November 2015
Macroprudential Surveillance Department
Monetary Authority of Singapore
## PREFACE

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Definitions and Conventions

As used in this report, the term “country” does not in all cases refer to a territorial entity that is a state as understood by international law and practice. As used here, the term also covers some territorial entities that are not states but for which statistical data are maintained on a separate and independent basis.

In this report, the following country groupings are used:

- Euro zone comprises Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Luxembourg, Malta, Netherlands, Portugal, Slovakia, Slovenia and Spain
- “G3” refers to the euro zone and United Kingdom, Japan, and the United States
- “G20” refers to the Group of Twenty comprising Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Korea, Mexico, Russia, Saudi Arabia, South Africa, Turkey, the United Kingdom, the United States and the European Union
- “Asia-10” comprises China (CHN), Hong Kong (HK), India (IND), Indonesia (IDN), Korea (KOR), Malaysia (MYS), the Philippines (PHL), Singapore (SGP), Taiwan (TWN) and Thailand (THA)
- “Asia-7” comprises India, Indonesia, Korea, Malaysia, the Philippines, Taiwan and Thailand
- “NEA-3” comprises Hong Kong, Korea and Taiwan
- “SEA-5” comprises Indonesia, Malaysia, the Philippines, Singapore and Thailand

Abbreviations used for financial data are as follows:

- Currencies: Chinese Renminbi (RMB), Euro (EUR), Hong Kong Dollar (HKD), Indian Rupee (INR), Indonesian Rupiah (IDR), Japanese Yen (JPY), Korean Won (KRW), Malaysian Ringgit (MYR), Philippine Peso (PHP), Singapore Dollar (SGD), Taiwan Dollar (TWD), Thai Baht (THB), Vietnamese Dong (VND), US Dollar (USD)

Other Abbreviations

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<td>ABMI</td>
<td>Asian Bond Market Initiative</td>
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<td>ABS</td>
<td>Association of Banks in Singapore</td>
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<td>ABSD</td>
<td>Additional Buyer’s Stamp Duty</td>
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<td>ACU</td>
<td>Asian Currency Unit</td>
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<td>AFC</td>
<td>Asian Financial Crisis</td>
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<tr>
<td>AFS</td>
<td>Available-for-Sale</td>
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<td>Bank for International Settlements</td>
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1Republic of Korea
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<td>Bank of Japan</td>
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<td>CAR</td>
<td>Capital Adequacy Ratio</td>
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<td>CCP</td>
<td>Central Counterparty</td>
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<td>CCR</td>
<td>Core Central Region</td>
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<td>CCS</td>
<td>Credit Counselling Singapore</td>
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<td>CCyB</td>
<td>Countercyclical Capital Buffer</td>
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<tr>
<td>CFTC</td>
<td>Commodities Futures Trading Commission</td>
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<td>CGFS</td>
<td>Committee on the Global Financial System</td>
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<td>CPMI</td>
<td>Committee on Payments and Market Infrastructures</td>
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<td>Cyber Security Agency</td>
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<td>Domestic Systemically Important Banks</td>
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<td>Domestic Banking Unit</td>
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<td>DCO</td>
<td>Derivatives Clearing Organisation</td>
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<td>DDOS</td>
<td>Distributed Denial-of-Service</td>
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<td>DDRS</td>
<td>DTCC Data Repository (Singapore) Pte Ltd</td>
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<td>DOS</td>
<td>Department of Statistics</td>
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<td>Depository Trust &amp; Clearing Corporation</td>
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<td>Debt-to-Income</td>
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<tr>
<td>EBITDA</td>
<td>Earnings Before Interest and Tax, Depreciation and Amortisation</td>
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<td>European Commission</td>
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<td>ETF</td>
<td>Exchange-Traded Fund</td>
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<td>Financial Institution</td>
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<td>Global Systemically Important Bank</td>
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<td>GAAP</td>
<td>Generally Accepted Accounting Principles</td>
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<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>GFC</td>
<td>Global Financial Crisis</td>
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<td>GFSR</td>
<td>Global Financial Stability Report</td>
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<td>HLA</td>
<td>Higher Loss Absorbency</td>
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<td>Held-to-Maturity</td>
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<td>InterContinental Exchange</td>
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<td>ICPF</td>
<td>Insurance companies and pension fund</td>
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<td>ICR</td>
<td>Interest Coverage Ratio</td>
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<td>IDA</td>
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PREFACE

The Monetary Authority of Singapore (MAS) conducts regular assessments of Singapore’s financial system. Potential risks and vulnerabilities are identified, and the ability of the financial system to withstand potential shocks is reviewed. The analysis and results are published in the annual Financial Stability Review (FSR). The FSR aims to contribute to a better understanding among market participants, analysts and the public of issues affecting Singapore’s financial system.

Section 1 of the FSR provides a discussion of the risks in the external environment. This is followed by an analysis of the Singapore financial sector in Section 2. Finally, a review of the corporate and household sectors is provided in Sections 3 and 4 respectively.

The production of the FSR was coordinated by the Macroprudential Surveillance Department (MSD) team which comprises Gay Bing Yong Kenneth, Ng Heng Tiong, Chan Lily, Ang Shu Qin, Choo Chian, Ho Ruixia Cheryl, Lam Mingli Angeline, Lee Siew Cheng Wendy, Lee Su Fen, Liang Yongquan Phil, Lim Ju Meng Aloysius, Lim Weilun, Nguyen Thuy Duong Sophie, Qiu Qiaoling Angeline, Soon Shu Ning Gael, Teoh Shi-Ying, Wong Siang Leng, Wong Siew Yann Justin, Yap Su-E, Yeo Siok Lee Denise, Yip Ee Xiu, and Yoe Xue Ting Selene under the general direction of Dr Lam San Ling, Executive Director (MSD). The FSR also incorporates contributions from the following departments: Banking Departments I, II & III, Data Governance & Analytics Unit, Economic Analysis Department, Economic Surveillance & Forecasting Department, Insurance Department, Markets Policy & Infrastructure Department, Prudential Policy Department and Specialist Risk Department. The FSR reflects the views of the staff of the Macroprudential Surveillance Department and the contributing departments.

OVERVIEW

External headwinds and contagion risks have intensified

Uneven growth and divergent monetary policies across the G3 pose risks to financial stability in Asia and Singapore. At the same time, weak commodity prices have put strains on commodity-related firms with knock-on effects on banks, financial markets, sovereign balance sheets, and economies. Recent geopolitical developments could fuel further uncertainty.

Meanwhile, China faces a delicate balance between near-term economic performance and asset market stability on the one hand and longer-term structural reforms on the other. Strong intra-regional linkages could increase contagion from a China-related shock, while subdued regional growth adds to headwinds in Asia.

Singapore’s financial system remains sound, but industry must stand vigilant against rising risks

The credit cycle has begun to turn, with external and domestic loan growth moderating alongside slowing economic growth. This poses risks to Singapore’s banking system. Asset quality remains healthy, but there are signs of increased credit risks, e.g. a slight uptick in non-performing and special mention loans. Foreign currency funding pressures have eased with slowing regional loan growth, but risks from foreign currency mismatches have risen.

Singapore’s banking system remains resilient amid an uncertain external environment. Banks have strong capital and liquidity buffers to withstand severe shocks but continued vigilance is warranted.

Banks should continue to maintain prudent credit underwriting standards, monitor portfolio vulnerabilities and ensure adequate provisioning. Banks should also manage their foreign currency risks prudently and develop liquidity contingency plans.

Risks within the non-bank sector are contained. Singapore insurers are resilient against changing interest rate conditions. Progress has also been made in mitigating risks arising from over-the-counter (OTC) derivatives markets, financial market infrastructures, as well as evolving cyber threats.

Corporate balance sheets remain resilient, but firms should monitor leverage and currency risks

Corporate earnings in Singapore have weakened over the past year amid an uncertain operating environment. While corporate balance sheets remain healthy in aggregate, highly-leveraged firms in certain sectors could be vulnerable if interest rates rise or earnings weaken further. Firms with foreign currency exposures could also face
increased foreign currency mismatch risks should currency market volatility persist.

Overall corporate leverage has risen since the Global Financial Crisis (GFC) but has started to stabilise. MAS’ stress tests of corporate balance sheets suggest that most corporates can withstand interest rate and earnings shocks. The larger firms have ample financial buffers and are able to mitigate risks from their foreign currency exposures. Firms should continue to be pro-active in managing their leverage and foreign currency risks.

**Most households are prudent, but should actively review their financial health**

Macroprudential measures introduced in the last few years have helped to curb rising domestic household leverage. On aggregate, household balance sheets have remained firm and defaults on consumer loans have been low.

Nonetheless, the impending interest rate normalisation, coupled with headwinds in the external outlook and slower domestic growth, pose downside risks to the household sector. While most households have been prudent and would be able to service their housing loans and other debt obligations, some highly-leveraged households could encounter difficulties.

Households should continue to exercise prudence, review their debt obligations and financial health, and build up financial buffers where appropriate. Borrowers who require assistance in paying down unsecured debt can seek help from the various assistance schemes and consider repayment plans available. For some households, paying down their mortgages could help avoid a build-up of interest payments that could lead to spiralling debts and unsustainable debt servicing burdens.

Macroprudential Surveillance Department
Monetary Authority of Singapore
27 November 2015
1 Global Environment

Uneven growth and divergent monetary policies across the G3 pose risks to financial stability in Asia and Singapore. Uncertainty over US monetary policy could trigger higher market volatility, while accommodative monetary policies in the euro zone and Japan could fuel search for yield and financial excesses.

Meanwhile, weak commodity prices have put strains on commodity-related firms, with knock-on effects on banks, financial markets, sovereign balance sheets, and the economy. Recent geopolitical developments could fuel further uncertainty.

At the same time, China faces a delicate balance between near-term economic performance and asset market stability on the one hand and longer-term structural reforms on the other. Strong intra-regional linkages could increase contagion from a China-related shock, while subdued regional growth adds to headwinds in Asia. Asian banks remain sound, but should monitor their domestic and regional exposures closely.

Global Monetary Policy Risks

Uncertainty over US monetary policy normalisation could trigger higher market volatility...

The prolonged low interest rate environment has fuelled asset price growth and large capital flows into emerging markets (EMs). With the US Federal Reserve nearing its first rate hike after nearly a decade, asset prices and capital flows have started to reverse (Chart 1.1).

The US Federal Reserve has recently cited domestic and international developments in its decision on US interest rate normalisation. Uncertainty over the timing of US interest rate normalisation has resulted in greater volatility in financial markets and affected business sentiment, with companies holding back on investment.

Chart 1.1
Cumulative Net Capital Flows: Asia-7

Source: MAS estimates, International Monetary Fund (IMF) Balance of Payments, CEIC
Note: Asia-7 comprises India, Indonesia, Korea, Malaysia, the Philippines, Taiwan and Thailand.

The continuing gap between market expectations and projections by members of the Federal Open Market Committee (FOMC)
suggests there is also considerable uncertainty about the trajectory of rate increases (Chart 1.2). This could lead to disorderly adjustments when US monetary policy starts to normalise.

Chart 1.2
Federal Funds Rate Projections

Source: US Federal Reserve Board

...while accommodative monetary policies in the euro zone and Japan add to financial stability concerns

Meanwhile, the European Central Bank (ECB) and the Bank of Japan (BoJ) have moved in the opposite direction, with accommodative monetary policies to address growth concerns. Low interest rates continue to push their investors towards riskier, higher-yielding assets.

The expected widening of the interest rate gap between the US versus the euro zone and Japan has contributed to more volatile currency markets. Regional currency depreciation vis-à-vis the US dollar has weakened the financial positions of corporates with large unhedged USD-denominated debts.

Changes in the asset management ecosystem and market liquidity conditions have weakened markets’ resilience to shocks

The growth in global assets under management (AUM), together with shifts in asset allocations and investment strategies, has added risks to financial stability (See Box A “Emerging Fault Lines in Asset Management Ecosystem”).

Market participants have also raised concerns about the levels and resilience of market liquidity. MAS’ analysis of the structural factors driving bond market liquidity suggests a mixed picture for the resilience of Asian corporate bond markets (See Box B “Examining Structural Factors Affecting Asian Bond Market Liquidity”).

Depressed Commodity Prices

The commodity price rout has put strains on commodity-related firms, with spill-overs to banks...

Global commodity prices, from energy to metals and agricultural products, have fallen amid persistent oversupply and a subdued global economic outlook (Chart 1.3).
Commodity firms and commodity traders, especially those with higher leverage, have shown signs of financial strains. Banks with significant commodity-related exposures could face substantial losses as defaults increase.

...and potential contagion to financial markets, sovereign balance sheets, and the economy

Commodity traders have increased their presence in physical and derivatives markets in recent years as banks retreated from the commodity trading business. Large losses by global commodity traders could potentially trigger contagion to the financial system and economy.

Weakness in the commodity-related sectors has weighed on investor sentiments, with contagion to the high-yield bond markets (Chart 1.4).

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Note: The data in Chart 1.3 and Chart 1.4 are sourced from MAS estimates, Bloomberg, Bank of America Merrill Lynch, US Energy Information Administration.

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2State-owned companies often enjoy implicit or explicit support from their sovereigns.

3Petrodollar flows refer to the investment of foreign reserves earned through the export of petroleum.
China Spill-overs

Risks have built up in the Chinese financial system, though policy measures will help mitigate some risks

China’s private sector debt continues to grow faster than Gross Domestic Product (GDP). Local governments could also face debt servicing challenges from their growing debt burden, as land sales and fiscal revenues weaken. Shadow banking continues to grow.

Corporate credit risk has risen, with several notable defaults in bond markets this year, including by a state-owned company. The Chinese banking system has come under stress, with declining loan asset quality alongside slower growth in profitability.

The recent volatility in China’s equity and currency markets has affected investor confidence and could increase the pace of capital withdrawal from China.

Chinese policymakers have introduced measures to address some of these risks. These include measures to alleviate the debt-servicing burdens of heavily indebted local governments, stabilise asset markets, and tighten regulatory scrutiny over the shadow banking sector.

China faces a delicate balance between near-term asset market stability and longer-term structural reforms

In the longer-term, China’s continued progress in exchange rate and interest rate liberalisation marks a positive step in market reforms. However, policy calibration will be imperative amid growing market volatility and rising investor uncertainty.

The pace and sequencing of reforms will have to be carefully managed as the trade-offs between near-term asset market stability and longer-term structural reforms become increasingly challenging to manage.

Strong linkages between China and the rest of Asia could increase contagion risks

Strong financial linkages between China and the rest of Asia could increase the risk of contagion in the event of a China-related shock.

Banking systems in jurisdictions with significant exposures to China may be exposed to more borrower defaults and declines in loan asset quality. The rising intra-regional share of cross-border lending within Asia could increase Asia’s vulnerability to regional stresses.

Chinese banks have expanded internationally including within the region, faster than other Asia-Pacific-based banking groups, with outstanding offshore loans estimated to approach US$ 1 trillion at end-2014.4 Funding risks could arise if Chinese banks cut back on their lending in overseas jurisdictions to conserve liquidity.

As China’s economic and financial clout grows, the risk of negative developments in China affecting global investor sentiment

4Fitch Ratings (October 2015), “Internationalisation of Chinese Banks Driven by Policy Objectives”.
more generally has increased. Such spill-overs were seen during recent episodes of asset market volatility, when Asian equity markets declined alongside the stock market correction in China (Chart 1.5).

**Chart 1.5**
Stock Market Indices: Asia-10

![Stock Market Indices: Asia-10](chart)

Source: MAS estimates, Bloomberg

**Subdued Regional Growth**

A slowdown in China could spill over to the rest of Asia, given the close economic and financial ties within the region. Growth in the region has eased; sluggish global demand will continue to weigh on the region’s commodity producers and trade-dependent economies. Deteriorating investor sentiment on weakened growth prospects in the region could contribute to capital outflows from emerging Asia, adding to financial stability risks.

**Debt repayment capabilities of households and corporates could deteriorate**

Household (Chart 1.6) and corporate debt (See Box C “In the Crucible: Stress Testing Corporate Leverage in Asia”, Chart C1) in most regional economies have increased. Asian households and corporates may face debt repayment difficulties with rising interest rates and weakening growth.

Further weakening of regional currencies would exacerbate foreign currency mismatch risks for Asian corporates. MAS conducted a stress test of corporate balance sheets to assess the resilience of Asia’s corporate sector to interest cost and earnings shocks. We find that Asia’s corporate balance sheets — though less vulnerable than during the Asian Financial Crisis (AFC) — are generally weaker compared to the period preceding the GFC. Nonetheless, MAS’ reverse stress test indicates that widespread corporate distress is unlikely in most of Asia (See Box C “In the Crucible: Stress Testing Corporate Leverage in Asia”).
Asian banks remain sound, but should closely monitor domestic and regional exposures

Asian banks generally have low loan-to-deposit (LTD) ratios, and are significantly less dependent on wholesale funding compared to banks in other regions. Low non-performing loan (NPL) ratios and ample capital buffers provide safeguards against the turning credit cycle (Chart 1.7). That said, the performance of individual banks would vary depending on the specific macrofinancial and socio-political conditions of the jurisdictions in which they are based.

Given the confluence of risks arising from uncertain external conditions and increasing household and corporate vulnerabilities, Asian banks need to monitor both their domestic and regional exposures closely.

Source: MAS estimates, CEIC
*Using latest available 2013 data for India.

Source: IMF, Asia-10 Central Banks
Since the GFC, regulators have focused on strengthening the resilience of banking institutions at the core of the financial system. Concerns have since emerged that risks may have shifted to other parts of the financial system. In particular, the asset management industry now intermediates assets amounting to US$76 trillion (Chart A1). Regulators are looking into potential financial stability risks arising from asset management activities and considering measures to address them. Thus far, policymakers’ focus has largely been on market liquidity and structural vulnerabilities inherent in the design of investment funds. This box discusses the role played by asset owners in the asset management ecosystem and their impact on financial stability.

**Asset owners are important players in the asset management ecosystem**

Potential systemic risks do not stem solely from investment funds and their managers. Asset owners play an important role within the overall asset management ecosystem. Asset owners, comprising both institutional and retail investors, own approximately US$248 trillion of assets in aggregate. Of this, over 30% of all assets (or US$76 trillion) are invested through asset managers. Asset owners are central to the allocation of financial assets in both public and private markets. Understanding the characteristics and investment trends of asset owners would shed more light on the fault lines emerging in asset management and asset markets.

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6Institutional asset owners include pension funds, insurers and sovereign wealth funds, central banks and banks.

7Blackrock Viewpoint (May 2014), “Who Owns the Assets?”. 
In the wake of the GFC, several investment themes have underpinned the behaviour of asset owners and asset managers. First, in an environment of low interest rates in advanced economies, investors’ search for yield has led them to invest in the riskier segments of the fixed income risk spectrum, with corporate bond funds fast gaining popularity. Second, institutional investors have strived to diversify their portfolios by including non-traditional assets such as real estate and private equity, as such assets are perceived to have attractive risk-adjusted returns. Indeed, pension funds, insurers and sovereign wealth funds (SWFs) have increased their allocations to private market investments from 9% in 2007 to 16% in 2013 (Chart A2). Finally, investors’ disillusionment with the lower-than-expected returns from actively-managed funds could have led to the rapid growth of passive investing via exchange-traded funds (ETFs) (Chart A3), which have lower fee structures compared to actively managed funds.

<table>
<thead>
<tr>
<th>Pension funds, insurers and SWFs have increased allocations to private markets</th>
<th>Global ETF industry has gained traction</th>
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<tr>
<td>Chart A2</td>
<td>Chart A3</td>
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<tr>
<td>Asset Allocation of Pension Funds, Insurers and SWFs</td>
<td>Global ETF Industry’s AUM</td>
</tr>
<tr>
<td>Private Markets</td>
<td>Equities</td>
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<tr>
<td>Source: MAS estimates, Sovereign Wealth Centre, Towers Watson, Deutsche Asset &amp; Wealth Management, Insurance Europe</td>
<td>Source: The Economist</td>
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These investment themes have implications for both public and private markets. Market liquidity conditions of the underlying securities in corporate bond mutual funds may not be sufficient to meet massive redemptions. In private markets, some policymakers have expressed concerns over rising valuations of commercial real estate on the back of increased allocations from asset owners. Innovations in portfolio strategies could lead to more frequent outsized market movements in bond yields. Finally, while ETFs have seemingly added to market liquidity — especially in markets where underlying securities have limited liquidity — they could inadvertently trigger liquidity stresses. We elaborate on these implications in the following paragraphs.

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8According to the Investment Company Institute, corporate bond funds have grown at a pace almost thrice that of sovereign bond funds, with the AUM of the former growing at 14% y-o-y whereas the latter grew at 5% y-o-y from 2000 to 2013. As such, corporate bond funds now make up a larger share in the aggregate bond funds universe.
Market liquidity and redemption risks in corporate bond mutual funds

Market liquidity as well as structural vulnerabilities inherent in the design of investment funds has posed concerns to policymakers. Attention has centred on whether massive redemptions from open-ended corporate bond mutual funds, which allow investors to redeem units on a daily basis, could lead to severe market sell-offs if the funds’ underlying investments are not sufficiently liquid.\(^9\) On the other hand, some argue that mutual funds have not posed systemic risks in the past and are therefore unlikely to cause turmoil in the future.

We note that market liquidity conditions in certain segments of the bond markets such as corporate bonds may not be as resilient as they were in the past (See Box B “Examining Structural Factors Affecting Asian Bond Market Liquidity”). Moreover, liquid assets may suffer sharp mark-to-market losses if liquidity dries up during stress periods.\(^10\) Under stress, normally liquid assets may also face difficulties in meeting redemption pressures.

Real estate valuations are rising in some markets, and policymakers have expressed concerns

Global real estate transaction volumes have surged as asset owners increase allocations to real estate. DTZ Research projects commercial real estate deals to reach US$770 billion in 2015, just short of the previous record set before the GFC.\(^11\) Data from Cushman and Wakefield suggests that institutional investors such as pension funds, insurers and SWFs account for almost a third of purchases associated with such deals.\(^12\) Over the last five years, investment returns on global property have been strong, trailing closely behind those of global equities (Chart A4). The US Federal Reserve’s latest semi-annual report to the US Congress stated that valuation pressures in commercial real estate have been rising.\(^13\) Similarly, ECB officials reported that estimated valuations for prime commercial property in the euro zone “moved further away from their long-term average”.\(^14\) In Asia, officials from the Reserve Bank of Australia (RBA) highlighted that risks in commercial property have been rising in tandem with fast price growth and heightened investor activity.\(^15\)

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\(^9\) Some term this vulnerability as the “liquidity mismatch” between the liquidity of the fund (i.e. redeemability of fund units in cash) versus the liquidity of the underlying investments.

\(^10\) Liquidity shocks to other asset classes (known as liquidity spill-overs) could be amplified when market participants are highly-leveraged. IMF GFSR Chapter 2 (October 2015), “Market Liquidity — Resilient or Fleeting?”.

\(^11\) DTZ Research (June 2015), “Risks from Overheating Markets”.

\(^12\) Institutional investors may also invest via private equity funds and real estate investment trusts (REITs). Such funds account for the bulk of purchases. Cushman and Wakefield (2015), “Winning in Growth Cities”.

\(^13\) Deutsche Bank Markets Research (September 2015), “Long Term Asset Return Study”.

\(^14\) More specifically, the degree of estimated overvaluation has reached pre-GFC levels. ECB (May 2015), “Financial Stability Review”.

\(^15\) RBA (March 2015), “Financial Stability Review”.
Innovative and more volatile investment strategies could contribute to outsized market movements

Innovative portfolio strategies have contributed to larger institutional exposures to the bond markets, but such institutional players could also cut back bond exposures quickly, potentially resulting in outsized market movements.

One such innovation is the broader adoption of risk parity strategies, where asset allocations are adjusted so that the risk contribution from each major asset class to the overall portfolio is roughly balanced. While risk parity funds account for around US$400 billion of AUM, it is estimated that they ultimately control assets worth more than two times of their AUM. This is because leverage is applied to asset classes with lower volatility, such as sovereign and corporate bonds, to equalise the risk contribution from these assets vis-à-vis other higher risk assets. The use of leverage may cause asset managers to be more sensitive to spikes in volatility, potentially leading to larger-than-usual asset sales and outsized market movements.

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16Calculated based on leverage data from fund factsheets and AUM of risk parity funds. Morningstar, Alliance Bernstein (September 2015), “Playing With Fire – The Bond Liquidity Crunch and What To Do About It”.

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Market liquidity of corporate bonds falls off sharply as the size of bond issuance declines

Greater use of ETFs could mask growing liquidity issues in underlying securities
Another development has been the growth of the ETF industry, which may lead to market liquidity issues for the underlying securities in which ETFs invest. For example, there is significant variation in the trading liquidity of bond securities underlying investment grade bond ETFs. Trading frequency and volume tend to be correlated with issuance size (Chart A5). Given the lower liquidity of smaller bond issues, fire sales of such bonds to meet redemptions during stress periods could potentially cause significant market disruptions, if liquidation needs cannot be met.

What mitigating measures can be adopted?
Our analysis of asset owners and asset managers points to concerns in a number of areas. Firstly, asset owners’ simultaneous forays into non-traditional asset classes have led to rising valuations in certain private markets such as commercial real estate. Secondly, innovations in portfolio strategies could pose macro-financial stability concerns for certain fixed income markets. Finally, ETFs may give rise to “an illusion of liquidity” in otherwise illiquid assets that could quickly evaporate during stress periods. Asset owners, asset managers and policymakers have roles to play in addressing these vulnerabilities so that they do not endanger the global financial system.

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Mark Carney argues that the growth of ETF investing amplifies investors’ herding behaviour and thus exacerbates market “peaks” and “troughs”. Financial Times (December 2014), “Stress Testing should not just be for the Banks”.

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Monetary Authority of Singapore
Macroprudential Surveillance Department
The Financial Stability Board (FSB) has been spearheading international efforts to assess and address financial stability risks from asset management activities. The FSB has encouraged asset managers to conduct appropriate stress testing of funds to assess their ability to meet redemptions under adverse market liquidity conditions. Several areas of work have also been identified for further analysis by both the FSB and the International Organisation of Securities Commissions (IOSCO), including liquidity mismatch and leverage risks in investment funds.

The use of leverage to achieve a “well balanced” portfolio is not without risks, and may alter the traditional trading dynamics of asset classes with lower volatility, such as sovereign and corporate bonds. Policymakers should move beyond a static analysis of funds’ holdings, towards incorporating the dynamic nature of how these exposures shift under differing market conditions, so as to assess the potentially outsized impact on financial markets. Where stress testing of investment funds is concerned, regulators may need to re-assess the appropriate treatment of liquid assets. Some assets may suffer sharp mark-to-market losses if liquidity dries up during stress periods.

Policymakers should also monitor ETF activity closely. While ETFs ostensibly increase market liquidity, our analysis reinforces concerns over the market fragility risks they can pose. Investors should be mindful that while ETFs provide benefits as investment vehicles, they also carry risks.
Much of the analyses on bond market liquidity has focused on the plethora of market liquidity indicators. While liquidity indicators paint a mixed picture of underlying liquidity conditions, it is also important to consider the resilience of liquidity, or how fast liquidity conditions can decline during stress periods. Liquidity can suddenly evaporate when it is most needed, as evidenced during the 2013 taper tantrum.

This box examines the structural factors affecting corporate bond market liquidity, in particular the impact of the investor base on the resilience of liquidity. In advanced economies, taking the US as an example, we find that evolving investor profiles point to less resilient market liquidity. Investor profiles of Asian bond markets, however, provide a mixed picture of liquidity resilience.

We find that some groups of investors, including domestic banks and institutional investors, could still provide some support for market liquidity through stress periods. However, asset managers’ large holdings of Asian corporate bonds, which have been built up over years of monetary easing in advanced economies, and the increased participation of retail investors in Asian high-yield bond markets could add to market volatility as monetary conditions reverse. Policymakers and stakeholders need to consider ways to mitigate bond market liquidity risks in Asia.

**Advanced economy bond investor profiles point to less resilient market liquidity**

Our analysis of investor profiles in the US corporate bond market suggests that market liquidity has become less resilient due to the reduced market-making capacity of primary dealers even as the market grew. In addition, the increased market share of asset managers could add to liquidity concerns as there is evidence that they may underestimate liquidity risks and engage in procyclical behaviour.

**Primary dealers have retreated from their traditional role of warehousing risks...**

Primary dealers were important liquidity providers in the fixed income markets pre-GFC. They committed their balance sheets to make markets. Lower risk tolerance and higher costs, attributed in part to primary dealers’ response to regulatory reforms, have adversely impacted their capacities to warehouse risks and perform the market-making role. Between Q3 2007 and Q2 2015, US primary dealers’ fixed income inventories declined by over US$300 billion (or more than 70%). These reduced inventories support a much larger corporate bond market, suggesting that market liquidity could have become less resilient; though the use of electronic bond trading platforms may partially ameliorate some of the liquidity risks.

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18 Board of Governors of the Federal Reserve System Database, “Statistical Release”.

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Financial Stability Review, November 2015
In addition, banks have been shifting bonds from the Available-for-Sale (AFS) to the Held-to-Maturity (HTM) bucket of their balance sheets.\textsuperscript{20} From end 2008 to Q2 2015, US banks’ ratio of AFS to HTM assets fell from about eight times to less than four times.\textsuperscript{21} While this decline suggests that banks are in a better position to weather price volatility, it also implies that a sizable portion of outstanding bonds has been taken out of circulation. This leaves the markets potentially shallower and thus more susceptible to disorderly adjustments.

...while asset managers tend to underestimate and contribute to liquidity risks

Asset managers have become more important participants in the fixed income markets; their share of the US corporate bond market increased by 10 percentage points from 2008 to 2014 (Chart B1). As a result, their investment decisions today could have a larger impact on markets compared to previously.

Market volatility could be exacerbated by procyclical behaviours among asset managers. For example, asset managers may use common portfolio benchmarks, which could lead to correlated investment decisions. In addition, asset managers may try to mimic the portfolios of their peers to avoid underperformance against them.\textsuperscript{22} This could lead to herding behaviour among asset managers, which could increase liquidity pressures in a stressed market.

<table>
<thead>
<tr>
<th>Asset managers have grown in importance in the US corporate bond markets</th>
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</thead>
<tbody>
<tr>
<td><strong>Chart B1</strong></td>
</tr>
<tr>
<td><strong>Investor Profiles of US Corporate Bonds</strong></td>
</tr>
<tr>
<td>Household</td>
</tr>
<tr>
<td>0</td>
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</tbody>
</table>

Source: US Federal Reserve Board

There are also signs that asset managers could be underestimating the liquidity risks associated with bonds. A recent Bank of England (BoE) market survey showed that asset managers assumed that a significant proportion of their bond holdings can be liquidated within a day, without taking into consideration moves by other asset managers.\textsuperscript{23} If all asset managers surveyed were to try to do so, the

\textsuperscript{20}HTM assets are valued by book value, while AFS assets are marked to market.

\textsuperscript{21}Federal Deposit Insurance Corporation Database, “Statistics on Depository Institutions”.


cumulative amount of bonds for sale would be several times the size of the daily bond market turnover. This could put tremendous pressure on the market and potentially cause it to seize up.

Even asset managers that are fully aware of liquidity risks could contribute to a sudden evaporation of market liquidity, by front-running other market participants and hoarding cash in preparation for bad times. A recent study by the Bank for International Settlements (BIS) found that every $100 worth of bond sales due to investor redemptions was accompanied by $10 worth of discretionary bond sales by asset managers.  

Such discretionary sales by asset managers can add to existing liquidity pressures and exacerbate market volatility in times of stress.

**Long-term institutional investors might have become more procyclical**

Insurance companies and pension funds (ICPFs) are large participants in fixed income markets. With the long duration of their liabilities, they can afford to invest with a long-term horizon and often provide support for asset prices through economic and financial cycles.

In the aftermath of the GFC, ICPFms may have become more procyclical, as mark-to-market accounting and regulatory reforms could have increased their sensitivity to short-term market price movements. Additionally, some ICPFms may exhibit herding behaviour as they often use asset managers and investment consultants for advice on asset allocations and investment decisions, thereby adding to market liquidity concerns when the cycle turns.

**Structural factors in Asian corporate bond markets paint a mixed picture of liquidity resilience**

Asian bond markets are generally less liquid compared to advanced economies. However, our analysis of the Asian bond markets paints a mixed picture of liquidity resilience. On the one hand, Asian bond markets appear more resilient to liquidity shocks as the markets have reduced their reliance on foreign investors. Asia has strong banking sectors with the capacity to expand market-making, and a strong institutional investor base that may be less procyclical. On the other hand, the large market share of asset managers and the increased participation of retail investors in Asian high-yield bond markets could add to market volatility.

**Lower reliance on foreign investors in Asian bond markets could reduce vulnerability to external shocks**

Since the GFC, the participation of foreign investors in Asian corporate bond markets has fallen relative to local investors, in contrast to the trend in the US where foreign participation in corporate bond markets has increased (Chart B2). The growing share of Asian investors could reflect financial deepening, in part

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26 95% of Europe pension schemes use external consultants. IMF GFSR (September 2011), “Long-term Investors and their Asset Allocation: Where are They Now?”. 
due to regional schemes such as the Asian Bond Market Initiative (ABMI), which aims to develop efficient and liquid bond markets in Asia and enable better utilisation of Asian savings for Asian investments. The lower reliance on foreign investors could reduce vulnerability to external shocks, as domestic investors are generally less flighty than foreign investors.27

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Banks’ holdings of Asian investment grade corporate bonds remain stable

Data on Asian corporate bonds suggests that banks’ holdings of investment grade bonds have remained stable at around 20% of the total market since 2009 (Chart B3). Asian banks, in general, have been less affected by the GFC. Their stronger capital buffers put them in a good position to continue with or even expand their market-making activities. Anecdotal accounts from the industry suggest that banks in the region have, in fact, been increasing market-making activities in some Asian bond markets.

Asian ICPFs may be less procyclical

While institutional investors’ share of Asian corporate bonds is lower than in global markets (Chart B3), they may be less procyclical compared to in advanced economies. The lack of active secondary markets in Asian corporate bonds, as evidenced by the low turnover ratios, could be a challenge for implementing mark-to-market accounting — a feature often associated with procyclicality. Further, in many Asian countries, the nascent capital markets often result in an absence of reliable government yield curves that can serve as benchmarks for fair market-based valuations. As a result, Asian institutional investors may be less pressured to liquidate their holdings to limit further marked-to-market losses in bear markets.

In addition, while institutional investors in advanced economies tend to seek the advice of asset managers for their asset allocations, fewer institutions in Asia have chosen to outsource their investment decisions to external advisors. Only 22% of Asian institutional investors use investment consultants, as compared to 80 – 90% in the US. The high percentage of in-house investment by Asian institutional investors may reduce the risk of herding among these investors.

The large market share of asset managers could be a concern

Asset managers are large and significant investors in Asian corporate bonds (Chart B3). Given their sizeable holdings, asset managers’ investment decisions could have an impact on markets. Asset managers could be subjected to large redemption pressures, forcing them to sell off their bond holdings. This could be seen during the 2013 taper tantrum when outflows from bond funds investing in Asian corporate bonds far exceeded the total cash balance held by these funds (Chart B4). Furthermore, the availability of fewer portfolio benchmarks in Asia compared to advanced economies exacerbates the risk of correlated exits by asset managers in response to stress events.

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28While the share of banks in the high-yield bond market has come down, it is worth noting that the size of the high-yield bond market in 2009 was very small and has grown quite rapidly since then.
31Even though many Asian jurisdictions have adopted or gradually converged to International Financial Reporting Standard (IFRS), the actual implementation of IFRS, in particular IFRS 13 Fair Value Accounting is still believed to be challenging and limited. In China, for example even though the new China Generally Accepted Accounting Principles (GAAP), which require a greater use of fair value accounting, have been adopted since 2007, the requirements are only applicable when there is an active market and fair value can be obtained and measured reliably.
33Greenwich Associates (Q3 2015), “Asset Managers in Asia Vie for Growing Pool of Externally Managed Portfolios”.
34Ken Miyajima and Ilhyock Shim, BIS Quarterly Review (September 2014), “Asset Managers In Emerging Market Economies”.

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Increased participation of retail investors in high-yield corporate bond market could pose further risks
The increased participation of retail investors in the Asian high-yield corporate bond market presents a pocket of risk. From 2009 to 2014, the retail sector’s participation in the high-yield corporate bond market increased 13 percentage points (Chart B3), even as the overall size of the high-yield market nearly doubled. A closer look at the cumulative holdings of Asian bond funds during the taper tantrum reveals that retail funds experienced far sharper outflows than institutional funds (Chart B5). This suggests that retail investors as a group, might behave in a more flighty manner in times of stress.

A multi-pronged approach to mitigate bond market liquidity risks in Asia
Given the importance of market liquidity to the smooth functioning of the financial market and the increased vulnerability of Asian bond markets due to a higher participation of retail investors, stakeholders should stay vigilant and take pre-emptive measures to withstand liquidity shocks.

Investors need to price in appropriate risk premia for their bond holdings
While more bond market participants have sounded caution about the risks of a drop in liquidity, it is not clear if they have sufficiently priced in the appropriate liquidity risk premium or adapted their trading behaviour to the change in market liquidity. The emergence of liquidity-transforming instruments (e.g. bond ETFs) alongside a compression of liquidity risk premia could have masked the reduction in market liquidity to market participants. There is, thus, a need to alert less-informed bond market participants to the “new-normal” state of liquidity to reduce the risk of a disorderly exit.
Asset managers could conduct liquidity stress tests and review redemption terms
Asset managers should conduct regular liquidity stress tests to assess the potential impact of liquidity shocks on their business. Liquidity stress test scenarios should be realistic and conservative to account for the occurrence of extreme events. Asset managers could also consider reviewing their redemption terms, such as by introducing “swing pricing” and “dilution levies”. These tools could help to ensure that redeeming investors bear the price effects of their investment withdrawals, and allow illiquidity costs to be appropriately priced.

Policymakers need more clarity on investor holdings to assess resilience of market liquidity
The structure of the bond markets is evolving, and policymakers need to gain a better understanding of the changing bond market liquidity landscape in order to assess the resilience of current liquidity conditions. Traditional market liquidity indicators (e.g. bid-ask spreads, turnover ratio) provide a mixed picture of underlying liquidity conditions, and may not shed much light on whether current liquidity conditions are resilient in times of stress.

As investor profiles play an important role in determining the resilience of market liquidity, policymakers should enhance data collection and analysis of investors’ bond holdings. Such information would promote better assessment of market liquidity resilience as well as contagion risks across different markets and asset classes and groups of investors.

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35 Swing pricing is designed to reduce the negative impact of subscriptions and redemptions on non-trading investors in a fund. Dilution levies refer to an extra charge levied by fund managers on investors buying/selling units in a fund, to offset any potential effect on the value of the fund of such sales/purchases.
Corporate leverage in Asia has increased, and concerns are growing that tighter global financing conditions and slowing growth could weigh on firms’ debt repayment abilities in Asia.

MAS conducted a stress test of corporate balance sheets to assess the resilience of Asia’s corporate sector to interest cost and earnings shocks. The stress test was conducted using data from 1995 – 2014 on 19,378 non-financial corporates listed on the stock markets of China, Hong Kong, India, Indonesia, Korea, Malaysia, the Philippines, Singapore, Taiwan and Thailand. We also conducted a reverse stress test to determine the stress scenarios that could precipitate significant corporate distress in Asia.

We find that Asia’s corporate balance sheets have become weaker and more sensitive to interest cost and earnings shocks, compared to the period immediately preceding the GFC. However, Asian corporates in general have relatively high stress thresholds, and significant corporate distress remains a low probability scenario in most of Asia. Asian banks are well-capitalised and should remain resilient to stresses in the corporate sector.

Nonetheless, there are pockets of risk within Asia’s corporate sector: concentration of debt in highly-leveraged firms and some commodity- and property-related firms, as well as increased foreign currency risks. Firms can consider proactive hedging strategies to protect themselves against market volatility. Authorities have stepped up monitoring of the vulnerabilities in the corporate sector and the risks posed to financial stability.

**Rising corporate leverage in Asia — a cause for concern?**

Low interest rates globally and strong capital inflows into Asia post-GFC created a favourable environment for corporates in Asia to raise debt. The corporate debt-to-GDP ratio (Chart C1), a key measure of corporate leverage, has increased across the board in Asia.

Higher corporate leverage is not necessarily undesirable, especially if the debt raised was used for productive investments or capital-intensive restructuring. However, the higher debt burden increases the risk of debt repayment difficulties when interest rates normalise or firms’ revenue projections are not met. The median interest coverage ratio (ICR) of listed firms in Asia have broadly weakened (Chart C2), suggesting weaker corporate financial health.

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36 IMF found that greater borrowing by listed firms in EMs had been used more for net investment than for the accumulation of cash. IMF GFSR Chapter 3 (October 2015), “Corporate Leverage in Emerging Markets – A Concern?”.
37 ICR is calculated as EBITDA divided by net interest expense. It serves as an indicator of debt repayment ability as it measures the degree to which earnings are sufficient to cover the interest on debt.
With higher leverage and weaker debt repayment ability, concerns are growing over whether Asian corporates can withstand shocks from a tightening of global financing conditions and a further slowdown in Asia.

Corporate sector health impacts banks’ asset quality and financial stability in general. Across Asia, corporates still rely heavily on banks for external financing, although bond financing has also increased. Corporate loans make up the majority of bank loan exposures.\(^{38}\) Asian banks would be exposed to higher asset quality risks when corporate balance sheets weaken. Increased provisioning and non-performing loans (NPL) could translate into weaker earnings for banks. At the same time, a rise in corporate sector risks could trigger corporate bond sell-offs and trading losses.

\[\text{Corporate Leverage in Asia has risen alongside weaker debt repayment ability}\]

\[\text{Chart C1}\]

Corporate Debt-to-GDP: Selected Asian Economies

\[\text{Chart C2}\]

Corporate Interest Coverage Ratio (Median): Selected Asian Economies

Asian corporates have weakened since the GFC, and have become more sensitive to shocks

We conducted an analysis of the debt-at-risk\(^{39}\) and a stress test of corporate balance sheets to assess the resilience of Asia’s corporate sector to interest cost and earnings shocks.

Asia’s corporate balance sheets have weakened compared to before the GFC. The share of debt-at-risk to total corporate debt in most Asian economies is higher than the level pre-GFC (Chart C3). Furthermore, corporates in Asia appear to have become more vulnerable to shocks. MAS’ stress test indicates that the increases in debt-at-risk in response to interest cost and earnings before interest and tax, depreciation and amortization (EBITDA) shocks\(^{40}\) would generally be larger now, compared to if the same shocks were applied before the GFC (Chart C4).

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\(^{38}\)MAS FSR Box C (November 2014), “Asset Quality Risks in Asia”.

\(^{39}\)Debt-at-risk is defined as debt owed by firms with ICR below 2.

\(^{40}\)Applying interest cost and EBITDA shocks in the stress test allows us to study the combined effect of interest rate movements, profit shocks and adverse currency movements on corporate sector health.
Compared to pre-GFC, most Asian corporate balance sheets have weakened, and are more sensitive to shocks

**Chart C3**
Debt-at-Risk as a Share of Total Corporate Debt:
Selected Asian Economies

**Chart C4**
MAS Stress Test Results:
Post-Shock Increase in the Ratio of Debt-at-Risk to Total Corporate Debt

Source: MAS estimates, Thomson Financial

Note: Shocks refer to a 25% increase in interest costs together with a 25% decline in EBITDA.

These findings suggest that the share of debt-at-risk in Asia’s corporate sector could swell when global financing conditions tighten and economic growth in Asia slows further. In particular, corporates in some Asian economies were noticeably weaker and more vulnerable to shocks compared to their peers in other Asian economies.

Compared to before the AFC, Asian corporates are generally in a stronger position and more resilient to shocks.

**Concentration of corporate debt in highly-leveraged firms exposes the sector to macro-financial risks**

Amid easy global financing conditions over the past five years, corporate debt in Asia has become more concentrated in highly-leveraged firms (Chart C5). A larger share of total corporate debt in Asia in 2014 is accounted for by firms with debt-to-EBITDA greater than 4, compared to in 2010. Such firms would be more vulnerable to interest cost and earnings shocks.\(^41\)

In addition, corporate bond issuance in Asia post-GFC has been dominated by commodity-related and property-related sectors (Chart C6).\(^42\) Against a backdrop of lower commodity prices and slowing property markets across parts of Asia, these sectors have come under pressure, as evidenced by recent developments.

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\(^41\)IMF found that the most leveraged firms tend to have lower profitability and lower interest coverage ratios, and also tend to be less liquid. IMF Regional Economic Outlook (REO) Chapter 2 (April 2014), “Corporate Leverage in Asia: A Fault Line?”

\(^42\)The commodity-related sectors include Oil & Gas, Utility & Energy, Metal & Steel, Mining, and the property-related sectors include Real Estate/Property, Construction/Building as defined by Dealogic.
high-profile debt restructurings and corporate defaults by some firms. A shock causing debt repayment difficulties among weaker corporates could propagate a downward spiral involving a more generalised pullback of credit by banks and bond investors, which in turn could trigger wider defaults across the corporate sector.

Corporate debt has become more concentrated in highly-leveraged firms...

...and in the commodity-related and property-related sectors

Asia’s corporate sector is exposed to currency risks

Currency volatility in Asia has increased amid more volatile capital flows and balance of payment pressures in parts of the region. A sharp exchange rate depreciation could precipitate a rise in borrowing costs for corporates with significant unhedged foreign currency borrowings.

Most corporates have some form of natural hedges or financial hedges to mitigate foreign currency risk. Corporates can still be caught out by exchange rate shocks, however, if existing hedges taken out during normal times become insufficient when currency volatility increases. Furthermore, some EM corporate borrowers have been taking on foreign currency borrowings for carry trades, and would be exposed to currency fluctuations.

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43Recent examples include China’s Kaisa Group, Thailand’s Sahaviriya Steel Industries, and Singapore’s Jurong Aromatics Corporation.

44Committee on the Global Financial System (CGFS)-FSB Standing Committee on Assessment of Vulnerabilities (SCAV) (September 2014), “Summary: Joint CGFS-FSB-SCAV Workshop on Risks from Currency Mismatches and Leverage on Corporate Balance Sheets”.

45According to Moody’s, an increased number of companies have insufficient “hedges against their significant US dollar debt exposure”. Anjani Trivedi, The Wall Street Journal (April 2015), “Currency Swings Worry Treasurers in Asia”.

46A recent study by the BIS found that favourable global financial conditions and opportunity for carry trade are motivations for EM corporates to borrow in US dollar, while the need to finance foreign operations denominated in US dollar and precautionary motive are not. Valentina Bruno and Hyun Song Shin, BIS Working Papers No. 510 (August 2015), “Global Dollar Credit And Carry Trades: A Firm-Level Analysis”.

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THA IDN MYSSGP
IND
TWN HK
CHNPNL
KOR

20 30 40 50 60 70 80

2014 - Share of Corporate debt

2010 - Share of Corporate Debt

Construction/Building
Utility & Energy
Oil & Gas
Transportation
Real Estate/Property
Mining
Computers & Electronics
Metal & Steel
Others

2014 - Share of Corporate debt

Source: MAS estimates, Thomson Financial

Source: MAS estimates, Dealogic

Note: Data between 2010 to October 2015
While the corporate sector has become less resilient, significant corporate distress in Asia remains a low probability scenario

MAS further conducted a top-down reverse stress test to estimate the magnitude of interest cost and earning shocks that could precipitate significant corporate distress in each Asian economy.\(^47\) This analysis aims to examine whether significant corporate distress in Asia is a likely scenario.

On the whole, Asian economies appear relatively resilient. The reverse stress test indicates that corporate sectors in most of Asia require shocks far greater than those seen during the AFC or the GFC to come under significant distress (Chart C7).

Some Asian economies having lower stress thresholds and could be more at risk of significant corporate distress. Authorities in these economies are taking action to address vulnerabilities in the corporate sector. For instance, the Reserve Bank of India (RBI) had warned corporates about the risk of unhedged foreign currency exposures and rising indebtedness. Indonesia’s finance ministry tightened corporate debt financing rules,\(^48\) and Bank Indonesia has stepped up monitoring of corporate borrowers’ external debt and requires companies to hedge against foreign currency risks.

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**Corporate sectors in Asia have relatively high stress thresholds**

![Chart C7: Reverse Stress Test Results](chart)

Source: MAS estimates, Thomson Financial

Note: Historical maximum stress refers to the maximum EBITDA or interest cost shocks experienced by the each economy; these shocks have mostly occurred during the AFC or GFC. The 2014 stress threshold refers to the amount of EBITDA or interest cost shocks needed to precipitate significant corporate distress in each Asian economy based on corporate balance sheets as at end 2014.

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\(^{47}\)We define the corporate sector to be under significant corporate distress when more than 40 percent of firms have ICR of less than 2. The 40 percent threshold is set by taking the average of the historical maximum share of firms-at-risk across Asian economies.

\(^{48}\)Indonesia’s finance ministry issued a new decree, stating that a company can no longer write off interest payments against taxable income if its debt is more than four times its equity.
Firms exposed to volatility in financial markets can adopt proactive hedging strategies, with proper advice

Firms in Asia have become more susceptible to a worsening in global financial conditions, due to rising corporate leverage and increased market volatility. Hedging can help mitigate short-term shocks, and even corporates with existing hedges may need to proactively review the adequacy and effectiveness of their hedging strategies in the current environment.

Shallow hedging markets in Asia and associated hedging costs can pose a challenge to the ability and incentive for firms to hedge.\(^{49}\) For example, a survey found that close to 50% of surveyed Indian corporates do not use any derivatives for currency or interest rate risk management.\(^{50}\) Corporate borrowers may not fully understand and appreciate the complexity of hedging strategies, and may need advice on the appropriate hedging solutions.

As corporate financing needs in Asia grow in complexity, authorities need to ensure that companies have access to a wider range of hedging tools for risk management. This may involve developing deeper derivatives markets, and reducing regulatory barriers to accessing hedging instruments.

Significant corporate distress, while still unlikely in most of Asia, raises the possibility that lenders (i.e. banks or corporate bond investors) could pull back financing for corporates indiscriminately when corporate asset quality weakens. As some had done in past crises, policymakers could consider providing risk sharing schemes to ensure that credit continues to flow to the healthy segments of the corporate sector.

Scan QR code or access link at [http://www.mas.gov.sg/Stats/dv/alc/Asian_Corporate_Leverage.htm](http://www.mas.gov.sg/Stats/dv/alc/Asian_Corporate_Leverage.htm) to view how Asian corporate leverage has evolved over time.


\(^{50}\)Global Capital (February 2014), “Asian Companies Measure Up FX Hedging Options”.
Singapore Financial Sector

Singapore’s banking system remains resilient amid an uncertain external environment. Banks have strong capital and liquidity buffers to withstand severe shocks but continued vigilance is warranted.

The turning credit cycle poses risks to Singapore’s banking system. Asset quality remains healthy, but there are signs of increased credit risks alongside weaknesses in corporate balance sheets. Foreign currency funding pressures have eased with slowing regional loan growth, but risks from foreign currency mismatches have risen.

Banks should continue to maintain prudent credit underwriting standards, monitor portfolio vulnerabilities and ensure adequate provisioning. Banks should also manage their foreign currency risks prudently and develop liquidity contingency plans.

Credit Cycle Turning

The credit cycle has begun to turn, led by a decline in non-bank loans to China

After a period of strong credit growth, overall loan growth has slowed (See Panel 2A “Banking Sector: Credit Growth Trends”). The moderation was most pronounced in non-resident non-bank growth, which fell from 20.2% year-on-year (y-o-y) in Q3 2014 to 2.5% in Q3 2015. Resident non-bank loan growth also declined to 5.6% y-o-y from 9.5% over the same period.

Strong credit growth in recent years has been driven largely by credit intermediation to emerging Asia via Singapore (See Box D “Cross-border Lending by Banks in Singapore: An Update”). Non-bank loans to China have declined in the last year, alongside a reduction in trade finance (Charts 2.1 and 2.2). The contraction in trade bills has come on the back of a slowdown in the Chinese economy and a moderation in trade flows, as well as tightening underwriting standards.
Non-bank loan growth to the rest of emerging Asia remains robust, but market contacts expect credit growth to slow with weakening external conditions.

**Domestic loan growth has moderated in line with slowing economic growth**

Resident loan growth has also moderated in line with weaker economic activity.

The moderation in domestic loan growth has been broad-based across industries. In particular, loans to the manufacturing and general commerce sectors have contracted in recent months, due to sluggish industrial production and dampened demand for trade-related services.

Based on MAS’ survey of banks, continued weakness in non-bank loan growth is expected in the near future. Banks surveyed expect global macroeconomic factors including a slowdown in China, volatile regional currencies and depressed commodity prices to weigh on demand for corporate credit.

If credit tightens further, lower-rated corporates or small and medium-sized enterprises (SMEs) could find it more difficult to access bank credit and face working capital shortfalls.

**Asset Quality Risks**

**Signs of asset quality deterioration**

The asset quality of Singapore’s banking system remains healthy. The overall NPL ratio is low despite having ticked up in recent quarters.

However, credit risks have risen. Banks’ corporate loan portfolios face increased vulnerabilities as subdued regional growth could hit the profitability and debt servicing capacity of corporates in Asia (See Box C “In the Crucible: Stress Testing Corporate Leverage in Asia”).

There are some signs of asset quality deterioration (See Panel 2B “Banking Sector: Asset Quality and Liquidity Indicators”). The special mention loan ratio has increased gradually over the past two years and continues to trend upward.\(^{51}\)

The overall NPL ratio has also increased to 1.5% in Q3 2015, from 1.1% a year ago. In particular, the NPL ratio for the manufacturing sector rose to 4.0% in Q3 2015, from 2.5% in Q3 2014 (Chart 2.3). Banks with significant exposures to trade-related sectors that have been affected by the regional slowdown could face higher credit quality risks.

![Chart 2.3 Banking System’s NPLs by Sector](chart.png)

Source: MAS

\(^{51}\)Special mention loans are credit facilities that exhibit potential weaknesses but are not yet classified as NPLs.
In recent years, banks have set aside loan loss provisions in tandem with loan growth. However, recent defaults have eaten into these buffers. Total provisioning coverage in Q3 2015 fell to 129% from 157% a year ago. Specific provisioning coverage remains at historically low levels (Chart 2.4).

**Chart 2.4**
Banking System’s Specific Provisioning Coverage by Sector

Source: MAS

**Banks have sufficient capital buffers to withstand losses but should maintain prudent underwriting and adequate provisions**

The results of MAS’ annual stress test suggest that banks in Singapore would be able to withstand adverse external and domestic developments (See Box F “Industry-Wide Stress Test (IWST) 2015: An Annual Health Check of the Banking System”).

Local banking groups hold strong capital buffers that would allow them to remain solvent under stress (See Panel 2C “Banking Sector: Local Banking Groups”).

Banks should maintain prudent underwriting standards and set aside adequate provisions to withstand higher NPLs should the global economy remain sluggish for a prolonged period.

### Liquidity and Foreign Currency Mismatch Risks

**Pressures on foreign currency funding and liquidity are receding...**

Singapore’s banking system is self-sufficient in supporting domestic lending as banks in Singapore have more than enough domestic non-bank deposits to support domestic non-bank lending.

Pressures on foreign currency funding and liquidity are easing alongside the slowdown in cross-border non-bank loans. The banking system foreign currency loan-to-deposit ratio remains elevated, but has trended down to 126% in Q3 2015 from a high of 147% in May 2014.

The funding structure of the banking system has also improved. The growing share of funding accounted for by resident non-bank deposits and intragroup funding contributes to the funding resilience of the banking system (See Box E “Stress and Stability in Funding Networks: The Resilience of Singapore’s Banking System Funding Structure during Crisis Periods”).

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52This year’s stress scenario included a prolonged slowdown in China with spill-overs to the region, a spike in interest rates and currency market volatility and a sharp correction in the property market amid slower GDP growth.
...but foreign currency mismatch risks have increased

However, currency mismatch risks have increased amid uncertainty in global monetary conditions and greater regional currency volatility.

Foreign currency mismatches are inherent in a financial centre even with the benefit of a relatively stable and supportive funding network. For example, there would be currency mismatch risks when banks are funded in hard currencies (e.g. USD) but lend in EM currencies, or if banks are funded in one hard currency and lend in another hard currency. Borrowers with unhedged foreign currency exposures could also result in higher NPLs and loan losses to banks.

Currency market volatility in emerging Asia could exacerbate foreign currency mismatch risks for banks in Singapore.

Banks need to manage their liquidity and foreign currency risks prudently. This involves assessing potential funding stresses through close monitoring of their currency and maturity mismatches, diversifying foreign currency funding sources, and developing liquidity contingency plans.

MAS will continue to monitor banks’ liquidity positions and risk management frameworks

To mitigate liquidity risks in the banking system, MAS has long required banks in Singapore to maintain adequate Singapore dollar liquid assets for their operations. The phasing in of Basel’s Liquidity Coverage Ratio (LCR) requirement for all domestic systemically important banks (D-SIBs), on both all currency and Singapore dollar bases, should enhance banks’ liquidity positions (See Box G “Singapore’s Framework for Domestic Systemically Important Banks (D-SIBs)”).

MAS supplements these regulatory requirements with stress tests. Results from MAS’ annual stress test indicate that banks have sufficient liquid assets to meet cash outflows under a stress scenario that includes rising interest rates and depreciating regional currencies.

MAS will continue to monitor banking system exposures and trends closely, and assess the financial stability risks to the system.
Panel 2A  Banking Sector: Credit Growth Trends

Overall loan growth moderated to 5.4% y-o-y in Q3 2015 from 7.4% y-o-y in Q3 2014, driven by a slowdown in non-resident non-bank loan growth to 2.5% y-o-y from 20.2% y-o-y.

Lending to emerging Asia has slowed alongside a pullback in trade finance activities; the share of trade bills fell to 11.6% in Q3 2015 from a peak of 16.0% in Q2 2014.

The moderation in domestic non-bank loan growth is broad-based across sectors. Cross-border interbank loans remained flat.
Panel 2B   Banking Sector: Asset Quality and Liquidity Indicators

Asset quality remains healthy, but overall non-bank NPL ratio increased (to 1.5% in Q3 2015) amid lower provisioning coverage.

![Chart 2B1: Banking System’s Asset Quality](chart1.png)

![Chart 2B2: Banking System’s Provisioning Coverage](chart2.png)

Source: MAS

Singapore’s banking system has sufficient resident deposits to fund resident loans. The foreign currency LTD ratio (126% in Q3 2015) and currency mismatch risks warrant close monitoring.

![Chart 2B3: Banking System’s Domestic Non-bank Loans and Deposits (as at Q3 2015)](chart3.png)

![Chart 2B4: Banking System’s Non-bank LTD Ratios](chart4.png)

Source: MAS
Panel 2C  Banking Sector: Local Banking Groups

Local banks’ earnings and profits have remained robust, supported by a rising net interest margin (1.8% in Q3 2015).

Local banks’ credit quality has remained strong despite a slight uptick in NPL ratio (1.0% at Q3 2015). Provisioning coverage has come down as increased defaults have eaten into these buffers.

Local banks’ capital and liquidity positions have remained healthy, with capital adequacy ratios (CAR) and all-currency LCRs above regulatory requirements.
Panel 2D Insurance Sector

The insurance industry in Singapore remains well-capitalised. The average CARs for the direct life and direct general insurance industry were 234% and 276% respectively as at Q3 2015.

New business premiums of the direct life insurance industry grew in 2015, largely attributable to significant growth of investment-linked products. However, net income fell due to unrealised investment losses.

Direct general insurance industry continued to grow with positive underwriting and investment profits except in Q3 2015.

The chart is truncated at -S$200 million; the underwriting loss and underwriting margin was S$2.1 billion and -254% in Q4 2011 respectively.
Box D
Cross-border Lending by Banks in Singapore: An Update

Post-GFC, the focus of cross-border lending by banks in Singapore has shifted from the advanced economies to emerging Asia.\textsuperscript{54} However, with the slowdown in regional growth and hence demand for credit, the amount of net lending to the region has declined in the past year. The reductions were most significant among the local, Japanese and European banks, although they remain the largest lenders to emerging Asia.

Net lending to emerging Asia has declined over the past year, matched by a similar decline in net funding from advanced economies

As an international financial centre, Singapore intermediates credit globally (Chart D1). Prior to the GFC, banks in Singapore channelled surplus savings from emerging Asia to Europe and developed Asia. Post-GFC, the flows reversed with the banks intermediating funds from the rest of the world to emerging Asia. The global search for yield and stronger growth prospects in emerging Asia contributed to this trend.

\textit{Net lending to emerging Asia has moderated since March 2014, matched by a decline in net inflows from advanced economies}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{chart_d1.png}
\caption{Singapore Banking System: Net Lending by Region}
\end{figure}

However, the recent economic slowdown in Asia has led to a reduction in the volume of credit intermediation. Net fund flows from Singapore to emerging Asia in September 2015 was 31.6\% below its peak in March 2014. The reduction in lending to emerging Asia has been matched by a decline in net fund inflows from advanced economies.

\textsuperscript{54}MAS FSR Box I (November 2014), “Funding Needs and Cross-border Exposures of Singapore’s Banking System: Financing the Domestic Economy and Beyond”. 
The main lenders to emerging Asia are the local, Japanese and European banks. The increase in net lending to emerging Asia post-GFC was driven by the local, Japanese and European banks (Chart D2). While these banks have collectively reduced their exposures to emerging Asia over the past year, they continue to be the main lenders to emerging Asia.

Local, Japanese and European banks remain the primary lenders to emerging Asia

Historically, Japanese banks in Singapore have intermediated funds to emerging Asia. This intermediation has increased post-GFC. Cross-border lending from Japanese banks in Singapore to emerging Asia more than tripled from S$23.8 billion in March 2010 to S$82.9 billion in September 2014, before moderating to S$73.9 billion in September 2015. Over the same period, local banks also expanded their lending to emerging Asia. Net lending to the region grew to S$110.3 billion in September 2014, before moderating to S$82.8 billion in September 2015. European banks in Singapore have also become net lenders to emerging Asia since end-2010. Their regional loan portfolios grew to S$76.9 billion in June 2014 before moderating to S$49.3 billion in September 2015.

MAS will continue to monitor banks’ business models and their risk management

The structure of cross-border credit intermediation has shifted significantly post-GFC, reflecting changes in banks’ business models. MAS expects banks to make enhancements to their risk management strategies and contingency plans, commensurate with the new risks arising from these developments. For example, banks will need to assess and take appropriate measures to address the asset quality risks of their regional exposures as well as funding liquidity risk against a backdrop of interest rate normalisation in the US and slowing economic growth in Asia. MAS will continue to monitor and engage banks on their business models and risk management, including funding and liquidity risks.
Box E

Stress and Stability in Funding Networks:
The Resilience of Singapore’s Banking System Funding Structure during Crisis Periods

This box examines the historical stickiness and behaviour of different types of funding for banks in Singapore during past crises. We conclude that non-bank deposits, particularly resident non-bank deposits, are an important source of stable funding. We also find that intragroup funding can play an important stabilisation role during a crisis. The rising shares of these two sources of funding contribute to the resilience of Singapore banks’ funding network.

Singapore’s banking system relies primarily on non-bank deposits and cross-border interbank funding

The main sources of funding for the Singapore’s banking system are non-bank deposits and cross-border interbank funding (Charts E1 and E2).

Interbank funding in Singapore is driven largely by cross-border interbank funding. As the domestic interbank market accounts for a small proportion of total interbank funding, our analysis of interbank funding focuses on cross-border interbank funding.

Resident non-bank deposits were the most stable source of funding during crisis periods

We examine bank funding in Singapore during two crisis periods, the AFC and the GFC. The data indicates that non-bank deposits tend to be more stable than interbank funding (Chart E3).

Further, resident non-bank deposits appear to be more stable than non-resident non-bank deposits. Resident non-bank deposits registered steady positive growth through the AFC and GFC. Non-resident non-bank deposits remained relatively flat during the AFC and decreased slightly during the GFC.
Intragroup funding could be a “stabilising” force for some foreign bank branches and subsidiaries during crisis periods

During the AFC and GFC, both types of cross-border interbank funding — intragroup as well as from unrelated banks — were more volatile compared to non-bank funding. However, the nature of their volatility differs (Chart E4).

Intragroup funding serves as a source of emergency funding during crisis periods

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**Chart E3**

Banking System’s Funding Trends during Crisis Periods

- Intragroup Funding
- Unrelated Cross-border Interbank Funding
- Resident Non-bank Deposits
- Non-Resident Non-bank Deposits

**Chart E4**

Pre-crisis vs Crisis Period Funding Growth Trends

Cross-border interbank funding from unrelated banks is more vulnerable to shocks, dropping significantly during periods of rising counterparty risk aversion. In contrast, intragroup funding served as an emergency source of funding for some foreign bank branches and subsidiaries during crisis periods. Despite higher volatility during crisis periods, the average y-o-y growth rates of intragroup funding remained broadly stable during the AFC and GFC, suggesting that banks’ head offices continued to provide funding support to their branches and subsidiaries in Singapore even as unrelated interbank funding dried up.

This was borne out by the net positions of intragroup funding for foreign and local banks during the GFC. Foreign banks in Singapore saw an increase in net intragroup funding from abroad, coinciding with the withdrawal of net unrelated interbank funding. Likewise, the local banks increased net intragroup lending to their branches and subsidiaries outside Singapore (Chart E5).

**Local (foreign) banks provided (received) net intragroup funding during crisis periods**

**Chart E5**

**Local vs Foreign Banks’ Interbank Funding Behaviour during Crisis Periods**

- Foreign Banks’ Net Intragroup Funding
- Foreign Banks’ Net Unrelated Cross-border Interbank Funding
- Local Banks’ Net Intragroup Funding (RHS)
- Local Banks’ Net Unrelated Cross-border Interbank Funding (RHS)

Source: MAS
Increased shares of resident non-bank deposits and net intragroup funding in the Singapore’s banking system contribute to funding stability

Resident non-bank deposits, historically the most stable funding source for banks in Singapore, have seen a steady increase post-GFC and now form 34% of total bank funding (Chart E6).

Intragroup funding has also grown in importance, particularly for foreign banks in Singapore. Pre-GFC, foreign banks in Singapore were net intragroup lenders. Post-GFC, as banks from the advanced economies shifted towards providing funding to growth regions, foreign banks in Singapore have become net recipients of intragroup funding (Chart E7). Intragroup funding also replaced unrelated interbank funding which has not recovered to pre-crisis levels.

A resilient Singapore funding network

Resident non-bank deposits and intragroup funding have become larger sources of funding to the Singapore’s banking system. Their increased importance relative to interbank funding from unrelated banks serves as a buffer to funding stresses and contributes to a more resilient banking system.

However, rising interconnectedness between foreign banks and their head offices could increase contagion risks and propagate systemic shocks within a banking group. Foreign banks’ reliance on intragroup funding increases the risk of stressed liquidity positions should head office funding become inaccessible. The growing significance of intragroup funding for foreign banks underscores the importance of ongoing supervisory engagement between MAS and the head offices of these foreign banks as well as supervisory cooperation with their home regulators. MAS will continue to monitor closely the funding and liquidity profiles of banks in Singapore.
Box F
Industry-Wide Stress Test (IWST) 2015:
An Annual Health Check of the Banking System

As part of its financial stability mandate, MAS conducts an annual IWST of all major FIs in Singapore using a common macroeconomic stress scenario. This box highlights the key observations from this year’s IWST exercise, focusing on the resilience of the banking system as well as potential risks to the corporate and household sectors over a three-year stress period.

The IWST stress scenario includes significant economic as well as financial and asset market stress
This year’s stress test assumes a significant weakening of the external economic environment, with the US Federal Reserve raising interest rates more aggressively than expected by markets and a prolonged slowdown in China as structural reforms stall. Under this scenario, a USD funding squeeze ensues and core euro zone and Japan slip into recession.

On the back of these hypothetical events, growth is expected to slow and unemployment to increase across the rest of Asia. Financial conditions are assumed to tighten significantly, with sharp increases in interest rates and credit spreads and regional currencies depreciating against the USD. These in turn could trigger large corrections in property markets in Singapore and the region.

Banking System Resilience

The banking system would remain resilient under the IWST stress scenario
The stress test results underscored the banking system’s ability to withstand severe shocks. The major banks would remain solvent, with their CARs remaining above regulatory requirements. The banks also hold healthy liquidity positions and would be able to meet cash outflows under stress.

Asset quality would deteriorate under the stress scenario. Corporate loans extended to firms with regional business exposures would be most at risk to a regional economic slowdown. In particular, profitability for firms in the trade-related sectors such as manufacturing, general commerce as well as transport, storage and communication (TSC) would be adversely affected. In addition, depressed commodity prices would increase credit risks arising from the commodity-related sectors. Loans to the building and construction (B&C) sector would be affected by the significant property market correction. Higher interest rates would have a negative impact on banks’ loan books by increasing corporate debt servicing burdens and the risk of default. Nonetheless, banks have adequate capital buffers and provisions built up over the past few years to absorb the losses from higher NPLs and write-offs.

To test the resilience of the banking system to stresses in the interbank market, banks were asked to assume that their top Asian bank counterparty (excluding G-SIBs) fail amidst challenges in the region. Chinese banks featured as the top interbank counterparty for many banks participating in the IWST exercise. Banks could withstand this shock with minimal spill-overs to the interbank market.

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55MAS FSR Box H (November 2013), “Stress Testing Financial Institutions: Going the Distance”.
Some banks reported that the negative impact of the stress scenario could be partly offset by a rise in net interest income as they could pass on interest rate increases to borrowers. Banks should reassess their ability to do so, taking into account the risk that rising interest rates against a backdrop of subdued economic growth could further worsen the debt servicing ability of borrowers, which could in turn lead to higher NPLs and write-offs for banks.

**Risks to the Corporate and Household Sectors**

**SMEs and firms with USD loans could be more vulnerable under the stress scenario**
Banks reported higher NPL ratios under the stress scenario for loans to SMEs compared to large corporates. As loans to large corporates form the bulk of banks’ corporate loan books, the higher stressed NPL ratios for SME loans would not severely impact banks’ overall asset quality. However, SMEs’ access to funding could be affected should banks become more risk averse in their credit underwriting for SME loans.

Under the stress scenario, stressed NPL ratios for USD loans were higher compared to other loans. This could reflect risks to corporates with USD-denominated loans that were not fully hedged. Given the global economic outlook, corporates should manage their balance sheets with a view to reducing currency mismatch risks through appropriate hedging strategies.

**Highly-leveraged households could face difficulties in debt servicing**
Banks reported higher stressed NPL ratios for households that took up housing loans at higher debt servicing ratios. Slower economic growth would adversely impact employment and household incomes. Together with higher interest rates, households’ ability to service their housing loans would be adversely affected. Households should review their debt obligations and financial health, and take steps to build up their financial buffers in advance.

**The IWST exercise is an integral part of MAS’ macroprudential surveillance**
The IWST exercise is an important part of MAS’ surveillance of risks to Singapore’s financial stability. It helps MAS to better understand the sources of risks to the financial system and their potential impact should they materialise. MAS shares relevant IWST results with the participating FIs and engages them in discussions on their resilience to plausible risk events and their proposed risk mitigating actions. MAS will continue to work closely with banks to improve and refine stress testing methodologies,\(^{57}\) to ensure that the banking system remains resilient to severe but relevant stress scenarios.

\(^{57}\)For example, MAS has in the last two years asked participating banks to share their reverse stress tests results to help identify stress events that would pose most risk to the banks.
Box G
Singapore’s Framework for Domestic Systemically Important Banks (D-SIBs)

Following the GFC, the international community, including the G20, FSB and Basel Committee on Banking Supervision (BCBS), resolved to avoid a repeat of the failures and subsequent bail-outs of large, global systemically important financial institutions (FIs) that occurred during the crisis. Among the reforms that were introduced to improve the resilience of banks and banking systems, a framework was established to identify Global Systemically Important Banks (G-SIBs) and subject these institutions to more intensive supervision, higher loss absorbency (HLA), and requirements for recovery and resolution planning (RRP).

To complement the G-SIB framework and to address similar risks posed by systemically important banks at the national level, the BCBS also published a set of principles to guide the development of D-SIB frameworks by supervisors. This allows for national discretion in identifying banks whose distress or failure could create large negative externalities on the domestic economy and in adopting appropriate measures to address the risks they pose. This box sets out Singapore’s D-SIB framework.

MAS’ approach to assessing systemic importance of banks
MAS assesses all banks licensed in Singapore for their systemic importance based on their size, interconnectedness, substitutability and complexity. The scope of assessment includes all locally-incorporated banks (including subsidiaries of foreign banks) and foreign bank branches.

MAS has adopted a two-stage assessment process. The first stage uses quantitative indicators to identify a preliminary list of banks for further consideration. The second stage involves reviewing supplementary indicators and applying supervisory judgement to form an overall assessment. This two-stage assessment process is premised on two principles:

- The failure of a bank that ranks high in any one of the size, interconnectedness and substitutability categories could have a significant impact on the domestic financial system and economy.  

- The assessment of systemic importance needs to be supplemented by supervisory judgement to avoid a mechanistic reliance on quantitative indicators.

Policy measures to strengthen the resilience and stability of Singapore’s banking system
MAS will apply a range of policy measures, as appropriate, on the identified D-SIBs to strengthen their resilience and help insulate against negative spill-overs should a D-SIB fail (Table G1).

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58 As complexity in itself is unlikely to make a bank systemically important, it will be considered only when the bank is near the threshold of a core indicator in any of the other three categories.
### Table G1
MAS’ D-SIB Policy Measures

| Locally-incorporated bank group | • Higher loss absorbency  
| | • Enhanced disclosure  
| | • Recovery and resolution planning  
| | • Effective risk data aggregation and risk reporting  
| | • Liquidity coverage ratio  
| Foreign bank group | • Recovery and resolution planning  
| | • Effective risk data aggregation and risk reporting  
| | • Liquidity coverage ratio  
| | • Local incorporation of retail operations if retail presence is significant (Note: The locally-incorporated entity will be subject to the policy measures that apply to the locally-incorporated bank group)  

### HLA to provide stronger capital buffers
In contrast to a multi-tiered HLA framework for G-SIBs, MAS introduced a single-tiered HLA requirement of 2 percentage points above the Basel-III minimum for all locally-incorporated D-SIBs. This is appropriate in Singapore’s context, given the small number of D-SIBs.

### LCR to enhance banks’ liquidity management
The LCR framework enhances MAS’ existing Minimum Liquid Assets (MLA) requirement. All D-SIBs are required to meet both the Singapore dollar and all-currency LCR requirements.

### RRP to address systemic impact of banks in distress
All D-SIBs will be subject to RRP requirements. These requirements aim to restore the financial viability of a bank if it were to come under severe stress, and ensure that it can be resolved in an orderly manner without disrupting the critical functions of the economy. For a foreign banking group, RRP development will be done in consultation with the parent bank and its home regulator.

### Local incorporation of D-SIBs with significant retail presence
MAS continues to subscribe to the universal branching model. Nevertheless, there is a risk of contagion to domestic retail depositors if a foreign banking group were to come under severe stress. To accord better protection to depositors, a foreign bank that has a significant retail presence in Singapore will be required to subsidiarise its retail operations. The bank can choose to retain its wholesale operations in the branch.

### Seven banking groups have been designated as D-SIBs
Along with the publication of the D-SIB framework, MAS designated seven banking groups as D-SIBs. They are: DBS Bank, Oversea-Chinese Banking Corporation, United Overseas Bank, Citibank, Malayan Banking Berhad, Standard Chartered Bank and The Hong Kong and Shanghai Banking Corporation.
Box H

The Countercyclical Capital Buffer (CCyB):
Expanding the Macroprudential Toolkit

MAS will include the countercyclical capital buffer (CCyB) in our macroprudential policy framework with effect from 1 January 2016. Taking into account current economic and financial conditions, MAS will set the CCyB at 0% effective 1 January 2017.

CCyB is intended to mitigate pro-cyclicality and protect the banking sector during stress periods

The BCBS introduced the CCyB as part of the Basel III capital framework, to limit pro-cyclicality of the financial system (Figure H1). It is a macroprudential policy instrument aimed at increasing the banking sector’s resilience: banks build up capital buffers during periods of excessive credit growth that can be released during periods of financial stress when banks may otherwise cut back lending. The release of the CCyB supports the continued flow of credit to the economy, which in turn reduces the probability of negative feedback from an economic slowdown to the banking sector through increased credit losses. A side-benefit of the CCyB is that it could lean against the wind during an up-cycle — by restraining credit growth that may otherwise fuel an asset bubble or lead to a build-up of other financial system vulnerabilities.

The aim of CCyB is to limit pro-cyclicality of the financial system

Figure H1
Stylised illustration of how CCyB limits pro-cyclicality

Source: MAS
The applicable CCyB requirement for a bank is the weighted average of the CCyB requirements in effect in the jurisdictions to which the bank has private sector credit exposures. The home authority of the bank is responsible for ensuring that the bank calculates and maintains its CCyB requirement correctly based on the geographic location of its exposures. BCBS members may set their respective CCyB requirements at any rate but mandatory jurisdictional reciprocity will apply only for CCyB ranging between 0% and 2.5% of risk weighted assets.

Including CCyB in MAS’ Macroprudential Toolkit

MAS supports the BCBS’ objective to address the build-up of systemic risks from excessive broad-based credit growth, and will include the CCyB as one of the measures in our macroprudential policy toolkit. In deciding whether to activate the CCyB, MAS will consider a range of factors, including the following (Figure H2):

- Whether there is a build-up of systemic risks in the domestic financial system;
- Whether the build-up of systemic risks is driven by domestic factors, in particular broad-based domestic credit growth; and
- Whether there are other policy measures that may be more appropriate for addressing the identified risks.

MAS will assess the appropriateness of using CCyB alongside other macroprudential policy tools

![Figure H2 Assessing domestic credit overheating: an illustration](source)

59For example, suppose Bank X’s private sector credit exposures are allocated as follows: 50% to country A, 30% to country B and 20% to country C and the CCyB rates of countries A, B and C are 0%, 1% and 2%, respectively. Then the applicable CCyB requirement for Bank X is (0.5 x 0%) + (0.3 x 1%) + (0.2 x 2%) = 0.7%.

60The maximum CCyB rate for reciprocity will be phased in from 2016: 0.625% in 2016, 1.25% in 2017, 1.875% in 2018 and 2.5% from 2019 onwards. Mandatory reciprocity applies only to BCBS member jurisdictions.

61MAS Notice 637 sets out the requirements for Singapore-incorporated banks in respect of Singapore’s CCyB, and the CCyB of other relevant jurisdictions.
Assessing the Build-up of Systemic Risk in Singapore

MAS monitors a broad suite of indicators to assess the build-up of systemic risk. These include the BCBS-recommended credit-to-GDP gap (Chart H1), as well as other indicators relating to the economy, the banking sector, and asset markets (Table H1). MAS will overlay the quantitative indicators with qualitative information and judgment in assessing whether it is appropriate to activate the CCyB. MAS will not apply the indicators mechanistically and will review their effectiveness periodically. The CCyB, if activated, will normally be between 0% and 2.5%.

Once activated, the CCyB may be released if the systemic risk it is meant to address dissipates or materializes. To support credit supply in a downturn when systemic risk materializes, MAS will consider high frequency financial market indicators and other market intelligence to supplement our assessment of when to release CCyB (Table H2).

The credit-to-GDP gap for Singapore is 3.2% as of Q3 2015 and declining

<table>
<thead>
<tr>
<th>Chart H1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Credit-to-GDP Gap</strong></td>
</tr>
<tr>
<td>Per Cent</td>
</tr>
<tr>
<td>Source: MAS</td>
</tr>
</tbody>
</table>

MAS will consider a range of indicators covering different aspects of the macrofinancial environment

### Table H1

<table>
<thead>
<tr>
<th>Selected Macrofinancial Indicators (non-exhaustive)</th>
<th>Economy</th>
<th>Banking Sector</th>
<th>Asset Markets</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Output gap</td>
<td>• Credit-to-GDP Gap</td>
<td>• Equity prices</td>
<td></td>
</tr>
<tr>
<td>• Unemployment</td>
<td>• Liquidity</td>
<td>• Bond yields</td>
<td></td>
</tr>
<tr>
<td>• Inflation</td>
<td>• Leverage</td>
<td>• Credit spreads</td>
<td></td>
</tr>
<tr>
<td>• Household debt</td>
<td>• Asset quality</td>
<td>• Property indicators</td>
<td></td>
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<tr>
<td>• Corporate debt</td>
<td></td>
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</tbody>
</table>

Source: MAS
MAS will use high frequency indicators to supplement our assessment of when to release CCyB

### Selected High-Frequency Indicators (non-exhaustive)

<table>
<thead>
<tr>
<th>Banking</th>
<th>Money Markets</th>
<th>Bond Markets</th>
<th>Equity Markets</th>
<th>Foreign Exchange Markets</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Lending premium</td>
<td>• Realised volatility of three-month Singapore Interbank Offered Rate (SIBOR)</td>
<td>• Realised volatility of the Singapore Government Securities (SGS) ten-year bond index</td>
<td>• Stock-bond correlation</td>
<td>• Realised volatility of Singapore Dollar nominal effective exchange rate (NEER)</td>
</tr>
<tr>
<td>• Realised volatility of idiosyncratic equity return of bank stocks over the STI</td>
<td></td>
<td>• Ten-year interest rate swap spread</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: MAS

Communication

MAS will announce the CCyB rate for banks’ exposures to Singapore at least on an annual basis together with MAS’ assessment of systemic risk.62 These announcements will be posted on the MAS website. Any decision to activate or to raise the level of CCyB will be pre-announced by up to 12 months in order to give banks time to make the necessary adjustments, while any decision to release the CCyB will take effect immediately.

A CCyB of 0% is appropriate for Singapore given current conditions

Based on the information and analyses in this FSR, MAS does not observe any excessive broad-based domestic credit growth at this juncture. Singapore’s resident non-bank loan growth was 5.6% in Q3 2015, lower than the ten-year average of 11.8% and the recent peak of 14.1% in Q4 2013. The credit-to-GDP gap has declined by 13.5 percentage points over the last two years to 3.2% as of Q3 2015. MAS will therefore set a CCyB of 0% effective 1 January 2017.

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62Typically together with the FSR.
Box I
A Wider Lens: Banking System Data Collection

MAS relies on data collected from banks to conduct banking system surveillance. Such data provides insights into the state of the banking system and aids policy formulation. This box describes the sources of data used in MAS’ banking system surveillance, key areas of review and the steps MAS is taking to improve its data collection.

Sources of Data
Most data on the Singapore’s banking system is collected through regulatory returns. A wide range of data is collected, from monthly data on MLA to annual audited accounts. Supervisors in the Banking Department (BD) use this data to monitor banks’ health and compliance with regulatory requirements. The Macroprudential Surveillance Department (MSD) also uses data from regulatory returns to monitor the overall state of the banking system.

To monitor specific areas of interest, MAS also collects data through surveys. These surveys include the annual SME Financing Survey as well as the Housing Loan Survey. The use of surveys reduces the banking industry’s reporting burden, as surveys are generally sent only to banks with significant market shares.

On a monthly basis, MAS publishes aggregated banking system information in the Monthly Statistical Bulletin (MSB). As a central trusted source, MAS is able to collect data from banks without raising concerns on market sensitivity or confidentiality. Publishing this data provides banks and other stakeholders with more transparency on the state of the banking system.

Banking System Surveillance
MAS Notice 610 and MAS Notice 1003 (MAS 610/1003) collect monthly data on banks’ and merchant banks’ assets and liabilities as well as foreign exchange transactions, and quarterly data on classified exposures. They are key sources for MAS’ banking system surveillance. This section describes selected types of data that MAS regularly reviews to determine key trends and formulate policies.

As Singapore is an international financial centre, MAS pays close attention to the banking system’s exposures to other countries. Annex 1E of MAS 610/1003 collects data on banks’ and merchant banks’ non-bank and interbank loans and deposits broken down by individual countries. This data is used to identify and assess the risks posed by a build-up in exposures to individual countries or regions. For example, during the euro zone debt crisis, MAS closely reviewed banks’ and merchant banks’ exposures to various European countries using this data, supplemented with additional granular data. On a monthly basis, MAS publishes aggregated information on these exposures in Table I.16 of the MSB.

MAS regularly reviews banks and merchant banks’ exposures to corporates and individuals. Annex 1D of MAS 610/1003 collects data on loans broken down by industrial sector, including manufacturing, B&C and general commerce, as well as loans to individuals, including housing and bridging loans, car loans and credit card loans. MAS reviews this data, together with more granular data from surveys, to monitor the banking system’s provision of credit to the domestic economy. On a monthly basis, MAS publishes aggregated information on loans to non-banks in Tables I.5A and I.5B of the MSB.
As the largest foreign exchange centre in Asia, MAS also monitors banks’ and merchant banks’ foreign exchange business. Appendix 2 of MAS 610/1003 collects data on banks’ and merchant banks’ exposures to major currencies, broken down by instrument type and counterparty. This data is used to assess the size of the foreign exchange market and consequent risks. On a monthly basis, MAS publishes total foreign exchange market turnover conducted in Singapore in Table III.2 of the MSB.

**Proposed Enhancements to MAS 610/1003**

MAS periodically reviews its regulatory returns to ensure that the data collected remains relevant and up-to-date with developments in the financial industry. Since the last review of MAS 610/1003, the banking system’s exposures to the region have increased in line with Singapore’s development as an international financial centre. At the same time, Singapore’s economic restructuring warrants closer review of the banking system’s links to the domestic economy.

In December 2014, MAS issued a consultation paper on proposed changes to MAS 610/1003. Several banks provided feedback during the consultation period, which closed in February 2015. Considering the significance of the feedback and to factor in the more recent announcement on the removal of the DBU-Asian Currency Unit (ACU) divide, MAS expects to conduct a second round of consultation on the proposed enhancements.

The revised MAS 610/1003 will collect more granular data that supports banking system surveillance. These improvements are in line with global efforts to improve data collection and surveillance of financial systems following the GFC. Banks and merchant banks will be required to break down their international exposures by currency and by economic sector, allowing for a finer understanding of potential risks posed by loans to individual countries. Data on loans to industry sectors will be further broken down by residency and currency, giving a clearer picture of banks’ and merchant banks’ exposures to these sectors. Foreign exchange turnover will also be expanded to collect other currencies such as the Chinese Renminbi (RMB) and Korean Won (KRW), in recognition of the growing importance of Asian currencies.

MAS recognises that the revised MAS 610/1003 will add to the banking industry’s reporting burden. Banks and merchant banks will need to build systems to track and compile data at the required level of granularity. MAS will work closely with banks and merchant banks to ensure that these systems are in place when the revised MAS 610/1003 takes effect.

MAS is also reviewing what additional information can be shared with the industry. Increasing the amount of data published lets banks, merchant banks and other stakeholders better understand the state of the industry and consequently, make better business decisions. MAS will work closely with the industry to determine what aggregated data sets would provide the most value and how best to provide this data.

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63 BIS results show that Singapore is the largest foreign exchange centre in Asia and third largest foreign exchange centre globally. BIS (September 2013), “Triennial Central Bank Survey—Foreign Exchange Turnover in April 2013: Preliminary Global results”.

64 The DBU-ACU is an accounting concept, where banks are required to segregate domestic and offshore operations into the DBU and ACU. The removal of the DBU-ACU divide was announced by Mr Tharman Shanmugaratnam, Deputy Prime Minister and Chairman, MAS, in June 2015. In August 2015, MAS released a consultation paper on the implementation issues of removing the DBU-ACU divide.
Box J

Singapore Insurers are Resilient against Changing Interest Rate Conditions

Insurers globally have faced challenges arising from a prolonged period of low interest rates, such as lacklustre investment results and weaker overall profitability. In Europe, solvency concerns have arisen for European life insurers due to guaranteed policy pay-outs exceeding investment yields, and long asset-liability duration mismatches. Similar challenges have been faced by insurers in some Asian countries, where guaranteed pay-outs to policyholders had also been high.

Singapore has similarly faced a prolonged period of low interest rates, but this is expected to reverse with the upcoming normalisation of US monetary policy. This box examines the impact of the prolonged low interest rate environment on Singapore insurers and the potential implications of a reversal in interest rate conditions.

Singapore insurers have been resilient against low interest rates as guaranteed benefits provided by Singapore insurers are low...

Around 60% of the life insurance business in Singapore comprises participating policies (Chart J1), for which insurers have the discretion to adjust future non-guaranteed bonuses. In addition, the guaranteed benefits for the in-force and new participating policies are low in Singapore, at around 1 – 2% on average.

Investment-linked and non-participating policies each accounts for around 20% of the market (Chart J1). For investment-linked policies, the investment risks are borne by the policyholders, not the insurers. With the exception of universal life policies, non-participating policies are mostly protection-oriented such as term and medical policies, which are not sensitive to interest rates. For universal life policies, the guaranteed rates are low, at around 2% currently.

... and Singapore insurers have been prudent in their pricing assumptions

Singapore insurers are also less likely to have assumed high yields from Singapore dollar fixed-income assets when pricing their products as domestic sovereign bond yields have not been as high as in other countries historically (Chart J2). Moreover, the drop in sovereign bond yields in Singapore has been less severe than in other countries (Chart J3). Consequently, the impact on Singapore insurers’ earnings and solvency has also been less pronounced. Life insurers in Singapore have remained profitable in the last ten years, except during the GFC, and their solvency ratios have also been healthy at above 200% (Chart J4).

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65 According to the European Insurance and Occupational Pensions Authority (EIOPA) Insurance Stress Test 2014, if the interest rates remained low, some European insurers would be unable to meet their guaranteed pay-outs to policyholders in around ten years, with a risk that a quarter of them would not be able to meet the regulatory capital requirement.

66 MAS will focus on life insurers since they are more sensitive to interest rate movements due to the long-term nature of the business. General insurers typically hold shorter-duration fixed-income assets, and most of the policy liabilities are short-term and are hence typically not discounted under the current capital framework.

67 The percentage is expressed as a proportion of total assets of life insurance funds.
The majority of life insurance business in Singapore comprises participating policies. Singapore domestic sovereign bond yields are historically lower than in other countries.

**Chart J1**
Total Assets: Life Insurance Funds

Source: MAS

**Chart J2**
Ten-Year Sovereign Bond Yields

Source: Bloomberg

The drop in Singapore’s sovereign bond yields has been less severe than in other countries.

Life insurers in Singapore have remained profitable and have healthy solvency ratios.

**Chart J3**

Source: MAS estimates, Bloomberg

**Chart J4**
Solvency and Performance of Life Insurers

Source: MAS

MAS and insurers have been taking proactive measures to address risks.

MAS requires insurers to have board-approved policies for investment management, product development and pricing, and participating (par) fund management. MAS regularly reviews these policies to ensure that they are appropriate, and assesses the robustness of insurers’ risk management practices.

Life insurers in Singapore have been proactive and have already adopted for some time investment management, product development and pricing, and par fund management strategies for mitigating risks from the low interest rate environment. Some of the strategies are similar to those adopted or considered by other global insurers. The strategies include:

- Having products with lower guaranteed benefits and where a higher proportion of profit derives from insurance underwriting, such as protection-oriented products;
- Proactively monitoring pricing assumptions so that insurers can re-price or withdraw the product if necessary, e.g. reducing the guaranteed rate for universal life policies;
- Managing the level of guarantees according to the rules and guiding principles set out in the board-approved internal governance policy; and
- Continuing to adopt close asset-liability matching so as to insulate against financial market volatility.

**No significant evidence of search for yield**

MAS has been monitoring insurers’ underlying investments closely over the past years and has not noted any significant evidence of search for yield resulting in a shift in their investment risk profile. Life insurers in Singapore remained prudent, investing largely in sovereign and well-rated corporate debt securities (Charts J5 and J6). MAS will continue to monitor the trend closely.

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**Life insurers in Singapore invest largely in well-rated sovereign and corporate debt securities**

<table>
<thead>
<tr>
<th>Chart J5</th>
<th>Chart J6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Asset Allocation of Life Insurers</strong></td>
<td><strong>Credit Rating of Life Insurers’ Debt Securities</strong></td>
</tr>
<tr>
<td>Other Invested Assets</td>
<td>AAA</td>
</tr>
<tr>
<td>Loans</td>
<td>AA</td>
</tr>
<tr>
<td>Structured Debt Securities</td>
<td>A</td>
</tr>
<tr>
<td>Government Debt Securities</td>
<td>BBB</td>
</tr>
<tr>
<td>Other Listed Equities</td>
<td>BB</td>
</tr>
<tr>
<td>Corporate Debt Securities</td>
<td>B</td>
</tr>
<tr>
<td>Land and Buildings</td>
<td>CCC and below</td>
</tr>
<tr>
<td>Equities - CIS</td>
<td>Unrated</td>
</tr>
</tbody>
</table>

Source: MAS

---

**Singapore insurers will also remain resilient against the upcoming increase in interest rates**

The normalisation of US interest rates could pose near-term risks to insurers’ investment performance and balance sheets, particularly for life insurers, which tend to hold longer-duration fixed-income securities to match longer-term liabilities. Rapidly rising interest rates will reduce the mark-to-market value of insurers’ fixed-income instruments and could prompt a potential increase in policy surrenders from policyholders searching for higher yield from capital markets. MAS’ liquidity stress test indicates that life insurers in Singapore hold sufficient liquid assets to meet cash outflows under a stress scenario that included a mass lapse event, coupled with investment shocks, reduction in new business and reinsurance recoverables, and increased management expenses.

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*Insurers are required to put in place an internal governance policy on the management of its participating life insurance business under MAS Notice 320.*

*A mass lapse event assumes a significant proportion of policyholders surrender their savings policies.*

*Following a pilot test in 2012, MAS has formally introduced liquidity stress test for direct life insurers this year to assess the soundness of the insurers’ liquidity risk management practices.*
In the longer-term, a higher interest rate environment is expected to improve insurers’ balance sheets. Insurers may start offering more savings-oriented products and higher bonus rates for participating products that may attract more investors. Insurers will also receive higher coupon income from new fixed income assets. In addition, insurers’ liabilities will be discounted at a higher interest rate, which would enhance their solvency positions.
Box K
Enhancing the Safety and Efficiency of Financial Market Infrastructures (FMIs)

The growing use of central counterparties (CCPs) globally and the resulting concentration of risks have given rise to concerns that CCPs may become “too-big-to-fail”. To address these concerns and ensure that CCPs maintain rigorous risk management standards, the Committee on Payments and Market Infrastructures (CPMI)-IOSCO in April 2012 established international risk management standards for systemically important financial market infrastructures, including CCPs.

MAS has taken steps to ensure that financial market infrastructures in Singapore are safe and efficient. In January 2013, MAS adopted the CPMI-IOSCO Principles for Financial Market Infrastructure (PFMI) as part of MAS’ supervisory objective and approach. In our ongoing supervision of FMIs, MAS conducts assessments to ensure that FMIs comply with the PFMI, and have put in place robust governance and risk management frameworks to manage the risks to which they are exposed. MAS also issued a Notice on Financial Market Infrastructure Standards in August 2015 to further strengthen MAS’ legal and regulatory framework for the supervision of systemically important financial market infrastructures regulated by MAS.

MAS’ approach underwent peer review by CPMI-IOSCO in 2015 and has been assessed to be fully aligned with the PFMI.
Box L
An Update on Progress in Over-the-counter (OTC) Derivatives Reforms

In 2009, the G20 and FSB agreed to implement a set of reforms to improve transparency, mitigate systemic risk, and protect against market abuse in the over-the-counter (OTC) derivatives markets.71 The reform programme was expanded in 2011 to include margin requirements for non-centrally cleared derivatives.72

MAS is fully committed to meeting the G20 and FSB reform objectives and has made good progress in implementing the reforms. In addition to developing regulations on OTC derivatives markets, MAS has also focused on ensuring that the financial market infrastructure is in place to support the OTC derivatives reforms. In 2013, we extended our regulatory framework to include trade repositories and clearing facilities for OTC derivatives. In 2014, we commenced trade reporting to collect data on OTC derivatives transactions.

In February 2015, MAS consulted on legislative amendments to complete the OTC derivatives reforms. We proposed to regulate OTC derivatives intermediaries and trading platforms, to assume powers to impose a trading mandate if appropriate, and to expand our regulatory ambit to cover OTC commodity derivatives.

To better manage potential systemic risks posed by the OTC derivatives sector, MAS also issued a consultation paper on mandatory clearing of OTC derivatives in July 2015. MAS proposed to start with SGD and USD interest rate swaps for central clearing, as these are the most widely traded interest rate derivatives in Singapore. More recently, in October 2015, MAS consulted on proposals to implement margin requirements on non-centrally cleared OTC derivatives, complementing MAS’ earlier proposal on mandatory clearing of OTC derivatives.

To ensure that clearing infrastructure is in place for mandatory clearing, Singapore CCPs have gained the requisite recognition from both European Union (EU) and US authorities. In 2015, the Singapore Exchange Derivatives Clearing Limited (SGX-DC) and InterContinental Exchange (ICE) Clear Singapore were recognised by the European Securities and Markets Authority as third-country CCPs. SGX-DC has also been registered with the US Commodities Futures Trading Commission (CFTC) as a Derivatives Clearing Organisation (DCO) since December 2013. MAS expects to approve or recognise more CCPs, which will strengthen accessibility to clearing infrastructure from Singapore.

MAS continues to review other aspects of our OTC derivatives regulatory regime, including completing the roll-out of trade reporting for foreign exchange, equity and commodity OTC derivatives. MAS is also conducting an in-depth study on the conditions that would be appropriate for a trading mandate to be implemented in Singapore.

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71 The G20's 2009 OTC derivatives reform programme comprised four elements: (a) All standardised OTC derivatives should be traded on exchanges or electronic platforms, where appropriate; (b) All standardised OTC derivatives should be cleared through central counterparties (CCPs); (c) All OTC derivatives should be reported to trade repositories; and (d) Non-centrally cleared OTC derivatives should be subject to higher capital requirements.

MAS commenced mandatory reporting of OTC derivatives transactions in April 2014, starting with interest rate and credit derivatives contracts. Trade reporting of foreign exchange derivatives began on 1 May 2015. Reporting of other derivatives contracts will be phased in over time.

Trade reporting is not an end in itself. Data on OTC derivatives transactions enables MAS to monitor and address potential financial stability risks associated with such activities. This box discusses preliminary insights obtained from Singapore’s OTC interest rate derivatives data, and outlines how we may use this data to assess systemic risks posed by the OTC derivatives activities of market participants in Singapore.

**Interest rate derivatives form the largest asset class**
Interest rate derivatives account for 80% of the global OTC derivatives market. They also make up the largest derivatives asset class in Singapore, accounting for approximately 70% of banks’ derivatives positions based on OTC trade repository data.

**Multi-dimensional, granular OTC data deepens our understanding of derivatives activity**
Granular information on individual derivatives transactions — product type, currency, tenure, and counterparty characteristics — expands our understanding of market structure, functioning of the market, individual counterparty behaviour and interactions between counterparties.

As a global financial centre, Singapore attracts market participants drawn to investments and trading opportunities in the region. These market participants trade actively in contracts that are denominated in the Singapore dollar and other Asian currencies, which make up two-thirds of the Singapore market for OTC interest rate derivatives (Chart M1).

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73 The total outstanding amount of OTC derivatives contracts for H1 2015 stood at US$ 553 billion, with interest rate derivatives accounting for US$ 435 billion. BIS Database, “Semi-annual OTC Derivatives Statistics”.
74 As of November 2015, the three biggest asset classes (interest rate, credit and foreign exchange derivatives) were in scope for full reporting by banks. Reporting of foreign exchange derivatives has not yet been phased in for non-bank FIs.
Most interest rate derivatives contracts in Singapore are denominated in SGD and Asian currencies

Chart M1
Interest Rate Derivatives by Currency Denomination

The top 10 counterparties, which accounted for 86% of all interest rate derivatives activity, trade in contracts denominated in a variety of regional currencies (Chart M2). In contrast, the smaller counterparties tend to trade in fewer currencies, with a greater focus on contracts denominated in USD. This suggests that top counterparties are more exposed to regional interest rate risks, while smaller market participants are generally more exposed to US monetary policy risks.

Large counterparties are more exposed to regional interest rate risks compared to smaller counterparties

Chart M2
Interest Derivatives: Distribution of Each Counterparty’s Trades across Currencies (Top 50 Counterparties and Top 10 Currencies)

Note: Each box indicates the concentration of a counterparty’s transactions in interest rate derivatives in the specified currency, depicted on a scale of 0% (blank) to 100% (in dark green). A darker square indicates a higher concentration of transactions in derivatives denominated in the specified currency.

Size is measured by the gross notional amount of all interest rate derivatives contracts reported by each counterparty.
OTC data can facilitate more sophisticated network analysis

Granular OTC data provides essential information on the nature of interactions between counterparties. Such relationships can be markedly different across different products. For example, the network diagrams below illustrate that the important nodes in the USD interest rate derivatives market are quite different from those for the overall market (Chart M3). Such information can help national authorities to better assess the systemic impact of specific stresses, e.g. a shift in USD interest rates.

<table>
<thead>
<tr>
<th>Interactions between counterparties differ across different market segments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chart M3</strong></td>
</tr>
<tr>
<td>Interest Rate Derivatives: Illustrative Network Diagrams</td>
</tr>
<tr>
<td>Overall</td>
</tr>
</tbody>
</table>

Source: MAS estimates, DDRS
Note: Each node represents a reporting entity, while the size of the node denotes the relative size of the notional amounts of transactions reported by each entity. Lines between two nodes indicate that transaction(s) were reported between both entities, with the thickness of each line representing the relative size of the transaction(s) reported.

Data quality improvements will open up more opportunities for systemic risk analysis

Data quality and the analytical use of OTC data is an iterative process. Detailed analysis of OTC data contributes to improvements in data quality and completeness, which in turn facilitates the use of the data for stress tests and systemic risk assessments.

MAS recognises the key role played by the industry in this process. MAS has engaged reporting entities in resolving operational difficulties faced in complying with the reporting requirements. Data analytics provides insights to help us identify key data quality gaps, and allow us to follow up with reporting entities on the more common operational errors. Data quality has improved as reporting entities enhanced their internal processes.

MAS is committed to global efforts to harmonise data standards for key data elements.\(^{76}\) The adoption of these standards will further improve the accuracy of OTC data. Additionally, the expiry of various reliefs by 2016 will enable MAS to conduct more effective trade matching and identification to improve the quality of analyses performed using OTC data.\(^{77}\)

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\(^{76}\)See CPMI-IOSCO, Consultative report (September 2015), “Harmonisation of Key OTC Derivatives Data Elements (Other Than UTI and UPI) – First Batch” and CPMI-IOSCO, Consultative report (August 2015), “Harmonisation of Unique Transaction Identifier”.

\(^{77}\)For example, MAS granted relief for reporting the Unique Transaction Identifier.
**Box N**

**Building Resilience to Address Cyber Risks**

**Financial Sector Cyber Threat Landscape**
Technology has been transforming the global financial and commercial landscape rapidly. The use of technology has become so prevalent and extensive today that it forms an integral part of the business and operations of most companies, particularly FIs. The advent of internet banking, mobile payment and banking, as well as online trading has enabled easier and faster access to financial services. As more financial services are delivered over the internet, cyber risks are on the rise.

Increasing interconnectedness and interdependencies among financial market participants also mean that a serious cyber breach in one institution can quickly escalate into a more systemic problem. The frequency, scale, and complexity of cyber-attacks observed are increasing globally. Examples of successful cyber-attacks include exfiltration of customer data from banks’ systems, system compromises, and distributed denial-of-service (DDOS) attacks that disrupted online services. Successful cyber-attacks can have a serious impact on the safety and soundness of the financial sector at large especially when such attacks are against systemically important FIs.

**Building Cyber Resilience through Multi-pronged Supervision**
MAS adopts a multi-pronged and risk-based supervisory approach to address technology and cyber risks in the financial sector. MAS issues regulations and guidelines that advocate standards of good technology and cyber risk management such as the Technology Risk Management Guidelines. The Guidelines set out risk management principles and best practice standards to guide FIs to establish a sound and robust technology risk management framework, and to strengthen system security, reliability, resiliency, and recoverability. In addition, MAS conducts risk-based on-site and off-site supervision to ascertain the cyber resilience posture of FIs, and requires them to promptly address any security and control deficiencies found during the course of supervision.

**Building Cyber Resilience through Collaboration**
MAS takes a collaborative effort to combat cyber threats and enhance cyber resilience in the financial sector. We partner with industry bodies such as the Association of Banks in Singapore (ABS)’s Standing Committee on Cyber Security and Association of Information Security Professionals, and government agencies like the Infocomm Development Authority of Singapore (IDA) and Cyber Security Agency (CSA) on a range of cyber initiatives. These include industry-wide cyber exercises, industry penetration testing, co-creation of penetration testing guidelines, and accreditation of penetration testing experts.

**Building Cyber Resilience through Information Sharing**
The timely sharing of cyber intelligence is crucial for FIs to take early pre-emptive measures to foil attacks. Besides encouraging regular cyber information sharing through the quarterly Financial Sector-Information Sharing (FS-IS) forum and the annual ABS-MAS Technology Risk Seminar to foster cross-fertilization of cybersecurity knowledge within the financial sector, MAS also exhorts FIs to participate actively in global cyber threat information sharing arrangements such as the Financial Services-Information Sharing and Analysis Center (FS-ISAC) platform. To catalyse and promote greater cyber
information sharing, MAS has also established and hosts the Financial Intelligence platform (FINTEL) to facilitate timely exchange and discussion of cyber threats and intelligence amongst FIs with a view to building stronger cyber situational awareness within the sector.

**Conclusion**

MAS regards cyber security of the financial industry in Singapore as an important priority. Much like a cat and mouse game, both cyber miscreants and FIs have been enhancing their cyber tools and techniques along with advances in technology as well as in response to one another. The finance industry needs to stay abreast of developments in the cyber threat landscape, and evolve and improve their cyber risk mitigating measures. As the industry strives to strengthen its cyber resilience, it is also crucial to have more global dialogues and cooperation with a view to converge to common cyber resilience standards for FIs worldwide. After all, the cyber resilience of the financial ecosystem is only as strong as its weakest links.
3 Singapore Corporate Sector

Corporate earnings have weakened over the past year amid an uncertain operating environment. While corporate balance sheets remain healthy in aggregate, highly leveraged firms in certain sectors could be vulnerable if interest rates were to rise or if the earnings outlook were to weaken. Firms with foreign currency exposures could also face increased foreign currency mismatch risks should currency market volatility persist.

Overall, corporate leverage has risen since the GFC but has started to stabilise. MAS’ stress tests of corporate balance sheets suggest that most corporates can withstand interest rate and earnings shocks. The larger firms have ample financial buffers and are able to mitigate risks from their foreign currency exposures. Firms should continue to be pro-active in managing their leverage and foreign currency risks.

Corporate Balance Sheets Generally Resilient

Corporate earnings have weakened amid an uncertain operating environment, especially for trade-related sectors

Overall corporate profitability has dipped as headwinds in the domestic and external environment weighed on business outlook and earnings. The median return on assets (ROA) of companies listed on the Singapore Exchange (SGX) edged down from 3.9% in Q2 2014 to 3.5% in Q2 2015, with the trade-related sectors registering larger declines (Chart 3.1).

Notably, manufacturing sector ROA fell to 1.5% in Q2 2015 from 3.2% a year ago, against a backdrop of softening global demand. The ROA for the commerce sector also declined (2.1%), while ROA for the TSC sector (3.3%) was weighed down by excess capacity in the shipping sub-sector.

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Financial Stability Review, November 2015

Monetary Authority of Singapore
Macroprudential Surveillance Department
Banks’ corporate loan NPL ratio has increased from 1.4% in Q3 2014 to 1.8% in Q3 2015 (Chart 3.3).

In particular, the NPL ratio for manufacturing firms increased to 4.0% in Q3 2015, from 2.5% in Q3 2014. This reflects a subdued outlook for manufacturing firms, in line with weaknesses in major trading partners (Chart 3.4).

Despite the slowdown in earnings, corporate balance sheets have generally remained resilient. The median current ratio of SGX-listed companies stayed firm at 1.7 times, reflecting corporates’ ability to meet their cashflow needs (Chart 3.5).
The median ICR has also remained healthy at 3.9 times as of Q2 2015. This suggests that corporates are able to cover their interest expenses (Chart 3.6).

Chart 3.6
Interest Coverage Ratio of SGX-listed Firms
(Median)

<table>
<thead>
<tr>
<th>Year</th>
<th>Commerce</th>
<th>Construction</th>
<th>Hotels &amp; Restaurants</th>
<th>Manufacturing</th>
<th>Multi-Industry</th>
<th>Property</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q4 2004</td>
<td>10</td>
<td>15</td>
<td>10</td>
<td>10</td>
<td>15</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Q4 2006</td>
<td>10</td>
<td>15</td>
<td>10</td>
<td>10</td>
<td>15</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Q4 2008</td>
<td>10</td>
<td>15</td>
<td>10</td>
<td>10</td>
<td>15</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Q4 2010</td>
<td>10</td>
<td>15</td>
<td>10</td>
<td>10</td>
<td>15</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Q4 2012</td>
<td>10</td>
<td>15</td>
<td>10</td>
<td>10</td>
<td>15</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Q2 2015</td>
<td>10</td>
<td>15</td>
<td>10</td>
<td>10</td>
<td>15</td>
<td>10</td>
<td>15</td>
</tr>
</tbody>
</table>

Source: MAS estimates, Thomson Financial

Nonetheless, earnings weakness, coupled with rising interest rates, remains a risk that could weigh on corporates’ balance sheets.

SMEs may face tighter financing conditions if subdued economic conditions persist

Financing conditions for SMEs have remained generally positive, with bank credit to SMEs continuing to grow in Q2 2015, albeit at a slower pace. Loans to SMEs grew by 8.2% y-o-y in Q2 2015 compared to 13% in Q2 2014.

Banks’ overall NPL ratio for SME loans has increased from 0.7% in Q2 2014 to 1.3% in Q2 2015. It remained slightly below the overall NPL ratio for corporate loans (1.4% in Q2 2014 and 1.6% in Q2 2015 respectively), partly due to banks’ prudent underwriting for SMEs. Most SME loans (about 80%) are collateralised.

The overall NIM on SME loans has inched up in the last 18 months, from 1.6% in Q4 2013, to 1.8% in Q2 2015, possibly reflecting the pricing in of credit risks on the back of a subdued business outlook (See Panel 3A “Small and Medium-Sized Enterprise (SME) Financing Conditions”).

Looking ahead, SMEs could face tighter financing conditions as banks expect to tighten credit terms and conditions in response to the economic uncertainties. Banks reported higher NPL ratios under the IWST 2015 stress scenario for loans to SMEs across major industry sectors (See Box F “Industry-Wide Stress Test (IWST) 2015: An Annual Health Check of the Banking System”).

Credit risk-sharing schemes for SMEs, such as those implemented by the government in 2008 – 2009, could help to ensure that viable SMEs continue to have access to credit to sustain their operations.

Corporate Leverage and Currency Risks

While aggregate corporate leverage has started to stabilise...

Corporate leverage rose during the post-GFC period as firms took advantage of low interest rates to fund investments and fuel growth.

78For example, SMEs are taking longer (from an average 42 days in Q4 2014 to 44 days in Q1 2015) to pay their debts. DP Information Group (April 2015), “SMEs Slower to Pay their Debts in 1Q”. The Singapore Business Federation (SBF)-DP SME Index indicated that the overall business outlook for the six months ending March 2016 has declined, reaching a three-year low of 51.9 as of September 2015 (as compared to 55.5 a year ago). The latest Business Times-UniSIM Business Climate Survey yielded similar results with a net balance of 54% of small firms expecting worsening business prospects in the six months ending March 2016.
Growth in bank lending to corporates has since slowed from a peak of 29% y-o-y in September 2011 to 5% in Q2 2015. Corporate bond issuance has also contracted.

Aggregate corporate debt-to-GDP has started to stabilise after increasing from 95% in 2010 to 145% in 2014 (Chart 3.7).

\[ \text{Chart 3.7 Corporate Debt-to-GDP} \]

The median debt-to-equity ratio of SGX-listed companies has hovered around 40% since Q4 2013, after rising from about 30% in Q2 2009 (Chart 3.8).

\[ \text{Chart 3.8 Debt-to-Equity Ratio of SGX-listed Firms (Median)} \]

The number of firms which are highly-leveraged has increased. The share of firms with a debt-to-equity ratio greater than two times increased from 5.7% of listed corporates in Q2 2014 to 7.0% in Q2 2015. These firms accounted for 13% of total corporate debt (Chart 3.9).

\[ \text{Chart 3.9 Share of Corporate Debt of SGX-listed Firms Based on Debt-to-Equity Ratio} \]

The share of firms with a debt-to-EBITDA ratio of more than four times has grown from 30% in Q2 2014 to 36% in Q2 2015. These firms accounted for 67% of total corporate debt (Chart 3.10).

\[ \text{Chart 3.10 Share of Corporate Debt of SGX-listed Firms Based on Debt-to-EBITDA Ratio} \]

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\[ ^{79}\text{Debt-to-EBITDA is computed as total debt over the rolling average of four quarters of EBITDA to adjust for the seasonality of earnings. EBITDA refers to the earnings of a company before interest, income taxes and depreciation.} \]
Monetary Authority of Singapore

Macroeconomic and Financial Stability Review, November 2015

65

The share of firms with both a debt-to-equity ratio of more than two times and a debt-to-EBITDA ratio of greater than four times has remained stable at 3% of all listed corporates. However, their share of debt has risen from 8% in Q2 2014 to 10% as of Q2 2015 (Chart 3.11). Such firms would be most susceptible to debt repayment difficulties if interest rates were to increase or if earnings projections were not met.

**Debt servicing ability has also weakened**

Firms’ ability to service their debts has also weakened over the past year. While interest costs should remain manageable for most firms, firms with an ICR of less than two (“firms-at-risk”) now make up about 23% of all listed corporates, up from 21% in Q2 2014. The amount of corporate debt held by such firms (“debt-at-risk”) has grown from 8% in Q2 2014 to 11% in Q2 2015 (Chart 3.12).

**MAS stress tests suggest that the corporate sector would be resilient to interest rate and earnings shocks**

Under a stress scenario of a 25% increase in interest costs and a 25% decline in EBITDA, most listed firms would still be able to service their debts. MAS estimates that the percentage of firms-at-risk under this stress scenario would increase from 23% to 32% of all corporates, and their share of debt-at-risk would increase from 11% to 22% (Chart 3.13). However, taking cash reserves into consideration, the percentage of firms-at-risk would drop to 9%, and their share of debt-at-risk would fall to 2%.
Some firms have taken steps to manage their interest rate risks. Of the 30 largest firms at risk, approximately half of them use interest rate derivatives and fixed-rate debt to hedge or protect against interest rate risk (Chart 3.14).

Corporates should manage their leverage and foreign currency risks proactively

While highly-leveraged corporates could face some strains in servicing their debts under various adverse scenarios, corporate balance sheets remain on the whole resilient. Nonetheless, given the uncertainties in economic and financial conditions, firms should continue to be pro-active in managing their debt levels and foreign currency exposures.

72% of Singapore firms have overseas engagements and more than 49% are generating more than 50% of total turnover from abroad. The SBF represents all companies with more than S$0.5 million in share capital. SBF (2015), “SBF National Business Survey 2014/2015”.

Firms could be exposed to foreign currency mismatch risks, although they have ample financial buffers to withstand shocks

Currency market volatility has spiked over the course of 2015. Singapore corporates that have grown their external wings and taken on foreign currency exposures could be subject to foreign currency mismatch risks. Nonetheless, Singapore corporates remain resilient as many of the listed firms with foreign currency exposures tend to be larger and have ample financial buffers to withstand shocks. Many of them also employ some form of hedging against currency risks (See Box O “Sailing in Choppy Seas: The Impact of Currency Market Volatility on Singapore Corporate Balance Sheets”).

72% of Singapore firms have overseas engagements and more than 49% are generating more than 50% of total turnover from abroad. The SBF represents all companies with more than S$0.5 million in share capital. SBF (2015), “SBF National Business Survey 2014/2015”.

Source: MAS estimates, Companies’ Annual Reports
Panel 3A  Small and Medium-Sized Enterprise (SME) Financing Conditions

Bank lending to SMEs continued to grow, albeit at a slower pace.

The commerce and construction sectors account for more than half of outstanding loans.

The vast majority of SME loans are collateralised.

While asset quality of SME loans remained strong, the NPL ratio has increased in recent quarters.

NIMs ticked up slightly since Q2 2014, but remain below the medium-term average.

Source: MAS
Headwinds in the external outlook and volatility in currency markets over the course of 2015 have refocused attention on leverage and foreign currency risks in Singapore’s corporate sector. Given the open nature of the Singapore economy, a significant portion of corporate borrowing would be denominated in foreign currencies to finance regional expansion and trade.81

Firms could face currency risks if they have unhedged foreign currency debt, or if they have trade or investment linkages — including customer and supply chain relationships — that are denominated in foreign currency.

This box examines the impact of recent currency volatility on firms listed on the SGX (Chart O1). Using regression analysis to assess the relationship between stock performance and currency movements, MAS estimated that almost half of all listed firms were sensitive to foreign currency movements, with up to 30% of them vulnerable to a weakening of regional currencies against the USD. Most of these firms tend to be financially stronger, hold ample cash reserves, and are better able to hedge against currency risks, compared to the median firm. Some smaller firms with unhedged currency risks could be vulnerable, but they do not pose systemic risks to Singapore’s banking system.

**Regional currencies have depreciated in relation to the USD**

**Chart O1**

Currency Movements Against the USD

<table>
<thead>
<tr>
<th>SGD</th>
<th>MYR</th>
<th>IDR</th>
<th>THB</th>
<th>RMB</th>
<th>JPY</th>
<th>EUR</th>
</tr>
</thead>
</table>

Index (1 Jan 2013=100)

Source: MAS Estimates, Bloomberg

Singapore corporates could be exposed to foreign currency risks through foreign currency debt or through trade or investment linkages denominated in foreign currency

As a highly open economy, it would be expected that a large number of Singapore firms are exposed to

---

81 The international assets of Singapore listed firms rose from S$380 billion in 2008 to S$739 billion in 2014. MAS estimates that half of all non-financial corporate bonds issued in Singapore to date in 2015 were denominated in foreign currency.
foreign currency risks. Indeed, 72% of Singapore firms surveyed in 2014 said they had business dealings overseas, and half of them derived more than 50% of their turnover from abroad. An estimated 80% of firms listed on the SGX reported in their financial statements that at least 10% of assets or revenue in 2014 was derived from abroad.

A detailed assessment of the currency mismatch risks faced by corporates would require granular data of the currency composition of firms' assets, liabilities, revenues and costs. In particular, whether the risks are matched through natural hedging or financial derivatives. However, such information is not readily available. Data on corporate hedging activities and behavior is even more difficult to obtain.

The correlation of individual stock performance to currency pairs was used as a proxy, to assess how firms would be impacted by exchange rate movements. Firms could be exposed to currency risks even if they do not have unhedged foreign currency debt. For example, firms with assets or export revenue in regional currencies, or those that rely on machinery & equipment and intermediate inputs priced in USD for sales in Singapore and the region, could be vulnerable to exchange rate volatility and terms of trade shocks.

**Up to 30% of listed firms could be adversely impacted by exchange rate movements**

MAS conducted a regression analysis for about 600 firms listed on the SGX, on the sensitivity of their stock prices over the period of January 2012 to September 2015, to (a) exchange rate movements in any direction, and (b) depreciation of the SGD, regional currencies (MYR, THB, INR, IDR, RMB) and other major currencies (EUR, JPY or “QE” currencies) against the USD (See Appendix 1).

The regression results suggest that almost half the listed firms would be sensitive to exchange rate movements, i.e. their stock performance had statistically significant (positive or negative) correlations with at least one bilateral currency pair. Further analysis suggests that firms identified using this methodology had operations in more countries and had a higher share of foreign sales as a percentage of total sales, compared to other firms.

In addition, up to 30% of all listed firms could be adversely impacted by appreciation of the USD or depreciation of any regional currency.

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82 See SBF National Business Survey 2014/2015. The SBF represents all Singapore companies with more than $50.5 million in share capital.

83 Thomson Financial (as of Q3 2015). The Accounting Standards Council Singapore Financial Reporting Standards (FRS) requires firms to report assets, revenues and income in geographical segments if any of the geographical segments exceed 10%. See FRS 108 for more information.

84 Information on corporates' hedging activities and derivatives positions was highlighted by the CGFS/FSB-SCAV as a significant data gap.


86 For instance, in the construction sector, firms sensitive to exchange rate movements operated in 2.7 other countries on average (compared to 1.3 for other construction firms) and had 27% in foreign sales on average (10% for other construction firms). Estimates for foreign sales and countries of operations are based on data from Thomson Financial (as of October 2015).

87 For the 30% of listed firms, their stock prices showed either (a) a negative correlation to the appreciation of the USD against the SGD and/or; (b) at least one positive correlation to the depreciation of regional currencies against the SGD.
Firms that are sensitive to exchange rate movements are generally larger and financially stronger with ample cash reserves to mitigate currency risks

MAS conducted further analysis on the 50% of listed firms that are sensitive to exchange rate movement and found that these firms had larger assets on average than other firms. Further, 20% of these firms had interest coverage ratio (ICR) of less than two (“firms-at-risk”), compared to 30% for other firms. Under a stress scenario of a 25% decline in EBITDA and 25% increase in interest costs, the proportion of firms-at-risk remains lower for corporates that are sensitive to exchange rate movements (28%) compared to other firms (37%) (Chart O2). After accounting for cash reserves, the proportion of firms-at-risk falls below 5% for corporates sensitive to exchange rate movements (Chart O2). These firms-at-risk account for less than 1% of the total debt of corporates that are sensitive to exchange rate movements.

A significant number of firms hedge against currency risks, through natural hedging or the use of currency derivatives

Foreign currency risks may be mitigated by natural hedging or the use of currency derivatives.88 Based on the annual reports of the 50 largest firms that are sensitive to exchange rate movements (accounting for close to 90% of the debt held by such corporates), 80% of these firms employed either natural hedging or foreign exchange derivatives to manage currency risks. Of these firms, 12% relied only on natural hedging, 60% used derivatives only, and 28% employed both methods. Stock returns were least

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88Natural hedges include matching the currencies of liabilities, costs and revenues. Derivative hedges include foreign exchange forwards, foreign exchange swaps and other financial derivatives to hedge foreign currency movements.
adversely impacted by foreign currency movements for corporates that used both natural hedging and derivatives (Chart O3).  This suggests that firms with a diversified hedging strategy are more effectively hedged against currency risks.

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**Firms that use diversified hedging strategies tend to be less affected by currency volatility**

![Chart O3: Responsiveness of Stock Returns to Foreign Currency Movements for Top 50 Firms](chart)

Source: MAS Estimates, Bloomberg, Thomson Financial

However, not all hedging options may be available or viable for all firms. The availability of natural hedging strategies would depend on business and operational considerations. Derivatives may be costly, particularly for longer-maturity hedges. Liquidity in hedging markets may disappear in times of stress and market volatility, when demand for hedges and rollovers would be at the highest.

**Smaller firms could do more to hedge currency risks**

Smaller listed firms tend not to hedge currency risks and could be more exposed to currency market volatility. Around half of the 20 smallest firms that are sensitive to foreign exchange movements did not hedge their currency risks. Results from IWST 2015 reflect this vulnerability as banks expect USD loans and SME loans to post the highest NPLs (compared to other corporate loans) under the stress scenario, which included the depreciation of the SGD and regional currencies in relation to the USD (See Box F “Industry-Wide Stress Test (IWST) 2015: An Annual Health Check of the Banking System”). While smaller

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89The responsiveness of stock returns to foreign currency movements for each firm is measured by averaging the absolute value of the coefficients for each bilateral currency pair ($\beta$) in the modified Adler-Dumas model. ($\beta = \frac{\sum_{i=1}^{n} \beta_i}{n}$)

90This is also supported by a regression of the firms’ absolute value of coefficients ($\bar{\beta}$) on dummies for hedging strategies, while controlling for each firm’s total debt and its share of sales denominated in foreign currency. The coefficient was the most negative for the dummy where both natural hedging and derivative hedging were employed, compared to when only natural hedging or derivative hedging but not both was employed.

91For instance, firms would have to agree with suppliers to invoice in the firms’ currency of choice for a natural hedge. In a study of 15 exporting and importing firms, the Singapore Institute of International Affairs found that most Singapore firms do not invoice in SGD but in USD or the currencies of their counterparties (2010). The level of bargaining power, transactions costs and ease of accounting and management are important factors that affect a firm’s choice of invoicing currency. See Döhring, European Commission (EC) DG ECFIN Economic Paper 299 (January 2008) “Hedging and invoicing strategies to reduce exchange rate exposure: a euro-area perspective” for a further discussion on how natural hedges can be operationalised.
firms do not pose systemic risks to the banking system, they should pay closer heed to their currency risks.

Indeed, the benefits from earnings stability arising from hedging could well outweigh its costs, especially in an environment of rising currency volatility. This could potentially mitigate adverse effects on profitability and balance sheets of smaller firms (See Appendix 2).

Conclusion
A growing number of firms in Singapore's highly open economy are exposed to foreign currency risk. This risk arises not only when a firm takes on foreign currency debt which is unhedged, but also when there are currency mismatches between revenues and costs. The recent depreciation in regional currencies underscores the need for firms to monitor and manage their foreign currency risks.
Appendix 1
Methodology to Identify Firms that are Sensitive to Foreign Exchange Movements

The sample of firms used in the study is all non-financial firms listed on SGX which had weekly stock price data from January 2012 to September 2015. A total of 614 firms were taken as sample.

The regression model used is a multivariate version of the Adler-Dumas model (which used one currency pair), using weekly returns of eight bilateral currency pairs as explanatory variables. The regression is specified below:

\[ R_{t}^{\text{Stock }i} = \alpha_t + \sum_{j=1}^{N} \beta_j R_{t}^{j/SGD} + \epsilon_{t,i} \]

where the variables are expressed in terms of growth rates. \( R_{t}^{\text{Stock }i} \) is the weekly return of stock \( i \) at time \( t \), \( R_{t}^{j/SGD} \) is the weekly return of currency \( j \) in relation to the SGD (\( j/SGD \)) at time \( t \) and \( \epsilon_{t,i} \) is the error term. The coefficient \( \beta_j \) is the responsiveness of return of stock \( i \) to the return of \( j/SGD \). The currency pairs (in relation to the SGD) used in the model were: USD, MYR, IDR, THB, INR, RMB, JPY, and EUR.

The signs and statistical significance of the coefficients \( \beta_j \) were used as criteria to identify whether a firm is sensitive to foreign currency movements and whether the firm is adversely impacted by USD appreciation and/or regional currency depreciation (See Table O1).

Some studies have included control variables in the model to control for other macroeconomic effects on stock returns. However, in our model, adding other control factors (e.g. market portfolio returns, change in industrial production) did not improve the model specification due to possible multicollinearity, as the control variables tended to be significantly correlated with exchange rate movements. MAS conducted further analysis and found that firms that were identified as sensitive to foreign currency movements — using the modified Adler-Dumas model — generally operated in more countries and had higher foreign sales (as a percentage of total sales) compared to other firms. Model specifications with additional control variables fared less well in this regard, with firms identified as sensitive to foreign currency movements generally having less foreign sales (as a percentage of total sales) and operating in fewer countries compared to other firms. Hence, the specification without other control variables was chosen due to its better performance in identification.

Table O1
Identification Algorithm

<table>
<thead>
<tr>
<th>Possible scenarios</th>
<th>Sensitivity of firms’ stock returns to:</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Appreciation of USD</td>
<td>Depreciation of other currencies</td>
</tr>
<tr>
<td>Losses from USD appreciation or depreciation of any other currency</td>
<td>−</td>
<td>−</td>
</tr>
<tr>
<td></td>
<td>−</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>+</td>
<td>−</td>
</tr>
<tr>
<td>Gains from USD appreciation and no losses from depreciation of any other currency</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>No correlation with any currency movements</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
ABC firm, a hypothetical Singapore-based company, sells its products in Regional Country X. It sells 1,000 units of a good, priced at X$400 per unit, to be delivered and with payment to be received in three months. The goods cost S$95 per unit with payment of S$95,000 to the supplier to be made in three months. The current spot exchange rate is S$1 to X$4. ABC firm is considering whether to enter into a foreign exchange forward (“FX Forward”) to manage its foreign currency risk. If so, the firm would agree to sell X$400,000 at an exchange rate of S$1 to X$4.02 in three months.\(^9\)

Figure O1 highlights that the benefits of hedging could well outweigh the costs, especially in an environment of rising currency volatility. Hedging helps to stabilise earnings by mitigating the potential adverse effects of currency movements on firms’ profitability and balance sheets.

\[\text{Figure O1} \quad \text{The Use of an FX Forward to Manage Foreign Currency Risk}\]

<table>
<thead>
<tr>
<th>Without Hedging</th>
<th>With Hedging</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Losses if regional currency depreciates</strong></td>
<td><strong>Stable profits even with currency volatility</strong></td>
</tr>
<tr>
<td>Regional Currency Appreciates 10%</td>
<td>Regional Currency Appreciates 10%</td>
</tr>
<tr>
<td>$$111,111$</td>
<td>$$100,000$</td>
</tr>
<tr>
<td>$$0$</td>
<td>$$0$</td>
</tr>
<tr>
<td>$$95,000$</td>
<td>$$95,000$</td>
</tr>
<tr>
<td>$$16,111$</td>
<td>$$5,000$</td>
</tr>
</tbody>
</table>

\[^9\]This assumes that the firm hedges the full X$400,000 of revenue. In reality, firms can choose to hedge their exposures partially. The rate at which FX forwards are priced can vary due to many factors including, inter alia, expectations of future currency movements, interest rate differentials, the liquidity of the underlying currencies, and the maturity of the contract.
4 Singapore Household Sector

Macroprudential measures introduced in the last few years have helped to curb rising household leverage. On aggregate, household balance sheets have remained firm and defaults on consumer loans have been low.

Nonetheless, the anticipated interest rate normalisation, coupled with headwinds in the external outlook and slower growth in the domestic economy, poses some risks to the household sector. While most households have been prudent and would be able to service their housing loans and other debt obligations, some highly-leveraged households could encounter difficulties. More borrowers are missing their unsecured credit payments, and credit card charge-off rates have increased.

Households should continue to exercise prudence, review their debt obligations and financial health, and build up financial buffers where appropriate. Borrowers who require assistance in paying down unsecured debt should seek help from the various assistance schemes and consider the repayment plans available. For some households, paying down their mortgages could help avoid a build-up of interest payments that could lead to spiralling debts and an unsustainable debt servicing burden.

Household Balance Sheets — Resilient but with Pockets of Risk

Growth in household net wealth has slowed

Household net wealth (defined as household assets less household debt) has continued to grow but at a slower pace. The y-o-y growth in household net wealth rebounded immediately after the GFC to 10% on average between 2010 and 2013, and moderated to an average of 2.6% y-o-y over the past year. Household net wealth stood at $1.5 trillion in Q3 2015, almost four times GDP (Chart 4.1).

Source: Department of Statistics (DOS)
Note: Household net wealth is the difference between household assets and household debt. Data for 1997 – 2007 is as at Q4.
The continued moderation in residential property prices has tempered the growth in household wealth. On an aggregate basis, property assets ($828 billion in Q3 2015) accounted for 46% of total household assets, while the share of financial assets has edged up to 54% in Q3 2015 from 53% in Q3 2014. Aggregate cash and deposits continue to exceed total household liabilities (Chart 4.2).

Overseas property transactions by Singapore households moderated further in H1 2015. The value of overseas property purchases by Singaporeans transacted by real estate agencies in Singapore declined to $0.4 billion in H1 2015 from $1.1 billion in H1 2014 (Chart 4.3). This suggests that Singaporeans are adopting a more cautious attitude towards such investments.

While the weakening of some regional currencies vis-à-vis the SGD may lower the cost of investing in overseas properties, households should be mindful of the additional risks associated with investing in overseas property markets. In particular, currency fluctuations could affect the value of their debt obligations and their rental returns. Potential oversupply problems in overseas property markets could exacerbate the risk of significant price falls and capital losses to investors.

Households should continue to carry out due diligence before making any property investments, including for overseas properties.

Aggregate household indebtedness has moderated...

Household debt has continued to moderate as macroprudential measures introduced to curb rising household indebtedness work through the system. The growth in household debt slowed to 2.9% y-o-y in Q3 2015, down from an average of 8.7% over the last five years. Household debt-to-GDP increased by nearly 4
percentage points per annum between 2011 and 2013, but has since stabilised at its long run average (since 2000) of about 75%. The household debt-to-income (DTI) ratio has stayed at 2.2 times since 2013, after edging up from 1.9 times in 2008 (Chart 4.4).

The growth of housing loans (from FIs) has declined to 4.8% y-o-y in Q3 2015, from 6.5% y-o-y a year ago. The credit risk profile of households has also improved. Most housing loans have loan-to-value (LTV) ratios of 80% or lower; a negligible share of housing loans is in negative equity.

Likewise, the growth of other household debt has moderated (Chart 4.5). In particular, motor vehicle loans have declined by an average of 10% y-o-y over the last three years. The growth in credit card loans peaked at 16% y-o-y in Q3 2012, but has since turned negative in Q2 2015.

Based on data from Credit Bureau Singapore (CBS), the growth in outstanding unsecured credit extended by FIs has slowed from 14% y-o-y in June 2012 to 2% y-o-y in June 2015. In fact, rollover balance per cardholder fell 5% in Q3 2015 compared to a year ago (Chart 4.6).

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94Rollover balance is defined as the amount of the outstanding balance that is not paid in full within the billing month.
...but slower economic growth and rising interest rates could weigh on household balance sheets

As interest rates normalise, households’ mortgage and other debt service payments are likely to increase. Higher borrowing costs could be a strain for some households, especially if their incomes were to be adversely affected by external shocks or slower domestic growth.

Household Debt — Pockets of Risk in Housing Loans and Unsecured Credit

Most households should be able to manage their debt servicing burdens

Most households have been prudent and their debt servicing burdens would remain manageable under stress (See Box P “Cents and Sensibility: Mortgage Rate Scenarios and Implications for Households’ Debt Servicing”).

MAS’ Total Debt Servicing Ratio (TDSR) framework has helped to improve the risk profile of new borrowers. Almost all new housing loans granted since the introduction of TDSR fall within the 60% threshold. The proportion of new housing loans with TDSR of less than 40% increased to 40% in Q3 2015, from 37% in Q4 2013.

The bulk of outstanding housing loans (73% as at Q3 2015) are for owner-occupation, and housing loan defaults remain infrequent, with the NPL ratio at 0.4% in Q3 2015.

A small group of highly-leveraged households will take time to pay down housing loans

Nevertheless, a small group of borrowers with high debt-servicing burdens has remained. MAS estimates that 5-10% of households have debt-servicing ratios above 60%. This number is expected to decline as households pay down their loans, but it will take time.

The unsecured credit situation remains sound on the whole, although more borrowers have missed payments

The unsecured credit situation remains sound on the whole. While the ratio of outstanding credit card balances to GDP has grown with increasing card usage, the ratio of rollover balances to GDP has remained low at about 1.4%. Further, the share of revolvers has fallen from 38% at the end of 2011 to 35% in September 2015.\(^95\) The decline is reflected across cardholders in all age groups (See Panel 4A “Credit Card Indicators”).

Nonetheless, some households are facing difficulties paying off their unsecured debts. Interest rates on unsecured credit are significantly higher than that of housing loans and outstanding balances could build up quickly unless the debt is paid off or restructured.

Credit card charge-off rates, which had remained largely stable since 2010, increased to 6.2% in Q3 2015, from 5.4% a year ago (Chart 4.7).\(^96\)

\(^{95}\) Revolvers refer to credit cardholders who do not pay in full their outstanding credit card balances.

\(^{96}\) Charge-off rates refer to bad debts written off expressed as a percentage of total rollover balances.
The number of individuals who had missed two months or more of their unsecured debt payments rose from 80,390 (5.0% of unsecured credit customers) in September 2014 to 94,950 (5.8%) in September 2015.

However, MAS estimates that the number of borrowers with high outstanding unsecured debt (i.e. outstanding unsecured debt exceeding 24 times of monthly income) has nearly halved, from 32,000 in February 2015 to 18,000 in September 2015.

MAS encourages borrowers to work actively with their FIs to restructure their unsecured debts if they need help with managing their debt repayments.

**Households should stay financially prudent and seek help where necessary**

MAS has taken measures to encourage financial prudence among households and promote sound lending practices by FIs. These measures have helped to moderate the growth in consumer borrowing and improve the risk profile of housing loans.

Households should continue to exercise prudence, review their debt obligations and financial health, and build up financial buffers where appropriate. Borrowers who need assistance in paying down their unsecured debt are encouraged to seek help from their FIs or Credit Counselling Singapore (CCS) who are able to offer various assistance schemes and repayment plans.
Panel 4A  Credit Card Indicators

The ratio of rollover balances to GDP has remained low despite increased credit card usage. Furthermore, the proportion of revolvers has declined since 2011.

Similarly, the shares of revolvers and frequent revolvers have declined across age groups in recent years.

Source: MAS
Source: CBS
Note: Revolvers refer to credit cardholders who do not pay in full their outstanding credit card balances.

Note: Frequent revolvers refer to those who have not paid their outstanding balances in full for at least three consecutive months.
Housing loans account for three-quarters of total household liabilities and could be a significant source of risk for some households. This box examines how the mortgage servicing burden (monthly payment as a share of total income) of households could be affected when interest rates normalise and borrowing costs increase.

Measures introduced by MAS over the past few years to promote financial prudence have discouraged excessive borrowing and helped ensure that financial buffers are in place. Households are generally prudent, and housing loan payments — a significant expenditure for many families — would remain manageable relative to household incomes for most households should mortgage rates rise significantly.

Nonetheless, pockets of risk remain: households that have leveraged up to purchase more expensive homes and those that have taken on multiple loans to finance investment properties may face stresses when mortgage rates increase. Households should review their debt obligations and take steps to build up adequate financial buffers.

**Mortgage rates have risen in the first ten months of 2015 and are expected to continue to rise**

The three-month SGD SIBOR (3M SGD SIBOR) — the most common reference rate for housing loans — has risen by about 60bps since end-2014, reaching about 1.1% as of mid-November 2015 (Chart P1). Market participants expect the 3M SGD SIBOR to continue its upward trend as interest rates normalise.

**Mortgage servicing burden would remain manageable for most households in stress scenarios**

The majority of housing loans offered by FIs in Singapore are floating-rate packages. Survey data from key mortgage lenders indicates that some 65% of housing loan packages were pegged to SIBOR/Swap Offer Rate (SOR) as at Q3 2015, with another 20% pegged to bank board rates (which are adjustable) and the remaining 15% were mostly housing loan packages with mortgage rates fixed for the first few years of the loan. Floating-rate packages were particularly attractive just after the GFC when interest rates
globally and in Singapore were declining.

Based on survey data for H1 2015, most households that took up housing loans from FIs had above-median household incomes and were financing purchases of private homes. At prevailing mortgage rates of around 2% per annum, the mortgage servicing burden would be comfortable for most households. However, this could change as mortgage rates rise.

MAS’ simulations indicate that the higher mortgage servicing burden would remain manageable for the median household within each income band should mortgage rates rise by 300bps (Chart P2(a)). In a more adverse stress scenario, where household incomes decline by 10% on top of a 300bps rise in mortgage rates, the median household within each income band would still be able to service their housing loans.

<table>
<thead>
<tr>
<th>Income: ≤S$7,000</th>
<th>Income: S$7,001 – S$12,000</th>
<th>Income: &gt;S$12,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current mortgage rates</td>
<td>S$1,250</td>
<td>S$2,250</td>
</tr>
<tr>
<td>300bps increase</td>
<td>S$1,730</td>
<td>S$3,100</td>
</tr>
</tbody>
</table>

**Average mortgage servicing burden remains manageable for most households**

**Pockets of risk: Below median household income financing private housing loans**

**Chart P2**

**Monthly Mortgage Repayment by Income Bands under Various Mortgage Rate Scenarios**

(a) For Private and Public Housing

- Current mortgage rates
- 300bps increase

**For Private Housing**

- Current mortgage rates
- 300bps increase

Source: MAS estimates, Housing Loans Survey

Note: Survey data covers new and refinanced residential property loans for H1 2015. Simulations are done using the median loan quantum and income for borrowers within each income band.

There are pockets of risk however: some highly-leveraged households could be vulnerable

However, certain segments of households that are highly-leveraged could be at risk when mortgage rates rise significantly. One group of vulnerable households is those with below-median household income (i.e. less than S$7,000) that took up loans to purchase private housing (Chart P2(b)). For these households with a mortgage servicing burden exceeding 40% at inception, a 300bps increase in mortgage rates coupled with a 10% reduction in income could push their mortgage servicing burden beyond 60%. Their total debt servicing burden could be even higher if they also have car loans and credit card debt.
Another group of borrowers that might be at risk is households with multiple housing loans for investment properties, especially if they are relying on rental income to service their housing loans. Weakening rental markets and rising mortgage rates would impose additional financial stress on these households.97

**Households are taking steps to mitigate risks from rising mortgage rates**
Recent data shows that more borrowers are opting for fixed-rate loan packages that result in a more predictable monthly mortgage payment.98 Many borrowers are also comparing loan packages across banks when they refinance.99 As more households switch to fixed-rate loan packages, household balance sheets could be less vulnerable to a rise in mortgage rates. However, as fixed-rate loan packages offer fixed mortgage rates for only the first few years of the loan, households will still face higher mortgage repayments eventually if interest rates continue to rise, unless they pay down their debt.

Some households are pre-paying their housing loans to avoid higher interest costs and monthly repayments. Floating-rate packages typically allow for pre-payment without penalty. The interest savings could be substantial. For instance, a lump sum pre-payment of 5% on an S$800,000 loan at 5% per annum and a loan tenure of 25 years would reduce monthly repayment by about S$230 (Chart P3) and yield net interest savings of about S$30,150 (Chart P4). The interest savings are equivalent to about 75% of the pre-payment amount. The higher the mortgage rates and the larger the pre-payment, the higher the interest savings. Early pre-payment of housing loans strengthens household balance sheets.

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**Early pre-payment reduces monthly repayment (especially at higher mortgage rates)…**

**…and yields substantial interest savings**

---

**Chart P3**

**Monthly Mortgage Repayment Under Various Pre-payment and Mortgage Stress Scenarios**

<table>
<thead>
<tr>
<th></th>
<th>Current mortgage rates</th>
<th>100 bps</th>
<th>200 bps</th>
<th>300 bps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual</td>
<td>4,680</td>
<td>4,440</td>
<td>4,210</td>
<td>3,980</td>
</tr>
<tr>
<td>Pre-Pay 5%</td>
<td>3,980</td>
<td>3,740</td>
<td>3,510</td>
<td>3,280</td>
</tr>
<tr>
<td>Pre-Pay 10%</td>
<td>3,280</td>
<td>3,040</td>
<td>2,810</td>
<td>2,580</td>
</tr>
<tr>
<td>Pre-Pay 15%</td>
<td>2,580</td>
<td>2,340</td>
<td>2,110</td>
<td>1,880</td>
</tr>
</tbody>
</table>

**Chart P4**

**Interest Savings Under Various Pre-payment and Mortgage Stress Scenarios**

<table>
<thead>
<tr>
<th></th>
<th>Pre-Pay 5%</th>
<th>Pre-Pay 10%</th>
<th>Pre-Pay 15%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Mortgage Rates</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 bps</td>
<td>10</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>200 bps</td>
<td>20</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>300 bps</td>
<td>30</td>
<td>60</td>
<td>90</td>
</tr>
</tbody>
</table>

Source: MAS estimates
Note: Simulation assumes a borrower with a loan quantum of S$800,000 and a loan tenure of 25 years.

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97Based on URA’s data, rentals in the private residential property market have declined by a cumulative 6.7% since the peak in Q3 2013.
98Business Times (September 2015), “Higher Repayments Ahead for Home Loans”.
99Key mortgage lenders have reported that the value of housing loans that were refinanced from other banks doubled in the first nine months of 2015 compared to the same period in 2014. Some borrowers could have also undergone refinancing/repricing of their home loan packages with the same bank.
Households should continue to exercise prudence and build up financial buffers

Households should review their debt obligations and financial health as the interest rate cycle turns. Most households have been prudent, and their monthly repayments remain manageable even if interest rates were to rise by up to 300bps, coupled with a less buoyant income outlook.

However, some households will be at risk. For these households, paying down their mortgages could help avoid a build-up of interest payments that could lead to spiraling debt and unsustainable debt servicing burdens. Whether pre-payments or refinancing are possible or appropriate will depend on each household’s financial circumstances. Other options may include the sale of investment properties or downsizing of homes.

Meanwhile, banks should maintain prudent underwriting of housing loans. They should ensure that the mortgage fact sheets remain relevant, and work with their customers to address the risks of rising mortgage rates on new and existing housing loans. Banks should provide sufficient notice when informing borrowers of upward revisions in mortgage payments to allow borrowers time to adjust and consider their options.

Scan QR code or access link at [http://www.mas.gov.sg/Stats/dv/mc/Managing_Your_Mortgage_Payments.htm](http://www.mas.gov.sg/Stats/dv/mc/Managing_Your_Mortgage_Payments.htm) to calculate your mortgage payments under different mortgage rate scenarios. Find out how much you can save from making a partial pre-payment on your housing loan.
Private residential property prices continued to decline gradually in 2015. The cumulative 8% decline since Q3 2013 came after a more than 60% run-up from the trough in Q2 2009. Following the series of measures introduced since 2009 to stabilise the property market, risks in the sector are abating.

Nonetheless, some risks remain. While overall property prices have moderated, the decline has been uneven across different market segments. Prices remain elevated in the Outside Central Region (OCR), where around half of all private homes are located. At the same time, MAS remains vigilant to the risk that uncertainty in the timing and trajectory of interest rate increases by the US Federal Reserve and headwinds in the external outlook could trigger financial and asset market volatility that could in turn disrupt a measured and benign correction in the property market.

**Prices have continued to moderate, albeit at an uneven pace across market segments**

Property-related measures introduced by the Singapore government continued to cool the market, as reflected in the gradual moderation in prices (See Box R “Macroprudential Policies to Address Systemic Risks in the Housing Market”). Since peaking in Q3 2013, overall prices have declined an average 1% each quarter over eight consecutive quarters (Chart Q1).

The price fall was more pronounced in certain regions. For example, prices in the Core Central Region (CCR) and Rest of Central Region (RCR) have dropped 8.6% and 9.0% respectively from their previous peaks, while prices in the Outside Central Region (OCR) declined by a more modest 6.7% after a longer uptrend (Chart Q2). Prices in the OCR are still more than 30% above price levels pre-GFC.
Transaction activity has remained subdued, reflecting a mismatch in price expectations between buyers and sellers

Alongside the gradual moderation in prices, transaction volumes have declined and remained subdued across new sales, resales and sub-sales. An average of 1,200 private residential properties were transacted monthly in the first ten months of 2015, close to the 1,180 transactions recorded in 2014 over the same period (Chart Q3). The current transaction activity is less than half of that seen in the period between 2010 and 2012 — when monthly transactions surpassed 3,000 — and about 17% lower than the long-term historical average over the period 1995 to 2009 (Chart Q3). The current condition in the property market could reflect a mismatch in price expectations between sellers and buyers.

Demand-supply dynamics are likely to weigh on the property market outlook

Vacancy rates have been rising while the rental market has softened. Since 2013, vacancy rates have risen from 5.2% to 7.8% while rentals declined by 6.7% (Chart Q4). While some investors are able to hold out for capital gains or desired rentals, others with smaller financial buffers could face difficulties if they are relying on rental income to service housing loans on their investment properties. Market watchers expect rentals and vacancies to be under pressure as the market adjusts to the impending supply of new housing units coming on stream.

The starting point of the current property cycle was one of significant supply shortfall in completed units which is only now being addressed through the pipeline of constructed units. As of Q3 2015, some 60% of the 58,350 private residential units projected to come on stream in the next five years have already been sold (Chart Q5). The remaining 40% includes units that have not yet been launched for sale and units that have not commenced construction. Assuming a relatively mild take-up rate of new units equal to that seen in the preceding four quarters, it would take an estimated three years to clear the projected supply (Chart Q6). This is broadly in line with the long-term average and significantly lower than the peak of more than ten years during the GFC in Q1 2009.
Vacancy rates have been rising

Chart Q4
Vacancy Rates for Private Residential Property

Most of the units coming on-stream have been sold...

Chart Q5
Pipeline Supply of Sold and Unsold Private Residential Units

...and the time needed to clear the pipeline supply remains below the peak in 2009

Chart Q6
Number of Years Taken to Clear Unsold Units Based on New Sales

While property prices have declined at a measured pace with softening transaction activity, the risk of a sharper-than-warranted correction in the property market cannot be discounted. A culmination of adverse headwinds in the external outlook and surprises in the timing and trajectory of interest rate increases by the US Federal Reserve could prompt knee-jerk reactions by market participants and foment volatility in financial and asset markets. This could in turn disrupt a benign and orderly correction in the property market.

At the same time, as funds continue to flow into asset markets, property prices in regional markets remain buoyant (Chart Q7). Hence, even as the domestic property market moderates, MAS continues to remain watchful for signs of renewed froth on the back of still-elevated prices.
Monetary Authority of Singapore

Banking system remains resilient to risks arising from the property market

The y-o-y growth in outstanding housing loans continued to moderate, from 6.8% in January 2015 to 4.5% in September 2015 (Chart Q8). The value of new housing loans has declined from an average S$3.2 billion per month in 2013, to S$2.4 billion per month since 2014. Housing loans accounted for 16% of the banking system's non-bank loans in September 2015, compared to 18% in November 2012.

The risk profile of housing loans has improved. For instance, the share of new private housing loans with LTV ratios above 70% fell from 77% in Q2 2010 to below 60% in Q3 2015. The average tenure of new private housing loans has also declined, from 30 years in 2012 to 25 years in Q3 2015. Borrowers with multiple loans accounted for 20% of all new housing loans as of Q3 2015, compared to 30% in 2011.

The rise in mortgage rates, while manageable for the large majority of households, poses a repayment risk for a small number of more highly-leveraged households (See Box P “Cents and Sensibility: Mortgage Rate Scenarios and Implications for Households’ Debt Servicing”). Housing loan NPL ratios have seen a slight uptick since Q1 2014, but remained very low at 0.4% in Q3 2015 (Chart Q9). Mortgage loans that were more than 30 days in arrears have also risen marginally but remained low at about 1% (Chart Q10). The banking system is able to withstand a stress scenario that included a sharp correction in property prices.
Growth in housing loans has moderated

Chart Q8
Housing Loan Growth

Source: MAS

Housing loan NPL ratios remain low

Chart Q9
Housing Loan NPL Ratios

Source: MAS

Delays in housing loan payments have ticked up but still remain low

Chart Q10
Housing Loans That are More than 30 Days in Arrears

Source: CBS

Continued vigilance is necessary in light of the opposing risks of (i) renewed froth and (ii) over-correction in the property market

The measured decline in property prices so far suggests a benign scenario with property prices settling at sustainable levels over time. MAS will remain vigilant for signs of renewed froth in the property market on the back of still-elevated prices in certain market segments. At the same time, uncertainties in the financial markets and headwinds in the external outlook could add to risks of a sharper-than-warranted price correction, with spill-overs to the banking sector and economy. MAS will continue to monitor the property market carefully for risks to financial stability and take appropriate measures to maintain a stable and sustainable market.
Property market stability is closely linked to macroeconomic and financial stability in Singapore. Property is the largest component of household wealth, representing close to half of households’ assets and three quarters of households’ liabilities. In addition, banks have significant exposures to property—property-related lending accounts for about 28% of the banking system’s non-bank loans and many loans are collateralised by property.

Singapore has taken a multi-pronged approach—a combination of demand-side (including lending and tax measures) and supply-side measures (e.g. government land sales)—to mitigate macroprudential risks from unsustainably high and rising housing prices. This box examines how these macroprudential measures have helped to contain systemic risks in the residential property market.

**Singapore property market measures date back to the 1990s**
The Singapore government announced a package of property market measures in 1996 after the private residential property price index (PPI) more than doubled between 1990 and 1996. Seller’s Stamp Duty (SSD) and an income tax on gains were applied to sales of property within three years of purchase. An LTV limit of 80% was introduced for housing loans. Foreigners were prohibited from taking on SGD loans for property purchases. Land supply for property development was also increased. The measures had an immediate effect in cooling the property market. The PPI fell by about 16% between Q2 1996 and Q4 1997.

Measures to cool the property market were eased following the onset of the AFC when the PPI hit a trough in Q4 1998. The Singapore government introduced stamp duty concessions, including allowing buyers to delay paying stamp duties until their properties were completed. In 2003, the income tax on gains was lifted and foreigners were allowed access to SGD property loans. The LTV limit was raised to 90% and the minimum cash down payment reduced from 10% to 5% in July 2005.

**New round of cooling measures post-GFC**
When the property market began to show signs of an unsustainable upswing from mid-2009, a mix of lending and tax measures were progressively introduced and tightened to stabilise the market. The LTV limit was lowered to 80% and progressively tightened for corporates and borrowers with multiple loans. Loan tenures were capped in October 2012. In June 2013, the TDSR was introduced for all property loans to promote financial prudence among borrowers and strengthen credit underwriting practices by FIs. A seller’s stamp duty was introduced in 2010 to discourage speculative selling of properties, followed by

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100 An earlier version of this box appeared as an article in the South East Asian Central Banks (SEACEN) financial stability journal. Wong et al., SEACEN Financial Stability Journal (May 2015), “Using Macroprudential Tools to Address Systemic Risks in the Property Sector in Singapore”.

101 DOS Database, “Household Sector Balance Sheet”.

102 Property-related lending refers to lending to both the housing and B&C sectors.

103 The SSD imposes higher tax rates for sales within a shorter period after purchase. SSD rates are 16% for buyers selling their residential property within the first year after purchase, 12% within the second year, 8% within the third year, and 4% within the fourth year.
an Additional Buyer’s Stamp Duty (ABSD) in 2011 to curb over-investment in property. The Singapore
government also increased land supply for property development to meet the demand for housing.
Between Q4 2013 and Q3 2015, the PPI declined by a cumulative 8%. Monthly property transaction
volumes and new housing loans have also fallen.

A model of the drivers and transmission channels in Singapore’s private residential property market
To assess the effectiveness of macroprudential policies, we developed a model of the drivers and
transmission channels in Singapore’s residential property market. Figure R1 highlights the dynamic
linkages among the key primary variables in the model, i.e. property transactions, property prices, and
mortgage loans. These primary variables are in turn driven by policy variables (e.g. lending and tax
measures) as well as other demand and supply drivers in the market.

Figure R1
Interlinkages in Singapore’s Private Property Market

Source: MAS

The relationships and transmission channels are set out in three underlying equations (Table R1).
Regressions of these equations are estimated using data between Q3 2002 and Q2 2014. The ABSD was implemented in December 2011 and enhanced in January 2013, with tax rates tiered by the number of residential property purchases and nationality of the purchaser: (i) 15% for foreigners and non-individuals; (ii) 5% for Singapore Permanent Residents (PRs) buying their first property and 10% for PRs buying a second and subsequent property; and (iii) 7% for Singapore citizens buying their second property and 10% for Singapore citizens buying their third and subsequent property.

The data sources include MAS, URA, DOS and various databases such as Bloomberg and CEIC.
The model estimates indicate that the primary variables of the property sector — property transactions, property prices and mortgage loans — have statistically significant relationships and move in the same direction. These findings are in line with the existing literature. For example, higher property prices would increase household wealth, which in turn drives consumption demand, including property purchases. Higher property prices and transaction volumes would translate into a higher volume of mortgage loans. Conversely, mortgage loans are an important driver for property transactions and property prices as financing is required for property purchases.

The model includes other economic and financial factors — GDP per capita, interest rates, trends in other asset markets, and prices of product substitutes like foreign property. GDP per capita is an indicator of income and is a fundamental driver of housing demand. Higher interest rates reduce housing demand by raising borrowing costs. Equity prices capture wealth effects of households as well as general market sentiment. Foreign investors searching for yield also contribute to property demand. Their investment decisions are influenced by the relative prices of Singapore property vis-à-vis foreign properties.

**Macroprudential measures affect the level of mortgage loans, property transactions, and property prices**

Regression results based on MAS’ model indicate that lending measures, i.e. LTV limits and the TDSR framework, directly constrain mortgage loans and impact property transactions and prices through the credit channel.

Tax measures, i.e. SSD and ABSD, are found to reduce property transactions, with attendant effects on property prices and mortgage loans.

The government land sales programme is found to impact property prices, with spill-over effects on property transactions and mortgage loans.

106 The standard errors for the equations range from 5% to 28%.
107 Dummy variable 1 accounts for the jump in collective sales (where a single buyer purchases a group of housing units in order to redevelop the land on which the housing units are situated) between Q2 2005 and Q3 2007. The rules for collective sales were tightened in October 2007, leading to a significant decline in collective sales thereafter.
108 Dummy variable 2 accounts for an increase in mortgage equity withdrawal loans between Q2 2010 and Q2 2011. The rules for mortgage equity withdrawal loans were tightened in July 2011, leading to a significant decline in mortgage equity withdrawal loans thereafter.

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**Table R1**

<table>
<thead>
<tr>
<th>Equation</th>
<th>Primary Variable</th>
<th>Function of the respective drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Property transactions</td>
<td>Property price, Mortgage loans, Foreign property price, Tax measures, GDP per capita, Dummy variable 1</td>
</tr>
<tr>
<td>2</td>
<td>Property price</td>
<td>Mortgage loans, Property transactions, Equity price, Land supply</td>
</tr>
<tr>
<td>3</td>
<td>Mortgage loans</td>
<td>Property transactions, Property price, Interest rate, Lending measures, Dummy variable 2</td>
</tr>
</tbody>
</table>

Source: MAS
Tax measures had the most impact on property transactions and prices, while lending policies dampened growth in mortgage loans and improved the risk profile of borrowers

We use the model to assess and compare the effectiveness of the property market measures by simulating counterfactual scenarios had these measures not been implemented.111

Our analysis shows that the cooling measures helped dampen momentum in the market. Property transactions, property prices and mortgage loans could have been higher by as much as a third had the various measures not been implemented (Chart R1).

Tax measures had a larger impact on property transactions and property prices than lending and land supply measures. The SSD reduced sub-sales significantly, whereas the ABSD raised the hurdle rate of return for property investors.112 The share of private residential property purchases by foreigners, which peaked at close to 20% of total transactions in Q4 2011, fell sharply after the implementation of the ABSD.

Supply-side (land) measures had an empirically significant impact on house prices, even though these measures took the form of announcements of land supply for housing units which would be completed only much later. In other words, the signalling effects of land supply announcements were important.

MAS’ lending measures operated largely by tempering the growth of housing loans, with y-o-y growth moderating from a peak of 23% in August 2010 to about 5% in September 2015. The lending measures also improved the risk profile of borrowers. Borrowers with multiple loans accounted for 20% of all new housing loans as of Q3 2015, down from 30% in 2011.

111 The model is subject to further refinement, which may affect the estimated impact of the policy variables.
112 The hurdle rate is the minimum rate of return on an investment required by an investor.
Property prices, property transactions and mortgage loans would have been higher if property measures had not been implemented

Chart R1
Estimated Impact of Macroprudential Policies on Property Price, Property Transactions and Mortgage Loans in Counterfactual Scenarios

(a) Property Price in Q2 2014
(b) Property Transactions from Q1 2010 to Q2 2014
(c) Mortgage Loans from Q1 2010 to Q2 2014

A multi-pronged approach can help mitigate risks in the property market

The results illustrate the benefits of having a wide range of macroprudential policy tools to target specific risks posed by the private residential property sector. Lending measures work by mitigating the procyclical feedback loop between housing credit on one hand, and property transactions and property prices on the other. In contrast, tax measures and land supply impact property prices more directly. Further, the signaling impact of policy announcements could be significant and should not be ignored. These results are the outcome of a preliminary study of the effectiveness of the property-related measures introduced over the recent years. MAS will continue to carry out impact studies, including with more disaggregated and longer time series data.

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113The counterfactual scenarios estimate the impact on property prices, transactions and mortgage loans under the assumption that different combinations of the property measures introduced from Q1 2010 to Q2 2014 had not been implemented. The sensitivity ranges are simulated based on ± standard errors adjustments to the coefficients of policy variables in Table R1. Sensitivity ranges show a wider dispersion when results account for the volatilities of more than one policy variable.