



Monetary Authority of Singapore

financial • stability



macroprudential surveillance department
November 2017

financial • stability



November 2017

Macroprudential Surveillance Department

Monetary Authority of Singapore

ISSN 1793-3463

Published in November 2017

Macroprudential Surveillance Department
Monetary Authority of Singapore

<http://www.mas.gov.sg>

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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:

- “ASEAN” comprises Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Vietnam
- “Asia-10” comprises China (CHN), Hong Kong (HK), India (IND), Indonesia (IDN), Korea (KOR), Malaysia (MYS), the Philippines (PHL), Singapore (SGP), Taiwan (TWN) and Thailand (THA)
- “Euro zone” comprises Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Slovakia, Slovenia and Spain
- “European Union” (EU) comprises the euro zone, Bulgaria, Croatia, Czech Republic, Denmark, Hungary, Poland, Romania, Sweden and the United Kingdom (UK)
- “G3” refers to the euro zone and United Kingdom, Japan, and the United States (US)
- “G7” refers to Canada, France, Germany, Italy, Japan, the United Kingdom and the United States
- “G20” refers to the Group of Twenty comprising Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Korea¹, Mexico, Russia, Saudi Arabia, South Africa, Turkey, the United Kingdom, the United States and the European Union

Abbreviations used for financial data are as follows:

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

Other Abbreviations:

ABS	Association of Banks in Singapore
ACRA	Accounting and Corporate Regulatory Authority of Singapore
ADB	Asian Development Bank
AUM	Assets Under Management
BCBS	Basel Committee on Banking Supervision
BIS	Bank for International Settlements
BoE	Bank of England
BoJ	Bank of Japan
BPS	Basis Points
CAR	Capital Adequacy Ratio
CBOE	Chicago Board Options Exchange
CBS	Credit Bureau Singapore
CCP	Central Counterparty
CCR	Core Central Region
CCS	Credit Counselling Singapore

¹ Republic of Korea

CCyB	Countercyclical Capital Buffer
CGFS	Committee on the Global Financial System
CGIO	Centre for Governance, Institutions and Organisations
D-SIBs	Domestic Systemically Important Banks
DBU	Domestic Banking Unit
DCP	Debt Consolidation Plan
DDRS	DTCC Data Repository (Singapore) Pte Ltd
DOS	Department of Statistics
DTCC	Depository Trust & Clearing Corporation
EBIT	Earnings Before Interest and Tax
EBITDA	Earnings Before Interest and Tax, Depreciation and Amortisation
ECB	European Central Bank
ECF	Equity Crowdfunding
EIOPA	European Insurance and Occupational Pensions Authority
EMEAP	Executives' Meeting of East Asia Pacific Central Banks
EPFR	Emerging Portfolio Fund Research
ESG	Environmental, Social and Governance
FDI	Foreign Direct Investment
FI	Financial Institution
FinTech	Financial Technology
FRTB	Fundamental Review of the Trading Book
FSB	Financial Stability Board
FSI	Financial Stress Index
FSR	Financial Stability Review
FX	Foreign Exchange
GARCH	Generalised Auto Regressive Conditional Heteroscedasticity
GDP	Gross Domestic Product
GFC	Global Financial Crisis
GFMA	Global Financial Markets Association
GFSR	Global Financial Stability Report
GLS	Government Land Sales
HCE	Household Consumption Expenditure
ICR	Interest Coverage Ratio
IE	International Enterprise
IIF	Institute of International Finance
IMF	International Monetary Fund
INFRA	Infrastructure Recovery and Assets
IORP	Institution for Occupational Retirement Provision
IOSCO	International Organisation of Securities Commissions
IPTO	Insolvency and Public Trustee's Office
ISCA	Institute of Singapore Chartered Accountants
ISDA	International Swaps and Derivatives Association
IWST	Industry-Wide Stress Test
JFMC	Japan Financial Markets Council
LCR	Liquidity Coverage Ratio
LR	Leverage Ratio
LTD	Loan-to-Deposit
LTV	Loan-to-Value
M&OE	Marine and Offshore Engineering
MAS	Monetary Authority of Singapore
MDR	Merchant Discount Rate

MMO	Money Market Operations
MOVE	Merrill Lynch Option Volatility Estimate index
NFC	Non-Financial Corporate
NIM	Net Interest Margin
NPA	Non-Performing Asset
NPL	Non-Performing Loan
NUS	National University of Singapore
O&G	Oil and Gas
OCR	Outside Central Region
OECD	Organisation of Economic Co-operation and Development
OIF	Offshore Insurance Fund
OSV	Offshore Support Vessel
OTC	Over-the-Counter
P2P	Peer-to-Peer
PCA	Principal Component Analysis
RCR	Rest of Central Region
ROA	Return on Assets
SBF	Singapore Business Federation
SEACEN	South East Asian Central Banks
SEC	Securities and Exchange Commission
SFA	Securities and Futures Act
SGTI	Singapore Governance and Transparency Index
SGX	Singapore Exchange Limited
SIBOR	Singapore Interbank Offered Rate
SME	Small and Medium-Sized Enterprise
SPRING	Standards, Productivity and Innovation Board
SWF	Sovereign Wealth Fund
TCH	The Clearing House
TDSR	Total Debt-Servicing Ratio
TSC	Transport, Storage and Communication
TVP-FAVAR	Time-Varying Parameter Factor-Augmented Vector Auto Regressive
URA	Urban Redevelopment Authority
USFCI	US Financial Conditions Index
VAR	Vector Auto Regressive
VIX	CBOE Volatility Index

PREFACE

The Monetary Authority of Singapore (MAS) conducts regular assessments of Singapore's financial system. Potential risks and vulnerabilities are identified, and the ability of the financial system to withstand potential shocks is reviewed. The 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 financial sector in Section 2. Finally, a review of the corporate and household sectors is provided in Sections 3 and 4 respectively.

The production of the FSR was coordinated by the Macprudential Surveillance Department (MSD) team which comprises Kenneth Gay, Ng Heng Tiong, Lily Chan, Alex Phua, Aloysius Lim, Ang Shu Qin, Angeline Lam, Angeline Qiu, Cheryl Ho, Choo Chian, Denise Yeo, Evelyn Chen, Gael Soon, Koh Zhi Xing, Phil Liang, Tan Aik Khim, Wendy Lee, Wong Jian Xiang, and Wong Siang Leng under the general direction of Rosemary Lim, Executive Director (MSD) and Wong Nai Seng, Assistant Managing Director (Policy, Risk & Surveillance). The FSR also incorporates contributions from the following departments: Banking Departments I, II & III, Data Analytics Group, Economic Analysis Department, Economic Surveillance & Forecasting Department, Insurance Department, Markets Policy & Infrastructure Department, Monetary & Domestic Markets Management Department and Prudential Policy Department. The FSR reflects the views of the staff of the Macprudential Surveillance Department and the contributing departments.

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

<http://www.mas.gov.sg/en/Regulations-and-Financial-Stability/Financial-Stability.aspx>

OVERVIEW

While the global economy has strengthened, medium-term vulnerabilities remain

Gradual monetary policy normalisation in developed markets continues to support global growth. But accommodative financial conditions have also facilitated financial excesses amid persistent search for yield. This raises the risk of disruptive corrections when the excesses unwind.

Within the region, China has shifted its focus to addressing financial stability risks whilst still achieving firm economic growth. Close monitoring is warranted, given potential spillover effects on the global economy and financial markets.

Geopolitical risks and unexpected policy shifts in advanced economies may trigger a market correction and increased risk aversion, with attendant pullbacks from emerging markets.

Singapore's banking system remains resilient with strong capital and liquidity buffers to withstand shocks

Singapore's banking system remains resilient as the economic recovery gains traction. Both domestic and regional lending rebounded, in line with the regional economic revival.

While overall asset quality has improved, banks continue to face heightened credit risks from the marine and offshore engineering (M&OE) subsector. Foreign currency funding pressures have also risen alongside growing cross-border exposures.

Banks should continue to maintain sound credit underwriting standards and actively

monitor their borrowers' financial health. Banks should also stay vigilant in managing their foreign currency funding risks as they expand in the region.

MAS has not observed broad-based domestic credit overheating at this juncture. Accordingly, MAS will maintain the Countercyclical Capital Buffer (CCyB) at 0%.

Corporate profitability remains broadly stable, but firms should guard against potential balance sheet vulnerabilities

Corporate profitability remains broadly stable, supported by improvements in the global economy. The M&OE subsector in Singapore was, however, weighed down by low oil prices.

The aggregate corporate debt profile remains sound. MAS' stress test suggests that most corporates are able to withstand interest rate and earnings shocks. However, the pick-up in corporate leverage after a period of moderate credit growth bears close monitoring. Firms should continue to guard against potential balance sheet vulnerabilities, as higher interest rates could weigh on their debt servicing ability.

Singapore's household balance sheets are strengthening, but households should remain financially prudent

Household balance sheets are strengthening alongside the economic recovery. The main drivers are growth in financial and property assets.

While the overall employment outlook is expected to improve in 2018, wages are not expected to increase rapidly as the existing

slack in the labour market will take time to be absorbed. Against this backdrop and with higher interest rates expected in the period ahead, households should continue to stay financially prudent.

Recent developments in the property market pose potential risks to stability; market players should proceed cautiously

The private residential property market has picked up in recent quarters, underpinned by an improvement in buyer sentiment and low interest rates. Developers have also participated actively in en-bloc sales and the Government Land Sales (GLS) programme to replenish their land banks.

The development of en-bloc and GLS sites should more than double the number of units available for sale in the near term. In the medium term, the stock of private housing will increase. With slower population growth, there is considerable uncertainty as to whether existing vacancies and the new supply coming on stream can be fully absorbed by the market. If not matched by occupation demand, a supply imbalance could result and weigh on rentals and property prices.

Developers should take into account the significant rise in the number of private housing units available for sale in the near term when bidding for land.

Prospective buyers should remain prudent in their buying decisions. There is ample supply to meet occupation demand. Buyers should carefully assess their ability to service their mortgage debt in the long term, taking into account potential interest rate increases and uncertain rentals.

Banks should continue to maintain prudent underwriting standards and review their valuation practices to ensure that property appraisals remain realistic and substantiated.

Macroprudential Surveillance Department
Monetary Authority of Singapore
30 November 2017

1 Global Environment

While the global economy has strengthened, medium-term vulnerabilities remain. Gradual monetary policy normalisation in developed markets continues to support global growth. But accommodative financial conditions have also facilitated financial excesses amid persistent search for yield. This raises the risk of disruptive corrections when the excesses are unwound. A normalisation process that is not carefully calibrated could remove necessary support for sustained economic recovery, leading to shifts in market sentiment and highlighting vulnerabilities in emerging markets.

Within the region, China has so far managed to shift its focus to addressing financial stability risks whilst still achieving firm economic growth. Close monitoring is warranted, given potential spillover effects on the global economy and financial markets.

Geopolitical risks and unexpected policy shifts in advanced economies may trigger a market correction and increased risk aversion, with attendant pullbacks from emerging markets. These could derail global growth.

Monetary Policy Normalisation amid High Debt Levels

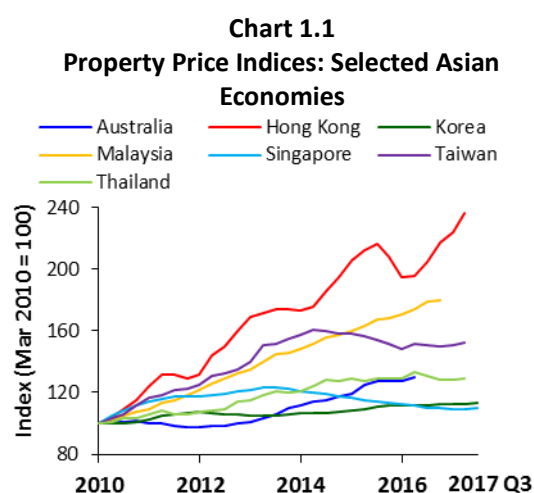
While the pick-up in global growth has reduced near-term financial stability risks, medium-term vulnerabilities remain

Global economic conditions have improved this year, and this improvement is expected to continue on the back of stronger global trade and still accommodative monetary policy. Improved economic conditions have reduced near-term financial stability risks from weak growth and profitability, but medium-term vulnerabilities remain.

Prolonged accommodative stance will continue to drive the search for yield and fuel the growth of debt

Expectations of a gradual normalisation of monetary policies in major advanced economies has contributed to a continued build-up of financial excesses and asset prices,

for example in some regional property markets (Chart 1.1), amid continued search for yield. This increases the likelihood of a disruptive correction in asset prices.



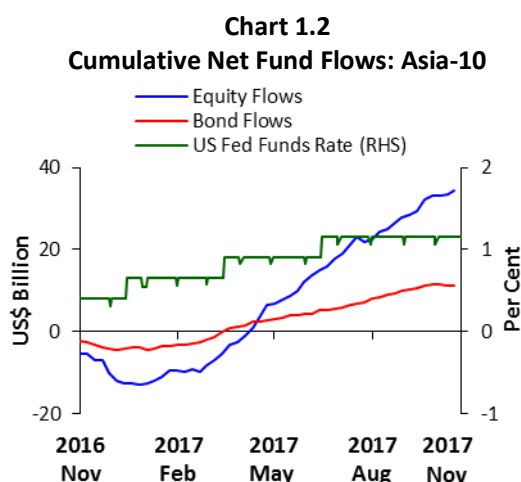
Source: CEIC

As corporate and household debt increases (See Box A “Drivers of Corporate Leverage in Asia” and Box B “Trends in Global Household

Indebtedness and Drivers of Household Leverage”), there are concerns on borrowers’ resilience to negative shocks and the potential spillover effects to banks and the wider financial system.

Monetary policy normalisation could have implications on capital flows in emerging markets, including Asia

While monetary policy normalisation will help correct financial imbalances, the process should be done delicately. Asian economies have so far weathered the gradual rise in US interest rates well, with portfolio capital inflows having stayed resilient (Chart 1.2).



Source: MAS estimates, Bloomberg, Emerging Portfolio Fund Research (EPFR)

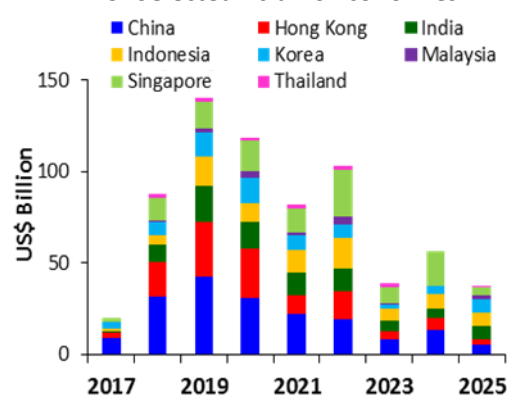
Note: Asia-10 comprises China (CHN), Hong Kong (HK), India (IND), Indonesia (IDN), Korea (KOR), Malaysia (MYS), the Philippines (PHL), Singapore (SGP), Taiwan (TWN) and Thailand (THA).

However, emerging market economies remain exposed to shifts in market sentiment and capital flight (See Box C “Financial Stress Indices of Selected Asian Economies” and Box D “Drivers of Gross Capital Inflows to Asia after the Global Financial Crisis”).

Capital flight would exert downward pressure on emerging market currencies, and together with rising US interest rates, make servicing

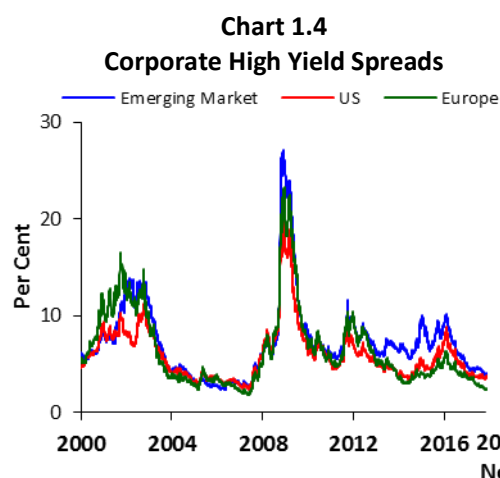
foreign currency debt more expensive. Furthermore, rollover risk of US dollar (USD)-denominated liabilities in the next few years will increase in Asia (Chart 1.3). That said, institutional investors’ counter-cyclical behaviour in Asian bond markets could help to provide a stabilising force (See Box E “The Behaviour of Institutional Asset Owners in Asia-10 Financial Markets: Pro-cyclical or Counter-cyclical?”).

Chart 1.3
Maturity Profile of USD-denominated Liabilities of Selected Asia-10 Economies



Source: Institute of International Finance (IIF)

Despite rising vulnerabilities, the historically low compensation for risk (Chart 1.4) suggests that the market may be underestimating downside risks.



Source: BofA Merrill Lynch, FRED Federal Reserve Bank of St. Louis

China's Continued Balancing Act

Authorities have shifted focus towards financial stability whilst still achieving firm economic growth...

Over the past year, concerns over China's capital outflows and exchange rate volatility have eased, and economic growth has remained resilient.

With this, China has shifted focus towards addressing financial stability risks associated with rising debt levels. Authorities have imposed stricter lending restrictions on the property sector. Measures have also been taken to tackle banking- and shadow banking-related risks, resulting in a reduction in banks' reliance on interbank funding and deceleration in shadow banking growth.

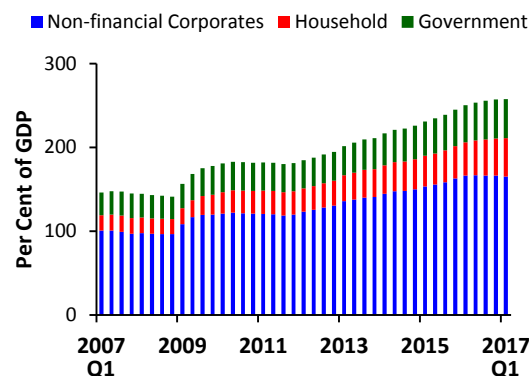
...but vulnerabilities remain

Household debt has grown significantly over the past few years, largely driven by mortgage loans. Property prices in China have continued to increase, albeit at a slower pace. China's high corporate debt levels could also present significant credit risks to the financial system.

In addition, asset quality risks from shadow banking activity are not transparent and could be amplified through interconnectedness with the banking system.

To date, authorities' attempts to encourage deleveraging in the financial system have seen some effect, with the pace of credit growth slowing in recent quarters (Chart 1.5).

Chart 1.5
China's Non-Financial Sector Debt



Source: Bank for International Settlements (BIS)

Policymakers continue to face a delicate balancing act between economic, financial and social stability

Policymakers continue to face the difficult task of rebalancing the economy away from the current credit-driven growth model while maintaining economic, financial and social stability.

China has a strong policy toolkit with many available levers, and has so far demonstrated its ability to manage this delicate balance. Even then, we need to closely monitor developments in China, as any risk events could have repercussions on the global economy and financial markets.

Global Uncertainty

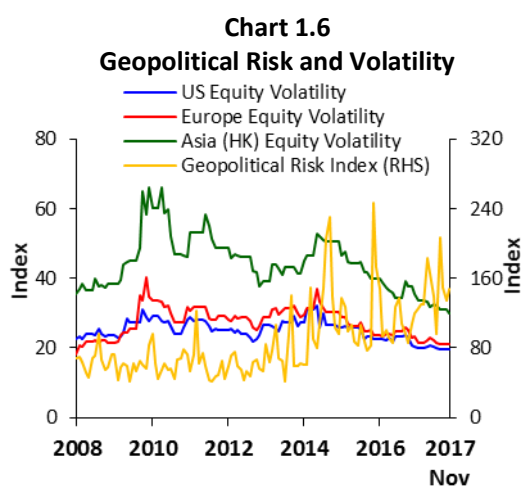
Heightened policy uncertainty and an escalation of geopolitical risk could derail global growth

The rise of populism and nationalism manifested in 2016 has translated to heightened policy uncertainty this year; with the path of ongoing regulatory and fiscal policy reforms in the United States (US) as well as

arrangements for the United Kingdom (UK) to withdraw from the European Union (EU) unclear.

In Europe, populism and separatist sentiments have increased in Germany and Spain. It remains to be seen if incumbent governments have sufficient support to push through with necessary reforms to strengthen their economies and financial systems, as well as to support European integration.

So far, periods of heightened geopolitical risks over the course of the year have not led to serious risk aversion — asset valuations remain high with volatility at historical lows (Chart 1.6).



Source: Bloomberg, Geopolitical Risk Index²

A change in market expectations regarding policy or a sharp escalation of geopolitical risks could trigger shifts in sentiment, a swift and disorderly repricing of assets, and a sudden increase in risk premia. The resulting market disruption could derail global growth.

Policymakers need to be on the lookout for other emergent risks

Apart from the aforementioned risks, the rise of technology in finance could bring along greater vulnerabilities from cyber- and financial technology (FinTech)-related risks (See Box F “Financial Technology and Financial Stability — What’s the Deal?” and Box G “As the Twain Meet: Analysing the Impact of Financial Technology on Asian Banks’ Payments, Deposit and Lending Businesses”). Policymakers must remain vigilant to these and other new risks as they arise.

² Dario Caldara and Mateo Iacoviello (August 2017), Board of Governors of the Federal Reserve Board Working Paper, “Measuring Geopolitical Risk”.

Box A Drivers of Corporate Leverage in Asia

Corporate leverage in Asia has risen post-global financial crisis (GFC). An increase in corporate leverage in itself is not necessarily a cause for concern if leverage is used to expand a firm's productive capabilities. However, elevated debt levels could be a source of vulnerability. Corporates' and their creditors' balance sheets can be adversely affected when interest rates increase or financial conditions tighten. Studies have also shown that elevated corporate debt levels often precede financial crises.³

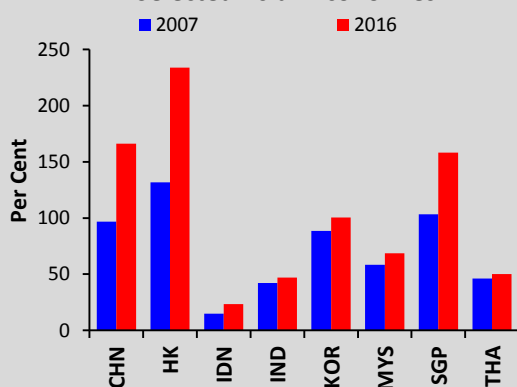
Corporate debt-to-Gross Domestic Product (GDP) ratios have increased across Asia since the GFC (Chart A1). However, corporate leverage has not increased uniformly across firms. In fact, in some Asian jurisdictions, the median debt-to-equity ratio of firms⁴ has declined since the GFC (Chart A2).

This box examines the degree to which firm-specific, industry-specific and macroeconomic factors have contributed to corporate leverage (in terms of debt-to-equity ratios) in Asia and the potential implications for policymakers.

While corporate debt-to-GDP ratios have increased post-GFC...

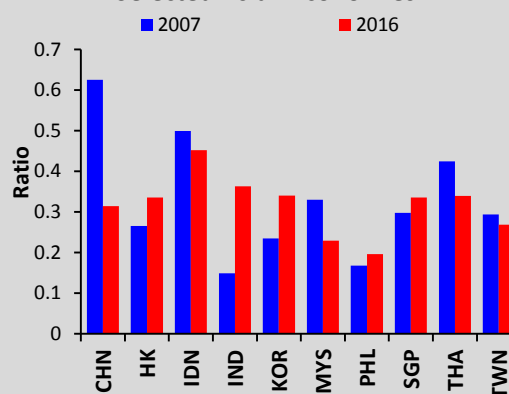
...at the firm level, median corporate leverage has declined in some economies

Chart A1
Corporate Debt-to-GDP:
Selected Asian Economies



Source: MAS estimates, BIS

Chart A2
Median Debt-to-Equity Ratio of Firms:
Selected Asian Economies



Source: MAS estimates, Thomson Reuters

Literature review

Rajan and Zingales (1995)⁵ find that four principal firm-specific factors contribute to corporate leverage across G7 economies⁶ — share of tangible assets, profitability, size and market-to-book value of firms. On the other hand, Gungoraydinoglu and Öztekin (2011)⁷ conclude that industry leverage has the most

³ Enrique G. Mendoza and Marco E. Terrones, NBER Working Paper No. 14049 (May 2008), "An Anatomy of Credit Booms: Evidence from Macro Aggregates and Micro Data".

⁴ The debt-to-equity ratio of individual firms is used as a measure of leverage and it reflects the degree to which debt and equity are used to finance assets.

⁵ Raghuram G. Rajan and Luigi Zingales, The Journal of Finance, Vol. 50, No.5 (December 1995), "What Do We Know About Capital Structure? Some Evidence from International Data".

⁶ G7 refers to Canada, France, Germany, Italy, Japan, the UK and the US.

⁷ Ali Gungoraydinoglu and Özde Öztekin, Journal of Corporate Finance, Vol. 17, Issue 5, (2011), "Firm- and Country-level Determinants of Corporate Leverage: Some New International Evidence".

significant impact on corporate leverage, even more so than firm-specific attributes. In addition, the International Monetary Fund (IMF) (2015)⁸ finds that global factors, in particular easier global financial conditions⁹, have become more significant drivers of corporate leverage in emerging markets post-GFC.

Methodology and data

Building on earlier studies, we conducted a fixed effects panel regression of the debt-to-equity ratio against a list of variables set out in Table A1. The regression used data of 9,000 non-financial firms listed on the stock markets of Asia-10 economies from 2009 to 2016.

Findings

We find that firm-specific, industry-specific and macroeconomic variables are important in explaining corporate leverage across Asia (Table A1). The estimated signs of the coefficients of the firm-specific, industry-specific and macroeconomic variables are also consistent with findings from the studies cited earlier.

Table A1
List of Variables Used in Regression

Variables	Estimated Sign of Coefficient
Firm-Specific	
Share of tangible assets	+***
Profitability	—***
Market-to-book value	—***
Growth rate	+**
Industry-Specific	
Median industry leverage	+***
Macroeconomic	
World GDP	+**
Bond yields	—*

Source: MAS estimates

Note: ***, ** and * represent statistical significance at the 1%, 5% and 10% levels respectively.

Firm-specific variables

At the firm level, we find that the share of tangible assets and the growth in the size of a firm are positively correlated with corporate leverage. The share of tangible assets of a firm is defined as the value of plant, property and equipment relative to the firm's total assets. A higher share of tangible assets, serves as a ready source of collateral and may enable a firm to gain greater access to credit. Similarly, the growth rate of a firm, measured by the growth in its assets, is positively correlated with corporate leverage. A possible reason is that fast growing firms may need to access external credit instead of relying on internal resources to grow.

⁸ IMF, Global Financial Stability Report (GFSR), Chapter 3 (October 2015), "Corporate Leverage in Emerging Markets — A Concern".

⁹ IMF proxies easier global financial conditions by using US shadow rates, which aim to capture the effects of the US' unconventional monetary policy stance when interest rates reach the zero lower bound.

On the other hand, the profitability (defined as the return on assets of a firm) and the market-to-book value ratio of a firm are negatively correlated with corporate leverage. Lower profitability could indicate that a firm has insufficient retained earnings and hence, increases the likelihood of it taking on more debt to support investment opportunities or meet its debt obligations.¹⁰ Conversely, high market-to-book values may signal higher risk firms that lenders may be more cautious in extending credit to.¹¹ Such firms may also prefer to exploit their higher valuations to raise equity financing instead of borrowing.

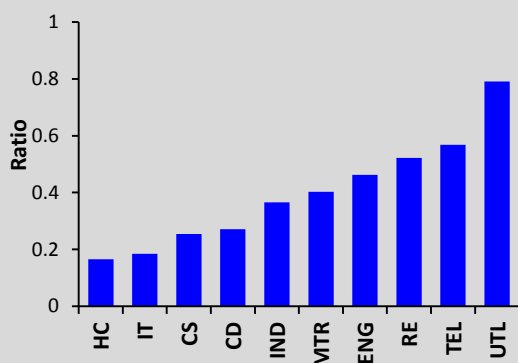
Industry-specific variable

A firm's leverage is positively correlated with the median leverage of the industry it belongs to. This is likely because firms within an industry would face similar regulations and cost structures. Capital-intensive industries such as utilities and telecommunication services tend to have higher leverage compared to less capital-intensive industries (Chart A3).

Certain industries are also more prone to cyclical fluctuations. The leverage of firms within these industries would likely co-move with changes in business conditions. For instance, in the energy sector, oil prices are likely to influence leverage trends (Chart A4). High oil prices until mid-2014 could have encouraged energy firms to take on more debt for expansion to meet demand. The subsequent decline in oil prices would have reduced the value of assets backing such debt, causing these firms to deleverage.¹² At the same time, lower oil prices would have discouraged energy firms from making further capital investments.¹³

Capital-intensive industries tend to have higher leverage

Chart A3
Median Debt-to-Equity Ratios Across Industries in Asia

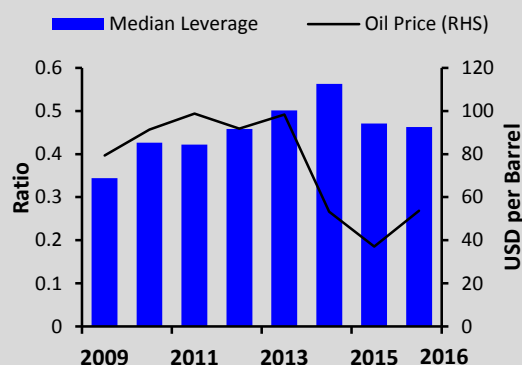


Source: MAS estimates, Thomson Reuters

Note: CD: Consumer Discretionary, CS: Consumer Staples, ENG: Energy, HC: Healthcare, IND: Industrials, IT: Information Technology, MTR: Materials, RE: Real Estate, TEL: Telecommunications, UTL: Utilities.

Leverage of energy firms likely to be affected by changes in oil prices

Chart A4
Median Leverage of Energy Firms in Asia and Oil Prices



Source: MAS estimates, Bloomberg, Thomson Reuters

¹⁰ This behaviour is in line with the pecking order theory which postulates that leverage and profitability are inversely related as proposed in Stewart C. Myers and Nicholas S. Majluf, Journal of Financial Economics, Vol. 13, Issue 2 (July 1984), "Corporate Financing and Investment Decisions when Firms Have Information that Investors Do Not Have".

¹¹ Stewart C. Myers, Journal of Financial Economics, Vol. 5, Issue 2 (November 1977), "Determinants of Corporate Borrowing".

¹² Dietrich Domanski, Jonathan Kearns, Marco Lombardi, Hyun Song Shin, BIS Quarterly Review (March 2015), "Oil and Debt".

¹³ According to the International Energy Agency, upstream O&G investment plunged 44% between 2014 and 2016.

Macroeconomic variables

While studies have traditionally focused on the influence of firm- and industry-specific characteristics on corporate leverage, macroeconomic conditions could also have a bearing on corporate leverage and influence firms' capital structure decisions. We find that domestic five-year sovereign bond yields, a proxy for the domestic borrowing cost for firms, are negatively correlated with leverage. Cheaper borrowing costs allow firms to take on more leverage. On the other hand, world GDP growth, a proxy for global economic conditions, is found to be positively correlated with leverage. A pick-up in global growth would have positive spillovers to global trade and business sentiments. This could in turn encourage firms to take on more leverage to expand their operations.

Summary of findings and potential policy implications

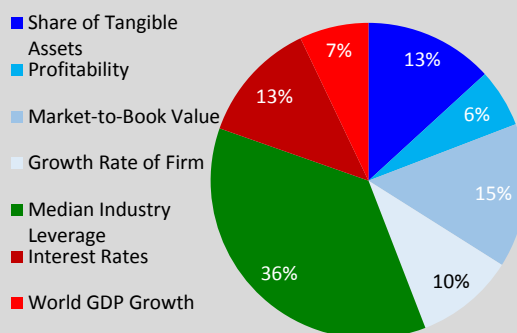
Chart A5 summarises the relative contribution of various factors to changes in corporate leverage. While firm-specific factors are the key drivers (44%), our findings also highlight the importance of examining other factors such as industry-specific (36%) and macroeconomic factors (20%). Accommodative monetary policy conditions could incentivise firms to bring forward their investments and take on more leverage. Some of these firms could face debt repayment difficulties when interest rates normalise. Firms should review their debt profiles and reduce their leverage over time.

Further, since industry-specific factors also contribute to changes in corporate leverage, authorities could place further emphasis on monitoring risks at the industry level. For instance, industries that tend to be more highly geared would be more vulnerable to fluctuations in business conditions. Measures to address corporate leverage could be more effective if targeted at specific industries. In contrast, broad-based policy measures that restrict overall credit could have unintended spillovers to other sectors.

Further research that explores the impact of other factors, such as country-specific variables, could shed more light on the drivers of corporate leverage. Examining the role of factors such as bankruptcy laws and tax codes would help authorities design better policy measures that manage risks associated with elevated corporate debt.

Firm-specific factors contribute most to corporate leverage

Chart A5
Relative Contribution of Various Factors to Change in Corporate Leverage



Source: MAS estimates, Thomson Reuters

Box B

Trends in Global Household Indebtedness and Drivers of Household Leverage

High household leverage renders an economy vulnerable to financial and macroeconomic instability. IMF (2017)¹⁴ notes that a higher household debt-to-GDP ratio contributes to a greater probability of a banking crisis. Lombardi et al (2017)¹⁵ find that a one percentage point increase in the household debt-to-GDP ratio is associated with a 0.1 percentage point decrease in GDP growth in the long run.

This box analyses trends in household indebtedness and drivers of household leverage in both Asian and advanced economies. We find that developments in the property market are an important determinant of household debt. Further, macroprudential policies have become more important in mitigating increases in household debt post-GFC.

While households in some countries have deleveraged post-GFC, household debt levels remain high

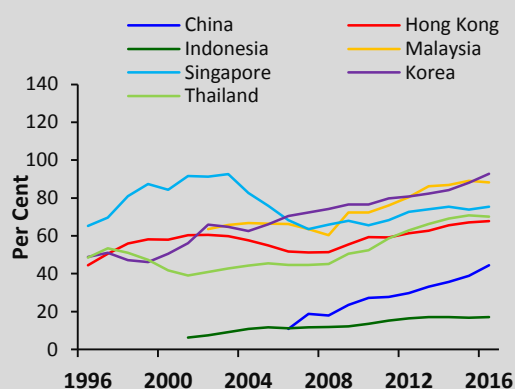
Household debt levels vary widely across countries. Household debt-to-GDP ratios range from 60% to 90% in many Asian economies, with the exception of Indonesia and China where the ratio stands at 17% and 44% respectively (Chart B1). In some advanced countries, household debt-to-GDP ratios remain elevated at above 100% (Chart B2).

Household leverage in Asia has generally increased post-GFC. However, the pace of increase has moderated in some Asian countries over the past three years (Chart B3). Outside Asia, households in a number of countries have deleveraged post-GFC.

*Household debt-to-GDP ratios
in Asia have
generally increased post-GFC*

Chart B1

**Household Debt-to-GDP Ratio:
Selected Asian Economies**

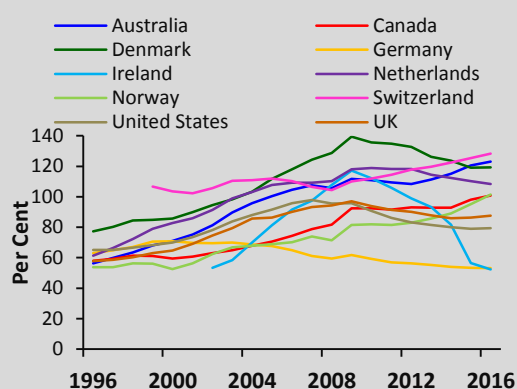


Source: MAS estimates, BIS

*Outside Asia, household debt-to-GDP ratios remain
elevated, although some advanced economies have
deleveraged post-GFC*

Chart B2

**Household Debt-to-GDP Ratio:
Selected Advanced Economies**

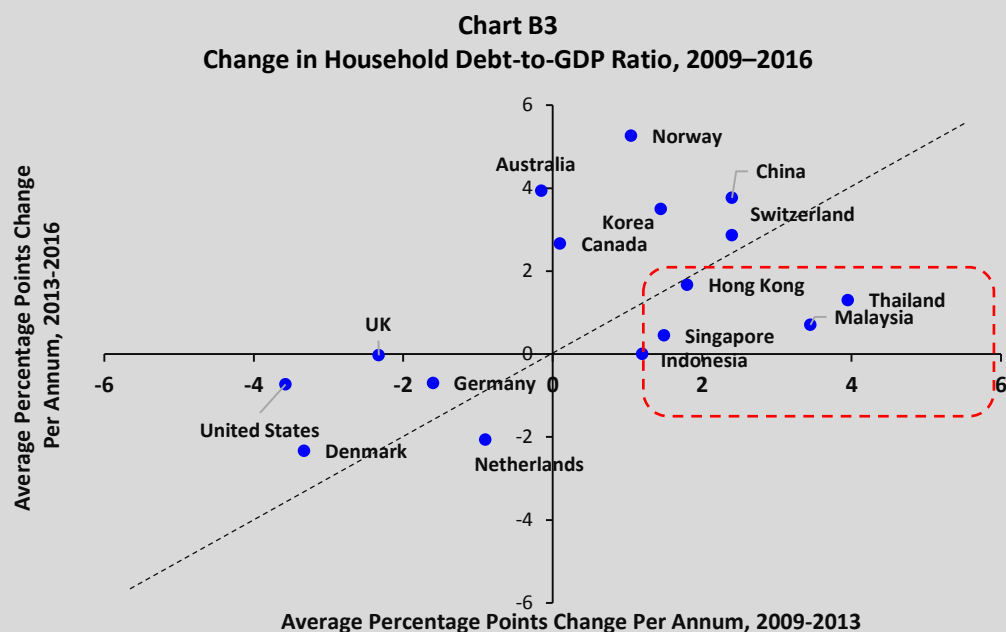


Source: MAS estimates, BIS

¹⁴ IMF GFSR, Chapter 2 (October 2017), "Household Debt and Financial Stability". Further, IMF notes that the relationship between increasing household debt and financial crisis is more pronounced at higher levels of indebtedness. While rising household indebtedness boosts consumption and real GDP growth in the short run, it may have a dampening effect on future real GDP growth in the long run.

¹⁵ Marco Lombardi, Madhusudan Mohanty and Ilhyock Shim, BIS Working Paper 607 (January 2017), "The Real Effects of Household Debt in the Short Run and Long Run".

Over the past three years, the pace of increase in household debt-to-GDP ratio has moderated in some Asian countries



Source: MAS estimates, BIS

Drivers of changes in household debt

Recent work by IMF (2017)¹⁶ and Jarmuzek and Rozenov (2017)¹⁷ identify income, interest rates and house prices as potential drivers of household debt. Building on this and earlier studies, the relative importance of different cyclical factors in driving household debt was analysed, using a fixed effects panel regression of changes in household debt-to-GDP ratios against a list of variables set out in Table B1. The regression used annual data for the period from 2001 to 2016 of 17 countries from Asia and other advanced economies.¹⁸

Variable selection

The permanent-income hypothesis suggests that consumption is determined by both current and expected future income. If current income is not sufficient to support current consumption, households may borrow to fund their purchases. Higher current income (proxied by GDP per capita) encourages borrowing by raising debt servicing ability. An increase in the value of assets such as property and stock holdings may lead to a wealth effect that causes households to front-load their consumption, resulting in higher current debt. Aoki et al. (2004)¹⁹ further demonstrate how house prices may affect household borrowing as increases in house prices generate additional collateral value against which households can borrow. Higher

¹⁶ IMF Regional Economic Outlook: Asia and Pacific (April 2017), "Rising Household Debt in Asia".

¹⁷ Mariusz Jarmuzek and Rossen Rozenov, IMF Working Paper WP/17/72 (March 2017), "Excessive Private Sector Leverage and Its Drivers: Evidence from Advanced Economies".

¹⁸ Australia, Canada, China, Denmark, Germany, Hong Kong, Ireland, Japan, Malaysia, Netherlands, New Zealand, Norway, Singapore, Korea, Switzerland, the UK and the US.

¹⁹ Kosuke Aoki, James Proudman and Gertjan Vlieghe (2004), Journal of Financial Intermediation Vol. 13 Issue 4, "House Prices, Consumption, and Monetary Policy: A Financial Accelerator Approach".

house prices may also induce investors to borrow more in anticipation of capital gains from property investments, especially given the reduced borrowing costs in the current low interest rate environment.²⁰

Post-GFC, countries have made wider use of macroprudential measures which moderate credit availability in overheated markets. Wong et al. (2015) find that macroprudential policies have dampened mortgage loan growth and improved the risk profile of borrowers in Singapore.²¹

Table B1
Panel Regression of Change in Household Debt-to-GDP Ratio

List of Drivers	Regression Estimates
Income	
Growth in per capita GDP	0.05*
Cost of Borrowing	
Change in interest rates	-0.73*
Wealth/Assets	
Growth in property prices	0.43***
Growth in stock prices	-0.08***
Policy Variable	
Changes in macroprudential policies ²²	-0.39*

Source: MAS estimates

Note: ***, **, * represent statistical significance at the 1%, 5% and 10% levels respectively.

Findings

Rising property prices are associated with higher household debt. The results corroborate the findings of Jarmuzek and Rozenov (2017) and Dyan and Kohn (2007).²³ Specifically, a one percentage point increase in property price growth is associated with a 0.4 percentage point increase in household leverage. Changes in property prices contribute about half of the change in household debt post-GFC (Chart B4). This is not surprising given that mortgage debt is a key component of household debt. In most countries, mortgage debt makes up more than 60% of total household debt, with the share exceeding 80% in a number of advanced economies (Chart B5).²⁴

²⁰ Household debt may conversely affect property prices through the portfolio channel where households borrow to speculate in property, driving property prices higher. We address this potential reverse causality between property prices and household debt using two-stage least square estimation.

²¹ Wong et al., South East Asian Central Banks (SEACEN) Financial Stability Journal (May 2015), "Using Macroprudential Tools to Address Systemic Risks in the Property Sector in Singapore".

²² Macroprudential policies applied from 2000 to 2014 are adapted from a dataset developed by Eugenio Cerutti, Ricardo Correa, Elisabetta Fiorentino and Esther Segalla, IMF Working Paper 110 (June 2016), "Changes in Prudential Policy Instruments-A New Cross-Country Database". Macroprudential policies implemented from 2015 to 2016 are updated based on information from IMF, Asian Development Bank (ADB), The Financial Times, Reuters, as well as the relevant government agencies' websites and media releases. Additional macroprudential policies targeted at mortgage loans such as debt servicing ratios, housing loan tenures, limits on interest-only loans, caps on the share of bank loans with high loan-to-value (LTV) ratios, limits on credit growth for investment property loans etc have also been added to the list of policy measures in the dataset developed by Cerutti et al. (2016).

²³ Karen E. Dyan and D. L. Kohn (August 2007), Federal Reserve Board Finance and Economics Discussion Series no 37, "The Rise in U.S. Household Indebtedness: Causes and Consequences".

²⁴ Higher mortgage debt levels in and of themselves may not be a cause for concern. To assess risks to households and FIs, we need to drill down to specific structural and institutional factors of each housing market. In some countries, higher household debt may be a reflection of higher home ownership rates. If supported by prudent LTV and debt-service limits, such markets may pose lower risks compared to countries with similar levels of mortgage debt but lower home ownership rates.

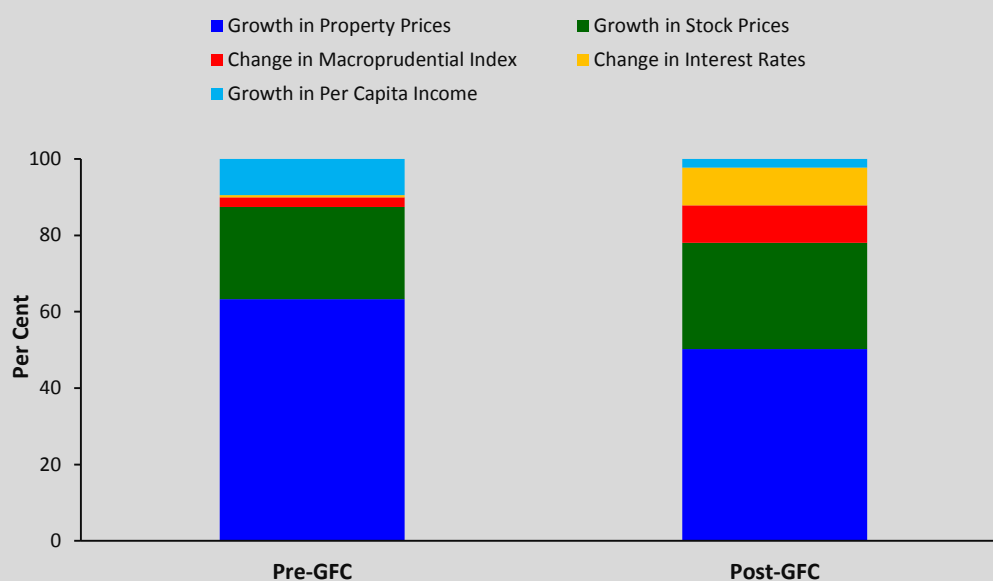
Contrary to our expectation, higher stock prices have a negative impact on changes in household leverage. This may be due to the substitution effect between stocks and property – higher stock prices increase the relative attractiveness of stock investments (vis-à-vis property investments). This reduces overall borrowings given that loan quanta for share financing are typically lower than for mortgage loans.

Tighter macroprudential policies have also mitigated the increase in household debt. Post-GFC, countries in Asia have made wider use of macroprudential measures, including borrower-based macroprudential instruments such as loan-to-value (LTV) limits, debt service ratios and housing loan tenure restrictions to arrest unsustainable increases in property prices and household debt. As a result, changes in macroprudential policies have become a more important driver in reducing household leverage post-GFC, contributing 10% of the change in household leverage.

Consistent with earlier studies, higher GDP per capita and lower interest rates have a positive impact on changes in household leverage. The relative contribution of higher GDP per capita in driving household leverage is much smaller post-GFC, in part due to lower GDP growth.

Changes in asset prices are key drivers of changes in household leverage; the impact of macroprudential measures on household leverage has increased post-GFC

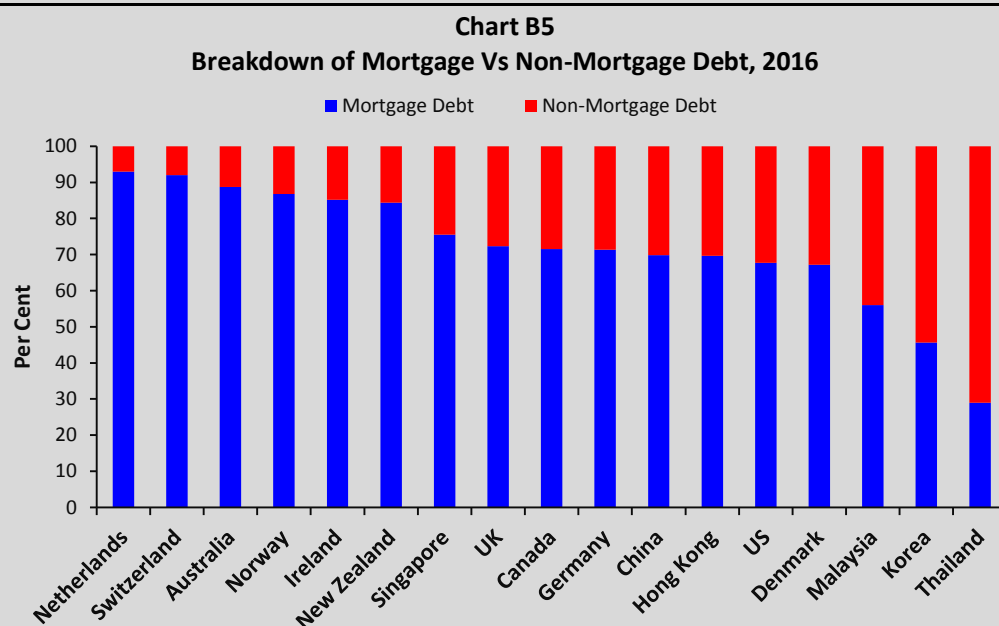
Chart B4
Relative Contribution of Various Factors to Change in Household Debt-to-GDP Ratio



Source: MAS estimates

Pre-GFC refers to the period from 2001 to 2007. Post-GFC refers to the period from 2009 to 2016.

Mortgage debt is a key component of household debt in many countries



Source: MAS estimates, Bloomberg, CEIC, Central Banks, National Statistical Agencies

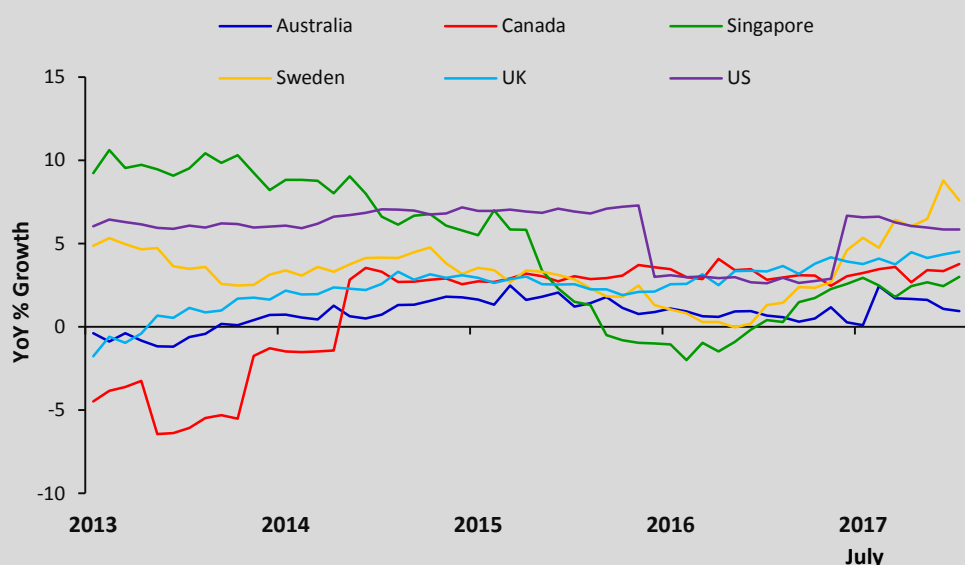
Growth in unsecured lending in some jurisdictions warrants close monitoring

More recently, central banks have called for enhanced monitoring of non-mortgage consumer debt, including credit card lending (Chart B6), which has outpaced income growth in some jurisdictions.²⁵ The credit quality of such unsecured loans could deteriorate quickly and losses could pick up in a downturn. Studies have shown that borrowers tend to first default on their unsecured lending, followed by mortgage loans in the event of repayment difficulties.

²⁵ In the US, the growth of consumer credit, especially in auto loans and credit cards, has outpaced household income growth. Further, the share of auto loans more than 90 days past due has reached a six-year high, rising to 3.9% in Q2 2017. The share of auto loans granted to riskier borrowers has consistently increased since 2010.

Growth in unsecured lending warrants monitoring

Chart B6
Growth in Credit Card Lending: Selected Economies



Source: MAS estimates, Bloomberg, CEIC, Credit Bureau Singapore (CBS)

Close coordination may be required among government agencies to promote household debt sustainability

Rapidly rising household debt can pose risks to financial and economic stability and the subsequent deleveraging process could be potentially disruptive for economic activity. Sharp increases in property prices, coupled with low interest rates and strong income growth, contribute to higher household debt. To mitigate this, countries could consider applying macroprudential policies, including borrower-based instruments, which have been deployed more widely post-GFC. Given that housing prices contribute significantly to changes in household debt, close coordination may be required among various government agencies to promote household debt sustainability. This is especially so since policy tools needed to directly arrest the increase in housing prices may not reside with prudential authorities.

Looking ahead, the growth of non-bank mortgage lending warrants close monitoring.²⁶ Given that non-bank lending is not always formally supervised or reported, there is a risk of regulatory arbitrage and under-reporting of household leverage. In addition, household debt servicing ability depends on the distribution of debt, income and wealth. The use of more granular household data could enhance understanding of the profile of highly leveraged borrowers and the risks they pose to financial institutions (FIs).

²⁶ In the US, shadow bank lenders' market share among all residential mortgage lending has grown from 30% in 2007 to 50% in 2015. Greg Buchak, Gregor Matvos, Tomasz Piskorski and Amit Seru (September 2017), "Fintech, Regulatory Arbitrage, and the Rise of Shadow Banks". In Netherlands, non-bank lenders accounted for 20% of new mortgage loans. Financial Times (December 2016), "Non-banks Shake Up Dutch Mortgages". In Australia, non-banks accounted for 36% of residential mortgage-backed securities market in 2016, up from 16% in 2015. Australian Broker (May 2017), "APRA's non-bank oversight may curb mortgage risks".

Box C

Financial Stress Indices of Selected Asian Economies

Historical stress periods such as the GFC and their negative effects attest to the importance of identifying and monitoring the build-up of financial system risks. Regular monitoring of financial stress is a multi-dimensional task that involves studying shocks to various parts of the financial system. Financial stress indices (FSIs) provide evidence of such shocks and can add to policymakers' surveillance toolkit for assessing the build-up of risks.

While an array of FSIs have been developed, including Asia-specific FSIs²⁷, there have been fewer FSIs for individual Asian economies. MAS (2009) published in the FSR an Asian FSI for monitoring financial stress in Asian economies and its underlying causes.²⁸ This study improves upon the earlier work by using more recent econometric techniques and allows us to address any structural changes in the Asian financial system since then. The improved construction can also help deepen our understanding of how different segments of the financial system contribute to systemic risk.

We constructed FSIs for China, India, Indonesia and Malaysia.²⁹ Interestingly, the variables that drive risk in the new FSIs are the same as those in the MAS (2009) FSI. We also analysed the various channels through which financial stress is propagated within the four economies, and find that stress episodes over the past decade were largely due to external shocks that affected the equity capital flows, exchange rates and foreign reserves of these economies.

Constructing individual Asian economy FSIs

There are numerous approaches in constructing FSIs. Balakrishnan et al. (2009) considers the fundamental characteristics of financial stress in terms of (i) large shifts in asset prices, (ii) an abrupt increase in risk and/or uncertainty, (iii) liquidity droughts, and (iv) concerns about the health of the banking system.³⁰ Other FSIs include variables that represent major components of the financial sector, i.e. the banking, securities and foreign exchange (FX) market (e.g. Cardarelli et al. (2011)³¹). There are also FSIs that capture sovereign risk (e.g. Park et al. (2013)), which is an important indicator for developing economies given the substantial impact on access to foreign credit.³²

²⁷ An example of an Asia-specific FSI is Margarita Debuque-Gonzales and Maria Socorro Gochoco-Bautista (January 2013), "ADB Economics Working Paper Series: Financial Conditions Indexes for Asian Economies". In terms of individual-economy FCIs, Goldman Sachs has constructed them for several emerging market economies.

²⁸ MAS FSR Box D (November 2009), "Asian Financial Stress Indicators".

²⁹ These countries have been selected based on their significant banking and trade linkages to Singapore.

³⁰ Ravi Balakrishnan, Stephan Danninger, Selim Elekdag and Irina Tytell, IMF Working Paper No. 09/133 (June 2009), "The Transmission of Financial Stress from Advanced to Emerging Economies".

³¹ Roberto Cardarelli, Selim Elekdag, Subir Lall, Journal of Financial Stability (2011), "Financial Stress and Economic Contractions".

³² Cyn-Young Park and Rogelio V. Mercado, Jr. (July 2013), "ADB Economics Working Paper Series: Determinants of Financial Stress in Emerging Market Economies".

We chose a set of financial variables representing the banking sector, debt, equity and FX markets, as well as variables that measure risk and liquidity premia. We then employed two methodologies to construct the FSIs:

- Principal Component Analysis (PCA)³³, which allows us to identify the drivers of systemic risk, based on fixed weights of the financial variables over time; and
- Time-Varying Parameter Factor-Augmented Vector Auto Regressive (TVP-FAVAR) model³⁴, which allows us to analyse the sensitivity of the financial variables to systemic risk, based on varying weights of the variables over time.

The PCA and TVP-FAVAR methodologies enable the choice and weights of the financial variables employed in the construction of the FSIs to be empirically driven, as opposed to being subjectively assigned (e.g. subjective application of equal weights to all financial variables chosen at the outset). Specifically, for each economy studied, we ran several hundred simulations of the models based on monthly data³⁵ and chose the FSI series for which the underlying combination of financial variables had the expected coefficient signs (i.e. that each financial variable in the series had the expected directional relationship with financial system stress) (Table C1) and that accurately captured historical stress episodes. Through this process, financial variables that do not carry the correct coefficient signs will be excluded; the remaining financial variables (with the correct coefficient signs) will carry weights that are determined by the data.

We find that the FSIs constructed using the two methodologies above, where the components and weights are freely determined, select components of the financial sector that are largely similar to those used in the MAS (2009) Asian FSI, where the components and weights were pre-selected. Specifically, the FSIs constructed largely consisted of variables covering the banking sector, the equity market, exchange rates, foreign reserves and sovereign risk.

³³ PCA is a popular approach in the construction of FSIs. Examples include the Financial Conditions Indices for 13 Asian economies in Carolina Osorio, Runchana Pongsaparn, D. Filiz Unsal, IMF Working Paper No. 11/170 (July 2011), “A Quantitative Assessment of Financial Conditions in Asia”, and the Kansas City Financial Stress Index in Craig S. Hakkio, William R. Keeton, Federal Reserve Bank of Kansas City (2009), “Financial Stress: What is it, How Can it be Measured, and Why Does it Matter?”.

³⁴ The TVP-FAVAR follows the methodology in Gary Koop and Dimitris Korobilis (December 2013), “A New Index of Financial Conditions”. It models financial and macroeconomic variables jointly, to incorporate interdependence between them. At the same time, the effect of macroeconomic conditions are filtered out so that the FSI reflects purely financial conditions. We estimate the model using the Bayesian approach, involving dual linear Kalman filters and smoothers for the coefficients, and variance discounting methods for the covariances. The estimation uses the MatLab codes provided by Koop and Korobilis (2013), appropriately adapted for our purpose.

³⁵ The data is seasonally-adjusted and transformed to stationarity, as appropriate.

The sign of the coefficient of each financial variable illustrates its relationship with financial system stress

Table C1
Financial Variables Underlying the Chosen FSIs and Their Relationship with the FSIs

Variables		CHN	IND	IDN	MYS
Banking Sector	Banking sector β	NA	√ (+)	√ (+)	√ (+)
	Net new loans	√ (-)	NA	NA	NA
Equity Market	Month-on-month (MoM) change	√ (-)	√ (-)	√ (-)	NA
	Volatility	√ (+)	NA	√ (+)	√ (+)
External Sector	Equity Flows	Monthly flows	√ (-)	√ (-)	√ (-)
	FX Market	Real effective exchange rate	NA	√ (-)	√ (-)
	Foreign Reserves	MoM change	√ (-)	√ (-)	√ (-)
Funding Liquidity Risk		Three-month interbank-government spread	√ (+)	√ (+)	NA
Short-term Liquidity Risk		Ten year vs. one year government spread	√ (-)	NA	NA
Sovereign Risk	US vs. country ten year government bond spread	NA	√ (+)	√ (+)	√ (+)
	Government credit default swap	NA	NA	NA	√ (+)

Source: MAS estimates

Note:

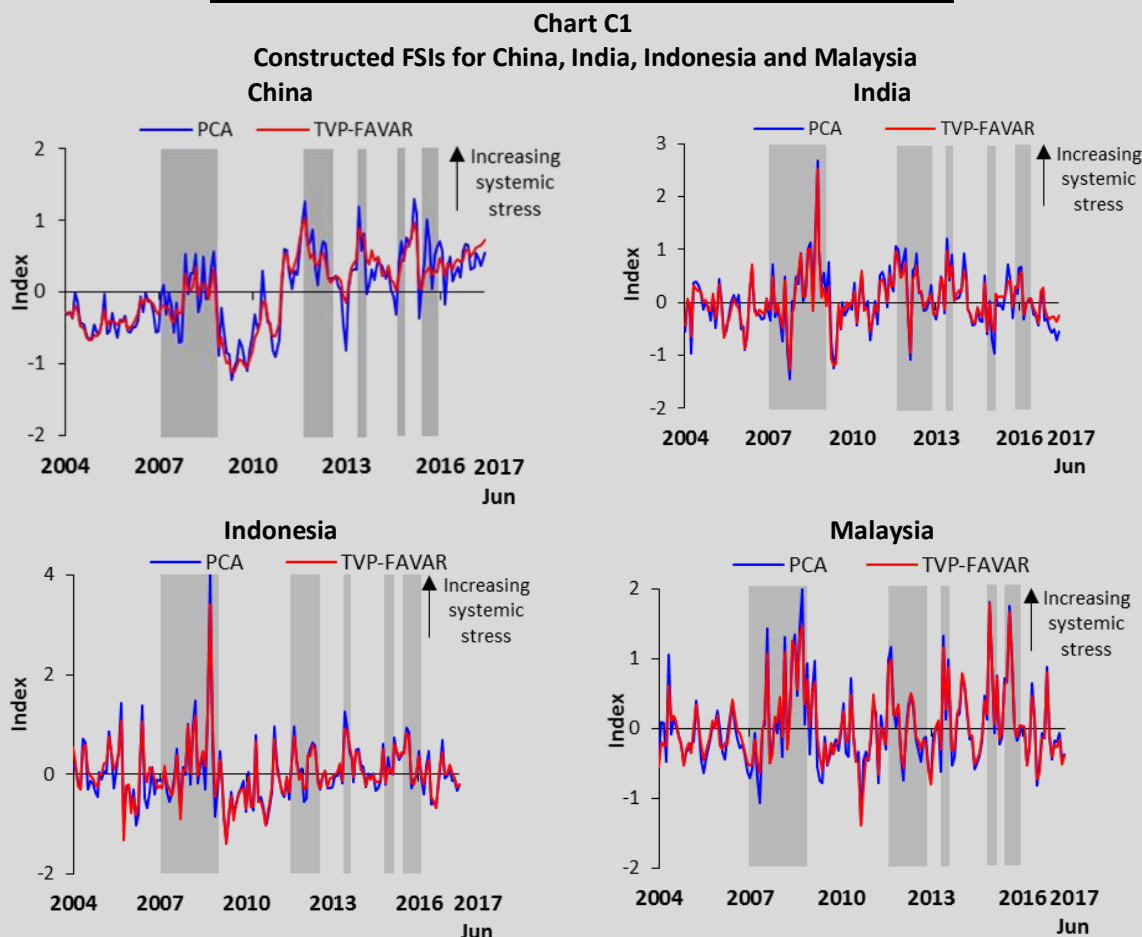
- A tick means that the particular variable was used in the construction of the specific economy's FSI, while NA means that it was not used in the construction of that economy's FSI.
- Signs in parenthesis denote the relationship of the financial variable with the FSI, based on the results generated from the PCA model. The TVP-FAVAR model produces time-varying coefficients of each variable, but mostly shows the same expected signs.
- The banking sector β is the ratio of bank share prices to total share prices. It provides a measure of relative equity-return volatility and isolates banking sector-specific shocks. A derived series, where all beta values below one were assigned as zeros, was also part of the dataset considered.
- Volatility of the equity market was calculated based on a Generalised Auto Regressive Conditional Heteroscedasticity (GARCH) process.

The FSIs capture historical stress periods of each economy well

Chart C1 displays the FSIs constructed for the four Asian economies based on the PCA and TVP-FAVAR analyses described earlier. All four sets of FSIs show elevated signs of stress during both external shocks

and economy-specific stresses. External shocks include the GFC in 2007–08³⁶, euro zone debt crisis in 2011–2012³⁷, the US taper tantrum episode in mid-2013, the end of the recent commodity cycle (characterised by a collapse in oil price) in end 2014/ early 2015, and the China stock market turbulence in H2 2015. Economy-specific stresses include the Chinese banking liquidity stress in mid-2013³⁸ and funding tightness in the Chinese financial system in early 2017.

The constructed FSIs capture historical stress periods well



Source: MAS estimates, Bloomberg, EPFR, Haver, Thomson Reuters, WIND

Note: Shaded portions represent stress periods identified earlier.

Stress periods over the past decade have been triggered by a mix of external shocks and economy-specific factors

Chart C2 presents a decomposition of the FSI constructed using the PCA methodology, where the financial variables are seen as drivers of overall systemic risk. The charts highlight that the external sector, represented by equity flows, exchange rates and foreign reserves, was a main source of financial stress. The GFC, euro zone crisis and taper tantrum triggered increased risk aversion, with consequent impact on

³⁶ With the exception of China, which rolled out a RMB 4 trillion stimulus package to minimise the impact of the GFC through increased government spending as well as bank lending. World Bank Infrastructure Recovery and Assets (INFRA) Update (June 2010), "Supporting China's Infrastructure Stimulus under the INFRA Platform".

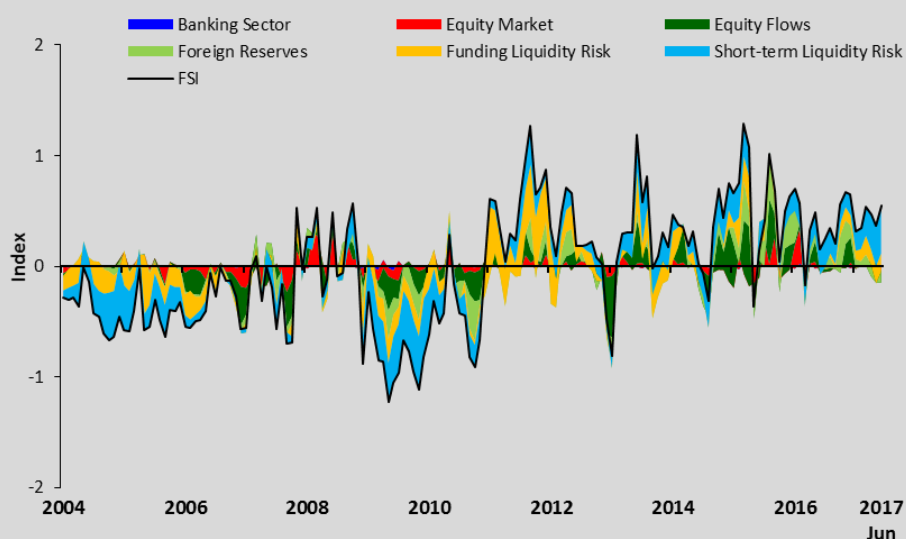
³⁷ We take the third quarter of 2011 as the start of the Eurozone crisis. Reuters (13 September 2011), "International Alarm over Eurozone Crisis Grows".

³⁸ This also overlapped with the US taper tantrum episode.

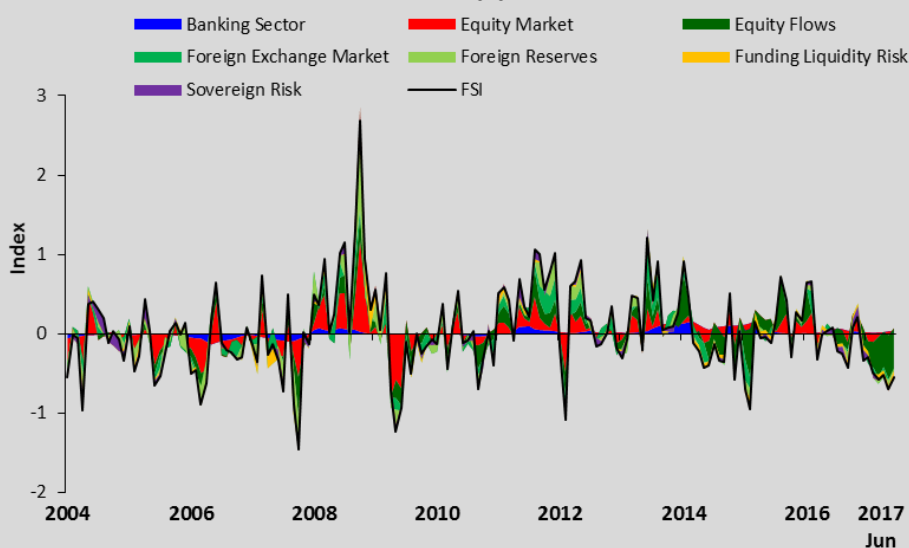
capital flows and exchange rates in emerging Asia. The China stock market turbulence similarly triggered risk-off sentiment in other Asian economies. This propagation effect corroborates with our previous finding that investors may not fully differentiate between the Chinese equity market and other equity markets in the region, preferring to enter and exit these markets concurrently.³⁹ The banking sector has been resilient and has not contributed to systemic risk in these stress episodes. The FSIs also reflected economy-specific stresses. For example, China's FSI rose in early 2017 (Chart F2), reflecting some funding tightness in the Chinese financial system, as the People's Bank of China sought to reduce banks' reliance on short-term interbank funding.

Historical stress episodes in each economy were driven by external shocks as well as economy-specific factors

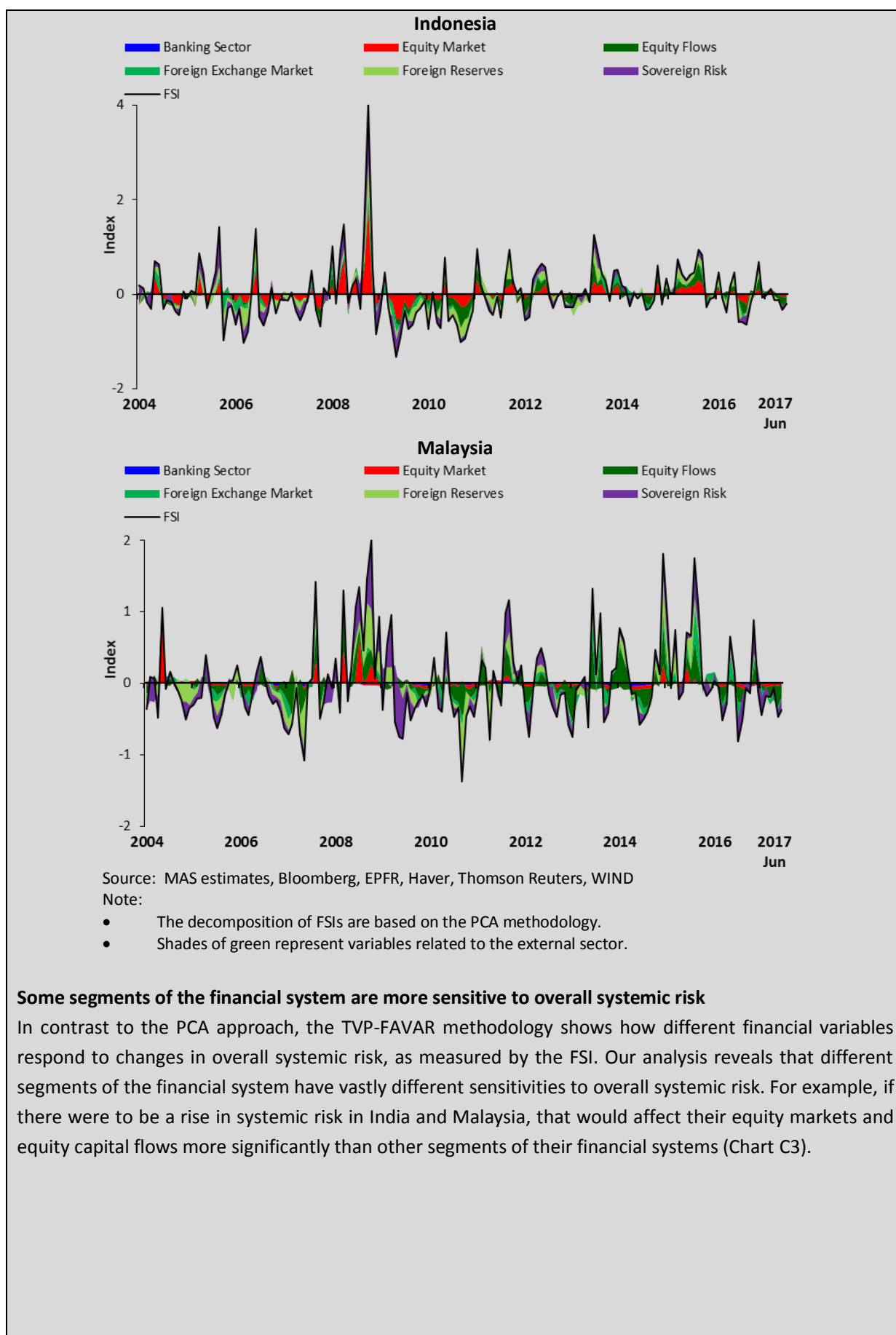
Chart C2
Decomposition of FSIs
China



India



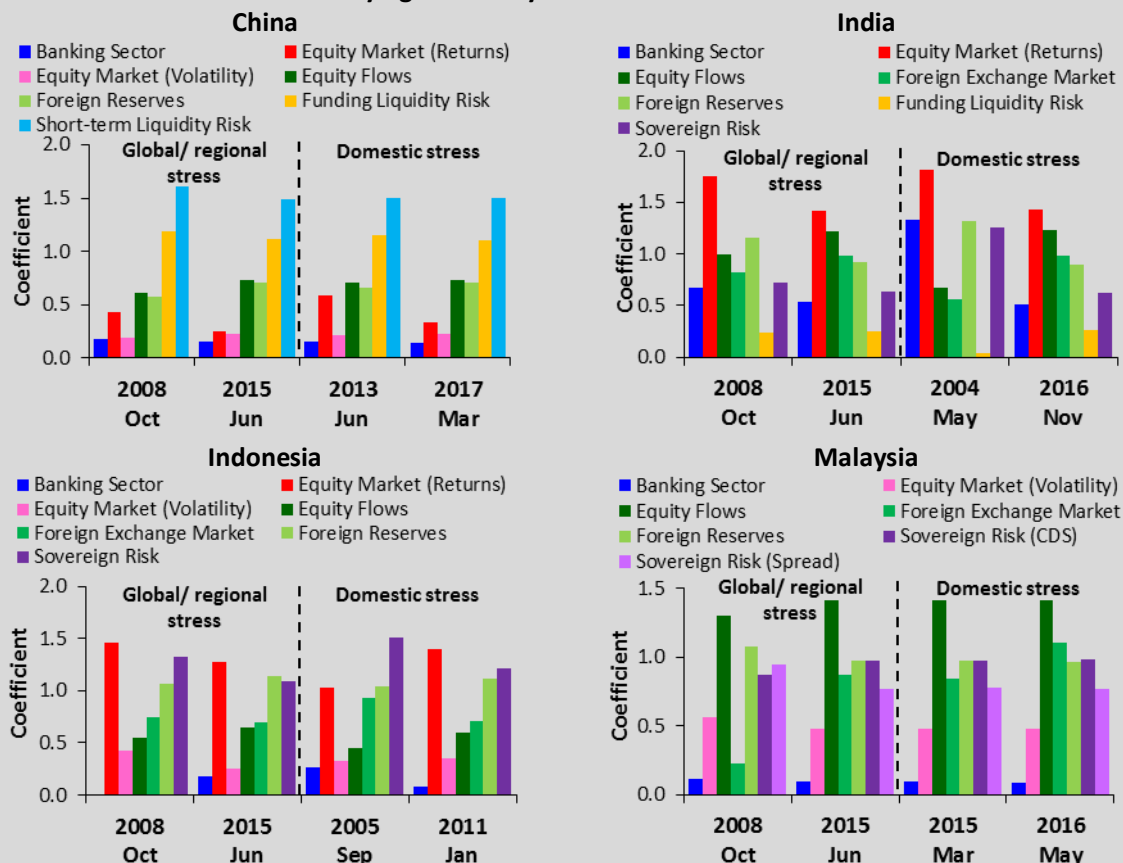
³⁹ See MAS FSR Box D (November 2016), "Drivers of Portfolio Flows in Asia: Do Global, Regional or Domestic Factors Matter More?"



The equity market, equity capital flows and foreign reserves tend to be more sensitive to overall systemic risk in most economies

Chart C3

Time-Varying Sensitivity of Financial Variables to FSIs



Source: MAS estimates, Bloomberg, EPFR, Haver, Thomson Reuters, WIND

Note:

- The sensitivities of the financial variables to FSIs are based on the TVP-FAVAR methodology, for selected stress episodes.
- Shades of green represent variables related to the external sector.

Conclusion

Individual Asian economy FSIs are a useful part of policymakers' surveillance toolkit. They can help identify drivers of systemic risk and the channels of propagation.

Our analysis shows that emerging Asia continues to be vulnerable to external shocks that could lead to capital outflows and F weakness, which in turn could exert pressure on foreign reserves. While Asia is now on a stronger footing to cope with capital outflows, continued surveillance will help detect future build-up of risks, especially in light of ongoing monetary policy and balance sheet normalisation by central banks of the advanced economies.

Box D

Drivers of Gross Capital Inflows to Asia after the Global Financial Crisis

Asia has experienced episodes of surges and reversals in capital flows after the GFC. Such volatility may pose macroeconomic and financial stability risks for the region as a whole. Large swings in short-term capital flows can cause disorderly fluctuations in financial markets, and in turn destabilise trade and economic growth.

In the MAS FSR 2016, we explored the drivers of equity fund flows (a component of shorter-term capital flows) to Asia using financial indicators.⁴⁰ In this box, we extended the analysis to (i) examine the determinants of short- and long-term gross capital inflows to Asia post-GFC; and (ii) establish the impact of a country's macroeconomic variables and macroprudential policies on capital flows. We find that macroprudential policies applied to contain the build-up of vulnerabilities could also have potential beneficial spillovers to capital flows in the region.

Gross capital inflows to Asia have declined recently, following the post-GFC surge. But the region remains susceptible to swings in capital flows

Post-GFC, Asia-9⁴¹ saw a period of strong short-term and long-term gross capital inflows (Charts D1, D2, D3 and D4). This came against a backdrop of low global interest rates and an attractive relative risk-return profile. While the magnitude of the inflows has moderated over the past two years, the regional economies remain exposed to potential disorderly adjustments in capital flows. Two key uncertainties are US monetary policy normalisation and geopolitics.

Gross foreign direct investment (FDI) (long-term) inflows to Asia have declined post-GFC...

...as have portfolio investment (short-term) inflows...

Chart D1

Gross FDI Inflows to Asia

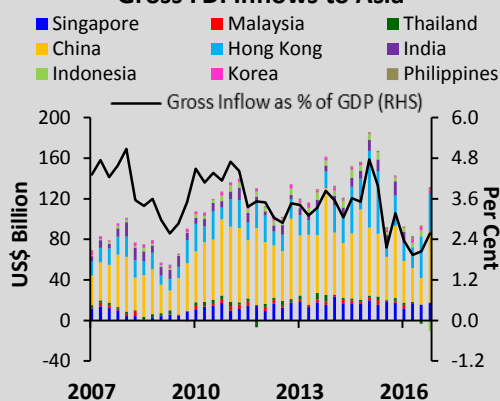
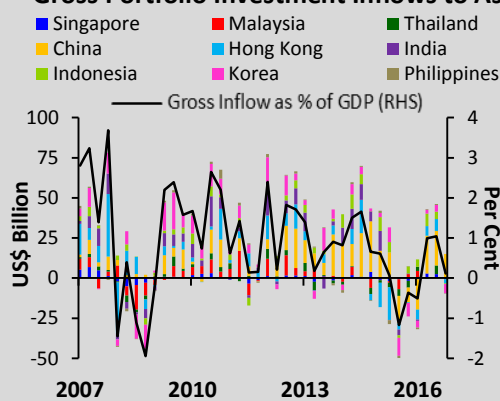


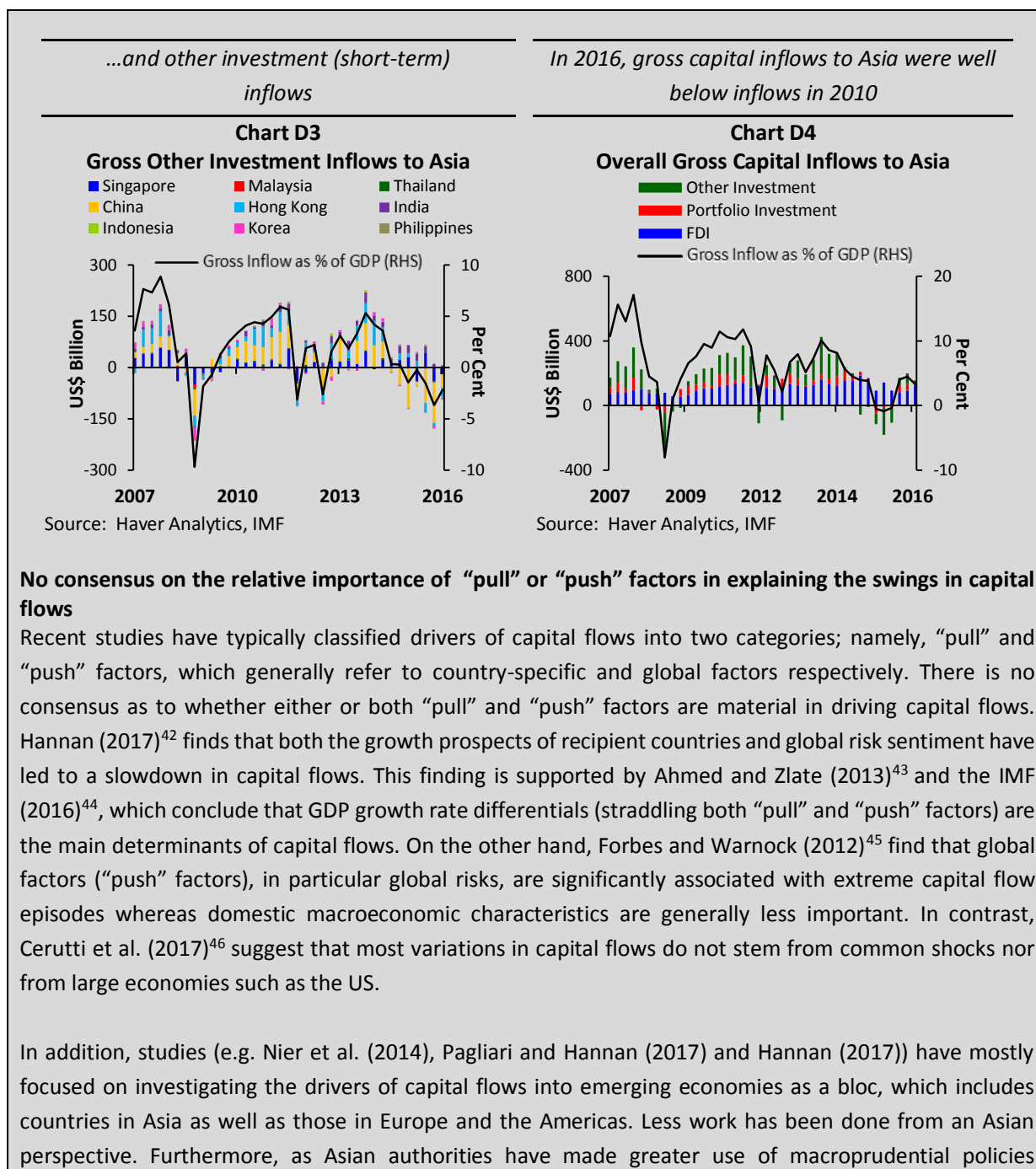
Chart D2

Gross Portfolio Investment Inflows to Asia



⁴⁰ MAS FSR Box D (November 2016), "Drivers of Portfolio Flows in Asia: Do Global, Regional or Domestic Factors Matter More?"

⁴¹ Asia-9 comprises China, Hong Kong, India, Indonesia, Korea, Malaysia, the Philippines, Singapore and Thailand.



⁴² Swarnali Ahmed Hannan, IMF Working Paper No. 52 (February 2017), “The Drivers of Capital Flows in Emerging Markets Post Global Financial Crisis”.

⁴³ Shaghil Ahmed and Andrei Zlate, Board of Governors of the Federal Reserve System International Finance Discussion Paper No. 1081 (June 2013), “Capital Flows to Emerging Market Economies: A Brave New World?”.

⁴⁴ IMF, World Economic Outlook, Chapter 2 (April 2016), “Understanding the Slowdown in Capital Flows in Emerging Markets”.

⁴⁵ Kristin J. Forbes and Francis E. Warnock, Journal of International Economics No. 88/2: pages 235–251 (November 2012), “Capital Flow Waves: Surges, Stops, Flight, and Retrenchment”.

⁴⁶ Eugenio Cerutti, Stijn Claessens and Andrew K. Rose, BIS Working Paper No. 661 (August 2017), “How Important is the Global Financial Cycle? Evidence from Capital Flows”.

compared to their counterparts from other regions⁴⁷, it would also be interesting to investigate potential spillovers from such policies to capital flows.

Data and methodology

We assessed both “pull” and “push” drivers of gross capital inflows to Asia-9 economies during the post-GFC period, using quarterly capital flow data between Q3 2009 and Q4 2016.

The assessment was conducted using panel regressions that involved macroeconomic, financial and policy variables (Table D1). Separate regression specifications were used for FDI, portfolio investment and other investment inflows in order to capture potential heterogeneity in their underlying drivers.⁴⁸

Table D1
List of Variables Used in Regressions

“Pull” and “Push” factors	<u>Macroeconomic variable</u> GDP growth differentials (Asia-9 vis-à-vis the US)
	<u>Financial variable</u> Interest rate differentials (Asia-9 vis-à-vis the US) ⁴⁹
	<u>Financial / Policy variable</u> Exchange rate movements (Asia-9 currencies vis-à-vis USD) ⁵⁰
	<u>Financial variable</u> Global risk aversion (proxied using VIX)
“Push” factor	<u>Policy variable</u> Macroprudential policies ⁵¹

While GDP growth differentials are found to be the main drivers of capital flows, gross short-term inflows are more influenced by financial drivers

The results from the panel regressions show that different factors are behind short- and long-term gross capital inflows to Asia post-GFC (Table D2). GDP growth differentials appear to be significant drivers for both short- and long-term inflows to Asia. But financial and policy-related variables, which may change significantly within a short period of time, have had a greater influence on short-term inflows than long-term inflows.

⁴⁷ IMF, Regional Economic Outlook: Asia and Pacific, Chapter 4: pages 61 to 74 (April 2014), “Macroprudential Policy and Capital Flow Measures in Asia: Use and Effectiveness”.

⁴⁸ FDI inflows/GDP, portfolio investment inflows/GDP, and other investment inflows/GDP are found to be not highly correlated. Correlation coefficients for the following pairs: i) FDI inflows/GDP and portfolio investment inflows/GDP; ii) FDI inflows/GDP and other investment inflows/GDP; and iii) portfolio investment inflows/GDP and other investment inflows/GDP, are 0.00, 0.44 and 0.30, respectively.

⁴⁹ Interest rate differentials between Asia and US are estimated based on the differences between the respective Asian countries’ interbank rates and the Wu-Xia shadow federal funds rate. The shadow federal funds rate is used as it takes into account monetary conditions arising from quantitative easing in the US.

⁵⁰ Measured in terms of depreciation of Asian currencies against the USD.

⁵¹ Macroprudential policies refer to policies directed at domestic macroeconomic vulnerabilities, which are unrelated to capital flows. Macroprudential policies applied from Q3 2009 to Q4 2014 are adapted from a dataset developed by Eugenio Cerutti, Ricardo Correa, Elisabetta Fiorentino and Esther Segalla, IMF Working Paper 110 (June 2016), “Changes in Prudential Policy Instruments-A New Cross-Country Database”. Macroprudential policies implemented from Q1 2015 to Q4 2016 are updated based on information from Reuters, IMF, ADB, The Financial Times, as well as the relevant government agencies’ websites and media releases. Additional macroprudential policies such as debt servicing ratios, property taxes, liquidity requirements, liquidity limits and currency-based measures have also been added to the list of policy measures in the dataset developed by Cerutti et al. (2016).

Post-GFC, FDI inflows to Asia have been largely driven by GDP growth differentials that reflect the relative prospects of countries' fundamentals. Relatively stronger economic growth in Asia created opportunities for more sustained returns for investors in Asian assets. In addition, investors are likely to increase FDI investments into Asia when Asian currencies weaken against the USD, as this reduces the cost of capital investment in USD terms.

Compared to FDI flows, short-term inflows such as portfolio investment and other investment are more sensitive to financial variables such as interest rate differentials and global risk aversion. For example, a one percentage point increase in interest rate differentials vis-à-vis the US is observed to increase portfolio investment and other investment inflows to Asia by 0.18% and 0.34% of GDP respectively, compared to 0.10% of GDP for FDI inflows (Table D2). Short-term capital inflows are also more impacted by changes in global risk aversion than long-term capital inflows. Amongst the two types of short-term inflows, other investment inflows share more similar drivers with FDI inflows. This could be because some elements of other investment inflows (eg. trade bills and loans for operating businesses) are driven by real economy developments and are therefore less sensitive to financial variables.

Table D2
Regression Estimates for Gross Capital Inflows to Asia (Share of GDP)⁵²

List of drivers	FDI	Portfolio Investment	Other Investment
GDP growth differentials	0.17**	0.12*	0.52***
Interest rate differentials	0.10*	0.18***	0.34***
Change in global risk aversion	0.02	-0.14***	0.10***
Exchange rate movements	0.17**	-0.16**	0.28**
Macroprudential policies (i.e. tightening of policies from previous quarter)	-0.02	-0.31*	-0.51*

Source: MAS estimates

Note: ***, ** and * represent statistical significance at the 1%, 5% and 10% levels, respectively.

Macroprudential policies have had some dampening effects on short-term capital movements into Asia

In the post-GFC period, Asian authorities have used macroprudential policies to contain the build-up of vulnerabilities and improve the resilience of their financial systems. For instance, Korea introduced caps on banks' currency forwards and cross-currency swaps in 2010 to reduce excessive volatility in the currency market. Around the same period, Hong Kong also extended the 60% LTV guideline to properties above HKD 12 million in value and non-owner occupied properties to improve banks' underwriting standards. While focused on addressing financial stability risks, macroprudential policies have also impacted short-term capital inflows to Asia. Our estimates show that a tightening of macroprudential policies from the previous quarter could dampen portfolio investment and other investment inflows by as much as 0.31% and 0.51% of GDP, respectively. They also contribute to less volatile capital flows into Asia.⁵³

⁵² Regression estimates are based on fixed effects regression models. We have tested the robustness of our regression results by considering alternative specifications such as including the level of trade openness, change in sovereign ratings and share of government surplus over GDP. Our results are found to be robust to these alternative specifications as the magnitude and statistical significance of the estimated coefficients remain largely unchanged.

⁵³ Empirically validated by panel regressions on the standard deviations of capital flows (proxy for volatility of capital flows into Asia), which are also based on the same set of independent variables.

Implications for Asian policymakers

Our findings suggest that both short- and long-term inflows are dependent on macroeconomic variables. However, compared to long-term inflows, short-term inflows are more sensitive to financial and policy-related variables. Looking ahead, Asian policymakers should continue to build up good fundamentals (“pull” factors) to promote stable short- and long-term capital inflows. They could also broaden and diversify the investor base, deepen domestic capital markets, and reduce reliance on foreign debt to dampen volatility in short-term capital inflows caused by any changes in global risk aversion or other external developments (“push” factors). Macroprudential policies, while principally applied to contain the build-up of vulnerabilities, may also have a role to play in reducing the volatility of short-term inflows.

Box E**The Behaviour of Institutional Asset Owners in Asia-10 Financial Markets:
Pro-cyclical or Counter-cyclical?**

The Financial Stability Board (FSB) published in January 2017 policy recommendations to address structural vulnerabilities from asset management activities that may pose potential financial stability risks.⁵⁴ The recommendations are timely, in light of the significant increase in asset management activities over the past decade. Within the asset management sphere, an area pending further analysis is the investment behaviour of institutional asset owners and its implications for financial stability.⁵⁵

Efforts are underway globally to study the behaviour of institutional asset owners and their impact on financial stability

Institutional asset owners are generally considered to be long-term investors in global capital markets, i.e. they “buy and hold” assets through financial or economic cycles, thus contributing to financial stability. With the growth of asset management activities globally, academics, international think-tanks and policymakers have increasingly debated whether institutional asset owners’ behaviours are indeed counter-cyclical, or whether they are pro-cyclical instead.⁵⁶

A prolonged period of low interest rates following the GFC raises concerns for institutional asset owners. The G30 notes that “potential long-term investors are increasingly constrained in their ability to provide financing”.⁵⁷ The IMF notes that the life insurance and pension sectors face “a formidable transitional challenge” in the current low interest rate environment.⁵⁸ Such a headwind could potentially impair institutional asset owners’ abilities to “buy and hold” onto risky assets during stressful market conditions.⁵⁹

Evidence from studies on the behaviour of institutional asset owners have been mixed thus far, suggesting that investor behaviour varies across regions and investor types.⁶⁰ For instance, the IMF finds that portfolio

⁵⁴ The four structural vulnerabilities from asset management activities are: (i) liquidity mismatch between fund investment assets and redemption terms and conditions for open-ended fund units; (ii) leverage within investment funds; (iii) operational risk and challenges in transferring investment mandates or client accounts in stressed conditions; and (iv) securities lending activities of asset managers and funds. FSB (January 2017), “Policy Recommendations to Address Structural Vulnerabilities from Asset Management Activities”.

⁵⁵ We define pension funds, insurers and sovereign wealth funds (SWFs) collectively as institutional asset owners.

⁵⁶ The Bank of England (BoE) Procyclicality Working Group defined “pro-cyclicality” as the tendency to invest in a way that exacerbates market movements and contributes to asset price volatility, resulting in a deepening of the troughs and an exaggeration of the peaks of asset prices or economic cycles in a way that is potentially detrimental to financial stability and long-term economic growth.

⁵⁷ The G30 is a private, nonprofit, international body composed of very senior representatives of the private and public sectors and academia, that aims to deepen understanding of international economic and financial issues. G30 Working Group on Long-Term Finance (2013), “Long-term Finance and Economic Growth”.

⁵⁸ In particular, profitability and solvency ratios of segments of pension funds and insurers offering guaranteed returns – largely life insurers and pension funds offering defined benefit plans – could come under pressure, as their assets are typically of shorter duration as compared to their liabilities.

⁵⁹ BoE researchers have opined that the structure of regulations could impact insurers’ investment behaviour. They find that new Solvency II regulations could reduce UK life insurers’ willingness to act counter-cyclically, particularly in a falling interest rate environment. Bank Underground (September 2017), “Insurance Companies: Amplifiers or the White Knights of Financial Markets?”.

⁶⁰ To date, empirical research in this area tends to have a home bias – they have focused mostly on domestic institutional asset owners’ behaviour in relation to their home asset markets, but have not concurrently considered the investment behaviour of institutional asset owners in other developed market or emerging market economies.

changes for US institutional asset owners typically appear pro-cyclical.⁶¹ The Bank of England (BoE) finds some evidence of pro-cyclicality in the portfolio asset allocation behaviour of US and French insurers, and less evidence of pro-cyclical behaviour in UK insurers.⁶² On the other hand, results from the European Insurance and Occupational Pensions Authority (EIOPA) 2015 stress test exercise show that European pension funds behaved in a counter-cyclical fashion during the GFC.⁶³

Studies on institutional asset owners in emerging market and Asia-10 economies appear more sanguine. The IMF finds that global institutional investors' flows to emerging market economies are likely not pro-cyclical.⁶⁴ MAS also finds that Asia-10 asset markets with a higher proportion of institutional ownership tended to exhibit lower price volatility.⁶⁵

Against this backdrop, we assess potential drivers of institutional portfolio flows into Asia's financial markets

Studies that examine the aggregate behaviour of global institutional portfolio flows into Asia-10 economies are fairly limited.⁶⁶ We assessed potential drivers of institutional portfolio flows into Asia-10 financial markets using data from eVestment, which tracks quarterly data on institutional mandates from global asset managers approximating US\$24 trillion in assets under management (AUM) in public markets. This covers approximately 20% of institutional AUM held globally.⁶⁷

Our panel regression to study the potential drivers of institutional portfolio flows into Asia-10 bond and equity markets during the 2007 to 2017 period takes the following form:

$$\ln(\text{Flow})_t = \alpha_t + \beta_1 \text{Return}_{t-1} + \beta_k \text{Global Volatility}_{k,t}$$

where the measure for institutional portfolio flows is the natural logarithm of inflows (i.e. this measure examines the buying behaviour of pension funds, insurers and sovereign wealth funds (SWFs)). The variable Flow_t denotes quarterly net bond or equity inflows into Asia-10 bond or equity markets respectively. The variable Return_{t-1} is the quarterly returns of benchmark indices (J.P. Morgan Asia Credit Index for bonds; MSCI Emerging Markets Asia Index for equities). Return_{t-1} is used to examine momentum behaviour (i.e.

⁶¹ Bradley A. Jones (February 2016), "Institutionalizing Countercyclical Investment: A Framework for Long-term Asset Owners". Papaioannou, M. J. Park, J. Pihlman, and H. Hoon, (2014), "Procyclical Behaviour of Institutional Investors During the Recent Financial Crisis".

⁶² Procyclicality Working Group (July 2014), "Procyclicality and Structural Trends in Investment Allocation by Insurance Companies and Pension Funds".

⁶³ EIOPA (2015), "IORPs Stress Test Report 2015".

⁶⁴ The IMF finds that institutional portfolio flows to emerging market economies did not engage in returns-chasing behaviour (i.e. not pro-cyclical). In IMF's study, the dependent variable is net bond or equity inflows into a particular emerging market economy, and their study covers a subset of Asia-10 markets. IMF's data on institutional portfolio flows was sourced from custodian bank data. IMF GFSR Chapter 2 (April 2014), "How Do Changes in the Investor Base and Financial Deepening Affect Emerging Market Economies?".

⁶⁵ MAS finds that institutional investors tend to have a market-stabilising effect on Asia-10 asset markets. In MAS' study, the dependent variable is the price volatility of Asia-10 asset markets. MAS' data on annual institutional portfolio holdings was compiled from publicly available sources and estimated using widely-used asset class benchmarks. MAS FSR Box B (November 2016), "The Impact of Open-ended Funds and Other Institutional Asset Owners on Asia's Asset Markets".

⁶⁶ IMF GFSR Chapter 2 (April 2014), "How Do Changes in the Investor Base and Financial Deepening Affect Emerging Market Economies?" MAS FSR Box B (November 2016), "The Impact of Open-ended Funds and Other Institutional Asset Owners on Asia's Asset Markets".

⁶⁷ In estimating institutional AUM held globally, we used data from Willis Towers Watson, OECD and the Sovereign Wealth Fund Institute.

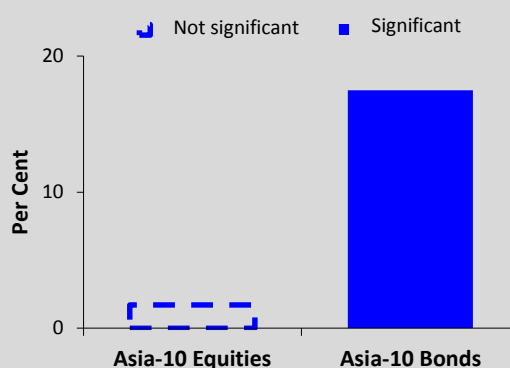
whether flows exhibit returns-chasing behaviour). The variable $Global\ Volatility_t$ denotes global market volatility and is used to examine the impact stemming from external shocks.⁶⁸

Our findings suggest that institutional portfolio flows into Asia-10 bonds tend to increase when bond prices fall

We find that institutional investors tend to demonstrate contrarian behaviour and smoothen market turbulence in Asia-10 bond markets. A one percentage point decrease in returns is associated with a 17.5% increase in institutional inflows to Asia-10 bonds the following quarter (Chart E1). This suggests that institutional inflows to Asia-10 bonds tend to be counter-cyclical — institutional asset owners tend to reduce bond purchases when markets rally, and conversely, increase bond purchases when markets decline. However, this behaviour is not evident in institutional portfolio inflows to Asia-10 equities.

Lower returns are associated with higher institutional inflows to Asia-10 bonds the following quarter

Chart E1
Sensitivity of Asia-10 Equity and Bond Inflows to Lagged Returns
(Percent Change in Inflows when Returns Decreases by One Percentage Point)



Source: MAS estimates

Institutional portfolio flows into Asia-10 bonds also increase when global financial conditions tighten

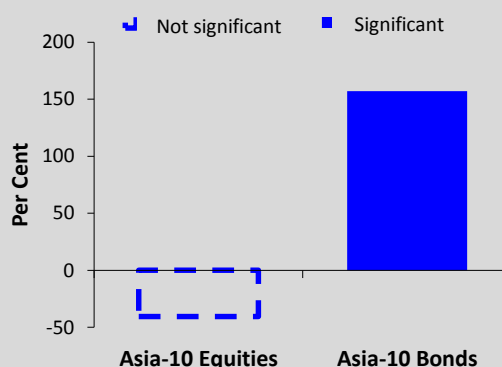
Our findings also suggest that institutional investors tend to increase purchases of Asia-10 bonds when global financial conditions tighten. A one percentage point increase in the Goldman Sachs US Financial Conditions Index (a proxy for global financial conditions) is associated with a 157% increase in inflows to Asia-10 bonds (Chart E2). This suggests that institutional investors tend to be counter-cyclical in response to a tightening in global financial conditions. We do not find similar behaviour in institutional portfolio inflows into Asia-10 equities.⁶⁹

⁶⁸ To assess global market volatility, we separately considered the Chicago Board Options Exchange (CBOE) Market Volatility index (VIX), the Merrill Lynch Option Volatility Estimate index (MOVE) as well as Goldman Sachs US Financial Conditions Index (USFCI).

⁶⁹ More broadly, we note that global risk aversion (as proxied by the VIX) as well as bond market volatility (as proxied by the MOVE) were not statistically significant in explaining Asia-10 institutional inflows (Table E1 in the Appendix).

Tighter global financial conditions are associated with an increase in institutional inflows to Asia-10 bonds

Chart E2
Sensitivity of Asia-10 Equity and Bond Inflows to Global Financial Conditions
(Percent Change in Inflows when US Financial Conditions Index (USFCI) Increases by One Percentage Point)



Source: MAS estimates

Evidence suggests institutional investors support stability in Asia-10 bond markets

Our findings suggest that institutional asset owners tend to behave in a counter-cyclical manner in Asia-10 bond markets that could support financial stability. Nonetheless, we recognise that there are some concerns among international policymakers that the combination of a weaker macroeconomic backdrop and lower investment returns could pose significant challenges to pension funds, insurers and other institutional asset owners. Further research efforts would be useful to improve our understanding of how the investment behaviour of these institutional asset owners can continue to support financial stability.

Appendix Regression Results

The dependent variable in Panel A is the logarithm of the net inflows into Asia-10 bonds during quarter t in the period from Q2 2009 to Q3 2017. The dependent variable in Panel B is the logarithm of the net inflows into Asia-10 equities during quarter t in the period from Q2 2007 to Q3 2017.

*Counter-cyclical behaviour seen in Asia-10 bond inflows —
Asia-10 bond inflows increase when returns decrease and
when global financial conditions tighten*

Table E1
Potential Drivers of Institutional Portfolio Inflows

Panel A	Dependent Variable: Institutional Inflows into Asia-10 Bonds		
	(1)	(2)	(3)
Intercept	4.10 *** (0.34)	4.06 *** (0.34)	4.13 *** (0.34)
Returns (–1)	–24.91 *** (6.53)	–24.63 *** (7.06)	–19.23 *** (6.59)
VIX	0.33 (0.64)		
MOVE		–1.00 (1.72)	
USFCI			94.37 ** (50.85)
Observations	46	46	46
R-Square	0.13	0.13	0.17

Panel B	Dependent Variable: Institutional Inflows into Asia-10 Equities		
	(4)	(5)	(6)
Intercept	4.30 *** (0.20)	4.29 *** (0.20)	4.33 *** (0.19)
Returns (–1)	–1.25 (1.69)	–1.22 (1.68)	–2.58 * (1.59)
VIX	–0.20 (0.54)		
MOVE		–0.18 (0.51)	
USFCI			–52.15 (35.71)
Observations	70	70	70
R-Square	0.06	0.05	0.09

Source: MAS estimates, eVestment

Note: Standard errors are reported in parentheses. ***, ** and * represent statistical significance at the 1%, 5% and 10% levels respectively.

Box F Financial Technology and Financial Stability — What's the Deal?

FinTech adoption has accelerated in recent years and benefited businesses and consumers. With its advent, global policymakers are paying closer attention to potential financial stability risks that FinTech may bring about. This box sets out some of the key themes in the on-going discussion on how FinTech could affect financial stability.

FinTech has been dubbed as a driver of innovation and disruption within the financial industry

FinTech is the intersection of financial services and technology. The use of existing and new technologies has spurred innovation that could transform the provision of financial services. Incumbents in the financial services industry could use FinTech developed internally, or in partnership with companies that specialise in FinTech, to enhance their service offerings. FinTech companies could also challenge incumbents and disrupt their existing business lines, for instance, by disintermediating borrowing and lending functions.

FinTech activities can be broadly characterised into five economic functions: (i) payments, clearing and settlement; (ii) deposits, lending and capital raising; (iii) insurance; (iv) investment management; and (v) market support.⁷⁰ Many FinTech companies operating in Asia already have a large digital footprint with a critical mass of consumers. They have leveraged this to foray into services traditionally provided by retail banks, with a current focus on the first two economic functions (Figure F1).

Many FinTech companies operating in Asia have focused their operations in the areas of payments and deposit and lending

Figure F1
Examples of Asian FinTech Companies Across Economic Functions

Payments	Deposits	Lending
Alipay (CHN)	Yu'e Bao (CHN)	MYBank (CHN)
Dash (SGP)		Crowdo (MYS)
GrabPay (IDN, MYS, PHP, SGP, THA)		Kakao (KOR)
Line (THA)		Funding Societies (IDN)
M-PESA (PHP)		K-Bank (KOR)
PayTM (IND)		MoolahSense (SGP)
Samsung Pay (KOR)		WeBank (CHN)
WeChat (CHN)		WeLab (HK)

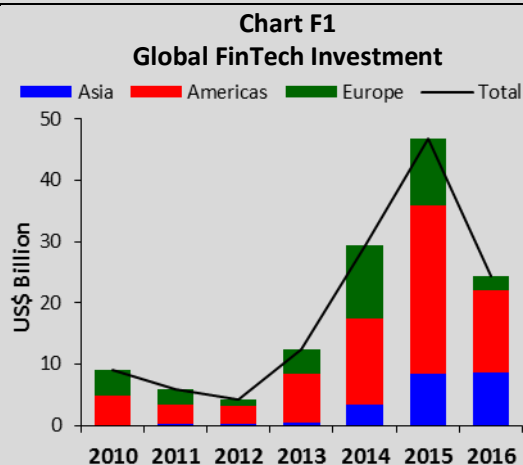
Source: MAS, FinTech company websites

While recognising the potential benefits of FinTech, global policymakers are also paying attention to the risks that FinTech could pose

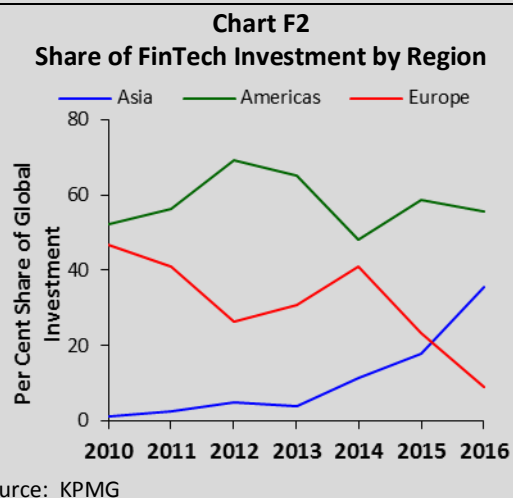
Investment in FinTech has grown significantly since the beginning of the decade (Chart F1). Asia has been accounting for a rising share of global FinTech investments (Chart F2). Global policymakers have hence started to look into the potential risks and financial stability implications of FinTech.

⁷⁰ FSB (June 2017), "Financial Stability Implications from FinTech".

Global investment in FinTech has grown significantly...



...and the share of investment from Asia is rising



The FSB (2017) finds that FinTech could strengthen financial stability by (i) encouraging decentralisation and diversification that could dampen the effects of financial shocks in the event of a failure of an institution; (ii) increasing transparency and enabling risks to be more accurately assessed and better priced; and (iii) improving financial inclusion of households and small businesses, which not only supports sustainable economic growth, but also provides a diversification of exposure to investment risk.

However, the FSB also highlights that FinTech has the potential to undermine financial stability by creating greater or new imbalances and contagion channels. FinTech companies are vulnerable to microfinancial risks, just like other FIs. These risks stem from both financial (such as maturity mismatch, liquidity mismatch and leverage) and operational (such as governance, cyber, common third party reliance) sources. The crystallisation of such microfinancial risks could trigger company- or sector-wide distress that in turn propagates to the rest of the financial sector. FinTech could also exacerbate system-wide macrofinancial risks, such as contagion, procyclicality or excess volatility, which can amplify shocks to the financial system.

The IMF (2017)⁷¹ highlights that emerging technologies could raise financial stability risks. For instance, technologies that increase the speed and volume of financial transactions could lead to greater volatility and instability. Automated transactions based on common algorithms could lead to herding behaviour that could increase volatility. Wider adoption of technological solutions may increase vulnerabilities to cyber-attacks.

The International Organisation of Securities Commissions (IOSCO) (2017)⁷², in its study on FinTech and securities markets regulation, cited risks to the operation of fair and efficient markets. That said, past IOSCO work on peer-to-peer (P2P) lending and equity crowdfunding (ECF) concluded that the sector did

⁷¹ IMF (June 2017), "FinTech and Financial Services: Initial Considerations".

⁷² IOSCO (February 2017), "IOSCO Research Report on Financial Technologies (FinTech)".

not pose a systemic risk due to its relatively small size and lack of interconnections with global financial markets.⁷³

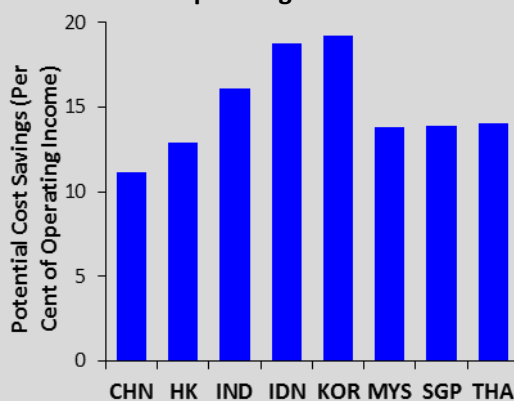
FinTech brings both opportunities for and risks to bank profitability

FinTech can also affect financial stability through its impact on bank profitability.⁷⁴

FinTech presents opportunities for banks to improve their profitability from both the cost and revenue angles. These can be exploited either internally within banks⁷⁵ or through collaborative partnerships with FinTech companies.⁷⁶ Analysts suggest that cost savings from leveraging on FinTech, for instance via automation of banking functions or the use of artificial intelligence, could yield a 30% reduction in costs.^{77,78} The estimated cost savings represent 10% to 20% of Asian banks' operating income (Chart F3).

Estimated cost savings from FinTech for banks are in the range of 10-20% of operating income

Chart F3
Estimated Cost Savings from FinTech as a Share of Operating Income



Source: MAS estimates, Capgemini, SNL Financial

⁷³ E. Kirby and S. Worner (February 2014), IOSCO Research Department Staff Working Paper "Crowdfunding, An Infant Industry Growing Fast".

⁷⁴ For example, increased competition from FinTech lenders could erode bank profitability. Specifically, the "unbundling" of bank business lines by specialised FinTech credit platforms (and other FinTech providers) could erode revenue bases, making banks more vulnerable to losses and weakening their access to internal and external funding. If this process happens quickly, there could be amplification effects given the systemic importance of some banks and their provision of critical services other than credit. The FSB and the BIS Committee on the Global Financial System (CGFS) (May 2017), "FinTech Credit: Market Structure, Business Models and Financial Stability Implications".

⁷⁵ For example, OCBC Bank launched The Open Vault in 2016 to drive open innovation and help OCBC develop relevant ideas to fuel breakthroughs in banking and insurance. OCBC (February 2016), "OCBC Bank Sets Up New FinTech and Innovation Unit – The Open Vault at OCBC – to Strategically Harness Open Innovation for Meaningful Financial Solutions".

⁷⁶ For example, Maybank has launched a regional, collaborative FinTech sandbox aimed at helping ASEAN FinTech startups test and develop their products. E27.co (June 2017), "Maybank Launches FinTech Sandbox to Help Regional Startups Develop Financial Products".

⁷⁷ Lower operating costs from automation and digitisation could help retail banks increase their net profit by 30%. McKinsey (2015), "Strategic Choices for Banks in the Digital Age".

⁷⁸ Adopting automation solutions could help banks realise 30% cost savings. Capgemini Consulting (2013), "Backing up the Digital Front: Digitising the Banking Back Office".

FinTech also facilitates potential revenue growth for banks, for instance through reaching out to new customers via mobile services, especially in countries with relatively lower financial inclusion.⁷⁹ As an example, DBS Digibank has leveraged on FinTech to create a mobile-led bank for more effective and cheaper market access in India and Indonesia.⁸⁰ The move towards cashless payments could also benefit banks, if such digital payment platforms are linked to bank-issued cards.⁸¹ McKinsey (2015) estimates that increased revenues from innovative new offers and business models could increase banks' net profits by 5%. Furthermore, increased revenues from new products, distinctive digital sales and using data to cross-sell products could increase banks' net profits by a further 10%.⁸²

However, FinTech can also disrupt banks' businesses if banks do not adequately position themselves for the onslaught of new technologies. The potential erosion of bank income from FinTech competition could result in weaker banks. This could in turn pose financial stability concerns.

In addition, financial stability risks may increase if banks were to engage in riskier activities in the face of FinTech competition. Technology- and cyber-related risks could also increase, if for instance, banks use new technologies but do not manage the attendant risks adequately.

More work needs to be done to assess the financial stability implications of FinTech on banks. The following box provides an assessment of the potential impact of FinTech on bank profitability in Asia (See Box G "As the Twain Meet: Analysing the Impact of Financial Technology on Asian Banks' Payments, Deposit and Lending Businesses").

Conclusion

Just as FinTech companies work to resolve pain points for consumers of financial services, it is equally important for policymakers and the industry to work together to identify potential systemic pain points that may inadvertently arise from FinTech adoption. Only then can FinTech serve as a sustainable driver of improvements to the financial services industry.

⁷⁹ PWC (August 2016), "The Un(der)banked is FinTech's Largest Opportunity".

⁸⁰ DBS (August 2017), "DBS Launches Digibank, an Entire Bank in the Phone, in Indonesia".

⁸¹ Business Times (September 2017), "Cashless Payment Trend 'May Profit Banks'".

⁸² McKinsey (2015), "Strategic Choices for Banks in the Digital Age".

Box G**As the Twain Meet: Analysing the Impact of Financial Technology on Asian Banks' Payments, Deposit and Lending Businesses**

With burgeoning FinTech development and adoption, questions have been raised as to whether FinTech poses a competitive threat to banks and their existing business models. This is especially pertinent in light of ongoing concerns about bank profitability and the implications for financial stability.

Research on the potential risks of FinTech to banks is still nascent (See Box F "Financial Technology and Financial Stability — What's the Deal?"). Most studies have been conducted at the broad financial sector level, qualitative in nature and with little focus on Asian banks.

This box assesses the extent to which FinTech companies could disintermediate Asian banks and erode their operating income over the next five years. We find that the FinTech challenge is generally more significant in the payments than in the deposit and lending business. This is especially so for banks in Hong Kong, Korea and Singapore, given their greater reliance on payment fee income.⁸³ Banks can, however, overcome FinTech disintermediation by building digital capabilities and integrating them into their business models.

FinTech is beginning to disrupt banks' dominance in financial intermediation, but its impact would likely vary across business lines

Banks play a dominant role in financial intermediation in Asia. However, FinTech companies are beginning to offer services that disintermediate banking services. The competitive threat and its corresponding impact is expected to vary across business lines. Analysts have highlighted that there is relatively more FinTech investment and hence, competition in retail and consumer banking, especially in the areas of deposit-taking, lending and payments.⁸⁴ This view is corroborated by our discussions with banks that operate in Asia. Our study therefore focuses on the impact of FinTech on banks' operating income in these areas.

Data and methodology

Our study estimated the potential reduction in banks' payment fee income and net interest income owing to disintermediation by FinTech companies. The analysis is based on a downside scenario where banks fail to take mitigating actions to address the competition.

⁸³ This could be due to higher credit card penetration rates in these economies.

⁸⁴ McKinsey (September 2015), "The Fight for the Customer: McKinsey Global Banking Annual Review 2015". In addition, these areas attract larger investment amounts compared to other banking business lines, measured by dollar invested in private FinTech companies. Citi Global Perspectives and Solutions (March 2016), "Digital Disruption: How FinTech is Forcing Banking to a Tipping Point". McKinsey has also observed that "payments represent the beachhead for the entire banking relationship, and this beachhead is under attack". McKinsey (May 2014), "Winning the Beachhead".

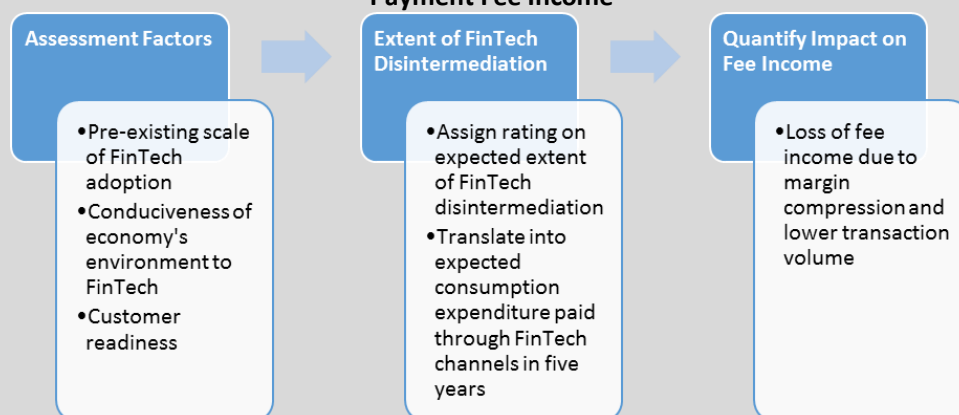
Impact on fee income from payments business

FinTech companies could offer payment options that compete directly with debit and credit cards issued by banks. This may erode banks' fee income through two channels:

- Lower payment transaction volumes as consumers switch from bank-issued payment cards to FinTech payment channels; and
- Lower fees as banks reduce the Merchant Discount Rate (MDR) that they charge for card payments in response to more competitive transaction fees offered by FinTech companies.

Figure G1 summarises how we assess whether an economy is conducive to alternative payment methods and the corresponding impact on banks' payment fee income.

Figure G1
Framework for Assessing Probability of Payments Disintermediation and Potential Impact on Banks' Payment Fee Income



Source: MAS

Using third-party information, we assessed the probability of payments disintermediation based on the following factors⁸⁵:

- Pre-existing scale of FinTech adoption;
- Conduciveness for FinTech to develop in terms of the regulatory environment, extent of government support and proximity to relevant expertise;
- Customer readiness, based on forecasted internet and mobile penetration rates in five years.

Combining these factors, each economy is assigned a rating based on a scale of 1–5, with 1 and 5 representing a low and high probability of payments disintermediation within the next five years respectively. Each rating is then mapped to a projected FinTech payments adoption rate, expressed as a proportion of Household Consumption Expenditure (HCE) (Table G1). The mapping takes into account the typical S-shaped innovation adoption curve⁸⁶ as well as China's global leadership in FinTech adoption.⁸⁷

⁸⁵ See Table G2 in Appendix for summary assessment for each of the selected Asian economies.

⁸⁶ Theorised by Everett M. Rogers (1962), "Diffusion of Innovations".

⁸⁷ China has the top FinTech adoption rate for money transfer and payments, financial planning, savings and investments and borrowing. Ernst & Young (2017), "EY Fintech Adoption Index 2017".

Table G1
Projected Adoption of FinTech Payment Channels in Five Years

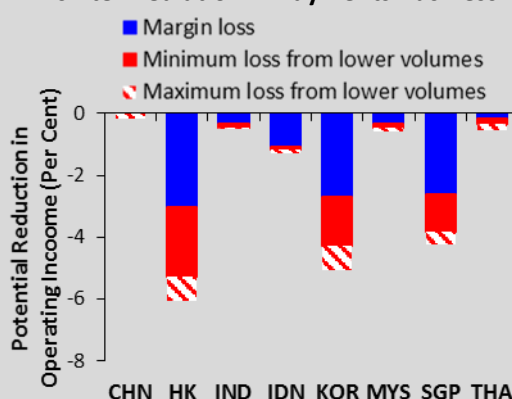
Rating	1	2	3	4	5
FinTech payments as a proportion of HCE (%)	<5	5-10	10-15	15-20	20-50

Source: MAS estimates

Based on the projected adoption rate of FinTech payment channels, we estimated the potential erosion of banks' payment fee income as a result of consumers switching to FinTech channels.⁸⁸ In addition, banks may opt to lower their MDRs in response to more competitive transaction fees to preserve remaining bank card consumption, resulting in margin compression and consequently lower operating income.⁸⁹

For the purpose of analysing a worst-case scenario, we summed up the reduction in operating income from both lower payment transaction volume and margin erosion (Chart G1). The estimated losses would probably be overstated as there would likely be some offsetting effects.⁹⁰

Chart G1
Estimated Potential Reduction in Operating Income from Disintermediation in Payments Business



Source: MAS estimates, CEIC, Central Banks, iResearch, SNL Financial

Note: The minimum and maximum losses correspond to the lower and upper bounds of the projected adoption rate of FinTech payment channels within each rating, as set out in Table G1.

⁸⁸ Calculated as:

$$\text{Estimated reduction in operating income from lower transaction volume} = \frac{(\% \text{ point increase in share of HCE paid through FinTech channels} * \text{HCE} * \text{Average MDR})}{\text{Latest available operating income}}$$

⁸⁹ Calculated as:

$$\text{Estimated reduction in operating income from MDR reduction} = \frac{(\% \text{ point reduction in MDR} * \text{Estimated bank card consumption expenditure in five years})}{\text{Latest available operating income}}$$

The estimated reduction in MDR is based on a comparison of existing average MDRs in each economy against the transaction rate that AliPay currently offers, as a proxy of the MDR that FinTech companies offer. Let's Talk Payments (September 2013), "AliPay Vs. TenPay — The China Payments Rivalry". For simplicity, we assumed the estimated bank card consumption expenditure in five years based on the estimated upper bound reduction in Table G1.

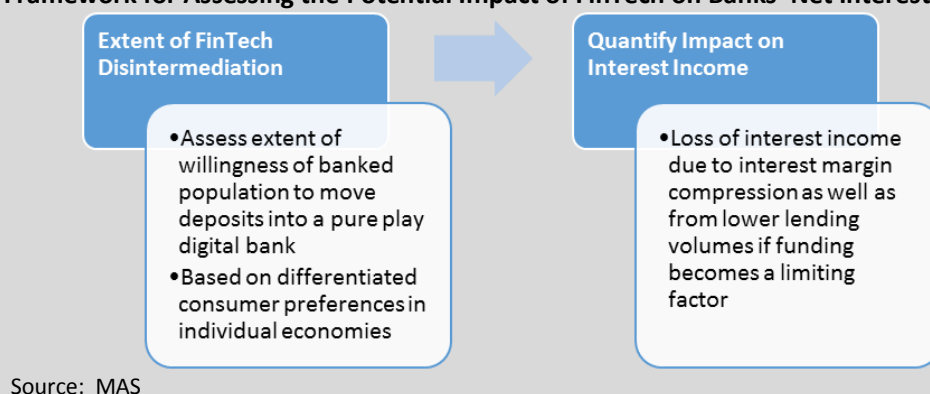
⁹⁰ For example, some reduction in MDR on the part of banks could help to reduce the loss of transaction volumes through traditional bank payment channels.

Impact on net interest income from deposit and lending business

FinTech enables pure play digital banks to be set up at lower cost than traditional banks. These new players may then be able to offer more attractive deposit rates. Such competition poses a threat to incumbent banks by eroding their deposit funding base. This would in turn increase banks' funding costs as they would need to either raise deposit rates to retain deposits or seek more costly funding in the interbank market. The higher funding costs would erode banks' interest margins. Alternatively, banks may reduce lending volumes if they are unable to secure adequate funding. Either strategy — narrower margins or less lending — would result in lower net interest income.

Figure G2 sets out the framework for assessing the impact of FinTech on banks' net interest income. We estimated the potential loss of deposit funding using third-party information on the share of the banked population that is prepared to switch to pure play digital banks (Chart G2) and the proportion of deposits that they would be willing to move to such banks (Chart G3). We then derived the potential increase in funding costs (and the resulting fall in net interest income) if the banks try to fill the funding gap by borrowing from the interbank market⁹¹ or by raising deposit rates to the interbank rate.⁹² Alternatively, assuming that banks choose to reduce lending to maintain their Loan-to-Deposit (LTD) ratios, we estimated the drop in net interest income as a result of lower business activity.⁹³

Figure G2
Framework for Assessing the Potential Impact of FinTech on Banks' Net Interest Income



⁹¹ We used the three-month interbank offer rates as at end-September 2017. The study assumed that the increased funding demand in the interbank market does not raise interbank rates substantially.

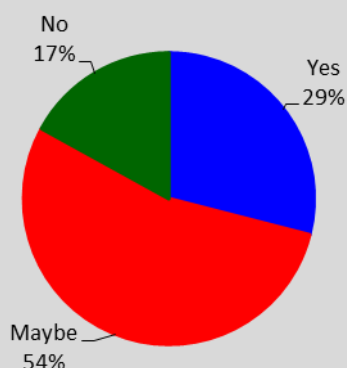
⁹² Calculated as:

$$\text{Estimated reduction in operating income from narrower interest margin} = \frac{(\text{Total deposit balance shifted} * \text{Difference between existing interbank rate and deposit rate})}{\text{Latest available operating income}}$$

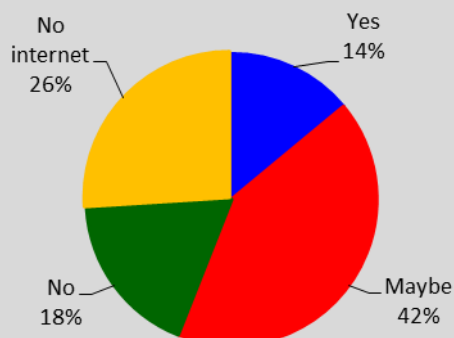
⁹³ Calculated as:

$$= \frac{\text{Estimated reduction in operating income from lower loan volume} = (\text{Total deposit balance shifted} * \text{LTD ratio} * \text{Existing interest margin})}{\text{Latest available operating income}}$$

Chart G2
Willingness to Open an Account with a Pure Play Digital Bank
Developed Asia⁹⁴

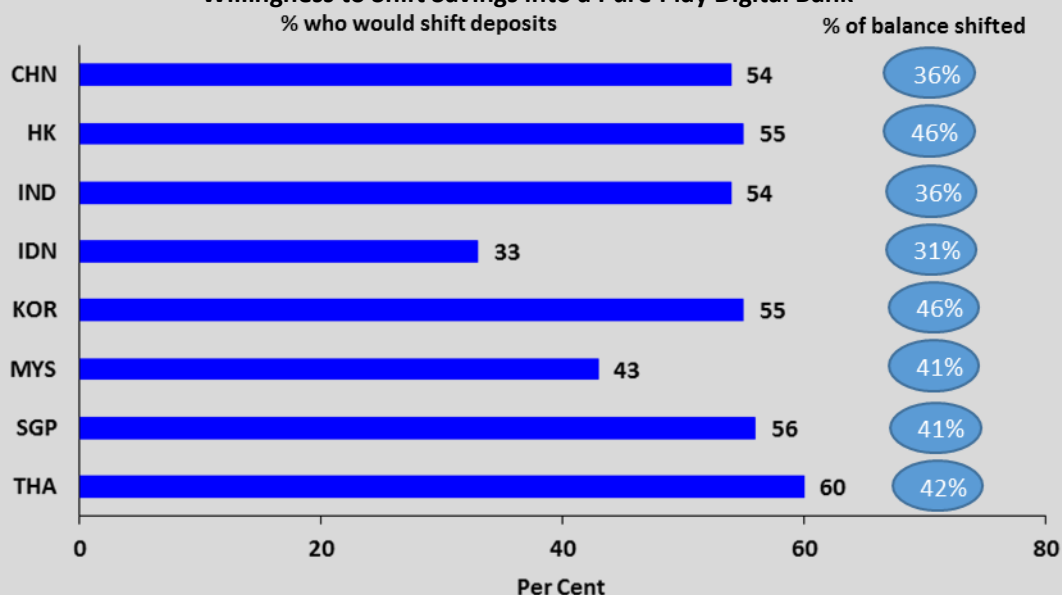


Emerging Asia⁹⁵



Source: McKinsey Personal Financial Services Digital Banking Survey 2014

Chart G3
Willingness to Shift Savings into a Pure Play Digital Bank
% who would shift deposits



Source: MAS estimates, McKinsey Personal Financial Services Digital Banking Survey 2014

Chart G4 illustrates the impact of disintermediation on banks' net interest income. We assumed that banks would take the option that would lead to a smaller drop in operating income. For example, banks in Singapore would likely increase their deposit rates and/or seek interbank funding as opposed to reducing their loan volumes.

Combined impact of disintermediation in the payments, deposit-taking and lending businesses on operating income

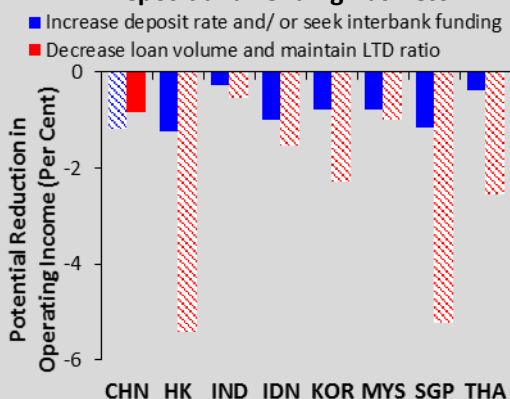
Chart G5 aggregates the estimated impact of FinTech-driven disintermediation on banks' payments, deposit-taking and lending businesses. With the exception of Chinese banks, banks in Asia would generally face larger potential reductions in operating income from their payments business, relative to their deposit and lending business. This is especially so for banks in developed Asia due to their greater reliance on payment fee income.

⁹⁴ Based on McKinsey's definition, developed Asia consists of Hong Kong, Korea and Singapore.

⁹⁵ Based on McKinsey's definition, emerging Asia consists of China, India, Indonesia, Malaysia and Thailand.

The impact on bank income from an erosion in deposit funding depends on whether banks choose to seek alternative funding or decrease their loan volume

Chart G4
Estimated Potential Reduction in Operating Income from Disintermediation in Deposit and Lending Business

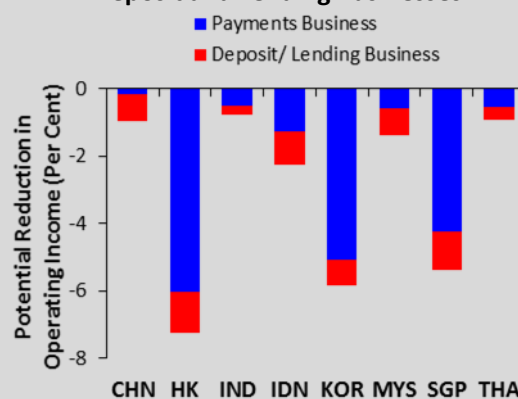


Source: MAS estimates, Bloomberg, CEIC, Central Banks, SNL Financial, World Bank

Note: Solid colour bars represent the potential impact based on the best option that banks in each economy would take to minimise their interest income loss; shaded bars represent the potential impact when the alternative action is undertaken.

The combined impact of disintermediation in the payments, deposit-taking and lending businesses is smaller in emerging Asia

Chart G5
Estimated Potential Reduction in Operating Income from Disintermediation in the Payments, Deposit and Lending Businesses



Source: MAS estimates

Note: Based on (i) maximum reduction in operating income from lower payment transaction volumes in Chart G1; and (ii) the option that would minimise net interest income reduction in Chart G4.

Banks can take actions to mitigate a reduction in operating income

The estimated potential reduction in operating income is based on an unmitigated scenario in which banks do not take actions to address the FinTech competition. In reality, banks can also harness technology — those that adopt a digital model successfully could perform better compared to those that do not.⁹⁶ The pace of a bank's digitalisation would depend on factors such as its ability (e.g. its resources, knowledge, and availability of talent) and openness to adopting technology.

The impact of FinTech on banks could be further differentiated depending on other bank-specific factors. For example, larger banks have broader customer bases that could make them more attractive to talent⁹⁷ or to FinTech companies for partnership opportunities.⁹⁸ However, larger banks may also be less nimble in the digitalisation journey as they could be bogged down with large legacy systems.

⁹⁶ DBS Group Research (September 2016), "Digital Banking: New Avatar — Banks Watch Out for Banks".

⁹⁷ A lack of leadership or digital talent tops the list of most significant challenges companies face in meeting their digital priorities. McKinsey (September 2015), "Cracking the Digital Code: McKinsey Global Survey Results". Some Asian economies may face difficulties in attracting talent in the area of FinTech. INSEAD (2016), "The Global Talent Competitiveness Index 2017".

⁹⁸ The Economist (May 2017), "Financial Technology is Proving Less of a Battleground than Feared".

In sum, as FinTech continues to develop, a bank that can build distinct digital capabilities⁹⁹, leverage on them and integrate them into its business model would be better placed for success.

Potential avenues for further work

FinTech is a growing space. As FinTech continues to develop over time, more data would become available that would allow for more comprehensive impact studies. For example, the study could be expanded to include other business lines, such as wealth management, insurance and remittance. The analysis can also be extended to assess potential second-round effects from FinTech disruption. For instance, disintermediation would reduce transaction flows and the amount of customer data that banks could collect about their clients. With fewer insights on their customers, banks would have fewer cross-selling opportunities and their risk assessments may become less robust.¹⁰⁰

⁹⁹ This includes data-driven digital insights, integrated customer experience, digital marketing, digitally-enabled operations, technology with the use of digital enablers of talent, governance and a culture of innovation. McKinsey (December 2015), "Cutting Through the FinTech Noise: Markers of Success, Imperatives for Banks".

¹⁰⁰ A retail bank can enjoy a 10% increase in net profit through digital innovation from new products, distinctive digital sales and using data to cross-sell. McKinsey (2015), "Strategic Choices for Banks in the Digital Age".

Appendix
Assessment of Conduciveness to FinTech Disintermediation in Payments Services

The probability of FinTech disintermediation in payments services is assessed based on an economy's pre-existing scale of FinTech adoption, structural environment and future customer readiness

Table G2
Assessment of Probability of FinTech Disintermediation in Payments Services in Each Economy

		CHN	HK	IND	IDN	KOR	MYS	SGP	THA
Pre-existing scale of FinTech adoption	Digital wallet penetration ¹⁰¹								
	Mobile banking usage ¹⁰²								
Supportive environment¹⁰³	Regulation								
	Government support								
	Proximity to expertise								
Customer readiness (2021 estimates)¹⁰⁴	Smartphone penetration								
	Internet penetration								

Judgement overlay, taking into consideration other factors, where relevant

Overall rating	5	4	3	1	3	2	4	2
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Source: MAS estimates, Bain & Company, Deloitte, Ernst & Young, Institute of Financial Services of the Lucerne University of Applied Sciences and Arts, MasterCard, Statista

Note:



The shades of light to dark blue represent a range from low to high conduciveness to FinTech development in each economy, relative to other economies studied. The latest available data is used for each metric. Where relevant, qualitative factors¹⁰⁵ are used to complete the overall rating.

¹⁰¹ Based on digital wallet penetration among mobile phone internet users in Asia-Pacific, converted to a proportion of an economy's population. MasterCard (2016), "Mobile Shopping Survey".

¹⁰² Based on percentage of survey respondents that have used mobile banking apps in the last quarter. Bain & Company (December 2014), "Customer Loyalty in Retail Banking: Global Edition 2014".

¹⁰³ Regulation assesses the extent to which regulators and the regulatory environment are conducive to FinTech growth (e.g. whether it supports sandbox concepts). Government support assesses the extent to which the economy's government supports FinTech (e.g. whether FinTech is on the government's agenda). Proximity to expertise assesses availability and level of talent (financial services, technological and entrepreneurial talent) within each economy. Deloitte (April 2017), "A Tale of 44 Cities — Connecting Global FinTech: Interim Hub Review 2017". Deloitte (September 2016), "Connecting Global FinTech: Hub Review 2016". Our assessment has also taken into account the evaluations by Ernst & Young (2016), "UK FinTech, On the Cutting Edge" and Institute of Financial Services of the Lucerne University of Applied Sciences and Arts (March 2017), "FinTech Study 2017".

¹⁰⁴ Forecasted smartphone and internet penetration rates in 2021. Statista.

¹⁰⁵ For example, the prevalence of ATMs and cash withdrawal points in an economy may make cash payments convenient, resulting in less impetus to switch to FinTech payment channels.

2 Singapore Financial Sector

Singapore's banking system remains resilient as the economic recovery gains traction. In line with the regional economic revival, the credit cycle has turned and Singapore's banking system has seen increased lending both domestically and to the region.

While overall asset quality has improved, banks continue to face heightened credit risks from the M&OE subsector that is weighed down with weakening demand and declining profitability. Foreign currency funding pressures have also risen alongside growing cross-border exposures.

Banks should continue to maintain sound credit underwriting standards and actively monitor their borrowers' financial health. Banks should also stay vigilant in managing their foreign currency funding risks as they expand in the region.

Credit Cycle Upswing

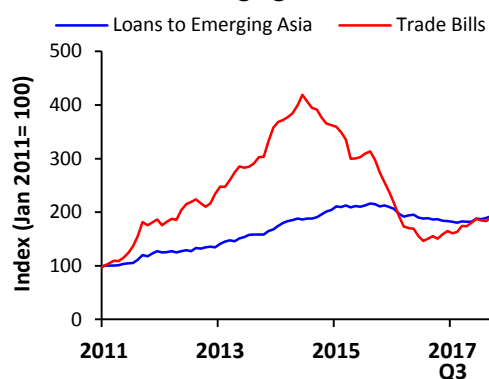
Non-resident loan growth has recovered, underpinned by regional economic recovery

Credit growth has seen an upswing in 2017 (See Panel 2A "Banking Sector: Credit Growth Trends"). In particular, non-resident loan growth has increased, reaching 12.2% year-on-year (YoY) in September 2017.

The rebound in non-resident lending has been underpinned by a broad-based, trade-led economic recovery (See Panel 2B "Banking Sector: Cross-border Lending Trends"). In particular, trade finance volumes to emerging Asia have recovered, growing 23.0% YoY in September 2017 (Chart 2.1).

In line with stronger economic prospects in the region, net lending to emerging Asia has increased as banks in Singapore intermediate more flows from advanced economies to emerging Asia (See Panel 2B "Banking Sector: Cross-border Lending Trends").

Chart 2.1
Volume of Trade Bills and Non-bank Loans to Emerging Asia



Source: MAS

Domestic lending has also picked up

Resident loan growth has picked up amid a recovery in lending to the General Commerce and Housing sectors. General Commerce loan growth has been healthy in line with an uptick in activity for consumer-facing industries buoyed by improved tourist arrivals and retail sales. Meanwhile, housing loan growth has been supported by increased activity in the private residential property market (See Box P "Update on the Private Residential Property Market").

Banks' responses to a survey conducted by MAS suggest that demand for non-bank loans is expected to improve further, supported by better economic prospects as well as increased overseas expansion and investment activities.

Uneven Recovery

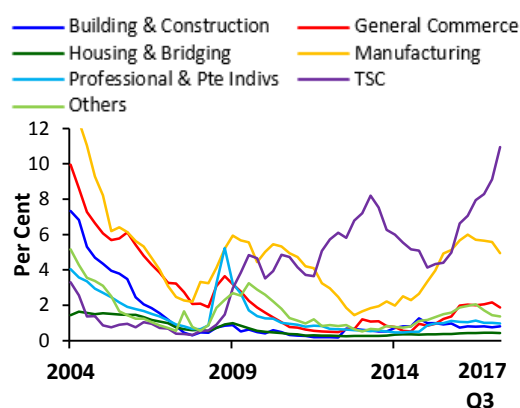
Credit quality has improved overall, but non-performing loans (NPLs) in selected sectors have continued to increase

The banking system's overall credit quality has started to improve alongside better domestic and regional economic prospects (See Panel 2C "Banking Sector: Asset Quality and Liquidity Indicators"). The overall NPL ratio declined slightly to 2.1% in Q3 2017, from 2.2% in Q4 2016. The special mention loan ratio¹⁰⁶ has also fallen to 3.3% in Q3 2017, indicating an improvement in asset quality.

However, asset quality risks in selected sectors remain. In particular, the NPL ratio for the Transport, Storage and Communications (TSC) sector has risen to 11%, while the NPL ratio for the Manufacturing sector remains elevated at 5% in Q3 2017 (Chart 2.2). While TSC forms a small percentage (less than 8%) of the overall non-bank loan book, the sector has been adversely impacted by the protracted weaknesses in the M&OE subsector due to low oil prices, weakening demand and declining profitability (See Section 3 "Singapore Corporate Sector").

¹⁰⁶ Credit facilities that exhibit potential weaknesses but are not yet classified as NPLs.

Chart 2.2
Banking System's NPLs by Sector



Source: MAS

Banks maintain adequate loan loss provisioning buffers. The banking system's total provisioning coverage¹⁰⁷ ratio is healthy at 114% in Q3 2017. These buffers are further augmented by general provisions held at the head offices of the foreign bank branches.

MAS also works closely with the home supervisors of foreign bank branches to support effective supervision of foreign banks, including on issues such as the adequacy of provisioning buffers.

Banks should continue to factor in risks in their lending decisions

In light of the credit risks in particular sectors, banks should maintain sound underwriting standards, including managing credit concentration risks prudently. Banks should also continue to monitor borrowers' financial health in line with sound risk management practices, and set aside adequate provisions as appropriate to buffer against asset quality risks.

¹⁰⁷ The banking system's overall provisioning coverage is computed as the sum of general and specific provisions as a share of unsecured NPLs.

Liquidity Risks Contained

Foreign currency LTD ratio has started to rise but remains below the peak in 2014

The recovery in lending to emerging Asia has resulted in foreign currency loans rising faster than deposits. This has in turn led to a slight increase in the foreign currency LTD ratio, which reached 123% in September 2017 even as the SGD LTD ratio remained stable at 84%.

Rising foreign currency funding costs could put pressure on further growth in cross-border lending (See Box H “Impact of US Dollar Funding Costs on Foreign Banks’ Cross-border Lending to Emerging Asia”).

Banks have strong capital and liquidity buffers to withstand shocks

Nevertheless, banks have maintained healthy liquidity positions. The all-currency liquidity coverage ratios (LCRs) of the domestic systemically important banks (D-SIBs) remain well above MAS regulatory requirements.

The results of MAS’ annual industry-wide stress test (IWST) also underscore the banking system’s ability to withstand severe shocks.¹⁰⁸ Strong capital and liquidity buffers built up over the years would enable the banks to absorb losses and meet anticipated cash outflows under the prescribed stressed conditions (See Box I “Industry-Wide Stress Test 2017: Enhancing the Stress Test Toolkit”).

Banks should continue to maintain strong liquidity buffers and manage their foreign

currency risks prudently, including ensuring that their funding sources are well-diversified and developing liquidity contingency plans.

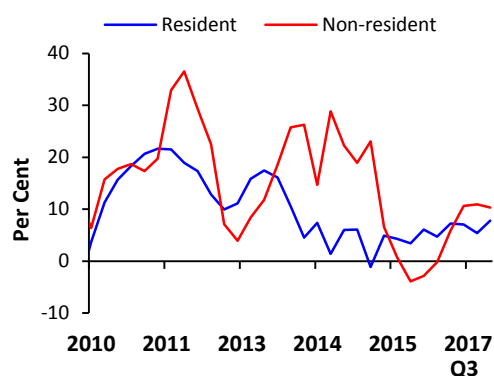
Local Banking Groups Remain Strong

Local banking groups saw strong growth in their loan books

Local banking groups experienced strong credit growth with non-bank loan growth of 9.1% YoY as of Q3 2017. The increase was largely driven by more lending to Asia as regional economic prospects improved. Local banking groups’ non-resident and resident loans grew 10.3% YoY and 7.8% YoY in Q3 2017, respectively (Chart 2.3).

Local banking groups’ earnings and net profit have remained firm over the past year (See Panel 2D “Banking Sector: Local Banking Groups”). This was supported by stable net interest margins (NIMs) of 1.7%.

Chart 2.3
Local Banking Groups’ Non-bank Loans by Residency



Source: Local Banks’ Financial Statements

¹⁰⁸ Stress scenario features a protracted slowdown in Europe and China, with weak global trade and commodity prices affecting the O&G, shipping, and M&OE sectors.

Local banking groups' asset quality and provisioning buffers remain healthy

The asset quality of local banking groups remains healthy. Their aggregate NPL ratio remains low at 1.6% in Q3 2017.

The local banking groups have been steadily building up provisioning buffers, alongside the recent period of stronger credit growth. As a result, local banking groups' overall provisioning coverage¹⁰⁹ are at a strong 211% in Q3 2017.

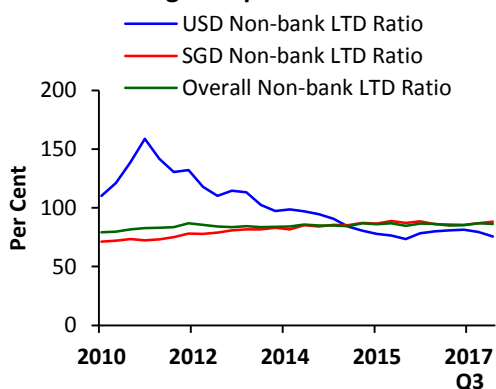
Local banking groups' capital and liquidity positions remain strong

Local banking groups have robust capital and liquidity positions. The average Capital Adequacy Ratios (CARs) and All-Currency LCRs are well above MAS' regulatory requirements. Local banks also have LTD ratios well below 100% (Chart 2.4).

and funding profiles as they expand in the region.

MAS will continue to monitor the exposures, asset quality and liquidity of the local banking groups and the banking system closely and assess the financial stability risks to the system.

Chart 2.4
Local Banking Groups' Non-bank LTD Ratios



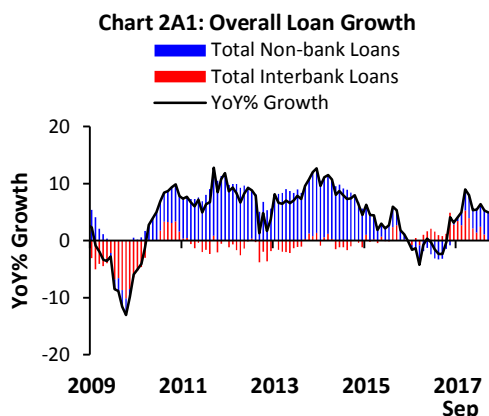
Source: Local Banks' Financial Statements

Local banking groups should continue to monitor and manage their risks prudently, including monitoring their credit performance

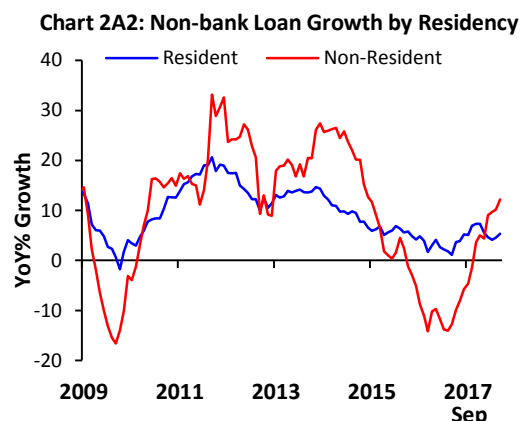
¹⁰⁹ Local banking group's overall provisioning coverage is computed as the sum of general and specific provisions as a share of total unsecured non-performing assets (NPAs).

Panel 2A Banking Sector: Credit Growth Trends

Overall loan growth has picked up over the past year. In recent quarters, the increase in overall loan volumes has been driven by an increase in both resident and non-resident non-bank lending.



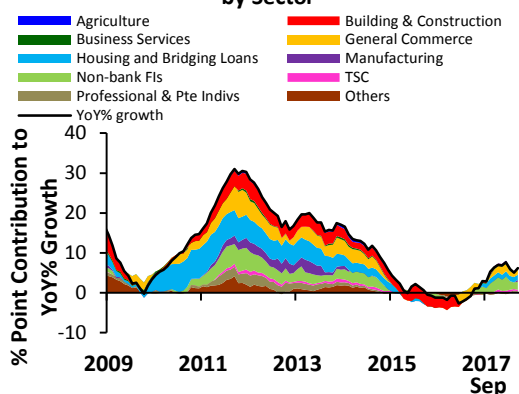
Source: MAS



Source: MAS

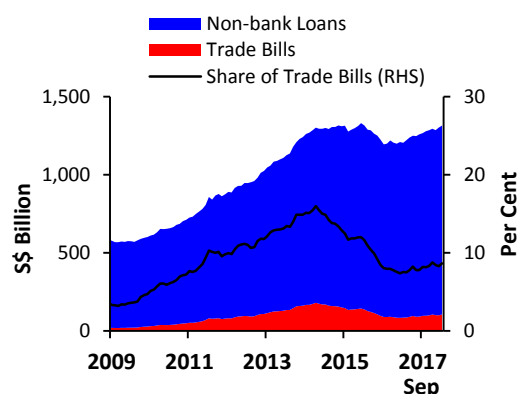
Lending to externally oriented sectors has started to recover alongside the recovery in regional and global economic prospects, with trade finance facilities starting to expand again.

Chart 2A3: Domestic Banking Unit (DBU) Non-bank Loans by Sector



Source: MAS

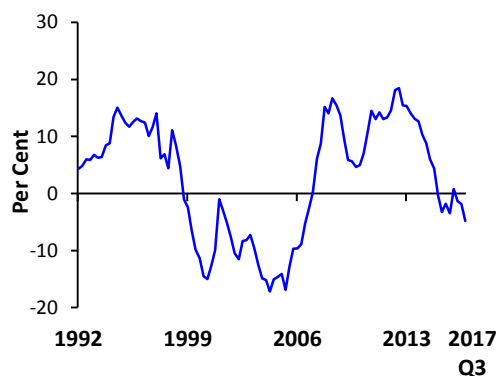
Chart 2A4: Share of Trade Bills in Non-bank Loans



Source: MAS

The credit-to GDP gap for Singapore has continued to decline over the past year (-4.8% in Q3 2017).

Chart 2A5: Credit-to-GDP Gap

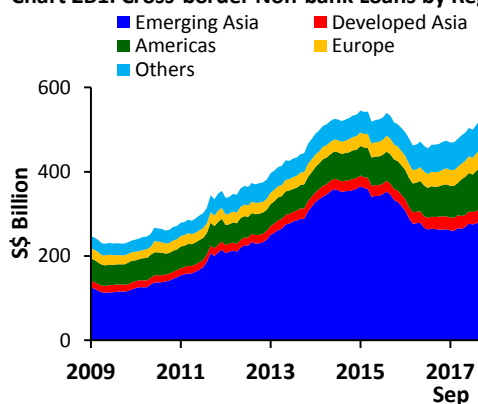


Source: MAS

Panel 2B Banking Sector: Cross-border Lending Trends

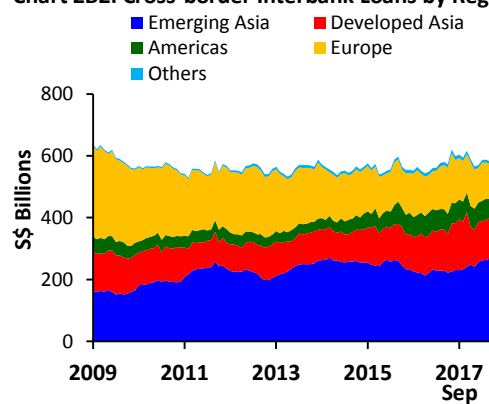
Cross-border lending volumes have started to rise again, driven by an increase in non-bank lending to emerging Asia.

Chart 2B1: Cross-border Non-bank Loans by Region



Source: MAS

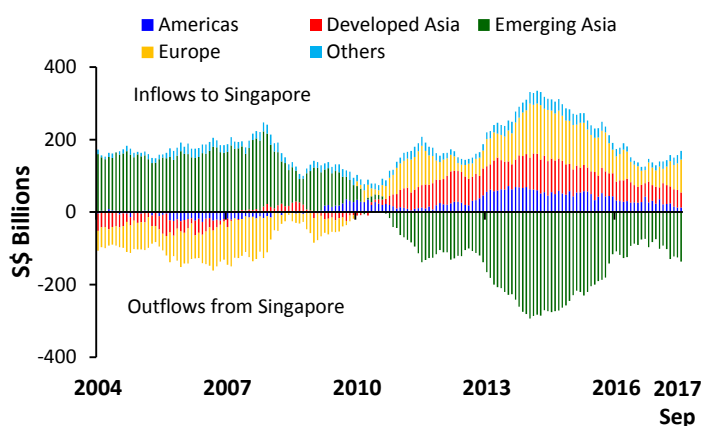
Chart 2B2: Cross-border Interbank Loans by Region



Source: MAS

Net lending to emerging Asia has started to increase in recent months alongside strengthening regional economic activity, matched by an increase in net funding from the rest of the world.

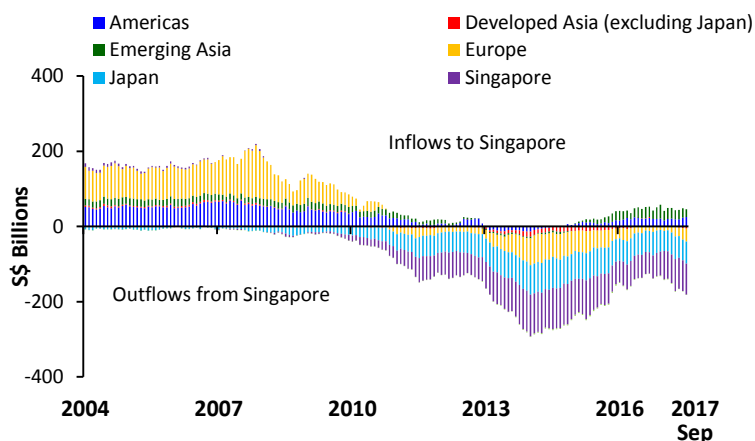
Chart 2B3: Singapore Banking System: Net Lending by Region



Source: MAS

The increase in lending to emerging Asia was driven by local and Japanese banks, which continue to be the main lenders to emerging Asia.

Chart 2B4: Net Lending to Emerging Asia by Bank Nationality

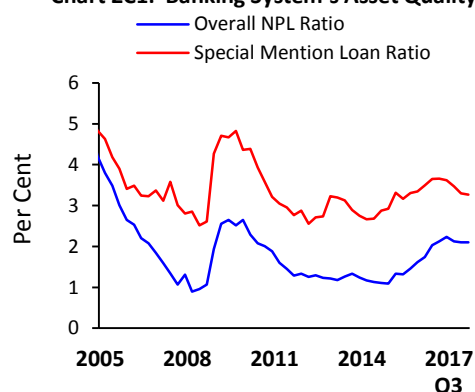


Source: MAS

Panel 2C Banking Sector: Asset Quality and Liquidity Indicators

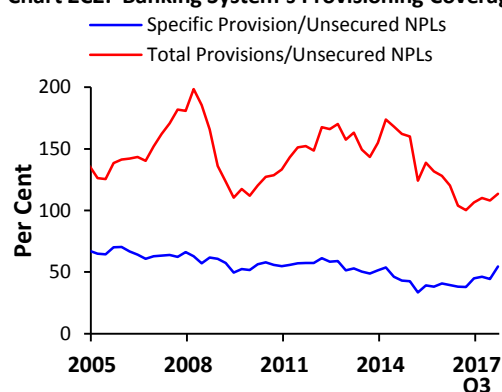
Asset quality has started to improve, with the overall non-bank NPL ratio decreasing to 2.1% in Q3 2017. Provisioning coverage has continued to remain healthy.

Chart 2C1: Banking System's Asset Quality



Source: MAS

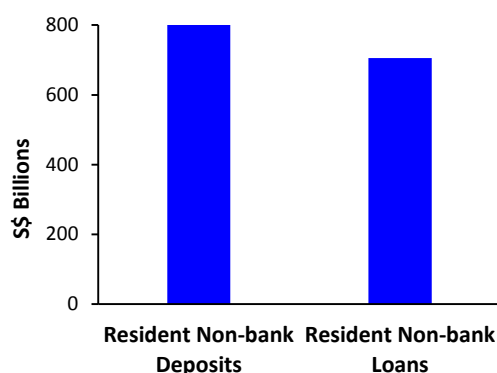
Chart 2C2: Banking System's Provisioning Coverage



Source: MAS

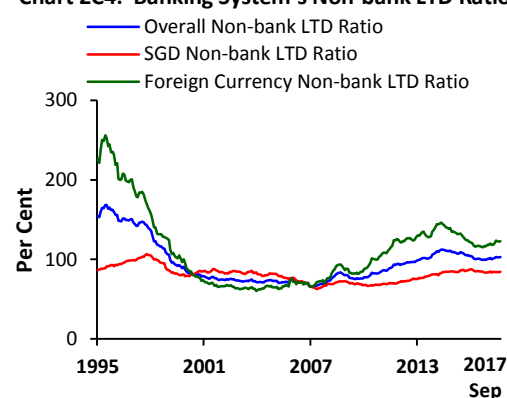
Singapore's banking system has sufficient resident deposits to fund resident loans. The foreign currency LTD ratio has started to increase slightly, alongside a pick-up in cross-border lending.

Chart 2C3: Banking System's Domestic Non-bank Deposits and Loans (as at September 2017)



Source: MAS

Chart 2C4: Banking System's Non-bank LTD Ratios

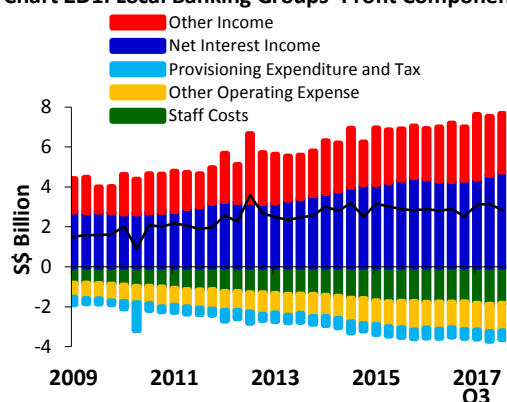


Source: MAS

Panel 2D Banking Sector: Local Banking Groups

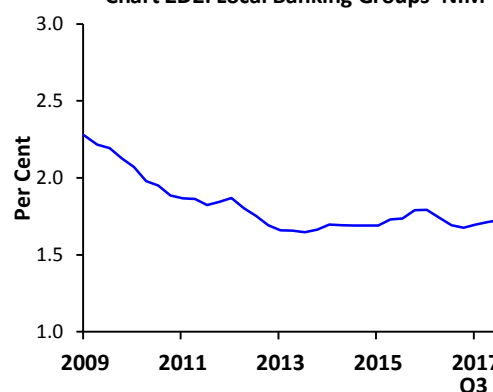
Local banking groups' earnings and profits have remained healthy, supported by a stable NIM (1.7% in Q3 2017).

Chart 2D1: Local Banking Groups' Profit Components



Source: Local banking groups' financial statements

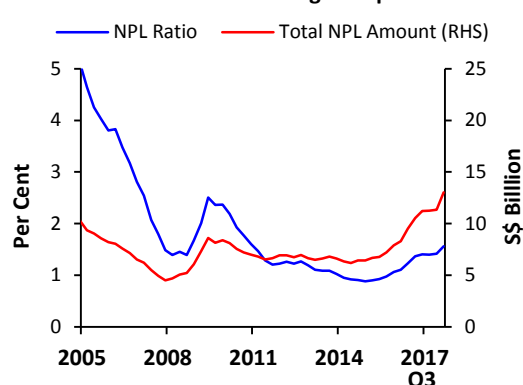
Chart 2D2: Local Banking Groups' NIM



Source: Local banking groups' financial statements

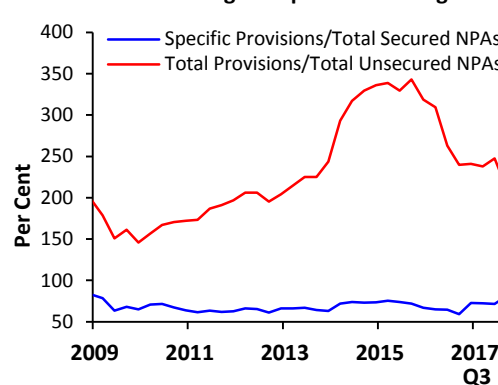
Local banking groups' NPL ratios have remained low with provisioning coverage at a strong 211% in Q3 2017.

Chart 2D3: Local Banking Groups' NPLs



Source: Local banking groups' financial statements

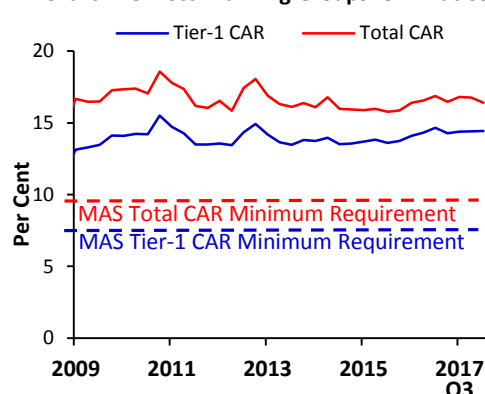
Chart 2D4: Local Banking Groups' Provisioning Coverage



Source: Local banking groups' financial statements

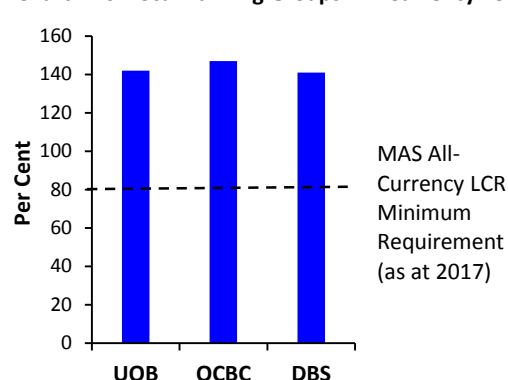
Local banking groups' capital and liquidity positions have remained healthy, with CARs and all-currency LCRs well above MAS' regulatory requirements.

Chart 2D5: Local Banking Groups' CAR Ratios



Source: Local banking groups' financial statements

Chart 2D6: Local Banking Groups' All-Currency LCR

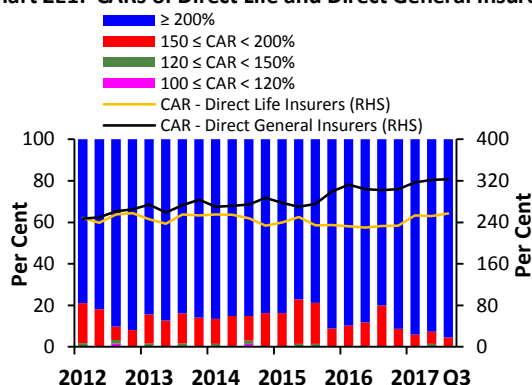


Source: Local banking groups' financial statements

Panel 2E Insurance Sector

The insurance industry in Singapore remains well-capitalised. The average CARs for the direct life and direct general insurance industry were 257% and 323% respectively as at Q3 2017.

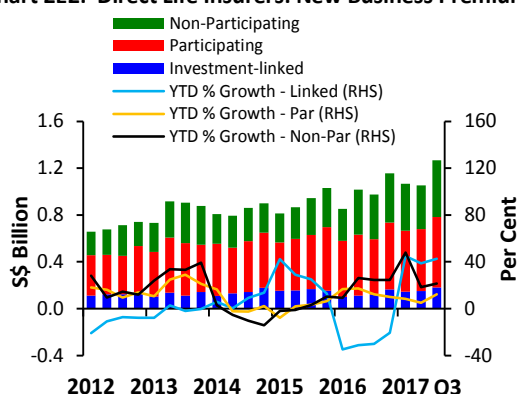
Chart 2E1: CARs of Direct Life and Direct General Insurers



Source: MAS

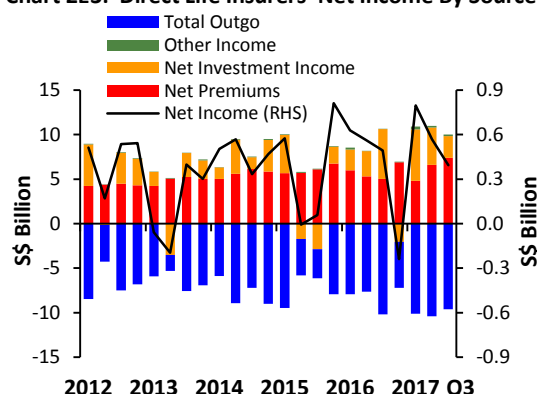
New business premiums of the direct life insurance industry grew significantly in 2017, with investment-linked products recording the highest percentage increase. Net income improved slightly due to better investment performance.

Chart 2E2: Direct Life Insurers: New Business Premiums



Source: MAS

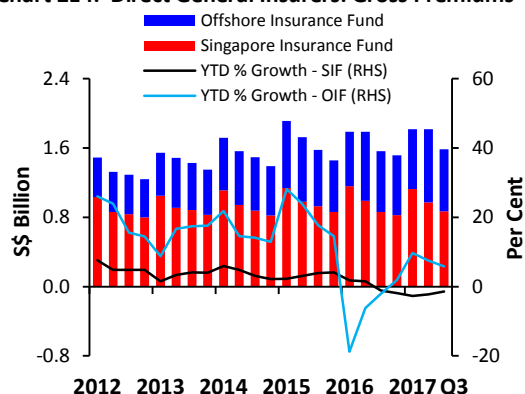
Chart 2E3: Direct Life Insurers' Net Income By Source



Source: MAS

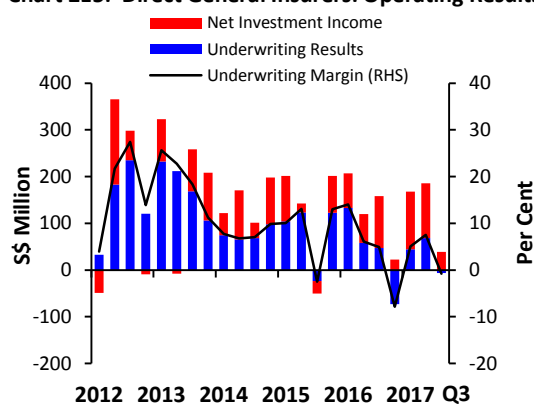
Gross premiums of the direct general insurance industry increased slightly in 2017, due to the increase in Offshore Insurance Fund (OIF) business. The industry also achieved underwriting and investment profits, though smaller underwriting profits were reported in 2017.

Chart 2E4: Direct General Insurers: Gross Premiums



Source: MAS

Chart 2E5: Direct General Insurers: Operating Results



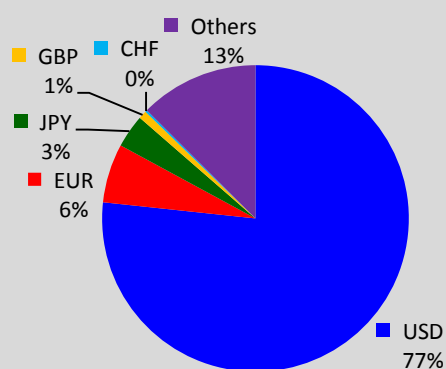
Source: MAS

Box H**Impact of US Dollar Funding Costs on Foreign Banks' Cross-border Lending to Emerging Asia**

USD funding costs have been rising since 2015 alongside the Fed's monetary policy normalisation and tighter USD liquidity in the swap markets.¹¹⁰ This can have implications for cross-border lending to emerging Asia¹¹¹, which is predominantly denominated in USD (Chart H1). This box examines whether rising USD funding costs have affected foreign banks' willingness to extend cross-border loans to emerging Asia, and if so, the implications for the Singapore banking system.

*USD accounts for the bulk of
cross-border credit to emerging Asia*

Chart H1
Currency Composition of Cross-border Credit to Emerging Asia



Source: BIS Locational Statistics
Note: As at Q1 2017.

USD cross-border lending to emerging Asia has declined amid rising USD funding pressures on banks

Banks' USD funding costs have been rising. The three-month USD London Interbank Offered Rate (3M USD LIBOR) climbed to 1.4% in November 2017, the highest in eight years (Chart H2). Tighter USD liquidity, and hence higher borrowing costs, have also been observed in the swap markets, with widening premiums vis-à-vis the USD LIBOR on one-year cross-currency basis swap contracts since the second half of 2014 (Chart H3).

Alongside rising US interest rates, USD cross-border lending to emerging Asia contracted between Q1 2015 and Q3 2016 (Chart H4). As a regional financial centre, Singapore intermediates credit to emerging Asia. Cross-border flows from Singapore's banking system to emerging Asia accounted for 21% of total cross-

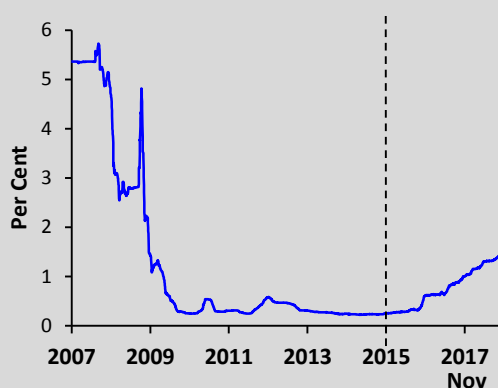
¹¹⁰ US money market reforms had also contributed to higher USD wholesale borrowing costs. The US Securities and Exchange Commission (SEC) announced new regulatory requirements for money market funds in 2014 and the full reforms came into effect in October 2016.

¹¹¹ For the purpose of this box, emerging Asia refers to China, India, Indonesia, Korea, Malaysia, the Philippines, Thailand, Taiwan and Vietnam. According to BIS Locational Statistics, these nine economies accounted for 86% of USD cross-border credit to the emerging Asia and Pacific regions as at Q1 2017.

border credit to the region as at Q1 2017.¹¹² Changes in bank lending decisions arising from higher USD funding costs would therefore have implications for credit intermediation via Singapore.¹¹³

*Banks face higher USD funding costs
alongside rising interest rates...*

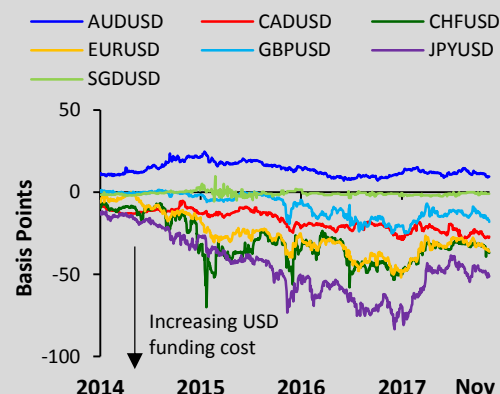
Chart H2
3M USD LIBOR



Source: Bloomberg

*...and tighter USD liquidity
in the swap markets*

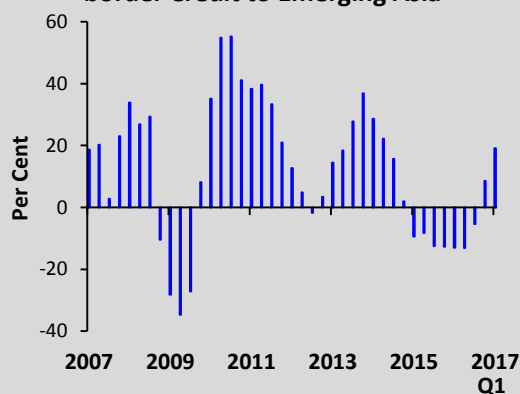
Chart H3
**One-Year Cross-currency Basis Swap Spreads
vis-à-vis USD**



Source: Bloomberg

*Cross-border credit growth to emerging Asia has
declined alongside rising USD funding costs*

Chart H4
**Annual Percentage Change¹¹⁴ in USD Cross-
border Credit to Emerging Asia**



Source: BIS Locational Statistics

Literature review

Existing literature on cross-border bank credit has focused on identifying demand- and supply-side drivers of international banking flows. Studies find that supply-side shocks to lender banks tend to dominate during

¹¹² BIS Locational Statistics and MAS estimates.

¹¹³ Singapore's banking system has seen declining intermediation flows to emerging Asia (See Chart 2B3 of Chart Panel 2B "Banking Sector: Cross-border Lending Trends") alongside softening regional economic activity since mid-2014. More recently, net lending from Singapore's banking system to emerging Asia has increased.

¹¹⁴ Annual percentage change is computed as the product of quarterly changes over four quarters, where quarterly change is computed as the FX-adjusted change_t/outstanding amount_{t-1}.

crisis periods (Amiti et al. (2017)¹¹⁵, Takats (2010)¹¹⁶). Many studies examined how cross-border linkages through the bank lending channel propagated shocks from advanced economies to emerging economies during the GFC (Cetorelli and Goldberg (2011)¹¹⁷, McGuire and Tarashev (2008)¹¹⁸). More recently, there is growing evidence that the currency distribution of cross-border bank lending has an impact on spillovers from international monetary policy shocks (Avdjiev and Takats (2016)¹¹⁹, Avdjiev et al. (2016)¹²⁰).

We extended these analyses by investigating how rising USD funding costs affect foreign banks' decisions to provide cross-border credit to emerging Asia under "normal" conditions (i.e. in the absence of shocks or heightened counterparty risk aversion).

Data, methodology and regression estimates

We conducted the analysis using the BIS Consolidated Statistics for the period from Q1 2015 to Q1 2017, which coincided with the period of rising USD interest rates and tighter USD liquidity. Specifically, we collated data on the international claims¹²¹ of banks from lender countries ("lender banks")¹²² on each emerging Asia borrower country ("borrower country").

We applied a fixed effects panel ordinary least squares (OLS) regression using the following functional form¹²³:

$$INTL_{ij} = \alpha + \beta_1 USD_j + \beta_2 CCY_BORR_i + \beta_3 CCY_LEND_i + \beta_4 LCY_i + \beta_5 LEND_DEP_i + \beta_6 LEND_CRE_i + \beta_7 BORR_EXR_j + \beta_8 BORR_GDP_j + \beta_9 BORR_BUD_j + \beta_{10} BORR_CRE_j$$

¹¹⁵ Mary Amiti, Patrick McGuire, and David E Weinstein, BIS Working Paper No. 639 (May 2017), "Supply- and Demand-side Factors in Global Banking". Amiti et al. (2017) find that bank flows during non-crisis periods can generally be explained by a common global factor and a local demand factor, while bank flows during crisis periods tend to be affected by idiosyncratic supply shocks to lender banks.

¹¹⁶ Elod Takats, BIS Quarterly Review (June 2010), "Was it Credit Supply? Cross-border Bank Lending to Emerging Market Economies during the Financial Crisis".

¹¹⁷ Nicola Cetorelli and Linda S. Goldberg, IMF Economic Review, Vol. 59, No.1 (2011), "Global Banks and International Shock Transmission: Evidence from the Crisis".

¹¹⁸ Patrick McGuire and Nikola Tarashev, BIS Quarterly Review (December 2008), "Bank Health and Lending to Emerging Markets".

¹¹⁹ Stefan Avdjiev and Elod Takats, BIS Working Paper No. 549 (March 2016), "Monetary Policy Spillovers and Currency Networks in Cross-border Bank Lending". Avdjiev and Takats (2016) find that the currency distribution of cross-border bank lending played a crucial role in determining the size, distribution and direction of international spillovers during the 2013 Fed taper tantrum.

¹²⁰ Stefan Avdjiev, Agne Subelyte and Elod Takats, BIS Quarterly Review (September 2016), "The European Central Bank's (ECB's) QE and Euro Cross-Border Bank Lending". Avdjiev et al. (2016) also find that the ECB's quantitative easing in January 2015 had a more pronounced positive impact on cross-border bank credit in lender-borrower pairs with a higher share of euro-denominated bank claims.

¹²¹ International claims on each borrower country refer to total cross-border claims in all currencies booked by the reporting banks' offices globally and any locally-extended claims in foreign currency booked by reporting banks' affiliates in the borrower country. For the purpose of this box, international claims are used as proxies for reporting banks' cross-border lendings.

¹²² Lender banks include consolidated banking groups headquartered in Australia, Canada, France, Italy, Japan, Korea, Netherlands, Singapore, Spain, Switzerland, UK and the US. Cross-section panels of lender banks *i* that account for a negligible share of total international claims on borrower country *j* were removed.

¹²³ Period effects were also fixed in our regression.

where $INTL_{i,j}$ is the percentage change in the international claims of lender banks from country i on borrower country j for each time period. Table H1 sets out the list of variables used in the regression and their associated regression estimates.

Table H1
List of Variables and Regression Estimates¹²⁴

Variable Type	List of Drivers	Estimated Coefficients
Key Explanatory Variables		
Borrower country's cross-border credit currency composition	USD share of cross-border credit to borrower country (USD_j)	-0.546*
Lender banks' USD borrowing costs in the swap markets	Lender banks' spread to borrow USD in swap markets (CCY_BORR_i) ¹²⁵	-0.003**
	Lender banks' spread for supplying USD in swap markets (CCY_LEND_i) ¹²⁶	0.002
Lender banks' business model	Local currency share of lender banks' total lending (LCY_i) ¹²⁷	1.925***
Control Variables		
Lender banks-specific	Lender banking system's deposit growth ($LEND_DEP_i$) ¹²⁸	0.843**
	Lender banking system's credit growth ($LEND_CRE_i$) ¹²⁹	0.434
Borrower country-specific	Borrower country's exchange rate change ($BORR_EXR_j$) ¹³⁰	-0.881***
	Borrower country's GDP growth ($BORR_GDP_j$)	0.274
	Borrower country's government budget balance ($BORR_BUD_j$) ¹³¹	3.505*
	Borrower country's banking system's credit growth ($BORR_CRE_j$) ¹³²	-0.769***

Source: MAS estimates

Note: ***, ** and * represent statistical significance at the 1%, 5% and 10% levels respectively.

¹²⁴ We tested the robustness of our regression results by considering alternative specifications and control variables such as GDP growth differential, borrower country's current account balance, lender banks' average equity price change and lender banks' average credit default swap (CDS) spreads. The magnitude and statistical significance of the estimated coefficients remained largely unchanged.

¹²⁵ The CCY_BORR_i variable refers to the one-year cross-currency basis swap spread for the lender banks' home currency vis-à-vis USD for lender banks from countries identified as net USD borrowers in FX swap markets following BIS' methodology. These countries include Canada, Italy, Japan, Spain, Switzerland and UK. Claudio Borio, Robert McCauley and Patrick McGuire, BIS Quarterly Review (September 2017), "FX Swaps and Forwards: Missing Global Debt?".

¹²⁶ The CCY_LEND_i variable refers to the one-year cross currency basis swap spread in the lender banks' home currency vis-à-vis USD for lender banks from countries identified as net USD lenders in FX swap markets following BIS' methodology. These countries include Australia, France, Netherlands and Singapore. Claudio Borio, Robert McCauley and Patrick McGuire, BIS Quarterly Review (September 2017), "FX Swaps and Forwards: Missing Global Debt?".

¹²⁷ Local currency lending extended by the lender banks' affiliates within the borrower country as a percentage of the lender banks' total lending to the borrower country.

¹²⁸ Percentage change in non-bank deposit in the home country of lender banks.

¹²⁹ Percentage change in bank credit to the non-financial private sector in the home country of lender banks.

¹³⁰ Percentage change in bilateral exchange rate of the borrower country, where a positive change indicates a depreciation in the borrower country's currency.

¹³¹ Borrower country's general government budget balance as a percentage of GDP.

¹³² Percentage change in borrower country's domestic banking system credit to the private non-financial sector.

Controlling for idiosyncratic borrower country- and lender bank-specific factors, the regression estimates for key explanatory variables are statistically significant, except the variable for lender banks' spreads for supplying USD in the swap markets.

Rising USD funding costs had a greater impact on emerging Asia economies with greater reliance on USD cross-border credit

We find that the USD share of cross-border credit to the borrower country has a negative relationship with the borrower country's access to cross-border lending. Emerging Asia economies that are more reliant on cross-border USD financing experienced a larger decline in cross-border lending in the current rising US interest rate environment. This suggests that rising USD funding costs could have had an impact on lender banks' decision to lend to emerging Asia economies.

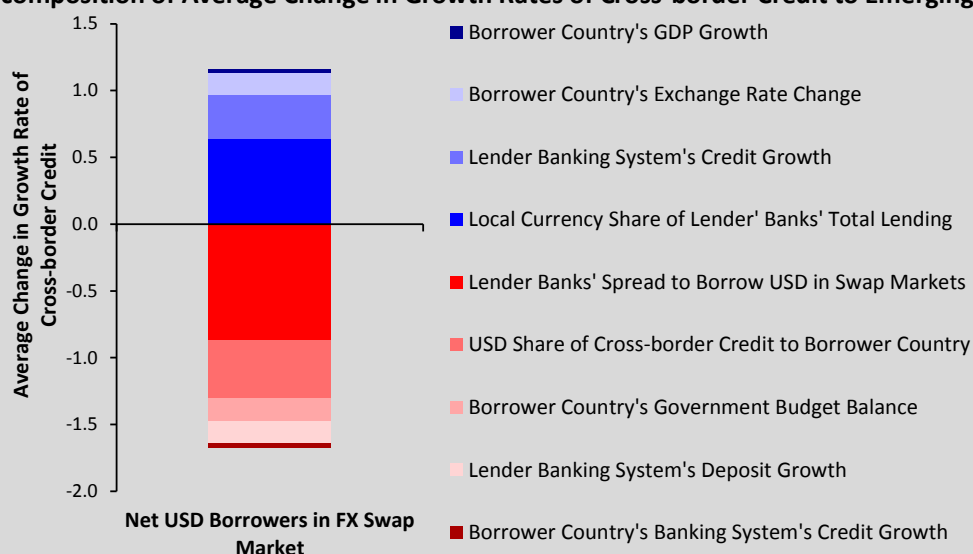
Tighter USD liquidity conditions in swap markets, and hence higher USD funding costs, also contributed to lower cross-border lending by banks that rely on FX swap markets for USD funding

Tighter USD liquidity in swap markets (proxied using the one-year cross-currency basis swap spreads vis-à-vis the USD LIBOR) have contributed to subdued cross-border credit to emerging Asia. Lender banks that rely on USD funding from swap markets are found to be sensitive to increases in the cost of borrowing USD in the swap markets. A 10 basis point (bps) increase in the swap spread is associated with a three percentage point drop in the growth rate of these banks' cross-border lending to emerging Asia. In contrast, widening swap spreads vis-à-vis the USD LIBOR do not appear to have an impact on the supply of cross-border credit to emerging Asia by lender banks that are net USD suppliers in the FX swap markets.

A decomposition analysis shows that, on average, higher USD borrowing costs in the FX swap markets has been the largest driver of the changes in the growth rates of cross-border credit to emerging Asia for lender banks that rely on swap markets for USD funding (Chart H5).

Elevated USD borrowing costs in swap markets is a major driver of the growth rate of cross-border credit to emerging Asia

Chart H5
Decomposition of Average Change in Growth Rates of Cross-border Credit to Emerging Asia



Source: MAS estimates, BIS, Bloomberg, CEIC, Central Banks, Haver Analytics, IMF, Organisation of Economic Co-operation and Development (OECD)

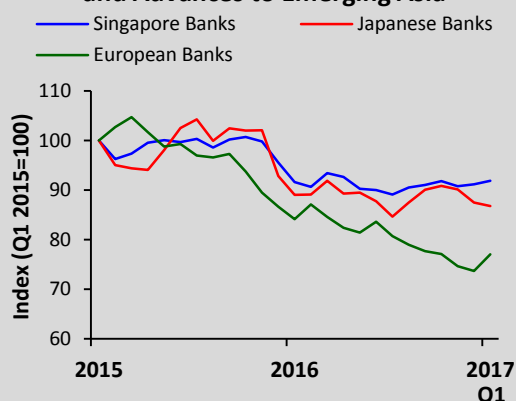
Lender banks with greater domestic presence in the borrower country have more resilient cross-border lending to emerging Asia

Cross-border lending tends to be more resilient where the lender banks extend substantial local-currency loans through domestic affiliates in the borrower country. Our regression estimates show that a one percentage point increase in the local currency share of lender banks' total lending to the borrower country contributes to a 1.9 percentage point increase in the growth rate of cross-border loans.

This suggests that the presence of domestic affiliates in borrower countries could create greater rootedness and lower the likelihood of a pull-back in cross-border lending. This is reflected in the amount of cross-border lending to emerging Asia intermediated through Singapore. Singapore and Japanese banks' non-bank lending out of Singapore to borrowers in emerging Asia have been more resilient than their European (excluding UK) counterparts' in the past three years (Chart H6). Chart H7 shows that Singapore and Japanese banks also tend to have a greater domestic presence in emerging Asia than European banks.

Singapore and Japanese banks' more resilient non-bank lending to emerging Asia...

Chart H6
Singapore Banking System: Non-bank Loans and Advances to Emerging Asia

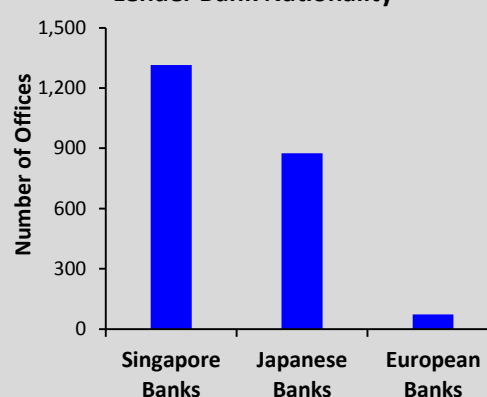


Source: MAS

Note: European banks exclude banks headquartered in UK.

...could be due to their greater domestic presence in emerging Asia

Chart H7
Number of Offices in Emerging Asia by Lender Bank Nationality¹³³



Source: SNL Financial

Note: European banks exclude banks headquartered in UK.

Post-GFC, Asian banks have expanded their regional footprint alongside greater intra-regional trade flows and the geographical expansion of their customers. They have set up more affiliates within emerging Asia in a bid to develop a permanent presence in their target markets.¹³⁴ This has also been observed in Singapore's banking system. Asian bank affiliates' share of total banking assets in Singapore has been rising steadily post-GFC to close to 30% in September 2017 (Chart H8).

The adoption of the ASEAN Banking Integration Framework (ABIF)¹³⁵ would encourage further foreign bank participation in the region, by providing ASEAN banks with greater access to neighbouring markets. In

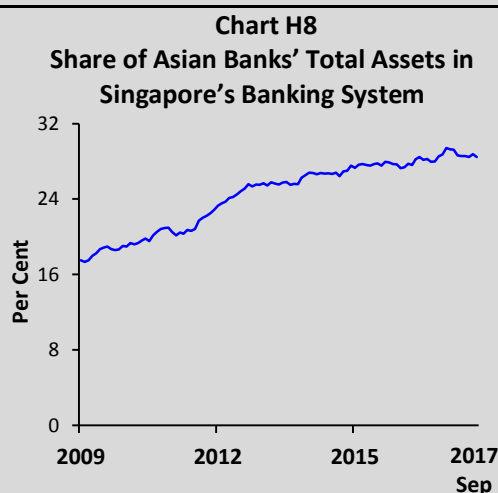
¹³³ The number of foreign bank offices (physical locations) in emerging Asia is used as a proxy for the number of foreign branch and subsidiary affiliates in emerging Asia. To the extent that these foreign branch and subsidiary affiliates extend local currency loans, the larger the number of offices, the larger the share of local currency lending by foreign banks.

¹³⁴ CGFS Papers No. 51 (March 2014), "EME Banking Systems and Regional Financial Integration".

¹³⁵ The ABIF and its attendant Guidelines were endorsed by ASEAN Central Bank Governors in December 2014 to encourage greater banking integration.

particular, Remolona and Shim (2015) find that ASEAN-headquartered banks generally have more subsidiaries than branches in other ASEAN countries compared to banks headquartered outside ASEAN.¹³⁶ With the benefit of local capital and liquidity buffers, subsidiaries would reinforce the resilience of cross-border credit within emerging Asia.

*Asian banks have been increasing their presence
in Singapore steadily post-GFC*



Source: MAS

While rising USD funding costs have had an impact on foreign banks' cross-border lending decisions to emerging Asia, financial stability risks remain limited

Our analysis shows that the effects of rising USD funding costs on cross-border lending to emerging Asia has been uneven. It poses a greater concern to economies that are more reliant on USD borrowing and to banks that rely on swap markets for USD funding. Some of these banks have started to reduce their dependence on relatively more expensive wholesale funding sources and raise more stable USD non-bank deposits.¹³⁷ Additionally, Asian banks' increased regional presence could also help to strengthen the resilience of foreign bank credit to emerging Asia. With the growing presence of Asian banks in Singapore, Singapore's banking system should remain resilient in intermediating flows to the region amid rising USD funding costs.

Nonetheless, Asian policymakers should continue to monitor the impact of rising USD funding costs on banks, as an unexpected USD liquidity freeze would have implications on the supply of credit to their economies and in turn, economic growth.

¹³⁶ Eli Remolona and Ilhyock Shim, BIS Quarterly Review (September 2015), "The Rise of Regional Banking in Asia and the Pacific".

¹³⁷ Non-US banks have managed to raise USD deposits outside the US, with offshore USD deposits on non-US banks' balance sheets rising by US\$531 billion to US\$4.5 trillion in the first three quarters of 2016. Inaki Aldasoro, Torsten Ehlers, Egemen Eren and Robert N McCauley, BIS Quarterly Review (March 2016), "Non-US Banks' Global Dollar Funding Grows Despite US Money Market Reform". In particular, major Japanese banks have shifted the composition of their foreign currency funding towards more stable funding sources, such as non-bank deposits and corporate bonds. The share of non-bank deposits on the major Japanese banks' foreign currency-denominated balance sheet has increased to 36% of liabilities in February 2017 from 30% in March 2016. BoJ's Financial System Report (April 2017) and Hiroshi Nakaso, Speech at a Meeting hosted by the International Bankers Association of Japan (January 2017), "Monetary Policy Divergence and Global Financial Stability: From the Perspective of Demand and Supply of Safe Assets".

Box I**Industry-Wide Stress Test 2017: Enhancing the Stress Test Toolkit**

MAS conducts an annual stress test of all major FIs in Singapore. The stress scenario in the exercise provides a common baseline for FIs and MAS to assess the resilience of individual institutions and the financial system as a whole to adverse macroeconomic and financial shocks. This box highlights the key results from IWST 2017.

Scenario for IWST 2017 extends on macroeconomic and financial stresses

This year's stress scenario centers on a protracted slowdown in Europe and China, with weak global trade and commodity prices affecting the oil and gas (O&G), shipping and M&OE sectors.¹³⁸ In addition to the severe macroeconomic and financial stresses prescribed, banks also had to assume:

- Exit of a core member country from the European Union (EU);
- Rating downgrades in sovereign exposures to a major Asian economy and top two EU member countries;
- Defaults by top bank counterparties from a major Asian economy and the EU;
- A significant share of exposures to large non-bank government-related entities in a major Asian economy becomes non-performing; and
- Defaults by top O&G, shipping and M&OE counterparties as well as rating downgrades on exposures to these sectors.

The banking system remains resilient under severe shocks

All banks remained solvent, with their CARs well above Basel regulatory requirements under the stress scenario. Strong capital buffers built up over the years enabled the banks to absorb losses from higher stressed NPLs and write-offs. This is despite additional sectoral stresses, sovereign downgrades, interbank and non-bank stresses as well as second-order effects from macro-financial feedback and interbank contagion. In addition, banks have sufficient liquidity buffers to meet anticipated cash outflows under the prescribed stress conditions.

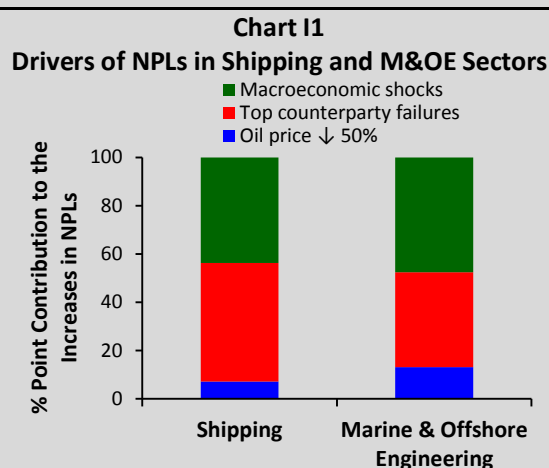
¹³⁸ At the same time, economic recovery in the US and Japan stalls due to negative spillovers and the US Federal Reserve halts further rate rises. The rest of Asia slips into recession and their currencies depreciate sharply, triggering a plunge in their property and stock markets. Financial conditions are assumed to tighten significantly, with sharp increases in interest rates and credit spreads. In this scenario, Singapore experiences a recession with unemployment reaching historical highs and a sharp fall in property prices. Selected financial market stress parameters are provided in the table below.

Financial Market Parameters	Stress Scenario (2017 – 2019)
Property prices	Cumulative drop of 50-55% over 3 years
Oil prices	Cumulative drop of 50% over 3 years
Equity prices	Cumulative drop of 40-60% over 3 years
Regional currencies (vs USD)	Cumulative depreciation of 20-25% over 3 years
Domestic interest rates	Cumulative increase of 200bps over 3 years

Shipping and M&OE NPLs driven by macroeconomic shocks, top counterparty failures and oil price shocks

IWST 2017 included a deeper analysis of the shipping and M&OE sectors, which have been facing a prolonged slowdown due to cyclical and structural forces. The results in Chart I1 show the percentage point contribution to the increases in NPLs under the stress scenario due to: (i) macroeconomic shocks; (ii) top counterparty failures; and (iii) fall in oil prices. We see that exposures to these sectors are more affected by macroeconomic shocks and counterparty defaults than by a fall in oil prices. M&OE firms are more sensitive to oil price shocks than those in shipping, as their business activities are more O&G-related. As several firms in the sector have announced debt restructuring plans in the face of repayment difficulties, counterparty failures are not implausible under a stress scenario. Banks should therefore continue to manage their exposures actively and undertake regular portfolio reviews and stress testing to guard against this risk.

Macroeconomic shocks and counterparty failures are the main drivers of NPLs



Source: MAS estimates

Evidence of non-linearities and lagged effects in stressed NPLs

Using data provided by banks for IWST 2017, we investigated how the profile of shocks under a separate set of scenarios would affect the resulting stress impact. The stress test results show that NPLs would be affected not only by the severity of the shock, but also how the shock is distributed over time and its duration.

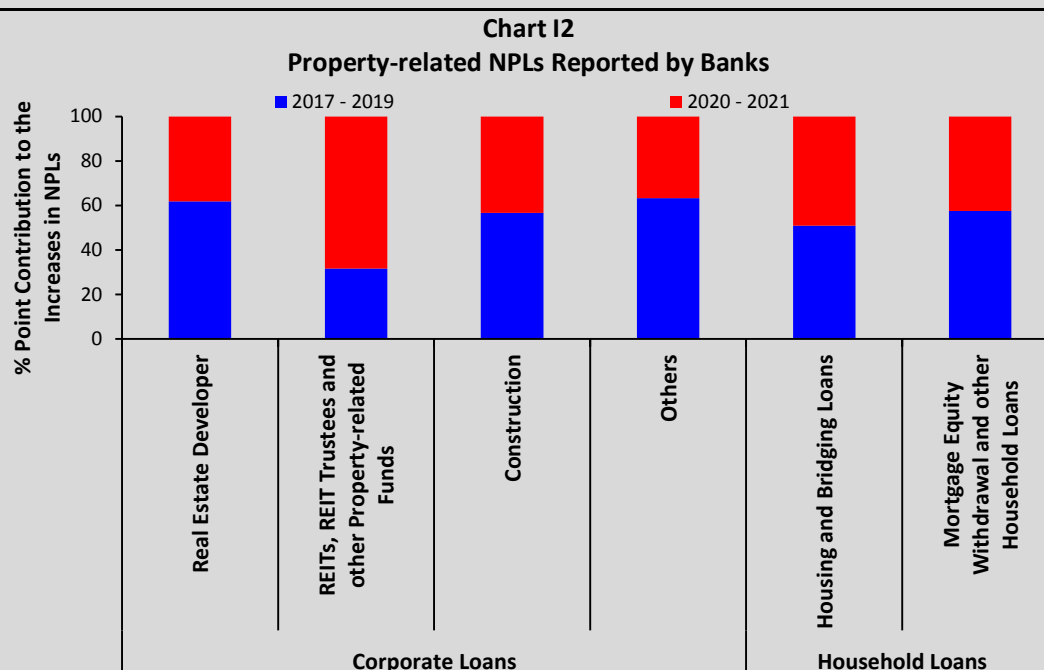
I. Non-linear effect of interest rate hikes on NPLs

We compared the NPLs reported by banks under two interest rate hike profiles: (i) a gradual increase of 150 bps in interest rates each year from 2017 to 2019; and (ii) a one-time large increase of 450 bps in interest rates in 2017. The results show that NPLs would be 10% higher at the end of three years under the second scenario. This suggests that an interest rate hike that is spread across a longer time period may not have as large an impact on NPLs as one of a similar magnitude but taking place over a shorter time period.

II. Lagged effects of shocks on property-related NPLs

We compared the increase in NPLs reported by banks under two stress horizons: (i) a 50% fall in property prices and 200 bps increase in interest rates over three years from 2017 to 2019; and (ii) a protracted recessionary environment where property prices remain depressed and interest rates stay elevated after 2019 for an additional two years. The results show that prolonging the stress without increasing its severity could worsen property-related NPLs significantly, although housing NPLs remain well below the levels observed during the Asian Financial Crisis. Nonetheless, banks should maintain prudent underwriting standards as a protracted recession and depressed labour market conditions could place severe strains on households' ability to service their mortgage obligations (Chart I2).

Prolonging the stress scenario without increasing the severity worsens property-related NPLs significantly



Second-order effects can be material

As part of the enhancements to the top-down stress test, MAS examined two types of second-order effects, namely, macro-financial feedback and interbank contagion.

I. Macro-financial feedback

Linkages between the real economy and financial sector can amplify shocks in a crisis. For example, an adverse macroeconomic shock could cause banks to deleverage in response to a rise in NPLs or a drop in capital ratio. This would in turn tighten credit conditions and hurt the economy. Drawing on Krznar and Matheson (2017)¹³⁹ and Hong Kong Monetary Authority (2016)¹⁴⁰, we adopt a framework comprising: (i) a macro model of Singapore's economy estimated using the seemingly-unrelated regression method; and (ii) a banking model of banks in Singapore estimated using the fixed effects

¹³⁹ Ivo Krznar and Troy Matheson, IMF working paper WP/17/149 (June 2017), "Towards Macroprudential Stress Testing: Incorporating Macro Feedback Effects".

¹⁴⁰ Hong Kong Monetary Authority, Half-yearly Monetary and Financial Stability Report (March 2016), "Box 5: A Stress-testing Framework with Macro-financial Feedback Linkages".

panel regression method, to estimate the additional impact of macro-financial feedback on Singapore's economy and banking sector under the IWSST stress scenario (Figure I1).

The model is estimated using quarterly data from March 2004 to December 2016 and the relationships between key variables are provided in Table I1. The results show that stressed macroeconomic and financial variables would deteriorate further with the feedback loop. For instance, GDP growth and property prices are around one percentage point and 10% lower respectively, while NPLs are about 5% higher given the external macroeconomic shocks prescribed under IWSST 2017.

Feedback effects between the macroeconomy and financial market can amplify initial shocks

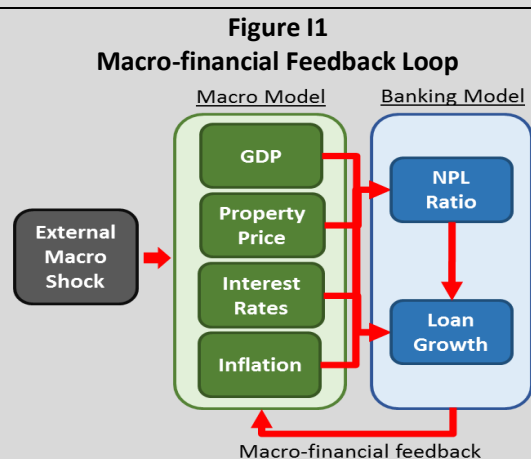


Table I1
Relationships between Key Model Variables

Independent variables	Dependent variables	
Macro model	GDP	Property prices
Loan growth	+	+
Banking model	NPL ratio	Loan growth
GDP	-	
Property prices	-	+
Interest rates	+	
NPL ratio		-

Source: MAS estimates

II. Interbank contagion

During a stressed period, a default by one or more banks could spillover to other banks which could in turn face similar challenges. To investigate the potential impact of contagion dynamics, we applied the DebtRank algorithm proposed in Bardoscia et al (2015)¹⁴¹ to Singapore's domestic interbank network. Based on this algorithm, when a bank suffers losses due to an initial shock, the percentage of claims it defaults on is proportional to the fall in capital it experiences. As such, shocks can propagate from one bank to another before capital is completely depleted.

Banks' bilateral exposure and equity data as at end-2016 are used to construct the domestic interbank network and default thresholds respectively.¹⁴² We first applied an initial shock using the fall in capital ratios reported by banks under the stress scenario to assess the contagion effects across the domestic interbank network. The results show that the capital of local banking groups and foreign bank subsidiaries could be further impacted by 6% on average. Next, we simulated a series of shocks whereby the capital of all banks were depleted with increasing order of severity from 1% to 35% so as to examine the degree of amplification within the network. As shown in Chart I3, the relative capital loss experienced by the banking system increases gradually as the initial shock increases before saturating at 34%.¹⁴³ When we repeated this simulation on the banking system during the GFC period, the saturation point is almost twice as high (>60%) and occurs for shocks as low as 10% of capital. This shows

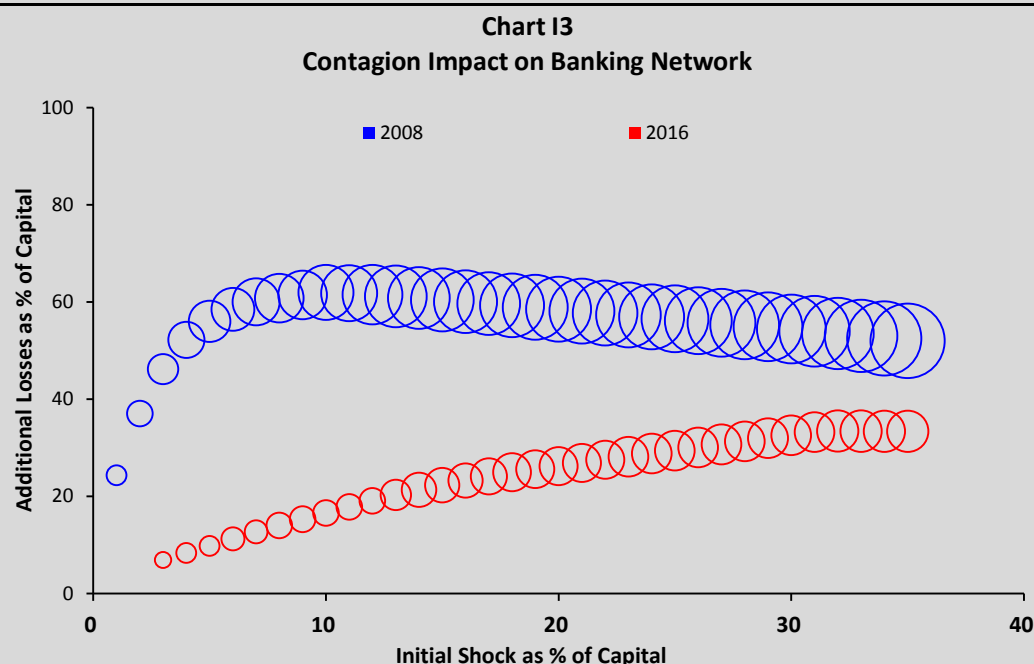
¹⁴¹ Macro Bardoscia, Stefano Battiston, Fabio Caccioli, Guido Caldarelli, PLoS One 10, e0134888 (June 2015), "DebtRank: A Microscopic Foundation for Shock Propagation".

¹⁴² To simplify the network, banks are aggregated by their banking groups and bidirectional loans are netted.

¹⁴³ The additional capital loss from contagion impact decreases after the saturation point due to "crowding out" by the initial shock as it increases.

that the domestic banking system has become considerably more resilient with significantly lower contagion risk since the GFC.

Contagion risk in the domestic banking system has declined significantly since the GFC



The insurance industry would be able to withstand severe shocks

The stress test results show that the insurance industry would remain resilient under the IWST stress scenario. While the capital positions of a few insurers would be impacted, most insurers would still be able to meet regulatory capital adequacy requirements under the stress scenario. A small number of insurers would need to revise their asset allocations and increase reinsurance coverage to strengthen their capital positions and support their business operations. MAS has reviewed these management actions and assessed them to be feasible. In addition to the IWST stress scenario, major insurers were also subjected to scenarios related to flu pandemic risk, non-life catastrophe risk and liquidity risk. The results indicate that insurers would remain robust under these scenarios.

Stress testing is a risk-discovery process and a tool for engaging the industry

MAS uses stress testing as a tool to engage the industry on both micro- and macroprudential issues. It allows us to better understand FIs' perspectives on emerging risks, identify common vulnerabilities and assess their resilience to plausible adverse scenarios. MAS' discussions with FIs on the stress test results can also help improve their risk management and discovery processes as well as augment and validate the feasibility of their management plans. The stress test results underscore the resilience of Singapore's financial system. MAS will continue to refine its stress testing capabilities to further assess the financial and economic impact from non-linearities and second-order effects, so as to ensure that the stress testing exercise remains a relevant and useful tool for MAS and the industry.

Box J**Do Trust Companies in Singapore Pose Shadow Banking Risks?**

This box provides an assessment of the shadow banking risks posed by trust companies in Singapore using regulatory and survey data of licensed trust companies in Singapore.

International shadow banking discussions include an assessment of potential risks posed by trust companies

Since the GFC, there has been increased international scrutiny of the shadow banking risks posed by non-bank entities across various jurisdictions.¹⁴⁴ A particular area of focus has been collective investment schemes with features that make them susceptible to runs. A run on collective investment schemes can lead to fire sales by asset managers to meet redemptions. This can in turn distort liquidity and pricing conditions in markets, with potential adverse spillovers on other market participants and counterparties. There has been concern that trust companies might exhibit similar features and risks as collective investment schemes even though they are not explicitly recognised or structured as "funds" or "investment vehicles". Against this backdrop, we assess trust companies in Singapore more closely to determine the extent of maturity transformation, liquidity transformation, leverage and credit risk transfer that they may undertake.

Trust companies are subject to regulation in Singapore

In Singapore, entities that carry out trust business¹⁴⁵ must be licensed under the Trust Companies Act.¹⁴⁶ Licensed trust companies are subject to ongoing supervision by MAS and must submit regular returns to MAS on information such as their revenues, expenditures and asset compositions.¹⁴⁷

Trust company activities and the associated financial stability risks can vary significantly across jurisdictions

In some jurisdictions, trust companies manage collective investment schemes on their clients' behalf and invest in credit assets, including in direct loans to non-financial corporate borrowers. These trusts may undertake liquidity and maturity transformation through their investments. This can give rise to run risks as they may face numerous redemption requests within a short time period under stressed financial conditions.

¹⁴⁴ The FSB defines shadow banking as "credit intermediation involving entities and activities (fully or partially) outside the banking system". The four key aspects of non-bank credit intermediation are:

1. Maturity transformation: Obtaining short-term funds to invest in longer-term assets.
2. Liquidity transformation: Using liquid/cash-like liabilities to buy illiquid assets.
3. Leverage: Borrowing money to buy assets to magnify the potential gains on an investment.
4. Credit risk transfer: Taking on or transferring of the risk of borrower defaults across different entities.

¹⁴⁵ Trust business include: (a) the provision of services with respect to the creation of an express trust; (b) acting as trustee in relation to an express trust; (c) arranging for any person to act as trustee in respect of an express trust; and (d) the provision of trust administration services in relation to an express trust.

¹⁴⁶ Singapore-domiciled funds that are structured as trusts are regulated separately as authorised funds under the Securities and Futures Act (SFA). Fund managers, regardless of whether they manage Singapore-domiciled or foreign funds, are regulated under the SFA as well.

¹⁴⁷ Beyond regular regulatory returns, MAS also collects additional information during its regular supervision to assess if trust companies have in place proper processes and controls to mitigate any risks underlying their business activities.

In contrast, licensed trust companies in Singapore do not manage collective investment schemes. The trusts that they administer are generally set up separately to serve individual high net worth clients for wealth preservation purposes. These assets/monies are managed on a long-term basis with clearly defined investment mandates. Additionally, licensed trust companies generally provide a wide range of administrative and advisory services for clients, with investment activities being mainly outsourced to third-party investment managers or banks.¹⁴⁸

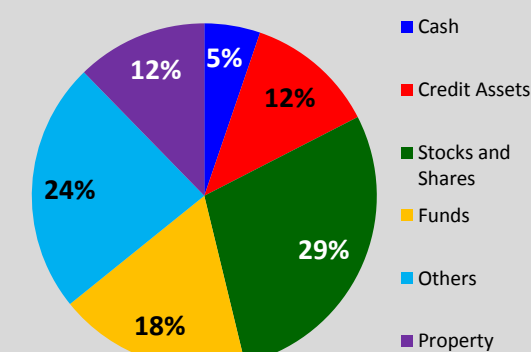
Trust companies in Singapore are generally small and do not engage in significant credit intermediation or credit risk transfer

The AUM of licensed trust companies form about 4.5% of Singapore's financial system assets as of end-2016. Of this, credit assets (including direct loans) form about 12% (Chart J1), while direct loans constitute only about 3%. Survey data¹⁴⁹ suggests that the median leverage ratio¹⁵⁰ among trusts is low at below 8%; Singapore trusts do not normally take on leverage. The low leverage and lending levels by trusts suggest that trusts do not form a critical part of the credit intermediation chain in Singapore's financial system.

Licensed trust companies also do not engage in significant credit risk transfer activities. Their combined volume of credit default swaps, credit insurance and credit guarantees amount to less than 0.5% of total trust assets. Singapore trust companies do not engage in securitisation activities.

Singapore trusts engage in limited credit intermediation; credit assets form only 12% of total trust assets

Chart J1
Asset Composition of Trusts Governed under the Trust Companies Act¹⁵¹



Source: MAS

¹⁴⁸ Third-party asset managers are regulated by MAS under the SFA, while the asset management arms of banks are already subject to regulation and supervision on a consolidated banking group basis. For Singapore-domiciled funds, both the asset managers and the funds themselves are regulated by MAS. In light of global efforts by the FSB and IOSCO to address structural vulnerabilities in asset management, MAS is exploring possible efforts to improve surveillance and mitigate liquidity and redemption risks in the fund management sector.

¹⁴⁹ The survey covered licensed trust companies that accounted for 70% of the industry's AUM.

¹⁵⁰ The leverage ratio is computed by dividing on-balance sheet debt by on on-balance sheet assets.

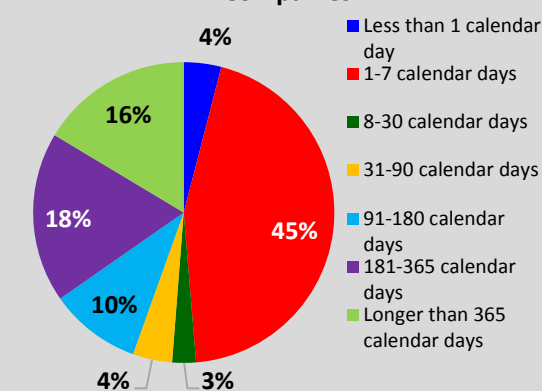
¹⁵¹ Others include fixed assets, commodities, annuities, artwork, insurance, precious metals and other alternative investments. While alternative investments may include investments in credit assets, alternative investments make up only 1.3% of all trust assets and do not add substantially to the proportion of credit assets held by trusts.

Trust companies face limited liquidity and maturity transformation risk

While trusts administered by trust companies hold illiquid assets such as real estate and artwork, an analysis of the liquidity profile of a representative sample of trusts shows that nearly half of their assets can be liquidated within one to seven calendar days (Chart J2). In general, trusts tend to hold a significant proportion of investments in the form of liquid assets, while spreading the rest across asset classes with varying degrees of liquidity.¹⁵² There is also limited maturity transformation as trusts hold a large proportion of assets with no maturity date. These include investments in fixed assets, real estate assets, as well as cash and equity stocks.¹⁵³

Nearly half of the assets held by trusts can be liquidated in one to seven calendar days

Chart J2
Liquidity Profile of Assets of Surveyed Trust Companies



Source: MAS

There are two other factors that mitigate run risks. First, trust companies generally have some discretion over the distributions from trusts and must comply with explicit and legally established distribution rules set out in the trust mandate. This mitigates the risk of trust companies having to liquidate trust assets at short notice to fund distributions. Second, distributions to beneficiaries are typically in kind and not in cash, and hence there is limited liquidity and maturity mismatch between the assets and liabilities of trusts.

Trust companies in Singapore pose limited shadow banking risks

Our analysis of trust company activities in Singapore suggests that they do not pose significant shadow banking risks, given that they perform limited credit intermediation and credit risk transfer. Moreover, they do not engage in significant liquidity or maturity transformation. Nevertheless, MAS will continue to closely monitor and assess the potential systemic risks that the sector may pose as part of our surveillance of the non-bank sector.

¹⁵² While these assets are considered to be liquid under normal financial conditions, it is still possible that such assets could become less liquid under stressed financial conditions as other financial entities could be liquidating the same asset classes at the same time. For the survey, trust companies are asked to categorise their assets under liquidity buckets based on their judgment.

¹⁵³ Beyond investment in cash, equities and property, a portion of the trust assets are also invested in private equity, unlisted shares and closed-end hedge funds where there is no explicit maturity date tagged to such investments. These investments, however, involve liquidity transformation and are typically categorised as illiquid assets that take more than 365 calendar days to liquidate.

Box K**Over-the-Counter Derivatives Transaction Data: Paving the Road to Market Transparency**

As part of international efforts to promote greater transparency in the Over-the-Counter (OTC) derivatives market, MAS commenced mandatory reporting of OTC derivatives transactions to trade repositories in 2014. Interest rate, credit and FX derivatives transactions are currently being reported. MAS intends to require mandatory reporting by banks for the remaining asset classes — equity and commodity derivatives — in October 2018, followed by other FIs and entities in a phased approach.

In parallel, MAS has made progress in analysing the reported transaction data to enhance our understanding of the Singapore OTC derivatives market. In December 2016, MAS staff published a paper that analysed liquidity in the FX derivatives market and the policy implications for platform trading of OTC derivatives.¹⁵⁴ The paper applied clustering techniques on OTC derivatives transaction data to assess the liquidity of one-month FX forward contracts traded in Singapore across a wide range of liquidity metrics. This year, MAS conducted a study on Singapore's USD FX swap market to understand the market structure and assess market resilience in times of stress (See Box L "Singapore's US Dollar Foreign Exchange Swap Market Structure and Resilience").

Future plans for data publication

MAS intends to begin publishing aggregated OTC derivatives transaction data in 2018. This will allow market participants to freely access information regarding domestic market activities, such as open positions and volumes across products. We are studying how best to conduct data cleaning and validation to facilitate regular disclosure of timely and accurate aggregated data.

MAS continues to explore other means of bringing greater transparency to and improving understanding of the OTC derivatives markets. Transaction-level data provides the greatest freedom of analysis for users. However, this is predicated on accurate reporting to avoid misinforming public analysis of the transaction data. Therefore, the arrangements for ensuring accurate transaction data must be robust and reliable. MAS intends to work in partnership with trade repositories and market participants to develop practical and effective solutions to improve the accuracy of transaction data.

¹⁵⁴ Jerome Chow, Jonathan Tan and Justin Wong, MAS Staff Paper No. 54 (December 2016), "Liquidity and Policy Analyses for Platform Trading of OTC Derivatives: A Perspective of Smaller Markets".

Box L**Singapore's US Dollar Foreign Exchange Swap Market Structure and Resilience**

This box uses transaction-level OTC FX derivatives data¹⁵⁵ to shed light on the structure of the USD FX swap market in Singapore and to assess financial stability risks during recent periods of heightened volatility.

FX swaps can be a double-edged sword for financial stability

The global OTC FX derivatives markets, particularly FX swaps and outright forwards, have grown significantly since the early 2000s (Chart L1). Non-US banks have become increasingly reliant on FX swaps to fund their USD needs¹⁵⁶, while corporates use FX swap markets to hedge currency risks from international trade.

While FX swaps could support financial stability if used for hedging FX exposures, they could also contribute to financial stability risks in the form of currency or maturity mismatches. In times of heightened volatility, the costs of rolling over short-term hedges of long-term assets could spike and amplify funding and liquidity stress.¹⁵⁷ Banks that rely on funding from FX swap markets could also shrink their balance sheets and reduce credit intermediation. During the GFC, FX swap markets experienced acute strains¹⁵⁸ caused by USD funding shortages among non-US FIs that could not obtain USD funding from the interbank market.¹⁵⁹ This prompted central banks to step in to provide USD liquidity to fund dollar assets.^{160,161} Furthermore, FX derivatives can also be used to take directional positions and thereby contribute to market risk. Though FX swaps are collateralised transactions, they are not entirely inured from counterparty risk. Replacement costs could be incurred if a counterparty defaults during the contract period.¹⁶²

¹⁵⁵ MAS commenced mandatory reporting of OTC FX derivatives transactions on 1 May 2015.

¹⁵⁶ Hiroshi Nakaso, Bank of Japan (BoJ) (January 2017), "Monetary Policy Divergence and Global Financial Stability: From the Perspective of Demand and Supply of Safe Assets". Claudio Borio, Robert McCauley, Patrick McGuire, BIS Quarterly Review (September 2017), "FX Swaps and Forwards: Missing Global Debt?".

¹⁵⁷ Market participants supplying dollar funding could face liquidity constraints and hence become more reluctant to lend over longer periods, leading to a sharp shortening of FX swap maturities and increasingly costly rollover activity. Bergljot B. Barkby and Li Lian Ong, IMF Working Paper WP/10/55 (March 2010), "FX Swaps: Implications for Financial and Economic Stability".

¹⁵⁸ FX swap market became increasingly one-sided during the GFC as market participants competed for USD liquidity, resulting in large premia paid to access USD funding. Naohiko Baba, Frank Packer, Teppei Nagano, BIS Quarterly Review (March 2008), "The Spillover of Money Market Turbulence to FX Swap and Cross-currency Swap Markets".

¹⁵⁹ Participants in the interbank market who had previously supplied USD were hoarding liquidity to support their own funding needs, and withholding lending over concerns of rising counterparty risk. Bergljot B. Barkby and Li Lian Ong, IMF Working Paper WP/10/55 (March 2010), "FX Swaps: Implications for Financial and Economic Stability".

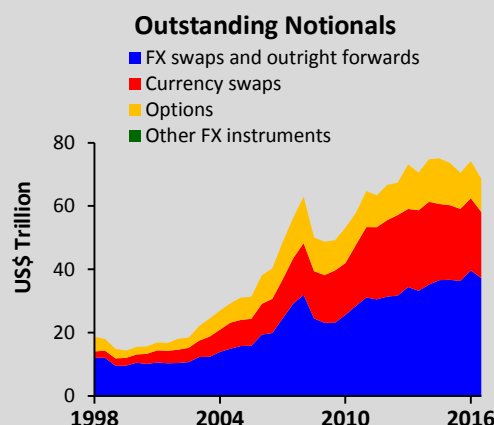
¹⁶⁰ Non-US central banks introduced USD central bank swap lines and USD liquidity operations in 2007 to alleviate USD shortages. Crystal Ossolinski and Andrew Zurawski, (June 2010), "The Financial Crisis Through the Lens of Foreign Exchange Swap Markets".

¹⁶¹ Patrick McGuire, Goetz von Peter, BIS Quarterly Review (March 2009), "The US Dollar Shortage in Global Banking".

¹⁶² Naohiko Baba, Frank Packer, Teppei Nagano, BIS Quarterly Review, March 2008, "The Spillover of Money Market Turbulence to FX Swap and Cross-currency Swap Markets".

*Global FX swaps and outright forwards markets
have grown rapidly over the years*

Chart L1
Global FX OTC Derivatives Market



Source: BIS

Against the backdrop of monetary policy normalisation by the US Federal Reserve, there are concerns that USD funding conditions could come under stress. These concerns could be pertinent to Singapore, which is the world's third largest FX centre.¹⁶³

Data on individual entities' usage of FX swaps has hitherto not been readily available, as they are off-balance-sheet. Recent analyses estimate banks' use of FX swaps through top down approaches. The Bank of Japan (BoJ) (2017)¹⁶⁴ approximates non-US banks' reliance on FX swaps by dividing banks' dollar funding gap by foreign claims. BIS (2017)¹⁶⁵ assumes banks run flat books for each currency, and that the currency mismatch in asset and liabilities are funded by FX swaps in a given currency.

Using transaction-level OTC FX derivatives data reported by FIs under MAS' OTC trade reporting regime, we analysed the structure of the USD FX swap market in Singapore and assess potential financial stability risks.

Overview of Singapore's USD FX swap market

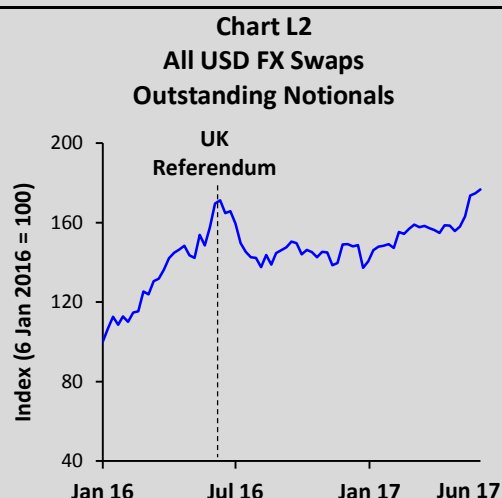
The outstanding notionals in Singapore's USD FX swaps have been growing in the past two years (Chart L2). The spike and subsequent fall in outstanding notionals around the UK referendum in June 2016 could be attributed to increased hedging activities in the run-up to the referendum. Most of the USD FX swaps contracts have tenors within a year (Chart L3).

¹⁶³ Data from 2016 BIS Triennial Central Bank Survey.

¹⁶⁴ Hiroshi Nakaso, BoJ (January 2017), "Monetary Policy Divergence and Global Financial Stability: From the Perspective of Demand and Supply of Safe Assets".

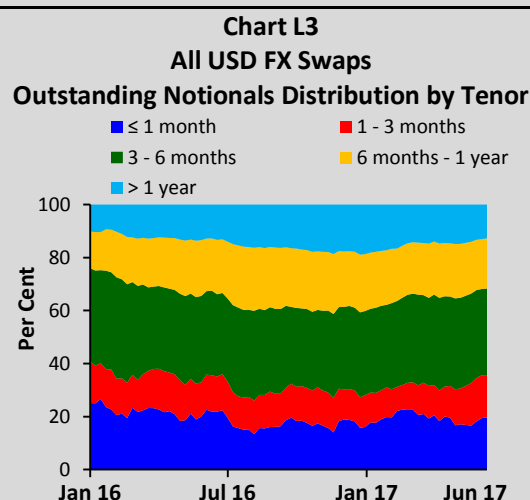
¹⁶⁵ Claudio Borio, Robert McCauley, Patrick McGuire, BIS Quarterly Review (September 2017), "FX Swaps and Forwards: Missing Global Debt?".

Outstanding notionals have been rising, with a spike and subsequent fall around the UK referendum



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

Tenors of USD FX swaps are mostly short-dated



Source: MAS estimates, DDRS

Banks are key players in Singapore's USD FX swap market

Singapore's USD FX swap market is dominated by banks, in particular European and US banks. The market shares of various market participants have been relatively stable (Chart L4). BoJ (2017)¹⁶⁶ highlighted that greater participation by non-banks as suppliers of USD could pose risks as non-banks might not be a stable source of funding. This is not the case in Singapore, as non-banks have not gained in prominence over time (Chart L4).

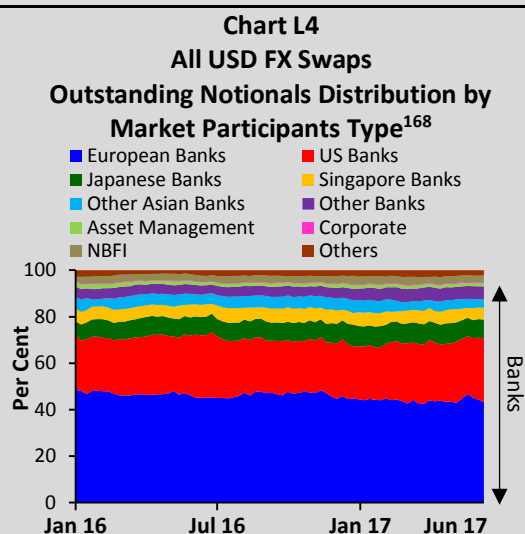
G16 dealer banks play an intermediary role in the market

Trades by G16 dealer banks¹⁶⁷ make up a significant share of Singapore's USD FX swap market and their market share has remained quite steady over time. Reflecting their intermediary role, G16 dealer banks run relatively flat books, with their gross buy and sell positions almost matched (Chart L5).

¹⁶⁶ Hiroshi Nakaso, BoJ (January 2017), "Monetary Policy Divergence and Global Financial Stability: From the Perspective of Demand and Supply of Safe Assets".

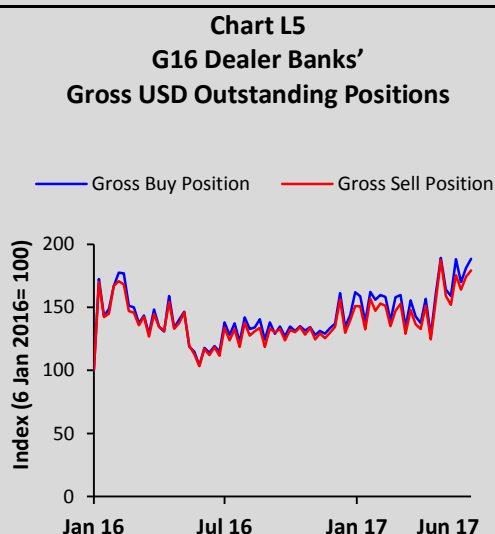
¹⁶⁷ G16 dealer banks include Bank of America, Barclays, BNP Paribas, Citigroup, Crédit Agricole, Credit Suisse, Deutsche Bank, Goldman Sachs, HSBC, JP Morgan Chase, Morgan Stanley, Nomura, Royal Bank of Scotland, Société Générale, UBS and Wells Fargo.

Banks take up a significant share of Singapore's USD FX swap market



Source: MAS estimates, DDRS

G16 dealer banks' gross buy and sell positions are closely matched, reflecting their intermediary role



Source: MAS estimates, DDRS

Corporate participants have regional focus, and appear to use FX swaps to hedge trade

Non-financial corporates (NFCs) whose transactions are reflected in the trade repository data generally have a regional focus. BIS (2017)¹⁶⁹ found that NFCs' use of FX swaps and forwards co-move with world trade, which suggests that they are used to hedge trade-related risks. Similarly, we find a positive correlation of 0.343 (p-value 0.096) between the growth in the monthly notional volume of NFCs' FX swaps and the growth in Asia-10 monthly trade volume. This suggests that NFCs could be using FX swaps to support regional trade.

A closer look at Singapore's USDSGD swap market

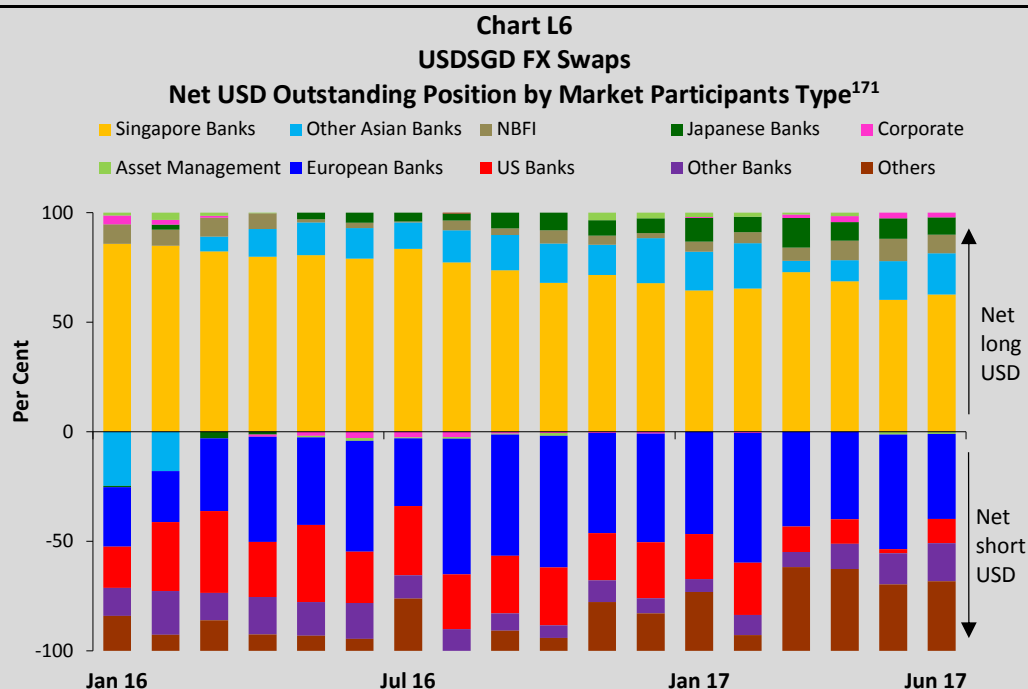
This section delves deeper into the USDSGD FX swap market as it is an important funding market in Singapore. The US and European banks are major providers of USD funding in Singapore's market (Chart L6). The local banks are the main participants¹⁷⁰ swapping SGD into USD (Chart L6), reflecting their strong base of SGD deposits.

¹⁶⁸ Market participants type classification is not directly available in the trade repository data. We classified counterparties based on MAS internal data and external sources. Bank nationality is determined based on their ultimate parent's location.

¹⁶⁹ Claudio Borio, Robert McCauley, Patrick McGuire, BIS Quarterly Review (September 2017), "FX Swaps and Forwards: Missing Global Debt?".

¹⁷⁰ Even though the local banks are the largest net buyers of USD in Singapore's USDSGD FX swap markets, FX swaps make up only a small proportion of their total USD funding which is predominantly from deposits. The local banks also have USD medium-term note and commercial paper programmes to raise USD funding.

European and the US banks are largest net providers of USD in the USDSGD FX swap market



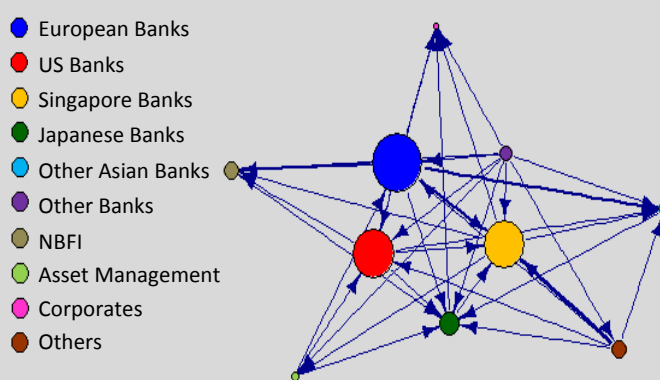
Source: MAS estimates, DDFS

Note: A positive number represents net USD long position.

We can also gain insights on the structure of the USD FX swap market by building network diagrams (Figure L1). The European, US and local banks are more central in the network (Figure L1) as they are more interconnected. Accordingly, they play an important role in the stability of the market.

The European, US and local banks are key participants in the USDSGD FX swap market

Figure L1
Network Diagram of USDSGD FX Swap Market



Source: MAS estimates, DDFS

Note:

- The Fruchterman Reingold layout algorithm is used to construct this force-directed network diagram. Nodes with higher eigenvector centrality are situated in the centre.
- The diagram is based on outstanding positions in the USDSGD FX swap market as of June 2017.

¹⁷¹ The "Others" category includes central banks. For example, MAS uses FX swaps to inject and withdraw SGD liquidity into and from the banking system as part of its daily Money Market Operations (MMO).

- The size of the node denotes the relative outstanding gross notional amounts for each market participant type.
- The direction of the arrows denotes the net USD long/short positions of the nodes, with an outward-facing arrow indicating net short USD positions vis-à-vis the other party, and vice versa.
- The thickness of the lines correspond to the sizes of the net USD positions.

Assessing resilience of key FX swap market during recent periods of heightened volatility

This section assesses the potential financial stability risks from the OTC FX swap markets. Our study focuses on whether there have been significant shifts in USD funding costs in Singapore's FX swap market during recent periods of heightened volatility, such as the US election and the UK referendum. Besides the USDSGD market, we also examine the USDJPY FX swap market as USDJPY is one of the most actively traded USD FX swap pairs in the Singapore market.

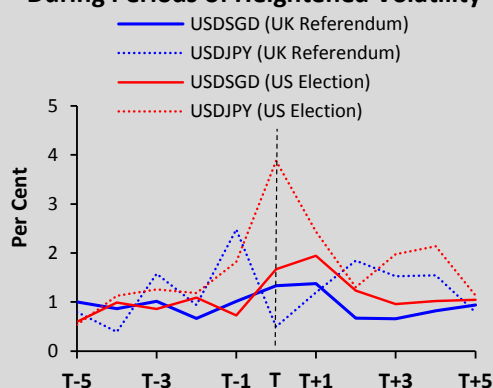
USD funding costs increased during volatile periods but swiftly return to pre-event levels

USD funding costs increased in both the USDSGD and USDJPY swap markets during key political events (Chart L7). During the US election, although transaction volumes remained resilient, the distribution of funding costs widened (Chart L8). The widened costs probably reflected reduced liquidity in the market in the face of heightened uncertainty. However, markets were resilient and recovered quickly, with USD funding costs and cost distribution returning to pre-stress levels soon after the event.

In terms of severity, the US election had a greater impact on USD funding costs than the UK referendum (Chart L7). This could potentially be attributed to the stronger association of the US election with its domestic currency (i.e. the USD). Granular OTC data can also be useful in allowing regulators to assess stress to different segments of the market, for instance the extent of funding stress experienced by different market participants during periods of heightened volatility.

Transacted costs went up temporarily during periods of heightened volatility, especially during the US election

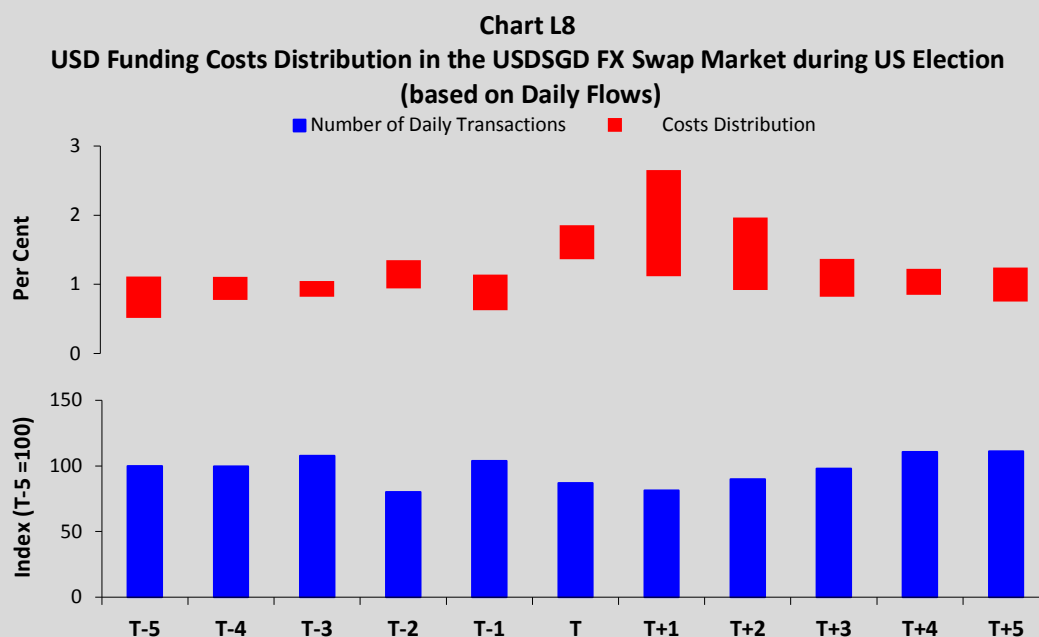
Chart L7
USD Funding Costs in
USDSGD and USDJPY FX Swap Markets
During Periods of Heightened Volatility



Source: MAS estimates, Bloomberg, DDRS

Note: T represents the day the outcome of the event was made known based on Singapore time.

Transacted costs distribution widened the day after the election. That said, costs distribution narrowed shortly after



Source: MAS estimates, Bloomberg, DDFS

Note: The red bar shows the USD funding costs that fall between the 5th and 95th percentiles of the costs distribution.

Conclusion

This box shows that granular OTC trade repository data can reveal useful insights into otherwise-opaque markets. Such analyses can help in policy formulation as well as in understanding data intricacies and improving trade reporting.

Nevertheless, the study has some limitations. The data covers a relatively short period of about two years. Also, we computed the USD funding costs for each transaction based on end-of-day data. Our analysis can be further improved using intra-day data to give more a more accurate depiction of funding costs, particularly during stress periods. We expect to enhance the coverage and accuracy of the data collection over time.¹⁷²

Further, our analyses covered only those transactions that fall within MAS' reporting mandate and not others that are reported in other jurisdictions. Such data fragmentation prevents a complete view of the market and its participants, particularly those with global operations. There is thus an urgent need for globally harmonised data fields and standards as well as concerted efforts to aggregate data across jurisdictions whilst addressing data privacy requirements, so as to provide a more meaningful overview of global OTC derivatives activity.

¹⁷² The identification of FX swaps in trade repository data is further complicated by the fact that FX swaps are typically reported as a combination of forwards, and there is no product identifier indicating FX swaps. Whilst we have verified our FX swaps identification methodology with the trade repository and banks with large OTC FX swap volumes, we found that reporting methodologies for FX swaps differ across banks. This added complexity and difficulty during the FX swaps identification and data cleaning processes.

Box M

Evaluating the Effects of Post-Crisis Regulatory Reforms

In response to the GFC, the G20¹⁷³ launched a programme of financial reforms to make the global financial system more resilient. With many of the reforms either implemented or at the implementation stage, the focus has now turned to evaluating their effects. The FSB has developed a framework to assess whether the reforms are achieving their intended outcomes and identify any material unintended consequences that should be addressed.¹⁷⁴

The FSB's framework proposes three types of evaluation i.e. effectiveness of individual reforms vis-à-vis their intended objectives, interaction and coherence among reforms, and the overall effects of the reforms on the G20 objectives of strong, sustainable and balanced growth. From the perspective of the global financial system, the latter relates to financial system resilience, the orderly functioning of markets, and the cost and availability of financing to households and non-financial businesses. The framework highlights the importance of assessing social as well as private costs and benefits, both unintended and intended effects, and distributional effects such as across users, sectors and jurisdictions. Several categories of evaluation tools were identified¹⁷⁵ based on their abilities to attribute observed economic or financial outcomes to specific reforms, reflect heterogeneity either cross-sectionally (e.g. across jurisdictions) or over time (e.g. on different parts of the financial cycle), and measure aggregate or general equilibrium effects.

In tandem with the FSB's work, MAS has embarked on assessing the effects of the global regulatory reforms in Singapore. In this box, we flesh out our evaluation framework by identifying the areas of focus as well as the corresponding issues and considerations.

MAS' evaluation framework focuses on cumulative effects and any deviation from intended outcomes

MAS' evaluation framework focuses on whether the reforms are addressing market anomalies or vulnerabilities as intended and whether there are any unintended effects. The latter includes potential spillovers from interactions among policies and from implementation by other jurisdictions. Before implementing any reform measure, MAS conducts ex-ante studies along with industry consultation to assess its potential impact. Therefore, MAS' ex-post evaluation focuses on any deviation from intended outcomes, with a view to assessing whether policy adjustments are needed.

The approach covers four impact areas: ***financial institutions, financial markets, financial end-users and the broader financial landscape*** (Figure M1). For a start, we analysed the cumulative effects across a range of reforms by conducting 'event studies' on indicators for the four impact areas, supplemented with qualitative information as necessary.

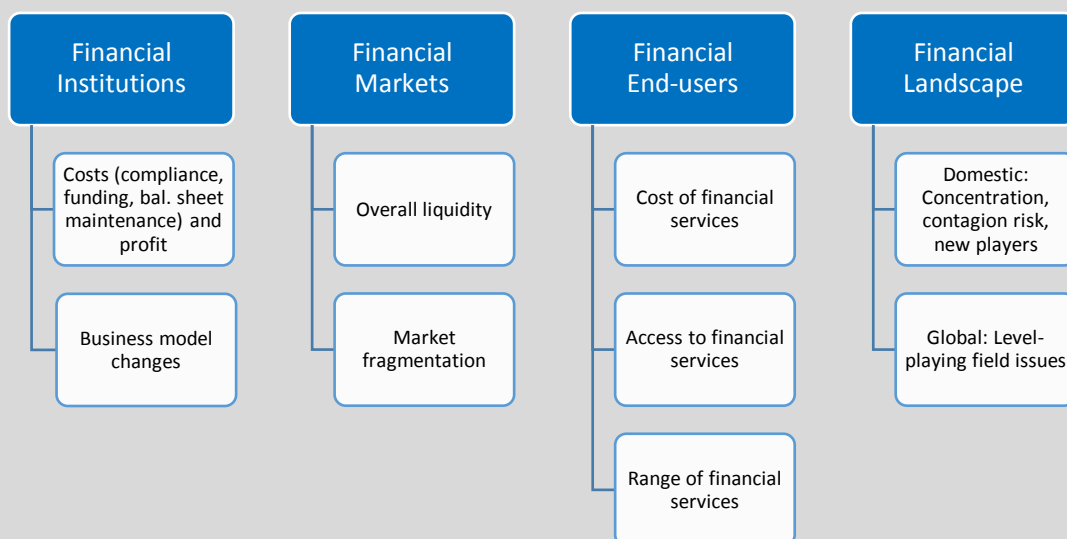
¹⁷³ G20 refers to the Group of Twenty comprising Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Korea, Mexico, Russia, Saudi Arabia, South Africa, Turkey, the UK, the US and the EU.

¹⁷⁴ FSB Reports to the G20 (July 2017), "Framework for Post-Implementation Evaluation of the Effects of the G20 Financial Regulatory Reforms".

¹⁷⁵ These tools were: i) Qualitative analyses, which include peer reviews, questionnaires, assessment methodologies or benchmarks to evaluate a reform; ii) Indicators and descriptive statistics including those typically used in financial stability reports; iii) Partial equilibrium analyses such as event studies, regression techniques and quasi-experimental designs; iv) General equilibrium analyses such as Vector Auto Regressive (VAR) and Dynamic Stochastic General Equilibrium (DSGE) models.

*The evaluation framework considers direct and indirect effects,
including impact on the broader financial landscape*

Figure M1
Framework for Assessing Effects of Regulatory Reforms



Source: MAS

Impact assessment for FIs entails identifying unintended costs and impact on business models

FIs will invariably incur costs when implementing reforms. The question is whether these costs are excessive or within expectations when compared to the benefits of enhancing financial system resilience. The latter includes potential reductions in risk premia as a result of lower systemic risk. One example of such analyses is the impact of Basel III capital and liquidity regulations on banks' funding costs.

Further, while the reforms aim to promote sustainable business models, it is useful to consider whether there has been any migration towards riskier products and services to maintain profitability, in the face of rising regulatory costs. This includes how foreign banks operating in Singapore are responding to the implementation of reforms in their home jurisdictions.

Singapore's financial markets have not experienced any major liquidity strains, but further assessments of the level and profile of liquidity are ongoing

Market liquidity has come to the fore in international discussions, with market fragmentations reported in some jurisdictions.¹⁷⁶ Examples include the exclusion of FIs from certain jurisdictions as counterparties, reduced market-making activity by some banks, and one-sided markets with few executed transactions and thus unreliable pricing benchmarks. These developments have been accompanied by occasional bouts of volatility, including flash crashes.

¹⁷⁶ FSB Reports to the G20 (July 2017), "Implementation and Effects of the G20 Financial Regulatory Reforms: Third Annual Report"; CGFS Papers No. 55 (January 2016), "Fixed Income Market Liquidity"; CGFS Papers No. 59 (April 2017), "Repo Market Functioning"; EMEAP Working Group for Financial Markets Report (August 2016), "Impact of the Liquidity Coverage Ratio (LCR) Requirement on EMEAP Money Markets, Central Bank Operations and Monetary Policy Transmission".

While Singapore has not experienced any major liquidity disruptions, the level and profile of liquidity in domestic markets warrant further study. This would require tracking more granular liquidity indicators and other data, such as fees and charges, which may provide further insights into market participants' behaviours. It would also be useful to assess whether particular rules, e.g. the classification of advanced and emerging market currencies under the Basel III Fundamental Review of the Trading Book (FRTB), could lead to potential market bifurcation.

Impact on financial end-users in terms of cost, access to and range of financial services is another area of focus

Besides the direct impact on FIs, any indirect impact on end-users of financial services such as smaller FIs, non-financial firms and households is an area which MAS pays close attention to.

A key question is whether FIs are adjusting to the costs of reforms by raising the prices of the financial services they provide or by reducing the supply. The impact on smaller players (e.g. small and medium-sized enterprises (SMEs) and sectors that could face financing constraints (e.g. infrastructure financing) is of particular interest.

Certain reforms may inadvertently affect particular end-users. For example, feedback by industry respondents¹⁷⁷ suggests that the upcoming Basel III Leverage Ratio (LR) requirement may constrain some banks' ability to extend clearing services to smaller clients, in order to fulfil the clearing mandate for OTC derivatives.

A holistic evaluation that includes effects on the broader financial landscape

Besides the specific assessments for FIs, markets and end-users, we need to consider whether there are significant changes in the broad financial landscape, such as concentration, contagion, entry of non-traditional players, and level playing field issues.

For example, while OTC central clearing helps to address interconnectedness and contagion risk, it leads to concentration risk at the central counterparties (CCPs). The FSB has been working with relevant standard-setting bodies to address this risk.

Another example is the requirement for banks to issue capital instruments which can be readily bailed-in to facilitate orderly resolution. These instruments, which typically offer higher yields, could be attractive investments to banks and other institutional investors such as insurance companies, pension funds and fund managers. While the requirement is meant to avoid tax-payer bail-outs of failing banks, such cross-holdings by FIs, if left unchecked, could raise contagion risk across the financial system. Some regulators have also noted that these complex instruments are not suitable for retail investors.

¹⁷⁷ Response to Basel Committee on Banking Supervision (BCBS) Consultative Document on "Revisions to the Basel III Leverage Ratio Framework" (July 2016), Comments by Global Financial Markets Association (GFMA), Institute of International Finance (IIF), International Swaps and Derivatives Association (ISDA), Japan Financial Markets Council (JFMC) and The Clearing House (TCH).

Evaluation of reforms should improve with more data and experience

Over time and as more data becomes available, MAS plans to employ methodologies that would better differentiate the effects of regulatory reforms from non-regulatory factors such as global financial conditions, risk aversion and technological advances. We also hope to draw on the experiences of the FSB, standard-setting bodies and other regulators, as more evaluation exercises of post-crisis reforms are conducted in the coming years.

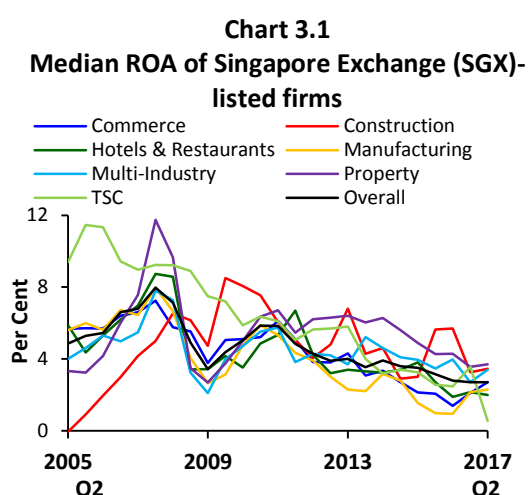
3 Singapore Corporate Sector

Corporate profitability has remained broadly stable, supported by improvements in the global economy. The M&OE subsector in Singapore however, continued to be weighed down by low oil prices. While this sector does not form a large share of financial system exposures, banks should continue to proactively manage these risks by monitoring portfolio vulnerabilities and setting aside adequate provisions.

The pick-up in corporate leverage after a period of moderate credit growth bears close monitoring, even as the aggregate corporate debt profile remains sound. MAS' stress test suggests that most corporates are able to withstand interest rate and earnings shocks. Nonetheless, firms should continue to guard against potential balance sheet vulnerabilities, as higher interest rates could weigh on their debt servicing ability.

Corporate Balance Sheets Remain Firm with Recovery in Certain Sectors

Overall corporate profitability remains firm, supported by improvements in the external environment. The median return on assets (ROA) of firms listed in Singapore has been broadly stable at 2.7% in Q2 2017, compared with 2.8% in Q2 2016 (Chart 3.1).

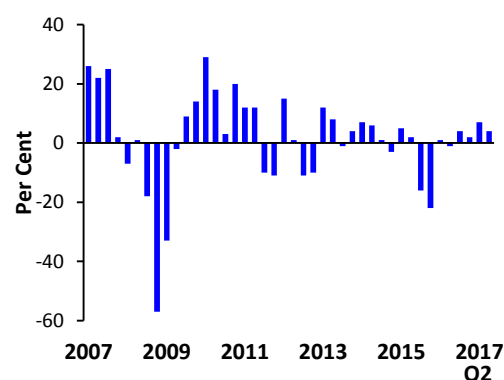


Source: MAS estimates, Thomson Financial

While certain sectors have shown signs of improvement, other sectors continue to face pressure from sluggish demand. Trade-related

corporates have shown signs of recovery from last year, supported by the upswing in the external environment. Manufacturing and Commerce ROA increased by 1.4 and 1.1 percentage points respectively. Reflecting the overall healthy state of these sectors, the outlook for manufacturing firms turned positive since Q2 2016 (Chart 3.2).

Chart 3.2
General Manufacturing Business Outlook (Net Weighted Balance)



Source: EDB

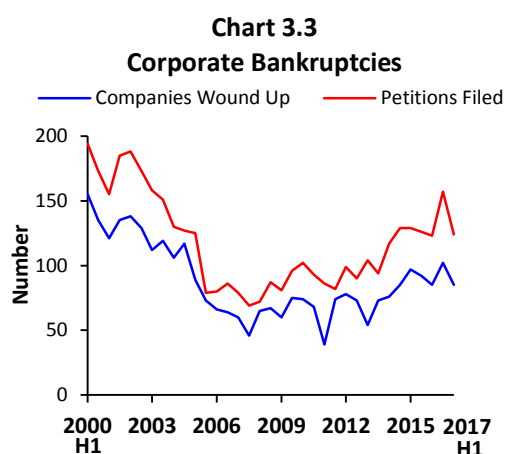
Note: "Net weighted balance" is the difference between the weighted percentages of respondents with a positive outlook and those with a negative outlook. A positive reading indicates a net positive outlook and a negative reading indicates a net negative outlook.

The TSC sector was weighed down by weak demand for O&G services and saw profitability

decline by 1.9 percentage points. Profitability also came under pressure for the construction sector from the slowdown in private projects and tighter margins arising from operational costs. However, the Government has committed to bring forward S\$1.4 billion of public infrastructure projects in the near term, which should provide some support to the sector.

Against the backdrop of an increasingly competitive and uncertain landscape, firms should take steps to improve their corporate governance frameworks. Firms with better corporate governance scores have been found to exhibit stronger balance sheets and be less vulnerable to external shocks (See Box N “Better Corporate Governance, Stronger Corporate Fundamentals: The Case for Firms Listed on the Singapore Exchange”).

The number of companies wound up in H1 2017 remained at 85, unchanged from H1 2016 and in line with the historical average (Chart 3.3).

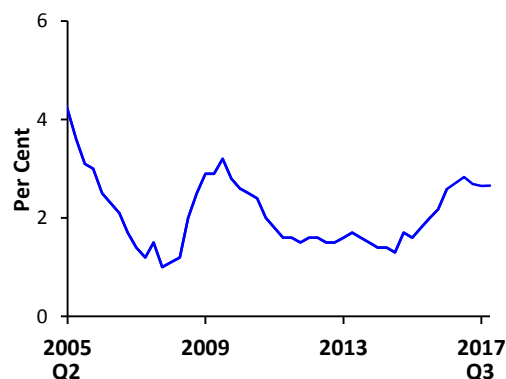


Source: Ministry of Law, Insolvency and Public Trustee's Office (IPTO)

Banks' corporate loan NPL ratio remained broadly unchanged at 2.7% in Q3 2017, compared to a year ago (Chart 3.4). In particular, the NPL ratios for the General Commerce and Manufacturing sectors

decreased by 0.2 percentage points and one percentage point respectively, in line with improvements in the external environment.

Chart 3.4
Corporate NPL Ratio



Source: MAS

M&OE firms continue to be weighed down by low oil prices

The global outlook has become more neutral for oil-related firms, with global offshore rig count utilisation rates remaining broadly stable at 70% over the past year. However, weaknesses in certain oil-related sectors persist amid continued low oil prices, with charter and utilisation rates for offshore support vessels (OSVs) remaining depressed. The median ROA of oil-related firms in Singapore has fallen to -6.4% as of Q2 2017, down from -0.1% in Q2 2016.

Most of the weakness has been concentrated in the M&OE subsector, which has contributed to banks' NPLs over the past year (See Section 2 “Singapore Financial Sector”). A number of M&OE bond issuers have defaulted on their bonds, while others have moved to restructure upcoming debt repayments. Bonds issued by oil-related firms amount to 13% of total outstanding bonds as of Q3 2017. Defaults by these issuers within the last 12 months represent around 1% of the total bond market.

The banking system's exposure to the O&G sector remains contained, at less than 10%¹⁷⁸, of which less than one-fifth is to the M&OE subsector.

Banks have been managing their risks actively

Banks have been working with borrowers to deleverage and restructure their loans. At the same time, they have been setting aside provisions to buffer against asset quality risks.

Government assistance schemes, namely International Enterprise (IE) Singapore's Internationalisation Finance Scheme and the Standards, Productivity and Innovation Board (SPRING) Singapore's Bridging Loan Programme have aided oil-related firms facing financing challenges amid the sectoral downturn. Since the introduction of these schemes in late 2016, more than S\$688 million in loan applications have been approved as of October 2017. These loans will provide firms with working capital to meet operational expenses before contract sums are received and to kick start new projects that can improve their revenue streams.

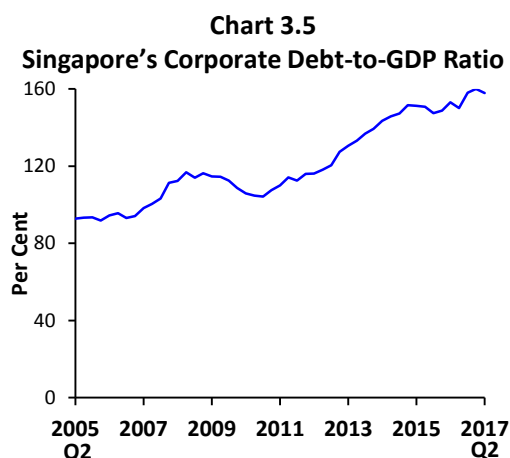
In the 2017 IWST, banks were subject to a three-year stress scenario where oil prices were halved. Banks were also asked to assume the failure of their top O&G counterparties and credit rating downgrades on their other exposures to the sector. Under this stress scenario, the banking system remains resilient and the local banks continue to meet Basel regulatory requirements comfortably (See Box I "Industry-Wide Stress Test 2017: Enhancing the Stress Test Toolkit").

¹⁷⁸ As a proportion of total exposures (i.e. including non-bank loans, debt securities and contingent liabilities).

Corporate Leverage Warrants Close Monitoring

While corporate debt profiles remain sound, rising corporate leverage warrants close monitoring

The corporate debt-to-GDP ratio rose from 150% in Q3 2016 to 158% in Q4 2016, driven primarily by bank lending to the General Commerce and Manufacturing sectors (Chart 3.5). While the ratio has remained broadly unchanged this year, the rising corporate leverage warrants close monitoring. Certain industries could see concentrations of highly-leveraged firms and risks could be amplified should there be a turn in the business cycle (See Box A "Drivers of Corporate Leverage in Asia").

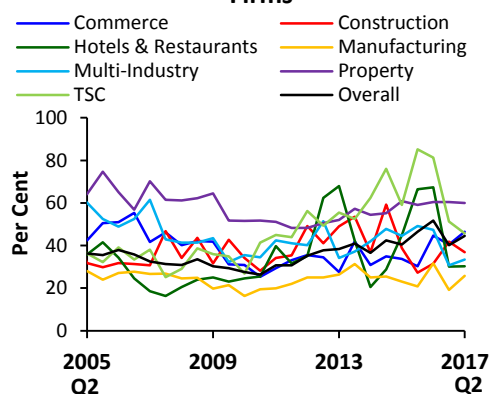


Source: MAS estimates, BIS, Dealogic

While aggregate leverage has increased, corporate debt profiles remain largely sound at the individual firm level. The median debt-to-equity ratio of SGX-listed firms fell from 51.7% in Q2 2016 to 44.6% in Q2 2017 (Chart 3.6). The majority of corporate liabilities are in the form of longer-term debt, with the median short-term debt to total debt ratio standing at 44% in

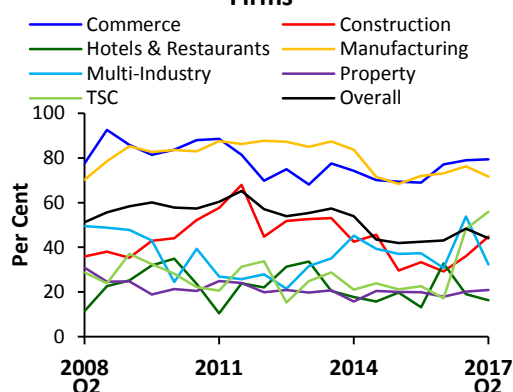
Q2 2017 (Chart 3.7). The bulk of Singapore firms have a bond maturity profile that is well termed out, with bonds coming due within the next two years making up about 29% of outstanding bonds (Chart 3.8).

Chart 3.6
Median Debt-to-Equity Ratios of SGX-listed Firms



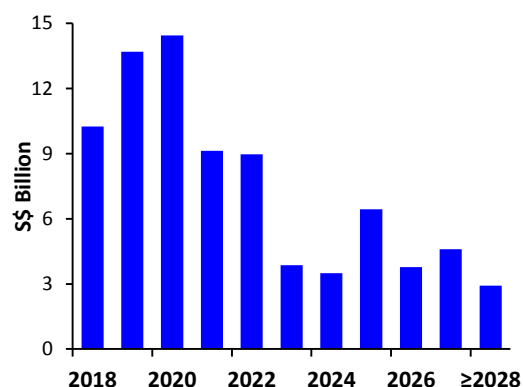
Source: MAS estimates, Thomson Financial

Chart 3.7
Median Short-Term Debt Ratios of SGX-listed Firms



Source: MAS estimates, Thomson Financial

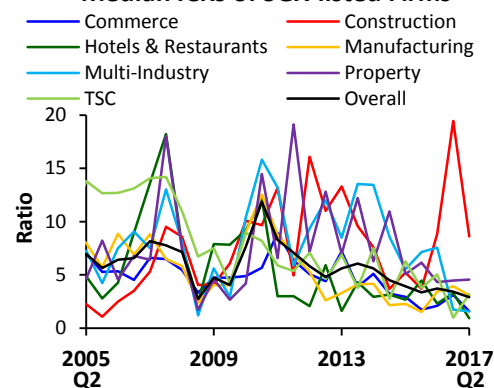
Chart 3.8
Maturity Schedule of Singapore Corporate Bonds



Source: MAS estimates, Dealogic

The median interest coverage ratio (ICR)¹⁷⁹ of SGX-listed firms stood at 2.9 times in Q2 2017, suggesting firms remain well-placed to meet their debt obligations (Chart 3.9). With earnings estimates more upbeat in line with the recovery, ICRs are expected to improve in the near term. Further, the median current ratio of firms remained stable at about 1.6 times, suggesting that most firms have adequate liquidity to meet their short-term obligations (Chart 3.10).

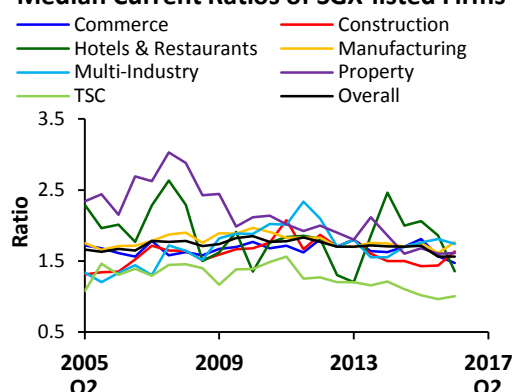
Chart 3.9
Median ICRs of SGX-listed Firms



Source: MAS estimates, Thomson Financial

¹⁷⁹ ICR is calculated as Earnings before Interest and Tax (EBIT) divided by interest expense. It serves as an indicator of debt repayment ability as it measures the degree to which earnings are sufficient to cover the interest on debt.

Chart 3.10
Median Current Ratios of SGX-listed Firms



Source: MAS estimates, Thomson Financial

SME business sentiment has improved, with continued financing support from banks

SME sentiment improved in Q3 2017 compared to a year ago.¹⁸⁰ However, there was a deterioration in SME debt repayment behaviour. The average time for SMEs to settle their debt increased from 29 days in Q2 2016 to 35 days in Q2 2017. Consequently, the share of SME debts that were paid on time declined to 37% in Q2 2017, down from 52% a year ago.

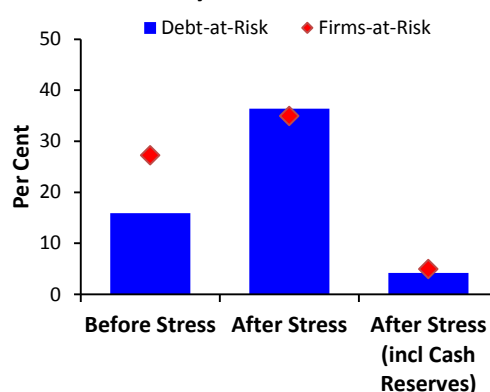
Nonetheless, banks in Singapore remain supportive of SME financing. Financing conditions for SMEs have been generally positive, with loans to SMEs continuing to grow in H1 2017. The number of SME customers, as well as banks' NIMs on SME loans, remained broadly stable as at H1 2017 (See Panel 3A "Small and Medium-Sized Enterprise Financing Conditions").

¹⁸⁰ Based on the SBF-DP SME Index, a quarterly index produced jointly by DP Information Group and the Singapore Business Federation. It provides a 6-month outlook of SMEs' business sentiments in relation to external economic conditions and activities.

Stress test shows most firms would be able to weather headwinds

MAS' corporate stress test suggests that most corporates will remain resilient to interest rate and income 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 and Tax, Depreciation and Amortisation (EBITDA), the percentage of firms-at-risk¹⁸¹ increases from 27% to 35% of all corporates, and their share of debt-at-risk¹⁸² increases from 16% to 36% (Chart 3.11). Taking cash reserves into account, the share of firms-at-risk would drop to 5% and debt-at-risk to 4%.

Chart 3.11
Share of Firms and Share of Corporate Debt Held by Firms with ICR < 2



Source: MAS estimates, Thomson Financial

Firms have taken steps to manage their interest rate risks. Of the 50 largest firms-at-risk, approximately half of them use interest rate derivatives and fixed-rate bonds to hedge interest rate risk.

¹⁸¹ Firms-at-risk refers to firms with an ICR of less than two.

¹⁸² Debt-at-risk refers to the amount of corporate debt held by firms with an ICR of less than two.

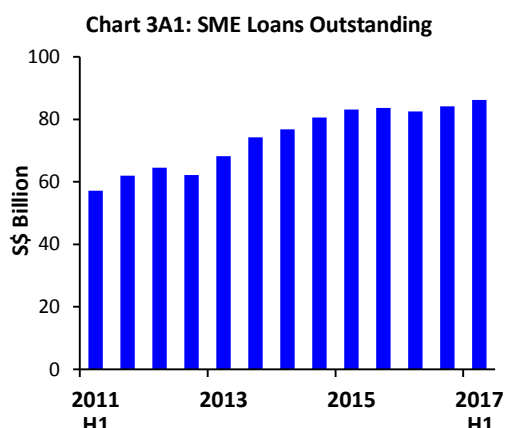
**Despite ongoing economic recovery, firms
should continue to guard against
vulnerabilities**

While trade-related firms have benefited from improved conditions in recent quarters, the performance of domestic-oriented firms remains subdued.

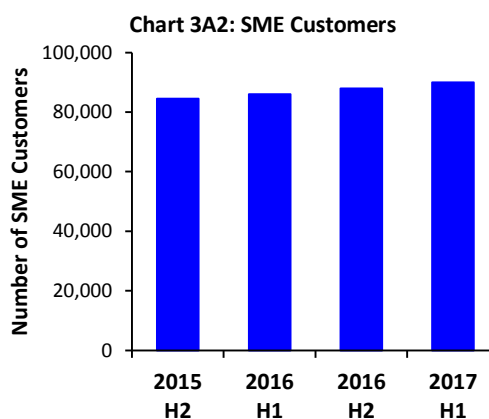
Firms should continue to be prudent and guard against balance sheet vulnerabilities. A weakening in the external environment, combined with rising interest rates, could weigh on corporate profitability and debt servicing ability. Firms should also continue to enhance their corporate governance frameworks and stakeholder engagement practices amid an increasingly competitive and uncertain landscape.

Panel 3A Small and Medium-Sized Enterprise Financing Conditions

Bank lending to SMEs has increased steadily over the past year.



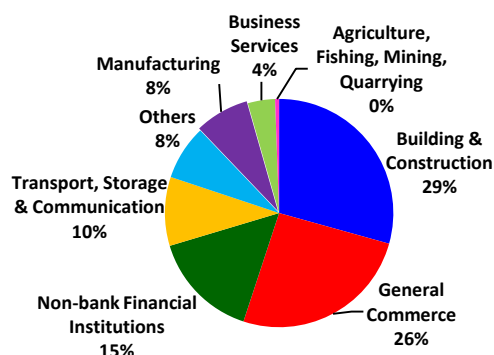
Source: MAS



Source: MAS

The Building & Construction and General Commerce sectors continue to account for the majority of SME loans.

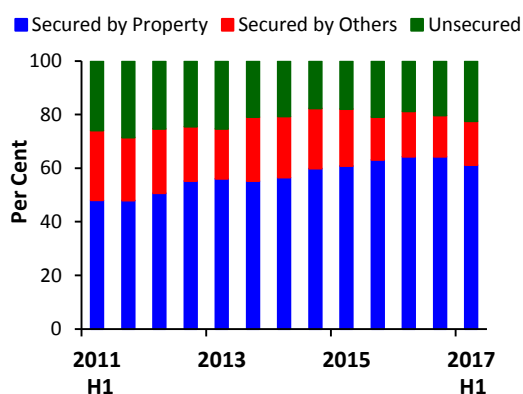
Chart 3A3: SME Loans by Sector (as at H1 2017)



Source: MAS

The share of outstanding SME loans secured by property has fallen.

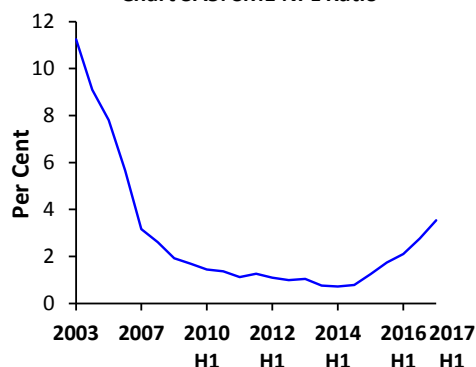
Chart 3A4: Outstanding SME Loans by Type of Collateralisation



Source: MAS

SME credit quality continued to deteriorate, with the NPL ratio rising to 3.5% in H1 2017.

Chart 3A5: SME NPL Ratio

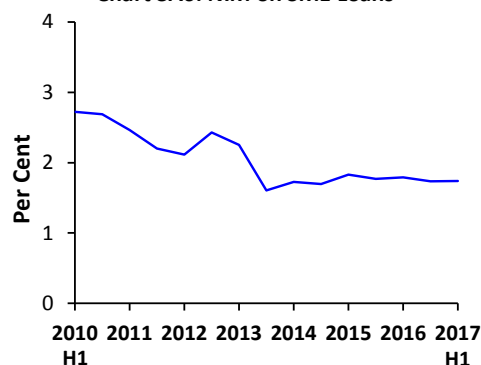


Source: MAS

Note: Prior to H1 2009, figures were based on banks' internal SME definitions. SME figures from H1 2009 onwards follow MAS' definition of SMEs, which are defined as businesses with an "annual sales turnover of up to S\$100 million".

Banks' NIMs on SME loans dipped slightly to 1.7% in H1 2017.

Chart 3A6: NIM on SME Loans



Source: MAS

Box N**Better Corporate Governance, Stronger Corporate Fundamentals: The Case for Firms Listed on the Singapore Exchange¹⁸³**

Corporate governance refers to having the appropriate people, processes and structures to direct and manage the business and affairs of the company to enhance long-term shareholder value, whilst taking into account the interests of other stakeholders. Corporate governance weaknesses can impede a company's performance and lead to financial difficulties and even corporate malfeasance. They can also contribute to financial crises and cause financial instability.¹⁸⁴ The FSB notes that one of the key lessons from the GFC is the need to strengthen corporate governance, both in terms of the frameworks and related rules, and the practices of FIs.¹⁸⁵ From the perspective of companies, sound corporate governance is increasingly viewed as an investment that could translate into improved future returns and greater resilience to external shocks.¹⁸⁶ In a study into the larger companies of 25 emerging market economies, IMF finds that firms with stronger corporate governance and investor protection frameworks tend to have higher market valuations, stronger corporate balance sheets and greater resilience to global financial shocks.¹⁸⁷

In Singapore, studies have mostly focused on the corporate governance and disclosure practices of SGX-listed firms.¹⁸⁸ Few studies have examined how good corporate governance practices could contribute to improved corporate fundamentals or market value; those that do so considered either a subset of corporate governance practices or a subset of the larger, more prominent firms. This box examines whether SGX-listed firms with strong corporate governance practices tend to have stronger corporate fundamentals — measured mainly by firm profitability and debt profile — and in turn show greater resilience to external shocks.

Data and methodology

For the purposes of this study, we used corporate governance data metrics from the National University of Singapore (NUS) Business School's Centre for Governance, Institutions and Organisations (CGIO) which maintains the Singapore Governance and Transparency Index (SGTI).¹⁸⁹ The SGTI evaluates SGX-listed companies on their corporate governance practices as well as the timeliness, accessibility and transparency of their financial disclosures. The SGTI overall score is computed from five areas spanning board responsibilities, rights of shareholders, engagement of stakeholders, accountability and audit, and

¹⁸³ This box is written in collaboration with the Centre for Governance, Institutions and Organisations (CGIO) at the National University of Singapore (NUS) Business School.

¹⁸⁴ Some academics have postulated poor corporate governance as a major culprit for the Asian financial crisis. Far Eastern Economic Review (August 1998), "A Different World".

¹⁸⁵ FSB Peer Review Report (April 2017), "Thematic Review on Corporate Governance".

¹⁸⁶ PWC Singapore (February 2017), "The Importance of Good Governance".

¹⁸⁷ IMF GFSR Chapter 3 (October 2016), "Corporate Governance, Investor Protection and Financial Stability in Emerging Markets".

¹⁸⁸ Where financial information is concerned, studies on SGX-listed firms have mostly focused on the reporting frequency or the quality of reporting. For instance, some researchers find that the usefulness of a company's financial statements is often limited by over-aggregation of information, insufficient disclosures and disclosures that are difficult to understand. Accounting and Corporate Regulatory Authority of Singapore (ACRA), Institute of Singapore Chartered Accountants (ISCA) and NUS Business School (August 2016), "Into the Minds of Investors - Investors' Views of Financial Reporting, Audit and Corporate Governance".

¹⁸⁹ The SGTI is a joint initiative of CPA Australia, NUS Business School's CGIO and the Singapore Institute of Directors (SID). <http://bschool.nus.edu.sg/cgio/our-research/sgti>.

disclosure and transparency. Data on firm-level financial performance and balance sheet strength were obtained from Bloomberg and Thomson Reuters. Our sample size covers over 350 SGX-listed firms, comprising more than 50% of SGX-listed firms, for the period 2011-2016.

For firm profitability, our panel regression takes the following form:

$$ROA_t = \alpha_t + \beta_1 CG_{t-1} + \beta'_2 F_{t-1} + \beta'_3 M_{i,t}$$

where ROA_t denotes the return on assets of SGX-listed firms. The variable CG_{t-1} is one of the firm-level corporate governance scores (i.e. SGTI overall score or one of the sub-category scores).¹⁹⁰ F_{t-1} is a vector of variables to control for firm tangibility and market valuations.¹⁹¹ M_t is a vector of macro variables to control for domestic macroeconomic conditions and country-level corporate governance.¹⁹²

When the debt profile of SGX-listed firms is considered, the panel regression takes the following form:

$$STD_t = \alpha_t + \beta_1 CG_{t-1} + \beta'_2 F_{i,t-1} + \beta'_3 M_{i,t}$$

where STD_t denotes the short-term-to-total debt ratios of SGX-listed firms. A firm with a lower STD will be less vulnerable to short-term credit supply shocks.¹⁹³ F_{t-1} is a vector of variables to control for firm leverage, profitability and size.¹⁹⁴ M_t is a vector of macro variables to control for global financial conditions and global market volatility.¹⁹⁵

SGX-listed firms with higher CG scores tend to exhibit higher profitability

We find that corporate governance, as measured by the SGTI, is positively correlated with firm profitability. A one point increase in the overall CG score is associated with a 0.2 percentage point increase in ROA, while a one point increase in the board responsibilities and accountability and audit sub-scores are associated with a 0.3 to 0.4 percentage point increase in ROA (Chart N1).¹⁹⁶ Amongst these sub-categories, accountability and audit has the biggest impact on ROA. This suggests that an independent and qualified audit committee, together with strong risk management and internal controls, could have a positive bearing on firm profitability.

¹⁹⁰ For the purposes of this box item, CGIO generated historical scores for three sub-categories in addition to the SGTI overall score — namely (i) board responsibilities; (ii) accountability and audit; and (iii) stakeholders' rights and engagement (comprising rights of shareholders, engagement of stakeholders, and disclosure and transparency). We note that historical data on stakeholders' rights and engagement may be partial as this sub-category was added into the SGTI scoring structure beginning in 2015.

¹⁹¹ Firm tangibility was proxied using current ratios (i.e. current assets divided by current liabilities), and market valuations were proxied using price-to-book ratios.

¹⁹² Domestic macroeconomic conditions were proxied using GDP growth rates, and country-level corporate governance was proxied using a measure of corporate governance (strength of investor protection) from the Global Competitiveness Index database.

¹⁹³ World Bank Global Financial Development Report 2015 – 2016 Chapter 2 (September 2015), "The Use of Long-Term Finance by Firms and Households: Determinants and Impact".

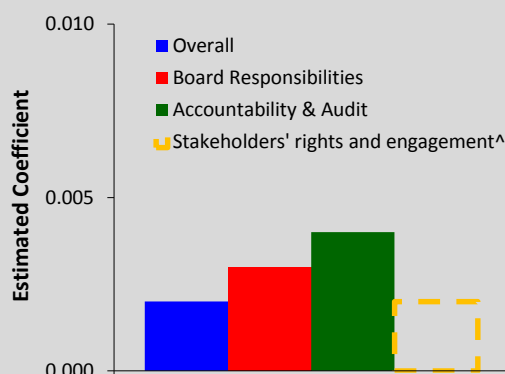
¹⁹⁴ Firm leverage was proxied using total debt divided by total assets, firm profitability was proxied using ROA, and firm size was proxied using market capitalisation.

¹⁹⁵ Global financial conditions were proxied using Goldman Sach US Financial Conditions Index, and global market volatility was proxied using Merrill Lynch Option Volatility Estimate index (MOVE).

¹⁹⁶ A typical year to year change in overall CG score for a firm is up to ten points, and such a change corresponds to a two percentage points change in ROA. We note that the average ROA of the top quartile CG firms was 3% whereas the average ROA of the bottom quartile CG firms was -13% in 2016.

Firms with higher CG scores tend to have higher ROA

Chart N1
Relationship between CG Score and Return on Assets



Source: MAS estimates

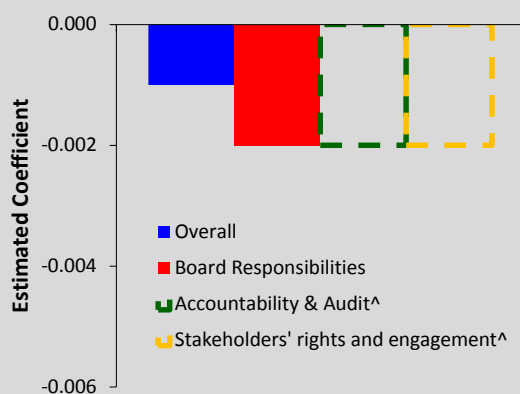
Note: ^ refers to non-significant variables.

SGX-listed firms with higher CG scores also tend to exhibit stronger debt profiles

Similarly, we find that firms with higher CG scores are characterised by stronger capital structures in the form of lower short-term-to-total debt ratios. A one point increase in overall CG score is associated with a 0.1 percentage point reduction in STD, while a one point increase in the board responsibilities sub-score is associated with a 0.2 percentage point reduction in STD (Chart N2). This suggests that a competent board could strengthen a firm's debt profile.¹⁹⁷

Firms with higher CG scores are characterised by stronger debt profiles

Chart N2
Relationship between CG Score and Short-Term-to-Total Debt Ratio



Source: MAS estimates

Note: ^ refers to non-significant variables.

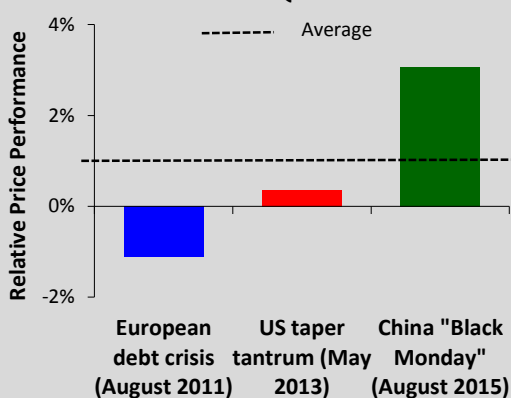
¹⁹⁷ A competent board is one that is likely to have an appropriate balance of independence, experience and diversity of skill-sets.

SGX-listed firms with higher CG scores tend to be less vulnerable to external shocks

SGX-listed firms with higher CG scores appear to experience milder equity price declines during episodes of external shocks. External shocks that had a fairly severe price impact on SGX-listed firms included the European sovereign debt crisis in 2011, the US taper tantrum in 2013 and the China “Black Monday” episode in 2015. Two groups of SGX-listed firms were studied: namely, those in the top and bottom quartiles of firm-level corporate governance scores as at the onset of these episodes.¹⁹⁸ We compared the average share price performance of both groups of companies during the week in which the external shock occurred. We observed that the top quartile group outperformed the bottom quartile group in two out of three instances, with the former outperforming the latter by three percentage points in the most recent episode (Chart N3). This suggests that better corporate governance could potentially shield SGX-listed firms from external shocks.

Firms with higher CG scores tend to fare better than firms with lower CG scores during external shocks

Chart N3
Relative Price Performance of Top Quartile CG Firms versus Bottom Quartile CG Firms



Source: MAS estimates, Thomson Financial

Our results underscore the importance of ongoing efforts to further strengthen the corporate governance regime and culture in Singapore

Our findings suggest that SGX-listed companies with stronger corporate governance tend to have better firm profitability, stronger debt profiles and greater resilience to external shocks.

Recent SGTI readings point to SGX-listed companies providing more disclosures on corporate governance practices, with the average score improving over the years (Chart N4 in the Appendix). Nevertheless, this is an ongoing journey and companies would do well to further enhance their corporate governance practices, and in so doing strengthen their resilience to external shocks. For instance, researchers at CGIO have flagged disclosures relating to stakeholder engagement as an area requiring further work against a backdrop of SGX-listed firms' increasing adoption of corporate governance best practices.¹⁹⁹ As issues such

¹⁹⁸ We excluded the largest market capitalisation stocks (large-cap stocks) from both the top and bottom quartile groups so as to control for potential biases caused by market liquidity conditions (i.e. equity managers may find it easier and cheaper to liquidate more liquid large-cap stocks as compared to less liquid small-cap stocks during stressful market conditions).

¹⁹⁹ More details of CGIO's assessment of SGX-listed firms' degree of compliance with the Code of Corporate Governance can be found in the Appendix. CGIO researchers have flagged disclosures relating to stakeholder engagement as an area requiring

as sustainability reporting come to the fore, SGX-listed companies could also enhance their disclosures relating to environmental, social and governance (ESG) policies, practices and targets.²⁰⁰ Last but not least, the ongoing review of the Singapore Code of Corporate Governance aims to ensure that the corporate governance framework remains relevant and progressive.²⁰¹ We believe that such efforts will foster sustained business growth and innovation for SGX-listed firms.

further work. The Business Times (2 August 2017), “Corporate Governance Reaches New High but Better Stakeholder Engagement Needed”. Other NUS researchers have flagged CG culture — a culture whereby companies, boards, investors, intermediaries, professional bodies, media and other market players drive corporate governance improvements — as another area requiring further work. The Business Times (20 April 2017), “Culture and Corporate Governance”.

²⁰⁰ Asset managers and institutional asset owners have shown greater interest in ESG investing, and this could be an area for further empirical work.

²⁰¹ The Singapore Code of CG was last reviewed in 2012. <http://www.mas.gov.sg/News-and-Publications/Media-Releases/2017/MAS-Announces-Establishment-of-Corporate-Governance-Council.aspx>

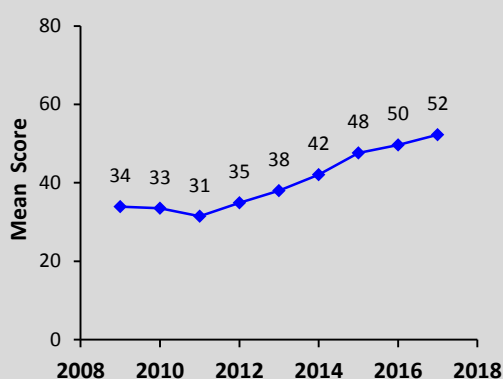
Appendix

Corporate Governance Disclosures Amongst SGX-listed Firms

Based on corporate governance metrics from the SGTI, SGX-listed companies have been providing more disclosures on corporate governance practices. The following index uses data from SGTI in assessing SGX-listed companies' compliance with the Code of Corporate Governance. Overall, the state of corporate governance disclosures amongst SGX-listed firms has been improving continually in recent years, reaching 52.3 in 2017 (Chart N4).

Corporate governance disclosures amongst SGX-listed firms rising but room for improvement remains

Chart N4
State of Corporate Governance Disclosures



Source: CGIO

However, not all companies have been making progress in terms of providing detailed corporate governance disclosures. Large market capitalisation firms and firms in the financial and telecommunication sectors tend to have better corporate governance disclosures than most others.

The average score of SGX-listed firms' corporate governance disclosures is currently 52.3 out of a maximum of 143, suggesting that there is room for improvement for the majority of companies.

4 Singapore Household Sector

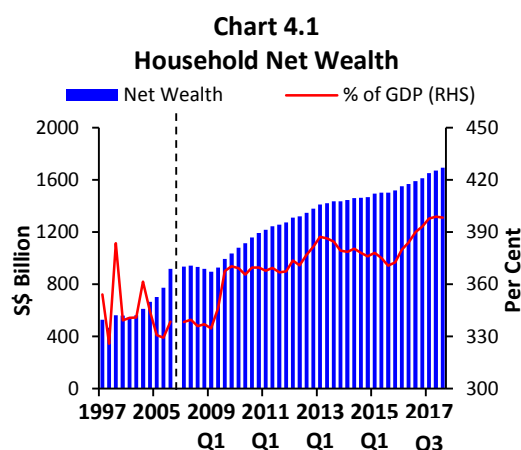
With the economic recovery gaining traction, household balance sheets are strengthening, driven by growth in financial and property assets.

Households should continue to stay financially prudent. While household debt growth remains in line with income growth over the past year, households should take into account their ability to service their debt in the longer term. Potential property investors should be aware that the subdued rental market and further interest rate hikes could weigh on borrowers' debt servicing ability.

Household Balance Sheets are Strengthening

Growth in household net wealth has picked up over the past year

On an aggregate basis, Singapore's household balance sheets remain healthy, with aggregate net wealth at four times of GDP (Chart 4.1). Liquid assets such as cash and deposits exceed total household liabilities, providing households with strong financial buffers.



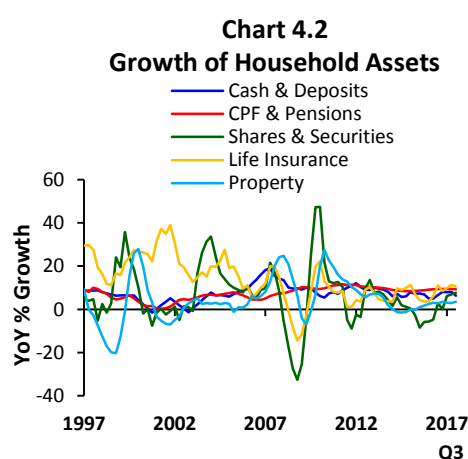
Source: Department of Statistics (DOS)

Note: Household net wealth is the difference between household assets and household debt. Data for 1997 – 2007 is as at Q4.

The growth in household net wealth has accelerated over the past year (from 5.8% YoY in Q3 2016 to 6.6% YoY in Q3 2017) due to increased financial and property assets.

Financial assets grew by 8.1% YoY in Q3 2017, up from 7.5% YoY in Q3 2016. In particular, the value of stocks and shares went up by 7.7% YoY in Q3 2017, from 2.8% YoY in Q3 2016 (Chart 4.2). Residential property assets grew 3.6% YoY in Q3 2017, alongside increased transaction activity in the private residential property market.

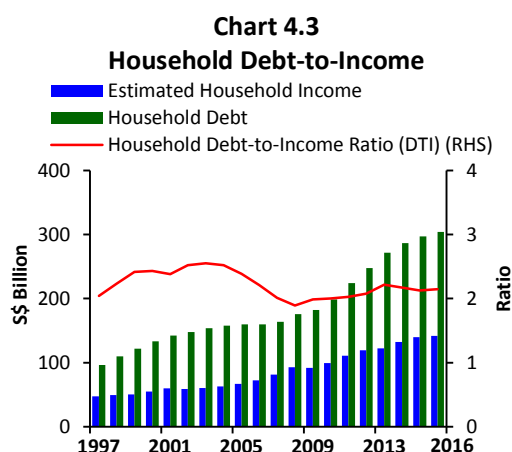
With growth in financial assets outpacing residential property assets in recent years, there has been further diversification of household assets towards financial assets. The share of financial assets edged up to 56% in Q3 2017, from 50% five years ago.



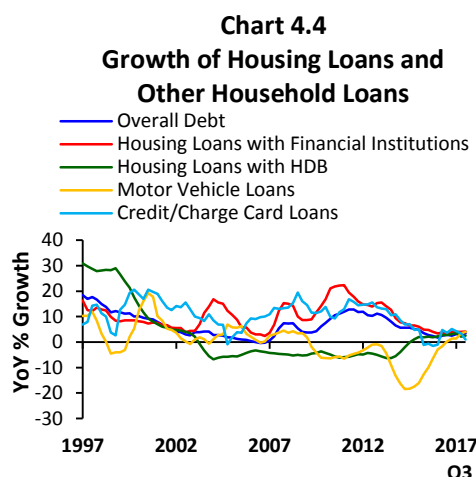
Source: DOS

Household debt has risen, driven by property loan growth

While the household debt-to-income ratio has stabilised at 2.2 times since 2013, household debt grew 3.3% YoY in Q3 2017 alongside an improved economic outlook and consumer confidence (Chart 4.3).²⁰² The main growth contributor was housing loans from FIs, which increased by 4.1% YoY in Q3 2017 (Chart 4.4).



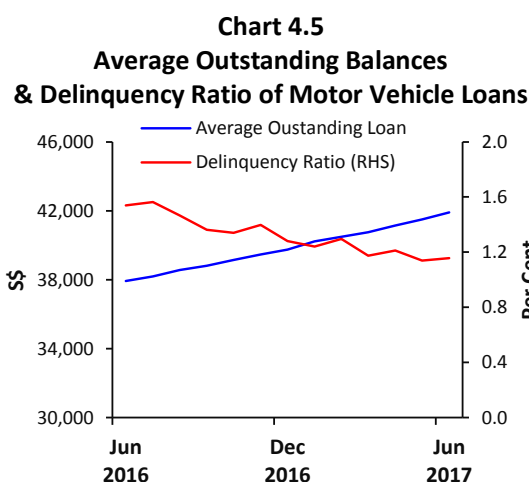
Source: MAS estimates, DOS



Source: DOS

²⁰² Consumer confidence in Singapore edged up in H1 2017, with the MasterCard Index of Consumer Confidence rising to 45.4 for H1 2017 from 30.0 for H2 2016, after a steady decline over the past two years. Consumer confidence improved across all components, primarily driven by the stock market and the more positive economic outlook.

Motor vehicle loans grew by 4.0% YoY in Q3 2017, compared to 0.3% YoY in Q3 2016. Data from CBS shows that the average outstanding motor vehicle loan increased by 10% over the year to S\$41,900 in June 2017. Nonetheless, overall delinquencies remained low at 1.2% as at June 2017 (Chart 4.5).



Source: CBS

Note: Delinquent loans refer to accounts with payments more than 30 days past due.

Unsecured credit situation has improved, with fewer borrowers accumulating excessive debt

Growth in outstanding loans from credit/charge cards has moderated from 3.7% in Q3 2016 to 1.1% in Q3 2017.

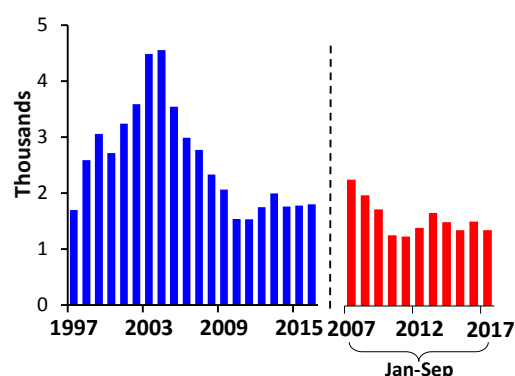
The unsecured credit situation has improved significantly following the introduction of tighter rules by MAS since 2013. The number of borrowers with high unsecured debt exceeding the industry-wide borrowing limit (of 18 times their monthly incomes) has almost

halved since 2015 (See Box O “Credit Cards and Other Unsecured Credit Facilities: Building Household Resilience for the Future”).

The number of individual bankruptcy orders remains below the long-run average (Chart 4.6). The first nine months of 2017 saw 1,253 cases, down from 1,395 cases in the same period last year.

factor in how that may affect demand-supply conditions, vacancy rates and rentals in the medium term (See Box P “Update on the Private Residential Property Market”).

Chart 4.6
Individual Bankruptcies



Source: Ministry of Law, IPTO

Households Should Continue to Exercise Financial Prudence

Households should continue to be prudent in managing their finances

While the overall employment outlook is expected to improve in 2018, wages are not expected to increase rapidly given that the existing slack in the labour market will take time to be absorbed.

Against this backdrop and with higher interest rates expected in the period ahead, households should remain prudent in managing their finances.

In particular, households considering property purchases should pay heed to the large upcoming supply of private housing units and

Box O**Credit Cards and Other Unsecured Credit Facilities: Building Household Resilience for the Future**

To encourage financial prudence and help individuals avoid accumulating excessive debt, MAS strengthened the unsecured credit rules from 2013.²⁰³ Amongst other safeguards, the industry-wide borrowing limit was introduced in June 2015. Under this rule, FIs would not be allowed to extend further unsecured credit to borrowers whose interest-bearing unsecured debts exceed the prevailing limit for three consecutive months. The limit is being phased in over four years to allow consumers more time to adapt and pay down their debts — starting with 24 times a borrower's monthly income from June 2015, to 18 times from June 2017 and further to 12 times from June 2019. In this context, MAS has also worked with the industry to ensure that there are assistance schemes and repayment plans available to help borrowers reduce their debt.

This box examines the impact of the unsecured credit rules implemented over the past two years on unsecured debt of households. We find that the unsecured debt situation has improved, with a significant reduction in the number of revolvers.²⁰⁴ Further, the number of borrowers with high unsecured debt exceeding the current industry-wide borrowing limit (of 18 times monthly income) has almost halved.

Recent trends in unsecured credit

The overall unsecured debt situation in Singapore has improved. Data from CBS shows that the growth in outstanding credit card balances extended by FIs has eased considerably from the peak of 14% YoY in Q2 2012 to an average of 2.6% YoY in the first nine months of 2017 (Chart O1). The ratio of outstanding credit card balances to GDP stabilised at about 2.5 times since Q1 2015, after rising from 1.6 times in Q1 2008 to 2.7 times in Q4 2014 (Chart O2).

The share of revolvers has also fallen substantially, from 35% in Q1 2015 to 28% in Q3 2017 (Chart O3). The decline is reflected across cardholders in all age groups (Chart O4). The rollover balances to GDP ratio has moderated, from 1.4 times in Q1 2015 to 1.2 times in Q3 2017. Rollover balances²⁰⁵ per cardholder fell 4.7% YoY in Q3 2017 (Chart O5).

Credit card charge-off rates eased further to 6% in Q3 2017, from the peak of 6.8% in Q2 2015 (Chart O6).

The financing situation for highly-indebted borrowers has also improved. The industry-wide borrowing limit has triggered action by highly-indebted borrowers. As of August 2017, there were 27,000 borrowers with outstanding unsecured debt exceeding 18 times their monthly income compared to 51,000 in February 2015, a decline of 47%. This reduced number represents less than 2% of all unsecured credit borrowers, and less than 0.5% of Singapore's total population. The drop is mirrored in the number of borrowers with unsecured balances exceeding 12 times their monthly income, which has fallen from 5% of unsecured credit users to 4% over the same period. However, despite the aggregate decline, we continue to observe new borrowers with debts above 12 times their monthly income.

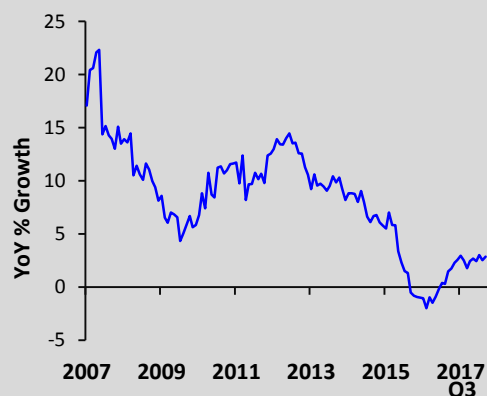
²⁰³ MAS made announcements in 2013 and 2015 on changes to the unsecured credit rules and the phasing in of the industry-wide borrowing limits respectively. MAS (September 2013), "Credit Card and Unsecured Credit Rules Strengthened to Help Individuals Avoid Getting into Debt Problems" and MAS (April 2015), "MAS will Phase in Borrowing Limit on Unsecured Credit".

²⁰⁴ Revolvers refer to credit cardholders who do not pay in full their outstanding credit card balances.

²⁰⁵ Rollover balance is defined as the amount of outstanding balance that is not paid in full within the billing month.

*Growth in outstanding unsecured balances
has eased considerably*

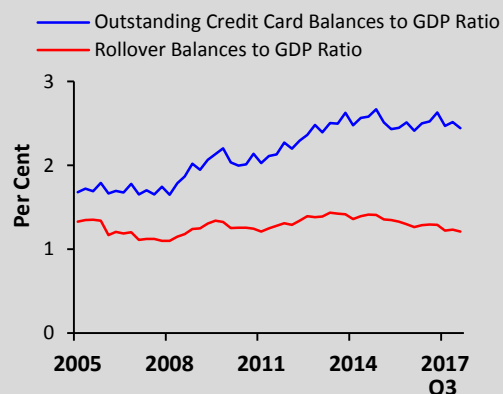
Chart O1
Growth in Outstanding Credit Card Balances



Source: CBS

*Ratio of outstanding credit card balances to GDP
has stabilised*

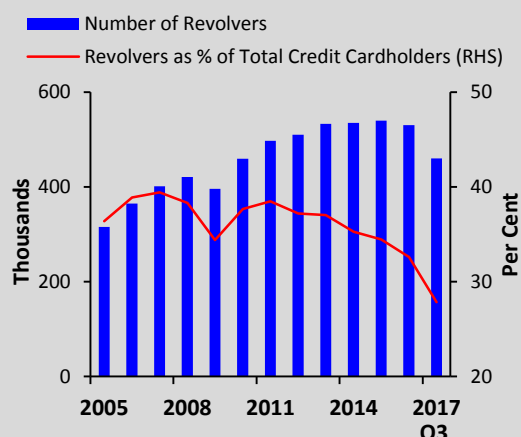
Chart O2
Credit Card Rollover Balances to GDP



Source: MAS estimates, DOS

*The proportion of revolvers has declined
substantially...*

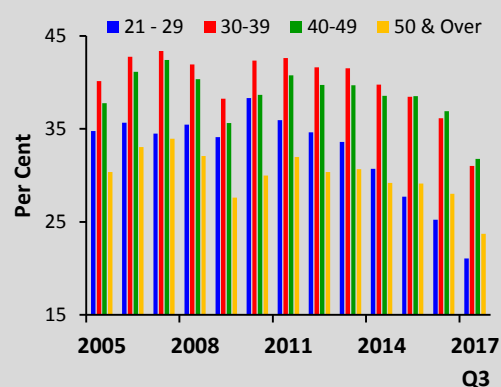
Chart O3
Revolvers among Credit Cardholders



Source: CBS

...across all age groups

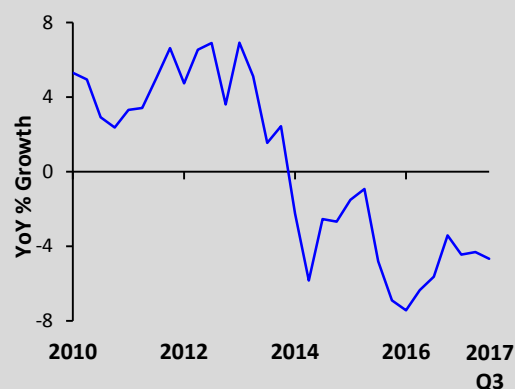
Chart O4
**Revolvers among Credit Cardholders
by Age Group**



Source: CBS

Rollover balances per cardholder has continued to fall

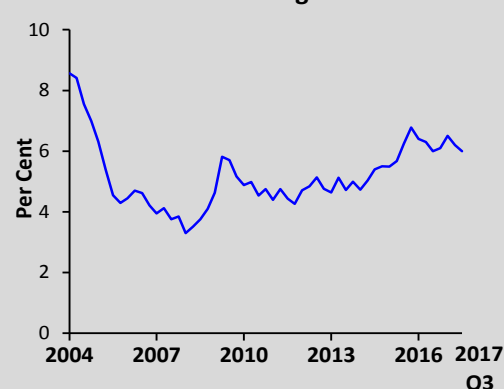
Chart O5
Growth in Rollover Balances Per Cardholder



Source: MAS estimates, CBS

Credit card charge-off rates have eased further compared to a year ago

Chart O6
Credit Card Charge-off Rates



Source: MAS

Assisting borrowers to reduce their debts with various schemes

MAS' measures aim to help borrowers avoid falling deeper into debt. Borrowers affected by the industry-wide borrowing limit are not required to pay down their debts immediately, but would need to reduce their outstanding debt balances before they can be granted new unsecured credit. There are several assistance schemes and repayment plans available to help these borrowers reduce their debt while ensuring that they do not suffer undue hardship.

One notable initiative is the Debt Consolidation Plan (DCP) launched by the Association of Banks in Singapore (ABS) in January 2017. The DCP allows borrowers with outstanding interest-bearing unsecured debts exceeding 12 times their monthly incomes to consolidate their debts with a single FI, at interest rates as low as 10% per annum. Borrowers on the DCP would be given a concessionary credit limit of one month to allow them to manage their daily expenses. According to ABS statistics, 5,000 borrowers have taken up the DCP as of Nov 2017. MAS supports ABS' efforts to develop and offer the DCP.

The DCP complements existing options offered by the FIs through bilateral restructuring plans and Credit Counselling Singapore's (CCS) Debt Management Programme.

A number of borrowers have either worked out a manageable repayment schedule under the DCP or have arranged to pay off their debts through other forms of restructuring programmes.²⁰⁶ MAS encourages borrowers to actively take control of their debt situation and seek assistance from either the FIs or CCS if they need help to better manage their debts.

Conclusion

The strengthened unsecured credit rules have further encouraged prudent lending and helped borrowers avoid accumulating excessive debts. While the overall consumer credit situation remains sound, households should continue to exercise prudence when taking on additional debt obligations. There are also a number of borrowers who are increasing their level of indebtedness above 12 times their monthly

²⁰⁶ The Straits Times (July 2017), "Weighed Down by Debt? There's Relief", Lianhe Zaobao (July 2017), "寻求何时解决方案 跳出债务困境", and Berita Harian (July 2017), "Usaha Pemerintah Jaya Kurangi Jumlah Penghutang".

income, even as others reduce theirs. Further, a small number of more highly-leveraged households could face repayment risks if interest rates rise. They should therefore continue to pare down their debt with the help of the DCP and other debt restructuring options.

Although credit card penetration and usage have decreased²⁰⁷, consumer credit services offered by Fintech companies²⁰⁸ could facilitate a rise in unsecured credit²⁰⁹ by lowering loan administration costs. Risks arising from such lending should be balanced with the potential financial inclusion benefits that such lending can bring about. For example, the use of technology and data analytics to assess creditworthiness has helped to increase the reach of microlending, especially to customers often overlooked by banks.²¹⁰ However, lower income borrowers typically have lower financial buffers and may be more vulnerable to interest rates and income shocks.

MAS will continue to monitor trends in unsecured credit facilities carefully, and take appropriate measures where necessary to further encourage financial prudence among households.

²⁰⁷ Credit card issuance has fallen over the past two years. The number of credit cards issued fell from a high of 9.7 million in 2014 to 9.4 million in 2016, after rising from 3.7 million in 2004. Consequently, the credit card penetration rate has fallen, from a peak of 4.4 in 2014 to 4.2 in 2016. This is consistent with global payment trends. World Pay noted that while credit and debit cards remain the most popular form of online payment, the share is expected to fall by 2020 as users gain awareness of and confidence in alternative payment methods. World Pay (2016), "Global Payments Report 2016".

²⁰⁸ For example, the Ant Check Later service offered by Alibaba's affiliate Ant Financial Services extends credit ranging from RMB 500 to RMB 50,000 based on its own risk assessment of its customers. The Straits Times (October 2017), "Buy Now, Pay Later: Easy Credit Leaving China's Millennials Spent".

²⁰⁹ In China, the online credit market has grown more than seventy fold, from RMB 6 billion in 2013 to RMB 437 billion as of 2016. iResearch (May 2017), "2017 年中国消费金融洞察报告".

²¹⁰ Forbes (March 2017), "A Chinese Company That Lends to Borrowers with No Credit Scores".

Box P Update on the Private Residential Property Market

The private residential property market in Singapore has picked up in recent quarters, with increases in both prices and transactions. Demand has been firm, underpinned by an improvement in buyer sentiment and low interest rates. Developers have also participated actively in en-bloc sale tenders and the GLS programme to replenish their land banks.

The development of the en-bloc and GLS sites will more than double the total number of units available for sale in the near term. Over the medium term, as these development projects are progressively completed, the private housing stock will grow. If this is not matched by increased occupation demand, it will add to existing vacancies that are already relatively elevated and weigh on rentals and property prices.

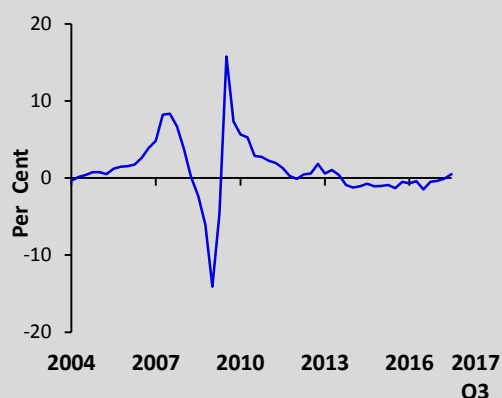
Prices registered a slight increase in the latest quarter...

Overall private residential property prices have fallen by a cumulative 11.0% since Q3 2013. After declining at a gradual pace for 15 consecutive quarters, prices registered a 0.7% increase in Q3 2017 (Chart P1). Price trends have been broadly similar across the regions, with prices in the Outside Central Region (OCR), Rest of Central Region (RCR) and Core Central Region (CCR) declining by 9.4%, 11.1% and 10.8% respectively from their peaks in 2013 (Chart P2). In the latest quarter, prices in the OCR, RCR and CCR rose by 0.8%, 0.5% and 0.1% respectively.

Property prices increased slightly in Q3 2017

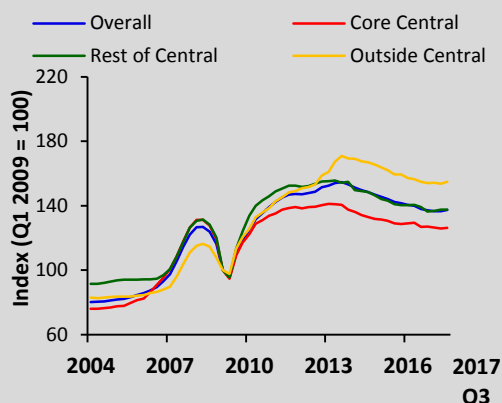
Different market segments have registered broadly similar trends

Chart P1
Quarter on Quarter (QoQ) Change in Private Property Price Index



Source: Urban Redevelopment Authority (URA)

Chart P2
Private Property Price Index by Region



Source: URA

...alongside increased transaction activity

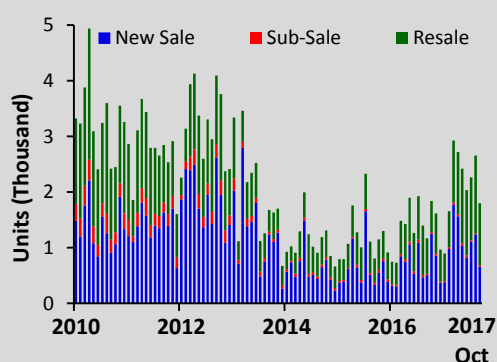
Buyer sentiment has improved in recent months. This was reflected in an increased take-up at recent project launches and higher resale activity. Total transactions in the first ten months of 2017 were 54% higher than that recorded over the same period last year (Chart P3). However, sub-sale transactions, a proxy for speculative activity, have remained low and broadly unchanged. In view of the significant reduction in the number of such speculative sales since the introduction of Seller's Stamp Duty (SSD) in

February 2010, the Government shortened the SSD holding period from four to three years and lowered the SSD rate by four percentage points at each tier in March this year.²¹¹

The increase in transaction activity has occurred amid continued low interest rates. The three-month SGD Singapore Interbank Offered Rate (SIBOR), a commonly-used reference rate for housing loans, remains low although it has increased slightly over the past year. The three-month SGD SIBOR stood at 1.1% in mid-November 2017, compared to a peak of 3.6% recorded in 2006 (Chart P4).

*Transaction activity has increased
in recent months*

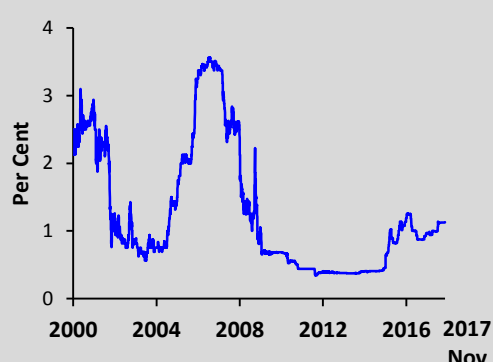
Chart P3
Number of Private Residential Property Transactions



Source: URA

*While the three-month SGD SIBOR has edged up
over the past year, it remains low*

Chart P4
Three-month SGD SIBOR



Source: Bloomberg

Meanwhile, rental market remains weak

Even though vacancy rates have declined from the peak of 8.9% in Q2 2016, they remain relatively elevated at 8.4% in Q3 2017 compared with 5.2% in Q1 2013 and the historical average of around 6.5% over the past decade (Chart P5). As at Q3 2017, there were more than 30,000 private housing units that were vacant. Rentals remained unchanged from the previous quarter in Q3 2017, after falling by a cumulative 12.5% since Q3 2013 (Chart P6). Should interest rates rise or rentals fall further, some borrowers could face difficulties meeting mortgage repayments on their investment properties.

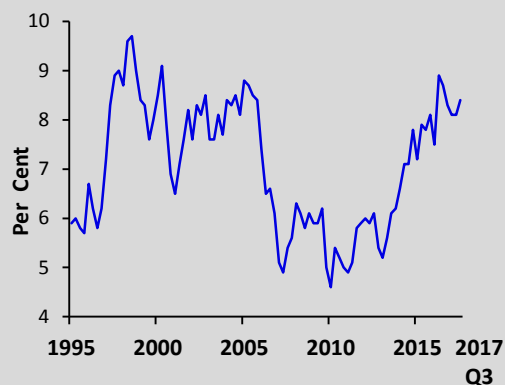
Units available for sale are expected to more than double in the near term

Collective sales have ramped up as developers sought to replenish their land banks. 20 residential projects, totalling about 2,900 units have been sold through en-bloc transactions as of mid-November this year, up from six deals in the whole of 2016 and one deal in 2015. The redevelopment of these en-bloc sites (coupled with supply from GLS sites) could potentially add another 20,000 new private housing units. This will more than double the number of unsold units currently in the pipeline within the next 1–2 years.

²¹¹ SSD rates are 12% for properties sold within the first year after purchase, 8% if sold within the second year, and 4% if sold within the third year. In addition, to provide borrowers with the flexibility to monetise their properties in their retirement years, the Total Debt-Servicing Ratio (TDSR) framework no longer applies to mortgage equity withdrawal loans with LTV ratios of 50% and below.

*Vacancy rates
remain elevated*

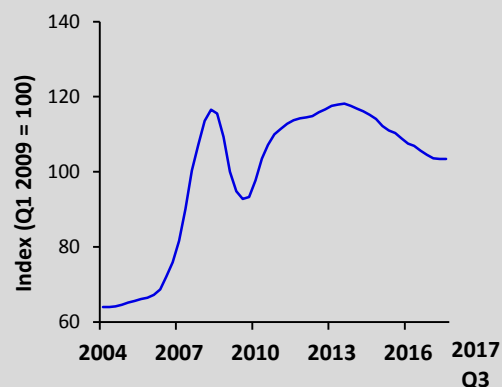
Chart P5
Vacancy Rates for Private Residential Property



Source: URA

*Rentals were flat in the last quarter
after a gradual decline*

Chart P6
Private Property Rental Index



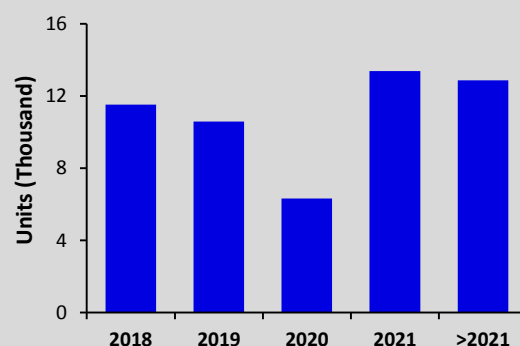
Source: URA

Private housing stock will increase and add to existing vacancies in the medium term as new units are completed and could weigh on the market if not matched by occupation demand

The development of en-bloc and GLS sites will increase the private housing stock over the next 3–5 years (Chart P7). Meanwhile, the compound annual growth rate of the population has moderated, from 3.0% (2007–2012) to 1.1% (2012–2017).²¹² With slower population growth, there is considerable uncertainty as to whether existing vacancies and the new supply coming on stream can be fully absorbed by the market. Should there be insufficient occupation demand for the completed housing units, a supply imbalance could result and place downward pressure on prices and rentals in the medium term.

*Private housing stock is projected to increase
significantly in 2021–2022 as units from en-bloc
sales are progressively completed*

Chart P7
**Pipeline Supply of Private Residential
Units (including Executive Condominiums) by
Expected Year of Completion**



Source: URA

²¹² As an example, a compound annual growth rate of 1.1% means that it would take five years for the population to grow 5%, in contrast to two years under a compound annual growth rate of 3%.

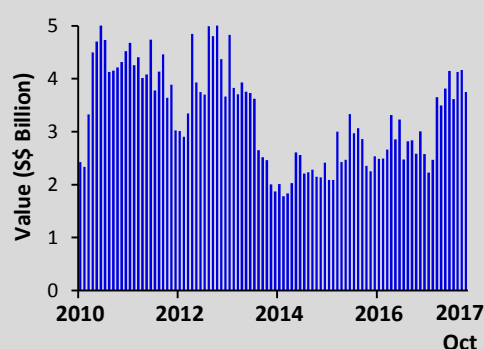
Asset quality of housing loans remains strong

Following increased transaction activity this year, new housing loans have risen to an average of S\$3.5 billion per month in the first ten months of 2017, up from S\$2.8 billion over the same period last year (Chart P8). Nonetheless, the growth in outstanding housing loans remains low at 4.0% YoY in October 2017. Housing loans accounted for 16.4% of total non-bank loans in October 2017, largely unchanged from 17.0% a year ago.

The asset quality of housing loans continues to be strong. Both loans in arrears and NPLs are low. The share of loans that are more than 30 days in arrears and NPL ratio were 1.0% and 0.4% respectively in Q3 2017, unchanged from a year ago (Chart P9). MAS' stress test results indicate that the banking system would be resilient to a sharp drop in property prices of 50% over a three-year period.

New housing loans have risen, following the increase in property transactions

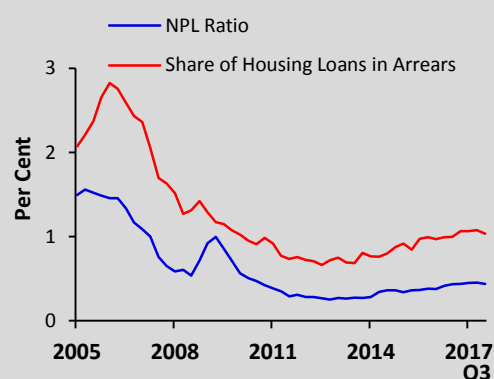
Chart P8
New Housing Loans



Source: MAS

Asset quality of housing loans remains strong

Chart P9
Share of Housing Loans that are More Than 30 Days in Arrears and Non-Performing Housing Loan Ratio



Source: MAS, CBS

Developers, potential buyers and lenders should proceed cautiously

Recent developments in the property market pose potential risks to stability. Developers should take into account the significant rise in the number of private housing units available for sale in the near term when bidding for land. The large upcoming supply could lead to a supply imbalance over the medium term if not matched by occupation demand. Prospective buyers should therefore remain prudent in their buying decisions. They should also factor in potential increases in their debt servicing burdens if interest rates rise and rentals fall given current elevated vacancy rates. Banks should continue to maintain prudent underwriting standards and review their valuation practices to ensure that property appraisals remain realistic and substantiated. MAS will continue to monitor market developments and where necessary, take appropriate actions to maintain a stable and sustainable property market.