maturities of more than 10 years, similar to the Operation Twist program implemented by the U.S. Federal Reserve in 2011. This would be natural as the BoJ already owns a large share of the JGB market at the short-end of the yield curve (text figure). Such purchases could lead to greater portfolio rebalancing by insurance and pension funds, possibly resulting in higher capital outflows and a declining home bias of Japanese institutional investors.
- Second, the BOJ's Securities Lending Facility could be expanded further to help alleviate potential collateral constraints as they arise. Banks will likely demand a minimum level of JGBs for collateral purposes, but having an easy to access security lending facility could allow banks to hold less JGBs, all else equal.
- Finally, the authorities could expand the purchase of private assets. At the moment, Japan has a relatively limited corporate bond market (text chart). Hence, this would require jumpstarting the securitization market for mortgages and bank loans to small and medium-sized enterprises which could generate more private assets for BoJ purchases (text chart).

BoJ's Holdings of JGBs by Residual Maturity

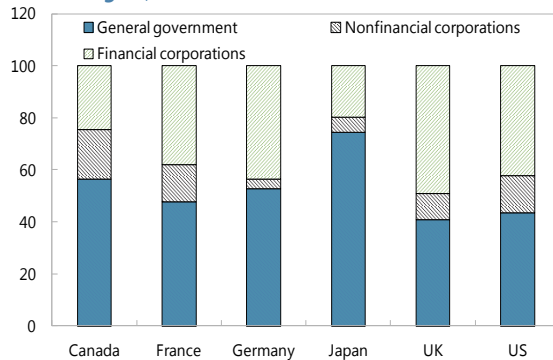
(In trillions of yen; end-April 2015)



Sources: Bank of Japan; and authors' calculations.

G7 Economies: Public and Private Debt Securities

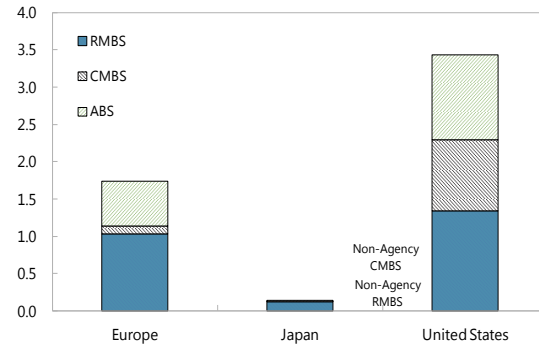
Outstanding (In percent of total domestic market; end-2014)



Sources: BIS and IMF staff estimates.

Securitization Market Outstanding

(In trillions of U.S. dollars, end-2014)



Sources: European Securitization Forum, JSDA, and SIFMA.

To further stimulate bank lending to the private sector and make QQE more effective, the authorities should enhance risk capital provision, including by encouraging more asset-based lending and removing barriers to entry and exit of small and medium-sized enterprises. An additional option includes lowering the interest rate on excess reserves, which could further lower government bond yields and increase incentives for bank lending, although this may hinder portfolio rebalancing by banks, in particular regional banks.

Finally, we presented evidence that capital outflows from Japan are likely to increase in coming years, as portfolio rebalancing extends to insurance and pension funds under QQE2. In particular, we estimated that Japanese insurance companies and pension funds could invest substantial amounts in foreign assets during 2015–17. This scenario assumes a significant but partial implementation of the other two arrows of Abenomics (fiscal and structural reforms). If announced policies are fully implemented and work to their fullest extent across the three reform arrows, portfolio outflows could be as much as \$550 billion. At the same time, if the other two reform arrows are not effectively deployed and efforts at pulling the economy out of deflation are not successful, portfolio outflow could be limited to \$225 billion over the same period.

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