International capital flow dynamics in Singapore

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Introduction

A large literature has documented the importance of global factors in driving capital flows into and out of open economies. As a small economy with fully open capital markets, Singapore is clearly subject to this dynamic. This note empirically examines the importance of global "push" relative to domestic "pull" factors in influencing the movement of capital into and out of Singapore.

During crises and over the shorter term, global "push" factors often dominate domestic "pull" factors in determining international capital flows. Forbes and Warnock (2012) show that Singapore experienced significant capital surge and flight episodes in the period around the Great Financial Crisis (GFC), supporting the view that capital flows to Singapore are affected by global factors.

The analysis for Singapore in this note confirms the strong influence of global "push" factors on private capital flows, with evidence of a structural shift in the key drivers following the GFC. Before the crisis, Singapore's capital flows were closely tied to growth in the core advanced economies (AEs). However, post-GFC, Singapore's capital flows responded more strongly to Asia and China's growth as well as to global financial risks.

An overview of Singapore's private capital flows

This section summarises a number of stylised facts on Singapore's capital flows, based on quarterly balance of payments data. Under BPM6, the financial account (FA) records two main categories of cross-border transaction flows:

$$FA\ balance = Net\ Acquisition\ of\ Financial\ Assets - Net\ Incurrence\ of\ Liabilities$$
$$= \Delta Assets - \Delta Liabilities$$

First, residents' net acquisitions of foreign financial assets – such as direct investment abroad, purchases of foreign securities, cross-border lending and deposits overseas. An increase in assets is recorded with a positive sign, meaning an *outflow* of funds. Second, residents' incurrence of financial liabilities owed to foreigners, including foreign direct investment into Singapore, foreign purchases of domestic securities and cross-border borrowing by local entities. An increase in liabilities is recorded with a negative sign and is considered an *inflow* of funds.

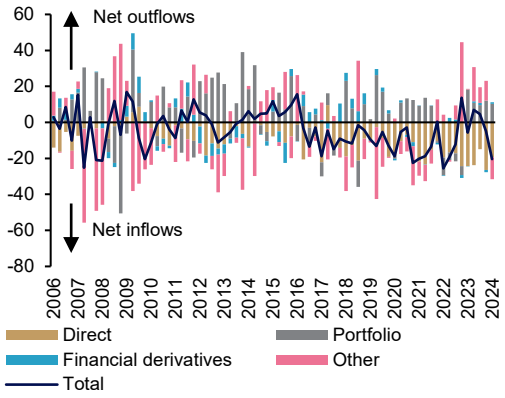
Net capital flows – the balance in the financial account – therefore arise from changes in the economy's foreign asset position minus changes in the liabilities it

owes to creditors abroad.[1] When increases in assets exceed increases in liabilities, the economy is a net lender, recording a net capital outflow. When the order is reversed and liabilities increase more than assets, the economy is a net borrower, experiencing net capital inflows.[2] The definitions of asset classes under capital flows can be found in Table A.1 in the appendix.

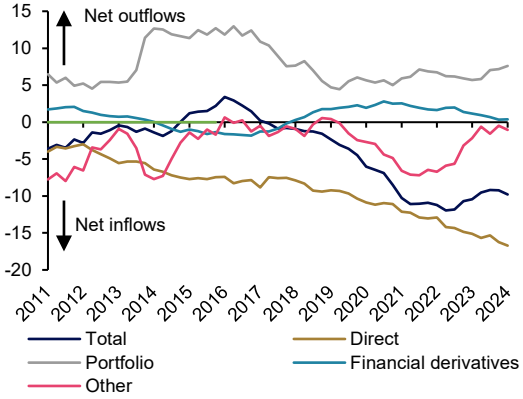
Singapore has been a net recipient of private capital inflows (ie negative net capital flows) from 2006 to 2024 (Graphs 1.A and 1.B). Based on a five-year rolling average, total net inflows as a percentage of nominal GDP have demonstrated a trend increase (Graph 1.B), largely driven by direct investment inflows. Other investment flows have been more volatile, but have seen longer periods of net inflows than of outflows. However, there has been a net outflow of portfolio investment over the period.

Capital flows for Singapore, 2006–24
As a percentage of GDP — Graph 1

A. Net capital flows



B. Net capital flows (five-year rolling average)



In Graph 1.B, the figure plots the five-year rolling average of net capital flows with a starting window of Q2 2006 to Q1 2011. Each point on the x-axis corresponds to the end of the respective rolling window.

Sources: Singapore Department of Statistics (DOS); Haver Analytics.

Reflecting Singapore's role as a regional financial centre, changes in financial assets and liabilities are large and volatile compared to the size of the economy. Summing the absolute magnitudes of the two, the total annual change averaged around 80% of GDP over 1995–2024, compared to about 10% in the United States and Japan. For Singapore, the standard deviations of the ratio of the changes in assets and liabilities to GDP are 57 percentage points (pp) and 60 pp respectively, higher than the 4 pp observed for the United States. The high volatility in Singapore's capital

[1] The changes refer purely to transaction flows; valuation changes do not impact the balance of payment flows.

[2] The sign convention in BPM6 entails that a positive FA balance indicates a net lending position (assets grew more than liabilities) and a negative FA balance indicates a net borrowing position (liabilities grew more than assets). This differs from the definition under BPM5, where the financial account balance is presented as capital inflows less capital outflows, effectively switching the sign convention for the overall financial account.

flows is driven by portfolio, financial derivatives and other investments, whereas direct investments are relatively stable.[3]

As Singapore's changes in financial assets and liabilities are highly correlated and thus largely offset each other (Table 1), net capital flows are consequently more stable. The standard deviation of the ratio of net capital flows over GDP falls considerably, to only around 11 pp (Table A.2).

Correlation of capital flow categories (Q1 1995–Q1 2024) Table 1

Total	Direct	Portfolio	Financial derivatives	Other
0.98***	0.36***	0.33***	0.80***	0.94***

*** p<0.01.

Push and pull factors affecting asset and liability flows

Consistent with the approaches used in the recent empirical literature, including BIS (2021) and Cerutti et al (2015), we use a linear regression framework of global and domestic factors to examine Singapore's capital flows. The empirical model is as follows:

$$Flows_t = \alpha + \beta_1 Push_t + \delta_1 Pull_t + \varepsilon_t \quad (1)$$

$Flows_t$ is defined as the ratio of changes in assets or liabilities to Singapore's nominal GDP at time *t*. Each flow type is analysed separately by investment categories: direct investment, portfolio investment by banks, portfolio investment by non-banks, other investment by banks and other investment by non-banks.[4]

The push and pull variables follow those identified in the literature, with a priority on those with longer time series to capture Singapore's key business and financial cycles (eg the Asian financial crisis (AFC) and the GFC). Table 2 lists a selection of the global business and financial cycle push and pull variables included in the model.[5]

Push factors

Push factors are economic and financial conditions in source countries that influence capital flows into Singapore, the recipient country. Key push factors include source country interest rates, GDP growth and financial market stability (Table 2). High interest rates and robust economic performance abroad can make investments in source countries more attractive, reducing net capital flows into Singapore. Conversely, economic instability or low returns in source countries can drive investors to seek higher returns abroad, increasing flows into Singapore. In addition, global financial conditions, such as liquidity and risk aversion, are also likely to play a role in determining the volume and direction of international capital flows.

[3] See Table A.2 for the standard deviation of Singapore's capital flows.

[4] Financial derivatives flows are not included because of data limitations.

[5] The full list and sources of variables used can be found in Table A.3.

List of push and pull factors Table 2

Push factors	
Business cycle	**Financial cycle**
• Simple average GDP growth rate of the core AEs (US, UK, EU and Japan) • Simple average GDP growth rate of Asian economies excluding China (Indonesia, Korea, Philippines, Chinese Taipei and Thailand) • GDP growth rate for China • US trade balance over GDP ratio in the US[1]	• Bloomberg Dollar Index • Leo Krippner shadow short rate of the US monetary policy rate • Two-year US bond yield • The first principal component from five financial risk indicators: Gilchrist and Zakrajšek (2012) spreads, Moody's Aaa and Baa corporate bond minus federal funds rate spreads and Moody's Aaa and Baa corporate bond minus 10-year Treasury • Change in the USDSGD spot rate
Pull factors	
Business cycle	**Financial cycle**
• A principal component score of Singapore's macroeconomic indicators (real GDP growth, inflation rate, industry productivity, unemployment rate, trade-to-GDP ratio)	• Singapore real interest rate[2]

Table footnote:

1. The Hodrick-Prescott filter is used to extract the cyclical component of the US trade balance ratio, which serves as a proxy for the US business cycle.
2. The real interest rate is computed as the difference between the nominal interest rate and inflation rate. For Singapore's nominal rate, we use SIBOR before 2015 and SORA from 2015 onwards (Table A.3).

Pull factors

Pull variables consist of variables related to Singapore's macroeconomic and financial fundamentals. Macroeconomic variables such as domestic GDP growth and inflation can drive relative changes in the demand and supply of capital. For example, positive shocks to Singapore's GDP growth may raise returns to investment in Singapore, pulling in capital flows. In lieu of incorporating multiple macroeconomic indicators as independent variables, a single, compact principal component score that captures the common variation in Singapore's macroeconomic variables is used.[6] Specifically, the lagged value of the principal component score is used to capture Singapore's underlying economic conditions.

Drivers of Singapore's capital flows

The baseline regression model, as specified in Equation 1, is estimated using quarterly data from Q1 1995 to Q1 2024. The regression results are shown in Tables 3 and 4.

[6] The principal component score of Singapore's macroeconomic indicators is obtained using the method of Hamilton and Xi (2024). Each indicator is first regressed on its own lags with the residual representing the cyclical component. Principal component analysis is then performed on the cyclical components of these indicators to obtain the principal component score.

Regression results for changes in assets (outflows) Table 3

Dependent variable	Total	Direct investment	Portfolio bank	Portfolio non-bank	Other bank	Other non-bank
Pull factors:						
Real interest rate SG	–0.337	0.066	0.525	0.009	–0.052	–0.794
	(3.690)	(0.361)	(0.879)	(0.392)	(3.249)	(0.702)
Macro PCA SG	–3.081	–0.277	0.509	–0.552	–2.534	–0.139
	(3.892)	(0.418)	(1.085)	(0.512)	(4.049)	(0.968)
Push factors:						
Real GDP growth G3+UK	3.594	–0.195	–0.571	0.040	3.773	0.445
	(2.404)	(0.172)	(0.419)	(0.277)	(2.406)	(0.374)
Real GDP growth Asia ex China	0.391	0.191	0.947*	0.515**	–0.778	–0.367
	(3.601)	(0.164)	(0.525)	(0.251)	(3.496)	(0.463)
Real GDP growth China	4.723**	0.506***	0.113	0.159	3.359	0.682**
	(2.112)	(0.191)	(0.371)	(0.213)	(2.034)	(0.339)
Inflation US	2.816	1.391**	–0.088	–1.679*	3.101	–1.907
	(6.512)	(0.563)	(1.698)	(1.005)	(6.693)	(1.265)
Real interest rate US	3.059	1.751***	–1.749	–1.068	3.072	–1.090
	(5.912)	(0.540)	(1.688)	(0.840)	(5.732)	(1.198)
Trade/GDP cyclical US	63.531	14.708***	39.661**	–5.124	17.984	14.244
	(59.300)	(4.467)	(16.149)	(7.694)	(62.956)	(11.425)
Two-year bond yield US	–7.611	–3.611***	2.109	0.233	–5.990	1.922
	(8.638)	(0.748)	(1.953)	(1.122)	(9.204)	(1.659)
USD growth	1.357	0.316***	–0.168	–0.099	1.356	0.036
	(1.410)	(0.078)	(0.261)	(0.116)	(1.268)	(0.233)
Financial risk indicator	–9.408*	–1.461***	–1.252	–0.939*	–5.519	–0.807
	(4.947)	(0.525)	(1.506)	(0.478)	(4.257)	(1.118)
Change in USDSGD spot rate	–3.258	–0.206	–0.177	0.403**	–2.807	–0.188
	(4.120)	(0.136)	(0.500)	(0.195)	(3.649)	(0.398)
Constant	10.216	15.429***	–4.639	5.348**	–9.235	–0.756
	(26.178)	(2.395)	(4.649)	(2.318)	(26.501)	(4.358)
Observations	117	117	117	117	117	117
R^2	0.214	0.286	0.169	0.154	0.131	0.093

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Regression results for changes in liabilities (inflows) Table 4

Dependent variable	Total	Direct investment	Portfolio bank	Portfolio non-bank	Other bank	Other non-bank
Pull factors:						
Real interest rate SG	–2.342	0.295	–0.166	0.386	–2.146	–0.013
	(3.758)	(0.493)	(0.178)	(0.271)	(3.662)	(0.648)
Macro PCA SG	–2.521	0.334	–0.068	0.184	–3.267	0.788
	(4.026)	(0.741)	(0.142)	(0.253)	(3.954)	(0.857)
Push factors:						
Real GDP growth G3+UK	2.774	0.421	0.066	–0.097	2.144	0.203
	(2.356)	(0.518)	(0.149)	(0.123)	(2.505)	(0.470)
Real GDP growth Asia ex China	0.917	–0.457	0.090	–0.016	1.308	–0.157
	(3.829)	(0.927)	(0.096)	(0.120)	(4.294)	(0.422)
Real GDP growth China	4.557**	–0.240	0.005	0.451***	3.909*	0.443
	(2.057)	(0.255)	(0.093)	(0.158)	(2.031)	(0.320)
Inflation US	4.862	2.333**	0.287	0.732	–0.022	0.989
	(6.700)	(1.026)	(0.439)	(0.569)	(6.619)	(1.249)
Real interest rate US	4.403	1.402*	0.025	0.870	–0.571	1.841
	(6.072)	(0.746)	(0.341)	(0.560)	(5.872)	(1.167)
Trade/GDP cyclical US	84.323	12.403	3.545	0.691	79.011	10.204
	(61.846)	(7.992)	(2.617)	(3.925)	(59.456)	(10.528)
Two-year bond yield US	–10.518	–4.153***	–0.140	–1.511**	–0.919	–3.114*
	(9.041)	(1.167)	(0.406)	(0.703)	(8.563)	(1.686)
USD growth	1.285	0.318	–0.041	0.056	1.093	–0.050
	(1.451)	(0.225)	(0.037)	(0.057)	(1.411)	(0.167)
Financial risk indicator	–12.264**	–2.821***	–0.209*	–0.783***	–8.203*	–0.449
	(4.827)	(0.714)	(0.126)	(0.281)	(4.636)	(0.786)
Change in USDSGD spot rate	–3.377	–0.625	0.107	–0.038	–2.782	–0.038
	(4.263)	(0.395)	(0.074)	(0.115)	(4.217)	(0.299)
Constant	17.833	31.657***	–0.276	1.228	–24.668	9.545**
	(26.446)	(3.354)	(0.795)	(1.774)	(25.205)	(4.555)
Observations	117	117	117	117	117	117
R^2	0.237	0.370	0.073	0.197	0.179	0.083

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

The key observations from the regression analysis are summarised below.

1. Push factors matter more than pull factors for Singapore's capital inflows (changes in liabilities) and outflows (changes in assets).

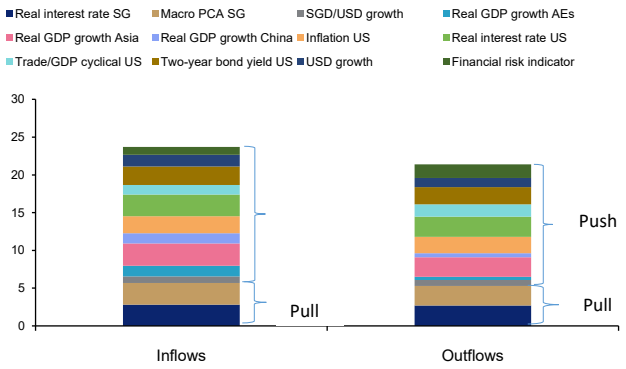
The results indicate that global and regional factors exhibit a strong association with Singapore's capital flows. In contrast, Singapore's pull factors are only weakly associated with capital flows.

- Singapore's financial asset and liability flows tend to increase during periods of robust regional economic growth and decrease when global financial risk is elevated. The coefficients on the financial risk indicator term are –9.4 and –12.6, respectively. This probably reflects the yield-seeking and risk aversion behaviour of Singapore resident and international investors.
- In terms of Singapore's financial assets, stronger growth in Asia leads to an increase in resident bank and non-bank portfolio flows abroad. Singapore's direct investment outflows are strongly sensitive to global financial risk and economic conditions in the United States and China. Non-bank portfolio outflows have a statistically significant and positive relationship with changes in the USDSGD spot rate. A depreciation of the SGD against the USD (positive increase in spot rate), controlling for the broad USD index, is correlated with higher non-bank portfolio outflows.
- For financial liabilities in Singapore, robust GDP growth in China appears to strongly stimulate (non-resident) non-banks' portfolio and (non-resident) banks' other investment flows into Singapore. In comparison, higher global financial risk leads to lower inflows into Singapore across most asset types.

A decomposition of R^2 by regressor[7] affirms that push factors contribute more to the explained variance of flows, relative to domestic pull factors. Among push factors, GDP growth of the AEs and China, global financial conditions and US dollar strength are the most important drivers of both inflows and outflows (Graph 2). The total contribution of pull factors for capital flow dynamics is lower than that of push factors, accounting for less than one third of the overall explained variance.

Decomposition of R^2 by regressors for changes in assets and liabilities

Percentage point contribution — Graph 2



Sources: EPG; MAS estimates.

[7] We apply semi-partial R^2 to quantify the unique contribution of an individual predictor to the total variance explained by a regression model. For further details, refer to the technical note by Shedden (2021) and similar methods applied in studies such as Nakagawa and Schielzeth (2013).

Overall, the results reflect Singapore's role as an international financial centre intermediating capital flows between the region and the rest of the world. They also indicate that resident investors perceive Singapore as a trusted and safe harbour during periods of heightened global financial risk given its macroeconomic and political stability and triple-A credit rating. Indeed, a key stabilising factor for Singapore's net capital flows is that residents tend to retrench their investments (from) abroad when global financial risks are elevated, offsetting the pullback of non-resident capital inflows from Singapore.

2. Regional economic growth and global financial risk factors have become increasingly important drivers of Singapore's capital flows in the post-GFC period.

The GFC led to significant changes in the nature, and thus possibly drivers, of Singapore's capital flows. As backdrop, for instance, AE banks retrenched from lending to the region, even as monetary policy in AEs turned ultra-accommodative.

Segmenting the full sample into the period before and after the GFC shows that Singapore's capital flows are increasingly being driven by regional growth factors.

- Before 2007, economic developments in AEs (United States, European Union, Japan, United Kingdom) were the primary external drivers of Singapore's capital flows. However, this relationship has largely diminished in the post-GFC period, with the estimated coefficients turning statistically insignificant (Tables A.4 and A.5).
- In contrast, Singapore's capital flows have become more strongly correlated with Asia's GDP growth post-crisis. This is consistent with the literature which finds that increased economic and financial integration in Asia since the GFC has led to greater co-movement in capital flows in the region (IMF (2014)).
    - This pattern applies in both directions: inflows to Singapore now respond more strongly to regional growth, whilst outward investment by residents has become positively associated with strong growth in Asia and China, probably reflecting Singapore's role as financial intermediary for regional capital flows.

A decomposition of R^2 analysis also shows that the influence of AEs on inflows and outflows as defined in this paper have shrunk substantially post-GFC (Graphs 3.A and 3.B). This result echoes a more general analysis of recent trends in Asian capital flows,[8] which showed that the impact of global factors on capital flows to leading Asian emerging markets has diminished since the GFC. At the same time, the impact of the global financial cycle on interest rates and other key financial variables remains substantial.

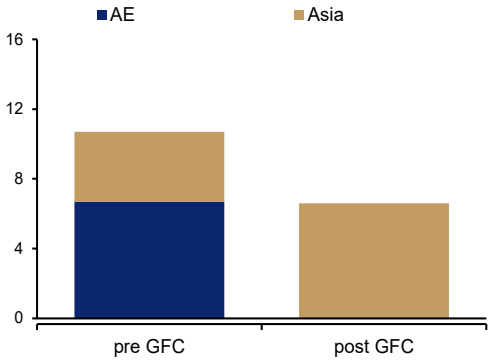
[8] See the special feature on "Asian Capital Flows and the Global Financial Cycle" in the 2024 MAS Financial Stability Report.

Decomposition of R^2, pre- and post- GFC

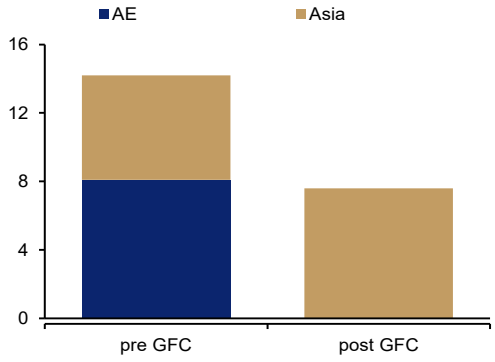
Percentage point contribution

Graph 3

A. Gross outflows



B. Gross inflows



Sources: EPG; MAS estimates.

In addition, in the post-GFC period, the coefficients on the global financial risk variable for both inflows and outflows turned negative and statistically significant, compared to the pre-GFC years where they were statistically insignificant or positive (Tables A.4 and A.5). Higher global financial risk (risk-off periods) is thus associated with reduced capital inflows and outflows, whilst lower global financial risk (risk-on periods) corresponds to increased capital flows in both directions.

Thus, the regressions suggest that domestic and international investors have become more sensitive to changes in global financial conditions since the GFC.[9] During risk-off periods, resident investors scale back on their overseas investments, resulting in a decline in capital outflows. The larger pullback in portfolio investment outflows after the crisis reflects resident investors' increased sensitivity to global risk factors, as well as Singapore banks' expanded regional intermediation role via portfolio investments following the reduced presence of global banks in the region after the GFC (MAS (2017)). Meanwhile, the decline in other investment outflows (cross-border loans, deposits) is consistent with a flight-to-safety response where resident investors increasingly view Singapore as a secure base during turbulent times.

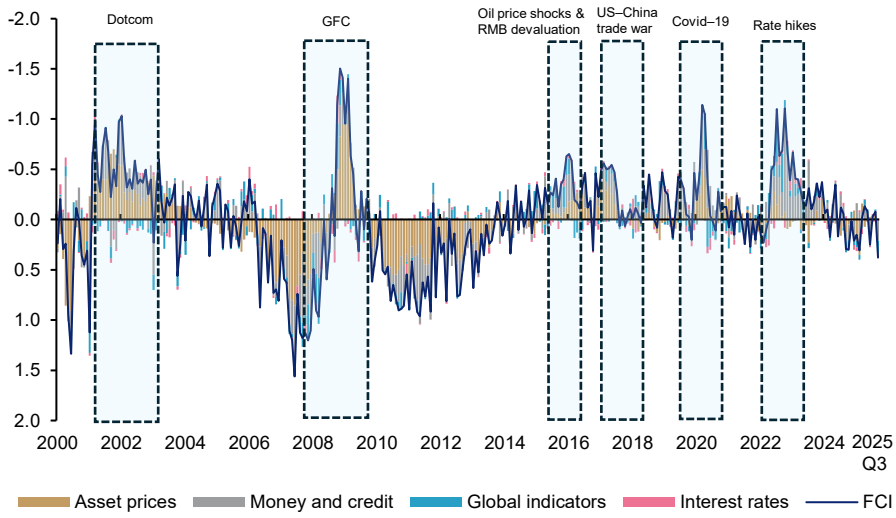
[9] This contrasts with Avdjiev et al (2020), who document reduced sensitivity of cross-border lending to global risk in the post-GFC period across both advanced and emerging market economies. The divergence may stem from differences in risk measurement approaches. Following Engel and Wu (2024), this note employs a corporate bond spread-based risk index, whereas the established literature predominantly utilises the VIX. Substituting the VIX into our specifications for Singapore yields statistically insignificant coefficients, suggesting that risk proxy choice may materially affect estimated relationships.

Capital flows and domestic financial conditions

Global push factors and capital flows can influence domestic financial conditions in Singapore through various channels. For instance, increased demand by non-resident investors for Singapore dollar bank deposits can generate appreciation pressures on the Singapore dollar, while non-resident investors' search for yield could also raise domestic asset prices and depress bond yields. Graph 4 presents a decomposition of MAS' Financial Conditions Index (FCI) into domestic asset prices, credit and money growth, interest rates and global indicators.[10] It shows that cycles of tightening and loosening in Singapore's FCI have been strongly coincident with global shocks such as the GFC, commodity price crashes and trade wars. These affect global and regional growth prospects, sentiment and risk-taking, and consequently domestic financial conditions which have implications for Singapore's output gap and inflation prospects. All else equal, MAS' monetary policy may lean against the impact of shifts in financial conditions, insofar as they induce aggregate demand conditions that may compromise domestic price stability.

Components of MAS' FCI

Graph 4



Sources: EPG; MAS estimates.

Conclusion

In line with a growing literature, Singapore's capital movements primarily reflect global and regional "push" factors such as global risk sentiment and Asia's growth prospects. Singapore's capital flows have become more sensitive to global financial conditions since the GFC. However, as resident investors tend to offset the actions of

[10] See MAS (2024), "Special feature 2: expanding the toolkit for macroprudential surveillance" for a discussion on how the FCI is constructed.

non-resident investors in Singapore, Singapore's net financial flows are relatively stable, even during times of global financial turmoil. Nonetheless, openness to capital flows also means that global factors are a significant driver of domestic financial conditions and thus domestic growth and price stability.

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Appendix

Singapore Department of Statistics definitions of asset classes under capital flows

Table A.1

Asset classes	Definitions	Components
Direct investments	Cross-border investment where a direct investor, residing in one economy, owns 10% or more of the ordinary shares or voting power in an enterprise residing in another country	• Equity and investment fund shares • Debt instruments (differs from securities in that it includes company reserves and net intercompany lending)
Portfolio investments	Cross-border investments by an investor in one economy into an enterprise that is resident in another economy with less influence than that of a direct investment relationship	• Equity and investment fund shares • Debt securities
Financial derivatives	A financial instrument that is linked to another specific financial instrument or indicator or commodity and through which specific financial risks (such as interest rate risk, foreign exchange risk, equity and commodity price risks, credit risk, etc) can be traded in their own right in financial markets. Treated separately from the values of any underlying items to which they are linked	
Others	Other investment is a residual category that includes positions and transactions other than those included in direct investment, portfolio investment, financial derivatives and reserve assets	• Trade credits and advances • Loans • Currency and deposits • Insurance technical reserves • Special drawing rights • Other accounts payables

Standard deviation of the ratio of Singapore's capital flows to GDP

In percentage points

Table A.2

	Total	Direct	Portfolio	Financial derivatives	Others
Net financial account	11.37	8.47	13.62	4.25	18.91
Changes in liabilities (inflows)	60.29	9.69	4.68	6.83	83.78
Changes in assets (outflows)	56.71	5.95	14.43	6.76	52.80

Description of data definitions and sources

Table A.3

Variable	Definition	Frequency	Coverage	Source
Capital flows				
		Net capital flows		
Net capital flows	Net balance between financial assets and liabilities. Computed as assets minus liabilities Transformed as the ratio of capital flows to nominal GDP Can be further broken down into portfolio, direct, other investments and financial derivatives	Quarterly	Q1 1986 to Q1 2024	Singapore Department of Statistics (DOS)
Assets and liabilities	Net acquisition of assets and net incurrence of liabilities Transformed as the ratio of capital flows to nominal GDP Can be further broken down into portfolio (bank and non-bank), direct, other investments (bank and non-bank) and financial derivatives	Quarterly	Q1 1995 to Q1 2024 Financial derivatives: Q1 2006 to Q1 2024	DOS
Pull variables				
SG real GDP	Real gross domestic product by expenditure in terms of 2015 Singapore dollars	Quarterly	Q1 1975 to Q1 2024	DOS
SG inflation	Year-on-year inflation rate for each quarter	Quarterly	Q2 1990 to Q1 2024	DOS
SG industrial production	Quarterly year-on-year percentage change in industrial production level	Quarterly	Q1 1984 to Q1 2024	DOS
SG unemployment	Unemployment rate	Quarterly	Q1 1992 to Q1 2024	DOS
SG trade balance	Nominal trade balance Constructed as the net balance between exports and imports	Quarterly	Q1 1986 to Q1 2024	DOS
SG SIBOR/SORA	Before 2015: Singapore Interbank Offered Rate (SIBOR) 2015 onwards: Singapore Overnight Rate Average (SORA)	Quarterly	Q3 1987 to Q2 2024	MAS
Push variables				
Real GDP growth Asia ex China	Average year-on-year GDP growth rate of Asian economies: Indonesia, Korea, Philippines, Chinese Taipei and Thailand	Quarterly	Q1 1994 to Q1 2024	Haver Analytics
Real GDP growth China	Year-on-year GDP growth rate of China	Quarterly	Q1 1992 to Q1 2024	Haver Analytics
Real GDP growth G3+UK	Average year-on-year growth rate of core real GDP: EU, Japan, UK, US	Quarterly	Q1 1986 to Q1 2024	Haver Analytics
US trade balance	Nominal trade balance	Quarterly	Q1 1992 to Q1 2024	Haver Analytics
Two-year bond yield US	US two-year treasury bond yield	Quarterly	Q1 1986 to Q1 2024	Federal Reserve Economic Data (FRED)
Dollar index	Tracks the performance of a basket of leading global currencies versus the US dollar. The index represents both developed and emerging market currencies that have the highest liquidity	Quarterly, mean of monthly figures	Q1 1990 to Q1 2024	Bloomberg

	in the currency markets and the biggest trade flows with the US			
Leo Krippner SSR	Leo Krippner shadow short rate of the US monetary policy rate Monthly data aggregated as quarterly mean	Quarterly, mean of monthly figures	Q1 1995 to Q2 2024	LJK Macro Finance Analysis
Global financial risk	The first principal component from five risk measures: Gilchrist and Zakrajšek (2012) spreads, Moody's Aaa and Baa corporate bond minus federal funds rate spreads and Moody's Aaa and Baa corporate bond minus 10-year Treasury	Quarterly	Q1 1973 to Q1 2024	Engel and Wu (2024)
USDSGD spot rate	Singapore dollar per US dollar	Quarterly, mean of monthly figures	Q1 1999 to Q1 2024	London Stock Exchange Group (LSEG)

Regression results for changes in assets (outflows) before and after the GFC

Table A.4

	Before GFC (1995–2006)						After GFC (2007–24)					
Dependent variable	Total	Direct invest.	Portfolio bank	Portfolio non-bank	Other bank	Other non-bank	Total outflows	Direct invest.	Portfolio bank	Portfolio non-bank	Other bank	Other non-bank
Pull factors:												
Real interest rate SG	7.936	0.263	0.407	–0.317	8.002	–0.769	0.025	0.009	–0.487	0.484	0.462	–1.027
	(8.961)	(0.641)	(1.291)	(0.347)	(8.849)	(1.407)	(4.248)	(0.448)	(1.280)	(0.604)	(4.036)	(0.790)
Macro PCA SG	4.009	–0.605	1.744*	–0.861**	4.752	–1.095	–7.754*	–0.163	–0.698	–0.291	–7.001	0.703
	(7.278)	(0.777)	(0.994)	(0.363)	(8.149)	(1.710)	(4.186)	(0.342)	(1.568)	(0.657)	(4.322)	(1.083)
Push factors:												
Real GDP growth G3+UK	38.808**	1.483	6.166***	–0.734	32.450	–0.061	–0.198	–0.188	0.253	–0.378	0.790	–0.167
	(18.799)	(1.366)	(2.220)	(0.737)	(21.107)	(3.972)	(2.260)	(0.192)	(0.663)	(0.442)	(2.342)	(0.580)
Real GDP growth Asia ex China	–8.040	–0.100	–0.129	0.431**	–7.458	–0.742	9.486*	0.479	–0.542	1.008	7.163	–0.119
	(6.162)	(0.280)	(0.549)	(0.169)	(6.014)	(0.678)	(5.245)	(0.413)	(1.296)	(0.918)	(5.722)	(1.261)
Real GDP growth China	–0.025	0.196	–1.416	0.482	–0.140	0.212	4.903*	0.629***	1.100*	0.525	2.488	0.883**
	(10.410)	(0.638)	(1.547)	(0.401)	(11.185)	(1.629)	(2.488)	(0.229)	(0.626)	(0.330)	(2.609)	(0.366)
Inflation US	–17.724	8.549**	6.448	1.712	–20.700	–15.953*	1.500	0.262	–4.642*	–2.851*	6.493	–1.453
	(30.736)	(4.094)	(4.848)	(1.976)	(32.709)	(8.133)	(9.515)	(0.840)	(2.350)	(1.591)	(10.081)	(1.436)
Real interest rate US	–17.723	3.747	2.338	4.200**	–24.594	–5.097	–1.677	0.859	–4.983**	–2.047*	2.793	–1.113
	(19.732)	(2.479)	(3.673)	(1.642)	(22.714)	(5.275)	(6.200)	(0.620)	(2.007)	(1.200)	(6.310)	(1.235)
Trade/GDP cyclical US	133.601	28.555**	41.534*	10.738	81.893	–24.635	63.221	16.513**	63.140**	–13.268	–1.622	28.533*
	(111.233)	(12.331)	(21.105)	(6.356)	(120.037)	(25.726)	(82.917)	(7.730)	(23.753)	(12.216)	(90.302)	(16.419)
Two-year bond yield US	6.575	–6.731**	–5.049	–3.315	17.189	6.549	–1.217	–2.076*	6.852**	1.672	–5.700	1.007
	(23.124)	(3.081)	(4.396)	(1.968)	(25.852)	(6.459)	(12.246)	(1.239)	(3.291)	(1.923)	(13.062)	(2.331)
USD growth	4.898	0.606***	0.344	–0.075	3.626	0.392	–1.467	–0.088	–0.340	–0.015	–1.237	0.589*
	(3.052)	(0.164)	(0.276)	(0.098)	(2.967)	(0.469)	(1.637)	(0.140)	(0.489)	(0.307)	(1.681)	(0.340)
Financial risk indicator	3.677	–0.167	1.959	2.249***	–0.377	–0.014	–12.637**	–1.723***	–3.937*	–2.143**	–4.252	–2.595*
	(10.326)	(1.079)	(2.231)	(0.546)	(12.573)	(2.270)	(5.864)	(0.473)	(2.143)	(0.858)	(5.042)	(1.311)
Change in USDSGD spot rate	–11.178	–0.720***	–1.672***	0.184	–8.470	–0.502	2.720	0.542**	0.843	0.656	1.679	–0.717
	(7.910)	(0.249)	(0.467)	(0.147)	(7.488)	(0.683)	(2.740)	(0.254)	(0.800)	(0.474)	(2.808)	(0.606)
Constant	25.143	9.269	9.391	3.228	–19.774	26.005	–23.981	13.702***	–8.454	2.169	–30.891	–2.537

	(136.965)	(9.634)	(19.907)	(7.909)	(147.144)	(22.578)	(23.920)	(2.717)	(7.986)	(4.054)	(25.247)	(6.167)
Observations	48	48	48	48	48	48	69	69	69	69	69	69
R^2	0.289	0.417	0.526	0.650	0.186	0.205	0.400	0.427	0.342	0.347	0.231	0.267

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Regression results for changes in liabilities (inflows) before and after the GFC

Table A.5

	Before GFC (1995–2006)						After GFC (2007–24)					
Dependent variable	Total	Direct invest.	Portfolio bank	Portfolio non-bank	Other bank	Other non-bank	Total outflows	Direct invest.	Portfolio bank	Portfolio non-bank	Other bank	Other non-bank
Pull factors:												
Real interest rate SG	4.115	0.275	0.115	0.037	3.361	0.193	–1.615	0.891*	–0.378	0.482	–2.087	–0.526
	(9.850)	(1.323)	(0.227)	(0.225)	(9.180)	(1.326)	(4.320)	(0.478)	(0.293)	(0.412)	(4.167)	(0.935)
Macro PCA SG	3.261	–0.174	0.166	–0.298	1.703	1.830	–6.458	0.717	–0.243	0.603	–6.743	–0.045
	(7.957)	(1.811)	(0.215)	(0.211)	(8.134)	(1.469)	(4.415)	(0.562)	(0.213)	(0.393)	(4.369)	(0.839)
Push factors:												
Real GDP growth G3+UK	38.222*	2.896	0.167	–1.080**	34.438*	2.022	–1.129	–0.238	0.001	–0.497*	0.431	–0.002
	(19.812)	(3.118)	(0.371)	(0.511)	(18.230)	(2.821)	(2.353)	(0.309)	(0.237)	(0.257)	(2.323)	(0.626)
Real GDP growth Asia ex China	–7.047	–1.162	–0.098	–0.103	–4.927	–0.742	10.041*	1.054	0.374	0.570	6.193	–0.217
	(6.692)	(1.460)	(0.076)	(0.092)	(7.398)	(0.440)	(5.603)	(0.725)	(0.380)	(0.435)	(5.118)	(1.146)
Real GDP growth China	–1.163	0.797	0.089	0.397	–3.550	0.841	4.613*	–0.258	–0.057	0.448*	4.398*	0.625
	(10.949)	(1.610)	(0.415)	(0.286)	(12.222)	(2.171)	(2.478)	(0.238)	(0.134)	(0.227)	(2.349)	(0.446)
Inflation US	–8.739	0.021	1.179	1.970*	–2.833	–9.947*	5.682	1.016	0.092	0.060	–0.585	3.110
	(34.466)	(7.319)	(0.802)	(1.016)	(34.280)	(5.156)	(9.989)	(1.003)	(0.656)	(0.951)	(9.109)	(1.862)
Real interest rate US	–12.340	–0.238	0.229	2.426***	–12.723	–2.721	1.382	–0.562	–0.268	0.013	–2.856	3.722**
	(22.747)	(5.422)	(0.620)	(0.773)	(22.572)	(3.351)	(6.377)	(0.814)	(0.545)	(0.874)	(6.224)	(1.396)
Trade/GDP cyclical US	178.399	1.231	4.179	–3.429	194.249	–16.075	82.736	14.064	6.641*	2.499	69.632	27.951*
	(118.701)	(23.874)	(2.750)	(3.912)	(119.998)	(17.187)	(83.590)	(9.613)	(3.929)	(7.147)	(80.980)	(14.175)
Two-year bond yield US	–1.132	–2.078	–0.795	–4.050***	1.772	4.870	–8.239	–0.377	0.361	0.060	1.378	–8.673***
	(25.711)	(6.645)	(0.795)	(0.925)	(26.064)	(4.235)	(12.669)	(1.581)	(0.905)	(1.604)	(11.791)	(2.738)
USD growth	4.838	0.527	0.036	0.188***	4.124	–0.044	–1.606	0.036	–0.164	0.148	–1.632	0.319
	(3.273)	(0.381)	(0.052)	(0.061)	(3.235)	(0.278)	(1.645)	(0.190)	(0.121)	(0.167)	(1.545)	(0.350)
Financial risk indicator	–0.657	–0.324	–0.143	–0.694**	–2.065	2.567	-15.266***	–3.065***	–0.197	–1.223***	–9.721	–2.383**
	(10.982)	(2.123)	(0.431)	(0.319)	(12.111)	(2.058)	(5.432)	(0.759)	(0.266)	(0.437)	(5.922)	(0.946)
Change in USDSGD spot rate	–11.399	–0.908	–0.074	–0.176*	–10.275	0.034	2.471	0.186	0.379*	0.096	2.527	–0.825
	(8.386)	(0.842)	(0.093)	(0.088)	(8.554)	(0.486)	(2.838)	(0.351)	(0.219)	(0.279)	(2.678)	(0.570)

Constant	39.909	16.700	0.141	11.002***	12.508	0.640	–10.877	22.858***	–1.592	–2.451	–41.793*	15.258***
	(144.734)	(21.294)	(5.652)	(3.773)	(156.796)	(28.193)	(24.518)	(4.192)	(1.766)	(3.305)	(23.160)	(5.586)
Observations	48	48	48	48	48	48	69	69	69	69	69	69
R^2	0.277	0.145	0.209	0.664	0.243	0.242	0.426	0.611	0.156	0.302	0.321	0.228

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.