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PEOPLE'S REPUBLIC OF CHINA—HONG KONG SPECIAL ADMINISTRATIVE REGION

SELECTED ISSUES

December 20, 2017

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Asia and Pacific Department

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MEDIUM-TERM FISCAL PROSPECTS AND IMPLICATIONS[1]

Questions: (1) What are the long-term challenges for Hong Kong SAR's fiscal policy and implications for fiscal space? (2) Policy recommendations?

Hong Kong SAR's fiscal framework has worked well over the last 20 years but challenges have emerged that will strain the fiscal position in the medium to long term. Consequently, while fiscal space is ample currently, it could become gradually constrained over time. The fiscal rule should be implemented flexibly and revenue mobilization needs to be considered down the road. On the expenditure side, containment will be hard given rapid aging and still high inequality. The challenge will be to maintain investment and boost land supply while increasing social spending to guarantee that those who need support are effectively protected.

A. Long Run Fiscal Challenges and Implications for Fiscal Space

Hong Kong SAR's fiscal framework has worked well over the last 20 years, but challenges have emerged. Fiscal space is ample currently but could become constrained in the future.

Hong Kong SAR's Fiscal Framework and Outcomes Over the Past Decades

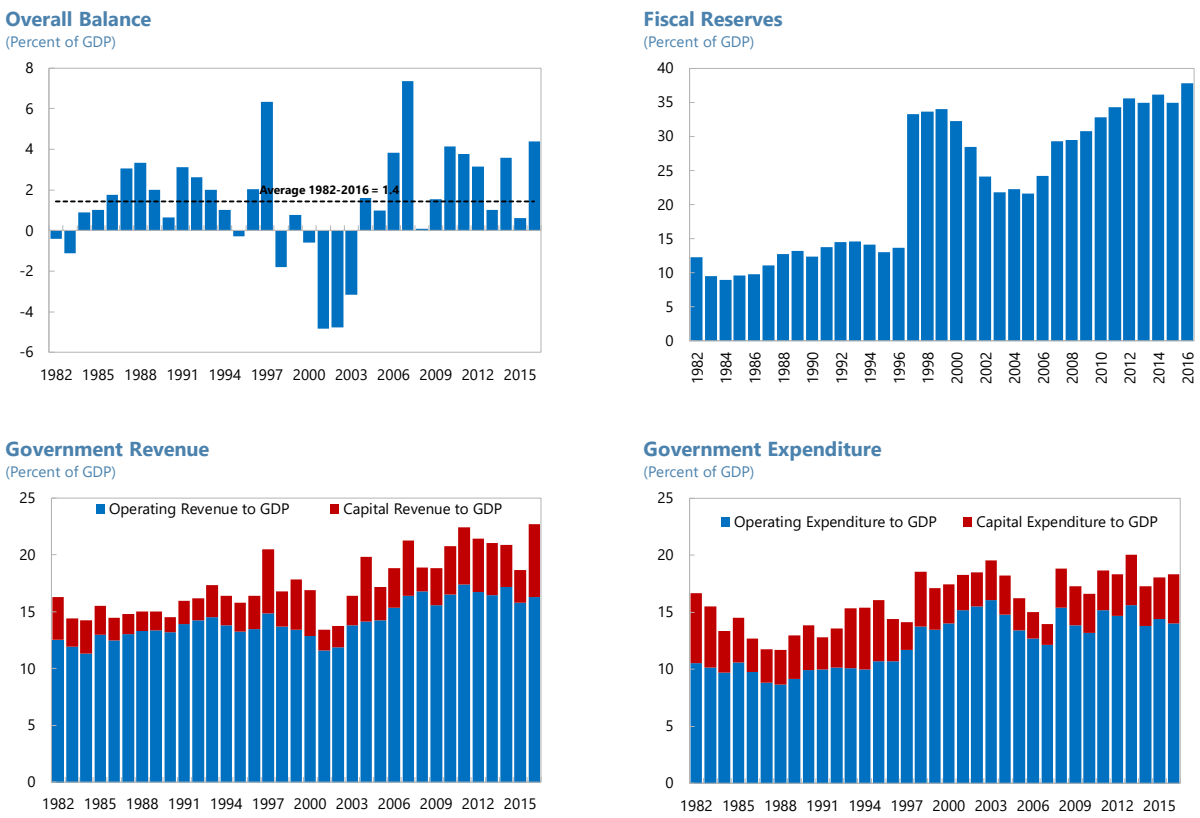
1. Public fiscal management was prudent even before the handover. In the 1980s, the principle of keeping expenditure to GDP roughly constant was explicitly introduced in the yearly Medium Range Forecast, where multi-year fiscal estimates are still formulated (see Lam, 2001).

2. The SAR's basic law enshrined the principle of fiscal prudence. In effect since 1 July 1997, the basic law states in its Article 107 that the government is to keep "…expenditure within the limits of revenues in drawing up its budget, and strive to achieve a fiscal balance, avoid deficits and keep the budget commensurate with the growth rate of its gross domestic product."

3. Hong Kong SAR has experienced systematic fiscal surpluses and rising fiscal reserves (figure 1). Hong Kong SAR's surplus averaged 1.4 percent of GDP since 1997. In fact, there have been fiscal surpluses in every year since FY03/04, maintained even through the GFC. Consequently, fiscal reserves accumulated over time and are now approaching 40 percent of GDP. Revenues and expenditure, as a percent of GDP, have been slightly trending up over the last 30+ years, but remained roughly constant since the handover in 1997.

[1] Prepared by Rui Mano (APD).

Figure 1. A Long-term View of Hong Kong SAR's Fiscal Performance



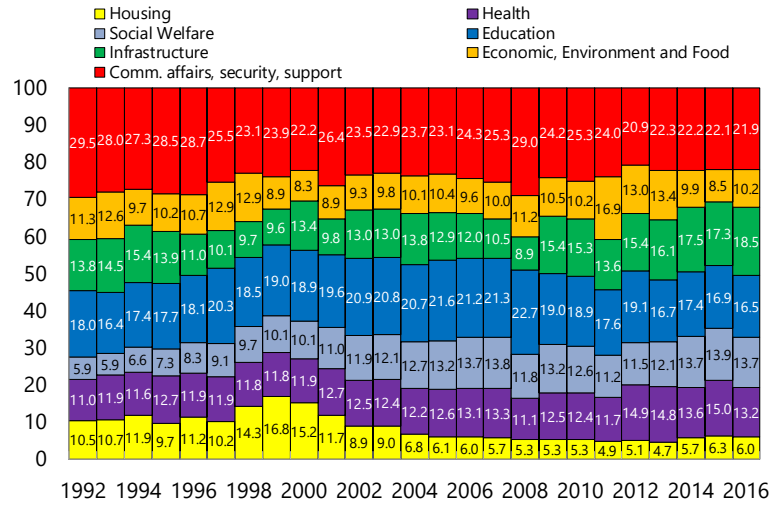
Sources: CEIC Data Co. Ltd. IMF staff calculations.

Challenges

Challenge 1: Rising Recurrent Spending in the Medium-term

4. Infrastructure, social welfare and health have been taking up a progressively larger share of total public spending (Figure 2). The share devoted to infrastructure out of total public spending has nearly doubled from 9.6 in FY97/98 to 18.5 in FY16/17. Health and social welfare are also progressively accounting for more of total public spending, increasing from around 22 percent to almost 27 percent in the same period. Spending on housing declined rapidly through the late 90s and early 2000s and is only recently rising with the renewed efforts to expand land supply. The share of public spending devoted to education has also declined slightly.

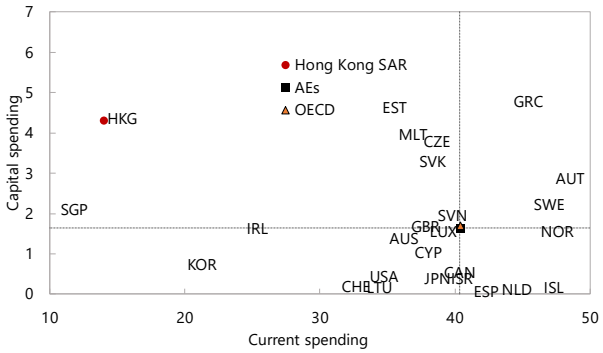
Figure 2. Public expenditure breakdown by main policy areas
(percent)



Sources: CEIC, staff estimates.

5. While infrastructure spending is on par or even larger than most other advanced economies, … At around 4 percent of GDP since FY08/09, capital spending is high in an international context and the quality of infrastructure is consistently ranked as one of the best in the world (Figure 3).

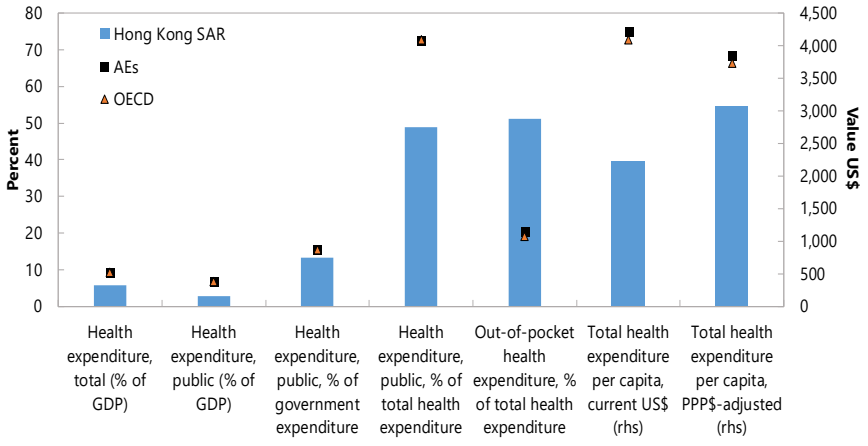
Figure 3. Current and Capital Spending in 2016
(percent of GDP)



Source: FAD's expenditure assessment tool.

6. …other types of spending are lower reflecting Hong Kong SAR's lean government philosophy and its current demographics. The government wage bill is low across several indicators: wage bill to GDP at 4.2 percent, wage bill to total public expenditure just shy of 20 percent, and public employment to working age population of 4.4 percent, all much lower than other AEs. Despite recent increases, social spending is also comparatively low. Social assistance, pension and health spending (Figure 4) are all below other advanced

Figure 4. Health Expenditure: Hong Kong SAR, AEs and OECD

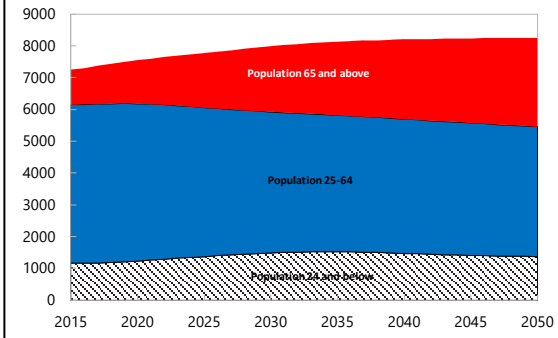


Source: FAD's expenditure assessment tool and staff estimates.

economies, in part due to Hong Kong SAR's relatively younger population at present.

7. However, Hong Kong SAR is aging rapidly and social expenditure is likely to rise gradually. Due to diminished fertility and rising life expectancy, the United Nations projects Hong Kong SAR's population to age quickly (Figure 5). The old-age dependency ratio (ratio of population over 65 to population aged 25-64) is expected to rise to 68.5 by 2050 from its 2015 level of 22.2.

Figure 5: Hong Kong SAR's population projected
(thousands)

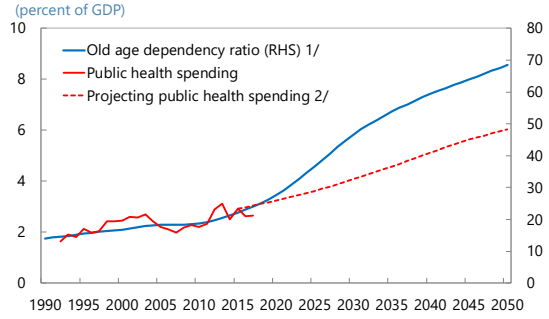


Sources: UN population projections, medium variant, 2017 revision, staff estimates.

8. As a result, health and pension spending could roughly double by 2050 (Figure 6). Based on the methodology developed in Clements and others (2015), public health spending could more than double to 6 percent of GDP by 2050 from its 2016 level of 2.9 percent of GDP.[2] Pension spending may increase to 3.9 percent of GDP by 2050 (based on Clements and others (2013) and IMF (2017a)), from 1.8 percent of GDP in 2015.[3] These estimates are likely conservative, since the impact of aging on economic activity itself is hard to predict and may not be well captured. Estimates in IMF (2017b) project a reduction of ¾ of a percentage point in Hong Kong SAR's real GDP growth due to aging.

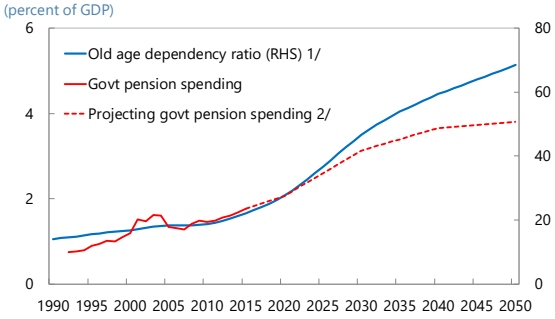
Figure 6. Public Expenditure Projections: Pension and Health

Old age dependency ratio and public health spending
(percent of GDP)



1/ In percent, population above 65 divided by population 25-64. 2/ Using IMF's Fiscal Affairs Department template for assessing the fiscal implications of demographic shifts.

Old age dependency ratio and public pension spending
(percent of GDP)



1/ In percent, population above 65 divided by population 25-64. 2/ Using IMF's Fiscal Affairs Department template for assessing the fiscal implications of demographic shifts.

Sources: The United Nations; Government of the HKSAR; and IMF staff calculations.

[2] The approach entails using spending indices by age cohort estimated from OECD countries and applying those to Hong Kong SAR's share of population by cohort. This approach is a simplification of that in de la Maisonneuve and Martins (2013), essentially ignoring non-demographic factors.

[3] Assuming a constant replacement rate and coverage ratio of pensioners to population aged above 65 years, changes in pension expenditure to GDP are proportional to changes in employment ratio times changes in old-age dependency ratio (See Appendix 1 of Clements and others, 2013). Given population and employment ratio projections and an initial level of pension expenditure to GDP, one can thus calculate subsequent levels of pension spending to GDP.

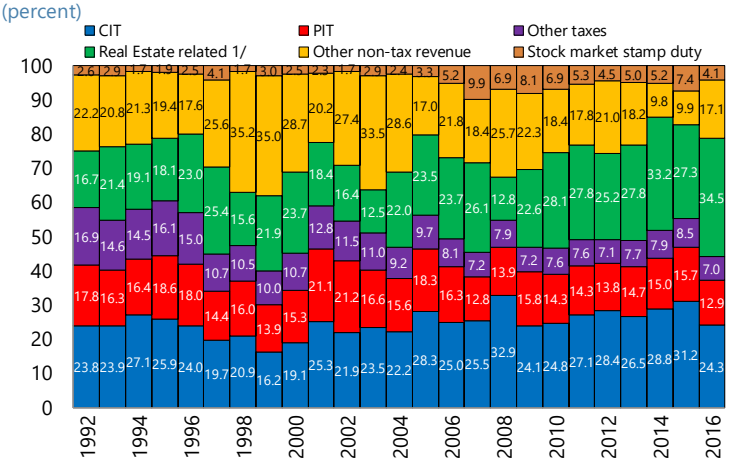
9. Additionally, high and persistent inequality is currently, and will likely remain, a catalyst for increased demand for public spending. Hong Kong SAR has elevated market income inequality, in part explained by the structure of its economy (see box in IMF 2016a). Additionally, rapid aging may exacerbate inequality dynamics. Recently, across the world there has been an increased focus on inequality and policies to address it. Hong Kong SAR has responded by considerably upgrading its redistributive policies but going forward the government may come under additional pressure to increase support to households at the bottom of the income distribution.

Challenge 2: heavy reliance on real estate related revenues and other volatile sources

10. Revenues have become particularly reliant on the real estate sector. Over time, revenues tied to the property market such as transaction and recurrent property taxes[4] have become a major source of revenues averaging more than 28 percent of total revenues during 2010-2016, up from an average of around 20 percent in the 2000s (Figure 7). In addition, stamp duties collected on stock market transactions accounted for 4.1 percent of total revenues in FY16/17 but have varied from a high of 9.9 percent and a low of 1.7 percent since FY92/93.[5]

Figure 7. Government revenue: breakdown by source

(percent)



1/ Government rent revenues added since FY2001/2, also includes stamp duties on leases and property and chargeable assignments. Sources: CEIC, staff estimates.

11. In fact, Hong Kong SAR relies more on tax revenue from property than other economies, although this revenue is highly volatile. Figure 8, top left, shows that Hong Kong SAR relies more than other economies on property taxes, even compared to other financial centers like Singapore or Luxembourg, and that this over reliance arises from transaction-based taxes like stamp duties, although recurrent property taxes also generate sizable income for Hong Kong SAR. Figure 8, top right, shows that although Hong Kong SAR has higher property tax revenues than any other

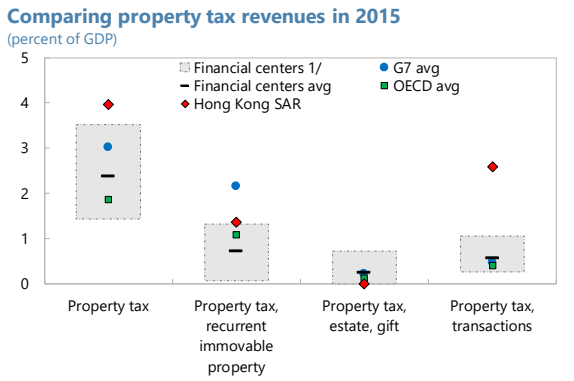
[4] Includes revenue from general rates and government rents charged at 3% of rateable values in accordance with the Government Rent (Assessment and Collection) Ordinance (Cap. 515).

[5] For example, stamp duties collected on stock market transactions, or on "contract notes", collapsed by 70 percent in FY98/99, and soared 136 percent in FY07/08, showing a very high degree of pro-cyclicality as expected.

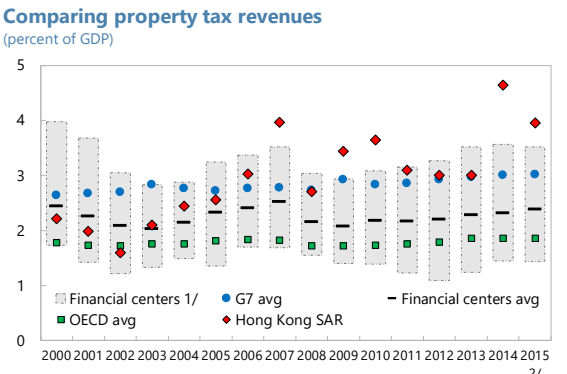
financial center considered since FY14/15, in the early 2000s it had lower revenues than the average financial center. The amplitude of property taxes to GDP is potentially large in general, and appears larger in Hong Kong SAR's case. Underlying these sharp movements are stamp duty revenues from both real estate and stock market transactions, the former benefiting from both expanding base and rates since the GFC.

12. Moreover, other major sources of revenue are also volatile given relatively low personal income and goods and services tax rates. Corporate income taxes (CIT) have also grown in importance to over 30 percent of revenues in FY15/16 and are highly subject to the business cycle. Figure 8, bottom left, shows that Hong Kong SAR relies relatively more on corporate income taxes than any other financial center, while its revenues from personal income tax (PIT) and sales/value added taxes (VAT) are below comparators due to low tax rates on personal income and no sales/value-added taxes (see figure 8, bottom right). While capital gains taxes tend to be zero in financial centers, tax rates on corporate profits, dividend income, top marginal personal income and VAT are generally higher in other financial centers. Other non-tax revenues (excluding land sales) have also been very volatile, particularly capital revenue that depends on uncertain investment returns.[6]

Figure 8. Benchmarking Hong Kong SAR's Tax Structure

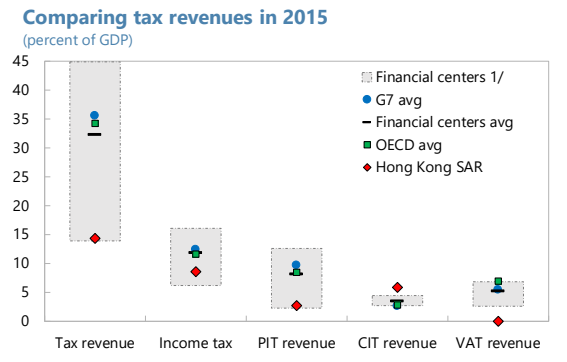


1/ Range for Belgium, Luxembourg, Netherlands, Singapore (2014) and Switzerland.

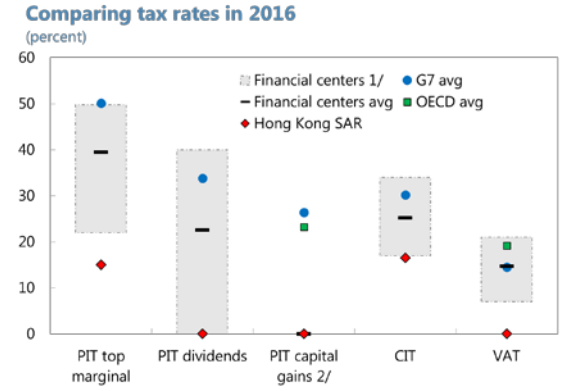


1/ Range for Belgium, Luxembourg, Netherlands, Singapore and Switzerland. 2/ Singapore and OECD avg for 2014.

[6] Capital revenues are highly volatile, with several instances of more than doubling or more than halving as a share of GDP from one year to the next.



1/ Range for Belgium, Luxembourg, Netherlands, Singapore (2014) and Switzerland.



1/ Range for Belgium, Luxembourg, Netherlands, Singapore and Switzerland. 2/ 2015.

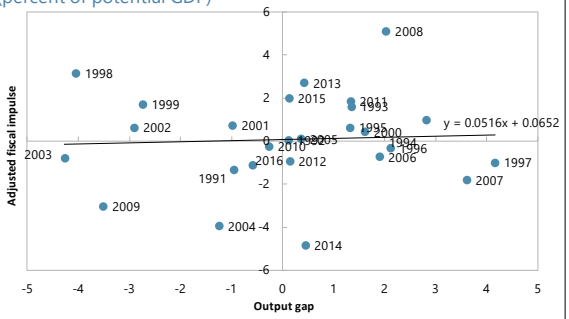
Sources: OECD revenue statistics; IMF, *World Economic Outlook* (WEO); CEIC Data Co. Ltd.; IMF staff calculations.

13. The volatility of key revenue sources is a risk particularly given the recent buoyancy in asset markets. In an extreme scenario where stock market transactions fall sharply, the business climate sours, and, at the same time, house prices correct, revenues could contract sizably as was the case in FY01/02. This could render medium-term revenue projections particularly uncertain. Even in a normalization scenario, revenues could decline significantly as the house price gap closes gradually. As an illustration, property tax revenue was on average 1 percent of GDP higher after 2009 than its 2001-2009 average.

Challenge 3: Counter-cyclical Policy, Flexible Demand Management

14. Fiscal policy could have been more supportive of demand conditions in the past. The fiscal impulse, measured by the change in primary balance adjusted for one-off non-policy factors and the business cycle has not been an effective tool to weather economic cycles[7]. Figure 9, showing combinations of output gap and fiscal impulse illustrates this finding: if fiscal policy had been countercyclical, most data points should congregate in the northwest-southeast quadrants, and the fitted line should have a negative slope, neither of which is true. Indeed, the chart shows that fiscal policy has been acyclical during the previous 20 years, mostly due to weak expenditure-side automatic stabilizers.

Figure 9. Adjusted Impulse compared to the output gap
(percent of potential GDP)



Source: IMF staff estimates.

15. Recently, the Chief Executive stated that the Basic Law should not preclude the government from supporting the economy when necessary.[8] In the past, the strict adherence to the fiscal rule inscribed in the Basic Law's article 107 may have prompted the authorities to run

[7] Appendix A has more details behind this calculation.

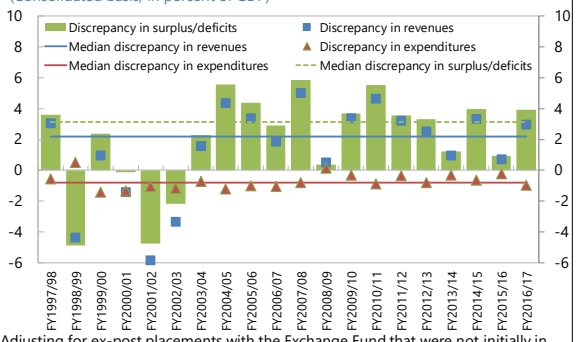
[8] Public speech made in Singapore as published by the South China Morning Post on August 3 2017.

larger surpluses than they would have otherwise done if taking into account demand management concerns and resulted in an asymmetric implementation of fiscal policy.

Challenge 4: Over Performance of the Fiscal Balance

16. Actual revenues tend to be higher than budgeted while the reverse is true for expenditures. Since FY97/98, actual revenues have been consistently larger than budgeted (by a median of 2.2 percent of GDP), with both operating and capital revenue typically over performing.[9] Expenditures, on the contrary, tend to be lower than budgeted (by a median of 0.8 percent of GDP), almost all of this explained by operating expenditures.[10]

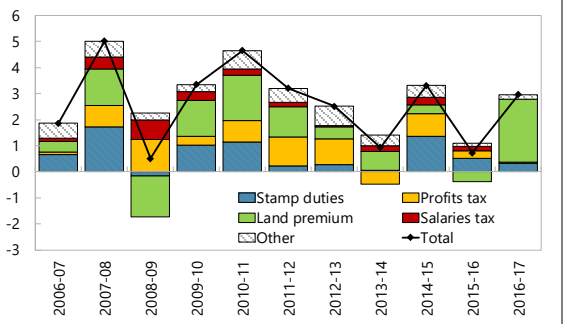
Figure 10. Discrepancy of Fiscal Outturn and Budget
(Consolidated basis; in percent of GDP)



Adjusting for ex-post placements with the Exchange Fund that were not initially in the budget. Sources: Government budget statements; and IMF staff estimates.

17. Revenue over-performance is pervasive across sources, although a large part can be attributed to land sales that are not projected in the budget. In the budget, the revenue estimate for land sales is determined by the sites to be sold and the conditions of the property market, and thus it is natural that actual revenues outpace the budget amid rising land prices and land supply. However, even ignoring land sales, over-performance is very common across all major categories.

Figure 11. Discrepancy between Actual and Budgeted Revenues (Percent of GDP)



Sources: Budget statements, IMF.

Implications for Fiscal Space

18. Fiscal space can be defined in different ways, but narrowly it is the ability of a government to expand its deficit without meaningfully changing debt sustainability and market access. Assessing fiscal space thus involves a judgement on whether a temporary fiscal expansion can be accommodated by accounting for the impact on debt dynamics, yields, the path of gross financing needs, as well as economic and structural conditions (IMF 2016b).

19. Given its ample fiscal reserves, low debt, and recent fiscal surpluses, it is clear that Hong Kong SAR has fiscal space defined in this narrow sense. Government debt is virtually zero, fiscal reserves are now at 38 percent of GDP, and the government has run surpluses in 24 of the last

[9] Median over-performance of operating revenue is 1.5 percent of GDP, while that of capital revenue is 0.5 percent of GDP. Capital revenue is more often lower than budgeted with 7 instances in the last 20 fiscal years, while operating revenue underperforms rarely (only 4 instances in the last 20 years).

[10] Operating expenditures have under-performed in 18 out of the last 20 fiscal years, whereas capital expenditures tend to be much more balanced and their median under-performance is virtually zero.

30 years. There is little doubt that if needed, Hong Kong SAR's government has the capacity to support the economy with either tax relief or higher expenditures.

20. But Hong Kong SAR's fiscal position is expected to worsen over the medium-term due to aging and a normalization of real estate related revenues, rendering narrowly-defined fiscal space less relevant. Pressures on the spending side are looming, due to aging but also high and persistent inequality (see challenge 1 in the previous sub-section). In addition, revenues are also temporarily elevated due to the buoyancy in the housing market (see challenge 2 in the previous sub-section). These two combined pressures may lead to a significant deterioration of the fiscal position over time.

21. A structural deficit is to emerge under current policies due to ageing and lower revenues tied to real estate. Putting together the estimates discussed in the sub-section devoted to rising recurrent spending (challenge 1) and those in the sub-section regarding overreliance on real estate revenues (challenge 2), a structural deficit would emerge in the next 10-15 years. Over the very long-run, this deficit could reach 3 to 6 percent of GDP, if considering an increase in health and pension spending by 3-5 percent of GDP and a decline in revenues by 3-5 percent of GDP due to lower land premium and revenues tied to a normalization of the real estate market.

22. In its comprehensive report, the Working Group on Long-Term Fiscal Planning projected a rapidly deteriorating fiscal position over the medium-term (FSTB 2014). The working group laid out several scenarios with expenditures driven chiefly by demographics, and found that structural fiscal deficits would arise by 2030 and that fiscal reserves would be exhausted by 2041, under a best-case scenario. This despite projecting a relatively stable revenue-to-GDP ratio, which under current policies could be hard to achieve as noted previously.

23. Such comprehensive long-term estimates should be revisited periodically. Producing an independent report every three to five years, updating projections and testing their robustness should be considered. One goal would be to have a more accurate picture of long-term fiscal space. Small changes in fertility rates cumulate to large differences in aging profiles when extrapolating, and thus imply different consequences for the path of fiscal position. Another important goal of periodic reporting would be to serve as a communications device to educate the public about long-run fiscal challenges.

B. Policy Recommendations

The fiscal rule should be implemented flexibly and revenue mobilization needs to be considered in the medium term. On the expenditure side, containment will be hard given rapid aging and high inequality. The challenge will be to maintain investment and boost land supply while increasing social spending to guarantee that those who need support are effectively protected.

Adjusting the Fiscal Framework

24. The fiscal rule as inscribed in the Basic Law should be implemented flexibly over the cycle. In the past, fiscal policy was relatively acyclical and could have better supported aggregate demand. It is important to let fiscal policy respond to the cyclical conditions of the economy, and fundamentally avoid it being asymmetrically implemented. In a downside scenario, revenues naturally decline but expenditures should not be adjusted to maintain the budget roughly balanced. Similarly, if economic conditions surprise on the upside, fiscal savings should be accumulated, as has been the practice in Hong Kong SAR.

25. More importantly, the implications of the medium-term fiscal challenges for the implementation of the fiscal rule should be considered carefully. Keeping expenditure growth close to trend GDP growth will be increasingly challenging given aging and elevated inequality.

Revenue Mobilization

26. If expenditures are indeed set to increase structurally, the only feasible way to continue adhering to the fiscal rule will be to raise more revenue. If spending demands increase significantly and/or real estate revenues wane, it will be extremely difficult and undesirable, both politically and economically, to cut back on service provision either reducing benefits per recipient or reducing coverage. On these premises, a structural deficit would eventually emerge under current policies, which could be financed by running down the existing fiscal reserves initially and eventually issuing debt. However, the debt levels required to sustain such structural deficits would be high.

27. Hong Kong SAR's comparative advantage lies partly in its flexible, low-tax business environment and thus potential measures need to be carefully studied. The emergence over the longer-term of a structural deficit requires early thought, and the authorities should start actively studying options to raise revenue in a growth-friendly way. Taxes that do not hamper Hong Kong SAR's business competitiveness should be considered first, such as possibly introducing a value-added tax or a sales tax and increasing selected excises. Personal income taxes could be made more progressive, as the top marginal tax still appears low even compared to other financial centers. All of these were identified through a simple international benchmarking exercise, and merit careful study of their implications for efficiency and growth, as well as distributional impacts. The good news is that Hong Kong SAR has amassed fiscal reserves that buy it time for careful planning and due consideration of the trade-offs involved.

28. The recent establishment of a tax policy unit (TPU) under the Financial Services and the Treasury Bureau is a welcome step. A stated goal of the TPU is finding "…ways to broaden the tax base and increase revenue."[11] This goal is crucially important for Hong Kong SAR's medium-term fiscal prospects, and should be expanded to include also possible changes to the tax structure. The

[11] See press release on the reply by the Secretary for Financial Services and the Treasury, Mr James Lau, in the LegCo session of July 5 2017 (http://www.ird.gov.hk/eng/ppr/archives/17070501.htm).

unit already conducted research that was behind two recent tax policy measures: the two-tiered profits tax and enhanced deductions for research and development.

Expenditure containment is hard, prioritization can only have a limited impact

29. Infrastructure spending and boosting land supply are key for the economy's medium-term growth prospects and should be maintained. While non-essential spending is already low, the government should continue to study opportunities to reduce it further and the 0-1-1 program could be expanded. However, it appears that prioritization and rationalization can only achieve limited savings because Hong Kong SAR's government is already lean and efficient.

30. Containing social spending will be challenging, and social policies may need to be better targeted. As aging sets in, public expenditures, particularly on healthcare, will rise, resulting in strained social safety nets and potentially a wider gap between rich and poor. In this context, the authorities should study whether programs can be better targeted, while at the same time raising the benefit per recipient. The Old Age Allowance program is not means-tested and its benefit levels are low. Merging this program with the Old Age Living Allowance and thereby raising means-tested benefits that are more vital for recipients could be considered.

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Appendix I. Computing the Fiscal Impulse Based on the Structural Balance

This section discusses the methodology followed to construct estimates of fiscal impulse mentioned in the text and presented in Figure 9. It uses the standard literature on the topic (Fedelino and others, 2009, Bornhost and others, 2011, and Price and Dang, 2011).

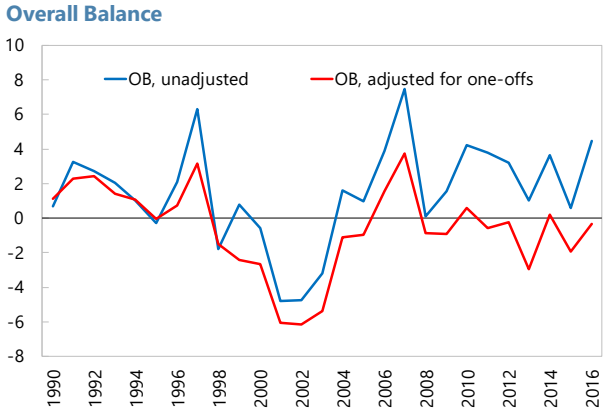
There are three main steps to computing the fiscal impulse based on the change in the structural fiscal balance. (Step 1) Revenues and expenditures must be adjusted for one-off or temporary measures that do not reflect a change in policy stance[1]; (Step 2) Elasticities of revenues and expenditures to economic cycles are estimated; and (Step 3) Estimates of the structural balance and its change from year to year, i.e. the fiscal impulse, are computed.

Step 1: Adjusting Revenues and Expenditures for One-offs and Excluding Land

List of main adjustments[2]:

- Revenues from land premium, and other asset sales are excluded;
- Equity injections under the Capital Investment Fund are adjusted to account for the lag of disbursements, but loans extended are not adjusted for;
- The tax rebate of FY1998 is adjusted to correct for a timing mismatch between recording and actual loss of revenue;

The resulting adjusted overall balance is significantly different than the unadjusted balance, particularly in more recent years (see figure below). Most of the discrepancy is due to the exclusion of revenues from land sales.



Source: IMF staff estimates.

[1] Classical examples include capital transfers or expenditures with disaster relief.

[2] These adjustments follow previous literature on estimating Hong Kong SAR's structural balance (see HKMA, 2002) and the rules of thumb in Larch and Turrini (2009).

(continued)

Step 2: Estimating Revenue and Expenditure Elasticities

Two main specifications are explored, using different measures of economic cycles.

First, we estimate the long run equation as in Liu and others (2015) [3]

$$\ln R_t = \gamma_Y \ln\left(\frac{Y_t}{Y_t^*}\right) + \gamma_S \ln\left(\frac{S_t}{S_t^*}\right) + \gamma_H \ln\left(\frac{H_t}{H_t^*}\right) + \delta t + e_t \quad (1)$$

Second, we estimate elasticities directly using the changes in (log) adjusted revenues regressed on measures of economic cycles:

$$\Delta \ln R_t = \beta_Y \Delta \ln\left(\frac{Y_t}{Y_t^*}\right) + \beta_S \Delta \ln\left(\frac{S_t}{S_t^*}\right) + \beta_H \Delta \ln\left(\frac{H_t}{H_t^*}\right) + u_t \quad (2)$$

Where:

- R_t are actual (adjusted) revenues, respectively
- Y_t , Y_t^* are actual and potential output, respectively
- S_t , S_t^* are actual and potential real equity price index, respectively[4]
- H_t , H_t^* are actual and potential real house price index, respectively
- e_t, u_t are error terms, t is time

The table below shows the results for equations (1) and (2).

The first four columns estimate equation (1) denoted by "in levels", and vary by the measure of economic cycle used. Column 1 shows the elasticity of adjusted revenues to non-inflationary output gap[5]. Note that the elasticity estimate at more than 3 is quite large, compared to typical elasticities used in similar economies like Switzerland, Luxembourg, Belgium, Ireland, or Netherlands where elasticities used are typically between 1.0 and 1.5. Column 2 measures the elasticity with respect to a the so called finance-neutral output gap, which includes financial variables as in Borio and others

[3] This sub-section follows closely Liu and others (2015).

[4] The potential stock price is estimated using an HP-filter with very large smoothing parameter of 1,562.5, which corresponds to an often-used smoothing parameter for financial variables of 400,000 at the quarterly frequency (see footnote 80 of IMF 2014).

[5] Computed through a multivariate filter with both output and inflation series.

(2013). Elasticity estimates in this specification are somewhat smaller but still larger than typically found for other economies, although these estimates should be taken with caution given the smaller sample size. Column 3 and 4, add two other measures of economic cycles, house price gap and stock price gap, to the non-inflationary output gap measure in column 1. Columns 5-8 follow the same logic as 1-4 but estimate equation (2) instead, labelled "in diff".

In general, the elasticity to the output gap is large. The elasticity to house price gap also seems to be significant although in the differenced equation it is just shy of the 10 percent significance level. The elasticity to the stock price gap is much less robust.

Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(log) Adjusted revenues	in levels	in levels	in levels	in levels	in diff	in diff	in diff	in diff
Non-inflationary output gap	3.73***		2.27***	2.91***				
	(0.00)		(0.00)	(0.00)				
Finance-neutral output gap		2.01***						
		(0.01)						
House real price gap			0.48***	0.47***				
			(0.00)	(0.00)				
HP-filter real stock price gap				-0.12				
				(0.38)				
Non-inflationary output gap, diff					3.45***		2.66***	2.82**
					(0.00)		(0.00)	(0.05)
Finance-neutral output gap, diff						2.92***		
						(0.00)		
House real price gap, diff							0.33	0.33
							(0.10)	(0.12)
HP-filter real stock price gap, diff								-0.03
								(0.88)
Constant	-85.87***	-94.62***	-70.09***	-68.12***	0.06***	0.05**	0.05**	0.05**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.02)	(0.03)	(0.04)
Observations	27	18	21	21	26	17	20	20

Time trend used in the first 4 columns, pval in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Quarterly data confirms that the elasticity of revenues to output gap is large (around 2) when estimating equation (1). Estimating equation (2) produces results that are not very robust because of residual seasonality even after using standard techniques to remove it.

Expenditure elasticities are never significant.

In the end, we use an elasticity of revenues of 2.5 with respect to the non-inflationary output gap and elasticity of 0.4 with respect to the house price gap. Expenditures are assumed to be invariant with the cycle in the stock market, as elasticity estimates were always insignificant.

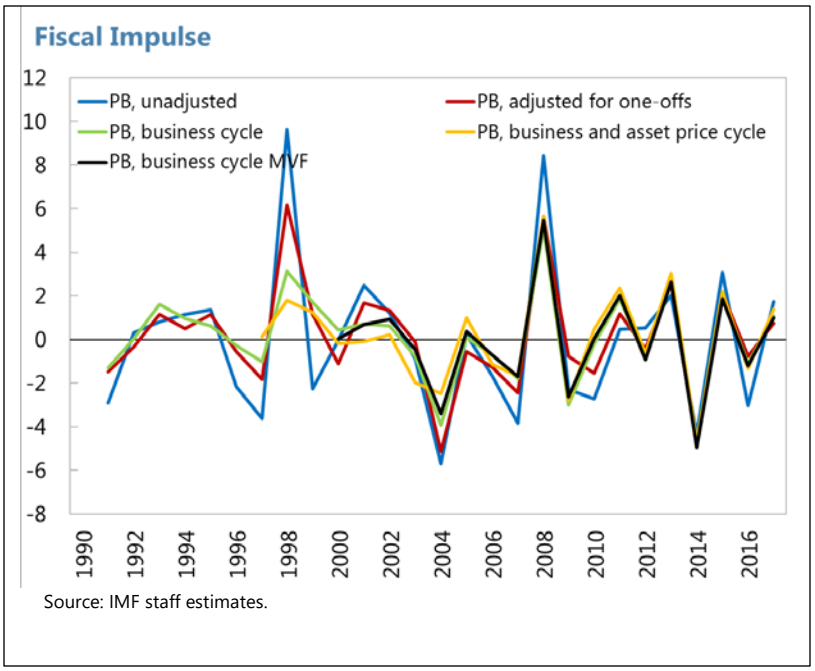
Step 3: Compute Fiscal Impulse

With the elasticities calculated in step 2, we compute adjusted revenues using:

$$\tilde{R}_t = R_t \left(\frac{Y_t}{Y_t^*} \right)^{-2.5} \left(\frac{H_t}{H_t^*} \right)^{-0.4} \quad (3)$$

The structural primary balance is the difference between $\tilde{R}$ and expenditures adjusted for one-offs, and deducting total investment income and interest expenses under the Capital Works Fund.

The fiscal impulse is the change in primary structural balance from the previous fiscal year to the current (see figure below). A positive number like the one projected for FY17/18 (the last data point shown in the graph) means that the structural balance is going to be larger in the current fiscal year vs the previous, and thus that fiscal policy is not supportive of aggregate demand this year. Note that different measures of fiscal impulse using non-inflationary output gap alone, together with house price gaps, or using finance-neutral output gap all deliver similar estimates recently, despite some differences in the past.



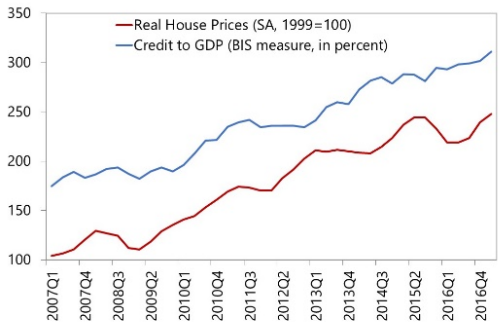
Source: IMF staff estimates.

HOUSE PRICES AND THE EFFECTIVENESS OF HOUSING MARKET POLICIES IN HONG KONG SAR[1]

During the last decade, Hong Kong SAR has experienced a large increase in house prices and credit, prompting the authorities to respond with several rounds of tightening macro-prudential rules and increasing stamp duty taxes. This chapter analyzes the effectiveness of these measures, and finds that they have helped reduce house price appreciation. The estimated impact of a 10 percent LTV tightening is a reduction of house prices of 4.8 percent over the next year. The estimated impact of a 1 percent increase in the ad valorem stamp duty tax is a reduction of house prices of 1.2 percent over the next year. Without these policies, house prices would have been 12.5 percent higher, and the mortgage credit-GDP ratio 15 percent higher.

A. Background

1. House prices and credit have increased substantially in Hong Kong SAR during the last decade. Global low interest rates after the Great Recession and abundant liquidity have led to a credit and housing boom, as in other advanced open economies such as Australia, Canada, Denmark, Norway, Sweden, and Singapore. In addition, domestic factors, including land supply constraints, have contributed to house price increases. In real terms, house prices have increased by 145 percent since mid-2007, while the credit-to-GDP ratio has increased from 183 percent to 316 percent. In contrast, real sector indicators have increased at a slower rate: real GDP growth and CPI inflation have averaged 3 percent in the last decade. This divergence has raised questions about the sustainability of the current credit and housing booms, the potential risk of a disorderly housing market correction, and the implications for financial stability.



Sources: Haver Analytics; BIS.

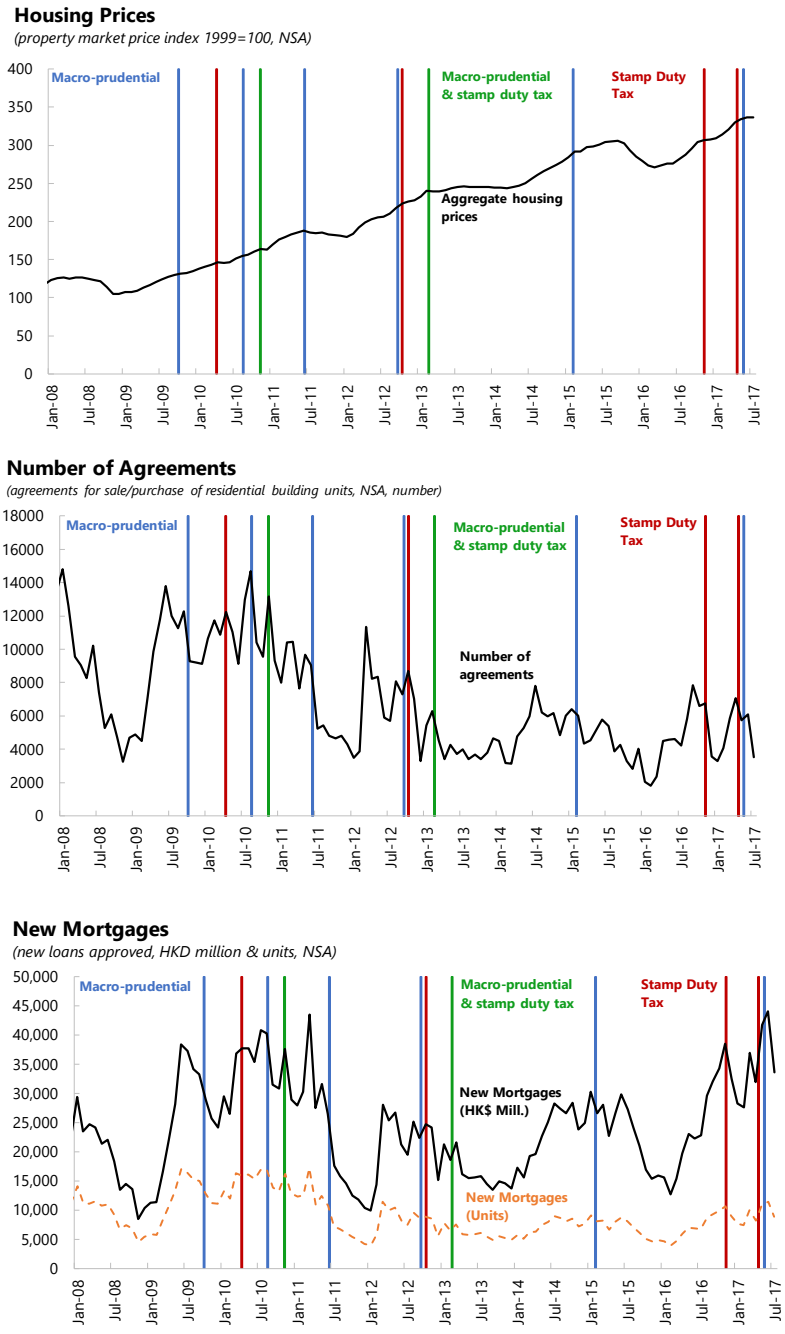
2. In response, the Hong Kong Monetary Authority (HKMA) has implemented eight rounds of macroprudential tightening since October 2009.[2] The tightening measures have included reductions in the maximum loan-to-value (LTV) ratio and debt service-to-income ratio (DSR). Currently, the maximum LTV ratio is 60 percent for the mass market and 50 percent for the luxury market. The maximum DSR ratio is 50 percent. These ratios are tighter for borrowers: (i) whose main source of income is not Hong Kong-based, (ii) with multiple mortgages, (iii) who

[1] Prepared by Pau Rabanal (RES) and Ananya Shukla (APD).

[2] Appendix III in the 2017 IMF Hong Kong SAR Staff Report details all the measures implemented by the authorities between October 2009 and end-2017.

purchase properties for investment purposes (non-owner occupied properties), and (iv) who receive mortgages based on their net worth instead of their income. The HKMA has also applied stricter risk weights for residential mortgages on banks.

Figure 1. The Role of Housing Market Policies



Sources: Haver Analytics; and HKMA.

Note: In November 2010 and February 2013, both macro-prudential and stamp duty tax was changed.

3. The authorities have also implemented several housing market-related tax measures to stabilize the housing market. The Hong Kong SAR government has implemented several increases in the Ad Valorem Stamp Duty (AVD) tax since 2010, with a current rate of 15 percent.[3] In October 2012, the government introduced a 15 percent Buyer's Stamp Duty (BSD) tax that targets certain types of investment demand, including by foreign buyers. In November 2010, a Special Stamp Duty (SSD) tax was implemented, targeting properties resold within 24 months or less with a highest rate of 15 percent. The restriction period for resale was extended to 36 months or less and the highest tax rate raised to 20 percent in October 2012. These measures appear to have had a stronger effect on the number of transactions than on prices. The impact of these measures on house prices, number of agreements and new mortgages appear to be short-lived (Figure 1). However, the econometric analysis in this chapter shows that housing market policies have had a moderating effect on prices.

4. Housing market policies have helped slow down house price appreciation. The analysis in this chapter suggests that the increase in house prices can be explained by macroeconomic fundamentals, both in the short- and in the long-run.[4] In particular, demand factors such as real GDP growth, credit growth, and interest rates, and supply factors such as rents, building costs, and land supply explain the evolution of house prices well. The analysis finds that housing market polices have had significant effects on house prices, but with some differences across market segments. Specifically:

- The estimated impact of a 10-percentage point tightening in the loan-to-value (LTV) ratio is a reduction of aggregate house prices by 4.8 percent over the next four quarters.[5] The analysis shows differences in the transmission mechanism across market classes, with LTV changes having a faster impact in the luxury market.
- The estimated impact of a 1-percentage point increase in the AVSD tax is a reduction of aggregate house prices by 1.2 percent over the next four quarters.
- There are differences in the impact of stamp duty taxes across property markets as well: the BSD tax and the SSD tax affect luxury market prices but not mass-market prices.
- A simulation based on a Dynamic Stochastic General Equilibrium (DSGE) model suggests that without housing market policy measures, real house prices would have been 12.5 percent higher, and the mortgage credit-to-GDP ratio about 15 percent higher.

[3] The highest AVD rate of 15 percent does not apply to an agreement or conveyance for a residential property where the purchaser or transferee is a Hong Kong SAR permanent resident acting on his own behalf and who does not own any other residential property in Hong Kong SAR at the time of acquisition of the subject property. In this case, a lower rate of up to 4.25 percent, depending on the value of the property, applies.

[4] Chung (2012), Glindro et al. (2013), Wu, Chen, and Wong (2017), and Leung et al. (2008) have examined the determinants of house prices in Hong Kong. Craig and Hua (2011) and Ahuja and Nabar (2011) study the effect of macroprudential policies on house prices in Hong Kong.

[5] Ahuja and Nabar (2011) report long lags (up to 8 quarters) in the transmission of LTV changes to house prices.

(continued)

B. Time Series Empirical Analysis

5. An equilibrium model of the housing market suggests that both demand and supply factors affect house prices in the long run. Following a methodology similar to Craig and Hua (2011) and Leung, Chow and Han (2008), a two-step error correction model specification was used to analyze the long- and short-run determinants of Hong Kong's housing prices. In the first stage, the level of real house prices is related to macroeconomic fundamentals in a cointegration framework. In addition to the aggregate housing market, the model was applied to all five residential property classes in Hong Kong SAR.[6] In the long run, aggregate real house prices are cointegrated with real rents, real credit, real interest rates, the construction deflator, and land supply.[7] In particular, as expected, house prices rise with increases in rents, credit and construction costs, but decline with increases in real interest rates and land supply (lagged 4 periods). In the aggregate, real GDP per capita does not affect house prices. (See Table 1).

Table 1. Hong Kong SAR: Long-Run Determinants of House Prices

	Aggregate	Class A	Class B	Class C	Class D	Class E
LOG(RENTS)1/	0.626 (4.957)***	0.532 (3.106)***	0.676 (5.381)***	0.835 (7.380)***	0.878 (8.058)***	0.935 (9.779)***
LOG(REAL_GDPPC)	0.051 (0.468)	-0.148 (-1.396)	0.065 (0.587)	0.535 (3.776)***	0.670 (4.211)***	0.874 (5.374)***
LOG(AGG_CREDIT)	0.342 (2.718)***	0.404 (3.248)***	0.289 (2.275)**	0.272 (1.727)*	0.268 (1.590)	0.251 (1.499)
REAL_RATE	-0.010 (-2.041)**	-0.015 (-3.221)***	-0.007 (-1.538)	-0.004 (-0.595)	-0.004 (-0.602)	-0.004 (-0.655)
LOG(CONSTRUC_DEFLATOR)	0.548 (3.448)***	0.702 (4.476)***	0.517 (3.234)***	0.235 (1.135)	0.176 (0.767)	0.124 (0.533)
LOG(LAND_SUPPLY(-4))	-0.005 (-3.081)***	-0.004 (-2.737)***	-0.004 (-2.933)***	-0.006 (-3.247)***	-0.007 (-3.530)***	-0.008 (-3.881)***
C	-6.017 (-3.332)***	-4.933 (-2.821)***	-5.494 (-3.054)***	-9.957 (-4.290)***	-11.305 (-4.412)***	-13.306 (-5.143)***
Observations:	85	85	85	85	85	85
R-squared:	0.979	0.985	0.977	0.961	0.951	0.954
Sample period:	1996Q2-2017Q2	1996Q2-2017Q2	1996Q2-2017Q2	1996Q2-2017Q2	1996Q2-2017Q2	1996Q2-2017Q2

Note: 1/ Rent data varies based on type of property; 2/ *** refers to 1% significance, ** refers to 5% significance, * refers to 10% significance.

[6] The residential property classes are as follows: Class A includes properties whose size is less than 40m2, Class B includes properties whose size is between 40 and 69.9m2, Class C includes properties whose size is between 70 and 99.9m2, Class D includes properties whose size is between 100 and 159.9m2, and Class E includes properties whose size is above 160m2. Classes D and E comprise the luxury market.

[7] Using aggregate domestic credit for use in Hong Kong SAR delivered better results than using mortgage credit or household debt. The Appendix describes the dataset (Table A1) and details the unit root tests for each time series, as well as the cointegration tests (Table A2).

6. Long-run determinants of house prices differ across class types. The same model when applied to the five property classes reveals important differences across class types (See Table 1). First, while the coefficient on rents is significant for all property types, it progressively increases through classes A-E. This suggests that prices are more closely linked to rents in the luxury market, where more properties are likely to be used for investment purposes. In the mass market, strong preference for ownership and tax incentives could explain why prices respond less strongly to rents. Second, the estimated coefficients on real GDP per capita are close to zero and non-significant for classes A and B, but considerably larger and significant for classes C-E. This suggests greater pro-cyclicality of the mid and luxury segments of the market. Third, the coefficients on aggregate credit and the real interest rate are significant for class A properties, signifying the impact of availability and cost of credit on lower-end property prices. The construction deflator also has a sizeable impact on classes A and B showing that higher construction costs are associated with higher prices only in the mass market. Finally, the coefficients on land supply are very significant for classes A-E, although, the coefficients seem to be marginally higher for the luxury market.

7. In the short-run, luxury property prices exhibit stronger procyclical behavior compared to the market as a whole. In the second stage of the analysis, the growth rate of house prices is related to the growth rate of macroeconomic fundamentals, the lagged error-correction mechanism coming from the first stage, and policy variables. The second step analysis reveals that house prices, both aggregate and across property classes, are highly correlated with real GDP per capita in the short-run. However, the coefficients are substantially higher for the luxury market (1.22 for class D and 1.65 for class E) demonstrating stronger pro-cyclicality in the short-run. Additionally, rents and the construction deflator continue to be significant determinants of house prices while credit, interest rate and land supply cease to have an impact on prices in the short-run (Table 2).

8. Macro-prudential measures implemented by the HKMA have been effective in reducing housing prices, though the transmission is heterogeneous across different market segments. The second step analysis also introduces macro-prudential measures to the housing price equations, in first differences, with lags up to 4 quarters. This choice helps avoid reverse causality issues, and allows for lags in the transmission of policies. The results show changes in macro-prudential policy implemented by the HKMA have reduced housing prices. The estimated impact of a 10 percent tightening in the LTV ratio is a reduction of aggregate house prices by 4.8 percent over the next four quarters.[8] The impact of changes in the LTV is reflected much faster in the luxury market as compared to the aggregate and mass markets. For example, the impact of changes in the LTV caps is visible in classes D and E within one quarter, while it takes between three to four quarters to fully materialize in the aggregate market and in classes A to C.

[8] This estimate coincides with the sum of LTV over the previous 4 quarters because the effect of the first lag of the dependent variable and the effect of reversion to the error correction mechanism cancel out. In the aggregate regression, and for classes A-C, the LTV ratio for borrowers whose income is derived in Hong Kong SAR, who purchase a single property, who only have one mortgage, and who purchase a property with a value below the threshold for the luxury market is used. For classes D-E, the LTV ratio for a borrower of the same characteristics who purchase a property whose value is above the threshold for the luxury market is used.

Table 2. Hong Kong SAR: Short-run Determinants of House Prices and the Role of Macro-prudential Policies

	Aggregate	Class A	Class B	Class C	Class D	Class E
C	0.001	0.001	0.001	-0.001	-0.003	-0.004
	[0.151]	[0.147]	[0.195]	[-0.112]	[-0.635]	[-0.704]
D(Log(Prop_Prices(-1))) 1/	0.21	0.261	0.199	0.175	0.312	0.075
	[1.977]*	[2.598]**	[2.048]**	[1.696]*	[2.730]***	[0.442]
D(Log(Rents)) 1/	0.762	0.81	0.751	0.654	0.397	0.629
	[3.722]**	[4.823]***	[4.093]***	[3.629]***	[1.650]	[2.349]**
D(Log(Real_GDPPC))	0.57	0.472	0.491	0.866	1.193	1.708
	[2.482]**	[2.217]**	[1.996]**	[3.608]***	[3.703]***	[4.781]***
D(Log(Construc_Deflator))	0.358	0.357	0.338	0.38	0.374	0.469
	[2.265]**	[2.585]**	[2.264]**	[1.906]	[1.535]	[1.928]*
Error_Correction(-1)	-0.21	-0.252	-0.185	-0.16	-0.157	-0.179
	[-3.855]***	[-4.881]***	[-3.317]***	[-2.987]***	[-2.792]***	[-2.707]***
Changes in LTV (1 Lag)	0.0493	0.044	0.039	0.135	0.200	0.379
	[1.029]	[0.995]	[0.754]	[2.300]**	[2.476]**	[2.398]**
Changes in LTV (2 Lag)	0.104	0.079	0.079	0.098	0.096	0.027
	[2.267]**	[1.883]*	[1.481]	[1.846]*	[0.747]	[0.128]
Changes in LTV (3 Lag)	0.212	0.187	0.163	0.27	-0.026	-0.228
	[0.063]**	[3.395]***	[2.278]**	[4.134]***	[-0.215]	[-1.103]
Changes in LTV (4 Lag)	0.114	0.202	0.035	0.067	0.004	0.161
	[1.874]*	[3.906]***	[0.485]	[0.963]	[0.022]	[0.599]
Sum of LTV coefficients 4/	0.48	0.512	0.281	0.503	0.200	0.379
Wald Test p-value	0.0149**	0.0030***	0.0872*	0.0033***	0.015**	0.019**
Observations:	84	84	84	84	84	84
R-squared:	0.766	0.772	0.767	0.713	0.655	0.626
Sample period:	1996Q3-2017Q2	1996Q3-2017Q2	1996Q3-2017Q2	1996Q3-2017Q2	1996Q3-2017Q2	1996Q3-2017Q2

Notes: 1/Data for property price, rent varies based on type of property; 2/ Data for LTVs categorized as luxury (classes D,E) and non-luxury (classes A,B,C and average); 3/ *** refers to 1% significance, ** refers to 5% significance, * refers to 10% significance.
4/ Sum of LTV coefficents up to the last significant lag at the 10 percent level.

9. The impact of stamp duty taxes is more homogenous across class types, with the ad valorem stamp duty being the most effective tax. Of the three fiscal measures implemented, increases in the ad-valorem stamp duty tax have proven most effective in reducing house prices: a 1 percent increase in the ADV tax reduces aggregate prices by 1.2 percent. The effects of the ADV tax build over four quarters in all markets, similar to the effect of LTVs. Increases in the BSD have a more muted effect and only seem to reduce prices in the luxury market segment. The SSD has been successful in reducing house prices in all categories, but the effect is significant in the aggregate

price level and in the luxury market. (Table 3).[9]

Table 3. Hong Kong SAR: The Effect of Stamp Duty Taxes

	Aggregate	Class A	Class B	Class C	Class D	Class E
Ad-valorem Stamp Duty						
Lag 1	-0.001	-0.014	-0.031	-0.022	-0.255	0.326
	[-0.006]	[-0.187]	[-0.335]	[-0.212]	[-1.084]	[1.245]
Lag 2	0.098	0.100	0.125	-0.027	-0.190	-0.446
	[2.746]***	[3.129]***	[3.352]***	[-0.582]	[-1.100]	[-3.320]***
Lag 3	-0.060	-0.308	-0.143	-0.059	0.010	-0.350
	[-0.123]	[-0.642]	[-0.303]	[-0.112]	[0.0535]	[-0.681]
Lag 4	-1.283	-1.328	-1.639	-1.442	-0.813	-1.047
	[-3.458]***	[-4.001]***	[-4.714]***	[-2.828]***	[-2.633]**	[-2.524]**
Sum of Coefficients 4/	*-1.245*	*-1.550*	*-1.688*	*-1.551*	*-1.248*	*-1.518*
Wald Test p-value	*0.049***	*0.0157***	*0.0082****	*0.021***	*0.021***	*0.110*
Buyer's Stamp Duty						
Lag 1	0.028	0.031	0.021	-0.004	0.008	-0.152
	[0.793]	[0.906]	[0.607]	[-0.102]	[0.107]	[-1.761]*
Lag 2	-0.037	0.012	-0.057	-0.124	-0.210	-0.002
	[-0.704]	[0.266]	[-1.076]	[-2.375]**	[-2.640]**	[-0.019]
Sum of Coefficients 4/	*-0.009*	*0.044*	*-0.036*	*-0.128*	*-0.202*	*-0.154*
Wald Test p-value	*0.915*	*0.579*	*0.663*	*0.147*	*0.186*	*0.446*
Special Stamp Duty						
Lag 1	-0.106	-0.003	-0.117	-0.259	-0.074	-0.405
	[-0.862]	[-0.0196]	[-0.609]	[-0.948]	[-0.525]	[-2.966]***
Lag 2	-0.157	-0.159	-0.255	-0.310	-0.140	-0.001
	[-1.249]	[-0.784]	[-1.292]	[-1.283]	[-0.981]	[-0.006]
Lag 3	-0.195	-0.389	-0.118	-0.108	-0.122	-0.229
	[-1.682]*	[-0.951]	[-0.568]	[-0.500]	[-1.860]*	[-4.491]***
Sum of Coefficients 4/	*-0.457*	*-0.551*	*-0.489*	*-0.677*	*-0.336*	*-0.634*
Wald Test p-value	*0.134*	*0.390*	*0.353*	*0.255*	*0.259*	*0.022***

Notes: 1/Data for property price, rent varies based on type of property; 2/ Data for property taxes categorized as luxury (classes D,E) using the highest rate and non-luxury (classes A,B,C and average) using the lowest rate; 3/ *** refers to 1% significance, ** refers to 5% significance, * refers to 10% significance. 4/ Sum of coefficents up to the last significant lag at the 10 percent level.

C. Counterfactual Scenario

10. A macroeconomic model with a housing sector and credit is employed to evaluate the effects of macroprudential and fiscal policies.[10] A standard real business cycle open economy model that takes as given the world interest rate is extended with a housing sector. Both domestic households and foreign investors can purchase the domestic housing stock, which is in fixed supply.[11] Household credit is subject to a loan-to-value constraint set by the regulatory authorities.

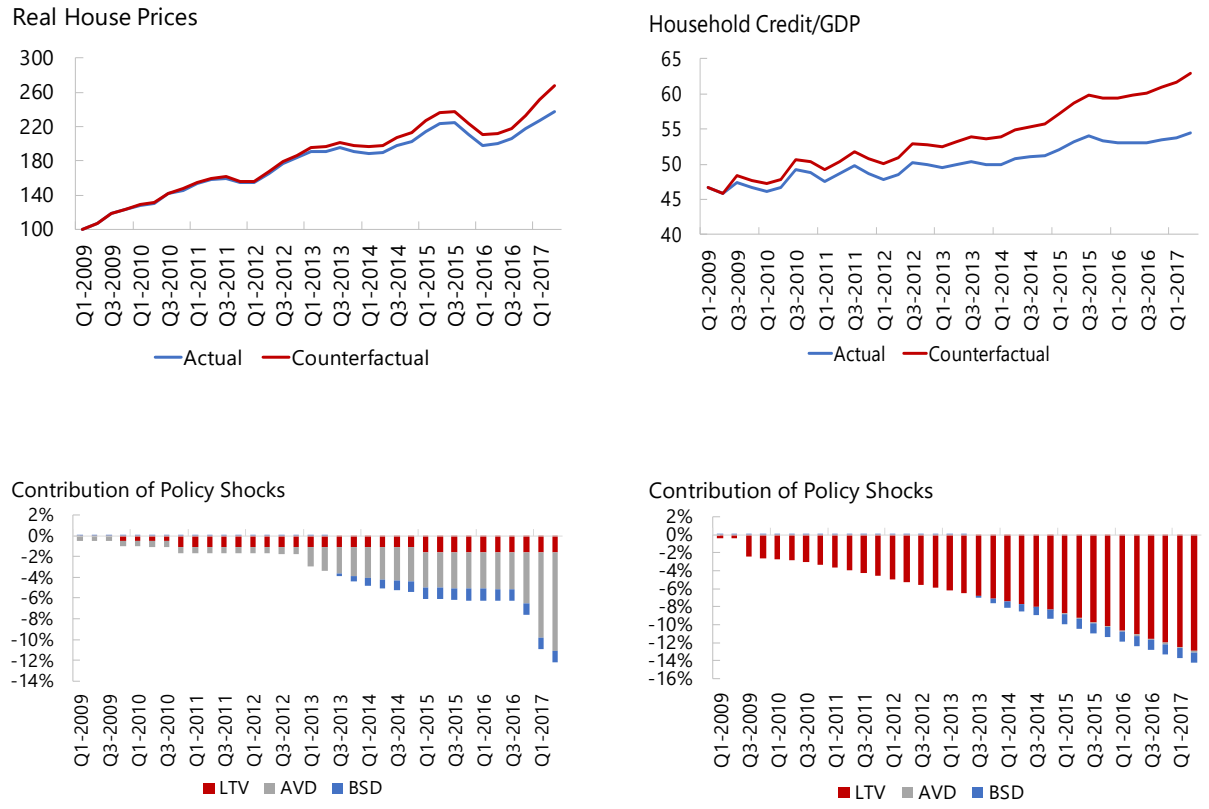
[9] For the aggregate price equation, the average of the Scale 1 ad valorem tax rate is used. For classes A-C, the average of the Scale 2 ad valorem tax rate is used. For classes D-E, the highest ad valorem tax rate is used. In the case of the special stamp duty, the average rate is used in the aggregate equation, the lowest rate is used for classes A-C, and the highest rate is used for classes D-E.

[10] The analysis is based on the forthcoming IMF Working Paper "An Estimated DSGE Model to Analyze Housing Market Policies in Hong Kong SAR" by Rabanal (2018). Funke and Paetz (2013) evaluate the effect of macroprudential policy in Hong Kong using an estimated macroeconomic model.

[11] Higher housing demand is also driven by foreign investors (particularly from mainland China) who view the Hong Kong housing market as a safe asset.

Changes in the LTV affect new loans, but not the stock of existing loans. This assumption adds realism to the model and helps match the evidence that the effects of macroprudential policies on the housing market are subject to lags, as shown in the previous section. The model is estimated using four macroeconomic time series (real GDP, real house prices, the household credit-to-GDP ratio, and the 3-month LIBOR rate deflated by the CPI) and three policy measures (the average LTV ratio, the AVD tax and the BSD tax) for Hong Kong SAR since 1997, using Bayesian methods.

Figure 2. Counterfactual Scenarios



Sources: Haver Analytics; BIS; and IMF staff calculations.

11. Counterfactual simulations suggest that real house prices would be 12.5 percent higher while household credit would be 15 percent higher without policy responses. Since the model is structural, counterfactual scenarios that are Lucas-critique free can be constructed.[12] The counterfactual scenarios assume that the policy variables are kept at their pre-October 2009 levels, before any of the new macroprudential and stamp duty taxes were implemented. This assumption implies that the LTV is kept constant at 70 percent, the AVD at its average rate of 1.875 percent, and

[12] The 'Lucas critique' is a criticism of econometric policy evaluation procedures that fail to recognize that optimal decision rules of economic agents vary systematically with changes in policy. It criticizes using estimated statistical relationships from past data to forecast the effects of adopting a new policy, because the estimated regression may change along with agents' decision rules in response to a new policy.

the BSD at 0 percent. The model confirms the results from the short-run regression analysis and attributes a larger effect to tax measures than macroprudential measures (Figure 2). The cumulative impact of LTV tightening measures dissipates overtime, and is estimated to have contributed about 3 percent to the reduction in house prices at the end of the sample period. This estimate is within the conventional confidence interval of the regression results. The model is also used to understand the effect of all policies on the household debt/GDP ratio, and suggests that the tightening of LTV policies have contributed to reducing household leverage. The contribution of LTV policies is to have reduced the household credit-to-GDP ratio by about 12 percent, and the remaining 3 percent is due to changes in stamp duty taxes This finding is in line with studies such as He (2014).

D. Conclusion

12. Housing market measures have helped reduce house price appreciation and credit growth in Hong Kong SAR, but have not prevented the credit and housing boom. The Hong Kong SAR housing market faced strong demand pressures over the last recent years. Low global interest rates, high liquidity and the cyclical position have contributed to increased house prices, amid tight supply constraints. The macroprudential policy measures have had a significant, although quantitatively small impact on house prices, with some differences across markets, and have helped contain systemic risk by lowering household credit. Stamp duty taxes have also helped contain house price appreciation, with the AVD having been the most effective tax. The BSD and SSD have mostly had an impact on the luxury market.

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Table A1. Hong Kong SAR: Data Description and Sources

Indicator	Description	Source
Property Prices	HK: Property Market Price Index: Private Domestic: All Classes (SA, 1999=100) HK: Property Market Price Index: Private Domestic: Class A (SA, 1999=100) HK: Property Market Price Index: Private Domestic: Class B (SA, 1999=100) HK: Property Market Price Index: Private Domestic: Class C (SA, 1999=100) HK: Property Market Price Index: Private Domestic: Class D (SA, 1999=100) HK: Property Market Price Index: Private Domestic: Class E (SA, 1999=100)	Haver Analytics
Rents	HK: Property Market Rental Index: Pvt Domestic: All Classes (SA, 1999=100) HK: Property Market: Rental Indices: Private Domestic: Class A (SA, 1999=100) HK: Property Market Rental Index: Private Domestic: Class B (SA, 1999=100) HK: Property Market Rental Index: Private Domestic: Class C (SA, 1999=100) HK: Property Market Rental Index: Private Domestic: Class D (SA, 1999=100) HK: Property Market Rental Index: Private Domestic: Class E (SA, 1999=100)	Haver Analytics
Real GDP per capita	Hong Kong: Gross Domestic Product (SA, Mil.Chn.2015.HK$) Hong Kong: Mid-Year Population (Thous)	Haver Analytics
Credit	Hong Kong: Loans and Advances to Customers: Total (EOP,NSA, Mil.HK$)	Haver Analytics
Inflation	Consumer Prices, period average	IMF, World Economic Outlook
Interest Rate	Mortgage Interest Rate (BLR until 2009; BLR & HIBOR Blended rate post 2009)	HKMA
Construction Deflator	Hong Kong: GDP: GDFCF: Building and Construction: Private Sector (NSA, Mil.HK$) H.K.: GDP: GDFCF: Bldg & Construction: Private Sector (NSA, Mil.Chn.2015.HK$)	Haver Analytics
Land Supply	Govt. Land Auction Sales: Area	CEIC
Loan-to-value	Changes in LTV ratios for: Income derived in HK, for self use, applicants who have not borrowed or guaranteed other outstanding mortgage(s) at the time of making a mortgage application (DSR based)	HKMA
Stamp duty taxes	Changes in ad-valorem, special stamp duty, and buyer's stamp duty taxes	Inland Revenue Department, Hong Kong

Table A2. Hong Kong SAR: Unit Root Tests

	(c,t,L)	Level	(c,t,L)	First Difference
LOG(AGGREGATE PRICES)	(c,0,3)	0.139	(c,0,0)	-4.176***
LOG(CLASS A PRICES)	(c,0,3)	0.418	(c,0,0)	-4.008***
LOG(CLASS B PRICES)	(c,0,3)	0.065	(c,0,0)	-4.318***
LOG(CLASS C PRICES)	(c,0,1)	-1.289	(c,0,0)	-4.454***
LOG(CLASS D PRICES)	(c,0,1)	-1.449	(c,0,2)	-5.748***
LOG(CLASS E PRICES)	(c,0,1)	-1.293	(c,0,0)	-5.469***
LOG(AGGREGATE RENTS)	(c,0,3)	-0.967	(c,0,2)	-6.031***
LOG(CLASS A RENTS)	(c,0,2)	-0.713	(c,0,0)	-4.111***
LOG(CLASS B RENTS)	(c,0,1)	-1.85	(c,0,2)	-6.164***
LOG(CLASS C RENTS)	(0,0,3)	-0.369	(c,0,2)	-5.709***
LOG(CLASS D RENTS)	(c,0,2)	-2.445	(c,0,1)	-5.543***
LOG(CLASS E RENTS)	(c,0,2)	-2.316	(c,0,1)	-5.431***
LOG(REAL_GDPPC)	(c,0,2)	-0.468	(c,0,1)	-4.562***
LOG(AGG_CREDIT)	(c,0,4)	-0.383	(0,0,3)	-2.089**
REAL_RATE	(c,0,0)	-1.461	(c,0,0)	-11.569***
LOG(CONSTRUC_DEFLATOR)	(c,0,4)	-0.15	(c,0,3)	-2.737*
LOG(LAND_SUPPLY)	(0,0,2)	-1.399	(c,0,1)	-11.779***
RESIDUAL (AGGREGATE)	(c,0,0)	-3.684***		
RESIDUAL (CLASS A)	(c,0,0)	-4.102***		
RESIDUAL (CLASS B)	(c,0,0)	-3.473**		
RESIDUAL (CLASS C)	(c,0,0)	-3.603***		
RESIDUAL (CLASS D)	(c,0,0)	-3.866***		
RESIDUAL (CLASS E)	(c,0,0)	-4.235***		

Notes: Augmented Dickey-Fuller Unit Root Test; Lags in the test are automatically selected;
c= constant, t=trend, L=lags; Null hypothesis: variable has a unit root; *** refers to 1% significance,
** refers to 5% significance, * refers to 10% significance.

FINTECH IN HONG KONG SAR–DEVELOPMENTS, CHALLENGES AND OPPORTUNITIES[1]

Fintech development in Hong Kong SAR has garnered considerable interest in recent years and is seen as presenting a unique growth opportunity for the economy. This note assesses current fintech developments in Hong Kong SAR, takes stock of government support initiatives, and outlines regulatory challenges for an industry that has no border and crosses traditional institutional boundaries. Finally, it seeks to map out fintech development opportunities for Hong Kong SAR that can complement and bolster its role as an international financial center. In this regard, government policies can play an important role.

A. Background – A Summary of Fintech Developments in Hong Kong SAR

1. Financial technology, or "fintech", the application of information technology to the provision of financial services, has surged in recent years, attracting considerable attention. The scope of venture-capital backed investment globally totaled over US$13 billion in 2016, more than five times the amount invested four years earlier.[2] In Hong Kong SAR, dedicated government efforts to promote fintech has led to an increase in the number of fintech startups in the city, from 86 in mid-2015 to 138 in August 2016. Venture capital invested in Hong Kong SAR fintech totaled US$394 million between early 2014 and late 2016. Notwithstanding these welcome developments, Hong Kong SAR is competing against other financial centers in an industry that is evolving rapidly. To succeed, Hong Kong SAR needs to continue its concerted efforts. Government policies, in this regard, can play a crucial role to support strategic development and help harness fintech's role in bolstering Hong Kong SAR's standing as a global financial center.

2. Current government initiatives include multi-prong efforts to advance fintech development. These efforts seek to create an fintech ecosystem that leverages Hong Kong SAR's financial center status and its proximity to China; the goal is that with a supportive environment, research, development and business incubation can take place.

- The government created the Steering Group on Financial Technologies in 2015 for one year to advise the government on fintech development; its report was released in 2016. Currently, there is a dedicated fintech team under InvestHK – the government entity that supports business development.
- The Fintech Facilitation Office (FFO) was set up by the HKMA in March 2016 to facilitate fintech development in Hong Kong SAR and to promote it as a fintech hub in Asia. Its efforts include the Cybersecurity Fortification Initiative (CFI), which looks to secure its banking system's cyber resilience and ongoing research on the deployment and regulatory framework for Distributed Ledger Technology (DLT). Additionally, the HKMA is coordinating the development of a trade

[1] Prepared by Sally Chen (MCM)

[2] Ernst & Young (2017) *Unleashing the potential of Fintech in banking*

finance platform with private banks and is discussing with the Monetary Authority of Singapore on building a cross-border infrastructure to connect the platforms across the two economies.

- To boost its technology competitiveness through applied research, the Hong Kong SAR government created several innovation hubs, including Cyberport, a government-sponsored digital hub and ASTRI - Applied Science Technology Research Institute.
- The 2017/18 budget allocated resources to the HKMA for the development of a new Faster Payment System (FPS), support blockchain technology development by ASTRI and the HKMA, and boost resources for the HKMA's cybersecurity program. Funding for government support includes a HK$2 billion Innovation and Technology Venture Fund as well as various Funds under Cyberport.
- The HKMA undertook the first phase of its central bank digital currency project in March 2017 to assess the feasibility and implications of such a currency. At the same time, the government is exploring new payment channels for settling government bills and fees.

B. Fintech Opportunities to Enhance Hong Kong SAR's Role as a Financial Center

3. Financial services make up one of the largest industries in Hong Kong SAR and offer rich opportunities for fintech development. By one estimate, the sector accounts for 18 percent of Hong Kong SAR's GDP and 6 percent of its employment.[3] Hong Kong SAR has homegrown advantage as the large number of financial institutions offer an existing platform for collaboration and financial industry knowledge. Broadening the adaptation of fintech across different industries and regulatory bodies could thus have a considerable impact on service provision, employment and regulatory oversight. More importantly, fintech development is crucial to ensure that Hong Kong SAR remains a global financial center.

4. Many financial centers have carved out their market niche in fintech: Israel has a focus on cybersecurity, the Netherlands and Belgium on payments, Ireland, with Dublin as its hub, focuses on fund administration, Malta and the Isle of Man on cryptocurrencies, and Estonia on financial identity. Toronto, which has gained traction as a cybersecurity hub, ranks fifth in a January 2017 Survey in which London ranked first and Hong Kong SAR seventh.[4]

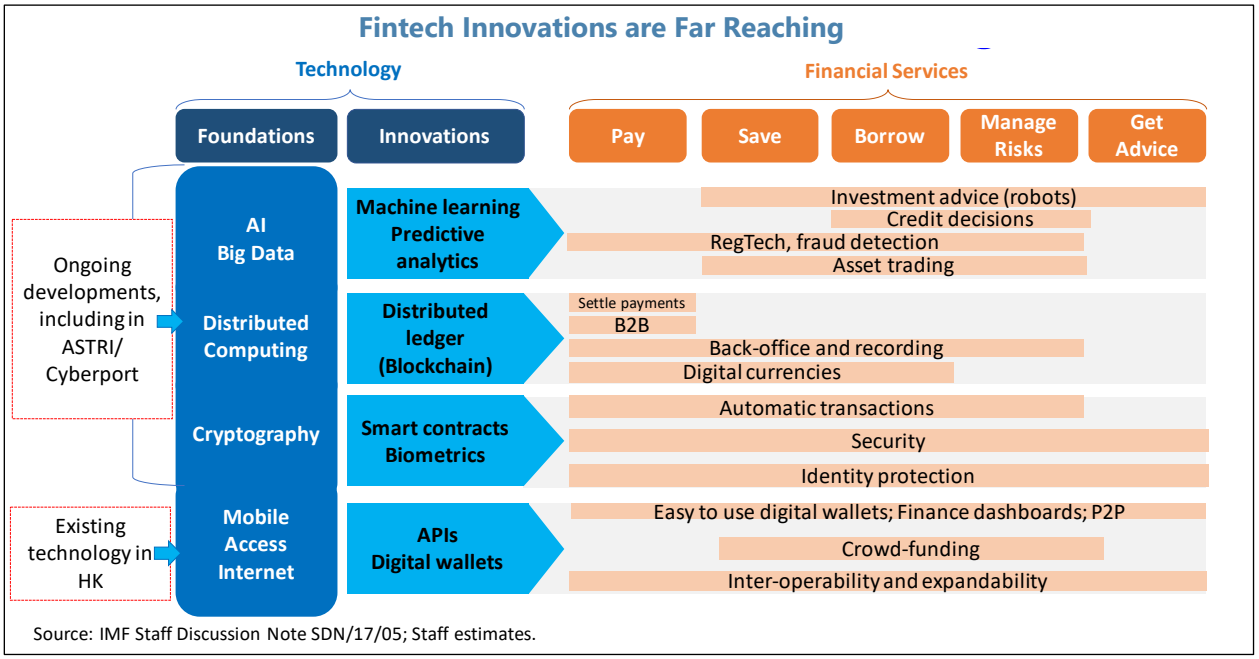
5. The challenge for Hong Kong SAR is to find its comparative advantage relative to other financial centers. Rather than focusing on one area, Hong Kong SAR is aiming to take a comprehensive approach and is looking to develop an "ecosystem" that is based on domestic and international collaboration, while leveraging its status as a leading international financial center and its proximity to Mainland China. HKMA recently signed an agreement with the Monetary Authority of Singapore on development collaboration; it is also discussing development opportunities with

[3] HK Financial Services Development Council (2017) *The Future of Fintech in Hong Kong*

[4] Ibid; Toronto Financial Services Alliance & Z/Yen Group (2017) *Trends and Innovation in Financial Services*

Mainland authorities on initiatives involved in the Guangdong-Hong Kong SAR-Macao SAR-Bay Area Development.

6. A government advisory group highlighted business-to-business ("B2B") transactions as an area ripe for Hong Kong SAR fintech investment and development.[5] These areas include cybersecurity, big data and analytics, RegTech and blockchain-related financial services, including payments and securities settlements. Specifically, payments and settlement systems at the interbank (i.e. B2B) level can support Hong Kong SAR's role in foreign exchange trading and international banking. Initiatives that facilitate payments and settlement, support cybersecurity, widen digital ID utility to address know-your-customer (KYC) requirements can all boost Hong Kong SAR's role as a financial center. Meanwhile, the advisory group noted that "RegTech" – fintech applied by financial institutions to improve their regulatory compliance – as well as "SupTech" – fintech applied by supervisory agencies to improve their internal processes, reporting arrangements, and supervision – can support Hong Kong SAR's well-respected regulatory and supervisory capabilities, particularly given the large presence of regional financial institutions and other business headquarters in Hong Kong SAR. As a security hub, Hong Kong SAR can set the standard for the region and cement its solid reputation.



Source: IMF Staff Discussion Note SDN/17/05; Staff estimates.

[5] HK Financial Services Development Council (2017) *The Future of Fintech in Hong Kong*

C. Regulatory Responses and Policy Recommendations

7. *Regulatory Responses*. Fintech regulation efforts in Hong Kong SAR are carried out by multiple regulators and government departments. The HKMA established a Fintech Supervisory Sandbox in September 2016 to facilitate pilot trials of fintech and other technology initiatives. The Payment System and Stored Value Facilities Ordinance, which became fully operational two months later, empowers the Monetary Authority to license and supervise Stored value facilities (SVF)[6]. There are also dedicated liaison platforms set up by the HKMA, Securities and Futures Commission (SFC) and the Insurance Authority (IA) for communication across different agencies related to fintech regulatory and development efforts. Within the HKMA, the liaison responsibility falls onto the Fintech Facilitation Office; in SFC, Fintech Contact Point; and in IA, Insurtech Facilitation Team. The Coordination Group on Implementation of Financial Technologies Initiatives is in place at the Financial Services and the Treasury Bureau to coordinate among the regulators.

8. *Policy Challenges.* Regulation should continue to evolve to address challenges from fintech businesses that have fluid borders and cut across multiple business lines. The presence of multiple regulatory fintech bodies arose in large part because regulation has traditionally been institution based. Specifically, bank regulation is under the purview of the HKMA, securities brokers under the SFC, and insurers, IA. But fintech business models cut across traditional business lines; regulations therefore need to shift focus to be more "activity-based" for fintech businesses. For example, licensing regimes will need to be redesigned to bring new types of service providers within the regulatory perimeter where appropriate (e.g. P2P lending). Meanwhile, Hong Kong SAR's regulatory process is based on the principle of "Know Your Clients" ("KYC"); but fintech firms operate with fluid borders, making it difficult to verify customer identity. In response to these challenges, the authorities have introduced several initiatives:

- The HKMA introduced the Cybersecurity Fortification Initiative (CFI) in 2016, which includes an assessment framework for banks on cyber resilience, the Professional Development Program to foster fintech talent and the Cyber Intelligence Sharing Platform for intelligence sharing.
- Regulators introduced supervisory sandboxes where new technologies are rolled out to a limited audience on a trial basis. At the end of 2017, the HKMA introduced a FinTech Supervisory Chatroom for prompt feedback to banks and tech firms at the early stage of their fintech development; meanwhile, different regulators' sandboxes were linked to provide a single point of entry for pilot trials of cross-sector fintech products.
- Stored value facility providers are required by the HKMA to have a capital of HK$25 million to ensure sufficient user protection. Currently, SVF licenses are granted to 13 non-banks and 3 banks.

[6] Stored value facility (SVF) is a form of prepared electronic cash, which can be used as means of payment for goods and serviced provided by participating merchants.

9. *Policy Recommendations*. Continuing to strengthen interagency cooperation to explicitly encompass regulating, licensing, and supervising fintech activities and the involvement of other relevant governmental bodies. At the current juncture, continued strong interagency coordination is crucial, including between the HKMA and SFC, so that regulators can better manage vulnerabilities originating from financial market infrastructures. Meanwhile, legal rules and regulations that have clarified the rights and obligations within the new landscape (e.g., the legal interpretation of digital tokens and their underlying activities) helped to ensure that the oversight and supervisory framework remains effective. A stronger regulatory and supervisory focus on "activities", in addition to "entities" are necessary. The HKMA's plan to launch the Enhanced Fintech Supervisory Sandbox by the end of 2017 and a single point of entry that integrates different agencies' regulatory sandboxes for pilot trials are welcome developments. Future considerations to involve other relevant authorities would also be beneficial as the nature of activities of fintech firms continue to evolve (e.g., the issuance of money service operator licenses by the Customs and Excise Department to firms providing innovative remittance services).

10. As a global financial center, Hong Kong SAR can set the fintech standard for the region and carve out its market niche. As a major center for offshore RMB transactions, Hong Kong SAR can leverage its position as a payments hub. With no clear leader in digital ID, Hong Kong SAR can step in, particularly as it looks to boost its KYC efforts. As new technologies disrupt existing business platforms and traditional boundaries, financial centers – along with its technology, human capital and regulatory response – need to evolve. For Hong Kong SAR, the opportunities – and challenges – are abundant. Government policies can play a crucial role to encourage fintech development in Hong Kong SAR and capture the potential these new technologies offer. As the sector grows, continued vigilance and regulatory changes will be warranted to ensure continued financial stability and resilience.

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IMPACT OF FED TIGHTENING ON CAPITAL FLOWS IN HONG KONG SAR[1]

Historically, Fed rate hikes have been associated with capital outflows from emerging markets. A strengthening U.S. dollar and widening interest rate differentials between the U.S. and domestic economies have encouraged capital outflows. This paper examines the drivers of capital flows in Hong Kong SAR and finds that growth differentials between Hong Kong SAR and the U.S. as well as relative asset price performance matter the most. While Fed rate hikes and interest rate differentials between Hong Kong SAR and the U.S. have an effect on capital flows, the impact is limited. In addition, as a large financial center, the abundance of global liquidity and swings in risk appetite – which both support local asset prices and enable Hong Kong SAR's role as a financial intermediary – also drive capital movements in and out of Hong Kong SAR. While many external factors that affect Hong Kong SAR are outside of its control, a robust, flexible domestic economy can serve as a bulwark against sharp swings in capital flows and help contain the attendant impact on domestic financial markets. In particular, a flexible price and wage system, combined with robust supervisory and regulatory infrastructure that ensures financial stability, can provide buffers against volatile capital movements.

A. Introduction

1. As the Federal Reserve begins to normalize U.S. interest rates and unwind its portfolio holdings accumulated during Quantitative Easing, there is renewed focus on the potential impact of increased U.S. rates on capital flows to and from Hong Kong SAR. As a small, open economy, with a peg to the U.S. dollar, Hong Kong SAR imports the U.S. monetary stance, with changes in the Fed Funds rate affecting domestic financial conditions, and by extension, domestic interest rates and capital flows. This paper assesses the drivers of capital flows into Hong Kong SAR, including the extent to which movements in the Fed Funds target affect flows. Both "push" and "pull" factors are considered. In addition, in line with work from Forbes and Warnock (2011), we consider both net and gross flows. The paper also considers whether the current rate hike cycle might be different, reflecting the possibility that tapering from the high-liquidity, low-interest rate environment since the GFC could be different from past episodes. The key takeaways are as follows:

- In line with recent literature, the results suggest that capital flows in Hong Kong SAR are affected by a confluence of factors, most importantly, relative asset performance, growth differentials, global risk aversion, and global liquidity.
- The policy implications of these results are several. First, both push and pull factors matter for capital flows. This means that while external – push – factors, including changes in the Fed funds

[1] Prepared by Sally Chen, with research assistance from Daniel Law

rate, global risk appetite and global liquidity, are outside of Hong Kong SAR's control, domestic – pull – factors such as domestic growth prospects and related policies are important in supporting inflows and bolstering financial stability. Second, against this context and as suggested by the results, a robust, flexible economic system remains the best bulwark against volatility from capital fluctuations.

2. The paper is organized as follows. We outline the behavior of different financial flow components over the past three Fed rate hike cycles since 1999. Our observation spans the four quarters before and after the first Fed rate increase in a cycle. We find no discernable patterns across different asset and liability components of financial flows (Section II); this finding suggests that factors other than interest rate movements might dominate. We then identify the different push and pull factors and discuss the empirical strategy (Section III). Section IV concludes.

B. Overview of Capital Flow Patterns During Past Fed Rate Hikes

3. On net, capital flows into Hong Kong SAR have been dominated by portfolio outflows and deposit inflows (see text charts on net capital flows and net other investment flows[2]). Moreover, direct investment into Hong Kong SAR has increased in recent years, likely attributable to the booming housing market and associated inflows, though data related to the source of such investments are not available. Another notable feature of capital flows is the sizable swings in the years immediately post GFC. At a time when risk aversion reached multi-decade highs (the VIX index reached its record high in late March 2009), both inflows and outflows increased. While Hong Kong SAR residents accumulated sizable portfolio assets, non-residents also placed a large volume of deposits in Hong Kong SAR.

4. Capital movements during Fed rate hike cycles have been varied. Although Hong Kong SAR saw net capital outflows during the most recent 2015 rate hikes, it had seen net positive inflows during previous cycles (text chart on net capital flows during Fed rate hikes). Past episodes indicated that Hong Kong SAR growth and exports rose in the periods post Fed rate hikes. This suggests that any increases in interest rates – and the corresponding tightening in financial conditions – were offset by stronger U.S. growth and the associated positive spillovers to Hong Kong SAR.[3]

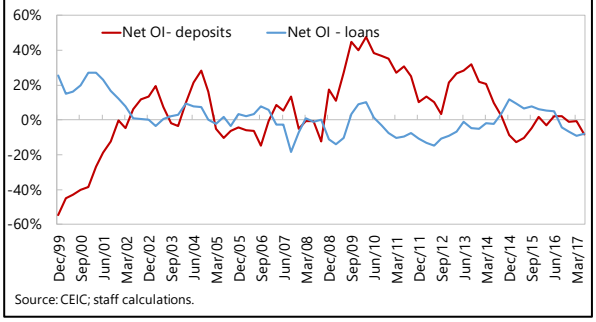
5. The current rate hike cycle may be different from others, as evidenced by the movements in net deposits and loans. Both net loan and deposit outflows picked up since mid-2016, the first time since 2008 with net acquisition of loans and deposits offshore, though the

[2] Other investment flows are mostly deposits and loans.

[3] IMF (2014) "Fed's Tapering and Implications on Hong Kong SAR" *IMF Country Report* No. 14/132

magnitude remains modest. Anecdotal evidence suggests that robust growth in the Mainland likely played a role in recent outflows. Indeed, Hong Kong SAR banks' exposure to Mainland entities rose since mid-2016, with total exposure to Mainland non-bank corporates at about 200 percent of GDP as of 2017Q1. Also, widening interest rate differentials between the U.S. and Hong Kong SAR suggests that the opportunity cost of keeping cash in Hong Kong SAR has increased in recent months. The current interest rate spread between the 3-month Libor and Hibor is about 60 basis points, near its widest level since the GFC (though still narrow historically).

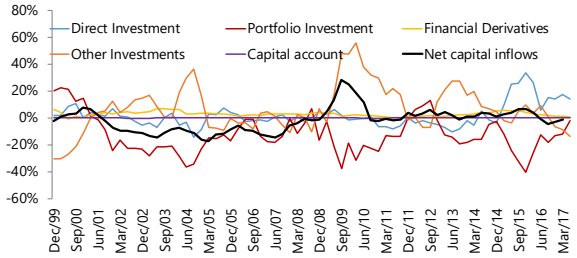
Figure 1. Hong Kong SAR: Net other investment flows
(percent of GDP, 4Qma)



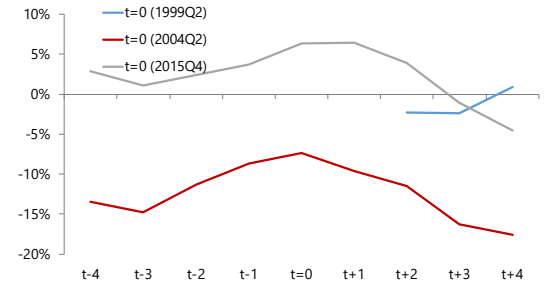
Source: CEIC; staff calculations.

Figure 2. Capital Flows in Hong Kong SAR

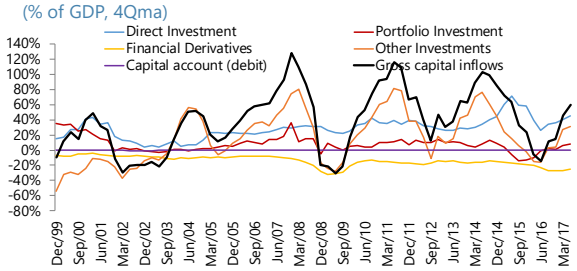
Hong Kong SAR: Net capital inflows
(% of GDP, 4Qma)



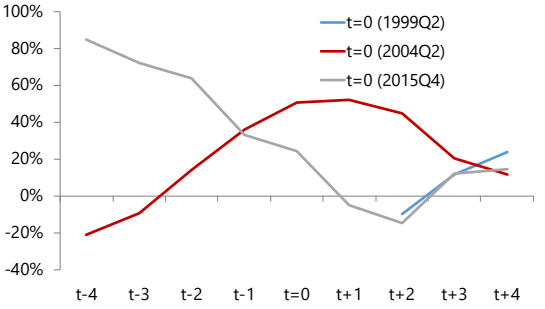
Net capital inflows during Fed rate hikes



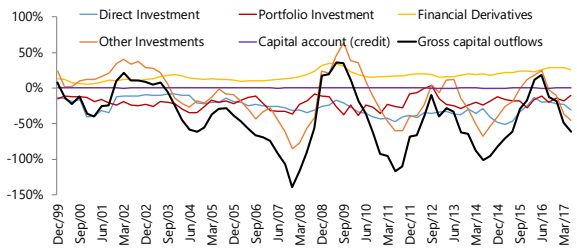
Hong Kong SAR: Gross capital inflows
(% of GDP, 4Qma)



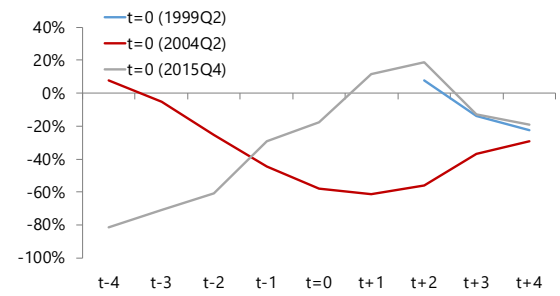
Gross capital inflows during Fed rate hikes



Hong Kong SAR: Gross capital outflows
(% of GDP, 4Qma)



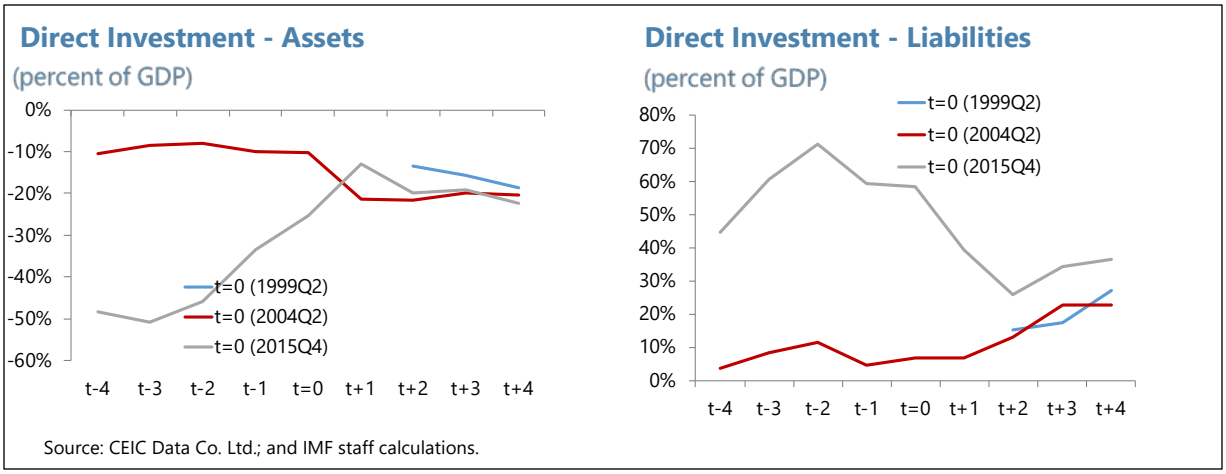
Gross capital outflows during Fed rate hikes



Sources: CEIC Data Co. Ltd.; and IMF staff calculations.

Direct Investment

6. Direct investment tends to increase post Fed rate hikes. The direction of these flows suggests that factors other than interest rate differentials might be driving direct investment. Studies suggest that improving U.S. growth during rate hikes and the positive spillover to Hong Kong SAR likely dominated.[4] Moreover, a recent survey indicated that a favorable and simple tax system, security and political stability, free flow of information, corruption-free government and rule of law are the five most important factors attracting investments into Hong Kong SAR (BIS Papers No. 44). Interestingly, direct investments abroad also increased on average, likely boosted by positive prospects elsewhere, including higher U.S. growth. Moreover, direct investments, compared to other investments such as portfolio flows, tend to have longer investment horizons and are therefore less affected by changes in financial conditions that can be frequent and volatile. On net, our analysis finds that global risk aversion is the most significant driver affecting direct investments in Hong Kong SAR (Appendix, table 1). Not surprisingly, increases in risk aversion are associated with large declines in direct investments in Hong Kong SAR.



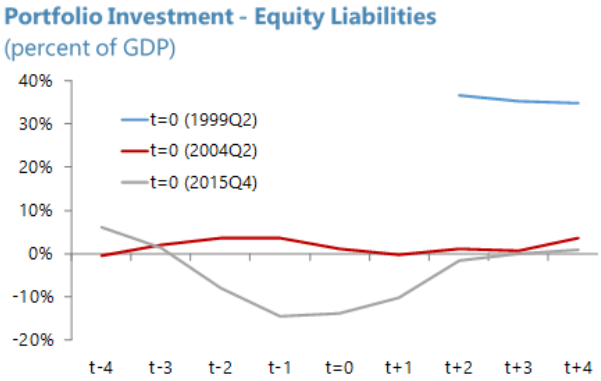
Source: CEIC Data Co. Ltd.; and IMF staff calculations.

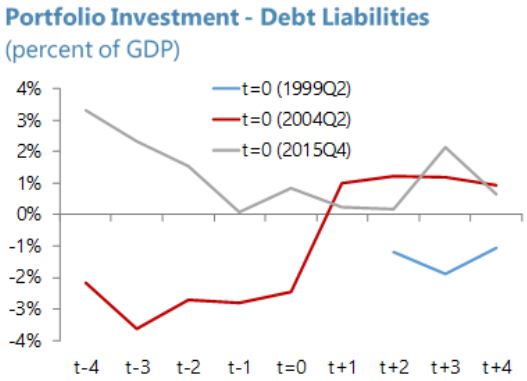
Portfolio Investments

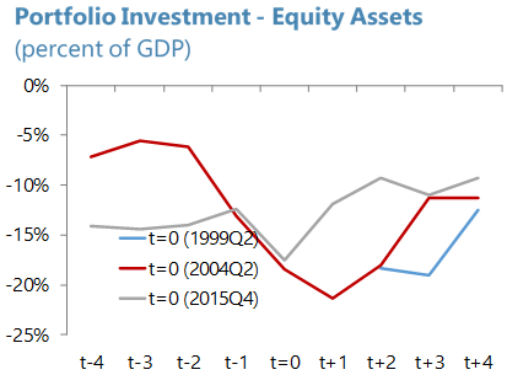
7. There were no discernable patterns to portfolio flows in response to Fed rate hikes. Equity and debt investments have mostly remained positive, regardless of rate movements. Moreover, the absolute amount of portfolio assets has increased in recent years. These developments likely reflect Hong Kong SAR's role as a fund-raising center for Mainland firms. CPIS data indicated that Hong Kong SAR residents' equity investment in China rose more than 33-fold between 2001 to 2015 to HKD 1.5 trillion. By contrast, non-residents' holdings of Hong Kong SAR debt and equities have mostly declined post Fed rate hikes. Such behavior is in line with the general trend of net portfolio outflows (as indicated by the chart on net capital flows). A tightening un

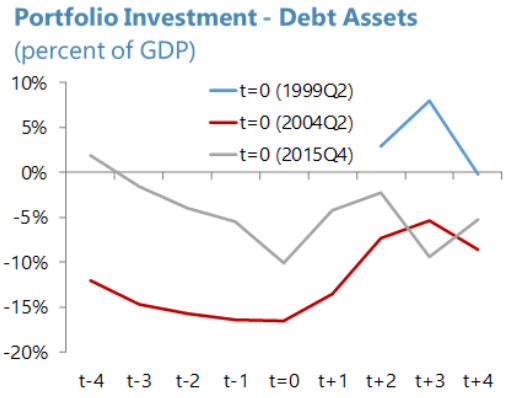
[4] Ibid.

financial conditions in Hong Kong SAR, coupled with stronger U.S. growth, likely dampened portfolio inflows.







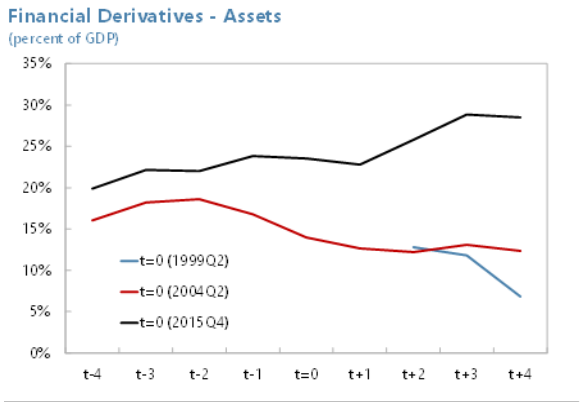


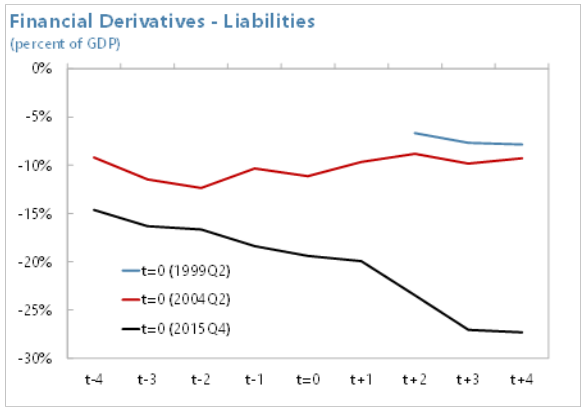
8. Financial derivative flows – both into and out of Hong Kong SAR– tend to increase following Fed rate hikes, with investors taking offsetting positions to hedge against potential losses (e.g. selling foreign assets to protect against possible losses in foreign holdings). This is likely related to the need to adjust portfolio exposures and to hedge against higher U.S. rates and the corresponding fluctuations in currencies.

Other investments

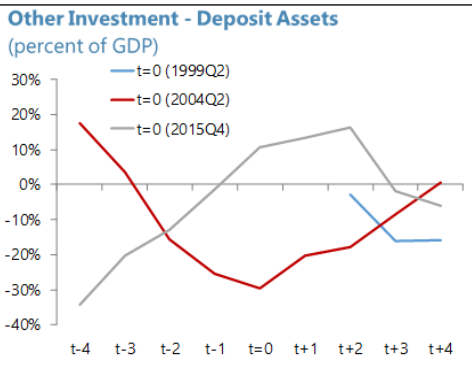
9. These "residual" items, mostly in the form of loans and deposits, have been large and volatile. While Hong Kong SAR residents reduced their deposit accumulation offshore post the Fed rate hike in 2004, they increased these assets in 1999 and during the current cycle. The fact that Fed rate hikes have not decisively pulled deposits out of Hong Kong suggests other factors play a greater role; we discuss these in Section III. Another notable feature is the changing pattern of loan asset and liability accumulation in recent years. While Hong Kong SAR residents have lent more

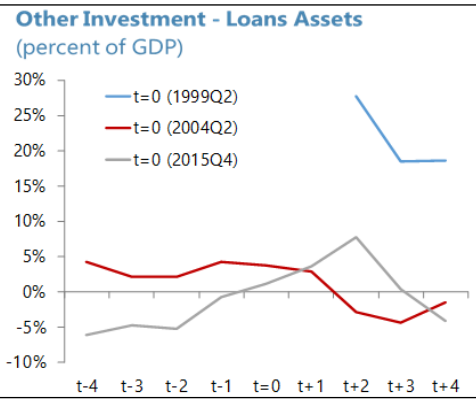
following the 2015 rate hike, reflecting in part increased lending to Mainland firms, non-residents have lent less to Hong Kong SAR over the same period.



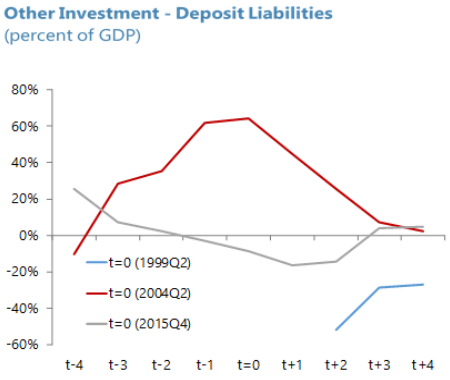


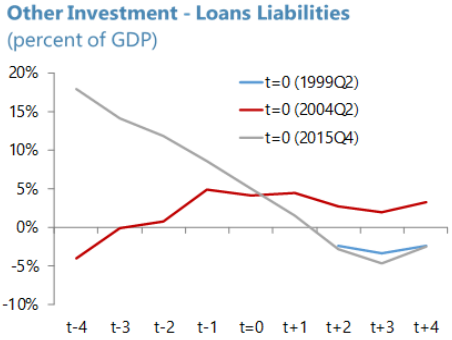
Source: CEIC Data Co. Ltd.; and IMF staff calculations.





Source: CEIC Data Co. Ltd.; and IMF staff calculations.





Source: CEIC Data Co. Ltd.; and IMF staff calculations.

C. Drivers of Capital Flows In and Out Of Hong Kong SAR

Empirical Strategy

10. Empirical analysis considers the impact of "push" and "pull" factors in driving capital flows;

$$Y_t = \alpha_0 + \beta_0 External_t + \beta_1 Domestic_{t-} + \varepsilon_t$$

The left hand-side, Yt, represents the ratio of flows relative to Hong Kong SAR's nominal GDP. The right-hand side consists of variables representing domestic (pull) or external (push) factors as widely used in literature. The push factors consist of changes in the Fed funds target, global risk aversion, as proxied by the VIX index and global liquidity, proxied by the annual growth rate of M2 in G7 countries.[5] Domestic "pull" factors include the growth differential relative to the U.S., differences in the real exchange rates, interest rate differentials for 3-month rates as well as differences in equity market returns between these two economies. We consider quarterly observations (from March 1999 to March 2017) from balance of payment statistics, focusing primarily on financial flows as they represent the bulk of cross-border flows in Hong Kong SAR. We excluded observations from the Asian Financial Crisis and the two years – 2007 and 2008 – that spanned the Great Financial Crisis in our baseline analysis.[6] In a separate robustness check, we included all observations; the results are qualitatively the same.

11. Before discussing the findings, we note a few important caveats in our analysis. We recognize that capital flows react to macroeconomic conditions, investment considerations and swings in market sentiment. Interpreting these results as a causal link between capital flows and growth, currency movements, risk sentiment as well as global liquidity warrants caution. To mitigate some of these concerns, a different robustness test used lagged domestic pull variables to minimize the problem of reverse causality. This test finds similar results on the impact of currency differentials, equity returns and external "push" factors such as global liquidity and risk aversion. The notable difference is the role of interest rate differentials; in contrast to findings from the baseline model, Hibor--Libor spreads do affect equity portfolio and deposit flows into Hong Kong SAR, though the degrees of sensitivity are limited.

Results

12. Push/Pull factors: On net, cyclical factors such as growth differentials, equity and currency differentials matter for financial flows, though the magnitude of impact differs according to types of flows. Surprisingly, interest rate differentials do not have a significant impact on overall capital flows while changes in the Fed funds target only has a limited impact on debt portfolio flows. This finding is in line with equity performance in the last two rate hike cycles, with the Hang Seng Index rising

[5] There is no one definition of "global liquidity". The common measure of "global liquidity" involves both quantity and price-based indicators that assesses the "ease of funding" at a particular point in time (IMF 2014). In our analysis, global liquidity captures "core" funding – traditional monetary aggregates – and ignores the role of "non-core" funding, which is more affected by the shadow banking system. We chose a quantity-based core measure as price-based indicators and the shadow system are captured by other variables such as VIX and interest rates in our analysis.

[6] Consistent with HK-SAR Census and Statistics Department's practice, a positive value indicates financial inflow (liability) while a negative value indicates outflow (asset investment). Net positions are therefore the sum of assets (debit entries) and liabilities (credit entries).

(continued)

following Fed rate hikes (and was generally far more volatile than the S&P). Hang Seng's performance suggests that more fundamental drivers, including corporate profitability and a positive growth outlook, likely played a bigger role in asset performance. These results underscore the fact Hong Kong SAR is not an emerging market; factors that typically buffet flows into EMs have limited impact on Hong Kong SAR.

We discuss notable results in more detail below:

- *Interest rate differentials* do not have a significant impact on financial flows in the baseline analysis. This is in line with a number of recent findings.[7] Under the Hong Kong SAR's Linked Exchange Rate System, domestic interest rates adjust and counteract the impact from the original capital movements. That said, an alternative test where domestic conditions – including interest rate differentials – are regressed on a lagged basis finds that interest rate differentials have a statistically significant, though limited, impact on portfolio and deposit flows (Appendix Table 2). The muted response to interest rate differentials relative to currency differentials (bullet below) could be a result of the close interplay between changes in interest rates and movements in the Hong Kong dollar. It appears that the currency impact outweighs the interest rate impact when the two factors are considered together. Moreover, recent record-low interest rates could have also dampened the overall impact of interest rates on capital flows. Although the 3-month Hibor has risen sizably since 2016, it remains low by historical standards – it had risen to around 0.75 percent by mid-October 2017. Domestic liquidity has remained ample – the Monetary Base is well over HKD 1 trillion, significantly higher than in the years before the GFC. Against this context, the pace of interest rate increase – and associated capital flows – are likely to be modest. It is possible that as rates rise in the future, the role of interest rate differentials could begin to have a larger impact on capital flows.

- *Currency differentials.* Movements in the Hong Kong dollar relative to the U.S. dollar in real terms are highly correlated with both inflows and outflows. We find that a one percentage point increase in the pace of HKD appreciation relative to the USD is associated with net financial inflows into Hong Kong SAR by about 1.8 percentage points (see "Currency Differential" text chart below). Specifically, such HKD appreciation is correlated with an increase in the pace of financial inflows by more than 7 percentage points, while the pace of outflows slowed, by 5.6 percentage points. Specific responses are more nuanced: a strong Hong Kong dollar pulls capital into Hong Kong SAR, including deposits, but loan growth also tends to fall, likely due to the fact that a stronger HKD at loan maturity would have lowered the return on those loans extended to Hong Kong SAR residents.

- *Growth differentials.* High growth in Hong Kong SAR relative to the U.S. also has a significant impact on net inflows. In general, a one percentage increase in Hong Kong SAR's growth differential relative to the U.S. boosts net deposits in Hong Kong SAR by about 3.5 percentage points of GDP. Generally, growth differentials have a similar impact on capital flows as currency

[7] Jao and Sheng (2011); IMF (2014)

differentials. This is not surprising. *All else equal*, capital flows gravitate towards markets that offer higher returns, such as those with better growth expectations.

13. Push factors:

- *Risk aversion*. The model finds that global risk aversion dampens direct investments while boosting deposit inflows into Hong Kong SAR. The sensitivity to increases in global risk aversion is relatively high: a one percentage point increase in VIX lowers gross direct investment into Hong Kong SAR by 18.7 percentage points, while boosting gross deposit inflows by more than 29 percentage points. These sizable flows are not surprising. As a global financial center, financial flows into Hong Kong SAR are high and volatile, susceptible to changes in risk sentiment. Net direct investments swung between +39 percent and -5 percent of GDP since 2011 and for net portfolio investments, movements were flat to -45 percent of GDP over the same period. Movements in gross flows can be several times larger. To the extent that deposits are seen as a safe and liquid asset, heightened risk aversion could increase inflows into these assets while curtailing direct investment – which includes items such as significant real estate transactions.

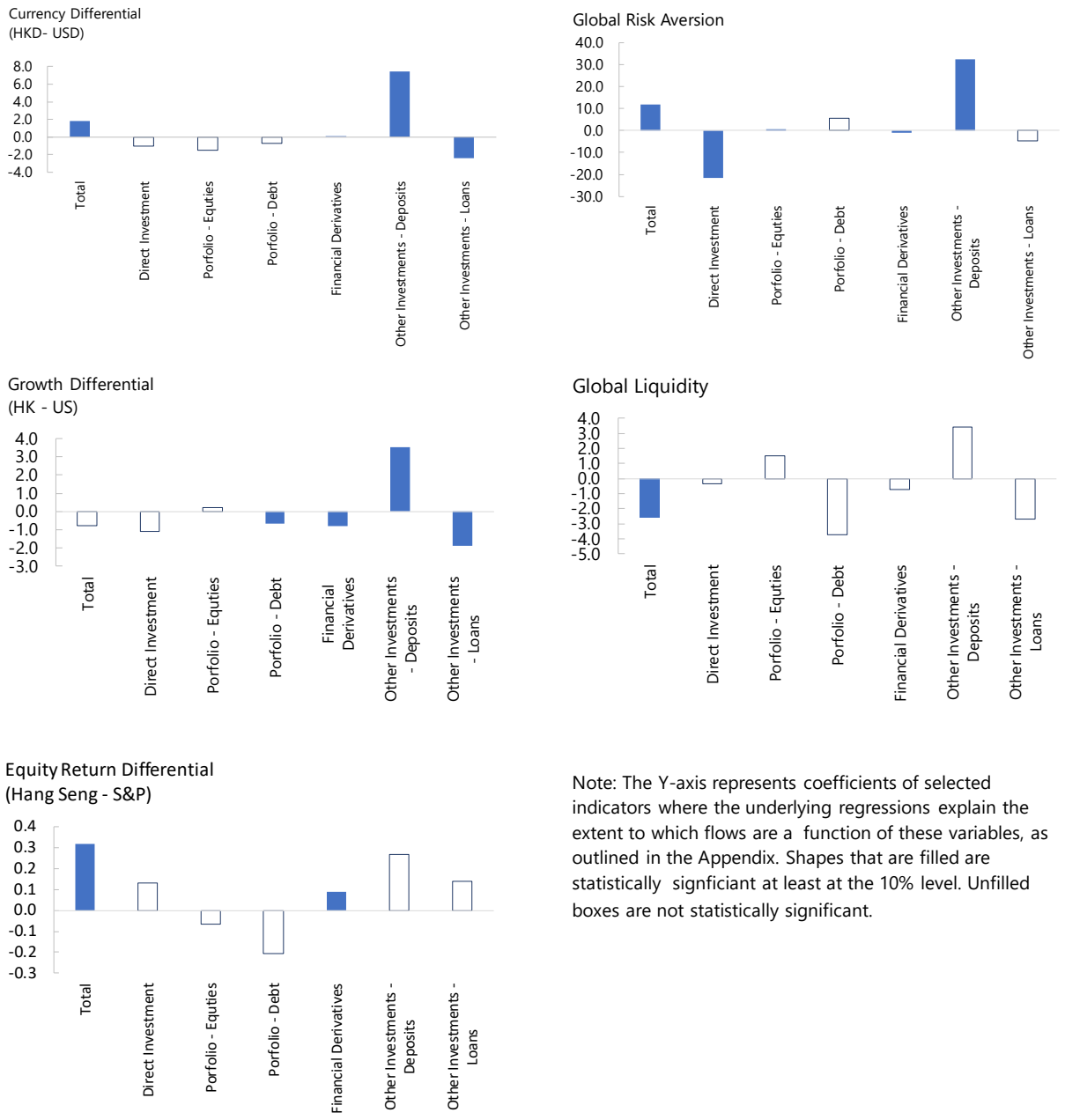
- *Global liquidity*. An increase in G7 M2 is associated with large swings in capital flows in and out of Hong Kong SAR. The definition of "global liquidity" warrants some discussion in this analysis, particularly for a global financial center such as Hong Kong SAR. In general, "global liquidity" is loosely defined as financial conditions that facilitate access to international funding. Drivers of global liquidity include policies, risk appetite and bank leverage. These drivers are transmitted through bank funding – typically shadow credit or "noncore" funding as well as cross-border bank and portfolio flows. Their cumulative impact can be seen in credit growth and asset prices of local economies (IMF, 2014). As there is no one accepted indicator of "non-core" funding, we focus on M2s – "core" funding that banks draw on during normal times.[8] Since core does not include inter-bank deposits and the endogenous liquidity created through financial innovation, it does not capture leverage created in the financial system and much of the attendant increase in liquidity that could flow to an open financial system such as Hong Kong SAR.[9] The response of capital flows in this analysis, therefore, reflects sensitivity to changes in G7 policy rates as well as central bank liquidity support. We find that increases in core funding in G7 is associated with increases in deposit flows into Hong Kong SAR, likely reflecting search for higher return but safe

[8] Non-core liabilities can be calculated from aggregate liabilities of securities (other than shares) and loans. A detailed measure of shadow banking computed by the New York Fed on U.S. shadow credit is one such measure. However, such disaggregated measure across different credit instruments is not available in other major economies, preventing the construction of a consolidated measure of global non-core liquidity.

[9] Core, though occasionally move in tandem with non-core, can also behave different from non-core. Prior to the GFC, core funding across the major economies was flat, while noncore liquidity rose, as financial institutions relied increasingly on endogenous "money" creation to fund their expansion. Once the crisis struck, noncore funding contracted, and core funding partially filled the gap—reflecting the exceptional policy support during the crisis—provided by central bank liquidity injections (Chen et al., 2012). It is important to note that a decline in core funding growth does not necessarily correspond to increases in noncore funding. For example, currently, while major central banks have begun to normalize rates and trim accommodation, regulatory tightening since the GFC has also contained the growth of noncore funding in major economies.

and liquid investments found in Hong Kong SAR. At the same time, this increase in G7 M2s is associated with a decline in loans lent to Hong Kong SAR residents; this could reflect the more dominant impact of deposit inflows. Others factors, including the possibility that such flows took place during periods of strengthening HK dollar, could have also dampened loan inflow (Appendix table 1).

Figure 3. Impact on Net Capital Flows
(percent of GDP)



Note: The Y-axis represents coefficients of selected indicators where the underlying regressions explain the extent to which flows are a function of these variables, as outlined in the Appendix. Shapes that are filled are statistically signficiant at least at the 10% level. Unfilled boxes are not statistically significant.

Source: IMF staff calculations.

D. Implications on Monetary and Financial Stability

14. Hong Kong SAR remains sensitive to changes in global financial conditions. Global risk appetite and global liquidity play a significant role in capital flows into Hong Kong SAR; these factors are beyond Hong Kong's control. That said, findings here also suggest that fundamental, domestic drivers, including growth differentials and domestic asset performance, could also affect capital flows into Hong Kong SAR. Hong Kong SAR's long-standing price and wage flexibility, for example, has been found to have a positive correlation with growth (Guo, 2017). These results underscore the crucial role economic policies play in bolstering financial stability and the buffer that strong, resilient growth can provide against volatile capital movements.

Appendix I. Regression Results

Net Financial Account Flows (Share of GDP) – Excluding AFC and GFC

Variables (3/1999 - 3/2017)	(1) Total	(2) Direct Investment	(3) Porfolio - Equties	(4) Porfolio - Debt	(5) Financial Derivatives	(6) Other Investments - Deposits	(7) Other Investments - Loans
Interest rate differential	0.016	0.029	0.055	-0.008	-0.023	-0.025	-0.015
	(0.039)	(0.067)	(0.073)	(0.062)	(0.018)	(0.083)	(0.054)
Change in Fed Fund rate target	-0.000	-0.000	0.001	0.001*	-0.000	-0.002**	0.000
	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Currency differential	1.848***	-1.023	-1.511	-0.732	0.093	7.427***	-2.412***
	(0.597)	(1.030)	(1.113)	(0.952)	(0.280)	(1.271)	(0.822)
Equity return differential	0.319***	0.131	-0.064	-0.208	0.090*	0.265	0.139
	(0.112)	(0.194)	(0.210)	(0.179)	(0.053)	(0.239)	(0.155)
Global risk aversion (log)	11.930**	-21.737**	0.750	5.474	-0.912	32.672***	-4.674
	(5.593)	(9.647)	(10.421)	(8.915)	(2.624)	(11.896)	(7.692)
Growth differential	-0.789	-1.116	0.230	-0.654	-0.801**	3.508**	-1.900**
	(0.657)	(1.134)	(1.225)	(1.048)	(0.308)	(1.398)	(0.904)
Global liquidity (growth)	-2.587*	-0.371	1.500	-3.701	-0.748	3.412	-2.664
	(1.517)	(2.617)	(2.827)	(2.418)	(0.712)	(3.227)	(2.087)
Constant	-18.645	68.464**	-18.000	-3.176	10.188	-106.007***	30.441
	(17.614)	(30.378)	(32.819)	(28.075)	(8.262)	(37.464)	(24.224)
Number of observations	65	65	65	65	65	65	65
R^2	0.278	0.098	0.082	0.124	0.119	0.482	0.277

Standard errors in parenthesis
*** p<0.01, ** p<0.05, *<0.1

Net Financial Account Flows (Share of GDP) – Excluding AFC and GFC; Lagged Variable

Variables (3/1999 - 3/2017)	(1) Total	(2) Direct Investment	(3) Porfolio - Equties	(4) Porfolio - Debt	(5) Financial Derivatives	(6) Other Investments - Deposits	(7) Other Investments - Loans
Interest rate differential	-0.016	0.039	0.156**	0.071	0.013	-0.228**	-0.066
(t-1)	(0.043)	(0.072)	(0.072)	(0.065)	(0.018)	(0.087)	(0.046)
Change in Fed Fund rate target	-0.014	-0.043	0.088	0.116*	0.017	-0.180**	-0.020
	(0.044)	(0.074)	(0.074)	(0.067)	(0.019)	(0.089)	(0.047)
Currency differential	1.354**	0.115	-2.394**	-0.820	-0.549*	6.940***	-1.843**
(t-1)	(0.650)	(1.092)	(1.078)	(0.984)	(0.277)	(1.308)	(0.694)
Equity return differential	0.228*	0.109	-0.029	-0.293	-0.118**	0.354	0.253*
(t-1)	(0.119)	(0.200)	(0.198)	(0.180)	(0.051)	(0.240)	(0.127)
Global risk aversion (log)	11.063*	-16.156	-7.119	7.198	-0.966	30.870**	-3.306
	(5.779)	(9.706)	(9.586)	(8.750)	(2.464)	(11.631)	(6.173)
Growth differential	-1.267*	-0.901	0.992	1.499	-0.192	-1.445	-1.309*
(t-1)	(0.677)	(1.138)	(1.124)	(1.026)	(0.289)	(1.363)	(0.724)
Global liquidity (growth)	-2.561	0.908	1.902	-2.869	-0.202	1.035	-3.149*
	(1.584)	(2.660)	(2.627)	(2.398)	(0.675)	(3.187)	(1.691)
Constant	-16.535	46.688	1.787	-14.512	6.441	-83.167**	26.845
	(17.958)	(30.160)	(29.788)	(27.189)	(7.657)	(36.143)	(19.180)
Number of observations	64	64	64	64	64	64	64
R^2	0.210	0.067	0.189	0.138	0.175	0.407	0.313

Standard errors in parenthesis
*** p<0.01, ** p<0.05, *<0.1

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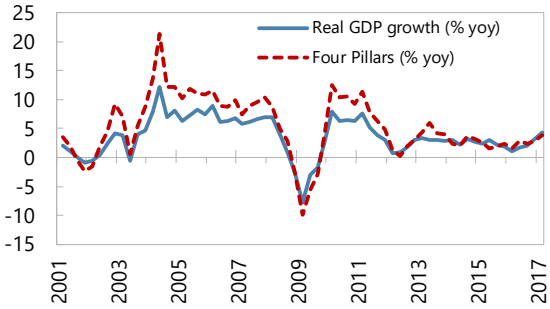
SYNCHRONIZATION OF HONG KONG SAR'S BUSINESS CYCLES WITH THE US AND MAINLAND CHINA[1]

While Hong Kong SAR's business cycle remains more synchronized with that of the United States, Mainland China plays an increasingly important role in driving idiosyncratic developments in key sectors. This note sheds light on how external developments affect growth prospects of Hong Kong SAR.

1. Understanding the synchronization of Hong Kong SAR's business cycles with those of major trading partners is important for assessing its growth prospects. Hong Kong SAR is a small highly-open economy, buffeted not only by domestic factors, but also external developments. Although it has traditionally been predominately affected by spillovers from the U.S., in recent years, Hong Kong SAR's economy has become increasingly integrated with that of Mainland China. The impact of spillovers on Hong Kong SAR's business cycle and sectoral developments is important for assessing Hong Kong SAR's growth prospects. We consider developments in the Four Pillar industries which include financial services, tourism, trading and logistics, and professional services and other producer services, accounting for 57 percent of GDP in 2015.[2] The correlation between headline real GDP growth and Four Pillars industries was 0.97 during 2001Q1 to 2017Q1.

Hong Kong SAR: Real GDP Growth and Estimated Growth of Four Pillar Industries



Sources: C&SD; and IMF staff calculations.

A. Hong Kong SAR's Business Cycle Remains More Synchronized with that of the US

2. The sectoral growth of Four Pillar industries can be decomposed into a common shock and idiosyncratic sectoral shocks (using principal components).[3] The first principal component of the growth rates of Four Pillar industries, labeled henceforth as the "common shock", has moved closely with headline GDP. We label the residual of each sector's growth after deducting the common shock as a "sectoral shock", which tracks idiosyncratic developments in the corresponding

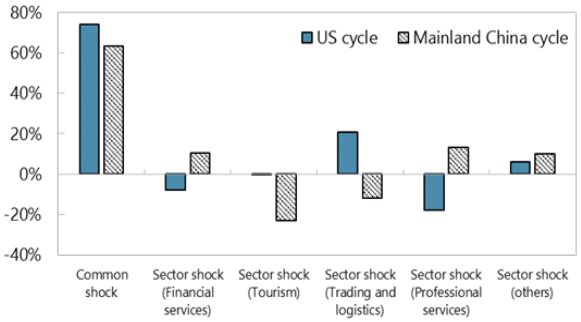
[1] Prepared by Daniel Law.

[2] The official data of Four Pillars' growth is only available at annual frequency up to 2015. The data series of Four Pillars are extended using weighted averages of chain-linked growth rates of industries in the breakdown of quarterly real GDP growth by industry.

[3] In line with HKMA analysis (see for example, Box 3 of HKMA's semiannual Financial Stability Report, September 2016 issue). The Annex provides details on the methodology.

sector. The correlation between the common shock and cyclical swings in the U.S. and Mainland China were 0.74 and 0.63 respectively, during 2001Q1-2017Q1, showing significant unconditional bilateral spillovers from both the U.S and Mainland China. The magnitudes of the correlation of each sector with either U.S. or Chinese business cycles were generally smaller and their signs varied across sectors. In a multivariate regression to explain the common shock, the coefficients of the cyclical swings in the U.S. and Mainland China were both significant at 0.69 and 0.46 respectively. This preliminary evidence suggested that Hong Kong SAR has a more synchronized cycle with the U.S. than with Mainland China.

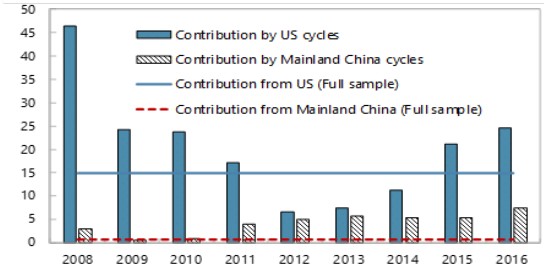
Correlations between shocks in Hong Kong's growth and cycles in US and Mainland China



Sources: C&SD; and IMF staff calculations.

3. Further analysis confirms that Hong Kong SAR's business cycle is still more synchronized with the U.S. In the literature, He, Liao and Wu (2015)[4] tested Hong Kong's growth synchronization with a structural VAR model based on the permanent-income hypothesis, and found that the transitory component of income in Hong Kong SAR remains more driven by that of the U.S. while the permanent component of income (or trend growth) in Hong Kong SAR is more driven by that of Mainland China. We used the reduced-form VAR model, and the variance decomposition provides direct information on the relative contribution from each external business cycle.[5] For the full sample of 2001Q1-2017Q1, headline growth (as proxied by the common shock) was more affected by cyclical swings in the U.S., which accounted for 15 percent of the variation. The impact of cyclical swings in Mainland China was much smaller at only 0.6 percent.

Contribution of Variation in HK's Business Cycle from US and Mainland China (Common Shock)



Sources: C&SD;and IMF staff calculations.

4. However, spillovers from Mainland China have been growing. We estimated 32-quarter rolling window versions of the 3-variable VAR to examine the extent of spillovers over time. The effect of the U.S. was the highest at 46 percent during the global financial crisis in 2008, then fell gradually to 6.6 percent in 2012, and rebounded subsequently to 25 percent in 2016. On the other

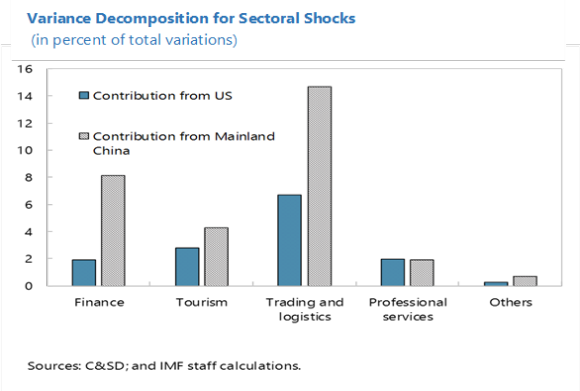
[4] See He, Dong, Wei Liao and Tommy Wu, 2015, "Hong Kong's Growth Synchronization with China and the U.S.: A Trend and Cycle Analysis", IMF Working Paper WP/15/82.

[5] We used a 3-factor VAR model which included the common shock, cyclical swings in the U.S. and China with 1-quarter lags. The variance decomposition was obtained using the average contribution across two Cholesky decompositions: one where shocks to Mainland China's business cycle are not contemporaneously affected by the U.S. and common shock and another where shocks to the U.S. business cycle are not contemporaneously affected by Mainland China or the common shock.

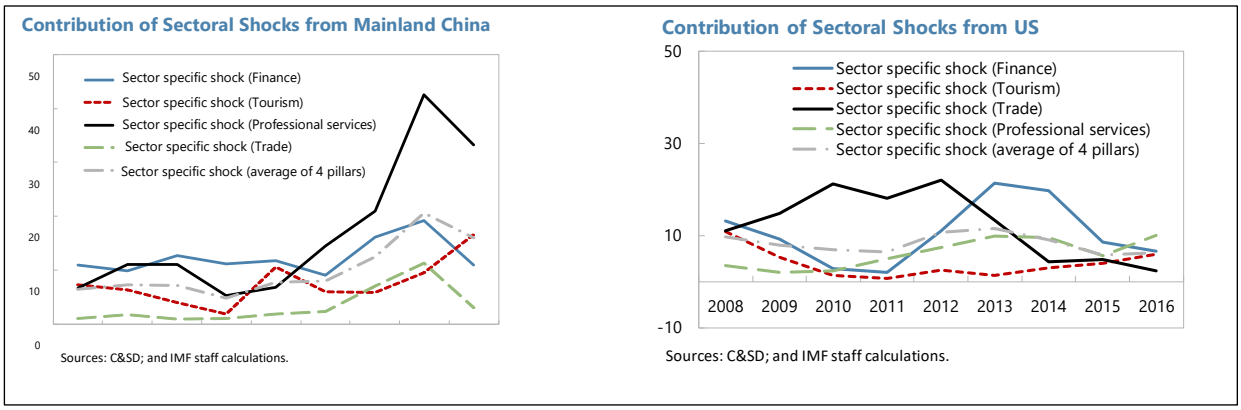
hand, influence from Mainland China has been growing though it is still smaller; it jumped to 4 percent in 2011 from (below 1 percent) and then rose gradually to 7.4 percent in 2016.

B. Increasing Contribution of Mainland China in Key Sectors

5. Analysis showed that China is playing a bigger role in driving idiosyncratic developments in certain sectors in Hong Kong SAR. We assess whether Mainland China or the U.S. cycles drive sectoral shocks, by replacing the common shock with sectoral shocks in the 3-factor VAR models. The results suggest that idiosyncratic developments of the key sectors are increasingly driven by Mainland China, reflecting greater integration. Financial services have benefited from gradual capital account liberalization in Mainland China. Tourism stayed weak on stalled momentum in Mainland tourist arrivals and their spending, while trading and logistics was sensitive to external demand from Mainland China.



6. The influence of Mainland China on the idiosyncratic developments in the key sectors rose in recent years, especially on trading and logistics. Using variance decompositions over rolling 32-quarter samples, one can see the decline in the role of the U.S. business cycle and the rising importance of Mainland China. On average, the contribution from cyclical swings in the U.S. has declined from the peak at 11 percent in 2013 to about 6 percent in 2016. On the other hand, the influence from cyclical swings in Mainland China rose from 5 percent in 2011 to the peak at 21 percent in 2015, easing slightly to 16 percent in 2016. The trading and logistics sector witnessed the sharpest increase among the Four Pillars with 33 percent of variation from Mainland China in 2016, compared to 3 to 17 percent for other three Pillars. For tourism, the contribution from both US and Mainland China increased in recently years.



7. In summary, based on analysis of common and sectoral shocks of pillar industries, Hong Kong SAR's business cycles are still more related to the cyclical swings in the U.S. Mainland China's influence has grown substantially, and cyclical swings in Mainland China

contributed more to idiosyncratic sectoral developments in Hong Kong SAR, in particular in trading and logistics and tourism. These results are in line with He et al (2015) that transitory shocks from the U.S. remain a major driving force behind Hong Kong SAR's business cycle fluctuations, while permanent shocks from Mainland China have a larger impact on Hong Kong SAR's trend growth.

Annex I. Technical Details on the Synchronization of Hong Kong SAR's Business Cycles with the US and China

Data on Four Pillars and Headline GDP

The data series of Four Pillars were only available annually up to 2015 and were extended to span from 2000Q1 to 2017Q1 using weighted averages of chain-linked growth rates of industries in the breakdown of quarterly real GDP growth by industry (with different classification from Four Pillars).

Decomposition of Common Shock and Sectoral Shock

Following HKMA half-yearly financial stability report (September 2016 issue), we decomposed the growth of Four pillars into common shock and sectoral shock,

Sectoral growth = constant + β (common shock) + sectoral shock, and

Common shock = first principal component for Four Pillar industries and the residual "Others" industries

Correlation Analysis

To conduct correlation analysis, we need to estimate the cyclical swings in the US and China respectively. Therefore, we use HP filter on the quarterly real GDP growth of the US and China respectively to get the residuals. The residuals are assumed to be the cyclical swings in the US and China.

For the correlation analysis, we calculated the correlation coefficients of the cyclical swings in the US with common shock and sectoral shocks respectively and then the cyclical swings in the US is replaced by the cyclical swings in China. The sample period is 2001Q1 – 2017Q1.

Multivariate Regression

We regressed the common shock on the cyclical swings in the U.S. and China to get a sense on their sensitivity to the business cycle:

Common shock = $\alpha + \beta_1$ (cyclical swings in the U.S.) + β_2 (cyclical swings in China) + ε

VAR Model for Common Shock

VAR model is a useful tool to identify the source and response, especially from the distribution of variance decomposition. In order to understand the source of Hong Kong's business cycle (common shock as proxy). For sample period of 2001Q1 – 2017Q1, we used a simple 3-factor VAR model (with 1-quarter lag based on SIC):

$X_t = A + B X_t + \varepsilon_t$, and

X_t = (common shock, US cycle, China cycle), A is a vector of constant, B is a vector of slope coefficients and ε_t is a vector of error terms.

The variance decomposition is obtained from Cholesky decomposition, which is affected by the ordering of variables. Therefore, we also ran the model in the variable order of (common shock, China cycle, US cycle) and take the averages for the two in the variance decomposition. A 10-quarter forecast horizon was used.

As the common shock is simply first principal component (the contribution from common shock is a scalar factor multiplied by the first principal component), we did not run the model for each of the Four Pillars as they should give the same variance decomposition.

In order to know how the contribution evolved over time, we ran the models using rolling 32-quarter samples ending 2008Q4, 2009Q4, 2010Q4, 2011Q4, 2012Q4, 2013Q4, 2014Q4, 2015Q4 and 2016Q4 respectively.

VAR Models for Sectoral Shocks

Similar to the VAR for common shock, we replaced the common shock by sectoral shocks to examine the impact of cyclical swings in the US and China on Hong Kong's idiosyncratic sectoral developments.

$X_t = A + B X_t + \varepsilon_t$, and

X_t = (sectoral shock of industry i, US cycle, China cycle)', A is a vector of constant, B is a vector of slope coefficients and ε_t is a vector of error terms.

We also ran the models for each of the Four Pillar industries with variable order of (sectoral shock of industry i, China cycle and US cycle) and with rolling 32-quarter samples. The variance decomposition is from Cholesky decomposition and a 10-quarter forecast horizon was used.

References

He, D., W. Liao and T. Wu, 2015, "Hong Kong's Growth Synchronization with China and the U.S.: A Trend and Cycle Analysis," IMF Working Paper WP/15/82.

Hong Kong Monetary Authority, 2016, "Box 3. The unemployment rate of Hong Kong: The effects of aggregate and sectoral channels," Half-Yearly Monetary and Financial Stability Report (September 2016 issue).