November 2019
Macroprudential Surveillance Department
Economic Policy Group
Monetary Authority of Singapore
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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 groupings are used:

- “Emerging Asia” comprises Asian economies such as China (CHN), Hong Kong (HKG), India (IND), Indonesia (IDN), South Korea (KOR), Malaysia (MYS), Singapore (SGP) and Thailand (THA).
- “Eurozone” comprises Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Slovakia, Slovenia and Spain.

Abbreviations used for financial data are as follows:

- Currencies: Singapore Dollar (SGD), US Dollar (USD)

Other Abbreviations:

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<td>ATM</td>
<td>Automated Teller Machine</td>
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<td>BIS</td>
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<td>DDRS</td>
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<tr>
<td>D-SIB</td>
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<td>EBIT</td>
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<td>EBITDA</td>
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<td>Financial Vulnerability Index</td>
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<td>GaR</td>
<td>Growth-at-Risk</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>Global Financial Stability Report</td>
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<td>ICR</td>
<td>Interest Coverage Ratio</td>
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<td>IIF</td>
<td>Institute of International Finance</td>
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<td>IMF</td>
<td>International Monetary Fund</td>
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<td>IT</td>
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<td>Industry-Wide Stress Test</td>
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<td>LBS</td>
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<td>LCR</td>
<td>Liquidity Coverage Ratio</td>
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<td>Loan-to-Deposit</td>
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<td>LTV</td>
<td>Loan-to-Value</td>
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<td>M&amp;OE</td>
<td>Marine and Offshore Engineering</td>
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<td>Monetary Authority of Singapore</td>
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<td>MOM</td>
<td>Ministry of Manpower</td>
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<td>MSD</td>
<td>Macroprudential Surveillance Department</td>
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<td>MSR</td>
<td>Mortgage Servicing Ratio</td>
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<tr>
<td>NEER</td>
<td>Nominal Effective Exchange Rate</td>
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<tr>
<td>NIM</td>
<td>Net Interest Margin</td>
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<tr>
<td>NPL</td>
<td>Non-Performing Loan</td>
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<tr>
<td>OCR</td>
<td>Outside Central Region</td>
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<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
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<td>OIF</td>
<td>Offshore Insurance Fund</td>
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<tr>
<td>OTC</td>
<td>Over-the-counter</td>
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<td>PR</td>
<td>Permanent Resident</td>
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<td>q-o-q</td>
<td>Quarter-on-Quarter</td>
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<tr>
<td>RCR</td>
<td>Rest of Central Region</td>
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<tr>
<td>RHS</td>
<td>Right Hand Side</td>
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<td>ROA</td>
<td>Return on Assets</td>
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<td>SAAR</td>
<td>Seasonally Adjusted Annual Rate</td>
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<td>SBF</td>
<td>Singapore Business Federation</td>
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<td>SGX</td>
<td>Singapore Exchange Limited</td>
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<td>SIBOR</td>
<td>Singapore Interbank Offered Rate</td>
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<td>SME</td>
<td>Small and Medium-sized Enterprise</td>
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<tr>
<td>SSD</td>
<td>Seller’s Stamp Duty</td>
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<tr>
<td>TDSR</td>
<td>Total Debt Servicing Ratio</td>
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<tr>
<td>TSC</td>
<td>Transport, Storage and Communications</td>
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<tr>
<td>URA</td>
<td>Urban Redevelopment Authority</td>
</tr>
<tr>
<td>y-o-y</td>
<td>Year-on-Year</td>
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<td>YTD</td>
<td>Year-to-date</td>
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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 analyses and results are published in the annual Financial Stability Review (FSR). The FSR aims to contribute to a better understanding of issues affecting Singapore’s financial system among market participants, analysts and the public.

Section 1 of the FSR provides a discussion of the risks in the external environment. This is followed by an analysis of the Singapore corporate and household sectors in Sections 2 and 3 respectively. A review of the financial sector is then provided in Section 4. The final section features in-depth analysis on various topics in financial stability.

The production of the FSR was coordinated by the Macroprudential Surveillance Department (MSD) team that comprises Lily Chan, Evelyn Chen, Fan Jia Rong, Cheryl Ho, Koh Zhi Xing, Kong Yu Chien, Kwek Kiat Cong, Wendy Lee, Aloysius Lim, Kalena Lim, Rosemary Lim, Lim Yong Long, Low Yen Ling, Orchi Modhurima, Satish Nagdev, Ng Heng Tiong, Desmond Ong, Alex Phua, Edward Robinson, Moses Soh, Tan Aik Khim, Andrew Tan, Teoh Shi-Ying, Andrew Wilfred, and Wong Siang Leng. The FSR also incorporates contributions from Banking Department II, Data Analytics Department, Economic Analysis Department, Insurance Department, Monetary & Domestic Markets Management Department, Prudential Policy Department and Technology & Cyber Risk Supervision Department, Baskar Chinniah, and Harshitha Gooty. The FSR reflects the views of the staff of MSD and the contributing departments.

The FSR may be accessed in PDF format on the MAS website:
OVERVIEW

Global financial stability risks have risen amid several headwinds.

Risks to global financial stability have risen against a challenging macroeconomic backdrop. First, the global economy is still experiencing a synchronised slowdown and the outlook is characterised by continuing uncertainty reflecting ongoing trade and geopolitical tensions. Second, many major economies have faced persistently low or negative interest rates, with financial conditions expected to remain accommodative. This in turn has fuelled rising indebtedness, particularly among non-financial corporates. In light of weak revenue growth prospects, further downsides to the current challenging macro-environment could undermine the sustainability of such debt. Third, financial institutions (FIs) and investors have taken on higher risks to achieve their target returns. The result of such search for yield has been an increase in capital inflows into Emerging Market Economies (EMEs), raising the sensitivity of their domestic financing conditions to global shocks.

Domestic financial conditions have been accommodative.

This year, MAS has augmented its financial stability surveillance toolkit with three measures – the Financial Conditions Index (FCI), the Financial Vulnerability Index (FVI) and Growth-at-Risk (GaR) (see Special Study 1 “Financial Conditions Index, Financial Vulnerability Index and Growth-at-Risk for Singapore”). The FCI is a composite price-based measure to assess current domestic financial conditions, that incorporates information from various market indicators, including exchange rates, interest rates, and asset prices. Conversely, the FVI is a quantity-based measure used to monitor current financial vulnerabilities relative to their historical levels by incorporating indicators across the various domestic sectors. Together, these two measures interact to determine the state of financial stability, with the consequent implications for the distribution of future economic prospects reflected through the GaR measure.

MAS’ FCI analysis shows that domestic financial conditions have been accommodative, which should facilitate access to financing and support credit growth. However, persistently accommodative conditions could also induce a build-up in vulnerabilities over the medium term.

Corporates, households and banks in Singapore remain resilient amid a challenging environment.

The FVI provides an assessment of various vulnerability indicators across the domestic sectors. Overall, corporates, households and banks in Singapore remain resilient and the corresponding FVIs for the respective segments were generally unchanged on a year ago basis (see table on next page).
Corporate leverage remained stable, albeit at elevated levels. The financial positions of corporates in trade-related sectors have weakened amid slowing earnings growth in a more challenging external environment, while those in domestic-oriented sectors have stayed relatively stable. While there has been increased leverage risk owing to a build-up of debt against a backdrop of conducive financial conditions, the overall risk profile of debt has generally improved. Maturity risk has subsided as firms reduced their short-term debt, and foreign exchange risk stemming from currency mismatches remains manageable.

For households, balance sheets have strengthened alongside an increase in net wealth, with liquid assets such as cash and deposits exceeding total liabilities. Leverage risk has moderated on the back of slower growth in household debt, the latter in part due to the July 2018 property measures that led to a slower pace of housing loan growth. Shorter-term liabilities in the form of unsecured credit continued to recede following MAS’ moves since 2014 to strengthen unsecured credit rules, thus reducing household vulnerabilities to maturity risk.

Singapore’s banking system is healthy with strong capital and liquidity positions. Total credit growth has moderated to a more sustainable pace. While asset quality saw a slight deterioration in the recent quarter, banks continue to maintain ample capital buffers to cushion credit losses. Overall liquidity positions remained strong but banks’ foreign currency liquidity could face heightened pressures under stressed conditions in international markets.

The pace of aggregate resident credit growth is broadly in line with that of GDP growth, with the credit-to-GDP ratio close to its long-run trend as of Q3 2019. Hence, MAS will maintain the Countercyclical Capital Buffer (CCyB) at 0%.

**Singapore corporates, households and banks should remain vigilant, given increased uncertainties and expectations for prolonged sluggishness in global growth.**

Further uncertainty and weakness in the external environment could add pressure on corporates in the trade-related sectors and cause negative spillovers to the rest of the economy. Highly leveraged firms should continue to remain vigilant and judiciously manage cash flow positions against downside risks to revenue growth.

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1 For corporate FVI, the latest available data is as of Q2 2019.
Households that are already over-extended should be cautious in taking up new debt. While the July 2018 property cooling measures have helped to bring the property market closer to economic fundamentals, prospective buyers should be mindful of their ability to service their mortgage obligations amid uncertainty in the economic outlook.

Banks could face some pressures on net interest margins given the persistent low interest rate environment. The impact on bank profitability could be further exacerbated by ongoing weakness in the global operating environment. Accordingly, banks should continue to maintain sound credit risk management standards and practices, and ensure adequate provisioning buffers to guard against external vulnerabilities.
1 Global Financial and Economic Environment

The international financial system faces growing vulnerabilities amid several headwinds. First, the global economy is still experiencing a synchronised slowdown with an uncertain outlook because of trade and other geopolitical tensions. Second, many major economies have continued their accommodative monetary policy stance of low or negative interest rates, which has fuelled rising indebtedness. Third, these low rates have induced financial institutions and investors to take on higher risks to achieve their target returns. The result of such search for yield has been an increase in capital inflows to EMEs, raising the sensitivity of their domestic financial conditions to global shocks.

Uncertainty in the macroeconomic environment has weighed on global growth...

The continuing uncertainty in the macroeconomic environment is a source of fragility for financial systems. Lacklustre trade, manufacturing, and investment activity has dampened global growth (Chart 1.1). The trade conflict between the US and China is fuelling policy uncertainty and dampening business sentiment and investment (Chart 1.2). Going forward, the global economy faces downside risks from geopolitical developments such as a further escalation in trade tensions or an unexpectedly volatile Brexit, as well as a deeper-than-expected China slowdown.

Global financial conditions have eased further\(^2\) with declines in interest rates (Chart 1.3). Markets expect major advanced economy central banks to maintain accommodative monetary policies for longer (Chart 1.4), in response to sluggish growth and increased downside risks.

MAS’ analysis shows that domestic financial conditions have been accommodative (see Special Study 1 “Financial Conditions Index, Financial Vulnerability Index and Growth-at-Risk for Singapore”). These conditions will facilitate participants’ access to financing and support credit growth, but also have the

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potential to encourage a build-up in vulnerabilities over the medium term. MAS monitors these vulnerabilities using indicators such as the FVI, as described in the subsequent sections of this FSR.

This has fuelled a build-up in vulnerabilities through increased corporate indebtedness...

The extended low interest rate environment since the Global Financial Crisis (GFC) has contributed to rising corporate indebtedness, particularly in EMEs (Chart 1.5).

A continuation of such supportive financial conditions could encourage further borrowing by already highly leveraged corporates. The high debt levels would in turn increase the susceptibility of these firms to an unexpected earnings shock or rise in funding costs (see Special Study 2 “Assessing Corporate Resilience in Emerging Asia”). In addition, corporates in EMEs with extensive currency mismatches could also be negatively affected if the currency in which their revenues are denominated, depreciate against the currency of their debt. Such currency movements will increase risk to corporate debt servicing capability, and could in turn impair banks’ asset quality, with attendant negative impact on financial system stability.
Conversely, the low interest rate environment in major advanced economies has given emerging market central banks some policy space to lower their own rates, which will support growth and mitigate some of the effects of earnings shocks.

**...and encouraged a search for yield that has seen increased lending to weaker borrowers and boosted asset valuations...**

Loose financial conditions amid the low or negative interest rate environment have continued to spur “search for yield” investment behaviour. In addition, debt is increasingly being taken on by riskier borrowers. The markets for leveraged loans and collateralised loan obligations have grown significantly over the past decade. The proportion of loans issued to “B-” companies in the US has also hit an all-time high of almost 35% this year.³

The search for yield has at the same time supported asset prices in economies with negative interest rates over the past few years (Chart 1.6). Yet, corporates face an increasingly challenging earnings outlook in light of weakening global growth prospects (Chart 1.7). This increases the risk of a divergence between financial market valuations and the underlying performance of the real economy. Credit spreads have so far responded only modestly to rising corporate indebtedness and slowing global growth (Chart 1.8). Such a phenomenon points to the possibility that risks are being mispriced. In this environment, shocks (potentially including policy changes and geopolitical developments) that negatively shift risk sentiment could lead to a relatively sharp and disruptive adjustment in market pricing.

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Chart 1.6
Asset Returns in Selected Economies with Negative Interest Rates

- Bond
- Equity

Source: Bloomberg, Datastream, MAS estimates
Note: Returns are calculated based on Eurozone and Japan bond and equity indices.

Chart 1.7
Expectations of Corporate Earnings Growth For the Next 12 Months

- USA
- Europe
- Asia

Source: Duke Chief Finance Officers (CFO) Survey
Note: Based on a survey of CFOs, as of October 2019. China’s and Japan’s CFO Survey results were included in the Asia aggregate only until September 2007 and December 2012 respectively.
The search for yield has seen higher portfolio capital flows from advanced economies into EMEs (Chart 1.9). Foreign ownership of EME local currency bonds has generally grown since 2010 (Chart 1.10). Investors are expecting to further increase their allocations to EME equities amid growing expectations of a lower-for-longer interest rate environment (Chart 1.11).
While international portfolio capital flows have allowed EMEs to access a broader pool of savings and a more diverse pool of investors, these flows have also made EME financial conditions more sensitive to global shocks. A downturn in the global economy leading to heightened risk aversion could cause a retrenchment of funds from EMEs. For example, shifts in investor sentiment from trade tensions between the US and China in May and August this year led to capital outflows, widening Asian credit spreads and downward pressure on their currencies (Charts 1.12 and 1.13). 

EMEs, especially in Asia, have built up buffers, including through the accumulation of foreign exchange reserves, strengthening of external balances, and reduction of sovereign balance sheet currency mismatches. There is a need to ensure that financial resilience does not slip amid the uncertain macroeconomic environment characterised by low interest rates and volatile portfolio capital flows.
2 Singapore Corporate Sector

Corporate balance sheets have remained resilient overall, amid stable but elevated debt levels and slowing earnings growth. The prolonged period of depressed external demand conditions has caused some weakening in the financial positions of firms in the trade-related sector, while that of domestic-oriented businesses have stayed relatively healthy, though there was some unevenness across sectors.

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<td>Overall Corporate FVI</td>
<td>↑</td>
<td>→</td>
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<td>Leverage risk</td>
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<tr>
<td>Liquidity risk</td>
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<tr>
<td>Maturity risk</td>
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<td>↓</td>
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<tr>
<td>Foreign Exchange risk</td>
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</table>

The overall corporate FVI was stable over the last year, although it remained at an elevated level. Conducive domestic financial conditions in recent years have led to a build-up of corporate debt, resulting in increasing leverage risk over the past two years. Nonetheless, maturity risk improved over the last year as firms reduced their short-term debt, while liquidity and foreign exchange risks were largely unchanged.

MAS’ stress tests suggest that most corporates can withstand significant concurrent interest rate and earnings shocks, with balance sheets providing some buffer against headwinds. Highly leveraged firms should exercise financial prudence amid the risk of a persistent slowdown in growth and trade tensions, which could continue to weigh on corporate profitability and thus strain debt servicing ability.

Corporate balance sheets resilient amid elevated debt levels

Corporate debt-to-GDP increased slightly over the past year, from 154% in Q2 2018 to 157% in Q2 2019 (Chart 2.1). In the post-GFC low interest rate environment, the corporate sector had experienced a build-up of leverage between 2010 and 2014. Since 2015, corporate debt-to-GDP has stabilised at around 150%. The increase in leverage was mainly driven by the property and commerce sectors. These sectors accounted for around two-thirds of overall corporate debt growth between 2010 and 2019.4

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4 Estimated using data from SGX-listed firms.
Corporate earnings have declined, weighing on firms’ debt repayment ability and raising overall leverage risk.

The median return on assets (ROA) of SGX-listed firms decreased from 3% in Q2 2018 to 1.9% in Q2 2019 (Chart 2.2). The maturing of the global electronics cycle and slowdown in global growth have led to a fall in ROA in trade-related sectors, with the median ROA in the Manufacturing and the Transport, Storage and Communication (TSC) sectors declining by 0.8 percentage points and 2.1 percentage points respectively from Q2 2018 to Q2 2019. Some of the weakness in the TSC sector can also be attributed to continued earnings weakness in the Marine and Offshore Engineering (M&OE) subsector amid volatile oil price movements and low, though improving, global offshore rig utilisation rates.

In comparison, performance was more varied across the domestic-oriented sectors. While the construction sector had previously been weighed down by a prolonged contraction in construction demand, the sector expanded by 2.8% y-o-y in Q2 2019, up from the −4.3% y-o-y change in Q2 2018. In comparison, the performance of consumer-facing services remained sluggish due to falling sales volume, as reflected by the reduced profitability of the sector, with the ROA of the Commerce sector falling from 1.9% in Q2 2018 to 1.7% in Q2 2019.
Notwithstanding these developments on the revenue front, most firms should be able to service their debt obligations. MAS considers firms to be at risk of not meeting their debt obligations if their interest coverage ratio (ICR), the ratio of earnings before interest and taxes to interest, falls below two. The median ICR of listed firms remained above two in Q2 2019 (Chart 2.3) implying that for a majority of firms their earnings provide sufficient buffer to cover interest payments.

That said, deteriorating profitability and increasing leverage have weighed on the debt servicing abilities of specific sectors. The Commerce, Hotels & Restaurants, Multi-Industry, and Construction sectors saw median ICRs of below two in Q2 2019. The median firm in the Construction sector which reported their ICR, in particular, has a negative ICR. This could be due to the prolonged weakness and hence lower profitability in the sector over the past three years. The financial conditions of Construction firms are expected to improve going forward, supported by a steady pipeline of both public and private infrastructural projects, e.g. Punggol Digital District and the redevelopment of en-bloc residential sites.

Property firms are generally financially sound although some highly leveraged firms with unsold inventory could face pressures.

Property firms tend to take on higher leverage due to the capital-intensive nature of the industry, and have contributed to the increase in overall corporate leverage in the post-GFC period. The median debt-to-equity ratio for property firms was around 60% for the past few years, compared to the median of 37% for SGX-listed firms overall (Chart 2.4). However, the sector remains resilient at the firm level with property firms generally having adequate financial buffers. The median ICR for listed property firms held steady at about four times in Q2 2019, above the overall median across all corporates, suggesting that property firms remain well-placed to meet their debt obligations.

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5 Only about one-third of firms report their ICR, compared to the higher reporting rates (60–80%) for other financial ratios. This is, in part, why the median ICR for the Construction sector is negative, whereas the median ROA for the sector is positive as of Q2 2019.

6 Property firms include firms engaged in real estate management, development and REITs.
While larger developers (with total asset size above S$10 billion) tend to have higher debt-to-equity ratios compared to smaller and less-diversified developers, they also have stronger ICRs and more diversified income streams and geographical exposure.⁷

Property developers are more cautious in their bidding for land compared to H1 2018. Unsold inventory has also increased, which could weigh on developers with weaker financial ratios, especially if these units remain unsold in the medium term. However, for now, the market continues to see relatively healthy sales for selected new launches (see Box A: “Update on the Private Residential Property Market”).

That said, continued vigilance is needed. Property firms should exercise prudence, especially those that have built up high levels of leverage and hold large unsold inventory. They should take the significant increase in the upcoming supply of private housing units over the medium term into account in their business and financial planning.

The risk profile of corporate debt has improved

Maturity risk has improved, with the median short-term debt to total debt ratio of SGX-listed corporates decreasing from 47% in Q2 2018 to 40% in Q2 2019 (Chart 2.5). In particular, the property sector saw an improvement in the median short-term debt to total debt ratio from 22% in Q2 2018 to 16% in Q2 2019.

⁷ Among SGX-listed firms, larger developers had higher median debt-to-equity ratio at 78%, compared to 62% for smaller developers in Q2 2019. Nonetheless, larger developers have higher median ICRs of 4.6, compared to 3.7 for smaller developers.
The bond maturity profile of Singapore firms remains well termed out, with bonds due within the next two years making up about one-third of outstanding bonds (Chart 2.6). Of the issuers with SGD bonds maturing in the next year\(^8\), around 60% have ICRs above two and 60% have current ratios above one. Some bond issuers could come under stress and face refinancing difficulties if financial conditions tighten quickly and market conditions worsen, as experienced by the M&OE subsector in 2016–2017.

Liquidity risk remained largely unchanged over the past year with the median current ratio of SGX-listed firms decreasing slightly from 1.6 in Q2 2018 to 1.5 in Q2 2019 (Chart 2.7).

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\(^8\) Including perpetual bonds with first call dates in the next year.
MAS’ corporate stress test suggests that most corporates would be resilient to interest rate and earnings shocks, with cash reserves providing additional buffers. Under a stress scenario of a 25% increase in interest costs and a 25% decline in earnings before interest, tax, depreciation and amortisation (EBITDA), the percentage of firms-at-risk increases from 36% to 45% of all corporates, and their share of debt-at-risk increases from 19% to 45% (Chart 2.8). However, after taking net cash reserves and hedging into consideration, the share of firms-at-risk would drop to 29% and debt-at-risk to 38%.

Foreign exchange risk remains manageable.

Corporates that borrow in a currency that is different from their earnings are subject to foreign exchange risk, if these exposures are unhedged.

In Singapore, the foreign exchange risk faced by corporates remains manageable. The foreign currency bond issuance in Singapore as a proportion of total bond issuance has been declining from an average of 72% over Q3 2017 to Q2 2018, to 51% for Q3 2018 to Q2 2019. Singapore’s listed corporates are not excessively reliant on foreign currency borrowings, and have adopted hedging strategies to mitigate foreign exchange shocks. A firm-level analysis conducted in 2018 found that 62% of SGX-listed firms have natural hedges or foreign exchange (FX) derivatives in place to manage currency risks. While trade-related sectors could come under more stress arising from volatility in external

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9 Firms-at-risk refers to firms with an ICR of less than two. Debt-at-risk refers to the amount of corporate debt held by firms with an ICR of less than two.

10 For the purposes of the stress test, MAS considered that firms would use cash reserves to repay debts as long as they maintain quick ratios (ratio of current assets net of inventory to current liabilities) of at least one. Hedging was assumed to reduce the interest rate shock by 50%, as more than half the listed firms analysed reported the use of interest rate hedging instruments or took on fixed rate debt.
conditions, they are also the sectors that have a higher proportion of firms hedging these risks, with 70% of the firms in these sectors employing natural hedging or FX derivatives.

**Singapore’s corporate non-performing loan ratios were broadly stable, although those for the trade-related sectors picked up slightly.**

The Singapore banking system’s corporate non-performing loan (NPL) ratio has remained broadly stable at 2.5% in Q3 2019, compared to 2.4% in Q3 2018 (Chart 2.9). However, the NPL ratios for the trade-related sectors showed an uptick in the recent quarter. The NPL ratios for the Manufacturing and TSC sectors increased to 4.6% and 9.6% in Q3 2019, from 3.6% and 8.4% in Q2 2019 respectively. While the projected improvement in the manufacturing sector in 2020 should cap a further deterioration in NPLs, the trade-related sectors as a whole still bears closer monitoring.

**Chart 2.9**

Singapore Banking System Corporate NPL Ratio

Business outlook appears to have stabilised and financing conditions remain favourable

**Businesses are cautious but their expectations going forward appear to have stabilised.**

Against the backdrop of global economic uncertainties, the general outlook for the manufacturing sector has improved slightly over the recent quarter while the services sector has remained slightly positive (Chart 2.10). In the Q4 2019 Business Expectations surveys by the Economic Development Board (EDB) and the Department of Statistics (DOS), a net weighted balance of five per cent of manufacturers predict a less favourable business situation in October 2019 to March 2020, an improvement from the 11% in Q3 2019. Within the manufacturing sector, the chemicals, general manufacturing, and precision engineering subsectors had the least optimistic outlook given rising uncertainties from ongoing trade tensions. In comparison, business expectations in the services sector remain slightly positive with a net weighted balance of one per cent of firms predicting a more favourable business outlook for October 2019 to March 2020, a reduction from the net weighted balance of two per cent of firms in the previous quarter.
Business sentiment among small and medium-sized enterprises (SMEs) has softened over the past year on trade tension fears and the global economic slowdown. The Singapore Business Federation (SBF)-Experian SME Index\(^{11}\) contracted from 51.0 in Q3 2018 to 50.6 in Q3 2019. Nonetheless, according to Experian, there was an improvement in debt settlement in the overall SME sector, with the average time taken to settle debts falling from 33 days in Q2 2018, to 30 days in Q2 2019.

![Chart 2.10: General Business Outlook for Manufacturing & Services Sector (Net Weighted Balance\(^{12}\))](chart)

Source: DOS, EDB

Note: The data point for Q4 2019 refers to the business outlook for October 2019 to March 2020.

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**Banks remain supportive of SME financing.**

Financing conditions for the corporate sector have remained favourable, as credit to non-financial corporates grew by 6% y-o-y. Some firms have turned to the debt market to issue bonds to lock in the low interest rates or refinance existing debt over longer maturities. Bank lending to SMEs have declined slightly over the past year, amid the backdrop of a slowing economy. Beyond financing support from banks and finance companies in Singapore, existing government risk-sharing initiatives and the growth of alternative financing platforms would also help to further support SME’s access to financing.

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\(^{11}\) The SBF-Experian SME Index is a six-month forward-looking index. It measures the sentiments of SMEs in the areas of turnover, profitability and capacity utilisation. A value above 50 indicates that SMEs expect business to improve in the next 6 months, whereas a value below 50 indicates that they expect lower business activity.

\(^{12}\) “Net weighted balance” is the difference between the weighted percentages of respondents with a positive outlook and those with a negative outlook. A positive percentage indicates a net positive outlook and a negative percentage indicates a net negative outlook.
Highly leveraged firms should remain vigilant to downside risks to revenue growth

Corporates should remain vigilant against balance sheet vulnerabilities.

External headwinds have resulted in a weakening of financial positions in the trade-related sectors. While some industries (for instance, construction) in the domestic-oriented sectors are expected to experience improved earnings growth, profitability in other industries (such as retail) could remain weak. The trade-related sectors, are more vulnerable to further uncertainty and weakness in the external environment, which in turn could cause negative spillovers to the rest of the economy. Highly leveraged firms should continue to exercise financial prudence in their planning as well as credit decisions, and remain vigilant to downside risks to revenue growth which could extend over a prolonged period. The pressures on the debt servicing ability of over-leveraged firms could build up under such conditions, thus causing a slippage in the corporate sector’s FVI.
Small and Medium-sized Enterprise Financing Conditions

Bank lending to SMEs and the number of SME customers declined slightly over the past year, against the backdrop of the slowing economy.

Chart 2A1: SME Loans Outstanding

Chart 2A2: SME Customers

The B&C and General Commerce sectors continued to account for the majority of SME loans.

Chart 2A3: SME Loans by Sector (as at H1 2019)

The share of outstanding SME loans secured by property remained stable.

Chart 2A4: Outstanding SME Loans by Type of Collateralisation

The SME NPL ratio improved to 4.2% in H1 2019.

Chart 2A5: SME NPL Ratio

Banks’ net interest margins (NIMs) on SME loans remained stable at 1.5% in H1 2019.

Chart 2A6: NIMs on SME Loans

Source: MAS
3 Singapore Household Sector

Household balance sheets have strengthened alongside a moderation in leverage risks. Default rates of household debt have remained low. Amid the possibility of an extended period of sluggish GDP growth, wage increases are expected to ease, which could weaken households’ debt servicing ability. Households that are already over-extended should therefore continue to be cautious in taking on new debt, which would increase their vulnerability to income shocks.

<table>
<thead>
<tr>
<th>Household sector FVI (YOY Changes)</th>
<th>Q3 2018</th>
<th>Q3 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Household FVI</td>
<td>↓</td>
<td>↓</td>
</tr>
<tr>
<td>Leverage risk</td>
<td>↓</td>
<td>↓</td>
</tr>
<tr>
<td>Maturity risk</td>
<td>↑</td>
<td>↑</td>
</tr>
</tbody>
</table>

The overall household sector FVI has improved since last year. Household leverage risk has moderated, as slower growth in property prices following the July 2018 property cooling measures\(^{13}\) tempered housing loan growth and contributed to an improvement in overall indebtedness. The maturity risk profile is stable, with vulnerabilities relating to the use of unsecured credit — representing households’ shorter-term liabilities — remaining low, as the progressive implementation of strengthened unsecured credit rules by MAS since June 2014 further encouraged financial prudence.

Leverage risks in the household sector have moderated

Household leverage risk has moderated in Q3 2019 on the back of slower growth in aggregate household debt...

Growth in Singapore’s aggregate household debt edged up from an average of about 3.2% y-o-y between Q1 to Q3 2017, to 4.5% y-o-y between Q4 2017 to Q2 2018, before the July 2018 property measures. Its growth has slowed since then, registering a slight decline of 1.3% y-o-y in Q3 2019. (Chart 3.1). As a result, household sector leverage vulnerabilities improved over the past year.

\(^{13}\) The Additional Buyer’s Stamp Duty (ABSD) was increased by 5 percentage points for all individuals (except Singaporean and PR first-time buyers); and by 10 percentage points for entities. In addition, a non-remittable ABSD of 5% was introduced for developers purchasing residential properties for housing development, on top of the ABSD rate of 25% for entities. The maximum Loan-to-Value (LTV) ratio was tightened by 5 percentage points across all housing loans granted by financial institutions.
The growth in household debt remains in line with income growth, with the household debt-to-income ratio stabilising at 2.1 times in recent years, down from a peak of 2.2 times in 2013 (Chart 3.2). The household debt-to-GDP has also fallen from its peak of 73.8% in Q4 2014 to about 65% in Q3 2019 (Chart 3.3).

Housing loans account for three-quarters of total household debt (Chart 3.4) and thus are a key determinant of overall financial vulnerabilities. Growth of outstanding housing loans (from FIs) averaged 3.3% in 2018, and moderated in recent quarters as borrowers paid down their existing loans (Chart 3.5). However, new housing loans have risen in Q2 and Q3 2019, in line with the increase in transaction activity in the property market (Chart 3.6). The improving trend in outstanding housing loans could reverse if there continues to be strong demand for new housing loans in the coming quarters.

...as outstanding housing loan growth slowed.
Credit quality of household debt remains sound.

The credit risk profile of household debt has remained sound following several rounds of tightening in prudential measures. The average loan-to-value (LTV) ratio of outstanding housing loans has fallen from about 54% on average in 2017 to 49% in Q3 2019 (Chart 3.7) following the reduction in maximum LTV limits in July 2018, suggesting households (and the banks which lent to them) are more resilient to any drop in property prices. The NPL ratio of housing loans has remained low at less than 0.5% as of Q3 2019 (Chart 3.8), and has been broadly stable over the past year.

Overall, household leverage risk has improved, with a moderation in outstanding housing loan growth and hence household debt. Credit quality was also relatively good, with improving LTV ratios contributing to increased resilience against any economic shocks or a fall in property prices.
Household maturity risk is stable

Shorter-term household liabilities, mainly in the form of unsecured credit, have receded since 2014, reducing household vulnerabilities to maturity risk. The strengthening of unsecured credit rules by MAS since June 2014 has encouraged household financial prudence and enhanced FIs' lending practices. The number of highly indebted borrowers with outstanding unsecured debts exceeding their annual income has reduced by 30% during the four years since June 2015, when the measures started to take effect. The outstanding debts of these highly indebted borrowers have also fallen by about $1.8bn over the same period.

Unsecured credit in Singapore is contained.

The growth in credit card debt is in check and its credit quality has improved. The ratio of outstanding credit card balances to GDP has stabilised at 2.3% as of Q3 2019 and the ratio of rollover balances to GDP has remained low at about 1.3% (Chart 3.9). This is despite an increase in the number of credit card holders (Chart 3.10).

![Chart 3.9 Credit Card Balances to GDP](chart.png)

![Chart 3.10 Number of Credit Card Holders](chart.png)

Source: MAS

Source: Credit Bureau Singapore (CBS), MAS estimates

The credit quality of credit card debt has improved. While the number of revolvers was unchanged, their share as a proportion of all cardholders has fallen from 35% in Q1 2015 to about 27% in Q3 2019 (Chart 3.11). Further, the credit card charge-off rate has remained largely stable at 6% since Q3 2017 (Chart 3.12).

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14 In particular, the industry-wide borrowing limit requires banks to suspend credit to borrowers with outstanding unsecured balances of more than 24 times their monthly income when it was introduced in June 2015. This limit was reduced in phases to a limit of 12 times their monthly income in June 2019.

15 Rollover balance is defined to be the amount of the outstanding balance that is not paid in full within the billing month.

16 Revolvers are credit card holders who have not paid off their balances in full.
Household sector balance sheets indicate adequate financial buffers

Household net wealth continued to grow.

Household net wealth (defined as household assets less household debt) has continued to grow, reaching almost four times of GDP in Q3 2019 (Chart 3.13). Further, liquid assets such as cash and deposits has continued to exceed total liabilities (Chart 3.14), providing households with an increased level of resilience.
Financial Stability Review, November 2019

MAS’ simulations suggest that Singapore households’ debt servicing burden remains manageable under stress.

MAS’ simulations indicate that in general, households’ mortgage servicing ratios (MSR)\(^\text{17}\) would remain manageable under stress situations. The MSR for the median household remains below 60% under a severe stress scenario of a 10% fall in income, on top of a 250 bps increase in mortgage rates. However, lower income households which have purchased private properties could face increased stress, as their mortgage servicing burdens rise above 70%.

**Private residential property market activity has moderated since the July 2018 cooling measures**

Price growth has slowed in the quarters since July 2018, although it has risen at a moderate pace in Q2 and Q3 2019. The volume of new developer sales has increased on the back of high launch volume, although sales performance was uneven across projects. Meanwhile, resale volume remained modest compared to pre-2018 July cooling measures level and developers are more cautious in their bidding for land.

With housing supply coming on stream with an increasing number of launched but unsold units, there are potential downside risks to the property market. As such, prospective buyers should be mindful of their ability to service their long-term mortgage obligations and be cautious in their buying and financing decisions.

For more details, please refer to Box A: “Update on the Private Residential Property Market”.

**Households that are over-extended should be cautious given uncertainties in the economic outlook**

Ongoing uncertainties in the economic outlook, softening labour market conditions, and slower income growth could weigh on households’ financial positions.

Amid the slowdown in GDP growth over the past two quarters, MAS assessed that labour demand could moderate in the near term.\(^\text{18}\) Resident wage growth is thus expected to ease in 2019 and 2020 compared to last year.

At this juncture, retrenchments remained low, but the number of employees placed on short workweek or temporary layoff has trended upwards (Chart 3.15). The ratio of job vacancies to unemployed

\[^{17}\] Only the income of the main borrower is considered in the calculation of MSR in simulations. This is a conservative estimate for household income as for joint applications, the loan account might be serviced by a dual income household. Further, it excludes CPF contributions from the employer and includes a 30% haircut on variable income (e.g. bonuses or rental income).

\[^{18}\] Section 3.1 of the October 2019 Issue of MAS’ Macroeconomic Review.
persons has also fallen below unity, reflecting firms’ growing caution in hiring amid uncertain economic conditions (Chart 3.16).

Should labour market conditions continue to soften further, for instance in response to an unexpected shock, this could undermine household income growth and consumer confidence.

**Chart 3.15**
Employees on Short Work-Week or Temporary Layoff

**Chart 3.16**
Ratio of Job Vacancies to Unemployed Persons (Seasonally Adjusted)

Households that are already over-extended should be cautious in taking on new debt amid uncertain economic prospects and downside risks to income growth.

The July 2018 property market cooling measures have helped to bring prices closer to their underlying fundamentals — price increases have slowed alongside transaction activities, and developers are more cautious in land bidding. This has contributed to improving household leverage risk as reflected in the FVI.

Nonetheless, there are potential downside risks to the property market, given the uncertain economic outlook. There is also further housing supply coming on stream even as the stock of launched but unsold units builds up. Prospective buyers should be mindful of their ability to service long-term mortgage obligations and be cautious in taking on new commitments to debt financed property and other large purchases. Highly leveraged households would be more susceptible to stresses in macroeconomic conditions, and need to build up financial buffers while ensuring that the debt servicing burdens remain manageable.
Box A
Update on the Private Residential Property Market

The cooling measures introduced in July 2018 have led to a moderation of the private residential property market. Compared to H1 2018, private housing price movement is more in line with economic fundamentals, overall private housing transaction volume has reduced, and developers are more cautious in their bidding for land.

While relatively healthy developer sales were observed in selected project launches in the past two quarters, this was largely due to project-specific features such as good location. Other projects saw moderate sales in the initial phase of their launches. Secondary market sales volume remained modest compared to pre-cooling measures levels.

Ongoing uncertainties in the economic outlook and a softening labour market could negatively affect households’ incomes and their demand for property. A large supply of unsold units in the medium term could also weigh on the property market. Given these downside risks, prospective buyers should be mindful of risks and remain prudent before entering into long-term decisions, for instance buying a property, taking on a mortgage, and servicing that mortgage.

**Price movements have moderated in the quarters since July 2018, and remained modest in Q2 and Q3 2019.**

Prices increased by 2.1% y-o-y in Q3 2019, lower than the 9.1% y-o-y increase in Q2 2018 (Chart A1). In Q3 2019, prices rose by 1.3% on a q-o-q basis, at a slower pace compared to the q-o-q increase of 1.5% in Q2 2019. Overall price developments in the latest quarter were attributed to price increases in all the three regions (CCR, RCR, OCR) (Chart A2).

**The pace of property price increase moderated in Q3 2019**

**Broad-based price increases observed in all market segments**

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**Chart A1**

Private Property Price Index (QOQ Changes)

Source: Urban Redevelopment Authority (URA)

**Chart A2**

Private Property Price Index by Region

Source: URA
While selected new projects saw relatively healthy sales in the last two quarters, others experienced only a moderate response.

Overall transaction volume increased in the last two quarters, led by new sales transactions (of private property excluding Executive Condominiums) which increased by 40% q-o-q in Q3 2019 (Chart A3). While new projects with attractive features and strong locational attributes were able to garner relatively healthy initial sales, there were several other projects that saw moderate sales in the initial phases of their launches. Compared to the year preceding the July 2018 cooling measures, overall transaction volume in the last four quarters was 32% lower, as resale activity continued to be muted.

Activity by speculators, foreigners and corporates has remained stable over the past year.

Regression analysis by the IMF using data over Q1 2004 to Q3 2018 showed that speculative activity, and transactions by foreigners and corporates were significantly related and were the principal drivers of private residential property price increases in Singapore (see Special Study 3 “The Effects of Speculative Activity, and Transaction Types on Private Residential Property Prices in Singapore”). Speculative activity, as indicated by short-term resales\(^{19}\), has been subdued since 2012. The share of transactions by corporates and foreigners remained stable, accounting for 1–2% and 5–7% of total transactions respectively over the past three quarters.

Meanwhile, the rental market has shown early signs of strengthening.

The vacancy rate has continued to fall from the peak of 8.9% in Q2 2016 to 6.1% in Q3 2019 (Chart A4), in part due to a decline in the number of new housing units completed.\(^{20}\) While rental prices rose by 1.4% y-o-y in Q3 2019, it remained 10.7% lower than its recent peak in Q3 2013 (Chart A5). The stability in rental prices suggests that occupancy demand is adequate at this juncture to absorb the newly completed units as they come on stream. Nonetheless, the tepid economic outlook coupled with an expected increase in the supply of completed units in the medium term, could lead to new

\(^{19}\) Short-term resale is defined as a resale of property within one year of purchase. The definition includes a sub-sale, which is a sale of a unit on the secondary market before the residential project has achieved its legal completion.

\(^{20}\) 1,093 new housing units were completed in Q3 2019, a decline of 42% from the 1,874 units completed in Q2 2019.
downward pressure on rentals. In addition, investors that borrowed at higher mortgage repayments relative to incomes, could face difficulties meeting the repayments on their investment properties.

<table>
<thead>
<tr>
<th>Vacancy rate for private residential property has improved</th>
<th>Rental prices show early signs of recovery after a gradual decline</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chart A4</strong> Vacancy Rate for Private Residential Property</td>
<td><strong>Chart A5</strong> Private Property Rental Price Index</td>
</tr>
</tbody>
</table>

Source: URA

Number of launched but unsold units continue to increase; land sales activity has remained muted.
Despite the decline in vacancy rate of completed units, the number of unsold units from launched projects (excluding Executive Condominiums) has doubled from 2,172 units in Q3 2018 to 4,377 units in Q3 2019 (Chart A6). This increase will likely be exacerbated in the medium term as developers continue to redevelop and launch projects on sites arising from the large volume of en-bloc sales from 2017 to 2018. The increase in the unsold inventory could place downward pressure on prices in the medium term, if unaccompanied by a corresponding rise in demand.

<table>
<thead>
<tr>
<th>The number of launched but unsold units continue to increase</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chart A6</strong> Launched But Unsold Units</td>
</tr>
</tbody>
</table>

Source: URA

While developers have continued to participate in Government Land Sales tenders, they have generally become more circumspect in their land bids over the past year. En-bloc activity has also slowed significantly, with only one project successfully sold since Q3 2018.
Outstanding housing loans growth has moderated; asset quality remains strong.

Outstanding housing loans growth has moderated, decreasing slightly by 1.0% y-o-y in September 2019. While new housing loans have risen in the past two quarters, in line with the increase in transaction activity, they remain lower than the period before the 2018 measures (Chart 3.6).

The 3M SGD SIBOR — a reference benchmark rate used by major mortgage lenders in Singapore — remains reflective of global market conditions. It rose in tandem with the hikes in US Fed Fund Rate in late 2018–early 2019, from 1.64% in October 2018 to 2.01% in May 2019, and has recently moderated to 1.88% in October 2019 following the recent Fed rate cuts.

The asset quality of housing loans remains strong. The share of loans that are more than 30 days in arrears and the NPL ratio for housing loans were 1.0% and 0.4% respectively in Q3 2019, broadly unchanged from a year ago (Chart A7).

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**Chart A7**

*Share of Housing Loans that are More than 30 Days in Arrears and Non-Performing Housing Loan Ratio*

Source: MAS, CBS
4  Singapore Financial Sector

Singapore’s banking system remains healthy, against the macroeconomic backdrop of slowing global growth and heightened uncertainties. Growth in credit to both the domestic economy as well as the region moderated, while overall asset quality and provisioning coverage declined slightly. MAS’ annual industry-wide stress test (IWST) results show that banks in Singapore have the capacity to withstand severe shocks.

Banks continue to have ample capital and liquidity buffers, but the extended uncertain global operating environment could present challenges. Some pressures on profit margins may re-emerge as interest rates are likely to stay lower for longer and banks face increasing competition amidst a slower pace of credit expansion. Banks should thus continue to maintain strong underwriting standards and ensure adequate provisioning coverage. In addition, banks should be vigilant to continuing pressures on their foreign currency liquidity positions. An unexpected tightening of global liquidity or stresses in the FX swap market could accentuate short-term foreign currency liquidity conditions in the banking system.

<table>
<thead>
<tr>
<th>Banking sector FVI (Y.O.Y Changes)</th>
<th>Q3 2018</th>
<th>Q3 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Banking FVI</td>
<td>↑</td>
<td>→</td>
</tr>
<tr>
<td>Non-Resident Leverage risk</td>
<td>↑</td>
<td>→</td>
</tr>
<tr>
<td>Liquidity risk</td>
<td>→</td>
<td>→</td>
</tr>
<tr>
<td>Maturity risk</td>
<td>→</td>
<td>→</td>
</tr>
</tbody>
</table>

Overall banking FVI has remained broadly unchanged over the last year, as resident leverage, non-resident leverage, liquidity and maturity vulnerabilities have been stable. Nonetheless, the relatively unchanged risk ratings in 2019 have come off the back of an earlier build-up in vulnerabilities as measured by the overall banking FVI in 2018.

Credit growth

Credit growth has moderated, although leverage vulnerability remains elevated.

Overall credit growth has slowed since November 2018, tapering to a still steady pace of 3.1% y-o-y in October 2019 (see Chart Panel 4A “Banking Sector: Credit Growth Trends”). Both resident and non-resident non-bank loan growth contributed to the moderation.

Vulnerabilities arising from leverage in the banking sector has remained unchanged compared to a year ago, as credit growth slows. However, leverage vulnerabilities in the banking sector are still at an
elevated level, due to the earlier build-up in credit growth to the rest of the economy over Q3 2016 to Q3 2018.

Non-resident non-bank loan growth exhibited a more pronounced weakening over the past year, in line with subdued global economic growth, before showing a slight improvement from the middle of this year. Non-resident non-bank lending continues to be underpinned by some underlying support in credit demand from Emerging Asia (see Chart Panel 4B “Banking Sector: Cross-border Lending Trends”). In particular, growth in lending to Emerging Asia has picked up in recent months, amid the trade diversions away from China to other parts of Asia.

Resident lending has been resilient, supported by loans to the Building & Construction (B&C) sector. This reflects the sustained public sector construction demand, boosted by major infrastructure projects and a pipeline of major industrial building projects over the past year.

Based on a survey conducted by MAS\(^{21}\), banks expect slowing global economic growth and rising uncertainties caused by trade and geopolitical tensions to weigh on the demand for corporate credit, particularly from the trade-related sectors. Concurrently, the challenging operating environment may also affect corporates’ financial performance and credit worthiness. As a result, banks expressed caution in lending activities over the next few months.

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Asset quality has slipped, particularly for trade-related sectors.

The banking system’s overall NPL ratio showed a slight uptick to 2.0% in Q3 2019 from 1.9% in the same period last year (see Chart Panel 4C “Banking Sector: Asset Quality and Liquidity Indicators”).

With the difficult external demand conditions, the NPL ratios for trade-related sectors increased in the recent quarter. The ratios for the Manufacturing and TSC sectors rose to 4.6% and 9.6% respectively (Chart 4.1). The special mention ratio, which frequently rises in advance of NPLs, has also risen slightly in recent quarters to 3.0% in Q3 2019 (Chart Panel 4C, Chart 4C1), possibly indicating some further weakening in asset quality in the period ahead.

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\[^{21}\text{The findings were obtained from an MAS survey of banks carried out in September 2019, which seeks industry participants’ views on the prevailing credit conditions and expectations over Q4 2019 and Q1 2020.}\]
The rise in NPLs has lowered banks’ loan loss provisioning buffers. Total provisioning coverage in the banking system fell to 90% in Q3 2019. Specific provisions also fell slightly to 56% from 58% a year ago. Nevertheless, general provisions held at the head offices of foreign bank branches help to augment these buffers.

Despite the slippage in asset quality, banks continue to maintain adequate capital buffers to cushion credit losses. Results of MAS’ annual IWST underscored the capacity of domestically systemically important banks (D-SIBs) to withstand severe shocks. D-SIBs were required to assume a protracted recession centred on a major slowdown in China and disruptions in global financial markets amidst ongoing US-China trade tensions and weak global trade. These external shocks hit Singapore severely in the form of a significant contraction in economic growth, rising unemployment and substantial declines in domestic asset prices (Table 4.1). Under such a severe stress scenario, the stress test results showed that all banks would remain solvent, with their aggregate Capital Adequacy Ratio (CAR) remaining above MAS regulatory requirements (Chart 4.2).

<table>
<thead>
<tr>
<th>Stress Parameters</th>
<th>Stress Scenario (2019–2021)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP Growth (%)</td>
<td></td>
</tr>
<tr>
<td>Singapore</td>
<td>−2.5 (2019), −3.3 (2020), 0.5 (2021)</td>
</tr>
<tr>
<td>China</td>
<td>2.9 (2019), 1.5 (2020), 4.2 (2021)</td>
</tr>
<tr>
<td>US</td>
<td>−0.1 (2019), −1.7 (2020), 0.3 (2021)</td>
</tr>
<tr>
<td>Eurozone</td>
<td>−1.1 (2019), −2.5 (2020), −0.1 (2021)</td>
</tr>
<tr>
<td>Property Prices</td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>Cumulative decrease of 50% over 3 years</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>Cumulative decrease of 45% over 3 years</td>
</tr>
<tr>
<td>Singapore</td>
<td>Cumulative decrease of 40% over 3 years</td>
</tr>
<tr>
<td>Oil Prices</td>
<td>Cumulative decrease of 45% over 3 years</td>
</tr>
<tr>
<td>Equity Prices</td>
<td>Cumulative decrease of 30–45% over 3 years</td>
</tr>
</tbody>
</table>

Source: MAS estimates

Banking system’s overall provisioning coverage is computed as the sum of general and specific provisions as a share of unsecured NPLs.

MAS conducted its 2019 IWST exercise in conjunction with the IMF’s 2019 FSAP.
Liquidity and maturity risks

Banks’ overall liquidity positions remain strong...

Banking vulnerabilities arising from overall liquidity and maturity risks have remained unchanged from a year ago.

Banks’ overall liquidity positions have remained strong, with the D-SIBs maintaining healthy buffers over the minimum regulatory Liquidity Coverage Ratio (LCR) requirements in all-currency and in Singapore dollars.

SGD funding remains adequate as deposits continue to exceed loans, with the SGD loan-to-deposit (LTD) ratio low at 84.3% in October 2019. However, foreign currency LTD ratio remains at an elevated level of 125.7% in October 2019, although the ratio has fallen slightly from a year ago as the increase in deposits outpaced loans.

...but banks’ foreign currency liquidity, particularly in the USD, could see some pressures under stressed conditions.

On an aggregated basis, the domestic banking system also does not face structural USD funding gaps, with USD-denominated liabilities more than sufficient to fund USD-denominated assets. Local banking groups’ USD LTD ratios have consistently remained well below 100%. The funding structure of foreign banks in Singapore also remained sound, with long-term debt and stable non-bank deposits accounting for 70% of total funding (Chart 4.3). Additionally, foreign banks also rely on relatively stable net intragroup funding from their head offices, while net unrelated interbank funding remains low at less than 10% of their total liabilities.
However, USD funding risks bear continued close monitoring. As highlighted in the IMF’s October 2019 Global Financial Stability Report (GFSR), USD funding fragility remains a source of vulnerability and could amplify the impact of a tightening in funding conditions in international financial markets. IMF had also previously highlighted that foreign exchange swaps, which are used to meet short-term currency needs, have shown to be more volatile than other short-term funding sources, suggesting that swap markets may not be a reliable backstop in periods of stress. Thus, a sharp tightening of financial conditions could expose structurally vulnerable liquidity positions and trigger forced asset sales or even defaults, amplifying and transmitting market turbulence.

Against the backdrop of liquidity risks in the USD funding of non-US banks globally, liquidity stress tests conducted with the IMF in conjunction with the 2019 Financial Sector Assessment Program (FSAP) for Singapore suggested that the foreign currency liquidity position of banks in Singapore could also be vulnerable to severe stress scenarios. Under the stress testing scenario, alternative assumptions were made in the form of higher deposit outflows, reduced inflows from maturing loans and higher haircuts applied on liquid assets. The stress test results showed that D-SIBs would maintain adequate SGD liquidity buffers, but could fall short of all-currency LCR regulatory requirements. The shortfalls in all-currency LCR are primarily driven by USD funding activity. Under assumptions of an adverse scenario and severe dislocations in the FX swap market, banks might be constrained from swapping excess SGD into foreign currency to meet its foreign currency obligations.

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25 Four out of seven D-SIBs did not meet all-currency LCR regulatory requirements under the IMF stress test. The number of failures were measured relative to regulatory requirements, which are 100 percent all-currency LCR for domestic D-SIBs and 50 percent all-currency LCR for foreign D-SIBs.
In recent years, banks have continued to mitigate foreign currency liquidity risks by diversifying their USD funding sources across a wide range of geographies, industries, and funding instruments. MAS also encourages banks to continue efforts to strengthen their USD liquidity profile. MAS will continue to closely supervise the banks’ management of their foreign currency liquidity risk, and conduct top-down stress tests to enhance the identification of foreign currency risks of banks. Banks should manage their foreign currency risks prudently under a variety of business conditions by developing liquidity contingency plans.
Local banking groups continue to extend credit to the domestic economy, and maintain good asset quality as well as provisioning coverage.

Local banking groups’ loan books continued to grow over the year, largely driven by corporate lending. Non-bank loans increased by 4.6% y-o-y in Q3 2019, underpinned by firm resident demand for credit (Chart B1).

Local banking groups’ earnings and net profit remain strong (see Chart Panel 4D “Banking Sector: Local Banking Groups”), boosted by fee and commission income and net interest income which was supported by stable net interest margins. The local banking groups’ NPL ratio remains low at 1.6%, below the banking system’s NPL ratio of 2.0%. In addition, they continue to maintain strong overall provisioning coverage of 196%.

Local banking groups’ capital and liquidity positions remain robust.

Local banking groups have robust capital and liquidity positions. The average CARs and all-currency LCRs remain well above regulatory requirements. The overall LTD ratio of local banking groups is below 100%, and the USD LTD ratio is at 74% (Chart B2).
Chart Panel 4A  Banking Sector: Credit Growth Trends

Overall loan growth slowed but kept to a steady pace over the past year, with both resident and non-resident non-bank loan growth contributing to the moderation.

Resident lending was generally resilient, supported by loans to the B&C sector. Trade financing volumes were stable over the year.

The credit-to-GDP gap for Singapore narrowed to 0.2% as at Q3 2019.
Chart Panel 4B  Banking Sector: Cross-border Lending Trends

Cross-border lending which picked up since the beginning of the year, was underpinned by growth in lending to Emerging Asia.

Net lending to Emerging Asia was stable, with net funding coming mainly from Europe and Developed Asia.

Local and Japanese banks continue to be the main net lenders to Emerging Asia.

Source: MAS
Chart Panel 4C  Banking Sector: Asset Quality and Liquidity Indicators

Asset quality and provisioning coverage has weakened slightly over the year. Overall non-bank NPL ratio ticked up from 1.9% to 2.0%, while provisioning coverage fell to 90% in Q3 2019.

Chart 4C1: Banking System’s Asset Quality

- Overall NPL Ratio
- Special Mention Loans Ratio

Source: MAS

Chart 4C2: Banking System’s Provisioning Coverage

- Specific Provisions/Unsecured NPLs
- Total Provisions/Unsecured NPLs

Source: MAS

Singapore’s banking system has sufficient resident deposits to fund resident loans. The foreign currency loan-to-deposit ratio remains elevated at 126% (as at October 2019) and bears close monitoring.

Chart 4C3: Banking System’s Domestic Non-bank Loans and Deposits (as at October 2019)

Source: MAS

Chart 4C4: Banking System’s Non-bank LTD Ratios

- Foreign Currency Non-bank LTD Ratio
- SGD Non-bank LTD Ratio
- Overall Non-bank LTD Ratio

Source: MAS
Local banking groups continue to maintain strong earnings and net profits, supported by a stable net interest margin (1.8% in Q3 2019).

Local banking groups’ NPL ratios (1.6%) were low. In addition, the local banks maintain strong total provisioning coverage of 196% of unsecured non-performing assets.

Local banking groups’ capital and liquidity positions were strong, with CAR and all-currency LCR well above MAS’ regulatory requirements.
The insurance industry in Singapore remains well-capitalised. The average CAR for the direct life and direct general insurance industry were 253% and 332% as at Q3 2019 respectively.

New business premium of the direct life insurance industry fell in 2019, largely attributable to decline of non-participating and investment-linked products. Net income increased mainly due to positive investment performance as compared to 2018.

Gross premium of the direct general insurance industry decreased in 2019, largely attributable to the decline in offshore insurance fund (OIF) business. While the industry achieved investment profits, underwriting losses were reported in 2019.
Chart Panel 4F  Over-the-counter (OTC) Derivatives

Based on trade reporting data, Interest Rate (IR) is the largest OTC derivative asset class booked and traded in Singapore, followed by Foreign Exchange (FX), reflecting the role played by Singapore in the global OTC derivatives market.

Chart 4F1: OTC Derivatives Market in Singapore by Asset Class and Notional Outstanding (End-Sep 2019)

Source: Depository Trust & Clearing Corporation Data Repository (Singapore) Pte Ltd (DDRS), MAS estimates

The FX derivative market in Singapore continues to be driven mainly by forwards and swaps. The majority of trades are conducted in developed market currencies.

Chart 4F3: FX Derivatives by Product: Monthly New Trades

Source: DDRS, MAS estimates

IR swaps make up the bulk of IR derivative contracts traded and booked in Singapore, and are mostly denominated in Asia-Pacific currencies.

Chart 4F5: IR Derivatives by Product: Monthly New Trades

Source: DDRS, MAS estimates
Special Studies on Financial Stability
Special Study 1: Financial Conditions Index, Financial Vulnerability Index and Growth-at-Risk for Singapore

To augment MAS’ surveillance toolkit, MSD has constructed three financial stability summary measures for Singapore: FCI, FVI and GaR. The FCI measures changes in the price of risks in financial and asset markets, as a gauge of the tightness in domestic financial conditions. The FVI measures institutional vulnerabilities, which may amplify the impact of financial “shocks” on the economy. The GaR measures the downside risk to future economic growth arising from prevailing financial conditions. The three measures interact to determine the state of financial stability and its implications for economic prospects (Figure S1.1).

Fig. 1.1

MAS’ Financial Stability Surveillance Framework

Source: MAS

The FCI, FVI and GaR complement one another. When financing conditions (measured by FCI) are loose, a build-up of financial vulnerabilities by financial institutions, corporates and households (FVI) could occur. Once the financial cycle turns, the need to deleverage and repair balance sheets can impair financial intermediation, investment and economic growth (GaR). These developments may in turn lead to a repricing of risk by investors (FCI).

Financial Conditions Index

The FCI is a gauge of how easy or difficult it is to obtain financing. It was introduced in the early 2000s, with the Bank of Canada (BOC) as one of the early adopters. Crises and early warning indicators available at that time were thought to be more relevant for emerging economies, which were prone to financial crises emanating from single markets, e.g. the foreign exchange market. BOC thus constructed the FCI covering multiple markets, which it deemed more suitable for advanced economies that tended to face system-wide stress.26 In addition, the prevailing indicators, which were

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binary in nature (i.e. “crisis” or “no crisis”), could not measure the severity of financial events. Over the years, the use of such FCI-type measures has proliferated.

**Methodology**

The FCI needs to cover a wide range of indicators to capture shocks from multiple sources. At the same time, it has to balance comprehensiveness against the inclusion of too many indicators which may result in a reduced signal-to-noise ratio for certain stress events. Thus, a few indicators from each of the key financial and asset markets (foreign exchange, interest rate, equity, property and commodity markets), including global indicators, are selected. The specific indicators chosen are known to have important signalling effects.

While the size and direction of the indicators in the FCI are estimated consistently in this study, researchers have found that the indicators relate to overall financial conditions in the following way:

- Tighter financial conditions are generally associated with a weaker exchange rate, because foreign currencies become more expensive to obtain; such periods also coincide with weak capital inflows or outright capital outflows. For Singapore, the opposite effects would hold since it has no net foreign debt and its current account is in surplus. In any case, the SSNEER is excluded as it is a policy instrument, but other exchange rate-related indicators such as the implied volatility, onshore-offshore forward spread and cross-currency basis swap spread of the SGD/USD rate are included.

- Higher interest rates and wider interest rate spreads (e.g. term spread and interbank spread), and lower equity, property and commodity prices would similarly be associated with tighter financial conditions. Heightened price or rate volatilities and deteriorating risk sentiments are other causes of tighter financial conditions.

To construct the FCI, Principal Component Analysis is applied to the indicators after they have been adjusted for any seasonality and non-stationarity. These are then expressed as standard normal variables. Further, the FCI is decomposed to identify its drivers: domestic, external and spillovers. Taking external drivers as given (since Singapore is a price-taker), spillovers are estimated by filtering out the effects of external drivers from domestic factors via a regression approach. The robustness of the FCI is assessed through its ability to detect past stress events as well as its performance vis-à-vis FCIs constructed using alternative methods. A high FCI value indicates tight financial conditions and is usually associated with elevated stress, while a low FCI value indicates loose financial conditions.

**Key Findings**

After the Dot-com crash in the early 2000s, domestic financial conditions were generally easy (shown by a negative FCI) and further loosened from 2006 onwards (Chart S1.1). The FCI spiked up during the GFC, marking the crisis as the tightest period in Singapore’s financial history over the past two decades or so. Financial conditions have been volatile since then, with the FCI swinging between easy and tight conditions, on average within a two to three quarter window. Other notable stress episodes included the Eurozone crisis and the 2014–16 oil price shock, which were also preceded by periods of loose financial conditions, though not as significant nor as prolonged as during the pre-GFC period.
In general, tight financial conditions have been driven by external factors (blue and red bars), reflecting Singapore’s economic and financial openness. Around half of the effect of external factors have been indirect spillovers from global markets to domestic markets (red bars), which then affect domestic financial conditions. Financial conditions are benign currently principally on account of domestic factors, including a decline in the contribution of exchange rate-related and property price factors.

Growth-at-Risk
The GaR is a recent concept popularised by Tobias Adrian (IMF’s Financial Counsellor) in academic research and IMF studies\(^\text{27}\). It provides a way to assess how the state of the financial system would affect the future performance of the real economy. This is done by linking prevailing financial conditions to all possible values of the GDP growth forecast, with a probability attached to each forecast value. Further, similar to the Value-at-Risk concept in finance, the GaR framework focuses on the lower end of the growth forecast distribution, hence emphasising the downside risks. Retrospective analyses of the GFC and other financial stress events show that growth forecasts augmented by financial conditions would have assigned higher likelihoods to the economic contractions that followed, compared to forecasts based on past growth alone.

Methodology
The crux of the GaR framework is the use of quantile regressions to forecast GDP growth. Instead of employing one regression, the approach entails carrying out a series of regressions based on different subsamples of past GDP growth data pre-ordered by percentiles (e.g. lowest 5\(^\text{th}\) percentile, 10\(^\text{th}\) percentile). The GaR represents the lowest 5\(^\text{th}\) percentile of the GDP growth forecast distribution.

\(^{27}\) Adrian, T et al. (2019) and IMF (2017).
Key Findings
Domestic financial conditions have an asymmetric impact on economic activity i.e., tight financing conditions can cause a material contraction in Singapore’s GDP growth while slack financing conditions are typically followed by only a marginal increase in GDP growth. Thus, the 5th percentile (lower bound of grey region) has been more volatile than the 95th percentile (upper bound) of GDP growth (Chart S1.2).

![Chart S1.2](chart1.png)

Source: DOS, MAS estimates

Domestic financial conditions have generally affected economic activity for only a short period, of up to a few quarters. This is illustrated in Chart S1.2 and S1.3, which show that the median GDP growth forecast (red line) tracks actual GDP growth (blue line) closely for one quarter ahead, but not for a longer duration. The short-lived effect could be attributed to the Singapore financial system’s relatively strong absorption capacity, which reduces the transmission of shocks to the real economy. This is in contrast to the US experience, where the effect could last up to two years (Adrian et al., 2019).

The current GDP growth is weaker than implied by the easy financial conditions (i.e., actual GDP growth is below the median and closer to the lower bound). The present weakness is dominated by real economy or trade shocks. Thus, compared to the historical experience, financial risk at the current juncture is expected to have only a small effect on the near-term economic outlook.

Financial Vulnerability Index
The FVI was introduced in the IMF’s April 2019 GFSR to highlight that financial vulnerabilities, which were already elevated in several systemically important countries, might continue to build up amid still accommodative financial conditions. In contrast to the FCI, which is primarily a price-based measure, the FVI is largely a quantity-based one. The slower-moving dynamics of quantities, as compared to prices, would allow the gradual build-up in vulnerabilities to be picked up and for preemptive measures to be taken where necessary. The slower-moving FVI resembles the financial cycle, which Borio (2014) has found tends to peak with financial stress or crises and is much longer than the business cycle.
Methodology
Using the IMF methodology, four broad categories of financial vulnerabilities are identified: leverage, liquidity mismatch, maturity mismatch and foreign exchange mismatch. Indicators for the vulnerability categories are transformed to standard normal variables and combined using weighted averaging to construct the FVI. The leverage category receives a higher weight due to its ability to provide risk warnings. This exercise is performed for banks (which account for close to 90% of financial sector assets), corporates and households, taking into account the relevance and data availability of each vulnerability category, resulting in three separate FVI series.

For the purpose of detecting build-ups in vulnerabilities, MAS focuses on changes, rather than levels, of the FVIs. To facilitate a simple yet constructive tracking process, the FVI series are calibrated according to deviations from their historical distributions and divided into five coloured bands which reflect varying degrees of year-on-year changes in the FVIs: significant increase (dark red), moderate increase (light red), largely unchanged (light blue), moderate decrease (light green), significant decrease (dark green).

Key Findings
All three sectors saw significant increases in vulnerabilities (dark red band) around major historical stress events (Table S1.1). For the GFC in particular, the FVI-based measures started flashing dark or light red three to six quarters before the collapse of Lehman Brothers, as vulnerabilities built up amid loose financial conditions.

Reflecting the wider ranging and more complex risks it was inherently subjected to, the banking sector continued to see more volatile changes in its FVI measure while the corporate and household sectors mostly experienced more moderate changes in vulnerabilities, after the GFC and Eurozone crisis (see lower half of Table S1.1). In the recent five to six years, the corporate sector has seen more increases than decreases in its level of vulnerabilities while the opposite holds true for the household sector. The former may be attributed to an extended period of low interest rates which made it cheap for firms to borrow while the latter, particularly the shifts away from the light red band immediately after mid-2013 and mid-2018, may be attributed to the implementation of domestic macroprudential policies which moderated the increase in household debt levels.

Other than leverage which carries a high weight by design, maturity risk typically drives changes in financial vulnerabilities especially of banks and corporates. Liquidity risk is also a significant contributor to corporate vulnerability.

Indicators include loans or debt in growth terms or as percent of GDP, debt service ratios, property prices and capital ratios (for leverage); share of less liquid assets or less stable funding (for liquidity mismatch); short-term liabilities to short-term assets or as a share of total liabilities (for maturity mismatch); foreign currency liabilities (for foreign exchange mismatch).

For banking and corporates, a 50% weight is assigned to the leverage category while the remaining 50% weight is divided equally among the other vulnerability categories. For households, a higher weight of 75% is assigned to leverage.
Table S1.1
Heatmap of Changes in FVI

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<thead>
<tr>
<th></th>
<th>Jun-06</th>
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Source: Thomson Financial, DOS, URA, MAS estimates
Note: The colour coding is calibrated based on the historical distribution of year-on-year changes in FVI. Darker shades indicate larger changes in the FVI.

Sum-Up
MAS will employ the three new surveillance measures alongside existing tools, to keep a better tab on build-ups in financial risks and vulnerabilities. The FCI and FVI, which are composite measures, would complement indicators currently used for surveillance of individual sectors and markets while the GaR would allow the impact of financial risks to be assessed in terms of GDP growth. Over time, MAS will explore refinements to the measures such as transforming the FCI (which currently behaves like a coincident indicator) to a leading indicator, as well as strengthening the measures of loose financial condition which is the phase when institutions typically increase risk-taking.

References
Special Study 2: Assessing Corporate Resilience in Emerging Asia

The prolonged low interest rate environment in the decade since the GFC has been accompanied by a steady build-up in Asian non-financial corporate debt, a significant portion of which is in foreign currency. As global growth slows and downside risks to corporate revenues in Asia increase, concerns have been raised over the serviceability of this debt.

Abrupt shifts in investor sentiment could trigger episodes of capital outflows and depreciation pressures on emerging Asian currencies. This could also affect corporates’ ability to service or refinance their debts where foreign exchange balance sheet mismatches exist.

As a regional financial centre, Singapore intermediates financial flows involving both financial and non-financial corporates. Banks based in Singapore have strong financial links with regional corporates, both directly (e.g. corporate loans) and indirectly (e.g. interbank lending to regional banks, which still account for the majority of corporates’ financing needs). Therefore, monitoring the financial health of regional corporates is an important part of ongoing surveillance of relevant factors for the financial stability of Singapore and the region.

This study examines Asian corporates’ resilience to slowing growth and currency volatility. A stress test and a reverse stress test are applied to publicly-listed Asian corporate balance sheets, and macro-indicators related to foreign currency borrowing in the corporate sector are examined.

Corporates' debt servicing ability has become more sensitive to shocks.

The first step in assessing corporate resilience to slowing growth is a stress test of corporates' debt servicing ability based on their 2018 financial statements. The share of debt-at-risk — defined as debt owed by firms with an ICR below 2 — is higher than pre-GFC levels in most Asian economies. However, the share remains lower than pre-Asian financial crisis (AFC) levels in some economies, and has come down over the past five years in some instances as corporates have reduced their borrowing costs in a low rate environment (Chart S2.1).

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30 The GDP-weighted non-financial corporate debt-to-GDP ratio in selected Asian economies (CHN, HKG, IDN, IND, KOR, MYS, SGP, THA) has risen from 97% to 127% from 2010 Q1 to 2019 Q1.

31 The stress test methodology was first published in Monetary Authority of Singapore (2015), "In the Crucible: Stress Testing Corporate Leverage in Asia", 2015 Financial Stability Review. Refinements to the methodology and framework since then mean that the results published in this study are not directly comparable to the previous stress test. Where comparisons over time are useful, the necessary historical statistics are reproduced based on the updated methodology.

32 ICR is defined as EBIT divided by interest expenses. The share of debt owed by firms with ICRs less than two is an indicative measure of potential debt servicing difficulties.
Stress tests conducted by applying a 25% reduction to earnings before interest and taxes (EBIT) and a 25% increase in interest expenses suggest that the increases in debt-at-risk in response to earnings and interest shocks would be larger for most countries now, compared to if the same shock was applied pre-GFC and in 2014 (Chart S2.2).

The probability of a sharp rise in interest rates has fallen somewhat as markets expect major central banks to ease monetary policy amid sustained low inflation, but corporates’ cost of funding could still increase due to a widening in credit spreads, while an EBIT shock could cause debt repayment difficulties among weaker corporates. Indeed, a sharp regional growth slowdown could see credit spreads and EBIT come under pressure simultaneously.

Buffers remain relatively high across Asia but have weakened somewhat in recent years.

A top-down reverse stress test was used to estimate the magnitude of shocks that could precipitate significant corporate distress in each Asian economy. Compared to the debt-at-risk approach used in the stress test above, this top-down reverse stress test uses a firms-at-risk approach to examine buffers against broad-based corporate stress. A stress affecting many firms could lead to negative sentiment and confidence effects, and propagate a more generalised pullback of credit by banks and bond investors.

Asian economies appear relatively resilient, although the margin of resilience has generally decreased as indebtedness has risen. The reverse stress test indicates that corporate sectors in most of Asia require shocks greater than those seen during the worst historical stress periods (typically the AFC or the GFC) before being confronted with significant distress conditions (Chart S2.3). Indonesia is the exception to this, as the shock to GDP, and correspondingly corporate earnings, during the AFC was very severe. However, it is worth stressing in this context Indonesia’s strengthened macroeconomic stability since the late 1990s (e.g. reduction of inflation and the current account deficit to modest

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33 The corporate sector is defined to be under significant corporate distress when more than 60% of firms have ICR of less than 2. The 60% threshold is calibrated by the average of the historical maximum share of firms with ICR of less than 2 across Asian economies.
levels, overall reduction in corporate debt as a percentage of GDP, the diminished volatility of growth) and the larger and more diversified base of publicly-listed firms. Some corporates with large cash buffers could also be more resilient to these shocks than the results suggest, as they have the option of paying off their debt to reduce their debt burdens. Although the aggregate position remains reassuring, the stress testing revealed that in most countries in Asia, somewhat smaller shocks, by an average two percentage points for EBIT and 40 percentage points for interest costs, are needed to cause significant distress compared to five years ago.34

**Stress thresholds have come down since the 2014 stress test exercise**

<table>
<thead>
<tr>
<th>EBIT Shocks</th>
<th>Interest Cost Shocks</th>
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<td>Shock needed for significant corp. distress in 2014</td>
<td>Shock needed for significant corp. distress in 2014</td>
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<tr>
<td>Shock needed for significant corp. distress in 2018</td>
<td>Shock needed for significant corp. distress in 2018</td>
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<tr>
<td>Shock during historical stress periods</td>
<td>Shock during historical stress periods</td>
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</table>

Source: Worldscope, MAS estimates
Note: Shock during historical stress periods refers to the EBIT or interest cost shocks experienced by each economy during the AFC, GFC and other idiosyncratic episodes of stress. The 2014 and 2018 shocks needed for significant corporate distress refers to the amount of EBIT or interest cost shocks needed to precipitate significant corporate distress in each Asian economy based on corporate balance sheets as at end 2014 and 2018.

**Corporates most sensitive to shocks are mostly in the Property, Commodities & Energy, and Industrial sectors.**

A sectoral breakdown of the firms that contributed to the increase in post-shock debt-at-risk highlights the sectors that are most sensitive to shocks.

Corporates in three sectors — Property, Commodities & Energy, and Industrial35, which together account for 5.6% of GDP 36 — appear to be most sensitive to shocks that impair debt servicing ability. Firms in these sectors account for around 84% of the total post-shock increase in debt-at-risk across all Asian corporates, compared to the 76% share of debt-at-risk that they account for, in the latest data (Chart S2.4). This is unsurprising as these sectors are typically more cyclically-exposed. Slowing

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34 A comprehensive picture of debt sustainability would also consider other metrics including total leverage, refinancing risk, profitability and short-term liquidity. It would also account for structural differences (e.g. different business models across industries), which could affect corporates’ ability to sustainably maintain different levels of debt. Such enhancements to MAS’ surveillance framework continue to be worked on.

35 The industrial sector consists primarily of capital-good manufacturers (e.g. machinery, electrical components, commercial vehicles) and industrial transportation companies (e.g. railroads, trucking, marine).

36 Based on the 2018 EBIT of publicly-listed corporates in Property, Commodities & Energy and Industrial sectors across our selected Asian economies.
growth and heightened levels of business uncertainty could weigh on demand for industrial goods, as well as affect the energy sector through further pressure on commodity prices. In some Asian economies, elevated real estate valuations have also raised concerns about the effects of a pullback in property prices on the property sector.

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**Firms in the Property, Commodities & Energy, and Industrial sectors are most sensitive to shocks**

**Chart S2.4**

**Sectoral Breakdown of Firms Sensitive to Shock**

- **Property**
- **Commodities & Energy**
- **Industrial**
- **Others**

Source: Worldscope, MAS estimates

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Asia's corporate sector could be more susceptible to currency volatility. Another important aspect of corporate debt analysis is currency mismatch risk. As granular data is not generally available across Asian economies, the focus is on macro-indicators of foreign currency borrowing.

The volatility of capital flows to EMEs has increased since the GFC, with the six largest weekly portfolio outflows of all time from EMEs occurring within the last decade during times of increased risk aversion (Chart S2.5). The higher frequency of such episodes of large and sudden outflows underscores the need to remain vigilant to exchange rate depreciation pressures. A sharp exchange rate depreciation would increase borrowing costs for corporates with significant unhedged foreign currency borrowings.

Data on international bank lending in selected Asian economies suggests that bank-intermediated foreign currency borrowing by corporates has increased materially since the GFC. Claims by international banks on non-bank counterparties in selected Asian economies have picked up over the past decade, and the majority of these claims have been denominated in foreign currencies, especially the USD (Chart S2.6).
Capital flows to EMEs have become increasingly volatile

There are also signs that foreign currency borrowing through the capital markets has been growing, although bank credit and local currency bond markets continue to account for the majority of Asian corporates' financing needs. Foreign currency issuance has roughly doubled from five years ago, driven largely by new issuance by Chinese real estate firms in the Property sector, as well as Commodities & Energy-related corporates in several jurisdictions (Chart S2.7). These sectors were identified above as being most sensitive to EBIT and interest expense shocks. Outstanding foreign currency bonds in Asia — which account for around 22% of total outstanding bonds as of 2019 Q2 — grew 8.2% from 2018 Q4 through 2019 Q2, outpacing total outstanding bond growth of 2.4% in the same period. As a proportion of GDP, the amount of outstanding foreign currency bonds has remained broadly stable since 2011 in emerging Asia, ex-China.

Foreign currency borrowing intermediated by banks and capital markets has been growing

Source: BIS locational banking statistics, Dealogic, MAS estimates
Note: Economies included in the charts are China, Hong Kong, India, Indonesia, Malaysia, Singapore, South Korea, and Thailand. Cross-border claims are claims by non-resident BIS-LBS reporting banks on resident counterparties in Asia.
With some advanced economies pursuing accommodative monetary policies towards the near zero-bound of interest rates, the renewed prospect of large and volatile cross-border capital flows and their implications for currency volatility bear watching. If foreign currency borrowing is not adequately hedged (naturally or otherwise) and local currencies were to depreciate sharply, foreign currency interest and principal repayment expenses in local currency terms would spike and weaken corporates’ ability to meet debt servicing payments.

More broadly, Asian jurisdictions with more foreign currency borrowing could face tightness in domestic funding conditions during times of global stress and heightened risk aversion. Corporates could find themselves less able to access financing at a time where they are experiencing heightened balance sheet and income shocks from foreign currency volatility.

**Sum-Up**

Asian corporate debt levels have risen, with buffers against stress weakening somewhat in recent years. While reverse stress tests show that Asian economies still appear relatively resilient, a further step-down in global demand, combined with episodic shifts in investor sentiment, could weigh on debt servicing ability and financing conditions. Firms should continue to be prudent and guard against balance sheet mismatches and vulnerabilities. Enhanced surveillance over sectors with relatively higher debt vulnerabilities is warranted.
Special Study 3: The Effects of Speculative Activity, and Transaction Types on Private Residential Property Prices in Singapore\textsuperscript{37}

Private residential property prices have exhibited significant cyclical swings since the GFC. Macroprudential policy has actively targeted sources of risks that potentially cause prices to deviate from economic fundamentals. In particular, recent macroprudential policies addressed transactions by speculators, foreigners and corporates through stamp duties and credit-based measures. This study documents developments of private residential property prices in Singapore over the last decade and studies how prices were related to speculative activity and transactions by foreigners and corporates.

Property prices surged after the GFC, despite the introduction of the early tightening measures of several macroprudential instruments and subdued economic growth. Prices in the private residential property market increased by almost 16% between 2010 and 2013. Speculative activity, as indicated by the large shares of short-term resales\textsuperscript{38} (Chart S3.1), as well as interest from foreigners, was high during this period. Purchases by foreigners were observed to peak at about 20% of all transactions in 2011 (Chart S3.2).\textsuperscript{39}

Global factors appeared to have partly driven residential property prices, as suggested by the high interconnectedness of cross-country house prices in the region, which declined significantly after 2013...

The presence of a high correlation in cross-country house prices, particularly before 2013, suggests that house prices are not only driven by domestic factors (Chart S3.3). In particular, demand for safe assets or global investors’ search for yield may have contributed to house price interconnectedness in the region. However, since 2013, Singapore’s house prices appear to have decoupled from the regional developments.

\textsuperscript{37} This study was prepared by Romain Bouis, senior economist in the Monetary and Capital Markets Department of the IMF, based on materials of the latest IMF FSAP of Singapore (IMF (2019a) and IMF (2019b)). The views expressed in this study are those of the author and do not necessarily represent the views of the IMF, its Executive Board, or IMF management.

\textsuperscript{38} Short-term resale is defined as a resale of property within one year of purchase. The definition includes a sub-sale, which is a sale of a unit on the secondary market before the residential project has achieved its legal completion.

\textsuperscript{39} Corporates’ purchases shown in Chart S3.2 include en-bloc transactions (collective sales of housing developments to a common buyer(s) when there is majority consensus among the unit owners to sell), while the computation of the Private Property Price Index reported in the chart excludes the en-bloc transactions as they are considered transactions in the land sales market rather than direct sales of units. En-bloc transactions are nevertheless expected to indirectly increase property prices as sellers in these transactions receive a premium and can thereby pay a higher price for the purchase of other units.
...while property prices started to decline gradually in Singapore with the implementation of a comprehensive set of cooling measures including the Additional Buyer’s Stamp Duty (ABSD) and Total Debt Servicing Ratio (TDSR) framework.

Following the implementation of a series of important macroprudential measures, and possible dampening effects from fundamental factors, prices in Singapore gradually fell over time, in contrast to a continued rise in house prices in other cities of the region. In 2013, the ABSD\(^{40}\) rates (first introduced at end-2011) were raised by five to seven percentage points for all buyers except Singapore Citizens purchasing their first residential property, the limit on LTV ratio was lowered, and the TDSR framework was introduced. These measures together seemed to have been effective in containing the rise in house prices. Seller’s Stamp Duty (SSD) measures, which had been implemented earlier, may also have contributed to the cooling of the market with a lag. Prices started to stabilise, and by Q3 2017 were about 12% below the previous peak of 2013.

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**Short-term resales were correlated with the growth of residential property prices before vanishing with the implementation of SSD measures**

**Foreigners’ purchases dropped sharply following the first ABSD measure whereas rising corporates’ purchases (including en-bloc transactions) were associated with a rebound of residential property prices in 2H 2017 and 1H 2018**

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**Chart S3.1**

**Short-Term Resales, House Prices and SSD**

- Short-term resales (% of total resales)
- Private Property Price Index (RHS)
- SSD Measure

**Chart S3.2**

**Foreigners, Corporates, House Prices and ABSD**

- Foreigners’ purchases (% of total purchases)
- Corporates’ purchases (% of total purchases)
- Private Property Price Index (RHS)
- ABSD Measure

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The private property market began to recover in the second half of 2017 after four years of falling prices...

Private residential property prices started to pick up in the second half of 2017 and recorded an increase of 9.1% y-o-y in Q2 2018—the largest since 2011. The turnaround of the market came in the context of strong economic performance and improved market sentiment, as well as the boom in

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\(^{40}\) The ABSD is a residency-based capital flow management /macro-prudential measure based on the International Monetary Fund’s Institutional View on capital flows.
Collective sales for redevelopments in the land sales market. Corporates’ purchases (including en-bloc transactions) increased during that period while purchases by foreigners remained low (Chart S3.2).

...and the authorities responded by raising stamp duties and lowering LTV limits in July 2018, reducing the price growth and proactively muting the potential build-up of financial risk.

In response to the rebound in prices and transaction volumes, authorities raised the ABSD rates applied to purchases by corporates, foreigners and individual buyers (excluding Singapore citizens buying their first residential property) and tightened the LTV ratio limits for all loans granted by financial institutions in early July 2018. Following these measures, total transaction volumes dropped by more than 25% in Q3 2018 compared to the previous quarter (mainly reflecting lower resale transaction volumes while en-bloc activity also slowed down) and the growth of private residential property prices decreased.

House price growth in Singapore had been synchronised with those of other cities and countries of the region until end-2013

The more recent data show a slight uptick in foreigners’ and corporates’ demand and in prices, following some moderation after Q2 2018.

The shares of foreigners’ and of corporates’ purchases in total purchases have slightly increased in Q2 2019. Simultaneously, the property price index increased by 1.5% over the quarter. These developments suggest that Singapore remains an attractive market for foreign investors searching for yield in a global low interest rate environment, while corporates’ purchases (including en-bloc transactions) increased slightly after a significant drop in the course of 2018.

Regression analysis using information at the regional level confirms that residential property prices were significantly related to speculative activity and to foreigners’ and corporates’ purchases.

The quarterly growth rate of residential property prices in each region (Core Central Region, Rest of Central Region, Outside Central Region) was regressed on proxies for speculative activity (the share of short-term resale transactions) and on foreigners’ and corporates’ purchases as a share of total purchases (Chart S3.4), controlling for the growth rate of rents and the change in total transactions (see IMF (2019b) for details).
Results of the regressions (Appendix Table I.1 of IMF (2019b)) indicated that the growth rate of private residential property prices was significantly related to short-term resales, in line with research findings that flippers (investors buying an asset to make a profit by reselling the asset in the short term) can influence residential property prices in Singapore, despite representing a small fraction of the market (on average about 5% of total resale transactions over 2004–2012), by inducing a positive feedback to non-flippers — rental investors and owner occupiers (Tu et al., 2016). Estimates also indicate that foreigners’ and corporates’ purchases were positively related to the growth of residential property prices. Results were qualitatively similar when focusing on the 2004–2013 period, before residential property prices declined and speculative activity and foreigners’ purchases dropped with the implementation of SSD and ABSD measures.

Chart S3.4
Short-Term Resales, Foreigners’ and Corporates’ Transactions and Private Residential Property Prices by Region

A. Core Central Region
- Short-term resales (% of total resales)
- Foreigners’ purchases (% of total purchases)
- Corporates’ purchases (% of total purchases)
- Private Property Price Index (RHS)

B. Rest of Central Region
- Short-term resales (% of total resales)
- Foreigners’ purchases (% of total purchases)
- Corporates’ purchases (% of total purchases)
- Private Property Price Index (RHS)

C. Outside Central Region
- Short-term resales (% of total resales)
- Foreigners’ purchases (% of total purchases)
- Corporates’ purchases (% of total purchases)
- Private Property Price Index (RHS)

Source: MAS, Urban Redevelopment Authority and author’s calculations
Note: Based on quarterly figures from Q1 2004 to Q2 2019.
Additional regressions suggest that there was causality from transactions to prices, and not the other way around.
Short-term resales could be positively related to residential property prices insofar as flippers were timing the market, meaning they were selling their properties when prices were rising fast. Likewise, a boom in residential property prices could increase the appetite of foreigners and corporate investors for the domestic property market. In these cases, the growth of residential property prices would be positively correlated with transactions. Individual regressions of short-term resales, purchases of foreigners and of corporates, however indicate that none of these variables were explained by the growth of residential property prices, including when different lags of the growth of prices were considered (Appendix Table I.2 of IMF (2019b)).

The effects were economically significant, with foreigners’ purchases having the largest impact on the growth of residential property prices.
A one-standard deviation increase in the share of short-term resales (+5.3 percentage points), foreigners’ purchases (+5.9 percentage points), and corporates’ purchases (+8.5 percentage points) were associated with increases in the quarterly growth rate of private residential property prices of 0.4, 1.2, and 0.5 percentage points, respectively. In comparison, the standard deviation of the quarterly growth rate of private residential property prices was four percentage points over the sample period.

By targeting sources of risks including transactions of speculators, foreigners and corporates through stamp duties, property market-related measures limited excessive property price increases and contributed to improving the resilience of households and financial institutions against shocks. Stamp duties (the SSD and the ABSD) helped to limit excessive property price increases in Singapore (see Appendix Table II of IMF (2019b) for empirical evidence) by curbing speculators', foreigners' and corporates' demands, which were found to be significant drivers of residential property prices. They could thereby reduce the loss given default faced by lenders in the event of a negative shock.

For example, for a given probability of default, the losses incurred by banks would be smaller if property price developments were well contained ex-ante and the sizes of price corrections were smaller ex-post. Further, the use of stamp duties was justified as the stamp duties directly targeted the sources of residential property price pressures — that were the demand by speculators, foreigners and corporates — and were more focused on the sources of risk, complementing the tightening of macroprudential credit-based measures, whose effects could be more broad-based depending on the choice of tool.

References


Special Study 4: Cyber Risk Stress Tests for Banks and Insurers

This study presents the background, methodology and results of the cyber risk stress test that MAS conducted with banks and insurers as part of the 2019 IWST exercise.\(^{41,42}\)

**Regulators have been concerned about the microprudential consequences of cyber risks, and well-designed stress tests can serve as a useful tool to quantify these impacts.**

In the 2018 *FSR*, MAS laid out a framework for assessing the implications of cyber risk on financial stability.\(^{43}\) The systematic approach identified the various microprudential risks (e.g. liquidity, market, credit, legal and reputational risks), including second-order liquidity and market impacts on FIs. Cyber stress tests can serve as a useful tool to quantify the severity of these risks.

**Bottom-up cyber risk stress tests for banks and insurers are used to assess their resilience and better understand the transmission channels of cyber risks.**

MAS has conducted a series of stress tests for banks and insurers to progressively attune participants to the microprudential implications of cyber risks. The first was conducted as part of the 2016 IWST exercise and involved a general scenario in which a series of simultaneous hacking attacks was launched on FIs in the region including Singapore. These attacks resulted in stolen customer databases and disruption to client-facing systems.

The 2019 bottom-up cyber risk bank stress test built on the earlier exercise, and besides assessing banks’ cyber resilience, served as a useful industry scan to better understand the type of severe cyber attacks that they are most vulnerable to. Banks were required to provide the two most impactful, plausible cyber attack scenarios, and quantify the effects on their profits, capital and liquidity, with and without contingency measures. The first cyber scenario featured a direct cyber attack on the bank, while the second scenario involved an attack on an external party (e.g. third-party service providers) that the bank heavily relied on. Given that a cyber event might operate differently from that of conventional shocks (e.g. liquidity, credit risks), banks were also asked to provide details on the nature of the transmission channels.

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\(^{41}\) The results of the cyber stress test are also covered in a forthcoming IMF Working Paper. The paper uses Singapore as a case study to present analytical techniques that can be used to assess cyber risks for financial institutions.

\(^{42}\) The general results and conclusions of the cyber stress test can also be found in IMF (2019).

\(^{43}\) MAS, 2018
For insurers\(^{44}\), a stress scenario was prescribed to highlight the risks associated with affirmative and non-affirmative (silent)\(^{45}\) cyber insurance coverage. Insurers were asked to consider the claims impact arising from affirmative coverage of their ten biggest cyber insurance clients, as well as non-affirmative (silent) cyber coverage of their ten biggest property and casualty insurance clients. Unlike the bank stress test, the insurer stress test did not consider cyber risk disruption on the insurers themselves. Such a scenario had already been considered in the 2016 IWST.

**Banks assessed that they would be most affected by theft and disruption-related cyber attacks**...

The bottom-up cyber stress test results suggest that banks expect to be most affected by theft and disruption-related cyber attacks on themselves and external parties (Charts S4.1 and S4.2). Examples of theft-related attacks cited by banks include automated teller machine (ATM) jackpotting, where malware causes ATMs to dispense cash, or hacking of banks’ payment systems to effect unauthorised fund transfers. For disruption-related attacks, banks identified distributed denial-of-service attacks that prevent customers from accessing internet and mobile banking applications, or a disruption to the banks’ internal payment processing systems. Finally, banks raised damage or corruption of customer data as an example of a damage-related cyber attack.

**Banks envisage that they will be most affected by theft and disruption-related cyber attacks**

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<th>Chart S4.1</th>
<th>Most Impactful Types of Direct Cyber Attacks Envisioned</th>
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<td>Theft of Data</td>
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Source: MAS  
Note: Percentages do not add up to 100% as some stress scenarios cut across more than one category.

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<th>Chart S4.2</th>
<th>Most Impactful Types of Cyber Attacks on External Parties Envisioned</th>
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<td>Theft of Data</td>
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Source: MAS  
Note: Percentages do not add up to 100% as some stress scenarios cut across more than one category.

...and expected to face significant financial impact from their envisaged “worst-case” cyber scenarios.

Given that banks were asked to prescribe the most impactful cyber stress scenarios, the corresponding financial impacts on banks were relatively significant. While banks did not expect loans to fall

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\(^{44}\) Only significant direct general and composite insurers were required to perform the cyber risk stress test. These insurers make up 80% of the general insurance market, by gross written premium. Reinsurers were not involved in the last stress test exercise but significant reinsurers would be involved from 2021 onwards.

\(^{45}\) Affirmative cyber coverage refers to insurance policies that cover cyber-attack events explicitly. Non-affirmative (silent) cyber coverage refers to insurance policies that do not explicitly include or exclude coverage for cyber risks but may be exposed to claims arising from cyber-attack events.
considerably, deposits could decline by about 1–5% due to the reputational and confidence effects of these cyber incidents in the absence of contingency measures (Charts S4.3 and S4.4). The total costs incurred from cyber attacks were expected to reach 35–65% and 20–50% of banks’ quarterly profits for direct and indirect (i.e. attack on external parties) cyber attacks respectively (Chart S4.5). Most of the decline in profits that banks anticipated would mainly reflect a reduction in future revenues due to reputational impact, and other higher costs from monies stolen, legal charges and marketing/public relations expenses (Chart S4.6).

Nevertheless, banks assessed that they have adequate contingency measures to mitigate the cyber attacks...

Banks represented that they have taken various measures to mitigate the cyber attacks. For example, banks have adopted multiple layers of security controls (e.g. system, network and application level security) to protect sensitive data and monies from theft. To enhance resilience against disruption-related attacks, banks have implemented distributed denial-of-service mitigation measures (e.g. clean pipe services) which are tested regularly to verify their effectiveness. Critical data is regularly backed up to storage systems which can be used to restore the information at a point in time if required to mitigate against prolonged disruption to the banks’ activities.

Banks have also extended their cyber preparedness measures to that of their third-party service providers. For instance, banks perform due diligence to verify that their service providers have adequate cyber security measures to mitigate cyber attacks. Periodic audits are performed to verify that these measures are in place. Additionally, business continuity measures are put in place to ensure that banks can either switch to an alternative service provider or perform critical services in-house when outsourced services are disrupted.

Beyond the adoption of technical, operational and business continuity measures, banks conduct regular cyber exercises, such as social engineering exercises, to test their cyber preparedness. At the macro level, MAS conducts industry-wide exercises to test banks’ business continuity and crisis management plans for addressing operational disruptions from cyber attacks.

Thus, the financial impact of the cyber stress scenarios is significantly mitigated after taking into account such contingency measures. Under the scenario where contingency measures are in place, banks expected stressed deposit outflows to decline by 1–3% (Chart S4.4). Banks also expected to incur costs amounting to 20–35% and 12–25% of quarterly profits for direct and indirect cyber attacks respectively (Chart S4.5).

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46 Social engineering is a process in which cyber criminals manipulate an unsuspecting person into performing actions or divulging sensitive details such as passwords through the use of techniques such as phishing, identity theft and spam. Exercises are conducted where phishing emails are sent to individuals to assess and raise awareness of cyber hygiene practices within the organisation.
The financial impacts of cyber attacks are potentially significant, but are mitigated by contingency measures that are put in place.

The significant impact of envisaged cyber stress scenarios on profits can be attributed mainly to reputational impact and other costs (e.g. monies stolen, legal charges, public relations expenses).

...and have adequate capital and liquidity buffers to weather shocks from the cyber attacks they envisioned.

Despite the significant costs incurred from cyber attacks, domestic systemically important banks (D-SIBs) maintain adequate capital and liquidity buffers to mitigate the associated impact regardless of whether contingency measures were in place. Without contingency measures, banks estimate that severe direct and indirect cyber attacks would deplete aggregate Total CARs by about 0–0.4 percentage points (Chart S4.7) from a starting aggregate Total CAR position of 17%. Similarly, the D-SIBs’ aggregate all-currency LCRs are expected to fall by about 8–35 and 1–4 percentage points for direct and indirect cyber attacks, respectively from a starting aggregate all-currency LCR position of 131% without mitigating measures (Chart S4.8). These impact estimates compare favourably with a six percentage point decline in Total CAR and a 56 percentage point decline in all-currency LCR for the 2019 IWST solvency and liquidity stress tests, respectively.
Banks have adequate capital and liquidity buffers to weather shocks from cyber attacks

Similarly, insurers face minimal impact to their CARs from affirmative and non-affirmative (silent) cyber coverage.

Based on the cyber stress test exercise, insurers reported exposures of $600 million and $3.4 billion for affirmative and non-affirmative cyber risks, respectively. Claims arising from these exposures amounted to $1.8 billion shared between insurers and their reinsurers. The net losses resulted in a decline of insurers’ aggregate CAR by 3 and 2 percentage points for affirmative and non-affirmative (silent) cyber coverage, respectively (Chart S4.9). Insurers’ share of losses under the cyber stress was small due to their having reinsurance arrangements in place. Some insurers which participated in the cyber stress test exercise and had exposure to silent cyber coverage have put in place risk mitigation actions, including inserting appropriate exclusion clauses in their contracts.

Insurers have adequate capital buffers and reinsurance protection to mitigate the effects of affirmative and non-affirmative (silent) coverage.
The stress test increased understanding of the microprudential impact of cyber risk events, and future cyber stress tests will extend the framework to the systemic implications.

The cyber stress exercise has been useful in quantifying the financial impact of cyber risks and identifying the transmission channels and scenarios that are most impactful for banks. Nevertheless, banks have generally considered the theft and disruption-related cyber risk scenarios that are more commonly observed and encountered, but which have relatively less systemic risk. In comparison, data damage-related attacks, while having the greatest potential of causing a systemic outcome47, appeared less frequently in banks’ responses. Given the evolving nature of cyber threats, banks will need to broaden their consideration of the various types of risks when assessing the potential impact of cyber incidents/threats.

Additionally, banks’ responses to the stress test generally centred around the transmission channels and impacts of microprudential risks without considering the implications of systemic risk channels (e.g. risk contagion or confidence effects). This was partly the intent of the 2019 stress test design, as banks were asked to come out with cyber risk scenarios that involved only their own banks or their service providers. Nevertheless, the results and lessons learnt would be useful in designing cyber stress scenarios for future industry-wide stress tests that consider broader industry-wide cyber attack scenarios and the potential spillover effects. This would then come closer to the assessment of system-wide cyber risk impacts.

Assessing systemic outcomes can also be done via the aggregation of the relevant system-wide information. Specifically, regulators can work with FIs to construct an IT network map to assess interconnectedness. The construction of the IT network map, along with complementary information on financial interconnectedness, can potentially be used to identify risk concentrations and better assess the amplification and feedback effects of cyber risks. For instance, cyber and financial interconnectedness information can allow regulators to more accurately assess the impact of a cyber attack on multiple banks and critical third-party service providers on the financial system.

The stress test raised awareness of insurers on non-affirmative cyber risk exposure.

The cyber stress test exercise has also been useful in raising awareness of the insurance industry (through sharing of stress test results by MAS) on non-affirmative (silent) cyber risk exposure. The exercise showed that there is room for insurers to take adequate risk mitigating actions on their exposure to non-affirmative (silent) cyber exposures. Additionally, more can be done to create greater awareness, especially among the small and medium-sized non-financial corporates and the general public, of the need for cyber insurance. Insurers in this line of business should undertake sound cyber underwriting practices, and continue to develop suitable products to meet cyber risk transfer and mitigation needs of consumers to help close the cyber protection gap.

Sum-Up

Many FIs have traditionally regarded cyber risk as a microprudential operational risk that can be addressed through entity-specific cyber security and contingency measures. Given the interconnected

47 MAS, 2018
and increasingly digitalised nature of the financial sector, it is now necessary to also consider the systemic financial stability implications of cyber risks. The cyber stress test and IT network map are examples of analytical and surveillance techniques that would help shed more light on the systemic risk implications of cyber risk events. Given the nascent understanding of the relationship between cyber risk and financial stability, concerted collaboration between regulators and the industry is required to make effective use of existing analytical tools and develop new approaches to better assess and enhance the financial sector’s cyber resilience.

**References**

