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Macroeconomic Review

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The *Macroeconomic Review* is published twice a year in conjunction with the release of the MAS Monetary Policy Statement.

The *Review* documents the Economic Policy Group's (EPG) analysis and assessment of macroeconomic developments in the Singapore economy, and shares with market participants, analysts and the wider public, the basis for the policy decisions conveyed in the Monetary Policy Statement. It also features in-depth studies undertaken by EPG, and invited guest contributors, on broader issues facing the Singapore economy.

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Contents

Preface	i
Monetary Policy Statement	ii-iv
1 The International Economy	
1.1 Global Economy	2
1.2 G3	10
1.3 Asia ex-Japan	13
2 The Singapore Economy	
2.1 Recent Economic Developments	17
2.2 Economic Outlook	26
2.3 Comparison with Past Downturns	30
Box A The Uncovered Interest Parity in Normal and Stress Periods	35
3 Labour Market and Inflation	
3.1 Labour Market	43
3.2 Consumer Price Developments	51
Box B Wage Forecasting in Singapore	61
4 Macroeconomic Policy	
4.1 Monetary Policy	68
4.2 Fiscal Policy	77
Box C Review of MAS Money Market Operations in FY2019/20	88
Special Features	
A Asian Monetary Policy Forum 2020	92
B Issues and Challenges in the Fiscal Policy Response to COVID-19	102
C Forecasting Singapore GDP Using SPF Data	112
Statistical Appendix	122

Abbreviations

ACU	Asian currency unit
AE	Advanced economy
AFC	Asian Financial Crisis
ASEAN	Association of Southeast Asian Nations
BIS	Bank for International Settlements
COVID-19	Coronavirus disease 2019
CPI	Consumer price index
DBU	Domestic banking unit
ECB	European Central Bank
EM	Emerging market
EU	European Union
EPG	Economic Policy Group
F&B	Food and beverage
FDI	Foreign direct investment
GDP	Gross domestic product
GFC	Global Financial Crisis
ICT	information and communications technology
IMF	International Monetary Fund
IT	information technology
m-o-m	month-on-month
NEA	Northeast Asian economies
NODX	Non-oil domestic exports
OECD	Organisation for Economic Cooperation and Development
OPEC	Organization of the Petroleum Exporting Countries
PMI	Purchasing Managers' Index
QE	Quantitative easing
q-o-q	quarter-on-quarter
REIT	Real estate investment trust
SA	seasonally adjusted
SAAR	seasonally adjusted annualised rate
SARS	Severe Acute Respiratory Syndrome
SME	Small and medium enterprises
UN	United Nations
WHO	World Health Organization
y-o-y	year-on-year

Data used in the *Review* is drawn from the following official sources unless otherwise stated: Building and Construction Authority (BCA), Central Provident Fund Board (CPF), Singapore Department of Statistics (DOS), Enterprise Development Board (EDB), Enterprise Singapore (ESG), Infocomm Media Development Authority (IMDA), Land Transport Authority (LTA), Ministry of Finance (MOF), Ministry of Manpower (MOM), Ministry of National Development (MND), Maritime and Port Authority of Singapore (MPA), Ministry of Trade & Industry (MTI), Singapore Tourism Board (STB) and Urban Redevelopment Authority (URA).

Preface

In this issue of the *Review*, Special Feature A documents the proceedings of the 7th Asian Monetary Policy Forum (AMPF), conducted virtually in June this year, which focused on the economic impact of the COVID-19 pandemic and the macroeconomic policy response, as well as the role of global safe assets in promoting macroeconomic and financial stability. The 7th AMPF was jointly organised by the University of Chicago Booth School of Business, the National University of Singapore (NUS) Business School and MAS, under the auspices of the Asian Bureau of Finance and Economic Research (ABFER). Special Feature B reviews the academic and policy discussion about fiscal policy responses to COVID-19. It discusses the peculiarities of the COVID-19 shock and the possible long-term consequences of an aggressive policy response. Our appreciation goes to Professor Tian Xie of the Shanghai University of Finance and Economics as well as Professor Jun Yu from Singapore Management University (SMU) for contributing Special Feature C, which utilises econometric and machine learning methods to forecast Singapore's GDP growth rate, using data from the quarterly Survey of Professional Forecasters (SPF). Box A explores how the uncovered interest parity (UIP) condition has evolved as Singapore became more financially integrated with global markets. It also delves into the impact on the relationship between the exchange rate and the interest rate of extraordinary events such as the GFC and the early stages of the COVID-19 crisis. We are also pleased to present Box B, which evaluates several econometric and machine learning techniques to identify methods that yield more accurate predictions of wage growth in Singapore. Finally, we would like to thank Professor Peter Wilson for his assistance in editing various sections of the *Review*.

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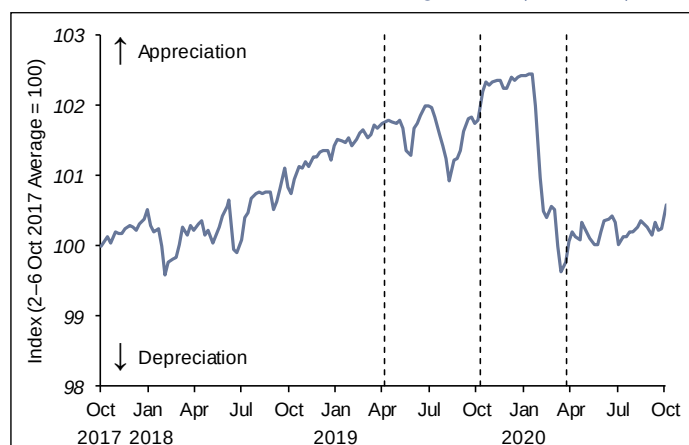
14 October 2020

Monetary Policy Statement

INTRODUCTION

1. In its April 2020 Monetary Policy Statement (MPS), MAS set the rate of appreciation of the S\$NEER policy band at zero percent per annum, starting at the then-prevailing level of the S\$NEER. There was no change to the width of the policy band. This policy stance was assessed to be appropriate given the deterioration in economic conditions and weaker inflation outlook, and aimed to complement fiscal, liquidity and financial policies in supporting the economy through the COVID-19 downturn.

Chart 1
S\$ Nominal Effective Exchange Rate (S\$NEER)



----- indicates last three releases of Monetary Policy Statement

2. The S\$NEER had fallen sharply in Q1 2020. Since the MPS on 30 March, it has hovered slightly above the mid-point of the new policy band. The relative stability of the S\$NEER has reflected the strengthening of the S\$ against the US\$, offset by its weakening against a number of regional currencies. The three-month S\$ SIBOR fell from 1.0% at end-March to 0.4% in early October, alongside the decline in the US\$ LIBOR.

OUTLOOK

3. Singapore's GDP picked up in Q3 2020 after its sharp contraction in the previous quarter. However, beyond the immediate rebound, GDP growth momentum is likely to be modest against a sluggish external backdrop, persistent weakness in some domestic services and limited recovery in the travel-related¹ sector. Nevertheless, barring a renewed worsening of the course of the COVID-19 pandemic, the Singapore economy is expected to expand in 2021, following the recession this year. Core inflation will remain low at 0–1% next year.

Growth Backdrop and Outlook

4. According to the *Advance Estimates* released by the Ministry of Trade and Industry on 14 October, the Singapore economy expanded by 7.9% on a quarter-on-quarter seasonally adjusted basis in Q3 2020, after a 13.2% decline in Q2. Compared to a year ago, GDP fell by 7.0% in Q3, moderating from the 13.3% contraction in the preceding quarter.

5. The sequential turnaround in Q3 largely reflected a resumption in domestic economic activity as circuit breaker measures were eased and policy stimulus took effect. The hardest-hit consumer-facing services and construction sector rebounded, while the manufacturing sector reverted to positive growth on the back of a sustained increase in the global demand for semiconductors and strong expansion in petrochemicals output.

6. Likewise, activity in Singapore's major trading partners saw a significant recovery in Q3 2020 as economies reopened. However, the pace of expansion is expected to moderate in the quarters ahead. A resurgence in infections in some countries has led to localised lockdowns. Heightened uncertainty over the course of the pandemic, the extent of future fiscal policy support, and tensions in US-China relations will also weigh on the global growth outlook.

7. Amid still cautious external demand and continued restrictions on cross-border travel, sequential growth in the Singapore economy is expected to slow in Q4 this year and remain modest in 2021. The initial uptick in consumer-facing services is likely to fade given soft labour market conditions and lingering public health concerns, while the industries that did well in 2020, such as pharmaceuticals, could also moderate in the year ahead. The travel-related sector will face prolonged headwinds.

8. The Singapore economy is forecast to contract by 5–7% this year, and record above-trend growth for 2021 due to the effects of the low base in 2020. The negative output gap will narrow as most sectors recoup their pre-COVID levels by the end of next year. However, activity in travel-related services will still be short of pre-pandemic levels.

9. While advanced manufacturing, ICT and digital financial services have attracted healthy investments even amid the pandemic, the economic scarring inflicted by the deep global recession in 2020 will weigh on external demand conditions in the next year or so.

Inflation Trends and Outlook

10. MAS Core Inflation, which excludes the costs of accommodation and private road transport, stayed low, averaging –0.3% year-on-year in July–August 2020, slightly more pronounced than the –0.2% recorded in Q2. Although domestic disinflationary pressures moderated following the reopening of the economy in June, this was offset by lower oil prices which passed through to electricity and gas costs. Imported food inflation also eased, dampening non-cooked food inflation, which has declined from its peak in Q2. CPI-All Items inflation showed more moderate disinflation at –0.4% compared to –0.7% in Q2, as private road transport costs fell at a slower pace in July–August.

11. In the quarters ahead, external inflation is likely to be low, given weak demand conditions in key commodity markets and the persistence of negative output gaps in Singapore's major trading partners. On the domestic front, cost pressures are expected to stay subdued. The resident unemployment rate rose to 4.5% in August and is likely to remain elevated. The accumulated slack in the labour market will weigh on wage growth. Nevertheless, the disinflationary effects of government subsidies introduced this year will fade, while demand for some domestic services would also gradually pick up. Consequently, core inflation is forecast to turn mildly positive in 2021.

12. Meanwhile, accommodation costs are expected to fall, in part due to the decline in foreign employment. Private transport costs should rise modestly amid a continued reduction in the supply of COEs.

13. All in, both MAS Core Inflation and CPI-All Items inflation are forecast to come in between -0.5 and 0% in 2020. In 2021, core inflation will average 0–1%, while headline inflation is projected to be between -0.5 and 0.5%.

MONETARY POLICY

14. The Singapore economy is expected to see a recovery in 2021, alongside receding disinflation risk. However, the underlying growth momentum will be weak, and the negative output gap will only narrow slowly in the year ahead. MAS Core Inflation will rise gradually and turn positive in 2021, but remain well below its long-term average.

15. MAS will therefore maintain a zero percent per annum rate of appreciation of the policy band. The width of the policy band and the level at which it is centred will be unchanged.

16. As core inflation is expected to stay low, MAS assesses that an accommodative policy stance will remain appropriate for some time. This will complement fiscal policy efforts to mitigate the economic impact of COVID-19 and ensure price stability over the medium term.

¹ Travel-related has been defined to comprise the air transport, accommodation and arts, entertainment & recreation industries.

1 The International Economy

- The global economy contracted sharply in H1 2020 as the COVID-19 pandemic and the public health measures imposed to contain it triggered a deep retrenchment in economic activity.
 - National authorities around the world loosened economic policies rapidly and substantially in response to the shock. Global activity in aggregate started to pick up in May as governments gradually eased movement restrictions and policy easing began to take effect.
 - The recovery is expected to continue into 2021. However, the outlook is subject to several risks, including the course of the pandemic, poorly timed withdrawal of policy support, and an escalation in adversarial US-China relations. Elevated uncertainty attendant in these risks, and damage to household and corporate balance sheets inflicted by the ongoing deep recession, are expected to weigh on demand, underpinning projections of a hesitant recovery and the persistence of a large output gap.
 - Global output is projected to regain its Q4 2019 level only in mid-2021. The protracted and partial recovery is expected to lead to a permanently lower trajectory for output, relative to pre-COVID forecasts.
-

1.1 Global Economy

The COVID-19 pandemic has triggered a deep global recession

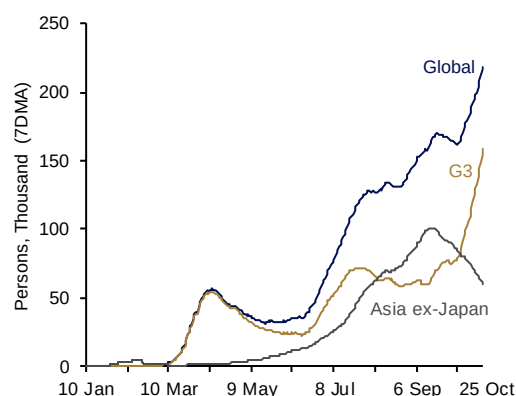
Since the outbreak of the COVID-19 pandemic, governments worldwide have imposed mobility restrictions to varying degrees of stringency, with uneven rates of success at curbing infections. In fact, after a tentative flattening of the curve from April–June, infections started to rise again, and improvements in population mobility stalled as lockdowns were reinstated albeit in a more limited way (**Charts 1.1 and 1.2**). The pandemic and associated restrictions have imparted a severe shock to the global economy, working through demand and supply channels. Necessary life-saving public health measures forced reductions in labour supply, disrupted production and shut down swathes of services activity reliant on person-to-person contact or travel. Household income and business revenue shortfalls, as well as heightened uncertainty, also curbed consumption and investment.

The resulting global recession is the deepest since the Second World War. Global GDP (weighted by country shares in Singapore's NODX) fell by 3.7% q-o-q SA in Q1 and then shrank further by 5.5% in Q2 as more of the global economy went into lockdown. In comparison, the decline in activity was much sharper than the 1.3% q-o-q SA contractions in both Q4 2008 and Q1 2009, during the GFC. As well as its greater depth, the 2020 recession was unusual in that consumption weakened sooner and more sharply compared to other recent global downturns (**Chart 1.3**). Typically, recessions result in a larger downturn in capital spending, whereas consumption is more stable. The more pronounced slump in private consumption in the

COVID-19 recession was a direct result of the pandemic, and its impact on consumer behaviour.

Chart 1.1 Global COVID-19 infections have started rising again

New COVID-19 infections in 2020

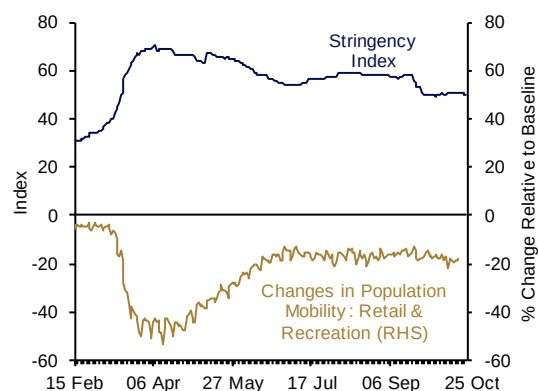


Source: WHO and EPG, MAS estimates

Note: The G3 grouping refers to the Eurozone, Japan and the US, while Asia ex-Japan refers to China, Hong Kong SAR, India, Indonesia, Malaysia, the Philippines, South Korea, Taiwan, Thailand, and Vietnam.

Chart 1.2 Recovery in population mobility has stalled in recent months

Global index of virus containment stringency and index of population mobility (NODX-weighted) in 2020



Source: Google Community Mobility Reports, Oxford University Blavatnik School of Government and EPG, MAS estimates

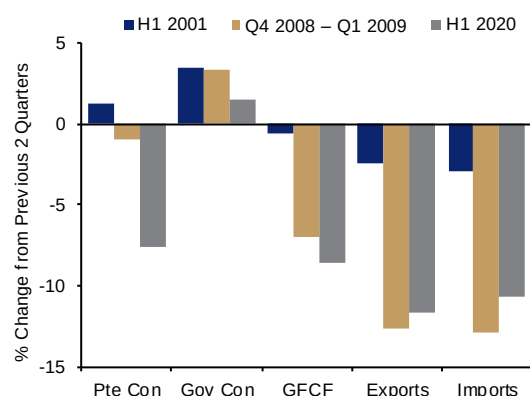
Note: The stringency index is calculated by weighting each economy's overall measure of outbreak containment stringency by its weight in Singapore's NODX. Countries/economies included in the index are Australia, China, Eurozone, Hong Kong SAR, India, Indonesia, Japan, Malaysia, the Philippines, South Korea, Taiwan, Thailand, US and Vietnam.

The baseline for the population mobility index is the median value for the corresponding day of the week during the five-week period from 3 Jan–6 Feb 2020.

Movement restrictions have affected the services sector much more adversely compared to manufacturing (**Chart 1.4**). Services dependent on contact or travel—such as transport, wholesale and retail trade, and accommodation and catering—have seen sharp declines. By contrast, the slowdown in financial and IT-related services has been less severe, as many workers in these industries have been able to work remotely during lockdowns. In addition, markets trading and some credit intermediation activities have continued to hold up. In H1 2020, global exports of IT and financial services fell by just 3.6% and 4.8% respectively from their pre-crisis levels, whereas travel receipts fell 75%.

Chart 1.3 The COVID-19 recession has had a larger effect on private consumption ...

Global GDP growth by expenditure (NODX-weighted)

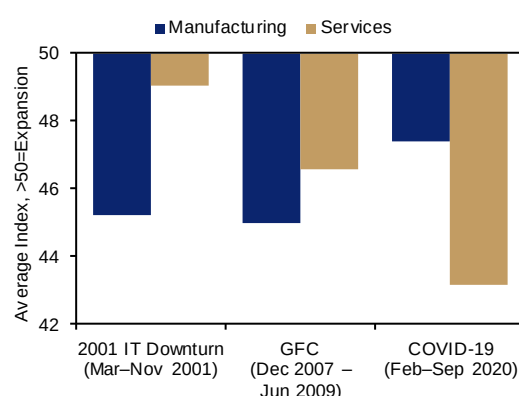


Source: Haver Analytics and EPG, MAS estimates

Note: Excludes Vietnam and China due to lack of data.

Chart 1.4 ... and on services, compared to previous recessions

Global manufacturing and services PMI



Source: IHS Markit

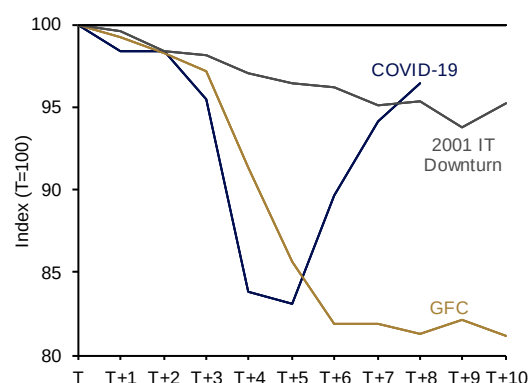
Conversely, spending on goods has rebounded relatively quickly. It is likely that the pandemic has induced households to switch some expenditure away from services towards merchandise goods. This in turn supported trade volumes as goods are more intensively traded across borders than services: merchandise trade accounted for three-quarters of global trade in 2019, according to WTO estimates. The volume of international merchandise trade was 17.0% below its December 2019 level at the trough in May, but underwent a V-shaped rebound and recovered to 3.5% below by August (**Chart 1.5**). The rebound in demand for goods is also reflected in global industrial production, which was just 3.4% below its end-2019 level by August 2020, according to estimates by the CPB World Trade Monitor.

The magnitude and timing of the GDP decline in Q2 varied considerably across countries, driven to a large extent by the relative severity of movement restrictions and by economies' sectoral structures. The G3 and ASEAN-5¹ countries were more exposed to these factors: services are a higher share of value-added in the G3, while the near-total shutdown in cross-border tourism heavily affected the ASEAN-5, particularly Thailand. Accordingly, they suffered larger contractions amid longer and stricter lockdowns. In comparison, the North Asian economies (China, Hong Kong SAR, South Korea and Taiwan), which were, on the whole, more successful in containing the virus, saw milder GDP declines (**Chart 1.6**). China is also an outlier in that it went through its lockdown phase about a quarter earlier than most other countries. Its economy expanded 12.4% q-o-q SA in Q2 after most movement restrictions were lifted at end-Q1, and the recovery continued into Q3 with output rising by 3.2% q-o-q SA.

¹ The ASEAN-5 comprises Indonesia, Malaysia, the Philippines, Thailand and Vietnam.

Chart 1.5 Trade volumes rebounded quickly during the COVID-19 shock

Global trade volumes

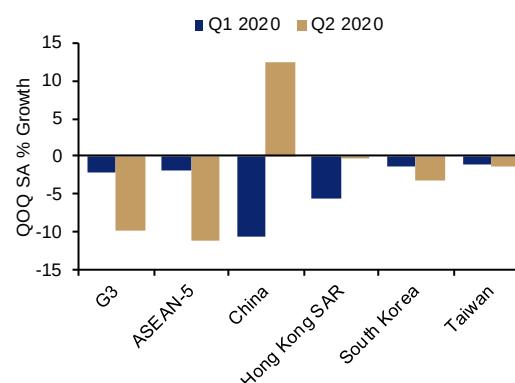


Source: CPB and EPG, MAS estimates

Note: T denotes the peak in the global trade volumes just before the onset of, or during the recession. T denotes December 2000 for the 2001 recession, July 2008 for the GFC and December 2019 for the COVID-19 shock.

Chart 1.6 The G3 and ASEAN-5 experienced large GDP contractions in Q2

GDP growth



Source: Haver Analytics and EPG, MAS estimates

Note: G3 and ASEAN-5 are weighted by country shares in Singapore's NODX.

The near-term rebound is expected to fade to an incomplete recovery

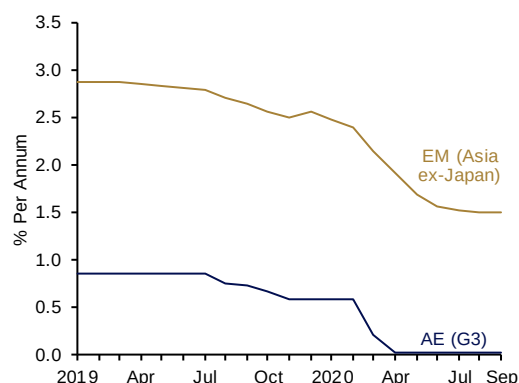
Governments and central banks around the world quickly loosened fiscal and monetary policies as the extent of the shock became clear in Q1. The IMF estimates the global aggregate fiscal deficit will widen by 8.8 percentage points to 12.7% of GDP in 2020. The resulting fiscal impulse is estimated at 6.4% of potential GDP, much larger than 1.8% in 2009. Besides on-budget fiscal measures, governments in many AEs have deployed substantial support to corporate and household sectors in the form of loan guarantees and debt moratoriums. Overall, the AEs have loosened fiscal policy by more than the EMs: the rise in the average AE fiscal deficit as a share of GDP is estimated at 11.1 percentage points, compared with 5.8 percentage points for EMs.

Turning to monetary policy, central banks in the major AEs have cut policy rates to, or close to, their effective lower bounds, and are expanding their quantitative easing programmes. EM central banks have also loosened policies, including those in Asia ex-Japan in aggregate (**Chart 1.7**). Collectively, this has contributed to a reversal in the dramatic tightening of financial conditions that occurred in March 2020. Left unaddressed, the surge in financial volatility could have significantly amplified the initial negative impulse from the shock, deepening and prolonging the ensuing downturn.

Global activity in aggregate began to rebound in May as movement restrictions were eased and policy loosening began to take effect. The level of global industrial output troughed in April and has since been increasing, while the global composite PMI rose above the 50-point threshold in July, indicating expansion (**Chart 1.8**).

Chart 1.7 Central banks cut their policy rates substantially in March and April

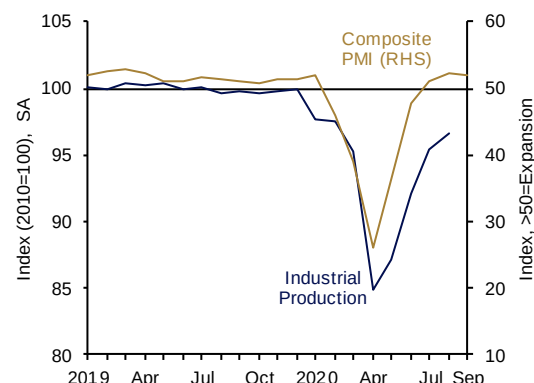
Central bank policy rates (NODX-weighted)



Source: Haver Analytics and EPG, MAS estimates

Chart 1.8 Global economic activity troughed in April

Global industrial production and global composite PMI



Source: CPB, IHS Markit and EPG, MAS estimates

Near-term prospects are supported by the substantial rise in household savings in many economies in Q2, reflecting the decline in consumption as well as policy support for household incomes. Household saving rates reached record highs of 25.2% in Q2 in the US, 24.6% in the Eurozone and 23.1% in Japan (compared with 7.5%, 13.1% and 4.7% in 2019, respectively). The significant increase in saving rates has been reflected in the upsurge in holdings of demand deposits (**Chart 1.9**). The higher stock of deposits appears to be supporting the recovery in consumer spending in H2 2020, even allowing for some increase in precautionary saving amid elevated uncertainty. Meanwhile, the volume of global goods trade is projected² to resume sequential expansion in Q3, and strengthen further in Q4 in line with the recovery. For 2020 as a whole, merchandise trade volume is forecast to contract by 10.7%. Investment is likely to be constrained by the persistence of negative output gaps in most economies; for example, more than 30% of the firms polled in the latest Kansas City Fed manufacturing survey do not expect capital spending to return to pre-pandemic levels until 2022 or 2023.

Overall, global GDP growth is projected to rebound to 5.0% q-o-q SA in Q3, and moderate to 2.9% in Q4. In the baseline, the global economy is projected to continue expanding at an above-trend pace next year. However, the speed of the recovery is not expected to be sufficient to close the large negative output gaps opened up by the COVID-19 recession, even by the end of 2021. The course of the pandemic is highly uncertain, but it seems likely that activity will continue to be hampered by recurrent localised outbreaks of the virus, and the imposition of associated movement restrictions, for some time. The resurgence in infections in many countries since July illustrates the potential for the virus to continue to exert a drag on activity. The recent rise in infections in several European economies is close to testing the downside of the assumptions reflected in the forecasts, and therefore warrants close observation.

The damage to household and business balance sheets inflicted by the deep recession of 2020 will also inhibit demand to some degree. Weakened corporate earnings will weigh on

² The forecast is based on a LASSO (least absolute shrinkage and selection operator) model that selects leading and coinciding indicators of global trade among those considered in the literature (Baltic dry index, world stock market prices, commodity prices, US high-yield spread, PMI and industrial production indexes for the US, China, Eurozone and Japan, and global real GDP growth).

capital spending and firms' hiring intentions, while headwinds to capital spending will dampen trade growth, given the greater trade intensity of investment compared to consumption. Higher debt loads may reinforce the dampening effect on consumer confidence from the rise in unemployment. Lower interest rates globally will reduce debt service costs, but this is unlikely to fully offset the impact of income losses and higher uncertainty.

Although monetary policy is expected to remain highly accommodative in the coming quarters, fiscal policy will become contractionary next year. The IMF anticipates the global fiscal impulse will turn negative by 3.6% points in 2021, although governments could withdraw stimulus at a faster or slower rate than these projections imply.

Table 1.1 Global growth will see a strong rebound in Q3 but the recovery is projected to be incomplete

	QOQ SA (%)			Annual (%)		
	2020 Q2	2020 Q3*	2020 Q4*	2019	2020*	2021*
G3	-9.9	5.3	2.4	1.5	-6.3	4.8
Asia ex-Japan	-3.6	5.0	3.1	3.8	-2.9	6.9
ASEAN-5	-11.2	7.1	4.3	4.5	-4.8	6.7
Global	-5.5	5.0	2.9	3.1	-3.9	6.2

Source: Haver Analytics and EPG, MAS estimates

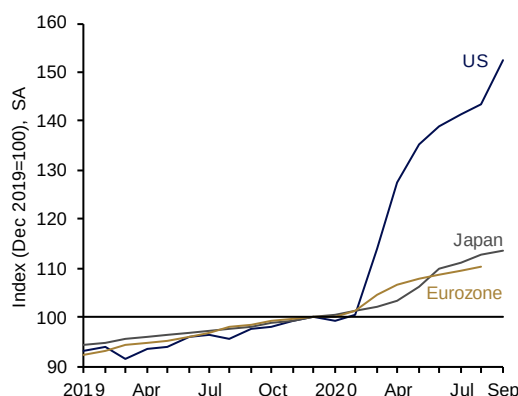
Note: The G3 refers to the Eurozone, Japan and the US, while ASEAN-5 comprises Indonesia, Malaysia, the Philippines, Thailand and Vietnam. Asia ex-Japan refers to China, Hong Kong SAR, India, South Korea, Taiwan and the ASEAN-5. All aggregates are weighted by country shares in Singapore's NODX.

* EPG, MAS forecasts

All considered, global GDP is projected to contract by 3.9% in 2020 and recover to grow by 6.2% in 2021 (**Table 1.1**). Global output is expected to regain its Q4 2019 level only in mid-2021 (**Chart 1.10**). The negative output gaps that will persist due to the protracted and incomplete recovery from the deep 2020 recession will likely lead to some loss of productive capacity, as higher unemployment over a sustained period will reduce investment and impair human capital. Growth is forecast to return to trend during 2022 as the recovery fades, but from a lower end-2021 level, leaving the global economy on a permanently lower GDP trajectory. At end-2021, global GDP will be about 4% below the level projected before the advent of the COVID-19 shock.

Chart 1.9 High saving rates are reflected in the sharp increase in holdings of demand deposits

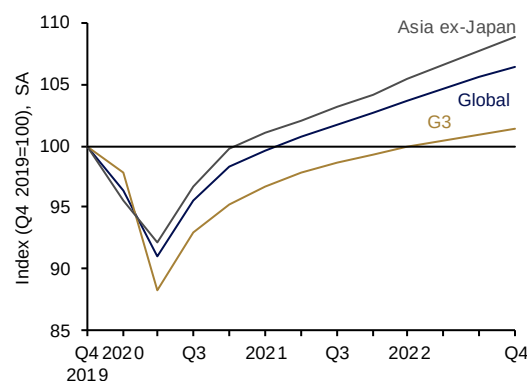
Stock of demand deposits in the G3



Source: Haver Analytics and EPG, MAS estimates

Chart 1.10 Global GDP is projected to regain its Q4 2019 level in mid-2021

GDP level by region (NODX-weighted)



Source: EPG, MAS estimates

Beyond the near-term rebound, the outlook for global growth is highly uncertain and subject to significant downside risks

The outlook for the global economy over the short to medium term is subject to several risks, which are skewed heavily to the downside. The first key risk stems from waves of new infections, which indicate that the pandemic is still far from being contained. The global seven-day moving average of new infections flattened off for a short period in April to June, but started to rise in July, and increased again in September. This has not so far translated into a significant overall tightening of global movement restrictions or a renewed decline in population mobility. However, the lack of improvement in mobility is a material risk to the outlook, potentially dragging out the recovery.

The second risk is that authorities may mis-time the withdrawal of highly accommodative policy settings, such that the stresses confronting economies are intensified rather than eased. The prevailing level of uncertainty over the economic outlook significantly increases the challenges that policymakers face in calibrating policy stances appropriately.

Third, the state of relations between the US and China continues to contribute to uncertainty, and has been exacerbated in the short term by forthcoming elections in the US.

Although the balance of risks is to the downside, there are some upsides from the possibility that effective COVID-19 vaccines become available and are deployed globally earlier than expected. This will lead to a much sharper recovery in household and business confidence, and thence global demand.

Persistent negative output gaps will weigh on global inflation in the coming year

The global economy has been subject to two strongly disinflationary shocks in 2020: the economic slowdown induced by the COVID-19 pandemic and a sharp decline in oil prices. The COVID-19 shock affected both aggregate demand and supply, but the demand channel has proved dominant, notwithstanding occasional temporary supply-induced spikes in prices for particular goods. Oil prices have averaged US\$40 year-to-date, well below their average level

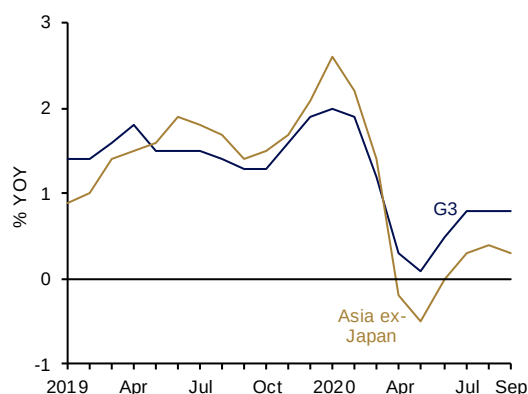
of US\$62 over the same period in 2019. However, swings in the oil price have fed through to volatility in headline inflation rates. This volatility was more pronounced in Asia ex-Japan than in the G3, largely owing to the greater weight of commodities in the former's consumer baskets. Meanwhile, core inflation has trended down over the year in response to the contraction in output. Overall, global headline CPI inflation³ averaged 0.5% y-o-y in Q3, down from 1.7% y-o-y in Q4 2019 (**Chart 1.11**).

Headline inflation in the G3 economies is projected at 0.8% in 2020 and 1.2% in 2021. Market-based indicators of G3 inflation expectations fell sharply in March, but aggressive policy loosening and the resumption of economic activity after lockdowns were lifted have succeeded in reversing most of the decline, reducing the risk that deflation might take hold (**Chart 1.12**). In Asia ex-Japan, inflationary pressures are also expected to remain muted due to negative output gaps and persistently low oil prices. Food price inflation picked up earlier in the year due to pandemic-related disruptions but has generally eased as supply has been gradually restored in most economies. The region's headline inflation is forecast at 0.6% in 2020, and is expected to increase moderately to 1.7% in 2021.

Overall, global CPI inflation is expected to come in at 0.7% in 2020, down from 1.5% in 2019, before rising to 1.5% in 2021 in line with the recovery in economic activity. This forecast would still leave inflation below the average of 2.2% seen in 2011–19, reflecting the persistence of sizeable negative output gaps.

Chart 1.11 Inflation fell sharply amid the contraction in economic activity

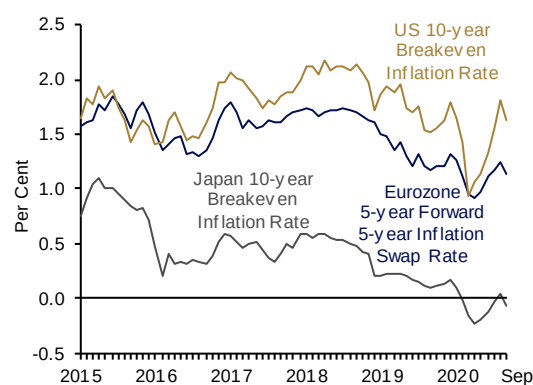
Headline inflation in the G3 and Asia ex-Japan



Source: Haver Analytics and EPG, MAS estimates

Chart 1.12 The decline in G3 inflation expectations has reversed

G3 breakeven inflation rates and forward swap rates



Source: Bloomberg

³ Global and regional CPI aggregates are weighted by country shares in Singapore's direct imports.

1.2 G3

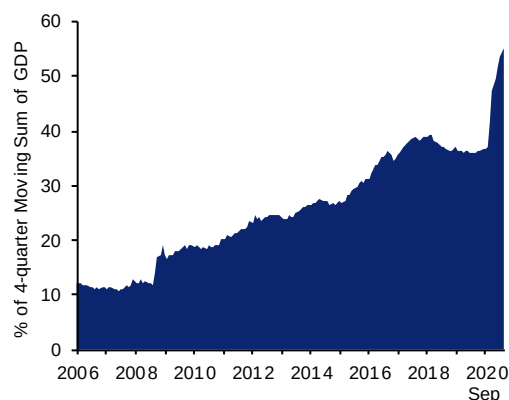
Rebound supported by substantial policy easing

GDP in the G3 fell by 7.0% sequentially in H1 2020 compared to H2 2019, illustrating the severe impact of the COVID-19 shock. For 2020 as a whole, the G3 economies are expected to contract by 6.3%, a larger decline than the 2.9% projected for Asia ex-Japan, or 3.9% for the global economy. The size of the impact on the G3 is partly a function of the higher weight of the services sector, which has been harder-hit by the pandemic. Services account for two-thirds of GDP in the Eurozone and Japan, and three-quarters of output in the US. In comparison, they make up only slightly more than half of GDP in the low-and middle-income economies, according to estimates by the World Bank.

The G3 economies are forecast to expand by 1.1% sequentially in H2 2020, and by 4.8% in 2021. The extent of the rebound reflects a resumption in economic activity as movement restrictions eased, and as the significant policy stimulus implemented by the authorities took effect. The US Federal Reserve cut the Fed Funds rate to zero in March, while all G3 central banks have expanded their quantitative easing programmes (**Chart 1.13**). Based on IMF estimates, the fiscal impulse in the G3 is projected at 7.9% of potential GDP for 2020, compared with just 1.9% during the GFC in 2009 (**Chart 1.14**). It is also substantially greater than the impulse of 4.2% in the EMs for this year.

Chart 1.13 Monetary policies in the G3 have been loosened significantly in 2020

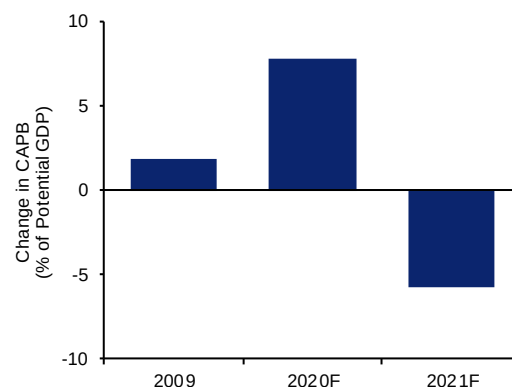
G3 central banks' balance sheets



Source: Haver Analytics and EPG, MAS estimates

Chart 1.14 Fiscal support in the G3 in 2020 will significantly exceed that in 2009

Fiscal impulse from the G3 (NODX-weighted)



Source: IMF and EPG, MAS estimates

Note: The fiscal impulse is measured by the cyclically adjusted primary balance (CAPB), i.e., an estimate of the fiscal balance (excluding net interest payments) that would apply under current policies if output were equal to potential.

G3 authorities have been able to deliver support to households quickly, including through job support schemes and direct cash handouts. The OECD estimates that one-quarter of workers in OECD economies have participated in job-retention schemes.⁴ However, there are important differences in the operation of support schemes across the G3. Europe and Japan have focused more on job retention programmes, which helped to stabilise the

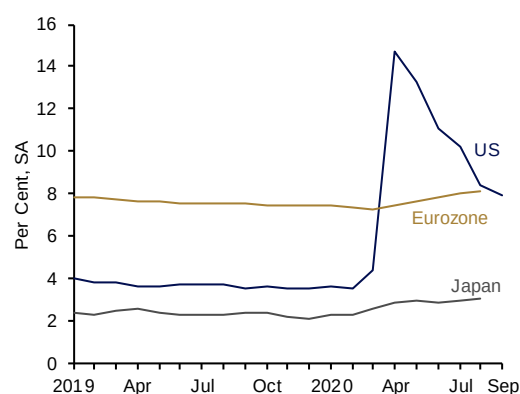
⁴ OECD (2020), "OECD Employment Outlook 2020: Worker Security and the COVID-19 Crisis", July 7.

unemployment rate in both economies (**Chart 1.15**). By contrast, support schemes in the US have largely concentrated on providing unemployment benefits; consequently, its measured unemployment rate rose much more sharply.

This level of support has underpinned the relative resilience of consumption. By June, real retail sales had already returned to the end-2019 level, and exceeded it by 3% in August (**Chart 1.16**). Still, the risks attached to the G3 outlook were underscored by an increase in COVID-19 infections since August, and signs of a pullback in the pace of expansion in activity in September and October (**Chart 1.17**). Specifically, in the Eurozone, where the recent upsurge in infections has been particularly pronounced, the services sector contracted afresh, with the related PMI falling to 48.0 in September and declining further to 46.2 in October according to flash estimates.

Chart 1.15 Unemployment rates in the G3 have diverged

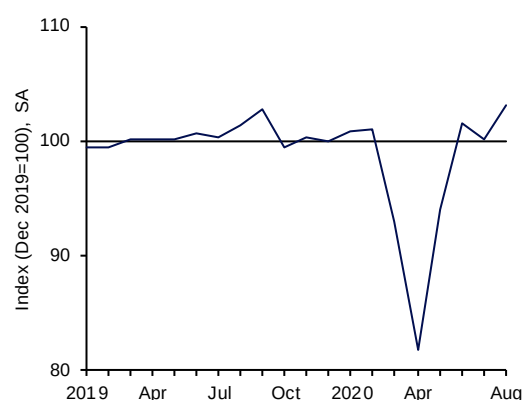
G3 unemployment rates



Source: Haver Analytics

Chart 1.16 The G3 recovery has been led by robust consumer spending

Real retail sales in the G3 (NODX-weighted)



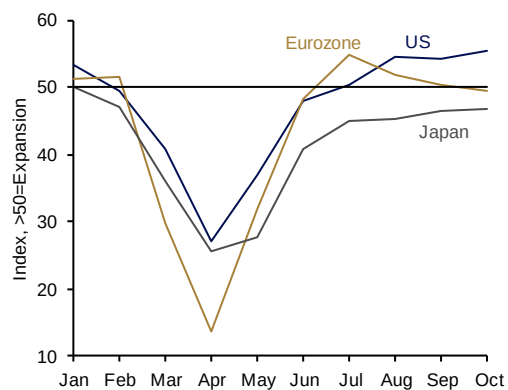
Source: Haver Analytics and EPG, MAS estimates

Manufacturing PMI sub-indices indicate strengthening new orders and declining stocks of finished goods across the G3, implying that the inventory cycle should support output in the short term (**Chart 1.18**). The combination of earlier production disruptions and the rapid rebound in consumer spending in the middle of the year has depressed firm inventory levels. However, beyond the short term, the expected slow recovery and persistence of large negative output gaps in 2021 will weigh on business investment.

As well as providing an immediate boost to incomes and demand, policy support may mitigate the loss of productive capacity of the economy. Measures to ease liquidity constraints of businesses whose revenues have been disrupted would allow otherwise viable firms to avoid premature closure, while job-retention subsidies may reduce the depletion of human capital that would otherwise ensue from a more substantial rise in unemployment.

Chart 1.17 Growth momentum in the G3 slowed in September

G3 composite PMIs in 2020

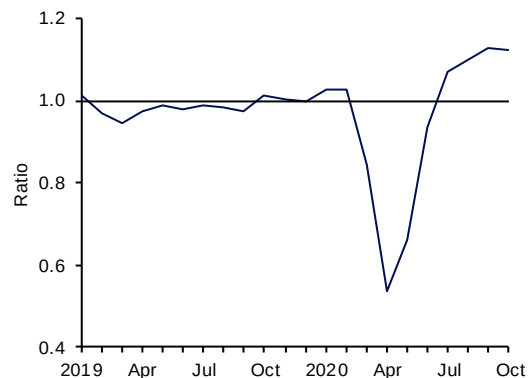


Source: IHS Markit

Note: October data are flash estimates.

Chart 1.18 A stockbuilding cycle will support output in the short term

G3 PMI new orders to stocks of finished goods ratio (NODX-weighted)



Source: Haver Analytics, IHS Markit and EPG, MAS estimates

Note: October data are flash estimates.

1.3 Asia ex-Japan

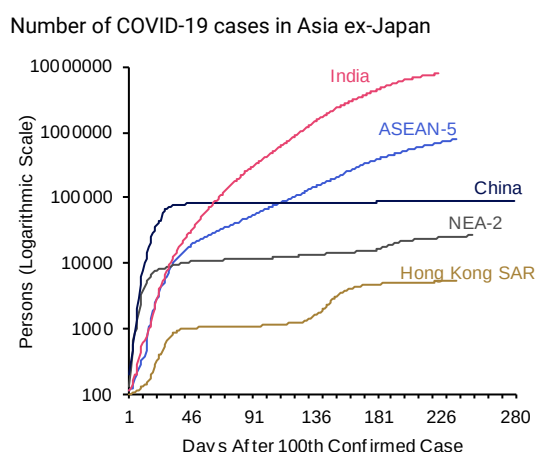
A gradual, uneven recovery is underway, supported by easing mobility restrictions and resilient export growth

Output in Asia ex-Japan contracted by 3.6% q-o-q SA in Q2, but with significant variation across economies. Differences in growth outturns across the region largely reflected the severity of the COVID-19 pandemic and the degree of policy support, although country-specific structural factors were also important.

In China, which was the first country to experience the virus outbreak in late 2019, GDP expanded by 12.4% q-o-q SA in Q2 2020 after contracting by 10.7% in Q1. The economy grew by 3.2% q-o-q SA in Q3, bringing output back above its Q4 2019 level. China's relatively complete recovery compared to other major economies reflected its rapid containment of the virus, as well as policy support feeding through, in particular via public infrastructure investment.

Elsewhere in the region, economies which have managed to flatten the pandemic curve decisively (**Chart 1.19**)—including South Korea, Taiwan and Vietnam—have experienced a relatively smaller hit to GDP. More effective virus containment has allowed for less severe movement restrictions, which explains in part why nominal retail sales in Vietnam and Taiwan have already exceeded December 2019 levels (**Chart 1.20**). Meanwhile, GDP contractions have been larger in India and Indonesia, where the number of new COVID-19 infections has continued to climb and fiscal support packages have been relatively modest. India's GDP plunged by 25.6% q-o-q SA in Q2 2020, while Indonesia's fell by 6.9%.

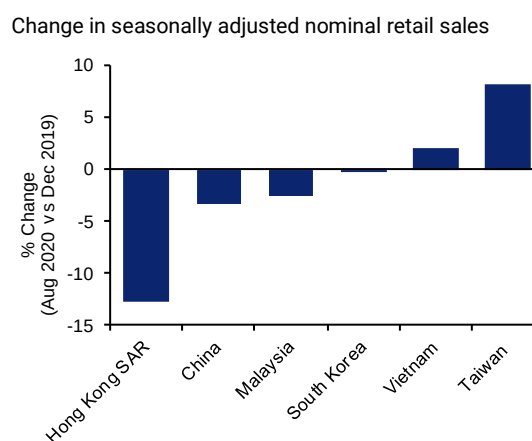
Chart 1.19 Containment measures have been generally effective at flattening infection curves



Source: CEIC, WHO and EPG, MAS estimates

Note: The NEA-2 comprises South Korea and Taiwan.

Chart 1.20 Retail sales have recovered in some economies



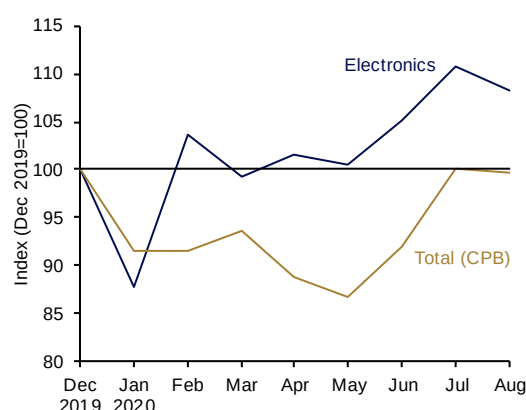
Source: Haver Analytics and EPG, MAS estimates

China's growth rebound in Q2, as well as the pickup in final demand from the G3 since May, have supported the level of goods trade in the midst of the COVID-19 recession and hastened the pace of recovery in Asia ex-Japan's trade-dependent economies. In particular, demand for electronics products has been robust, in part because of shifts in patterns of work and leisure towards online platforms during the pandemic. There is also some evidence that

downstream manufacturers have been stockpiling components on fears of future supply chain disruptions (**Chart 1.21**). These developments have benefitted economies which are integrated into regional electronics supply chains, including China, Malaysia, Taiwan, and Vietnam, where real industrial production has returned to pre-pandemic levels (**Chart 1.22**).

Chart 1.21 Asia ex-Japan's electronics exports have outperformed

Asia ex-Japan export volumes

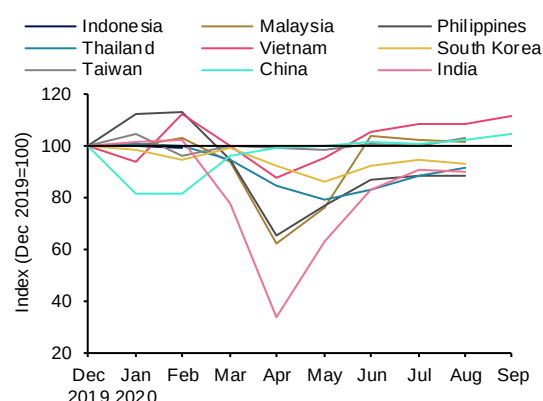


Source: CPB, CEIC, Haver Analytics and EPG, MAS estimates

Note: For both series, Asia ex-Japan also includes Singapore, and for the CPB data, Pakistan as well.

Chart 1.22 Industrial output has picked up since April, supported by firm external demand

Industrial production indices



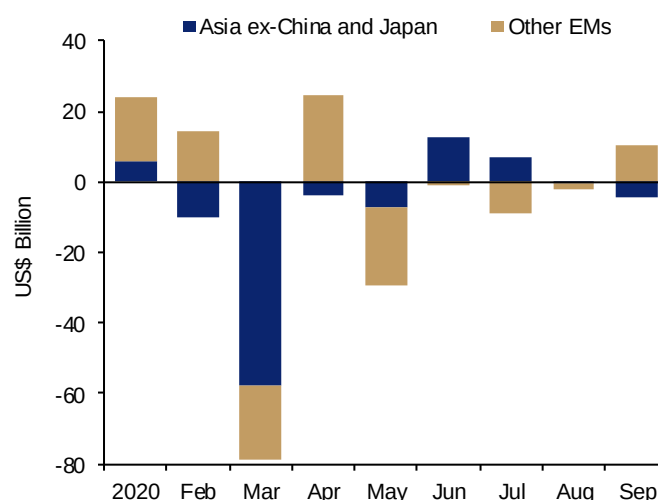
Source: Haver Analytics and EPG, MAS estimates

Note: The latest available reading for Indonesia's industrial production index is February 2020.

The sudden escalation in financial market volatility observed in March 2020, amid elevated uncertainty precipitated by the spread of COVID-19 around the world, triggered the largest monthly portfolio outflows from emerging markets on record. Since then, the swift and substantial policy response by major central banks has contained financial market volatility and eased capital outflow pressures in emerging economies, including in Asia. Portfolio flows in regional emerging markets have generally stabilised (**Chart 1.23**). Overall, Asia ex-China and Japan recorded net portfolio inflows of US\$2.4 billion in Q3 2020, comparable to the US\$2.1 billion in net inflows seen in Q2. China's V-shaped recovery supported a rapid resumption in portfolio inflows as well—according to official balance of payments data, net portfolio inflows totalled US\$42 billion in Q2 2020, after net outflows of US\$53 billion in Q1.

Chart 1.23 EM portfolio flows have stabilised following record outflows in March

Net portfolio flows



Source: Institute of International Finance and EPG, MAS estimates

Note: Reflects monthly data available as at 26 October 2020. Asia ex-China and Japan comprises India, Indonesia, Malaysia, Mongolia, Pakistan, the Philippines, South Korea, Taiwan, Thailand and Vietnam. Other EMs are Brazil, Bulgaria, Chile, Colombia, Czech Republic, Estonia, Hungary, Kenya, Latvia, Lebanon, Lithuania, Mexico, North Macedonia, Poland, Qatar, Romania, Russia, Saudi Arabia, Serbia, Slovenia, South Africa, Sri Lanka, Turkey, and Ukraine.

Weak labour markets and the likely persistence of curbs on international travel will weigh on the regional recovery

The economic rebound in Asia ex-Japan is expected to moderate in Q4 2020 as several factors weigh on the recovery of private domestic demand. Mandatory movement restrictions have been eased in general since April, but occasional outbreaks and uncertainty over the course of the pandemic will continue to constrain household spending. Labour markets are likely to remain weak for a considerable period, which will weigh further on consumer confidence. Employment sub-indices of regional economies' manufacturing PMIs signalled that employers in most economies continued to shed labour in September, apart from those in China (50.1), Hong Kong (50.9) and Taiwan (52.8) (**Chart 1.24**). Business confidence will also face a drag from prevailing uncertainty over the outlook, which is likely to be amplified by ongoing tensions between the US and China. This, in turn, will affect capital spending and hiring. In China, private fixed asset investment in the first three quarters of 2020 was still 1.5% below the level recorded for the same period a year earlier.

The pickup in Asia ex-Japan trade volumes is likely to ease going into 2021, as temporary supporting factors fade. The boost to Asia's electronics exports from the transition to home-working and consumption expenditure switching will wane, while restocking demand will normalise. A material recovery in Asia's services exports is contingent on a reopening of borders and a resumption of tourism, as activities involving cross-border travel constitute about 18% of emerging Asia's⁵ services exports. This will be particularly important for

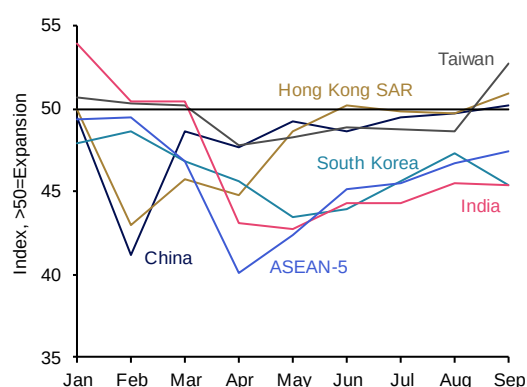
⁵ Emerging Asia comprises China, Hong Kong SAR, Indonesia, India, South Korea, Malaysia, the Philippines, Singapore, Taiwan, Thailand and Vietnam. The services trade figures are EPG, MAS estimates using the WTO TISMOS database, with data as at 2017.

economies most heavily exposed to travel-related activities (**Chart 1.25**). International tourism has effectively ground to a halt since the widespread implementation of border restrictions earlier in the year. In the Asia Pacific region, most countries remain closed to visitors, with August tourist arrivals down an estimated 97% from a year earlier.⁶ While some countries are tentatively reopening borders to certain categories of visitors, progress is likely to be slow in view of concerns around cross-border virus transmission. Nevertheless, the region's trade in services will receive countervailing support from services that can be delivered remotely by electronic means; these comprise about 26% of emerging Asia's services trade.

For the whole of 2020, real GDP in Asia ex-Japan is expected to contract by 2.9%, before recovering to 6.9% growth in 2021. This would leave the region's GDP 4.3% below pre-pandemic projections at the end of 2021, larger than the comparable figure of 3.7% for the G3.

Chart 1.24 Hiring intentions in the manufacturing sector have remained weak

Employment sub-indices of manufacturing PMIs in 2020

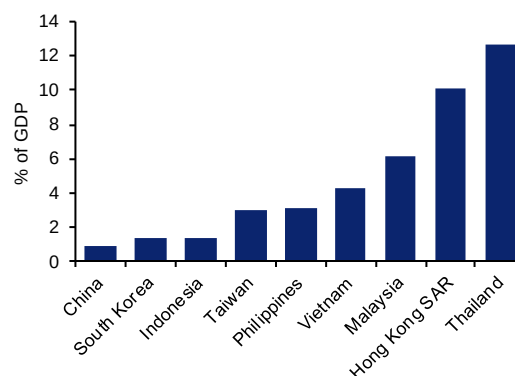


Source: IHS Markit and EPG, MAS estimates

Note: ASEAN-5 is calculated as a NODX-weighted average of the readings for Indonesia, Malaysia, the Philippines, Thailand and Vietnam.

Chart 1.25 Travel curbs have affected tourism-reliant economies

International tourist spending in 2019



Source: World Travel and Tourism Council and EPG, MAS estimates

⁶ International Monetary Fund (2020), "Tourism Tracker: Asia and Pacific Edition", Issue 7, September 22.

2 The Singapore Economy

- The Singapore economy registered its sharpest decline on record in Q2 2020, before experiencing a growth rebound in Q3. The contraction in Q2 was broad-based across sectors amid weak external demand and supply-side disruptions due to the circuit breaker measures. Some of these sectors have since seen a pickup as the economy reopened, but overall output is still some 7% below pre-COVID levels.
 - The supply-side impetus for the rebound in Q3 is expected to abate, leaving a gradual but uneven recovery path in subsequent quarters. Some pockets of the economy may not recover to pre-pandemic levels even by the end of next year. Firms and households will continue to be restrained by income loss and increased uncertainty, and will therefore hold back on investment and discretionary spending. Further, there are considerable downside risks to the growth outlook, such as a resurgence in infections or a weaker-than-expected recovery in external demand.
 - Compared to previous recessions, the current downturn has affected the domestic-oriented industries more severely. These sectors have stronger interlinkages with firms and households within the domestic economy, thus amplifying the negative shock. The particular nature of the COVID-19 shock is also evident in the expenditure and income components of GDP, with private consumption, public investment and government income contracting more sharply than in previous crises. In all likelihood, the recovery will be more protracted than those in the past.
-

2.1 Recent Economic Developments

The contraction in the domestic economy hit a record trough in Q2 2020

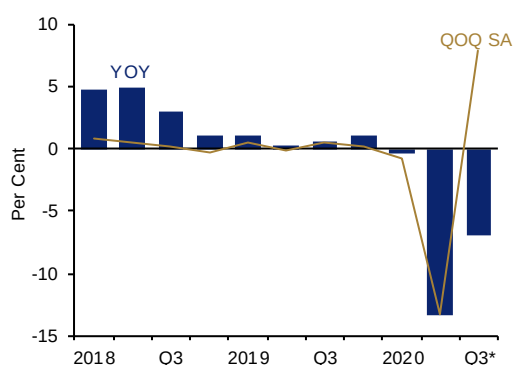
The Singapore economy registered an unprecedented contraction in the thick of the COVID-19 pandemic in Q2 2020, declining by 13.2% on a q-o-q SA basis, or 13.3% y-o-y (**Chart 2.1**). The downturn was evident across most industries. The travel-related, consumer-facing domestic-oriented and construction sectors were the worst hit, and they had a larger impact on overall GDP than their respective shares in the economy. Activity in the business services sector was significantly impaired by negative spillovers from the travel and construction sectors. Although less directly affected by the pandemic, the trade-related sector shrank alongside the slowdown of the global economy. The ICT and finance & insurance sectors also recorded sequential contractions due to the general reduction in activity across the rest of the economy and worsening business sentiment.

With supply-side restrictions easing in June following the circuit breaker, the economy turned around in Q3

Activities that were halted during the circuit breaker resumed with the phased reopening of the economy from June. Reflecting this supply-side reversal, the economy picked up in Q3 from the trough in Q2, growing by 7.9% on a q-o-q SA basis (**Chart 2.1**). In y-o-y terms, it contracted by 7.0%, moderating from the double-digit decline in the previous quarter. The upturn was broad-based with almost all sectors experiencing positive sequential growth. Data from Google location services showed that mobility levels at public places surged in the latter half of June and have continued to increase thereafter, albeit at a slower pace (**Chart 2.2**). As at end-September, mobility levels at malls & recreational places, workplaces and bus/train stations have improved by 2–3 times from their respective troughs.

Chart 2.1 GDP expanded by 7.9% q-o-q SA in Q3 2020, following the 13.2% decline in Q2

Singapore's real GDP growth

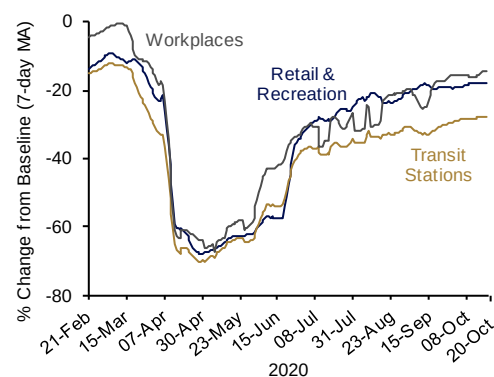


Source: DOS

* Advance estimates

Chart 2.2 Mobility levels rebounded as the economy gradually reopened

Change in population mobility



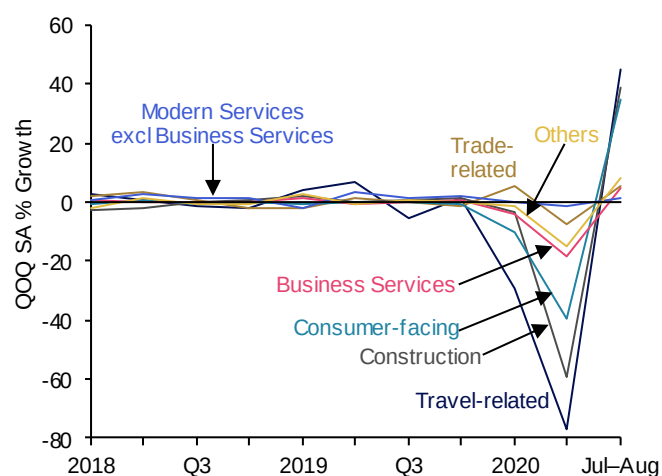
Source: Google Community Mobility Report, Singapore and EPG, MAS estimates

Note: The baseline is the median value for the corresponding day of the week, during the five-week period from 3 Jan–6 Feb 2020.

Nevertheless, the recent improvement has not been sufficient to offset the steep cumulative decline in output in the first half of the year, with overall GDP in Q3 still about 7% below its pre-COVID peak in Q4 2019. While the worst-hit sectors saw a sharp growth rebound in Q3, they remained substantially below pre-COVID levels (**Chart 2.3 and Table 2.1**). Within the significantly-hit sectors, business services were a shade below their pre-pandemic levels. Of the less affected clusters, the trade-related sector as a whole recovered in Q3, mirroring developments in the external economies where goods-producing sectors have rebounded, although certain segments were constrained by industry-specific factors. The financial and ICT sectors also recorded sequential improvements in Q3, following mild declines in the previous quarter.

Chart 2.3 Despite the growth rebound in Q3 ...

Economic activity index (EAI)



Source: EPG, MAS estimates

Note: The EAI is a composite index that aggregates the performance of coincident high-frequency indicators across the major sectors of the Singapore economy.

Table 2.1 ... overall economic activity remained below pre-COVID levels

Index (Q4 2019=100), SA	Contraction		Growth Rebound
	Q1 2020	Q2 2020	Q3 2020
Overall GDP	99.2	86.1	92.8
Worst-hit Sectors (12% of real GDP in 2019)			
• Travel-related (air transport, accommodation, AER)			
• Consumer-facing (food services, retail, land transport)			
• Construction			
Significantly-hit Sectors (15% of GDP)			
• Real estate			
• Other business services			
Less Affected Sectors (63% of GDP)			
• Trade-related (manufacturing, wholesale, transport & storage excluding air and land)			
• Modern services (ICT, financial)			
• Other domestic-oriented (public admin, health & social, education, others)			
Others (11% of GDP)			
• Ownership of dwellings			
• Taxes on products			

Source: EPG, MAS estimates

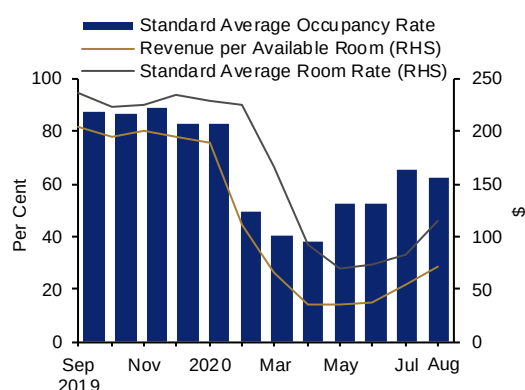
Note: Red (green) cells refer to output declines (increases) relative to Q4 2019 levels. The darker the colour, the greater the segment's deviation from its Q4 2019 level.

The worst-hit sectors have rebounded from their troughs but remained substantially below pre-COVID levels

The travel-related sector had stalled in Q2 with the closure of borders to all short-term visitors since 23 March. Average monthly visitor arrivals plummeted to 1,267 in Q2. Although monthly arrivals picked up to 7,877 in Jul–Aug, driven by visitors from Southeast Asia and China, this was substantially lower than the average of 1.6 million arrivals per month in 2019. The hotel occupancy rate had averaged 48% in Q2, partially supported by corporate bookings to house foreign workers who were unable to return home. It subsequently rose to 64% in Jul–Aug, alongside some increase in average room rates, boosted by a jump in staycations and a very limited resumption of admittance of non-residents (**Chart 2.4**). The arts, entertainment & recreation (AER) segment also expanded as tourist attractions reopened in July. In the air transport industry, the number of aircraft landings and air passengers carried remained extremely low in Jul–Aug, at 16% and 1.5% of their pre-pandemic levels. Nonetheless, total air cargo shipments handled at Changi Airport improved to 72% of pre-COVID levels (**Chart 2.5**).

Chart 2.4 Hotel occupancies plunged to 48% in Q2, before improving to 64% in Jul–Aug

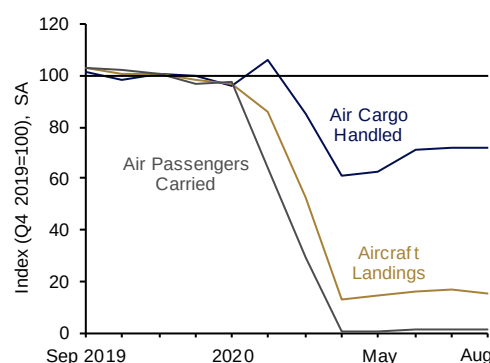
Hotel statistics



Source: STB

Chart 2.5 The air transport industry remained in the doldrums

Indicators of air transport



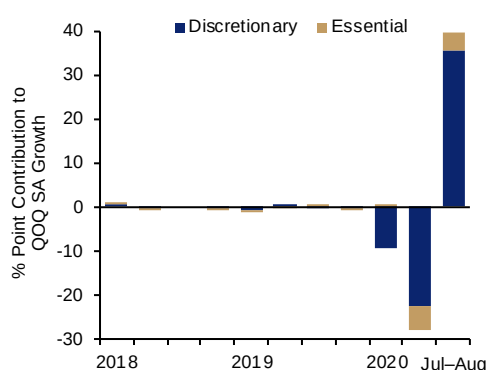
Source: CAAS and EPG, MAS estimates

Reflecting the effects of the circuit breaker in April and May, the retail and food & beverage (F&B) industries saw a sharp pullback in activity in Q2, with sales tumbling by 36% and 41% q-o-q SA, respectively. Following the reopening of physical retail stores and resumption of dine-in services, sales rebounded by 56% and 43% in Jul–Aug. The sequential recovery was largely due to an uptick in demand for discretionary goods which were badly affected in Q2 (**Chart 2.6**). However, amid low tourist arrivals and cautious consumer sentiment, the department stores, wearing apparel & footwear, as well as watches & jewellery segments continued to see sales decline on a year-ago basis by 25–32% in Jul–Aug, although this was a material improvement from the contraction of around 80% in Q2. In contrast, supermarkets & hypermarkets, furniture & household equipment as well as computer & telecommunications equipment industries grew by 15–24% y-o-y, on the back of increased demand for groceries, household appliances and computers as employees adapted to work-from-home arrangements. Outturns also varied in the F&B sector. Sales of food caterers declined by 50% y-o-y in Q2 and 59% in Jul–Aug as the provision of packed food services for the majority of foreign workers was no longer required after the mass quarantines in the

dormitories gradually eased. Meanwhile, turnover of restaurants, cafes, food courts & other eating places and fast food outlets contracted by 24–66% y-o-y in Q2, but the pace of contraction approximately halved in Jul–Aug, as activity picked up with caps on operating capacities. With the reopening of physical retail stores and resumption of dine-in services at F&B outlets in mid-June, the share of online retail and F&B sales declined from a peak of 25% and 45% in May to 11% and 21% in Jul–Aug. The fall was most noticeable in the sales of computer & telecommunication as well as furniture & household equipment, which had seen a surge in demand during the circuit breaker months (**Chart 2.7**).

Chart 2.6 Growth in retail sales was driven by discretionary goods

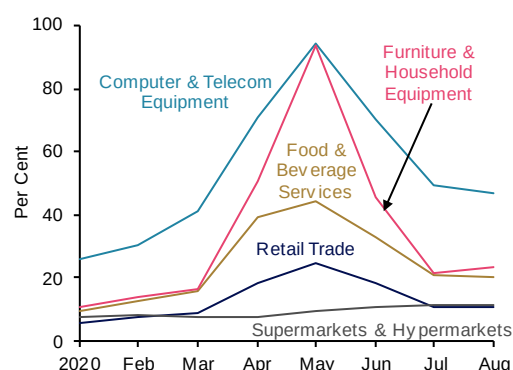
Growth in retail sales volume (excluding motor vehicles)



Source: DOS and EPG, MAS estimates

Chart 2.7 The share of online sales moderated with the reopening of physical retail stores

Share of online sales within each category

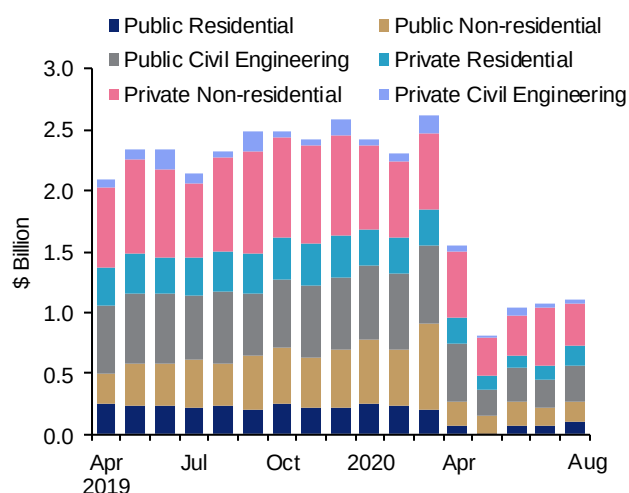


Source: DOS

The construction industry shrank by 59% q-o-q SA in Q2, with most building activities suspended amid the spike in infections among migrant workers staying in dormitories. Alongside the gradual work resumption, the sector expanded by 39% q-o-q SA in Q3. On a year-ago basis, it fell by 45% in Q3, a moderation from the 60% decline in Q2. Work resumption has been gradual due to the time needed to clear workers affected by the outbreak of infections in the dormitories, as well as the challenges faced by firms in meeting the safe management measures required at workplaces. While public sector construction certified payments contracted further in Jul–Aug by 56% y-o-y (–51% in Q2), the decline in certified payments for private sector construction moderated slightly to –47% (from –49% in Q2), supported by private non-residential industrial works (**Chart 2.8**).

Chart 2.8 Certified payments fell considerably in April and May but increased thereafter alongside an improvement in private non-residential construction activity

Certified payments in the construction sector



Source: BCA

The business services sector expanded in Q3 following the sharp contraction in Q2

In the real estate segment, the profit margins of landlords and developers were dampened in Q2 in the wake of lower returns from tenants' depressed sales revenue, rental waivers provided to tenants and weakness in real estate transactions. There was some recovery in Q3 with the reopening of physical retail stores, a gradual pickup in construction activity, and a resumption of home viewings. In the private residential property market, transactions rose 2.5 times to 6,445 in Q3, following a 37% q-o-q decline in Q2 amid the circuit breaker.

Some of the worst-hit sectors such as travel and construction weighed heavily on other business services in Q2. Contractions in the rental & leasing segment were attributable to weak demand for aircraft leases and construction machinery. Similarly, as the aerospace engineering industry reeled from the cessation of flights, the architectural & engineering segment saw new contracts decline sharply. Growth in business consultancy was also hampered by the travel ban, which posed challenges to acquiring new clients. Likewise, anaemic growth in other administration & support services—largely comprising travel agencies and MICE events¹—was due to the plunge in tourist and business arrivals.

Performance in other business services turned around in Q3. The rebound was notable in the HQ & business representative offices and architectural & engineering segments. In comparison, other administrative & support services saw mild improvements. The segment continued to be severely affected by border restrictions and limits on the scale of MICE activity in Phase Two. Notwithstanding the Q3 improvements, all segments are still operating below their pre-pandemic peaks.

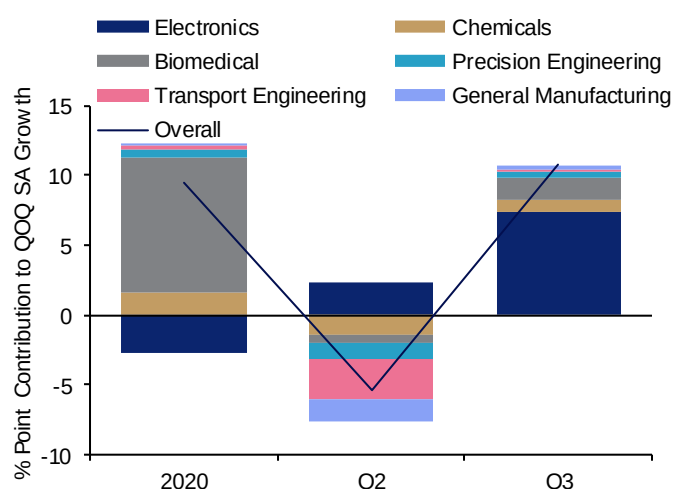
¹ MICE refers to meetings, incentives, conferences and exhibitions.

The performance of the trade-related sector was mixed with industry-specific factors affecting outcomes

Singapore's Index of Industrial Production (IIP) contracted by 5.3% q-o-q SA in Q2, before expanding by 11% in Q3 (**Chart 2.9**). While tepid external demand and domestic supply-side disruptions due to circuit breaker measures affected production in Q2, the gradual abatement of these factors in Q3 facilitated the recovery in some industries. For instance, the chemicals industry declined by 12% q-o-q SA in Q2 before rising by 7.7% in Q3. Similarly, the precision engineering industry shrank by 7.7% in Q2 but increased by 2.7% in Q3.

Chart 2.9 IIP declined in Q2 2020 before stepping up in Q3

Index of industrial production



Source: EDB and EPG, MAS estimates

However, there were some segments where the recovery had been slower than expected. Marine & offshore engineering was operating at slightly above half of its Q4 2019 production level in Q3, due to the movement restrictions imposed on foreign workers as they gradually returned to worksites from quarantine in their dormitories. Similarly, the 'miscellaneous industries' category, which includes segments that produce construction materials, was still operating at 76% of its pre-COVID level.

In the other manufacturing segments, sequential growth profiles were less obviously driven by the weak external environment and the closing and reopening of the economy. For instance, pharmaceutical production remained high over the course of the year. Following the surge in Q1, the segment contracted slightly by 1.5% q-o-q SA in Q2 before rebounding by 4.8% in Q3. The strong performance was supported by the higher output of active pharmaceutical ingredients and biological products. Meanwhile, the semiconductors segment expanded sequentially in both Q2 and Q3, by 8.8% and 21%.

Outside of manufacturing, the other industries within the trade-related sector largely rebounded in Q3 after hitting their troughs in Q2. For instance, the volume of sea cargo handled at Singapore's ports contracted by 11% q-o-q SA in Q2, before recovering to expand by 8.2% in Q3. Concomitantly, real non-oil exports (comprising both domestic exports and re-exports) rose by 7.9% in Q3, following the 7.0% decline in the previous quarter.

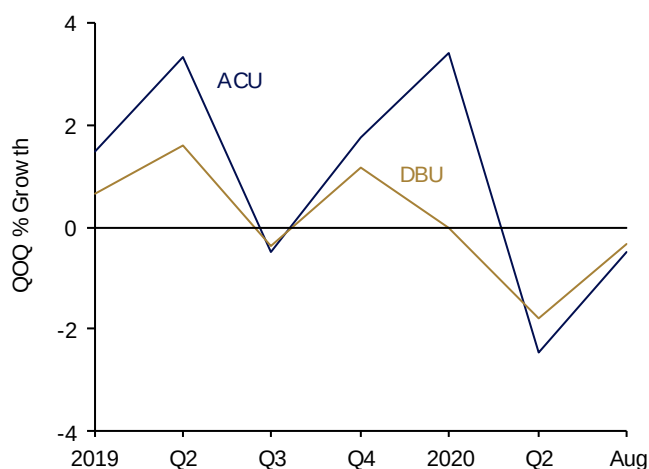
The less-affected finance & insurance and ICT sectors registered sequential declines in Q2, which reversed in Q3

The finance & insurance sector contracted by 1.4% q-o-q SA in Q2, weighed down by the banking segment. ACU and DBU non-bank loans declined by 2.4% and 1.8% compared to Q1 (**Chart 2.10**). The sentiment-sensitive segments—security dealing and forex activities—also posted significant contractions in Q2 as trading volumes fell to more normal levels from the surge in March. Nevertheless, pockets of resilience were to be found in insurance, as well as other auxiliary activities which mainly comprised credit card network players. The insurance sector continued to benefit from strong demand for life insurance products. Digital payment adoption also accelerated, as countries in the region entered lockdown.

Outturns in the finance & insurance sector improved in Q3. Other auxiliary activities recorded robust expansions alongside the resumption of consumer-facing activities in Singapore and the region. The insurance segment expanded at a healthy pace, benefitting from the favourable reception of new products launched in Q3. Nevertheless, the performance of the banking segment remained lacklustre as credit demand ebbed. In August 2020, ACU loans fell by 0.5% from end-June, while DBU loan growth stayed in negative territory at -0.3%, weighed down by manufacturing and housing & bridging loans (**Chart 2.10**).

Chart 2.10 Since the onset of the pandemic, onshore and offshore demand for credit has been weak

DBU and ACU non-bank loan growth



Source: MAS

The ICT sector shrank by 2.3% q-o-q SA in Q2. Growth in the IT & information services segment—due to steady demand for e-commerce, work-from-home and digital entertainment solutions during the circuit breaker period—was offset by a sharp pullback in telecommunication services, as travel and movement restrictions led to significant reductions in roaming and prepaid revenues.

The Q3 recovery in the ICT industry was underpinned by continued firm demand for IT services. The ongoing shift in consumer preferences towards e-commerce was a significant tailwind for leading Business-to-Consumer platforms. Growth in the telecommunications segment also picked up from the trough in Q2. Retail sales of computer &

telecommunications equipment rose by 23% in Jul–Aug from Q2, close to half of which were transacted online. Meanwhile, the other information services segment saw significant gains from stronger revenue streams among games and software publishers.

2.2 Economic Outlook

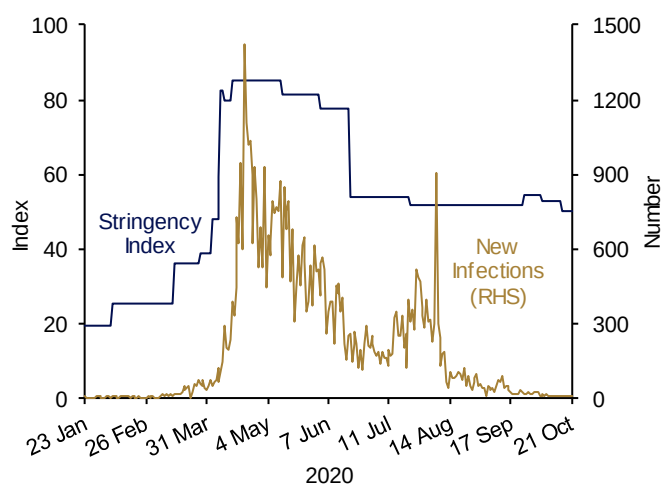
The economy's recovery trajectory is expected to be gradual and uneven

The number of new COVID-19 infections in Singapore has fallen substantially, averaging fewer than 10 cases per day in October, compared to 32 in September and 365 over the period of Apr–Aug (**Chart 2.11**). The stringency index, which measures the strictness of containment measures, has eased from an average of 76 in Q2 2020 to 53 in Q3 2020 and should decline further with the transition to Phase Three of the reopening, barring a significant pickup in community infections that could induce a tightening again (**Chart 2.11**).

The economic rebound in Q3 2020 was underpinned by the resumption of business activities post-circuit breaker. With most industries already reopened, the supply-side impetus to growth will taper off in the quarters ahead. At the same time, the shock will continue to propagate through the demand side of the economy as firms and households continue to be restrained by income loss and increased uncertainty, therefore holding back on investment and discretionary spending. Consequently, the growth momentum of the economy is expected to slow in Q4 and remain modest in 2021, notwithstanding some support from further work resumption in industries reliant on foreign workers. Some pockets of the economy are not expected to recover to pre-COVID levels even by the end of next year: in particular, activity in travel-related and some contact-intensive domestic services could still fall short of pre-pandemic levels until health risks abate.

Chart 2.11 The stringency index is expected to ease further as the economy gradually transits to Phase Three of the reopening, amid low and stable infection rates

Stringency index and daily new infections, Singapore



Source: Oxford University Blavatnik School of Government, WHO

The Q3 rebound in the consumer-facing sector should taper off in Q4

The worst-hit sectors could see diverging growth trajectories in the quarters ahead. The consumer-facing sector was the first to recover as social distancing measures were eased. However, this initial boost in Q3 is expected to wane in Q4. On the demand side, it remains unclear whether the early rebound in the retail and F&B sectors from pent-up consumer demand can be sustained, as tourist arrivals will stay depressed and heightened economic

uncertainty will continue to cap discretionary spending by households. While net firm formation in the retail and F&B sectors remained positive in Q3, there could be more firm closures in the coming months as government wage subsidies taper off, given that these industries were already facing structural challenges prior to the onset of the pandemic.

Industries with a high proportion of foreign workers should see further pickup, with construction supported by a firm pipeline of projects

In comparison, industries that rely heavily on foreign workers are expected to see a more significant pickup in Q4. As at Q3, not all construction worksites have fully resumed activity. In late September, MOM introduced a more targeted quarantine approach for foreign worker dormitories to minimise work disruptions and ensure that the system of safe distancing measures put in place remains sustainable. Activity in the construction sector should improve given the backlog of construction projects that had accumulated due to the circuit breaker and infections in dormitories. Contracts awarded—a leading indicator of construction activity—is also expected to increase in the quarters ahead, supported by public residential developments and upgrading works, developments at the Jurong Lake District, construction of new healthcare facilities and infrastructure projects including the Cross Island MRT Line.

Similarly, there are several industries within the manufacturing sector which employ relatively large numbers of foreign workers, such as marine & offshore engineering, that saw only a mild recovery in Q3. They are likely to experience better growth outturns in Q4 as more workers return to work. Nonetheless, there remains the possibility of periodic outbreaks within dormitories or workplaces, which could interrupt the normalisation of activities.

The travel-related sector is expected to be sluggish for a prolonged period

The travel-related sector is expected to face prolonged headwinds as international borders reopen very gradually. Singapore may lag the global recovery in air transport given the absence of domestic flights. While green lanes and travel bubbles are being progressively put in place, the revival of cross-border travel may be hesitant, due to recurrent waves of infection and onerous measures to ensure safe travel. Thus, the travel-related sector will recover more slowly than the rest of the economy. SIA's passenger capacity is expected to inch up to just 15% of its pre-pandemic level by the end of the year, and less than 50% by March 2021.

Nonetheless, pockets within the travel-related sector should see some support from domestic tourism, with the STB launching a \$45 million marketing campaign and injecting \$320 million in tourism vouchers for Singaporeans to go on local tours and staycations. Operating capacities at major tourist attractions have also been raised to 50%, from 25%. However, based on MAS' estimates using Input-Output Tables 2015, residents' share of consumption on accommodation and recreation services was only 6% and 26%. While they may divert some of their foregone overseas spending to the domestic market, this will not compensate for the loss in non-resident spending in Singapore.

Some of the sectors which performed relatively well amid the pandemic could moderate in the quarters ahead

The pharmaceutical segment had played a key role in supporting the overall economy thus far in 2020, but the level of activity could decline in the coming quarters. Nevertheless, output in the biomedical cluster as a whole, which also includes the medical technology

segment, is likely to remain healthy, in part driven by underlying demand for COVID-related products.

Alongside the continued recovery in the global electronics cycle, the domestic electronics sector should see a gradual, albeit volatile, expansion in the next few quarters. Global chip sales had increased steadily through H2 2019, and have generally held up amid the pandemic in recent months (**Chart 2.12**). A decomposition of global chip sales growth (y-o-y) suggests that final retail and investment demand remained lacklustre, notwithstanding the recent boost from more telecommuting around the world (**Chart 2.13**). As such, the resilience of global chip sales reflected, for the most part, stockpiling activity by downstream electronics manufacturers. In particular, Chinese electronics manufacturers were likely to have stockpiled chips in anticipation of trade sanctions by the US. The onset of the pandemic earlier this year could also have induced panic buying by other downstream manufacturers, further spurring the stockpiling. In addition, the resolution of the supply glut in the global chips market had pushed up chip prices, which helped support the value of sales to some extent.

Chart 2.12 Global chip sales rose through H2 2019 and earlier this year

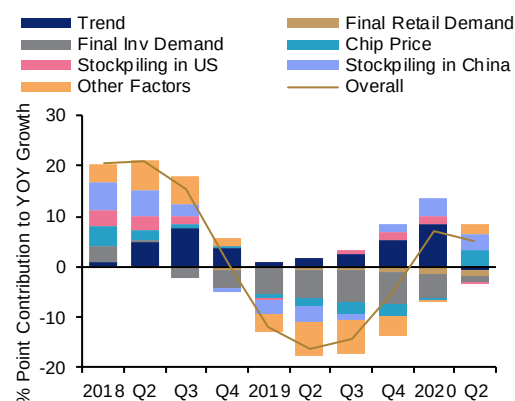
Global chip sales



Source: World Semiconductor Trade Statistics and EPG, MAS estimates

Chart 2.13 Recent growth in global chip sales has been driven by stockpiling

Decomposition of global chip sales growth



Source: Haver Analytics and EPG, MAS estimates

Note: Global chip sales data was first decomposed into trend and cyclical components using the Frequency Domain filter. The cyclical component was then regressed on the corresponding components in electronics retail sales (China and US), gross fixed capital formation (G3 and Asia), South Korea's PPI for semiconductors, materials inventory of electronics manufacturers in the US and integrated circuit imports by China. These regressors capture consumer demand, investment demand, chip price, stockpiling in the US and stockpiling in China.

In the coming months, the boost afforded by stockpiling activity in China would likely dissipate, as US trade actions that hinder Huawei from procuring chips came into effect in September. While consumer demand could remain resilient for products launched in Q4 this year, the impact of retail demand on global chip sales has been small in recent years. The outlook for the electronics industry is thus weighed down by the dissipation of factors that had supported activity earlier, thereby exposing domestic production to the broader weakness in global demand.

In the medium term, the structural support from the transition to 5G networks remains in place, even though the rollout is likely to have been delayed by the pandemic. In Singapore,

the rollout is expected to be completed by 2025. The industry could therefore benefit from new developments that would be triggered by the availability of the faster network, including a new round of tech refresh for existing devices such as mobile handsets, and the emergence of new applications in big data, Internet of Things, cloud solutions and artificial intelligence. These would increase demand for new gadgets and data centres, and therefore, chips.

Digitalisation will continue to drive growth in ICT and financial services

The ICT sector should continue on a modest recovery path, in part due to the resilience of IT & information services. The recent announcements by MNCs such as ByteDance and Tencent to make Singapore their headquarters in Asia should bolster long-term growth in the sector. In the telecommunications segment, mobile service revenue is expected to pick up as roaming increases with more green lane arrangements, and as delayed ICT projects come back onstream.

In the finance & insurance sector, credit demand could remain under pressure from lower risk appetite as the real economy stays subdued. However, the sector could see some offsets from improving fee incomes amid a healthy investment banking pipeline and recovering wealth management incomes. At the same time, the pandemic has fuelled a one-off step-up in demand for insurance services, especially for short-term plans and investment-linked products with lower entry-level premiums, and this is expected to fade as the pandemic drags on. Meanwhile, activity in the sector will continue to be supported by credit card network players as the uptake in digital payments accelerates, driven in part by the digitalisation of consumer spending.

Further downside risks could weigh on the economic growth outlook

All in, the Singapore economy is forecast to contract by 5–7% this year, and record above-trend growth for 2021 due to the effects of the low base in 2020. The path ahead remains clouded with uncertainty. While Singapore's economic policy uncertainty index² eased in Aug–Sep, it remained elevated. Faster progress on vaccine development and therapies could speed up the economic recovery globally and in Singapore. However, downside risks to the growth outlook could materialise if a resurgence in worldwide infections prompts more shutdowns and results in weaker-than-expected external demand, or if domestic labour market conditions deteriorate further and hamper a decisive pickup in consumer demand.

² Data from PolicyUncertainty.com. The Singapore EPU Index is a trade-weighted average of national Economic Policy Uncertainty (EPU) indices for 21 countries. Each national EPU index reflects the relative frequency of own-country newspaper articles that contain a trio of terms pertaining to the economy (E), policy (P) and uncertainty (U) in each month.

2.3 Comparison with Past Downturns

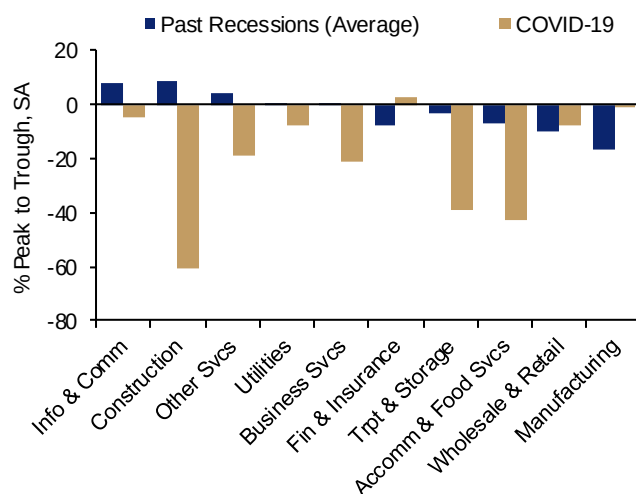
The COVID-19 shock had a greater impact on domestic-oriented industries, with their close linkages to the rest of the economy amplifying output losses

The COVID-19 recession has been unprecedented in its intensity, having resulted in a cumulative 14% decline in GDP from pre-crisis levels in Q4 2019 to the trough in Q2 2020. This compares with an average contraction of 6.1% across the previous recessions.³ This section compares the characteristics of the current downturn with past recessions in Singapore across three approaches: (i) production (or industry); (ii) expenditure; and (iii) income.

Previous recessions in Singapore were typically driven by the external-oriented⁴ manufacturing sector. In comparison, the COVID-19 shock has disproportionately affected domestic-oriented and travel-related services. As a result of the circuit breaker measures, domestic-oriented sectors such as F&B, retail, construction and other services recorded substantial contractions (**Chart 2.14**). The travel-related⁵ industries, which straddle both external and domestic-facing segments, were also severely affected by disruptions to international travel.

Chart 2.14 The COVID-19 shock has hit the domestic-oriented and travel-related sectors harder than the external-oriented industries

Change in sectoral VA across downturns



Source: DOS and EPG, MAS estimates

Although the domestic-oriented sectors account for a smaller share of GDP compared to the external-oriented sectors, they generate significant indirect effects or negative spillovers on the economy through the production and consumption channels. In the

³ In this analysis, past recessions refer to the AFC in 1997–98, the IT Downturn in 2001 and the GFC in 2008–09.

⁴ External-oriented sectors comprise manufacturing, wholesale, transportation & storage, finance & insurance, ICT and business services. Domestic-oriented sectors include construction, F&B, retail, other services and utilities.

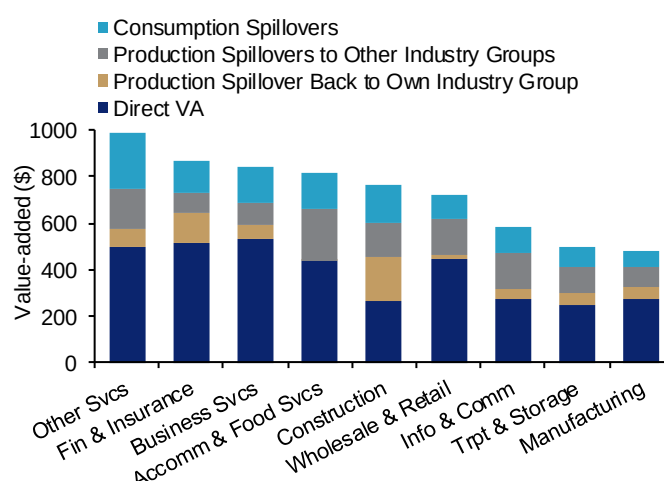
⁵ Travel-related industries are distributed across transportation & storage, accommodation and other services sectors.

production channel, the loss in final demand in the worst-hit sectors generates ripple effects through supply chains, thus affecting other firms in the same or different industries. In the consumption channel, the loss in final demand in the worst-hit sectors is assumed to result in a proportional decrease in wages for employees, thus weakening household consumption.

According to estimates derived from the Singapore Input-Output Tables 2016, every \$1,000 decline in final demand in the other services sector would result in a \$496 loss in VA due to negative spillovers, while a similar fall in the construction and accommodation & food industries would lead to a \$493 and \$385 loss in VA, respectively (**Chart 2.15**). At least half of the spillovers in these sectors take place through the production channel. The production spillovers in the accommodation & food and other services sectors are predominantly to other industries, but those for the construction sector are with respect to itself, likely because of the industry's long supply chain involving many construction firms that act as subcontractors in projects.

Chart 2.15 The spillovers are greater in the current downturn as the industries that are more severely impacted have more extensive production and consumption linkages to the domestic economy

VA per \$1,000 of final demand by industry



Source: Singapore Input-Output Tables 2016 and EPG, MAS estimates

Note: Direct VA refers to the VA generated from producing the output to meet the initial \$1,000 of final demand.

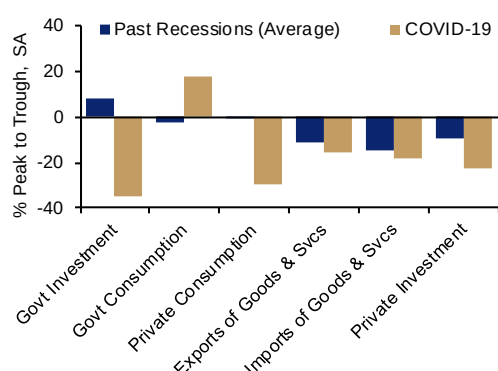
The total spillovers (both production and consumption) generated by the domestic-oriented sectors are higher than by the external-oriented ones. This can be attributed to two factors. First, the domestic-oriented sectors rely more on local firms as suppliers, which strengthens their interlinkages with the rest of the economy. Second, these sectors tend to be more labour-intensive. A loss in final demand in these sectors would result in lower wages for more workers, thus affecting household consumption to a greater degree. In sum, the collapse of final demand in these domestic-oriented sectors due to the pandemic would cascade down to many firms and households, culminating in a more significant impact on the economy.

The current recession has impacted the economy's expenditure and income components differently from the past

From the expenditure approach to GDP, the brunt of the COVID-19 shock has been felt in government investment, private consumption and the export and import of services in H1 2020 (**Charts 2.16 and 2.17**). Unlike in previous recessions where government investment was a source of counter-cyclical support, its sharp fall-off this time round reflected the suspension of construction activity due to the quarantine of foreign workers. Consequently, some large infrastructure projects were delayed, such as the construction of Changi Airport Terminal 5 and the extension of the MRT network. Meanwhile, the circuit breaker measures shut down non-essential services and disrupted population mobility, leading to a contraction in private consumption. In addition, trade in services was significantly affected, particularly travel, construction, maintenance & repair as well as transportation (**Chart 2.17**). These developments stood in contrast to past downturns when the impact was mainly felt in private investment and trade in goods. Although these expenditure categories also suffered setbacks in the current recession, their magnitude of decline was less severe than the other categories.

Chart 2.16 Expenditure components affected by movement restrictions plummeted

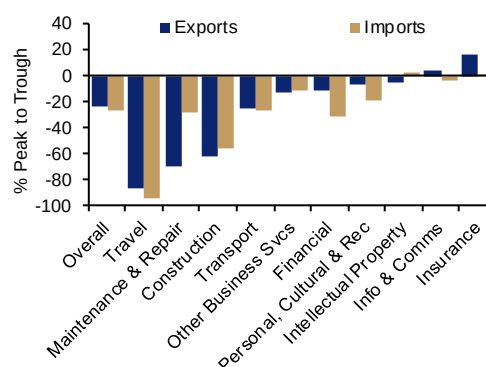
Change in real expenditure components across downturns



Source: DOS and EPG, MAS estimates

Chart 2.17 Exports and imports of travel and construction declined sharply

Change in nominal export and import of services, Q4 2019 – Q2 2020

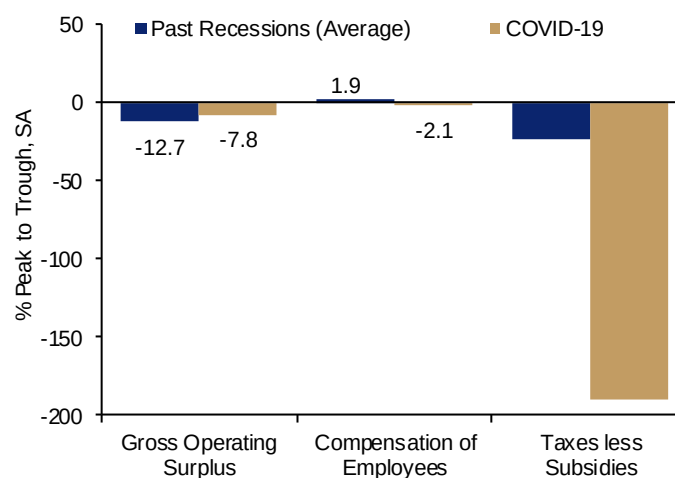


Source: DOS

From the income perspective, the hit to government income (i.e., taxes less subsidies) this time was much larger compared to previous downturns, reflecting the immense fiscal support provided by the government through various measures such as the Jobs Support Scheme (**Chart 2.18**). This contrasts with the positive contribution of government consumption to overall expenditure in the economy (**Chart 2.16**). Meanwhile, the fall in gross operating surplus appeared to be less severe than in past recessions. However, compensation of employees contracted slightly in this episode, even though it was relatively resilient in previous downturns. This was due to the more rapid fall in employment this time around.

Chart 2.18 Government income shrank more sharply than in previous recessions against the large increase in fiscal spending during COVID-19

Change in nominal GDP by income components across downturns



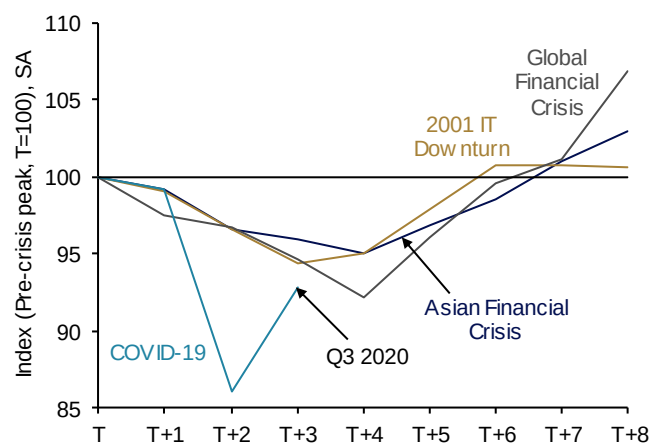
Source: DOS and EPG, MAS estimates

The current downturn is deeper and likely to be more protracted than previous recessions

Overall, the economy took about four quarters to fall from peak to trough in previous recessions. In the current episode, however, the trough in GDP had occurred by the second quarter, and was much deeper, due to the nature of the COVID-19 shock (**Chart 2.19**). In past recessions, the recovery profile was fairly symmetrical to the decline, with the economy taking three quarters to return from the trough to its pre-crisis level. In the present cycle, while the economy rebounded in the immediate quarter after the trough, this largely reflected the exit from the circuit breaker measures, and the momentum is unlikely to be sustained in the subsequent quarters. Without wide-scale implementation of vaccination programmes in Singapore and globally, the threat of repeated outbreaks will continue to generate economic uncertainty, hampering a more decisive recovery. Thus, the recovery will likely be more prolonged than in previous recessions.

Chart 2.19 The economy experienced a precipitous fall in GDP amid the COVID-19 outbreak and could take longer to recover compared to previous recessions

Comparison of Singapore's quarterly GDP profile across downturns (T=Pre-crisis peak in GDP level)



Source: DOS and EPG, MAS estimates

Note: T=Q4 2019 for COVID-19, Q1 2008 for GFC, Q4 2000 for the 2001 IT Downturn, Q3 1997 for AFC.

Box A: The Uncovered Interest Parity in Normal and Stress Periods

Introduction

Uncovered interest parity (UIP) is a relationship that links exchange rates and international interest rate differentials. It is a market equilibrium condition which states that the interest rate differential between two currencies would in general match the expected bilateral depreciation of the higher-yielding currency of the pair, in the absence of currency risk premia and expectational errors. For concreteness, UIP posits that the expected appreciation of the Singapore dollar (S\$) relative to the US dollar (US\$) should equal the spread of US\$ interest rates over S\$ interest rates, unless market participants require a risk premium to hold one currency over the other, or are consistently wrong in their expectations.

The UIP condition is one of the most important relationships in open-economy macroeconomics. From a theoretical point of view, UIP is a fundamental bedrock of macroeconomic models, linking interest rates and exchange rates. But its importance is also practical. For countries whose monetary policy instrument is the short-term interest rate and whose exchange rates are flexible, UIP describes how monetary policy is transmitted to exchange rates.¹

In Singapore, MAS manages the effective Singapore dollar exchange rate, and the UIP condition connects the developments in the managed exchange rate to interest rates. While MAS manages the Singapore dollar against a basket of currencies, the value of the domestic currency with respect to the US dollar is of special interest because the US dollar is the most traded currency in the world and often used as unit of value by global investors. When macroeconomic fundamentals and MAS announcements about the monetary policy stance are consistent with expected S\$ appreciation, S\$ interest rates are typically below US\$ rates. Conversely, when they are consistent with expected stability in the S\$ exchange rate, the gap between S\$ and US\$ interest rates typically narrows.

In light of developments in financial markets during the pandemic, this Box revisits the UIP condition in Singapore. It explores how the UIP condition evolved as Singapore became more financially integrated with global markets and how it was affected by extraordinary events such as the GFC and the early stages of the COVID-19 crisis. Since the beginning of the outbreak, there has been a significant (if largely temporary) reversal of capital flows to EMs, an unprecedented increase in equity price volatility, massive quantitative easing in AEs and EMs, and an inching of interest rates closer to the zero lower bound (ZLB) once again.

¹ In the canonical macroeconomic model, a rise in interest rates causes an immediate (“on impact”) appreciation of the currency where rates have risen, which would be expected to depreciate subsequently. The initial appreciation would pass through to imported goods prices and also shift demand away from domestically-produced goods, and via these two channels, would amplify the disinflationary effect of higher interest rates.

Empirical framework

UIP implies a relationship between expected currency movements and interest differentials. If S is the price of US\$ in terms of S\$, then UIP states that:

$$E_t \left[\frac{S_{t+k} - S_t}{k} \right] = (i_{SGD,t} - i_{USD,t}) \quad (1)$$

Expressing all variables in logs, this can also be written as the so-called Fama regression (Fama, 1984):

$$\ln\left(\frac{S_{t+k}}{S_t}\right) = \ln\left(\frac{1+i_{SGD,t}}{1+i_{USD,t}}\right) + \varepsilon_t \quad (2)$$

$$E_t[\varepsilon_t] = 0 \quad (3)$$

In its simplest form it is estimated as:

$$depr_{t,t+k} = \alpha + \beta idiff_t + \varepsilon_t \quad (4)$$

where $depr_{t,t+k}$ and $idiff_t$ represent the forward depreciation and the interest rate differential respectively (these map to $\ln(\frac{S_{t+k}}{S_t})$ and $\ln(\frac{1+i_{SGD,t}}{1+i_{USD,t}})$ correspondingly in Equation (2)), the

subscript t , $t+k$ denotes the period between t and $t+k$, and ε_t is an error term of mean zero. The null hypothesis of UIP holds when one cannot reject the following restrictions on the estimated coefficients:

$$\beta = 1 \quad (I)$$

$$\alpha = 0 \quad (II)$$

If (I) fails, the UIP hypothesis is rejected because expectations of exchange rate movements fail to respond to fluctuations in interest rate differentials. Rejection of (II) implies that interest rate differentials are a biased predictor of exchange rate movements, because there is a forecastable risk premium ($\alpha \neq 0$).

UIP violations thus indicate either non-rational formation of expectations or the existence of currency risk premia. The preferred explanations for violations of UIP in the academic literature are those related to the behaviour of time-varying risk premia. It is widely accepted that fluctuations in currency risk premia account for a significant share of the variability in exchange rates.²

Previous evidence for Singapore

Previous work on the validity of UIP for Singapore have found mixed results. For example, MAS (1999) found significant violations of the UIP, which were even more pronounced during the period of the AFC. Using survey data on exchange rate expectations, the study argued that the rejection of UIP can be explained by the divergence between rational expectations and the

² Mark (1988) is a seminal paper on time-varying risk premia in foreign markets; Christiansen *et al.* (2011) find that time-varying systematic risk goes a long way to explaining violations of UIP.

formation of expectations by market participants, as well as the existence of a compensating risk premium to hold assets subject to exchange rate risk.

Despite the rejection of UIP by econometric methods, it may have been the case that deviations from UIP were of minor economic importance. This argument is made by Khor *et al.* (2007) that UIP holds at least as a first approximation in Singapore, as *ex-post* uncovered interest differentials lie within a range of $\pm 2\%$ points, which as of their writing, before the GFC and subsequent extraordinary monetary loosening measures, could be considered narrow relative to market interest rates then.

The theme of UIP was revisited after the GFC. Tang (2011) used a panel cointegration model to test the UIP hypothesis in ASEAN countries, finding a strong rejection for Indonesia, Malaysia, the Philippines and Thailand, but not for Singapore, suggesting that the latter's financial sector is more integrated with the US economy. Mihov (2013) estimated tests of the UIP hypothesis based on 10-year rolling regressions for Singapore. His estimates indicated that, from the late 1980s, the coefficient β on the interest rate differential became insignificantly different from one, with the exception of the period of the AFC, roughly from the beginning of 1998 to the end of 2000. However, the fact that the coefficient β was always negative despite the failure to reject the null hypothesis $\beta = 1$ stems from the large uncertainty around the point estimates of β , which hovered around -1 for the period between the late 1980s and 2000. This large uncertainty is typical of UIP regressions and reflects the fact that interest rate differentials account for only a small share of the variation in exchange rates. That is, the fact that one cannot reject UIP may be partly because the test lacks statistical power to reject the null hypothesis.

Results

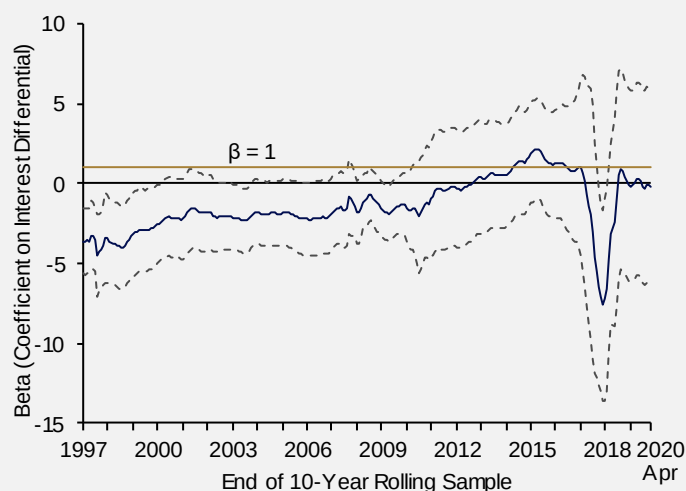
(a) Evidence from rolling regressions

Chart A1 shows the evolution of the coefficient β using end-of-period monthly data for the 3-month interbank rates in US\$ and S\$ and the 3-month annualised depreciation of the bilateral S\$-US\$ rate.

The UIP hypothesis is not rejected when the 90% confidence intervals in **Chart A1** include $\beta = 1$ (as indicated by gold line). The specification consistently fails to reject the UIP hypothesis for the 10-year periods ending in August 2010 until April 2020, with the exception of the windows ending at February 2018 through July 2018.

This finding is in line with the previous econometric results by Tang (2011) and Mihov (2013), which also failed to reject the UIP hypothesis for Singapore.

As discussed before, failure to reject the UIP hypothesis may be simply because uncertainty about the estimates is so large that no hypothesis may be rejected. In statistical parlance, that would occur because the model lacks power to distinguish between the null and alternative hypotheses. It is therefore reassuring that even though the coefficient β is imprecisely estimated, it is positive and hovers closer to 1 than to 0 since about 2013, with the exception of the brief period when UIP was rejected for the windows ending at February 2018 through July 2018.

Chart A1 Rolling UIP regressions (10-year rolling sample)

Note: The chart shows in the solid blue line the coefficient β in equation (4) estimated in rolling 10-year regressions; dashed lines indicate the 90% confidence intervals.

(b) Evidence from threshold regressions

Threshold regressions provide a straightforward approach to the question of inference about the timing of shifts in the validity of the UIP hypothesis. In a threshold regression, there is a variable that splits the sample in two or more sub-samples for which the coefficients of interest are different. Formally, the equation estimated is:

$$depr_{t,t+k} \begin{cases} \alpha + \beta_1 idiff_t + \varepsilon_t & \text{if } z_t < \text{threshold} \\ \alpha + \beta_2 idiff_t + \varepsilon_t & \text{if } z_t \geq \text{threshold} \end{cases}$$

where α is the common intercept and β_1 and β_2 are the slopes of the equation for, respectively, regions 1 and 2, where the regions are defined by the position of the variable z_t relative to an estimated threshold.

Two variables are considered that could potentially split the UIP regression into distinct regimes: time and the VIX (Chicago Board Options Exchange Volatility Index), a proxy for global risk appetite.

The pattern in **Chart A1** suggests that there may be two regimes chronologically sequenced: first, the parameter β in the Fama regression was negative and statistically significant; second, after the regime change, it became positive and statistically not different to unity. The results in **Table A1, Panel 1** show that the UIP hypothesis is strongly rejected prior to November 2001, but from that date onwards, the coefficient on interest differentials in the Fama regression becomes statistically indistinguishable from unity.

It may also be that uncovered interest parity is dependent on the state of global markets. In particular, it has been recognised that global factors, partly related to US monetary policy, affect the pricing of currencies, capital flows, financial conditions and risk appetite in countries integrated with international financial markets. Gabaix and Maggiori (2015) provide

a theory of exchange rate determination that brings to the fore the importance of the balance sheet of financiers that bear currency risk. Miranda-Agrippino and Rey (2019) identify US monetary policy shocks as drivers of the global financial cycle, with spillover effects transmitted by capital flows, asset prices, leverage of international financial intermediaries, and global credit.

To explore the possibility of different regimes for the validity of the UIP relation, the threshold regression is also estimated based on the VIX as a gauge of risk appetite in global financial markets.³ In the case of a single threshold, the sample is split into risk-on and risk-off sub-samples, for low and high values of the VIX respectively. When the VIX is used to determine the threshold, UIP holds when the VIX is lower than 19.06%, which could be characterised as risk-on periods, but it is again strongly rejected when the VIX is higher or risk appetite is lower (**Table A1, Panel 2**).⁴ A possible explanation for this pattern is that when risk appetite is lower, financial markets become less integrated, perhaps because speculators or financial intermediaries take smaller positions in their arbitrage activities.

Table A1 Threshold Fama regressions

Dependent Variable: depr	Panel 1: Time Threshold		Panel 2: VIX Threshold	
	Before November 2001	After November 2001	Risk-on VIX < 19.06	Risk-off VIX ≥ 19.06
idiff	-1.310* (0.532)	1.656 (0.940)	0.593 (0.698)	-1.758* (0.603)
Constant		-0.431 (0.850)		-0.841 (0.836)
R ²	0.039		0.035	

Note: Sample period is from January 1995 to April 2020. Standard errors are in parentheses.

* Statistically significant at the 5% level

UIP and interest rates behaviour

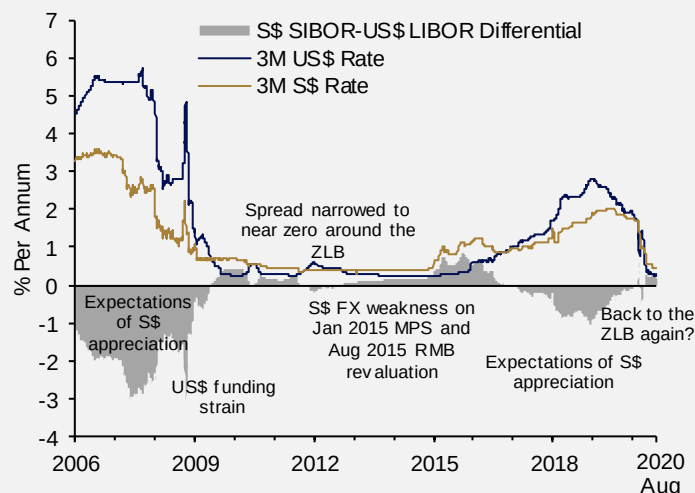
As a consequence of UIP arbitrage, S\$ and US\$ interest rate differentials have largely tracked Singapore's economic developments, including the monetary policy stance. The S\$ SIBOR is typically below the US\$ LIBOR when the slope of the policy band is positive, i.e., the currency is on an appreciation path. However, this discount can vary over time in line with changing economic conditions and the outlook for growth and inflation (**Chart A2**). However, the S\$ SIBOR has exhibited a positive spread over US\$ rates in the past, notwithstanding the positive slope of the policy band. This has typically occurred when macroeconomic conditions have deteriorated and markets priced in an easing of MAS' monetary policy settings. In particular, market participants generally understand MAS'

³ While the VIX is a measure of the implicit volatility in equity prices, it can be decomposed into risk aversion and uncertainty components. It turns out that both components are highly correlated with each other, so it is accurate to say that VIX could be a proxy for both risk aversion/appetite and underlying uncertainty. For a decomposition of the VIX into those components, see Bekaert *et al.* (2013).

⁴ Between January 1990 and August 2020, the monthly average VIX had median 17.45, mean 19.41 and standard deviation 7.78. The "calm" state (VIX below 19.06) happened 58% of the time, most notably during the 1990s before the AFC, in the mid-2000s before the GFC, and from 2012 until the beginning of the COVID-19 outbreak. Monthly average VIX peaked above 40 in only two occasions, during the GFC and in March–April 2020.

monetary policy reaction function and expect the policy stance to move in line with the evolving outlook.

Chart A2 US and Singapore 3-month interbank rates and S\$ SIBOR-US\$ LIBOR differential



Source: ABS Benchmarks Administration Co Pte Ltd and ICE Benchmark Administration Ltd

The discount of the 3-month S\$ SIBOR below the 3-month US\$ LIBOR began dissipating in early 2019 when it became evident that growth and inflation in the Singapore economy were weakening. Following MAS' monetary policy decision in October 2019 to reduce the slope of the policy band, the spread continued to narrow and by January 2020 had completely disappeared. On 15 March 2020, the US\$ LIBOR fell sharply on news that the US Federal Reserve had cut its target rate to 0–0.25%. However, the S\$ SIBOR was slow to move in tandem, although the 3-month S\$ SIBOR largely tracked the fall in US\$ LIBOR. In recent months, the spread has been close to zero as both S\$ and US\$ rates hover close to the ZLB.

Conclusion

The empirical analysis shows that for approximately the last two decades, the UIP hypothesis holds on average for Singapore, but there are specific periods of significant deviations. Like any other currency pair, the S\$-US\$ bilateral exchange rate is driven by many factors beyond interest rate differentials, notably by large movements in currency risk premia. The threshold regression analysis indicates that when the VIX is above 19.06%, which could be termed a risk-off threshold, there are significant deviations from the UIP condition.

In particular, the results show that risk-off periods (which are proxied by higher levels of the VIX) forecast an increase in the UIP deviation for the S\$-US\$ pair, that is, an increase in the difference between the expected S\$ depreciation and the given interest rate differential. This is consistent with higher currency risk premia during risk-off periods.⁵

The breakdown of the UIP relation during risk-off periods reveals a disconnect between the narrowly defined monetary policy stance and market-determined interest rates. This disconnect may indicate that market participants are not able or willing to engage in the arbitrage activities that link the monetary policy stance to the determination of interest rates

⁵ This finding is robust to using the JP Morgan EM volatility index as a proxy for risk. Indeed, the two indices have a correlation of 0.68.

in normal times. In international financial markets, liquidity facilities help preserve the orderly functioning of markets which can potentially reconnect asset prices through arbitrage relations.

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3 Labour Market and Inflation

- In Q2 2020, employment registered a sharp quarterly decline, while the number of workers on short work-week or temporary layoff rose.
 - In line with the experience of other economies, the reopening of the domestic economy in Q3 should see some underutilised labour capacity being absorbed. Beyond the immediate rebound, however, the employment recovery is likely to be protracted. Prolonged weakness in the travel-related sector is expected to spill over to some of the adjacent industries, while the shift in consumption away from labour-intensive services could also keep overall labour demand muted.
 - All in, employment is anticipated to only expand gradually next year. Even though most of the job gains will go to local workers, the recovery in employment may not be sufficient to absorb the accumulated slack from this year. Coupled with mismatch in the labour market, the resident unemployment rate could stay elevated next year, even as it should edge down from its peak in the latter half of 2020.
 - MAS Core Inflation came in at -0.3% y-o-y in Q3, slightly lower than the -0.2% outturn in Q2, mainly due to weak external inflation. In comparison, domestic-oriented components in the consumer basket experienced milder price declines as strong disinflationary pressures caused by the contraction in demand during the circuit breaker eased. Meanwhile, headline inflation came in at -0.3% in Q3, compared to -0.7% in Q2, as the increase in car prices more than offset the moderation in accommodation inflation. Both core and headline inflation are assessed to have troughed, and are forecast to come in between -0.5 and 0% in 2020.
 - In 2021, inflation should rise gradually, as disinflationary effects from government subsidies fade and oil prices cease to be a drag on inflation. The resumption of more activities and the gradual improvement in the labour market should also support the increase in inflation. While the threat of deflation has receded, underlying inflationary pressures in the Singapore economy are expected to be muted. Specifically, external inflation is projected to remain low amid weak global demand conditions. Domestically, the absence of inbound tourists, shifts in consumer patterns and excess capacity in factor markets will keep inflation subdued. MAS Core Inflation is forecast to range between $0-1\%$ while CPI-All Items inflation is projected to recover more modestly to -0.5 to 0.5% .
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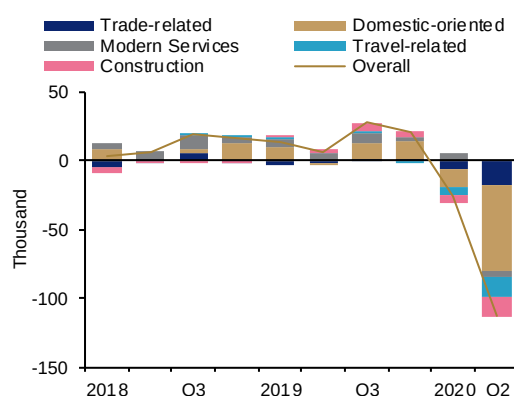
3.1 Labour Market¹

COVID-19 caused dislocations to the domestic labour market in Q2 2020

Overall employment (including foreign work pass holders and domestic workers) fell by 113,200 q-o-q in Q2 2020, worsening from the 25,200 decline in Q1 (**Chart 3.1**). Domestic-oriented services² accounted for more than half (54%) of the total headcount loss, although most other segments of the economy also shed workers. Apart from the electronics, insurance and IT & other information services segments, all 25 other sub-industries in the labour market recorded job losses (**Chart 3.2**).

Chart 3.1 Employment registered a record contraction in Q2 2020 ...

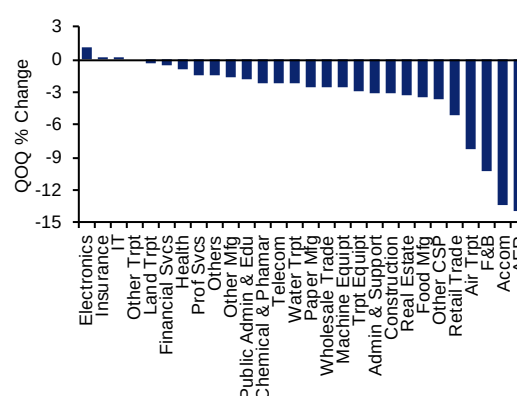
Quarter-on-quarter employment change by sector



Source: MOM and EPG, MAS estimates

Chart 3.2 ... and fell in nearly all segments of the economy

Employment growth by segments in Q2 2020



Source: MOM

The rate of job losses was highest in the travel-related sector, at 12.1% q-o-q (-15,000) in Q2. Employment in air transport fell by 8.3% q-o-q, as international movement restrictions greatly reduced demand for air travel and prospects for a quick recovery faded. With tourism halted, and social and recreational activities severely curtailed by the circuit breaker, employment in the accommodation and AER segments similarly contracted, by 13.4% and 13.9% q-o-q, respectively.

Employment in domestic-oriented services also shrank by a material 3.7% q-o-q in Q2 (-61,800), mainly on account of food & beverage (F&B) services, retail trade and other community, social & personal (CSP) services. Notwithstanding a shift towards online and alternative modes of sale (e.g., takeaways) during the circuit breaker period, retail and F&B sales fell significantly in Q2. With remote work unfeasible for many personal services (such as hairdressing and beauty services), labour demand in these segments also fell markedly. Similarly, headcount in the construction sector declined by 3.0% q-o-q (-13,600) as most building activities were put on hold.

¹ The commentary in this section is based on labour market data up till Q2 2020 only.

² The "domestic-oriented" sector encompasses land transport, retail trade, food & beverage, real estate, administrative & support services, community, social & personal services (excluding arts, entertainment & recreation) and utilities & others. The "modern services" sector comprises ICT, financial & insurance and professional services. The "trade-related" sector consists of manufacturing, wholesale trade, water transport and other transport industries. The "travel-related" sector is made up of air transport, accommodation, as well as arts, entertainment & recreation (AER) industries.

The pace of contraction in employment in the trade-related sector was the mildest at -1.9% q-o-q (-17,700), as hiring in a few sub-segments stayed resilient. Headcount increased in the electronics manufacturing segment alongside strong semiconductor demand, and held up in other transportation & storage services, possibly driven by the increase in e-commerce activities which benefitted parts of logistics and warehousing services. Nonetheless, job losses in the overall trade-related sector rose as other sub-segments collectively saw larger headcount reductions in Q2. Notably, employment fell by 3.0% q-o-q in the transport equipment segment as the oil price plunge in early Q2 led the marine & offshore engineering segment to consolidate headcount.

All in, the number of employed individuals fell by 138,400 in the first half of 2020, to 3.7% below the end-2019 employment level. Foreign work pass holders accounted for 55% of the decline, significantly higher than their share of the workforce.

The sharp fall in employment in the first half of 2020 reflected the near cessation in economic activity in the labour-intensive sectors

The downward adjustment in employment in H1 due to the COVID-19 crisis has been more rapid than in previous recessions, even when controlling for the magnitude of the GDP contraction. The 3.0% q-o-q decline in overall employment in Q2 was about 2% points worse than would have been predicted by a standard model of Okun's Law³ (**Chart 3.3**), likely due to the uneven impact of the pandemic shock across sectors. While certain sectors such as modern services and parts of manufacturing (e.g., pharmaceuticals) were able to operate throughout the circuit breaker in Q2, contact-intensive sectors, notably the domestic-oriented and construction sectors, had to severely curtail or cease activity. Many firms in this latter group, which is also highly labour intensive, would have seen a significant loss of revenue as a result, and appear to have chosen to reduce rather than retain headcount.⁴ Employment consequently adjusted much more rapidly in the current recession compared with past crises (**Chart 3.4**).

Part-time workers likely accounted for a significant share of those who lost their jobs in Q2.⁵ MOM's Labour Market Report for Q2 2020 highlighted the drop in the share of part-time workers among employed residents.⁶ This was possibly due to the higher proportion of part-time workers in sectors heavily impacted by COVID-19. The share of part-time workers in the hardest-hit sectors, such as accommodation & food, AER and administrative & support services, was 29%, 18% and 17%, respectively in 2019, higher than that in the overall economy (11%). Moreover, firms may generally prefer to reduce part-time rather than full-time workers, as the former have lower levels of firm-specific productivity.

³ Okun's Law is a short-term linear approximation of the relationship between employment growth and GDP growth.

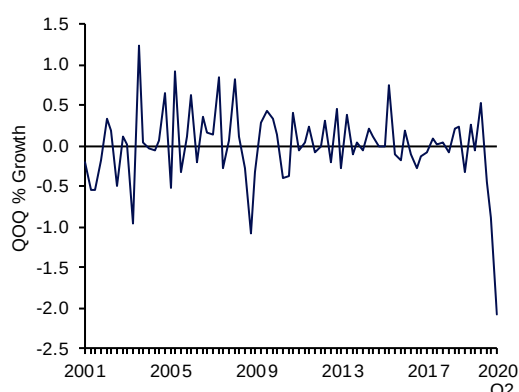
⁴ Despite the step-up in government wage support via the Jobs Support Scheme as well as the waiver of foreign worker levy and provision of rebates during the circuit breaker period, the short-term marginal productivity of labour may have dipped below wage costs, even if wages were highly subsidised.

⁵ Casual workers, such as part-timers, have similarly formed the bulk of job losses in many other advanced economies. The 2020 OECD Employment Outlook reported that in the initial stages of COVID-19, workers on temporary contracts accounted for a major part of employment declines in many advanced economies.

⁶ This was based on early data from MOM's Labour Force Survey.

Chart 3.3 The fall in employment in Q2 was worse than expected

Okun's Law residuals

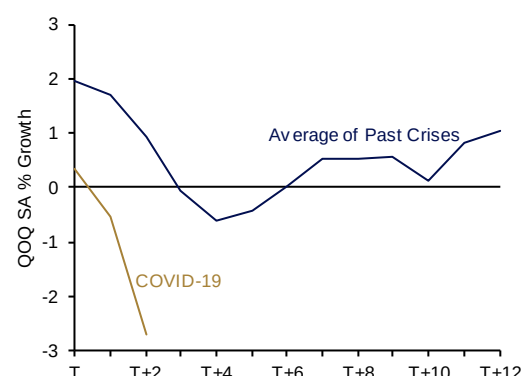


Source: DOS, MOM and EPG, MAS estimates

Note: Residual estimates are obtained from a regression model of Okun's Law. A negative (positive) residual indicates that employment fell (increased) by more than implied by the estimated relationship between GDP growth and employment growth.

Chart 3.4 Employment adjusted more rapidly compared to previous crises

Total employment adjustment



Source: MOM and EPG, MAS estimates

Note: T refers to pre-crisis peak in GDP levels. T=Q4 2019 for COVID-19, Q1 2008 for GFC, Q4 2000 for 2001 IT Downturn, Q3 1997 for AFC; the average of past crises is obtained by taking the simple average of the q-o-q SA % growth for the AFC, 2001 IT Downturn and GFC.

Many workers who were retained were put on shorter work-week or were temporarily laid off

In addition, a large number of workers who were kept on payroll had their working hours and/or incomes reduced in Q2. The number of workers placed on short work-week or temporary layoff⁷ rose to 81,700, from 4,200 in Q1, more than three times the previous peak of 26,500 in Q1 2009 during the GFC (**Chart 3.5**).

In comparison, the number of retrenchments rose in Q2, but the overall level remained relatively low (**Chart 3.5**). The more widespread use of short work-week and temporary layoff, sizeable wage subsidies provided under the Jobs Support Scheme (JSS), and foreign worker levy rebates and waivers, likely kept retrenchments in this recession low, despite a sharp reduction in revenue. In turn, there were comparatively fewer number of firm cessations during the circuit breaker period.⁸

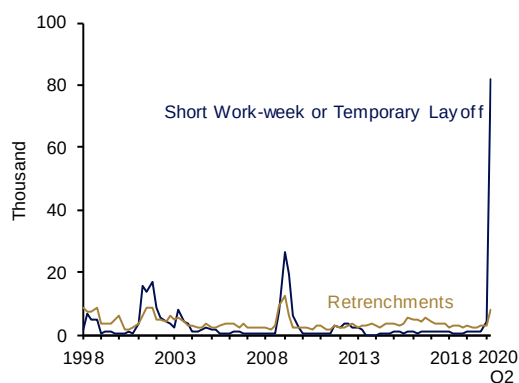
⁷ Workers placed on short work-week or temporary layoff would typically continue to be classified as employed, but would have seen significant reductions in hours worked and employment income. In particular, temporary layoff is an alternative labour adjustment measure to retrenchment. As part of temporary layoff measures, firms can ask employees to stop going back to work for a short period. During this time, however, firms will need to continue to pay employees at least 50% of their gross salary while they are temporarily laid off.

⁸ Firm cessations fell on a year-on-year basis in Q2 2020.

Overall, more sectors saw a reduction in employment⁹ rather than a cut in working hours in Q2. Most industries that saw larger employment declines have a smaller share of full-time workers, compared to the economy-wide average. In sectors such as construction and manufacturing (ex-electronics), where full-timers are more of a norm, firms had put more workers on short work-week or temporary layoff (Chart 3.6).

Chart 3.5 Employees who worked fewer hours rose to a record high

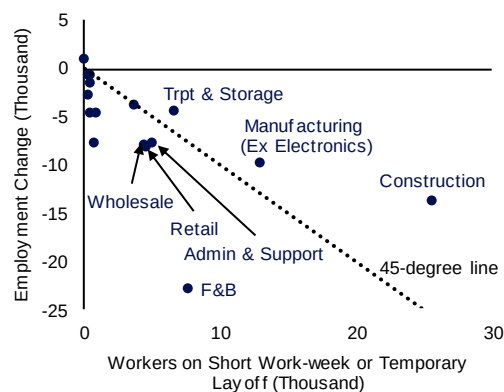
Workers on short work-week or temporary layoff and retrenched workers



Source: MOM and EPG, MAS estimates

Chart 3.6 Nature of employment adjustments varied across sectors

Workers on short work-week or temporary layoff and employment change by sectors in Q2 2020



Source: MOM

Labour market conditions weakened considerably in Q2

Amid the contraction in labour demand during the circuit breaker, slack in the domestic labour market rose in Q2. This was partly reflected in the pickup in the resident unemployment rate to a seasonally adjusted 3.8% in June 2020, from 3.3% in March (Chart 3.7), as well as an increase in time-related under-employment. MOM had reported that a larger number of part-time employees have indicated that they were willing and available to work additional hours in Q2, compared to the same period a year ago.¹⁰

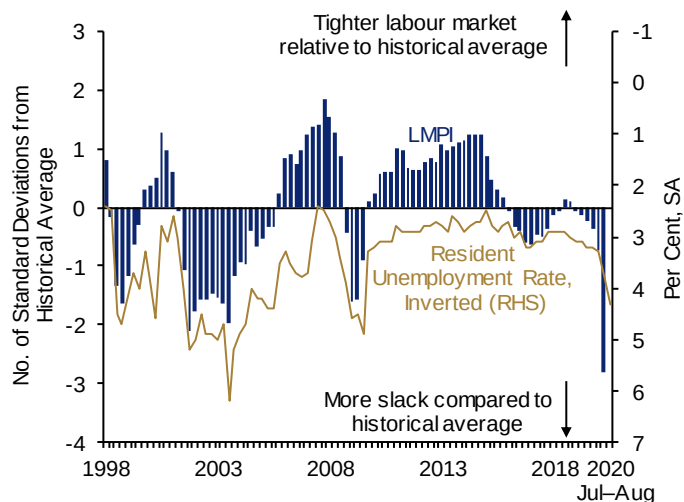
The poor hiring sentiment in H1 could have caused some prime-age workers who were separated from their jobs to exit the labour force. Many firms had stopped hiring activity during the circuit breaker months, which would have reduced incentives for unemployed workers to search for jobs. Some school-leavers may also have chosen not to enter the labour force. These developments would have led to a decline in the resident labour force participation rate, and possibly a slower-than-normal pace of increase in the resident labour force, suggesting that latent labour market slack may have built up as well.

⁹ Apart from retrenchments, employment declines may also be driven by other forms of job separations, such as non-renewal of contracts, resignations and retirements.

¹⁰ MOM (2020), "Labour Market Report Second Quarter 2020", September 14.

Chart 3.7 Labour market indicators showed an increase in slack in Q2

Quarterly labour market pressure indicator (LMPI) and seasonally adjusted resident unemployment rate



Source: MOM and EPG, MAS estimates

Note: The last datapoint for the resident unemployment rate is an average of July and August 2020 readings, while the last datapoint shown for LMPI is for Q2 2020.

EPG's summary labour market pressure indicator (LMPI) suggests that overall labour market slack in Singapore rose sharply in Q2 2020. Consequently, resident wage growth (based on average monthly earnings) eased to 1.0% y-o-y in Q2 from 2.4% in the previous quarter. This was well below the 10-year historical average rate of 3.7%, although it still likely understated the extent of wage cuts experienced by workers.¹¹ According to the Jobs Situation Report published by MOM on 20 August 2020, about 224,800 employees have been affected by firms' cost-saving measures, implying that reductions in take-home pay have been relatively widespread.

Some underutilised labour capacity should be absorbed as domestic activities resume

The relatively low number of permanent job separations (as proxied by retrenchments) and high incidence of temporary reductions of workers via short work-week and temporary layoff suggest that firms would have been able to quickly recall their staff and ramp up capacity as operations resumed in Q3. This would have the effect of reversing some of the labour market weakness. Indeed, domestic private consumption, as proxied by retail and F&B sales, staged a sharp recovery in June and July (**Chart 3.8**). Excluding catered food, F&B sales volume continued to expand month-on-month in all segments in August, while retail sales also continued to rise, albeit at a slower pace.¹²

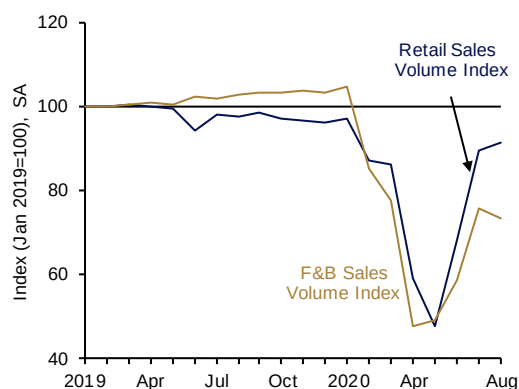
¹¹ Average wage growth likely understates the extent of wage cuts faced by employees due to composition effects, as part-time and casual workers, who tend to earn lower than industry average wages, had dropped out of employment.

¹² The overall F&B sales index edged down slightly in August entirely because of the large decline in demand for catered food provided to foreign workers, most of whom were no longer quarantined. See DOS (2020), "Retail Sales Index and Food & Beverage Service Index, August 2020", October 5.

The sharp rise in consumption activities suggests that employment prospects for F&B, retail and supporting services such as administrative & support services (which includes cleaning and security services) have likely rebounded. Construction activity has also gradually resumed in H2, which would be supportive of employment. With the easing of safe-distancing measures expected in October and November, including the resumption of MICE events as well as the reopening of some tourism-related activities such as cruise operations, the travel-related sector is also expected to see some modest employment recovery.

Chart 3.8 Employment should increase alongside the recovery in domestic consumption

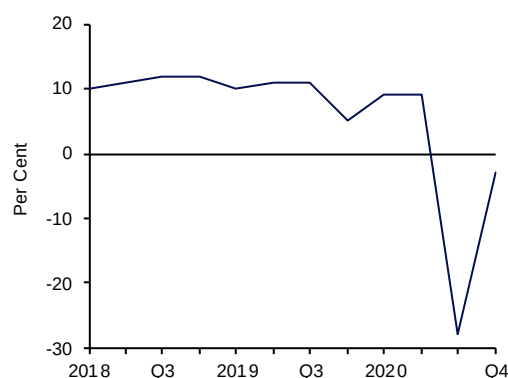
Retail and F&B sales volume indices



Source: DOS and EPG, MAS estimates

Chart 3.9 Hiring is likely to remain tepid in Q4

ManpowerGroup net employment outlook for Singapore



Source: ManpowerGroup

Note: The net employment outlook refers to the percentage of surveyed employers expecting to increase headcount less the percentage of employers expecting to reduce employment during the period. Data for each quarter is based on surveys conducted in the previous quarter.

The extended credit and fiscal support for firms should continue to help businesses bridge the weakness in revenues and keep firm closures and permanent job losses from spiking sharply. At the same time, substantial government transfers to bolster household incomes have helped underpin the recent rebound in domestic private consumption. The extended JSS, albeit at reduced levels, as well as the newly-introduced Jobs Growth Incentive, should also encourage the creation of new jobs in sectors that have brighter prospects, such as ICT, biomedical sciences, e-commerce, health & social services and financial & insurance services.

Beyond the immediate rebound, however, the recovery in the labour market will be protracted

The experience of OECD and Asian economies indicates that employment picks up strongly in the 1–2 months after the economy emerges from a lockdown, but then tends to fade thereafter. This was the case even in economies where the second wave of infections has been low.¹³ Likewise in Singapore, beyond the near-term recovery, employment prospects are expected to remain relatively subdued. ManpowerGroup's¹⁴ net employment outlook stayed in negative territory at –3% for Q4 2020, which indicates a subdued outlook, notwithstanding its significant recovery from –28% for Q3 (**Chart 3.9**). Given fairly poor prospects for a near-term recovery, certain segments of the domestic economy could continue to see manpower rationalisation. For instance, activity in the travel-related (includes air transport, accommodation and AER segments) and transport equipment sectors, which employed 6% of the overall labour force¹⁵, will likely be weak for an extended period. The downturn in these sectors, in turn, will have spillovers to the rest of the economy, weighing on the overall labour market.

Some segments within Singapore's domestic-oriented sector also have direct dependencies on inbound tourism. The lack of international leisure and business travellers has likely left a sizeable shortfall in the incomes of land transport operators such as taxi and private hire car services. Employment in these segments is unlikely to pick up significantly in the near term.

In addition, COVID-induced shifts in consumption patterns could also persistently dampen labour demand. For instance, there are indications that telecommuting could become more prevalent, reducing demand for domestic transportation services. Apart from continued social distancing, more home-based work could also reduce social and recreational activities and thus demand for workers in a wide range of labour-intensive services such as personal services and AER. The corresponding shift in consumption towards goods tied to home entertainment (such as household equipment and telecommunications & computers) and groceries is unlikely to generate a sufficient increase in labour demand to offset the fall-off in the former.

Overall labour market prospects will also likely be held back by the substantial uncertainty in the macroeconomic outlook next year. Activity in many sectors could be weaker than expected, which, together with further balance sheet strains, may constrain labour demand. Even in the better-performing industries, job growth could ease as firms may have brought forward hiring in the face of temporary government incentives. In the absence of a smooth handover from public-supported to private sector-led employment, a strong labour market recovery is not assured at this juncture. Taking all factors into account, overall employment is expected to only expand modestly in 2021.

¹³ For example, in Hong Kong SAR, the 3-month moving average of employment troughed in June 2020 and rose by 0.4% m-o-m in July before edging up by a significantly smaller 0.1% m-o-m in August. Similarly, employment in South Korea rose by 0.6% m-o-m in May, following its trough in April, before rising at an average of 0.1% m-o-m in Jun–Sep.

¹⁴ ManpowerGroup is a global workforce solutions company that helps organisations to source and develop talent.

¹⁵ Based on Q4 2019 employment data.

Resident unemployment will remain elevated

Notwithstanding the subdued outlook for the labour market, local employment is expected to rebound more strongly than foreign employment. This partly reflects government wage subsidies which are supporting the hiring of locals.

However, unlike the GFC where the resident unemployment rate returned to pre-crisis levels after six quarters, the unemployment rate in the current crisis will likely decline more gradually. Indeed, the resident unemployment rate had continued to rise to an average of 4.3% in Jul–Aug even after Phase Two of the economy’s reopening in June. While this likely reflected, in part, a recovery in labour force participation, as residents who stayed out of the labour force during the circuit breaker re-entered to search for jobs, the pickup in resident employment in 2021 is not anticipated to be sufficiently strong to bring the economy rapidly back to full employment.

Other than previously discouraged residents re-entering the labour force as the economy recovers, some individuals under the SGUnited Traineeships, SGUnited Mid-Career Pathways, and SGUnited Skills programmes could also add to the number of unemployed workers when they search for permanent roles after training, and are unable to secure employment.¹⁶

Finally, mismatch could also keep domestic labour market slack elevated. COVID-19 could accelerate structural declines in labour demand for low- and mid-skill services jobs that require a high degree of in-person tasks, due to the development of new labour-saving automated processes. At the same time, new labour demand could derive mainly from the modern services sector, where the jobs may be more intensive in cognitive and ICT skills. These emergent skills mismatches between excess labour supply and new labour demand may increase search frictions and impede labour market reallocation.

All in, the resident unemployment rate is forecast to only edge down gradually next year. In turn, it is expected to weigh on wages for the rest of this year and possibly into 2021.

¹⁶ MOM’s Jobs Situation Report (8th Edition) reported that 16,210 individuals were placed into short-term jobs as at end-August 2020. Another 3,510 individuals were placed into company-hosted traineeships, attachments and training or non-company hosted training programmes as at end-August 2020. Following international definitions, trainees who are paid are classified as employed, rather than outside the labour force.

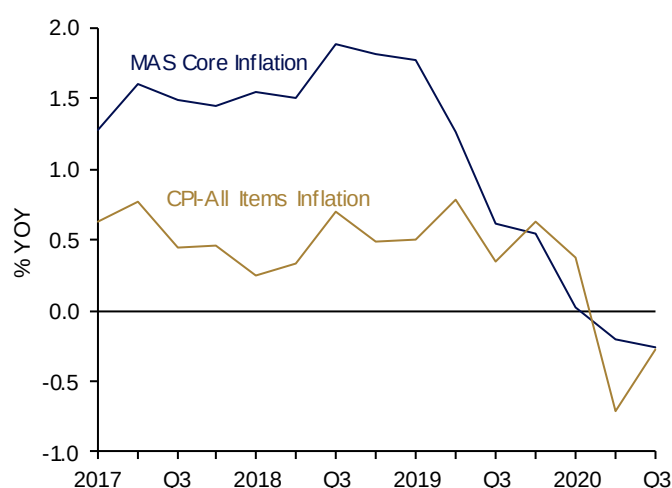
3.2 Consumer Price Developments

Inflation stayed negative even as disinflationary pressures eased

MAS Core Inflation edged down slightly to -0.3% y-o-y in Q3, from -0.2% in Q2, largely due to lower oil prices which passed through to domestic electricity & gas costs. In addition, non-cooked food inflation moderated as imported food inflation fell and demand normalised following the sharp spike during the circuit breaker. Accommodation costs also rose by less in Q3 as the increase in housing rentals slowed. Conversely, prices in the other major categories saw smaller declines in Q3, as the strong downward pressure on inflation caused by the contraction in domestic spending subsided somewhat. Specifically, retail goods and services registered a more modest decrease in prices compared to Q2, as most businesses resumed operations and consumer spending picked up from late June. Car prices also increased as pent-up demand led to a rise in Certificate of Entitlement (COE) premiums when bidding resumed. CPI-All Items inflation consequently came in at -0.3% y-o-y in Q3, up from the -0.7% outturn in Q2 (**Chart 3.10**).

Chart 3.10 Core inflation edged down, while the fall in CPI-All Items moderated in Q3

MAS Core Inflation and CPI-All Items inflation



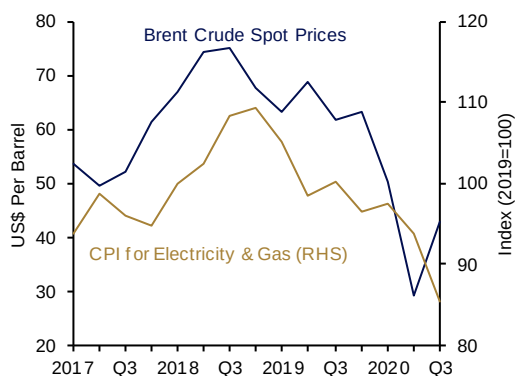
Source: DOS and MAS

Lower oil prices dampened the cost of electricity & gas while more moderate imported food inflation passed through to non-cooked food inflation

The sharp correction in global oil prices in early Q2 led to a subsequent downward revision in the electricity tariff charged by SP Group for Q3 (**Chart 3.11**). On a year-ago basis, SP Group lowered the electricity tariff for households by 19.1%, the steepest decline since Q3 2015. The impact of the reduced tariff on CPI inflation, however, was more moderate, as a sizeable proportion of households now subscribe to fixed-rate electricity price plans. This caused the cost of electricity & gas to fall by 14.7% y-o-y in Q3, which—while smaller than the reduction in tariff—was greater than the -4.6% recorded in Q2.

Chart 3.11 The sharp drop in oil prices in Q2 led to a decline in electricity & gas costs in Q3

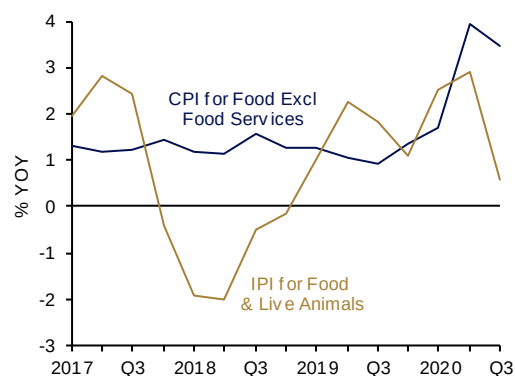
Brent crude spot prices and CPI for electricity & gas



Source: DOS and US Energy Information Administration

Chart 3.12 Non-cooked food inflation fell in Q3 as lower imported food inflation passed through

Measures of food inflation



Source: DOS

Note: IPI for Food & Live Animals in Q3 is the average y-o-y change in July and August.

Non-cooked food inflation slowed to 3.5% y-o-y in Q3 from its peak of 4.0% in the preceding quarter (**Chart 3.12**). Lower international food commodity prices and a moderation in freight costs contributed to the decline in Singapore's imported food inflation. The y-o-y increase in Singapore's Import Price Index (IPI) for Food & Live Animals eased to 0.6% in Jul–Aug, from 2.9% in Q2, as the drop in global food commodity prices in H1 2020 passed through to imported food prices.

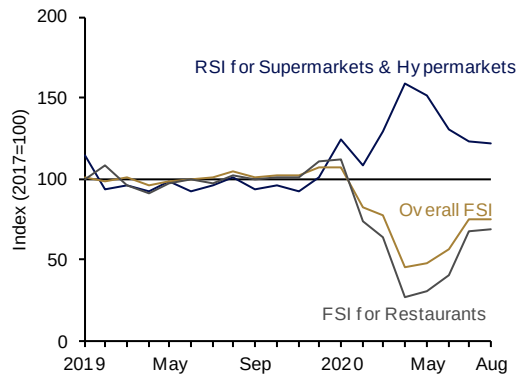
On the domestic front, the decrease in demand for non-cooked food following the resumption of dining-in services at F&B outlets from late June was also a factor driving the normalisation of non-cooked food inflation in Q3 (**Chart 3.13**). Retail sales in supermarkets & hypermarkets continued to contract, albeit by a milder 3% m-o-m on average over Jul–Aug, following the 14.2% fall in June when the circuit breaker ended.

The rate of disinflation in F&B services and retail goods eased with the rebound in consumer expenditure

Mirroring the turnaround in F&B sales, sequential food services inflation recovered from its trough of 0.2% m-o-m seasonally adjusted annualised rate (SAAR) in May to an average of 0.6% in Q3 (**Charts 3.13 and 3.14**). This was led by a pickup in hawker and restaurant food price inflation, while fast food and catered food prices remained unchanged. On a year-ago basis, however, food services inflation stayed low at 1.2% in Q3, down from 1.4% in Q2 and below its norm of 2% p.a.

Chart 3.13 F&B sales have risen with the reopening of the economy

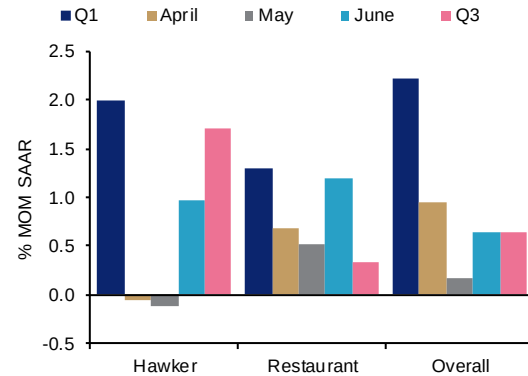
Retail Sales Index (RSI) and Food & Beverage Services Index (FSI)



Source: DOS

Chart 3.14 Price increases for food services picked up in June

Sequential price changes for food services CPI components



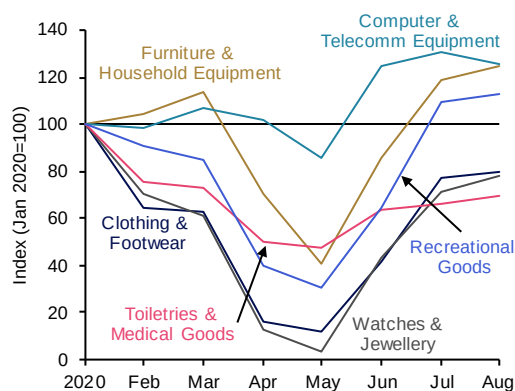
Source: DOS

Note: The outturns for Q1 and Q3 represent the average m-o-m SAAR inflation across the months in each quarter.

In June, the rebound in retail sales associated with the reopening of the economy also slowed the rate of the fall in prices for some items. The overall cost of retail goods came down by an average of 1.4% y-o-y in Q3, compared with the 1.9% drop in Q2. Notably, the extent of the price recovery across categories corresponded with their respective retail sales growth profiles (**Charts 3.15 and 3.16**). While prices of certain items such as clothing & footwear and personal effects continued to see large declines, prices of home-based products such as household durables and audio-visual equipment decreased more gradually, and that of telecommunication equipment rose significantly. These were in line with the shift in consumption and retail sales patterns observed.

Chart 3.15 Retail sales of home-based goods bounced back more strongly

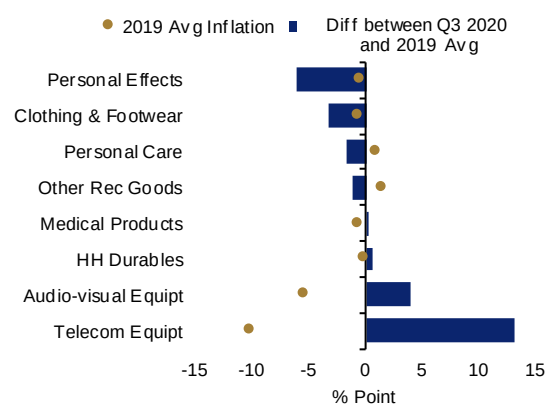
Retail Sales Index



Source: DOS and EPG, MAS estimates

Chart 3.16 Price support was firmer in categories where demand was stronger

CPI Inflation of selected retail goods categories



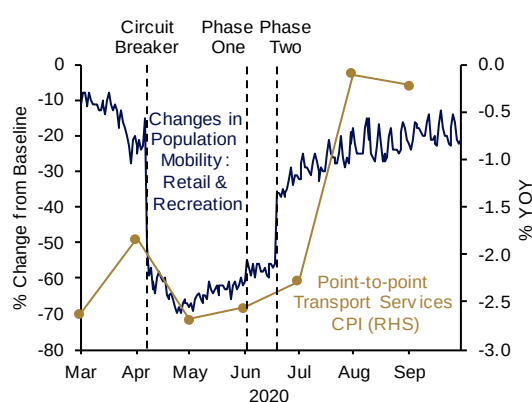
Source: DOS and EPG, MAS estimates

The improvement in mobility led to a more modest decrease in the cost of point-to-point transport services

In line with the rebound in mobility post-circuit breaker, the rate of decline in point-to-point transport services costs eased to 0.9% y-o-y in Q3, after a 2.4% drop in Q2 (**Chart 3.17**). This may also have reflected a shift in transportation preferences: taxi ridership, which is correlated with point-to-point transport demand, turned around more strongly than rail ridership, as some commuters may have had concerns over virus exposure on mass public transport (**Chart 3.18**).

Chart 3.17 The rebound in footfall led to a more modest drop in point-to-point transport costs

Point-to-point transport services CPI and change in population mobility at retail and recreational places

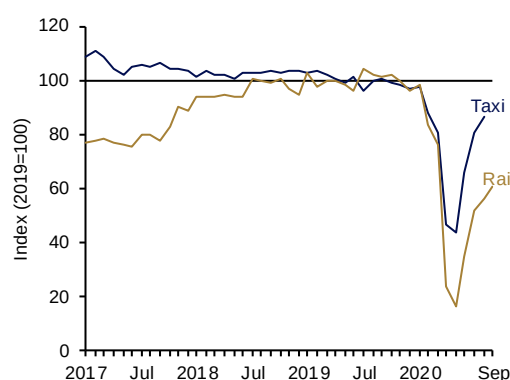


Source: DOS and Google Community Mobility Report, Singapore

Note: The baseline for the population mobility index is the median value for the corresponding day of the week during the five-week period from 3 Jan–6 Feb 2020.

Chart 3.18 Taxis regained ridership more rapidly than the MRT

Average daily taxi and rail ridership



Source: LTA and EPG, MAS estimates

At the same time, pent-up demand tempered the fall in private transport costs

Meanwhile, the pace of decline in private transport costs slowed to 1.5% y-o-y in Q3, compared with a 5.6% drop in Q2 as car COE premiums rose from a year ago. Amid the 3-month suspension of bidding exercises from Apr–Jun, motor dealers had accumulated a backlog of orders which caused the average number of bids for both Category A and B COEs in Q3 to rise by 57.8% from Q1, when bidding resumed. LTA's decision to spread the quotas accumulated from the suspension period over several COE exercises also kept monthly COE quotas low. Given the higher number of bids submitted relative to available quotas, average COE premiums rose in Q3 compared to Q1, by 7.1% and 13.8% for cars under Category A and B, respectively.

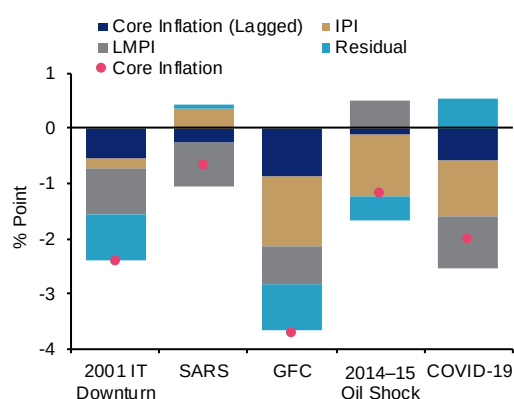
The decline in core inflation this year was driven by both weaker external inflation and a rise in domestic labour market slack

All in, MAS Core Inflation fell from 0.5% in Q4 2019 to -0.3% in Q3 2020. A Phillips Curve model, which explains almost 65% of the variation in core inflation, suggests that lower imported price inflation and the weaker labour market made roughly equal contributions to

the deviation in core inflation from its historical average in Q1–Q3 2020 (**Chart 3.19**). The current shortfall in core inflation is not as large as that seen in the 2001 and 2009 recessions. Nevertheless, the excess capacity in the domestic labour market (as proxied by EPG's LMPI) is exerting a larger drag on core inflation compared to past recessions. The positive residuals from the Phillips Curve equation also suggest that the weakness in core inflation in this recession has been more modest than predicted. This could reflect, in part, the imputation of airfares and holiday expenses in the CPI since the pandemic began.¹⁷

Chart 3.19 Labour market slack, lower external inflation accounted for the shortfall in inflation

Drivers of deviation in core inflation from historical average

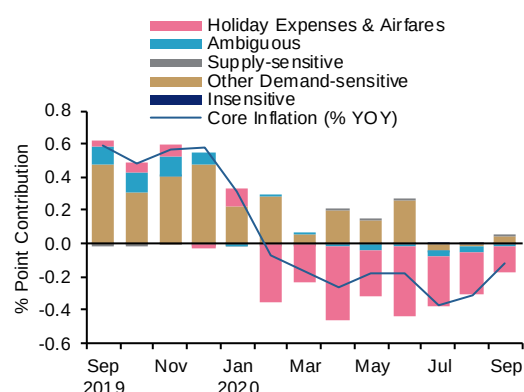


Source: DOS and EPG, MAS estimates

Note: 2001 IT Downturn refers to the period Q3 2001 – Q1 2002; Q1–Q2 2003 for SARS; Q1–Q3 2009 for GFC; Q3 2014 – Q2 2015 for Oil Shock; and Q1–Q3 2020 for COVID-19

Chart 3.20 Demand-sensitive components drove the recent fall in core inflation

Year-on-year contribution to core inflation



Source: DOS and EPG, MAS estimates

Note: Holiday expenses and airfares are demand-sensitive but have been imputed since April 2020.

EPG's analysis also shows that demand-sensitive components have driven most of the decline in core inflation this year (**Chart 3.20**). Holiday expenses and airfares, which are demand-sensitive, account for a significant part of the drag on inflation. However, even excluding these components, inflation in other demand-sensitive components have been weak. These findings are broadly consistent with that of the US¹⁸, which suggest that COVID-19 has largely had the hallmarks of a large negative aggregate demand shock, with attendant strong dampening effects on inflation.

¹⁷ Holiday expenses and airfares are imputed using the overall price change implied by other components in the CPI-All Items basket, as a representative sample of prices for these services is not available given the international travel restrictions. The imputations effectively exclude these travel-related components from the calculation of CPI, causing prices of travel-related services to fall by less than in past recessions.

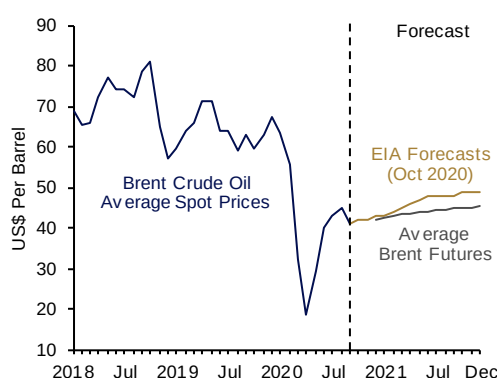
¹⁸ Shapiro (2020) assessed the inflationary effects of COVID-19 by grouping core personal consumption expenditure categories into COVID-sensitive and COVID-insensitive categories. The categories that are within the COVID-sensitive inflation group are further divided into demand-sensitive, supply-sensitive and ambiguous. Sensitive categories are those that experienced a statistically significant quantity or price change in Q2 2020 from its average change over the preceding 10 years. Demand-sensitive categories comprise CPI components whose quantities and prices changed in the same direction while supply-sensitive categories are those for which prices and quantities moved in opposite directions. See Shapiro, A H (2020), "A Simple Framework to Monitor Inflation", *Federal Reserve Bank of San Francisco Working Paper*, 2020–29.

External sources of inflation are expected to remain subdued

In the quarters ahead, external inflation is likely to be muted given generally weak demand conditions in international oil and food commodity markets. After reaching a high of US\$45 per barrel in August, Brent crude oil prices fell below US\$40 in early September as global oil demand faltered and supply rose with the resumption of Libyan oil exports after an eight-month blockade. Saudi Arabia also cut its pricing for oil sales in October, signalling a sluggish recovery in fuel demand. Moreover, several countries have recently begun imposing localised lockdowns, which will further delay the recovery in global land and aviation transport. Oil prices are expected to average US\$41 per barrel in 2020, and around US\$44 in 2021. As global oil prices rise slightly from their low in 2020, electricity & gas costs should exert a smaller drag on both core and headline inflation next year (**Chart 3.21**).

Chart 3.21 The weak demand outlook will cap the rise in Brent crude oil prices

Brent crude oil prices and forecasts

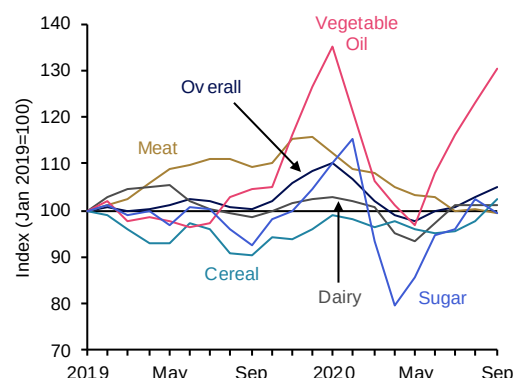


Source: Bloomberg and US Energy Information Administration

Note: Brent futures prices were averaged over working days from 1 to 22 October 2020.

Chart 3.22 Increases in food commodity prices were largely driven by specific food categories

FAO food commodity price indices



Source: UN Food and Agriculture Organization (FAO)

Similarly, international food monitoring agencies expect inflation in food commodities to rise modestly in 2021. Although price indices of global food commodities picked up in Q3 this year, these increases are not expected to be sustained. The pandemic will continue to weigh on global food demand. At the same time, recent higher prices were largely confined to certain subsets of food categories, such as cereal and vegetable oils (**Chart 3.22**), whose production prospects in the year ahead are favourable. International meat and dairy prices are also likely to be stable as global export availability still exceeds import demand.

Nevertheless, the La Niña and outbreaks of African swine fever globally suggest that there are upside risks to prices of selected food commodities such as edible oils and pork. In particular, pork reserves in China have reportedly slid to a record low.¹⁹ Higher rainfall as a result of the La Niña weather phenomenon could boost agricultural yields but could also lead to possible flooding, which would hurt output. Overall, amid generally ample global food supplies, weak demand and an expected moderation in freight transport costs, Singapore's imported food inflation should remain modest in the quarters ahead. Non-cooked food

¹⁹ Hudson, L and Emiko, T (2020), "China's pork reserves running out as prices soar, analysts say", *Financial Times*, September 21.

inflation is therefore projected to ease in 2021 from its peak this year but could stay elevated relative to its historical average, as demand for fresh food stays relatively strong.

Continued social distancing, still-cautious household expenditure and international travel restrictions will keep services inflation low

Inflation in most services and retail categories have likely troughed and should continue to pick up over the rest of the year and into 2021. Nevertheless, the recovery in domestic price pressures is likely to be weak.

Notably, inflation in a number of major services categories is likely to stay fairly muted amid continued social distancing and telecommuting. These would cap the extent to which public transport and recreation & entertainment inflation would improve. Similarly, lower levels of social activity and in-person work interactions compared to the pre-pandemic norm could weigh on the recovery of components such as food services inflation. These factors would compound the weakness arising from soft household expenditure. The scarring effects of significant job and income losses, as well as lingering uncertainty, could cause discretionary expenditure to be low, especially as pent-up demand dissipates.

At the same time, the shift in consumption away from services towards some discretionary goods is unlikely to significantly boost overall inflation. Inflation in most retail goods categories has historically been much lower than that in services. For example, the 10-year historical average inflation rates for household durables, telecommunication equipment and personal effects are 0%, -3.5% and 0.2%, respectively, well below that of services inflation as a whole.²⁰ The relatively small (fixed) weights assigned to these categories also imply that even if these categories were to see higher rates of inflation, they would not fully offset weaker inflation in the services components.²¹

Moreover, the absence of tourists and business visitors, for as long as international travel restrictions remain in place, could also directly dampen price increases in some services categories such as food services and point-to-point transportation. Non-resident expenditure in the domestic economy—a proxy for tourism expenditure—was found to have a direct and significant effect on core inflation: a 10% decline in non-resident expenditure locally is associated with a 0.15% point fall in core inflation, even after controlling for labour market conditions and imported inflation.²² The main CPI components that drive this result are holiday expenses, restaurant food and personal care products, which together make up a sizeable 18.3% of the core CPI basket.²³

²⁰ While household durables CPI includes a mix of “Services” (such as the repair of household appliances) and “Retail & Other Goods” categories, the bulk of the household durables CPI consists of retail goods items. The 10-year historical average inflation rate for services is 1.7%.

²¹ Overall, the combined weight of food services and public transport in the CPI basket is 17.4% while the weight of retail CPI components which experienced a pickup in inflation in Q3 is only 5.4%.

²² EPG augmented the Phillips Curve model with a proxy for tourism expenditure. The result that tourism expenditure has a direct, additional effect on domestic price formation beyond labour market slack and external inflation is robust to controls for external demand, such as Singapore’s goods exports. It is partly identified by the SARS episode, where non-resident expenditure locally plunged by 35.5% in Q2 2003. The result, however, holds even if the SARS episode is excluded.

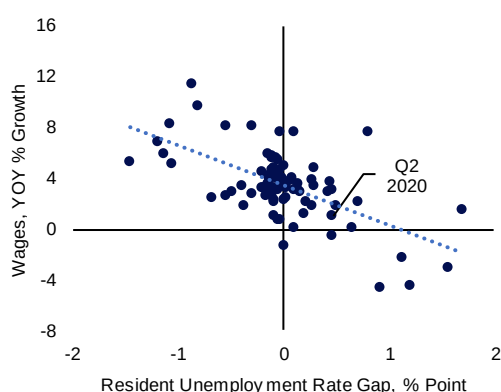
²³ Point-to-point transport services inflation was found to be unresponsive to tourism expenditure, although this likely reflected the lack of data, which only starts from 2014. Tourism expenditure domestically is also likely to be highly correlated with tourism expenditure globally. The latter in turn is a major determinant of the cost of holiday expenses, domestically and abroad, in the CPI.

Underutilised factors of production will dampen business cost pressures

On the supply side, excess capacity in domestic factor markets will keep business cost pressures low in the quarters ahead. While some firms may face higher business costs arising from measures to limit the risks of virus transmission (due to the need to monitor and enforce safe distancing restrictions and to undertake more frequent cleaning), the effect on inflation should largely be mitigated by reduced costs of major factors of production. Labour market slack is expected to weigh on wage growth, pushing down unit labour cost (ULC) for some time even as government wage support, which had previously lowered ULC substantially, fades in 2021 (**Chart 3.23**). Similarly, other business costs are expected to remain muted. Office rentals contracted by 4.5% q-o-q in Q3 2020 while retail rents fell by 4.5% in Q3, larger than the 3.5% drop in the previous quarter, as office and shop vacancies climbed (**Chart 3.24**).

Chart 3.23 Accumulated labour market slack is expected to weigh on wage growth

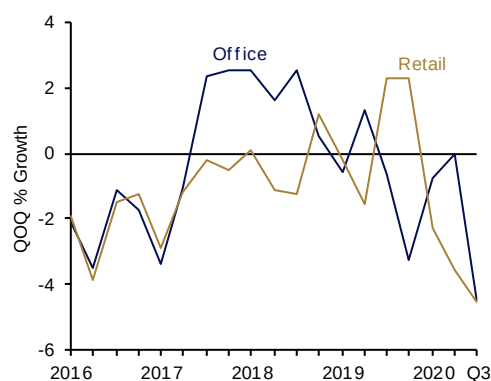
Wage Phillips Curve (Q1 2000 – Q2 2020)



Source: CPF, MOM and EPG, MAS estimates

Chart 3.24 Weak leasing demand led to continued soft commercial rentals

Office and retail rental



Source: URA

Private transport costs should be supported by the low COE quota in 2021 while accommodation costs are expected to fall amid weak demand

Next year, COE premiums are projected to rise slightly given the anticipated reduction in COE supply as the number of car deregistrations dwindles. In the near term, premiums should decline in Q4 2020 as motor dealers are likely to have cleared their backlog of orders accumulated during the circuit breaker. The increase in the total number of deregistrations in Q3 also led to an attendant rise in COE quota for the Nov 2020 – Jan 2021 bidding exercises.²⁴ However, quotas are expected to fall in 2021 compared to 2020 as a whole, while demand for cars could be sustained by a preference for private road transport as fears of virus transmission on public transport remain. Private transport costs are therefore projected to increase slightly next year compared to 2020.

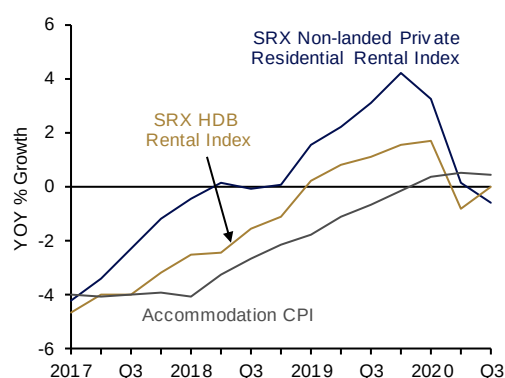
²⁴ Average monthly quota for Category B cars edged up by 16.5% while the quota for Category A remained relatively stable.

In comparison, demand for residential accommodation is anticipated to fall further in the coming quarters amid the soft labour market outlook. Partly driven by lower foreign employment²⁵, rental rates for non-landed private properties dropped by 0.6% y-o-y in Q3, reversing from the 0.1% increase in Q2 (**Chart 3.25**). While HDB rents declined at a more gradual pace in Q3, this was largely due to a spike in demand from Malaysian workers seeking temporary accommodation due to COVID-induced border restrictions.²⁶ This source of rental demand should fade as border restrictions with Malaysia are progressively lifted.

An anticipated increase in the housing stock could also weigh on residential property rentals. According to URA's estimate of private residential projects in the pipeline, the number of newly completed private residential properties (including Executive Condominiums) is projected to be 7,300 in 2021, up from 3,700 this year (**Chart 3.26**). Similarly, the number of HDB units that will reach their minimum occupancy period and thereby become eligible for leasing will also rise next year. Taking these factors into account, accommodation costs are projected to decline moderately in 2021.

Chart 3.25 Private housing rents have fallen

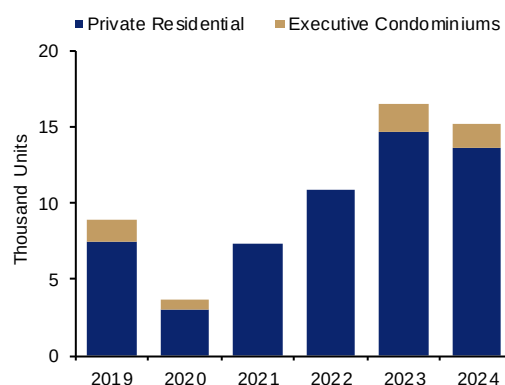
Rental price indicators and accommodation CPI



Source: DOS and SRX

Chart 3.26 The number of completed residential units is expected to rise in 2021

Pipeline supply of private residential units by expected year of completion



Source: URA

²⁵ The number of foreign workers (excluding foreign domestic workers and work permit holders from construction, marine shipyard & process) shrank by 48,100 in H1 this year. MOM (2020), "Labour Market Report Second Quarter 2020", September 14.

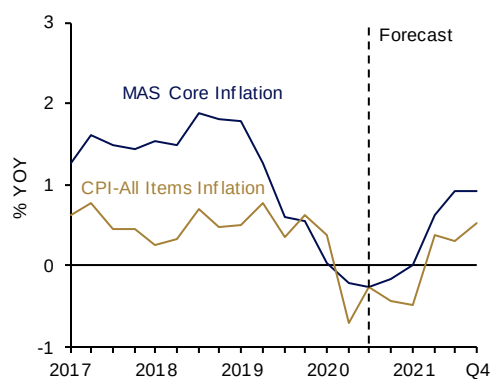
²⁶ Lim, J (2020), "Malaysian workers' return boosts home rental volumes", *The Straits Times*, October 15.

Core inflation will trough this year but stay low in 2021

All in, both core and headline inflation are expected to recover from their lows of between -0.5 and 0% this year, as demand for some services gradually improves. In 2021, the disinflationary effects of government subsidies introduced this year will fade²⁷, while electricity & gas costs should exert a smaller drag on inflation. However, a broad-based and sustained acceleration in consumer price increases is unlikely in the quarters ahead. The pickup in consumer spending in Q3 that provided respite from disinflationary pressures is likely to moderate, while the lack of tourist expenditure could exert an additional dampening impact on inflation. Both domestic and external cost pressures are also expected to stay muted. Core inflation is therefore projected to turn only mildly positive and average 0–1% in 2021. Headline inflation is estimated to come in slightly weaker at between -0.5 and 0.5%, as lower accommodation costs weigh on the CPI recovery (**Charts 3.27 and 3.28**).

Chart 3.27 MAS Core Inflation is expected to pick up next year

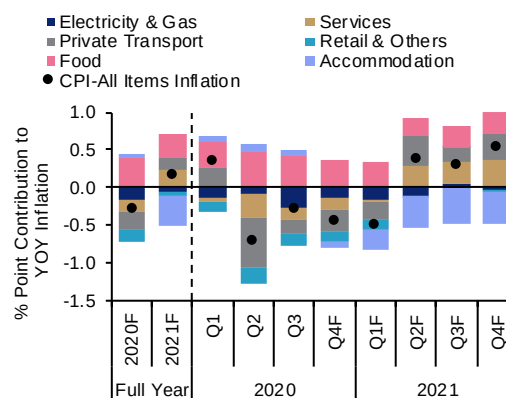
MAS Core Inflation and CPI-All Items inflation projections



Source: DOS and EPG, MAS estimates

Chart 3.28 Accommodation will exert a drag on headline inflation

Contributions to year-on-year inflation



Source: DOS and EPG, MAS estimates

²⁷ These include enhanced subsidies for preschool students (introduced in January 2020) as well as for full-time ITE students who are under the Higher Education Community Bursary and ITE Community Scholarship (effective from April 2020 and July 2020 for Higher-Nitec and Nitec students respectively). The Public Health Preparedness Clinic scheme subsidies which were introduced in mid-February 2020 would also cease weighing on y-o-y inflation from March next year.

Box B: Wage Forecasting in Singapore

Introduction

Accurate wage forecasts are important to monetary policymakers as wage growth is both an indicator of labour demand and a determinant of unit labour costs, two factors that have implications for growth and price inflation. The Phillips Curve has been an important tool for wage forecasting in Singapore, and previous work by MAS has found that the Phillips Curve relationship between wage growth and labour market slack is strong in Singapore relative to other AEs (see MAS, 2013 and MAS, 2019). However, the relationship appears to have weakened slightly after the GFC, making wage growth less predictable. In this Box, econometric and machine learning (ML) methods that take advantage of the greater availability of more granular economic data are evaluated for their potential to improve the accuracy of wage growth forecasts in the post-GFC period.

This Box investigates the potential of two classes of econometric and ML techniques to improve the accuracy of wage forecasts, comparing them to baseline models popular among macroeconomists, namely the AR(1) and Phillips Curve (PC) models. The first comprises regularised regression techniques—LASSO, Ridge and Elastic Net (EN)—that were developed primarily by econometricians, although they have a few principles in common with ML techniques. The second set includes two ML techniques that have been used for forecasting time series variables—Random Forest (RF) and Recurrent Neural Networks (RNN). A “horse race” is then conducted to evaluate the forecasting accuracy of these methods for resident nominal wage growth.¹

A broad overview of ML techniques in econometrics

In the forecasting context, two broad differences between econometric and ML techniques for forecasting are highlighted. First, rather than estimate economically meaningful model parameters, which is the traditional goal of techniques in econometrics, ML estimators typically aim to minimise out-of-sample forecasting error. For example, econometric estimators of the Phillips Curve aim to estimate the structural relationship between inflation and labour market slack, paying less attention to forecasting accuracy. In contrast to ML algorithms developed for forecasting specific time series variables, basic econometric techniques are simply not designed to maximise forecast accuracy. Second, some ML techniques have an advantage over popular econometric estimators such as Least Squares and kernel methods in terms of the ability to ignore irrelevant explanatory variables (see Athey and Imbens, 2019). If the dataset has a large number of potential explanatory variables, ML estimators such as RF are able to perform model selection tasks without a researcher specifying a data generating process or using economic theory to exclude certain variables. This allows many ML techniques to handle a large number of potential explanatory variables, which is particularly advantageous given the rapid increase in availability of more granular economic data.

The models examined in this Box were selected as they emphasise out-of-sample forecast accuracy, while having some potential to handle a large number of explanatory variables. A brief exposition of these models is provided.

¹ Special Feature C of this *Macroeconomic Review* follows a similar approach, applying a suite of econometric and ML techniques to forecast Singapore’s GDP growth.

Regularised regression techniques

Regularisation is a technique that enables linear regression models used in econometrics to reduce prediction error while handling a large number of explanatory variables. In standard multivariate linear regression models, it is known that adding more explanatory variables to the regression can render model estimates less reliable and reduce the accuracy of model predictions.² Regularisation penalises explanatory variables that increase the prediction error of a model, helping to prioritise explanatory variables that have high predictive power and increasing the model's forecast accuracy.

LASSO, Ridge and EN are techniques that apply regularisation in varying ways. The LASSO is designed to produce "sparse solutions", where a number of explanatory variables are essentially excluded from the model. In comparison, the estimated coefficients on explanatory variables under the Ridge regression tend to be non-zero with smaller coefficients for variables with lower predictive power. By excluding some explanatory variables completely, the LASSO has been shown to "over-regularise" (see Efron *et al.*, 2004), while the Ridge regression may retain even completely irrelevant variables. The EN method was introduced to overcome issues with each of these methods, as it is essentially a combination of LASSO and Ridge techniques. Notably, it produces sparse solutions while dampening over-regularisation (see Zou and Hastie, 2005).

ML techniques

Random Forest (RF)

Similar to regularised regression, RF has also been shown to be able to reduce forecast errors while handling a large set of explanatory variables (see Tyrallis and Papacharalampous, 2017). The core idea behind RF is to use subsets of the available data to estimate relationships between explanatory variables and the target variable. In the current study, sets of explanatory and target variables are randomly drawn from the available data, creating a number of samples of the data, which are called trees. Within each sample/tree, the data is further split into smaller subsets, called branches of the tree, a process that can be repeated to split the sample into multiple levels. At the end of each branch, a prediction is made by averaging the values of the target variable within that branch. Given a value for the predictor variables, each tree thus generates one prediction. The RF algorithm pools predictions made by all samples/trees and takes the average.

Similar to regularised regressions, RF algorithms have the feature of placing larger weight on explanatory variables with high predictive power, as these explanatory variables will be used for prediction in many of the samples/trees created.

Recurrent Neural Networks (RNN)

RNNs are examined here because they have been shown to have good properties for forecasting time series data (see Che *et al.*, 2018). A regular neural network takes explanatory variables as inputs and multiplies them by candidate linear coefficients (called weights in the ML literature). A specialised algorithm determines the values for these coefficients that

² Including more terms into a linear regression model is associated with a bias-variance trade-off for the model's prediction error. That is, when more terms are included in the regression model, the variance of model estimates rises, while the bias declines. The rise in variance of estimates from adding explanatory variables may increase the model's prediction error.

minimise a loss function, and the estimated model is then used to make predictions given values for the explanatory variables. An RNN modifies a regular neural network by allowing past forecasts to influence current predictions. Unlike the other methods reviewed so far, RNNs are not designed specifically to deal with a large number of explanatory variables, and some degree of feature engineering, or selection of relevant variables by the researcher, is often necessary to optimise forecasting performance.

Baseline models

Phillips Curve (PC)

Previous work by MAS has shown that nominal wage growth in Singapore is robustly correlated with measures of labour market slack, such as the unemployment gap. While the Phillips Curve relationship between wage growth and labour market slack has weakened since the GFC, it remains stronger relative to most AEs.

Here, a simplified version of the Wage PC model presented in MAS (2019) is used to forecast resident wage growth.³ Specifically, the model used to generate forecasts is a linear regression of wage growth on its own lags, trend labour productivity, the current resident unemployment gap and its one-quarter lag.⁴

AR(1)

The AR(1) model simply assumes that the target variable is linearly correlated with its one-period lagged value, and is included here to provide a naïve forecast for comparison. While far less sophisticated and computationally intensive than modern forecasting methods, the AR(1) model has been shown by Faust and Wright (2009), among others, to outperform more complex models when forecasting certain US macroeconomic time series such as inflation.

Data and implementation for forecasting resident wage growth

For each of our regularised regression and ML models, a fairly large set of explanatory variables is used to forecast one-quarter-ahead y-o-y resident wage growth in Singapore at the quarterly frequency. These include economic slack variables, inflation, labour productivity and lagged wage variables, as well as industry-level labour productivity variables and lagged wage variables (**Table B1**).

³ This version omits the effects of industry matching efficiency on wage growth, as the effects are negligibly small.

⁴ The number of lags in the model is chosen by the Akaike Information Criterion (AIC).

Table B1 Explanatory variables (YOY% unless otherwise stated)

	Lags	Industry Level
<u>Phillips Curve</u>		
Resident unemployment rate (%)	1	No
Resident unemployment gap (from HP-filtered trend, %)	1	No
Resident long-term unemployment rate (%)	0	No
Labour Market Pressure Indicator	0	No
Output gap (% of potential GDP)	1	No
Vacancy/Unemployment Ratio	0	No
<u>Price Level</u>		
MAS Core Inflation	0	No
CPI-All Items inflation	0	No
5-year moving average of MAS Core Inflation	0	No
5-year moving average of CPI-All Items inflation	0	No
SINDEX (one-year-ahead MAS Core Inflation expectations)	0	No
<u>Employment/Productivity</u>		
Labour productivity trend growth (HP-filtered)	0	No
Labour productivity growth	0	Yes
Overall employment growth	1	Yes
<u>Lagged Nominal Wage</u>		
Resident wage growth	4	Yes

Note: Each model is trained on data from Q1 1992 to Q4 2009. Using model estimates from the training period, one-quarter-ahead predictions for resident wage growth are obtained for the period Q1 2010 to Q4 2018. To simulate a realistic scenario where the forecaster only has access to contemporaneous data, only variables available in period t are used to obtain one-quarter-ahead (period $t+1$) forecasts. These are known in the forecasting literature as pseudo out-of-sample forecasts.

Results

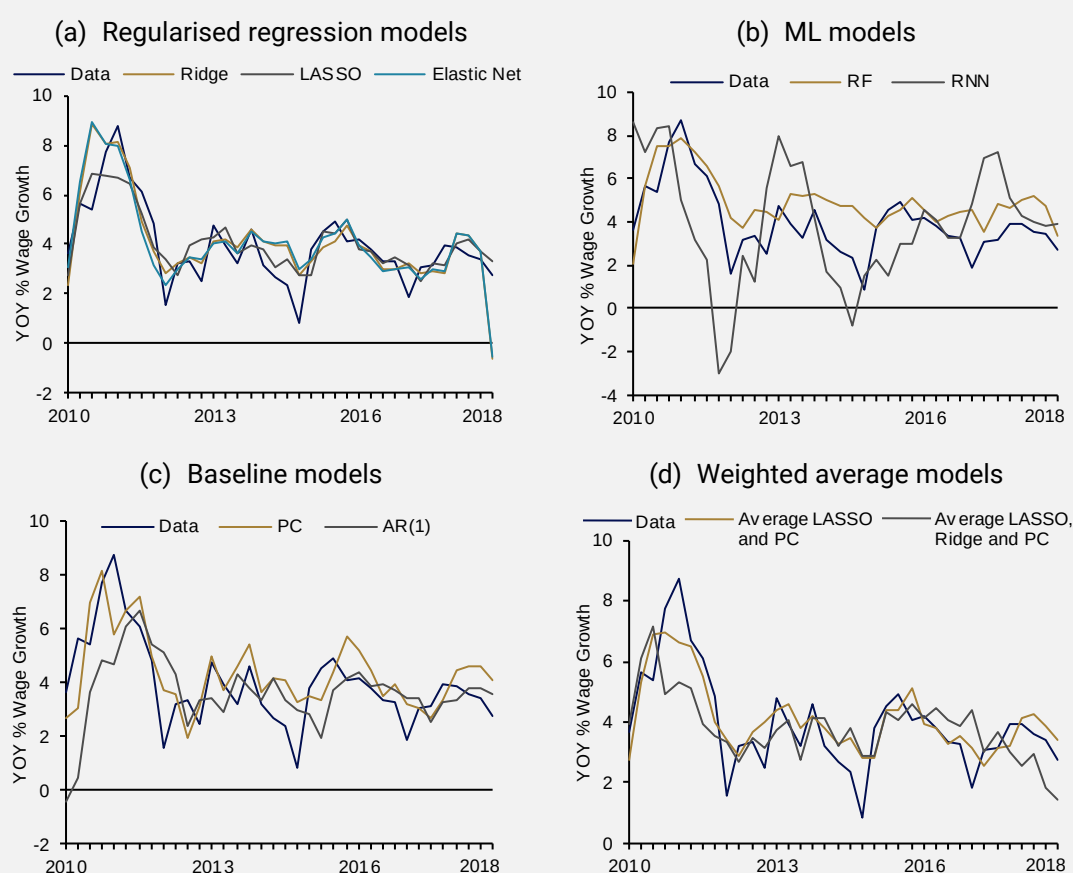
To evaluate the forecasting performance of each model, the Root Mean Square Error (RMSE), a standard metric in the forecasting literature, is calculated for each model (**Table B2**). Among the candidate models, regularised regressions perform the best, producing forecast errors of 0.9–1.16% with substantially higher forecast accuracy than both AR(1) (1.79%) and PC (1.29%) models. Among the three regularised regression models, the LASSO produces the most accurate forecasts. The ML models both perform worse than the PC model, with forecast errors of 1.49% for RF and 2.91% for RNN.

Table B2 RMSE forecast errors for individual models (%)

Regularised Regression			ML		Baseline	
LASSO	Ridge	EN	RF	RNN	PC	AR(1)
0.90	1.13	1.16	1.49	2.91	1.29	1.79

Examining the forecast plots for the testing period from Q1 2010 to Q4 2018, the forecasts from regularised regressions (**Chart B1(a)**) and RF (**Chart B1(b)**) models are qualitatively quite similar, managing to fit the cyclical directions of the wage growth data but underpredicting growth magnitudes at peaks and troughs of the business cycle. Among these models, the Ridge regression model is best able to match business cycle magnitudes. In comparison, forecasts using RNN (**Chart B1(b)**) overpredict growth magnitudes and seem to lead turning points in the data. Forecasts from the PC model (**Chart B1(c)**) predict growth magnitudes in the data reasonably well, although the model occasionally misses some turning points. Finally, the AR(1) model (**Chart B1(c)**) matches growth magnitudes in the data well but does poorly at predicting turning points, as is expected for a model that relies only on past values of the target variable for prediction.

Chart B1 Model forecasts



Using a weighted average of these models, forecast accuracy can be improved further. Drawing on the observation that the LASSO produces the most accurate forecasts, while Ridge has a slight advantage in matching growth magnitudes, predictions from LASSO and Ridge models were combined in a weighted average and tested for forecast accuracy. The optimal combination of LASSO and Ridge models slightly improved forecast accuracy (by 0.02% point) over the best performing single model, the LASSO (**Table B3**). Allowing for all models in **Table B2** to influence the prediction, the optimal combination of models was found to be a weighted average of LASSO, Ridge and PC models.

Table B3 Forecast errors for weighted average models

	Average 1	Average 2
Model	0.86*LASSO + 0.14*Ridge	0.79*LASSO+0.10*Ridge+0.11*PC
RMSE (%)	0.88	0.86

Note: To derive Average 1, the weights on LASSO and Ridge predictions that minimised RMSE were found. To derive Average 2, the weights on all models in Table B2 that minimised RMSE were found. In each case, a sequential grid-search method is used to find the model weights that minimised RMSE.

Interpretation

The boost in forecast accuracy provided by regularised regression models that include a large number of explanatory variables over the PC model suggests that there are variables outside of the standard Phillips Curve relationship that are informative about short-term dynamics of resident wage growth. In particular, among the variables in **Table B1**, both the LASSO and EN pick up the vacancy-unemployment ratio, labour productivity growth in manufacturing and wholesale & retail trade sectors, as well as lagged wage growth in the community, social and personal services sector as leading indicators of overall wage growth. This observation demonstrates one of the advantages of regularised regression techniques in that the estimated linear coefficients can be interpreted as the strength of the statistical correlation between economic variables.

The superior performance of regularised regression techniques relative to ML models in predicting wage growth suggests that linear models may be a good representation of resident wage growth dynamics in Singapore. While the RNN is a non-linear model, and RF forecasts rely on aggregating predictions across decision trees, each of which is non-linear, the regularised regression techniques tested here are all based on linear models. These results provide further evidence that the Phillips Curve, which also specifies a linear relationship between labour market slack and wage growth, remains useful for explaining wage dynamics in Singapore.⁵

Conclusion

It is found that regularised regression techniques can outperform the PC, AR(1), RF and RNN models in forecasting resident wage growth. In addition, averaged forecasts from multiple model classes can further improve forecast accuracy. The superior performance of regularised regression techniques has two implications that are economically meaningful, beyond the forecasting application. First, some industry-level variables contain information that make them useful leading indicators of overall resident wage growth. Second, linear models are a good fit for resident wage growth dynamics, helping to explain the robust Phillips Curve relationship for wages in Singapore.

⁵ It should be noted that the forecasting performance for both ML models is highly sensitive to the model specification, including several tuning parameters (called hyperparameters) and exact algorithm choice. Although the hyperparameters for our ML models were chosen after extensive testing to minimise prediction errors, the specifications used for forecasts in this Box are still fairly basic calibrations of both RF and RNN models.

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4 Macroeconomic Policy

- In October 2020, MAS maintained the zero per cent per annum rate of appreciation of the S\$NEER policy band. A tentative recovery abroad and domestically has begun, sparked by the easing of movement restrictions and the stimulative effects of expansionary macroeconomic policy. However, growth momentum in the Singapore economy is expected to be modest in the quarters ahead given the subdued outlook for external demand. The persistent negative output gap, slack in the domestic labour market and muted imported inflation will weigh on inflation outturns in the domestic economy. Core inflation will turn positive in 2021 as temporary disinflationary pressures dissipate, but stay well below its long-term average. Accordingly, MAS assesses that an accommodative monetary policy stance will remain appropriate for some time.
 - Fiscal policy has been at the core of Singapore's macroeconomic policy response to the COVID-19 downturn. Since the *April Review*, the government has extended and expanded on its measures to provide vulnerable households and businesses in the worst-hit sectors with additional short-term financial relief, recalibrated the extent of support for sectors that are recovering, and introduced initiatives that will facilitate the restructuring of the economy so that Singapore emerges stronger from the crisis.
 - All in, the suite of macroeconomic policies has significantly mitigated the economic impact of the pandemic, and will help to entrench the recovery in the domestic economy and secure price stability over the medium term.
-

4.1 Monetary Policy

On 30 March, MAS set the rate of appreciation of the S\$NEER policy band at zero per cent per annum, starting at the then-prevailing level of the S\$NEER

At the time of the April monetary policy review, Singapore's GDP was forecast to fall by between 1–4% in 2020. It was evident that the pandemic and health measures implemented to contain it would trigger a deep global recession. The sharp fall-off in external demand and disruptions to supply chains were anticipated to affect Singapore's trade-related industries. Consumer-facing services activity was expected to weaken as individuals reined in spending over health concerns, while output in the travel-related sector was already depressed by cross-border movement restrictions.

Accordingly, a significant degree of labour market slack was projected to emerge as firms curtailed their hiring and expansion plans. The resident unemployment rate would rise, even as government interventions such as the Jobs Support Scheme (JSS) would reduce the scale of retrenchments. The attendant decline in wages would keep domestic sources of inflationary pressures subdued. While prices for particular commodities would increase due

to temporary supply-induced disruptions, imported inflation was likely to be modest given that global oil prices were forecast to remain low and inflation in Singapore's major trading partners was expected to recede. Moreover, government subsidies that had been introduced this year, as well as the freezing of all government fees and charges for a year, would further restrain inflation. MAS Core Inflation was forecast to average between -1 and 0% in 2020, and remain below its historical average in the medium term.

Consequently, MAS eased monetary policy settings in its April 2020 Monetary Policy Statement (MPS) (released earlier on 30 March) by re-centring the policy band down to the then-prevailing lower level of the S\$NEER and concurrently flattening its slope. Over Q1 2020, the S\$NEER had depreciated within the policy band amid deteriorating macroeconomic conditions and expectations of a weaker outlook. In re-centring the mid-point of the policy band, MAS affirmed that the decline in the S\$NEER was sufficient to facilitate the adjustment of the real exchange rate towards its new equilibrium level. A strongly expansionary fiscal policy stance would provide the primary near-term offset to the reduction in private sector demand, while a stable S\$NEER would help underpin confidence in the Singapore economy during the COVID-19 crisis. These macroeconomic policy settings, together, would forestall even sharper falls in output, wages and prices.

The downturn was steeper than initially expected, but the global and Singapore economies began to recover in late Q2

Even at the time of the April MPS, the outlook for the Singapore economy was subject to significant uncertainty and downside risks. These partly materialised with the announcement of the circuit breaker in early April, and its extension later in the month. As the severity of the global and domestic economic contraction attendant on the pandemic became more apparent, the forecast range for Singapore's GDP growth in 2020 was downgraded to -7 to -4% in May.

The government countered this deterioration in the economic outlook by expanding on the package of fiscal measures in the Fortitude Budget in May. MAS and the financial industry also introduced a number of credit measures to help ease the financial strain on individuals and businesses caused by the pandemic (see page 74). In mitigating the liquidity crunch on businesses, these policies sought to cushion the recessionary and disinflationary impulses from the drag on income and revenue flows. In particular, as these policies would reduce the incidence of insolvencies and preserve productive capacity, the economy would be better-placed to recover once the virus transmission was contained.

Economic activity in Singapore's major trading partners began recovering from May and strengthened over Jun–Aug. Notably, global industrial output rose steadily from its trough in April as pent-up demand for consumer and investment goods was released. Meanwhile, services also picked up as in-person activities gradually resumed. These factors point to a projected 5.0% q-o-q SA rise in global real GDP in Q3 2020, following the 5.5% contraction in Q2.

As transmission of the virus eased within Singapore, the phased reopening of the economy from June led to a rebound in GDP in Q3. This was underpinned by a recovery in private consumption as evident in the turnaround in the consumer-facing services. Reflecting the global trend, output in Singapore's manufacturing sector also resumed expansion in Q3 2020 as global demand for semiconductors and chemicals strengthened. In contrast, the level of activity in Singapore's travel-related sector stayed depressed as cross-border travel restrictions remained in place. Overall, GDP in the domestic economy expanded by 7.9%

q-o-q SA in Q3, partially reversing the 13.2% contraction in Q2, but was still about 7% below pre-COVID (Q4 2019) levels.

The Singapore economy will continue to recover into 2021, albeit with modest growth momentum

The global economic recovery should continue into 2021, albeit at a more moderate pace. Localised outbreaks of the virus could occur over the next few quarters across a number of economies, while the impairment to household and firm balance sheets from the deep recession in 2020, lingering health concerns and elevated policy uncertainty will dampen global growth momentum for some time. World GDP is forecast to increase by 6.2% in 2021 after falling by 3.9% in 2020. However, the output gap in several economies will remain significantly negative for a substantial part of next year.

Amid the hesitant global recovery, quarterly sequential GDP growth in the Singapore economy is predicted to ease and stabilise at a modest pace in 2021. The rebound in private consumption is expected to fade as the soft labour market affects consumer sentiment. For the full year, the Singapore economy is projected to expand at an above-trend pace, although this largely reflects the low base this year. While overall GDP could return to, or slightly exceed, its previous peak by end-2021, the recovery would still be incomplete in some sectors. The negative output gap would thus persist, even though it should narrow over 2021.¹

Disinflationary pressures have eased, but core inflation will only recover gradually

Labour market slack increased significantly in Q2 2020, in the form of a significant rise in unemployment and under-employment. In addition, some residents may have stayed out of the labour force given weak job prospects during the circuit breaker.

Preliminary signs point to a partial recovery in labour demand in Q3 2020 following the reopening of the economy. Beyond the initial rebound, however, domestic labour market conditions are likely to improve only gradually in 2021. The subdued expansion in Singapore's consumer-facing services and travel-related sector will weigh on employment prospects. Hiring could also ease as wage subsidies are gradually reduced, while mismatch in the labour market could grow. These factors suggest that the accumulated labour market slack will take some time to be absorbed. Following its rise to 4.5% in August, the resident unemployment rate is forecast to remain elevated into 2021, and will weigh on wages this year and the next.

While the risks of persistent disinflation have been averted in the near term, core inflationary pressures are anticipated to remain subdued for an extended period. Domestic cost pressures should stay muted reflecting the soft labour market conditions and rising office and shop vacancies. At the same time, imported inflation is projected to be low given the persistent negative output gaps in Singapore's major trading partners. Sluggish global demand is also likely to keep international commodity prices weak.

¹ Similar to the April edition, the estimated size of the output gap is not reported in this *Review* for several reasons. An unusually wide confidence interval has emerged around the GDP forecast, underscored by high uncertainty over the size and duration of the pandemic shock to the economy's supply potential. Taken together, these considerations currently reduce the utility of point estimates of the output gap. Notwithstanding this uncertainty, measurable developments in output, employment, prices and firms' capacity support the assessment by MAS that the output gap is presently (relatively) large and negative.

MAS Core Inflation is forecast to turn mildly positive and come in at 0 to 1% in 2021 from –0.5 and 0% in 2020, reflecting the dissipation of the disinflationary effects of subsidies and some slight increases in services inflation. While car prices will rise modestly in light of a continued reduction in the supply of Certificate of Entitlements (COE), residential property rents are expected to moderate in the year ahead as demand for accommodation eases. All in, CPI-All Items inflation is projected to average –0.5 to 0.5% in 2021, after coming in at between –0.5 and 0% this year.

In October, MAS maintained the 0% slope in the policy band and signalled that an accommodative policy stance would be appropriate for some time

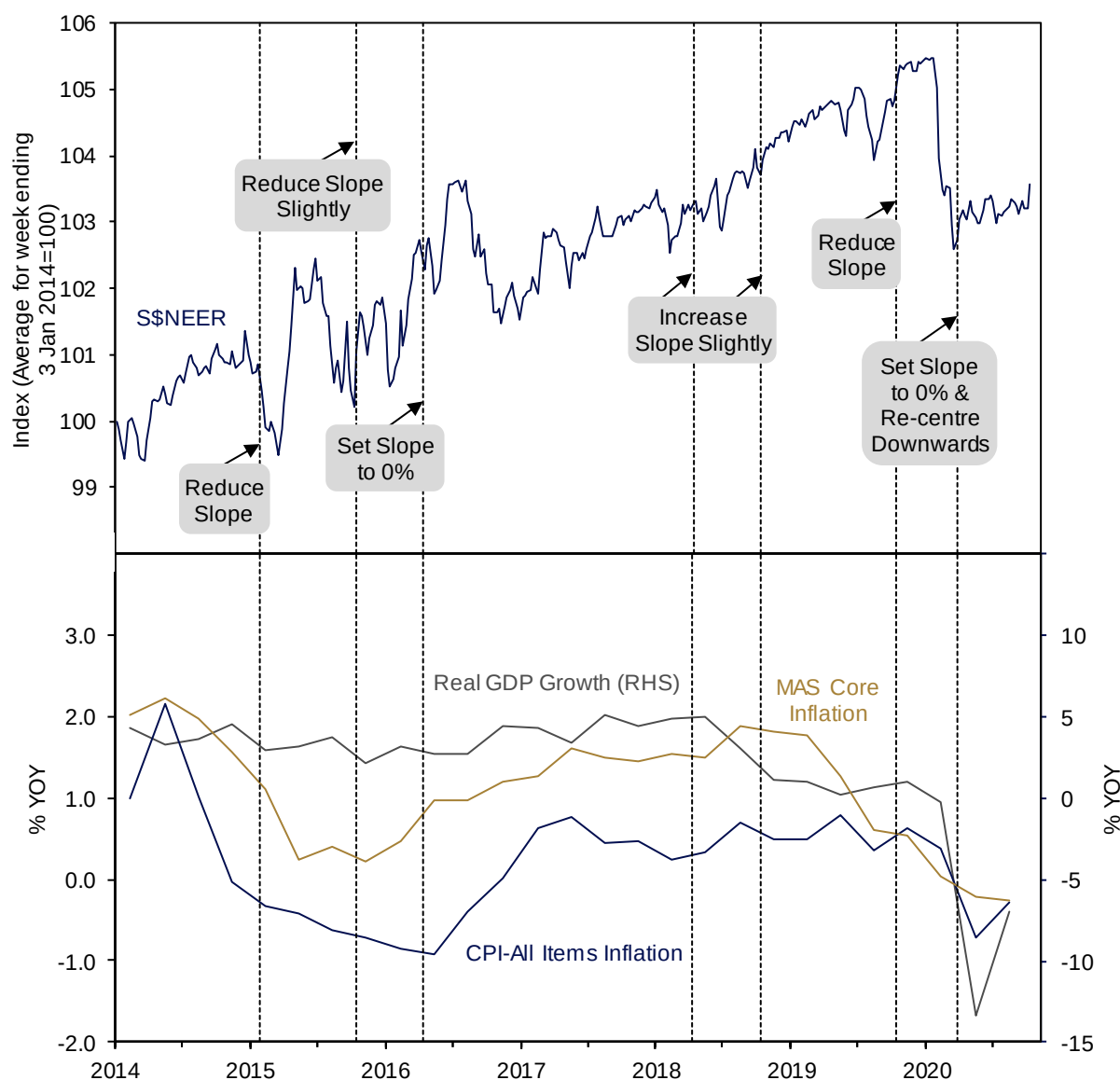
Against the turnaround in growth and inflation dynamics in the Singapore economy, MAS announced in the October MPS that it would maintain a zero per cent per annum rate of appreciation of the S\$NEER policy band. The width of the policy band and the level at which it was centred would be kept unchanged. In light of expectations that MAS Core Inflation would stay low beyond 2021, MAS indicated that it would be appropriate to maintain an accommodative policy stance for some time.

Over February and March, the S\$NEER depreciated by around 2% from its level in January. It has remained broadly stable since. This level of the trade-weighted index is expected to be mildly accommodative in H2 2020 and 2021, as economic activity and inflation recover from their troughs. The easing in the exchange rate has helped bolster the S\$ cashflow of firms who invoice their exports in foreign currency. It has also helped eliminate expectations of future depreciation in the S\$ and thus allowed S\$ interest rates to fall in tandem with global interest rates (see Box A).

The impact of the S\$NEER depreciation on the economy is estimated using the Monetary Model of Singapore (MMS). The results indicate a positive impact of 1.1% of GDP in 2020, and 0.8% next year, with the lower level of the S\$NEER dampening the negative inflation shock and supporting MAS Core Inflation by 0.5% point and 0.8% point in 2020 and 2021. Without a step-down in the nominal exchange rate, the necessary easing of the S\$ real effective exchange rate (S\$REER) would have had to occur through even greater relative price adjustments. Already-weak domestic inflation would have had to fall deeper into negative territory, or decline more persistently relative to that abroad, raising the risk of deflation. **Chart 4.1** summarises the recent shifts in monetary policy, GDP growth and inflation in the Singapore economy.

Chart 4.1 Key macroeconomic variables and changes to the monetary policy stance

S\$NEER, Real GDP Growth, CPI-All Items inflation and MAS Core Inflation



Source: DOS and EPG, MAS estimates

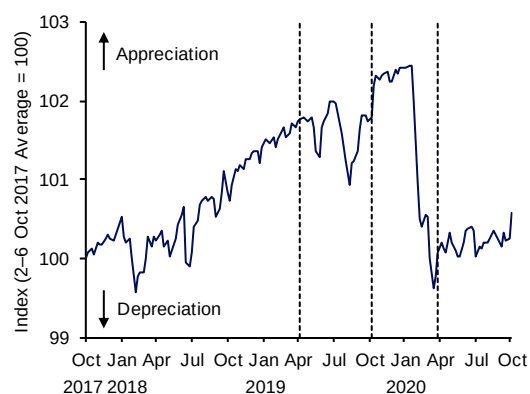
Note: Vertical dashed lines indicate changes to the settings of the S\$NEER policy band. For a summary of MAS past policy decisions, please see www.mas.gov.sg/monetary-policy/past-monetary-policy-decisions.

The S\$NEER has been broadly stable while S\$ interest rates have fallen close to their all-time lows

The S\$NEER has been broadly stable over the last six months, hovering slightly above the mid-point of the policy band established on 30 March (**Chart 4.2**). With improving risk sentiment over Q2 and Q3 2020, the S\$ strengthened against traditional safe haven currencies, such as the US dollar and Japanese yen, even as it weakened against the Australian dollar and the Indonesian rupiah (**Chart 4.3**).

Chart 4.2 The S\$NEER has hovered slightly above the mid-point of the policy band

S\$NEER, weekly average

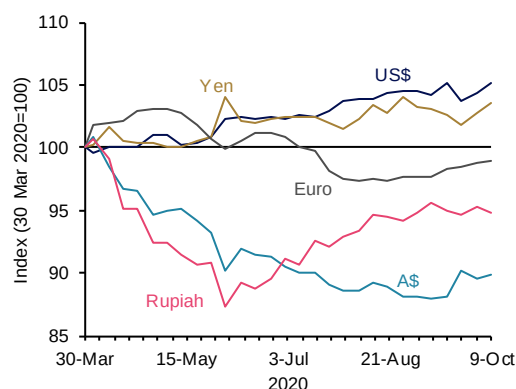


Source: EPG, MAS estimates

Note: Vertical dashed lines indicate the last three releases of the MPS.

Chart 4.3 Reversal of safe haven flows and policy actions drove bilateral FX developments

Bilateral exchange rates, weekly average



Source: EPG, MAS estimates

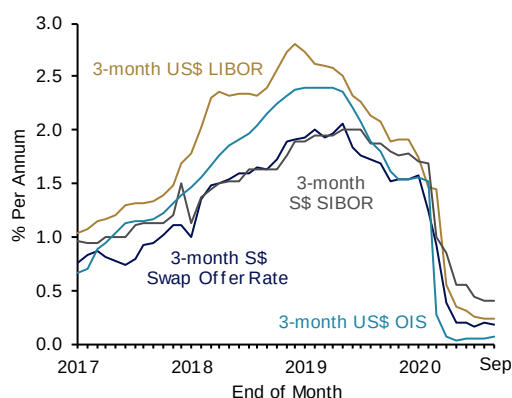
Global financial conditions have also eased significantly since April, reflecting the substantial loosening in macroeconomic policies around the world and an improvement in risk sentiment. The US\$ LIBOR declined from 0.6% in April to 0.2% as of end-September, which in turn caused the US\$ Overnight Index Swap (OIS)-LIBOR spread to narrow. This suggests that US dollar funding conditions continued to normalise.

Domestically, the 3-month S\$ SIBOR and S\$ Swap Offer Rate also fell, to 0.4% and 0.2% in end-September, from 0.9% and 0.4% in April (**Chart 4.4**). Domestic interest rates are now close to their all-time lows, and are expected to remain so for some time, given the weak global macroeconomic backdrop and some shift in major central banks' policy approaches, such as the Federal Reserve's guidance on its new monetary policy framework.² The Domestic Liquidity Indicator, which captures changes in the S\$NEER and the 3-month S\$ SIBOR, shows that the fall in domestic interest rates has contributed to a further easing in monetary conditions in the Singapore economy since April, even as the S\$NEER has been broadly stable (**Chart 4.5**).

² Specifically, in September, the US Federal Reserve indicated that it would maintain an accommodative monetary policy stance until inflation averaged 2% over time.

Chart 4.4 S\$ rates have fallen sharply alongside the decline in US\$ rates

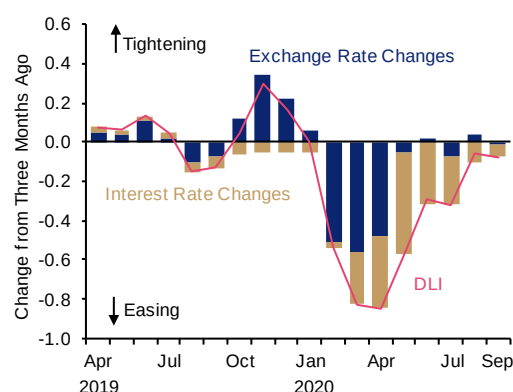
US\$ and S\$ interest rates, end of month



Source: ABS Benchmarks Administration Co Pte Ltd and ICE Benchmark Administration Ltd

Chart 4.5 The fall in domestic rates has helped monetary conditions ease further since April

Domestic Liquidity Indicator (DLI) and components



Source: ABS Benchmarks Administration Co Pte Ltd, ICE Benchmark Administration Ltd and EPG, MAS estimates

Demand for credit eased, although MAS, the government and the financial sector ensured that the supply of credit to the economy was maintained

Year-on-year credit growth slowed following the onset of the circuit breaker and turned negative from June amid the sombre outlook for the economy (**Chart 4.6**). Credit demand from corporates fell across all sectors, except for building and construction firms, which continued to tap on credit lines for short-term liquidity given delays in the resumption of construction activity (**Chart 4.7**). Meanwhile, the stock of consumer loans declined further, albeit at a more gradual pace since July.

The availability of credit over the last six months was supported by various policy measures introduced over the year. These included enhancements to Enterprise Singapore's (ESG) loan schemes and a new MAS SGD Facility for ESG Loans that lowers the cost of funding for financial institutions under these schemes.³ The package of measures that MAS worked with the financial sector to put together also included various loan moratoriums. The majority of loans extended under the ESG schemes and applications for repayment deferrals occurred between March and June, thus helping to ease pressures on the cashflows of the hardest hit businesses and households cashflows during the circuit breaker.⁴

In October, MAS and the financial industry announced an extension to the credit support measures, which will progressively expire over 2021. This would provide further relief to individuals and SMEs that continue to face cashflow challenges, while encouraging them to resume loan repayments to the extent they are able to do so, such that debt burdens would

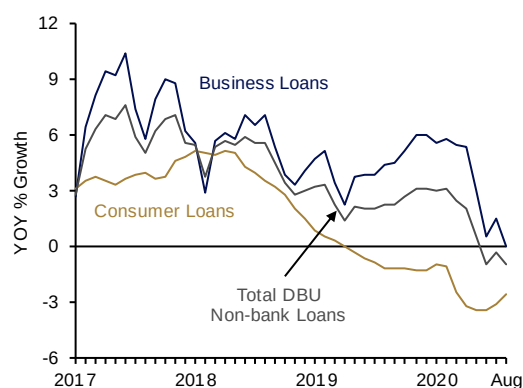
³ Since its introduction in April 2020, the MAS SGD Facility for ESG Loans has disbursed a total of \$5.7 billion to eligible financial institutions in support of their lending to companies under the ESG Loan Schemes. Taken together, the government's risk sharing through the ESG Loan Schemes and MAS' lower-cost funding through the Facility have helped to lower borrowing costs for businesses, to 1.5–3.0% per annum under the Temporary Bridging Loan Programme, compared with 6% or more for other unsecured working capital loans.

⁴ For instance, as of end-August 2020, financial institutions had received 38,900 applications to defer property loan repayments. They approved over 90% of these applications. More than 26,000 of the approved applications were for individuals seeking to defer their residential property loans. This amounted to almost \$20 billion of deferrals.

be sustainable as the economy recovers. The MAS Facility for ESG loans was also extended, to complement the extension of ESG's Temporary Bridging Loan Programme for another six months till 30 September 2021.

Chart 4.6 Credit growth has slowed due to the poor economic outlook

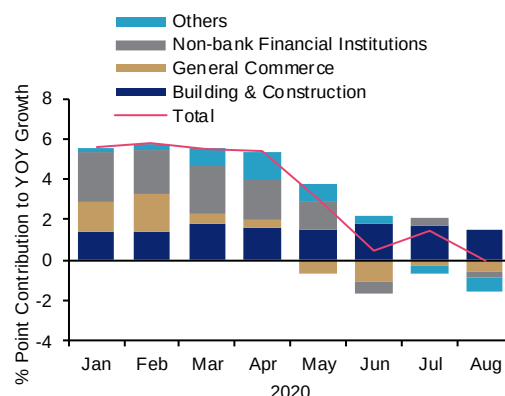
Outstanding stock of DBU non-bank loans



Source: MAS

Chart 4.7 The fall in business credit demand was observed across almost all sectors

Outstanding stock of DBU non-bank loans by sector



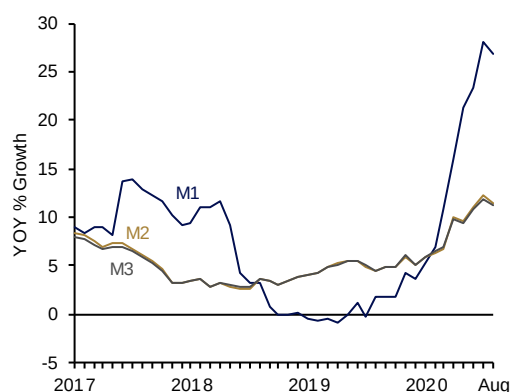
Source: MAS

Money supply rose sharply while velocity of money declined in Q2

In contrast to the easing in domestic credit growth, monetary aggregates have expanded significantly in recent months, similar to developments in other advanced economies. On average, M1 rose by 21% y-o-y in each month from March to August, more than three times faster than the 6% recorded in January and February (**Chart 4.8**). The increase in M1 was largely driven by a sharp step-up in holdings of demand deposits, which can be attributed to a confluence of factors. Over the last six months, significant net fiscal injections, funded by Singapore's reserves, have supported business cashflows and household incomes. At the same time, households have saved more, reflecting fewer opportunities to spend given the mobility restrictions and the heightened desire to hold precautionary balances amid elevated uncertainty about the economic outlook. The stronger preference for liquidity as well as lower interest rates, led broader measures of money supply (M2 and M3) to expand by a slower average monthly rate of 10% over March to August (**Chart 4.9**).

Chart 4.8 Money supply continued to expand in recent months

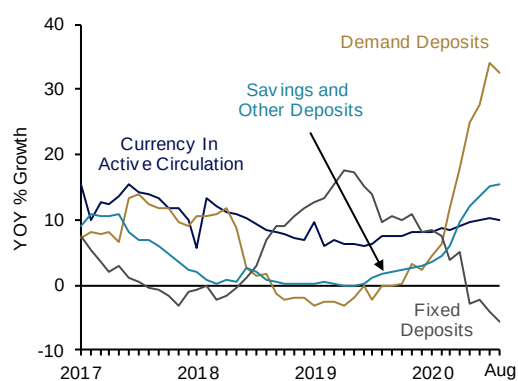
Monetary aggregates



Source: MAS

Chart 4.9 The growth in M1 was largely due to a surge in holdings of demand deposits

Components of the money supply

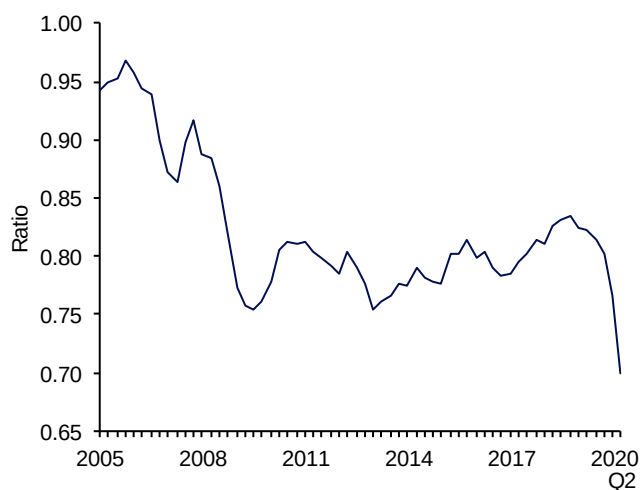


Source: MAS

As the rapid growth in money supply coincided with a steep decline in nominal GDP in Q2 2020, the velocity of broad money (M2) fell to a record low of 0.7 (**Chart 4.10**). It would, however, have recovered or stabilised in Q3, alongside the rebound in real GDP. As significant spare capacity in the economy remains, price increases should be relatively low. Consequently, the growth in money supply should continue to be supportive of real output.

Chart 4.10 The velocity of money fell sharply in Q2

Velocity of money (M2)



Source: EPG, MAS estimates

4.2 Fiscal Policy

The government has adjusted fiscal support as the recovery evolved

At the time of the April *Review*, the government had already delivered three Budgets—Unity, Resilience and Solidarity (plus an extension)⁵—over a nine-week period in response to the escalating impact of the COVID-19 pandemic on the global and Singapore economies. A wide array of measures, carefully formulated in view of the unique characteristics of the present crisis, were employed to deliver the necessary fiscal policy support. The bulk of the Budgets sought to provide immediate financial relief to firms and households that were facing a sharp step-down in revenue and income flows. The overarching purpose was to forestall premature firm closures and excessive job separations, and thereby minimise a permanent impairment of the economy’s productive capacity.

Since then, further adjustments have been made to the suite of fiscal measures. In late May, as Singapore was preparing to exit from the circuit breaker, the government announced a fourth budget (Fortitude). While the gradual reopening of the economy was expected to lead to a sequential pickup in activity, businesses and households were still likely to face significant difficulties in the near term. To limit the risk of renewed community spread, only around three quarters of the economy was allowed to resume operations immediately on the lifting of the circuit breaker, and social distancing measures were likely to remain in force for an extended period. Moreover, sharply lower cashflows in H1 2020 had weakened firm and household balance sheets, which was expected to affect investment and consumption. In response, the Fortitude Budget extended and expanded on the earlier measures to ensure that vital wage and cost relief, as well as income support, would continue to sustain the fragile recovery.

By August, the Singapore economy had progressed from the acute stage of the crisis into an uneven expansion. The spread of COVID-19 domestically was under control, with daily new cases in the community having fallen to very low levels. Meanwhile, activity in the global economy had picked up, even though it remained subject to recurring outbreaks in various parts of the world. Against this backdrop, the government took steps to taper some of the extraordinary support measures in place.

Over two Ministerial Statements⁶, the government adjusted the size and sectoral distribution of benefits so that public resources would be deployed most effectively. This entailed scaling down the degree of support for industries that had fared better, while channelling further assistance towards segments of the economy that were likely to grapple with the fallout from the pandemic for some time. For example, for the relatively resilient biomedical sciences, financial services and ICT sectors, the level of subsidy under the JSS was lowered from 25% to 10% in September, with payouts ceasing by the end of this year. In comparison, the aerospace, aviation and tourism industries would receive a 50% wage subsidy for another six months till March next year. There was also additional support for the travel-related sector through domestic tourism credits in the form of SingapoRediscover Vouchers and extensions to the Enhanced Aviation Support Package.

⁵ This refers to the set of supplementary Budget measures announced on 21 April 2020, alongside the 4-week extension to the circuit breaker. These measures were subsequently included in the Fortitude Budget unveiled on 26 May.

⁶ These refer to the “Ministerial Statement on Continued Support for Workers and Jobs” and “Ministerial Statement on Overview of Government’s Strategy to Emerge Stronger from the COVID-19 Pandemic” delivered by the Deputy Prime Minister on 17 August 2020 and 5 October 2020, respectively.

At the same time, the government recognised that some reallocation of resources was necessary for Singapore to adapt to the post-pandemic world. It was becoming evident that some of the new patterns of work and leisure adopted during the COVID-19 pandemic would likely endure. Moreover, the crisis was accelerating the structural shifts that predated the pandemic, including digitalisation, automation of work and the reshoring of production. These shifts in the economic landscape would require firms and workers to adapt, and attendant government measures to assist and facilitate the restructuring process.

Consequently, the Fortitude Budget, as well as the August and October Ministerial Statements, placed more weight on medium-term economic restructuring objectives compared to the Budgets earlier in the year. Notably, there was a shift in emphasis towards helping sectors with strong prospects to expand and employ more workers. The SGUnited Jobs and Skills Package partly seeks to help workers move into jobs in areas with higher growth potential. The Jobs Growth Incentive, announced in August, provides wage support to businesses that are expanding their local headcount. The government also diverted more resources towards encouraging further digitalisation at every level, capitalising on the pandemic-driven leap in digital adoption among consumers and businesses.

Both the government's initial response to the pandemic and its subsequent adjustments broadly conform to the recovery framework recently articulated and recommended by the IMF.⁷ The initial response in the acute phase focused on safeguarding lives and livelihoods. As restrictions eased, the quantum of support and its delivery channels were refined to place greater weight on medium-term fiscal sustainability, while ensuring that the help provided was not withdrawn too prematurely. More recently, as the progressive easing of restrictions facilitated some recovery, the government has shifted its stance away from broad-based support of employment, towards supporting viable but still-vulnerable firms, and helping retrenched workers acquire new skills and find new employment. The policy approach has also been increasingly aimed at enabling the structural changes required for the post-pandemic economy.

Table 4.4 at the end of this chapter summarises the key measures across the Fortitude Budget and Ministerial Statements.

The Budget measures announced in FY2020 represent a strongly expansionary fiscal policy stance

All in, the government committed about \$100 billion across four Budgets and two Ministerial Statements to counter the economic impact of COVID-19. Of this, \$22 billion was earmarked as capital for loan guarantees, while the bulk constituted direct fiscal injections into the economy (**Table 4.1**). Singapore's fiscal response has been one of the most substantial globally, even after accounting for the varying economic impacts of COVID-19 (**Chart 4.11**).

⁷ IMF (2020), "Fiscal Monitor: Policies for the Recovery", October 14.

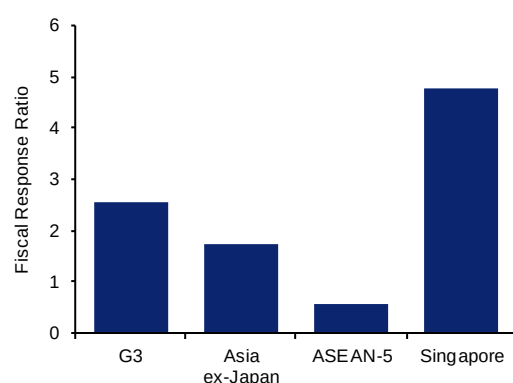
Table 4.1 Fiscal outlay in FY2020 (\$ billion)

	Fiscal Outlay (including Loans & Guarantees)	Fiscal Outlay (excluding Loans & Guarantees)
Unity Budget	6.4	6.4
Resilience Budget	48.4	28.4
Solidarity Budget	5.1	5.1
Fortitude Budget	33.0	31.0
Ministerial Statements	8.0	8.0

Note: The measures announced in the Ministerial Statements are partially funded using monies reallocated from the previous four Budgets in FY2020.

Chart 4.11 Singapore's fiscal stimulus is larger than that in other regions

Fiscal response ratio

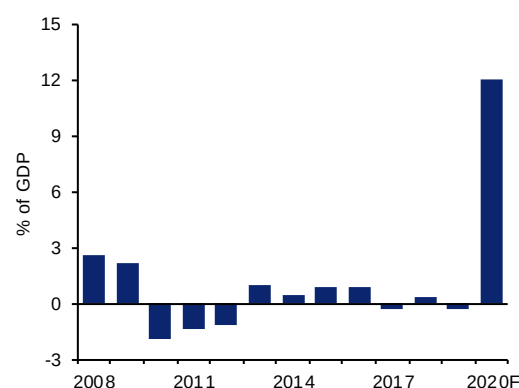


Source: EPG, MAS estimates

Note: The fiscal response ratio is calculated by dividing fiscal outlays (excluding loans and guarantees) as a share of 2019 nominal GDP by the expected percentage deviation in real GDP from pre-pandemic projections at end-2021. Country groupings are weighted by 2019 PPP-adjusted GDP.

Chart 4.12 The fiscal impulse will rise to around 12% of GDP in CY2020

Fiscal impulse



Source: EPG, MAS estimates

The fiscal impulse for CY2020 is estimated to be 12.1% of GDP and represents the most expansionary fiscal policy stance on record (**Chart 4.12**). The bulk of the fiscal support measures were in the form of business cost relief, as opposed to direct government expenditures, as it was recognised that the latter stimulus on its own might be less effective due to constraints on aggregate supply. MAS' MMS was used to estimate the macroeconomic impact of the impulse stemming from the Budget measures announced in FY2020. The substantial fiscal injection from the measures, together with its multiplier effect, are expected to offset GDP contraction by some 5.6% this year and 4.8% in 2021. Correspondingly, the resident unemployment rate would have been 1.7% points higher this year in the absence of these measures. A large part of the 1.7%-point impact is attributable directly to jobs-related measures, with the JSS alone estimated to contribute 0.9% point. Support for the labour market is expected to continue into 2021.

These effects worked through several channels that featured strongly in the Budgets. A broad categorisation of these Budget measures is presented in **Chart 4.13**.

First, there was a strong emphasis on supporting workers, with more than half of the outlay (excluding loans and guarantees) dedicated to providing wage cost relief to businesses to support worker retention. Accordingly, the JSS was the largest single element of the Budget measures announced in FY2020, comprising more than 40% of the fiscal injection.

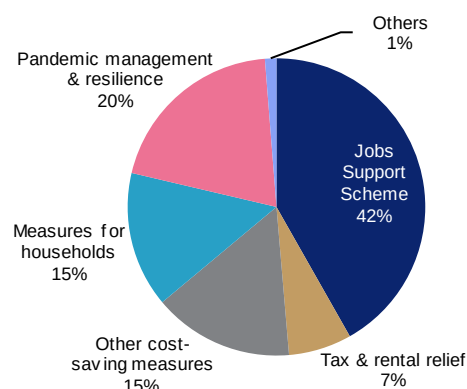
Second, it focused on mitigating cashflow difficulties for businesses so as to reduce firm closures and forestall a steeper decline in output. This was done through schemes such as the Property Tax Rebate and rental waivers. These business cost-saving measures have placed firms in a stronger position to capitalise on the recovery. Taken together, all cost-saving measures, including those aimed at preserving jobs, are expected to mitigate GDP loss by 2.1% in 2020, and a further 4.3% next year.

Third, the Budget measures announced in FY2020 also provided substantial support to households and vulnerable individuals, primarily in the form of cash transfers. These measures included one-off cash payments for all adult citizens (with lower-income individuals receiving more), grocery vouchers for lower-income households, the COVID-19 Support Grant and the extension of support through the Self-Employed Person Income Relief Scheme. Targeted assistance to vulnerable and liquidity-constrained individuals has helped to increase the estimated impact of the measures on economy-wide spending, as these individuals have higher propensities to consume than the general population. The disbursements are estimated to soften the GDP decline by 1.3% in 2020, with effects fading in 2021 as the measures expire.

Combined, the quarterly pass-through of these fiscal injections can be assessed by the ratio of the estimated budgetary impact on GDP to the overall fiscal injection as shown in **Chart 4.14**. This ratio peaks in Q3 at 0.23, before declining marginally for the rest of the year. The profile reflects the role of fiscal support in substituting for temporarily depressed private demand in the income streams that constitute GDP, and the pass-through to the economy eases in the appropriate counter-cyclical manner into 2021, as private demand picks up again.

Chart 4.13 About two-thirds of the direct fiscal injection (excluding loans and guarantees) comprises business cost-saving measures

Decomposition of the Budget measures announced in FY2020 simulated in MMS by type of measure

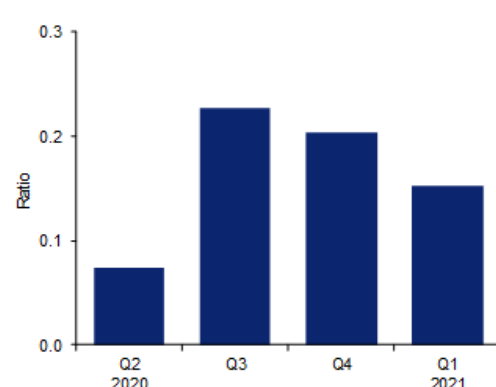


Source: EPG, MAS estimates

Note: (i) Measures for households (and individuals) include cash transfers, training subsidies and temporary unemployment support; (ii) The "Others" category includes measures not captured elsewhere that also support infrastructure development and broader restructuring.

Chart 4.14 Fiscal injections have been timely, with pass-through to real GDP expected to peak in Q3 2020

Pass-through of fiscal stimulus to real GDP



Source: EPG, MAS estimates

Note: The pass-through of fiscal injections to GDP is computed as the ratio of the estimated GDP loss averted in the quarter to the cumulative sum of fiscal injections up to the quarter.

The macroeconomic policy mix reflects the unique characteristics of the pandemic shock

In sum, fiscal and monetary policies are estimated to reduce domestic economic contraction by 6.7% in 2020 and 5.6% in 2021 (**Table 4.2**). In terms of monetary policy, the decline in the S\$NEER in early Q1 provided an initial buffer to the economy when the COVID-19 shock hit. This forestalled a broadening of disinflationary pressures and helped to keep inflation expectations anchored, thereby reducing the risk of a deflationary spiral taking hold. The fall in the S\$NEER had also reduced expectations of S\$ depreciation, which ensured that S\$ interest rates fell in tandem with global rates. Given the lags in the transmission of monetary policy to the economy, the current stance will continue to be accommodative next year.

Table 4.2 Estimated macroeconomic policy support for real GDP (%)

	2020			2021		
	Fiscal Policy	Monetary Policy	Total	Fiscal Policy	Monetary Policy	Total
Real GDP	+5.6	+1.1	+6.7	+4.8	+0.8	+5.6

Source: EPG, MAS estimates

However, the full impact of the overall policy mix on the economy is likely to be larger than that quantified above. The government's fiscal response has been supported by liquidity and other financial measures, which were not directly accounted for. These measures helped

to ensure that bank credit was available at non-penal costs, and thereby played a significant role in averting a credit crunch that would have exacerbated the income shock.

The modelled impact of fiscal policies conservatively employed multipliers conditioned on historical relationships. There are other factors in this particular crisis that might support stronger fiscal multipliers. For example, cross-border leakage will be reduced by the closure of borders to outbound tourism. Moreover, the size of the output gap that has opened up diminishes scope for crowding-out effects from public spending.

More broadly, the depth and unique nature of the 2020 recession presents a role for the public sector in spending and income support. In terms of the expenditure components of GDP, MAS estimates that the contribution of government demand will compensate for about 40% of the drag on growth in 2020 posed by the decline in private sector demand.⁸ It would not have been appropriate for policy to compensate fully for the contraction in private demand during a period when public health measures in response to COVID-19 reduced economic activity (see Special Feature B).

However, public policy had a critical role to play in buffering incomes, and thus preventing a still sharper contraction in overall spending and rise in unemployment. This can be seen more clearly from the contribution to GDP by income, where the substantial swing into deficit of the government's income position (estimated to subtract about 8% points) accommodated a modest rise in corporates' gross operating surplus and employee compensation, within the overall real GDP contraction for this year.

The mix of macroeconomic policies put in place is also likely to have alleviated the scarring effects of the COVID-19 shock on Singapore's growth potential over the longer term. Saving jobs and preserving firms' capabilities are a critical part of ensuring that ongoing restructuring efforts have the requisite base of skills and capacity to be the engines of future growth.

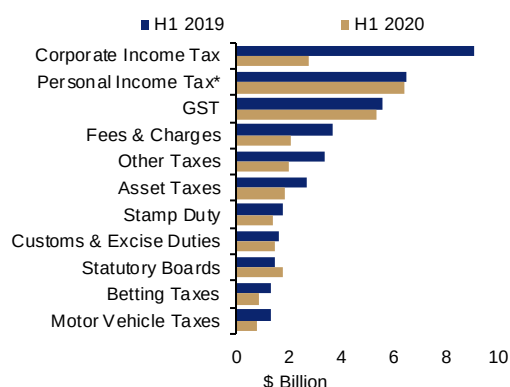
Government operating revenues saw a steep contraction in H1 2020

In H1 2020, total operating revenues fell to \$26.4 billion (11.7% of GDP) from \$39.0 billion (15.5% of GDP) the same period a year ago. The decline was broad-based across all major revenue sources, with the exception of Statutory Boards' Contributions (**Chart 4.15**). This reflected the impact of the deep recession, as well as relief measures the government rolled out in response to the COVID-19 downturn. Notably, the government collected only \$2.8 billion in corporate income tax in H1 2020, compared to \$9.1 billion in H1 2019, partly as a result of the deferment and Corporate Income Tax Rebate granted under the Budgets in FY2020 to alleviate pressures on firms' cashflows. Likewise, asset tax collection shrank in part because of the Property Tax Rebate for non-residential properties, while other taxes fell due to foreign worker levy waivers. The amount of vehicle quota premiums collected in H1 2020 was also \$1.1 billion lower than a year ago, given the suspension of COE bidding exercises over Q2.

⁸ This estimate excludes private residential investment, as no split is available between the public and private contribution.

Chart 4.15 The recession and relief measures led to a decline in government operating revenue

Operating revenue by source

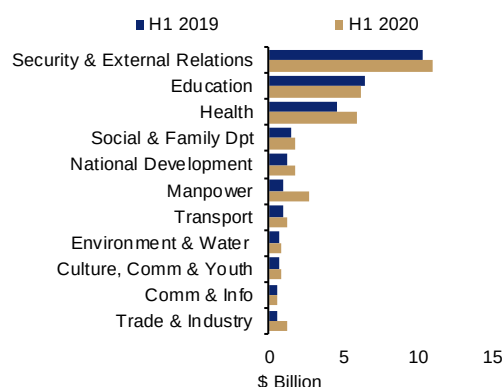


Source: MOF

* Includes withholding tax

Chart 4.16 Operating expenditure rose in H1 2020, largely driven by MOM and MOH

Operating expenditure by sector



Source: MOF

Operating expenditures rose sharply, although development expenditure fell

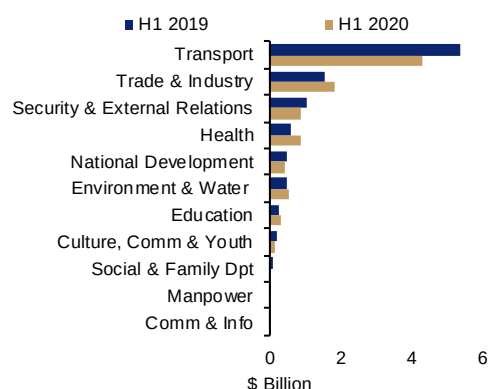
Total government expenditure increased by \$4.9 billion to \$45.2 billion (20% of GDP) in H1 2020 on the back of a step-up in operating expenditure, which more than offset the modest decline in development expenditure.

Operating expenditure, which includes expenses on manpower, operating grants and subventions to statutory boards and other organisations, rose to \$35.3 billion (15.6% of GDP) in H1 2020, from \$29.6 billion a year ago. The Ministry of Manpower (MOM) saw the largest step-up in operational outlay (\$1.7 billion) in part due to higher transfers to individuals (**Chart 4.16**). This was followed by the Ministry of Health (MOH), which spent \$1.4 billion more compared to the same period a year ago amid higher demand for medical services during the pandemic.

In contrast, development expenditure, which comprises longer-term investment in capitalisable assets such as buildings and roads, fell by \$0.8 billion to \$10.0 billion (4.4% of GDP) in H1 2020. This largely reflected delays in major public construction projects as a result of work stoppages during the circuit breaker, and more than offset higher developmental outlays by MOH and the Ministry of Trade and Industry (**Chart 4.17**).

Chart 4.17 Development expenditures were lower due to construction delays

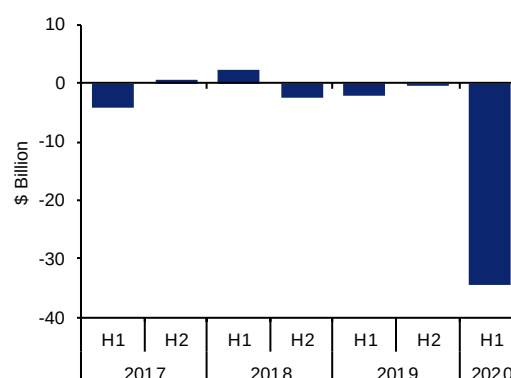
Development expenditure by sector



Source: MOF

Chart 4.18 The government saw its largest basic deficit to-date

Government basic deficit



Source: MOF

The government's basic deficit surged

The government registered a primary deficit of \$18.8 billion (8.3% of GDP) in H1 2020, compared to \$1.4 billion in H1 2019, as expenditures increased substantially and operating revenue fell.

Special transfers, excluding top-ups to endowment and trust funds, surged to \$15.8 billion, from \$0.8 billion a year ago, buoyed by the government assistance schemes aimed at supporting workers, households and firms through COVID-19. These included the cash transfers to individuals and households under the Solidarity Payment and Care and Support Package, as well as the JSS payouts to firms.

The government's basic balance, which is the primary balance less special transfers (excluding top-ups to endowment and trust funds), went into a record deficit of \$34.5 billion in H1 2020 (**Chart 4.18**).

The government revised its budget estimates for FY2020 to account for the outturn in Q2 2020 and the new Budget measures

The government's primary deficit for FY2020 is now expected to come in at \$38.3 billion, compared to \$19.4 billion as at early April (**Table 4.3**). This was largely due to lower operating revenues given weaker-than-expected economic activity and increases in total expenditure in light of additions and extensions to the support measures for COVID-19. Likewise, special transfers, including top-ups to endowment and trust funds, for FY2020 was revised up to \$54.5 billion, from \$43.6 billion. The two Ministerial Statements reallocated savings arising from lower-than-anticipated spending to new expenditures; sources of savings included reduced development expenditures, as the circuit breaker and safe reopening concerns led to delays in several major construction projects. Accordingly, the Ministerial Statements had little impact on the overall budget estimates. The overall budget deficit for FY2020 is projected to come in at \$74.2 billion, compared to \$44.3 billion as of the Solidarity Budget.

To finance the COVID-related measures, the government had obtained the President's approval to draw up to \$52 billion of Past Reserves, which was roughly equivalent to

accumulated budget surplus from the last 20 years. In recognition of the heightened uncertainty and the rapid pace at which the COVID-19 situation is evolving, the government also set aside \$13 billion of contingency funds to cater for urgent and unforeseen expenditure needs during the Fortitude Budget in May. This sum remains untapped, as the local transmission of COVID-19 has since come under control, while economic activity has picked up.

Table 4.3 Budget summary

	FY2020 Revised (as at Solidarity Budget on 6 Apr 2020)		FY2020 Budgeted (as at Ministerial Statement on 5 Oct 2020)	
	\$ Billion	% of GDP	\$ Billion	% of GDP
Operating Revenue	70.4	14.1	63.7	13.7
Total Expenditure	89.8	18.0	102.1	22.0
Primary Surplus (+) / Deficit (-)	-19.4	-3.9	-38.3	-8.2
Less: Special Transfers (excluding top-ups to endowment/trust funds)	26.3	5.3	37.1	8.0
Basic Surplus (+) / Deficit (-)	-45.6	-9.2	-75.5	-16.2
Less: Special Transfers (top-ups to endowment/trust funds)	17.3	3.3	17.3	3.7
Add: Net Investment Returns Contribution	18.6	3.6	18.6	4.0
Budget Surplus (+) / Deficit (-)	-44.3	-8.9	-74.2	-16.0

Source: MOF

Table 4.4 Summary of key measures across the Fortitude Budget and Ministerial Statements

KEY BUDGET INITIATIVES

A. FOR BUSINESSES

Cashflow, Costs and Credit Measures

A1. Jobs Support Scheme

- Co-fund between 25–75% of the first \$4,600 of gross monthly wages of every local employee (including those who are also shareholders and directors of the company, and have Assessable Income of \$100,000 or less for Year of Assessment 2019) for 10 months, up to August 2020, and 10–50% of the same from September 2020 to March 2021.
- Firms in harder hit sectors will get more wage support.

A2. Foreign Worker Levy Offsets

- 100% waiver of Foreign Worker Levies in June and July, and rebates of \$750 and \$375 for June and July respectively for all firms that are not allowed to resume operations from June, including all firms in the construction, marine & offshore engineering and process sectors.

A3. Cash Grant (given through property owners)

- Provide rental waivers to qualifying SME and specified Non-Profit Organisation tenant-occupiers.
- Cash grant of around 0.8 month's worth of rent for qualifying commercial properties (e.g., retail shops). Taken together with the Property Tax Rebate announced in the Unity and Resilience Budgets, this means up to 2 months' waiver of rent for qualifying commercial properties.
- Cash grant of around 0.64 month's worth of rent for other non-residential properties (e.g., industrial and office properties). Taken together with the Property Tax Rebate announced in the Unity and Resilience Budgets, this means up to 1 month's waiver of rent for other qualifying non-residential properties.

A4. Rental Waivers for Tenants in Public Properties

- Two additional months of rental waiver for stallholders at NEA hawker centres and commercial tenants.
- One more month of rental waiver for non-residential tenants of government agencies.

*Additional Assistance for Sectors Hit Hardest by the COVID-19 Pandemic***A5. Enhanced Aviation Support Package**

- \$187 million reallocated to extend cost relief measures for airlines, ground handlers and cargo agents to March 2021.

A6. Additional Support for Tourism Sector

- \$320 million worth of tourism credits for Singaporeans (SingapoRediscovered Vouchers).

A7. Support for Built Environment Firms

- Advance payment for public sector projects.
- Support for prolongation costs for public sector projects.
- Offsets for additional compliance costs due to COVID-19, including swab tests.

A8. Enhanced Training Support Package

- Six-month extension till 30 June 2021.
- Coverage of enhanced course fee subsidies widened to include marine & offshore, on top of air transport, tourism, retail, food & beverage, land transport, arts & culture and aerospace sectors.
- Enhanced absentee payroll rates to be lowered to 80% of hourly basic wages, capped at \$7.50 per hour per trainee, for eligible courses commencing between 1 January and 30 June 2021.

A9. Sports Resilience Package

- \$25 million to fund new and expanded support measures for the sports sector, such as operating grants and capability development initiatives.

*Emerging Stronger***A10. Support for E-payments**

- \$300 bonus per month for 5 months to encourage stallholders in hawker centres, wet markets, coffee shops and industrial canteens to use e-payments.
- Government to bear merchant discount rate payable by stallholders until 31 December 2023.

A11. Digital Resilience Bonus

- Up to \$5,000 for F&B and retail firms that adopt PayNow Corporate and e-invoicing, together with business process or e-commerce solutions.
- Additional \$5,000 for adoption of advanced digital solutions e.g., data analytics.

A12. Enhanced Productivity Solutions Grant (PSG)

- Extend enhanced support level of up to 80% from 1 January 2021 to 30 September 2021. The support level for PSG will revert to 70% after 30 September 2021.

A13. Enhanced Enterprise Development Grant (EDG)

- Extend the enhanced support level of up to 80% from 1 January 2021 to 30 September 2021. The support level for EDG will revert to 70% after 30 September 2021.

A14. Market Readiness Assistance (MRA) grant

- Enhance the support level from up to 70% to up to 80% from 1 November 2020 to 30 September 2021. The support level for MRA will revert to 70% after 30 September 2021.
- Expand scope to cover participation in virtual trade fairs.

*Creating Job Opportunities, Upskilling and Reskilling***A15. SGUnited Jobs and Skills Package**

- Create 100,000 jobs, traineeships and skills training opportunities.

Jobs

- Scale up job opportunities and career conversion programmes under the Adapt & Grow and the TechSkills Accelerator initiatives.

Traineeships

- Create 21,000 traineeships in high-demand areas (e.g., IT, engineering, software learning, Artificial Intelligence) for first-time local job seekers and 14,500 traineeships and training opportunities for local mid-career jobseekers.

- Co-fund qualifying stipends of companies offering traineeships and training places under these programmes.
- Training allowance of \$1,500 for mid-careerists under the Company Training programme.

Skills

- Subsidised training courses for around 30,000 jobseekers to upgrade skills while looking for a job.
- Training allowance of \$1,200 per month for course duration.

A16. Jobs Growth Incentive

- For each new local hire by employers that increases their local workforce from September 2020 to February 2021, government will co-pay up to 25% of the first \$5,000 of gross monthly wages for up to 12 months.
- Higher co-funding rate of up to 50% for mature local hires aged 40 and above and Persons with Disabilities.

B. FOR HOUSEHOLDS

Transfers to Households

B1. Solidarity Utilities Credit

- \$100 credit to offset utilities bill in July or August for each household with at least one Singapore Citizen.

B2. Workfare Special Payment

- \$3,000 payout for all Singaporean workers aged 35 and above in 2019 who received Workfare Income Supplement (WIS) payments for Work Year 2019.
- Eligibility widened to those who received WIS for Work Year 2020 and are not already receiving the Special Payment.

B3. COVID-19 Support Grant

- Cash grants of up to \$800 a month for three months for lower- to middle-income Singaporeans and Permanent Residents who have lost their jobs or face significant salary loss due to the outbreak.
- Unemployed applicants must demonstrate active participation in job search or training programme(s) to qualify.
- Extension of application deadline from end-September 2020 to end-December 2020, with applications open to both past/existing recipients and new applicants.

Support for Families, Communities and the Vulnerable

B4. Baby Support Grant

- \$3,000 per eligible Singapore Citizen child born from 1 October 2020 to 30 September 2022.

B5. Digital Inclusion

- By end-2021, every secondary school student will have a personal learning device.
- Seniors Go Digital movement: \$137 million set aside to strengthen digital literacy amongst seniors and provide subsidised smartphones and mobile plans to low-income seniors.

B6. Top-up to the Invictus Fund

- \$18 million top-up to the Invictus Fund to help social service agencies maintain service continuity, accelerate digitalisation and scale-up capabilities to transform their work in supporting the vulnerable.

B7. Enhanced Fund-Raising Programme

- \$100 million top-up to Tote Board's Enhanced Fund-Raising Programme to strengthen support for charities through dollar-for-dollar matching on eligible donations.

C. PANDEMIC MANAGEMENT & RESILIENCE

C1. Public Health and Safety

- Increase spending to raise capacity of healthcare system, including in testing for COVID-19.

C2. Access to Essential Supplies

- Build national stockpile of health supplies such as masks and hand sanitisers.

Box C: Review of MAS Money Market Operations in FY2019/20¹

Money market operations in Singapore are undertaken to manage liquidity within the banking system and are distinct from the implementation of exchange rate policy. This Box reviews MAS' money market operations in FY2019/20.

The conduct of money market operations is briefly explained in the context of Singapore's exchange rate policy framework. This is followed by a review of banks' demand for cash balances, the behaviour of autonomous money market factors, and the composition of money market operations during this period.

Money market operations in Singapore

The open-economy trilemma posits that a country that maintains an open capital account cannot simultaneously manage its exchange rate and domestic interest rates. Given Singapore's open capital account and exchange rate-centred monetary policy, domestic interest rates are necessarily endogenous. They are determined not just by MAS' exchange rate policy but also global factors, including international interest rates. MAS' money market operations are thus not targeted at any level of interest rate. Instead, they are aimed at ensuring that there is sufficient liquidity in the banking system to meet banks' demand for reserve and settlement balances, and to mitigate sharp interest rate volatility.

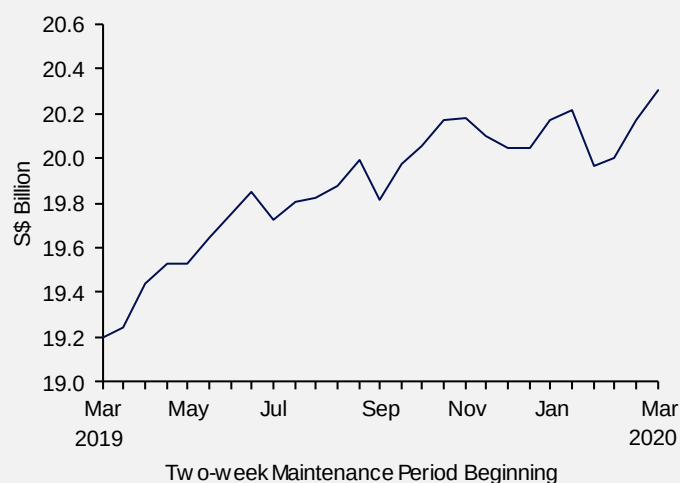
Money market operations are conducted daily by the Monetary & Domestic Markets Management Department (MDD) at MAS. The amount of liquidity required in the banking system is estimated from the banking sector's demand for funds and the net liquidity impact of autonomous money market factors.

Banks' demand for cash balances

Banks in Singapore hold cash balances with MAS to meet reserve requirements and settlement needs. They are required to maintain with MAS a Minimum Cash Balance (MCB) equivalent to an average of 3% of their liabilities base over a two-week period. This forms the base demand for cash balances. The total demand for cash balances could vary across periods as banks may choose to hold additional amounts of cash balances to make large payments (for settlement purposes) or for precautionary motives amid heightened market volatility.

In FY2019/20, banks' demand for balances to meet reserve requirements grew in line with the increase in their liabilities base. Towards the end of FY2019/20, MAS raised the target cash balance to ensure liquidity remained ample amid heightened market uncertainty arising from the global outbreak of COVID-19 (**Chart C1**).

¹ This Box was contributed by the Monetary & Domestic Markets Management Department of MAS. More information on MAS' money market operations is available in the monograph "Monetary Policy Operations in Singapore" published on the MAS website in March 2013.

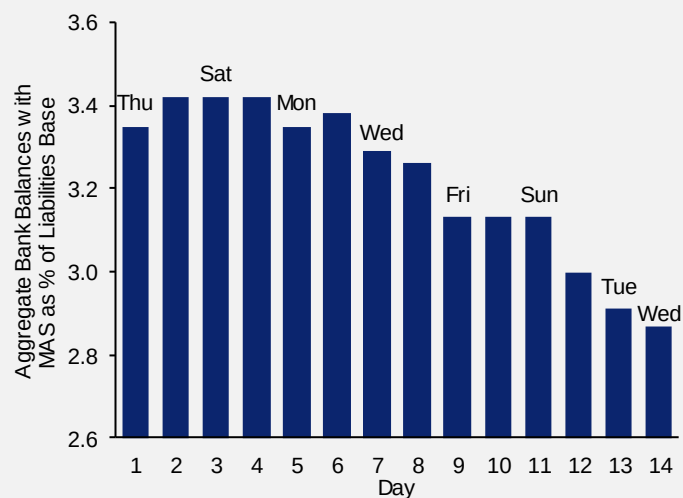
Chart C1 Average required cash balances over two-week maintenance periods

Although banks are required to keep an average cash balance of at least 3% of their liabilities base over the two-week maintenance period, their daily effective cash balances may fluctuate between 2% and 4% of their liabilities base. This provides them with more flexibility in their liquidity management, as they are allowed to adjust their cash balances in accordance with their liquidity needs over the course of each maintenance period.

Chart C2 shows the daily effective cash balances within an average maintenance period in FY2019/20. Banks tend to hold higher cash balances during the start of a maintenance period to avoid being short of cash towards the end of the period. Upon meeting the average MCB requirement of 3%, banks will deposit their excess cash with the MAS Standing Facility towards the end of the maintenance period to earn interest as MAS does not pay any interest on the cash balances.² Hence, the daily cash balances required by the banking system during the last few days of a maintenance period are usually lower.

² From a regulatory perspective, such deposits will also help to reduce the liabilities base, and in turn the amount of reserve balances banks are required to hold.

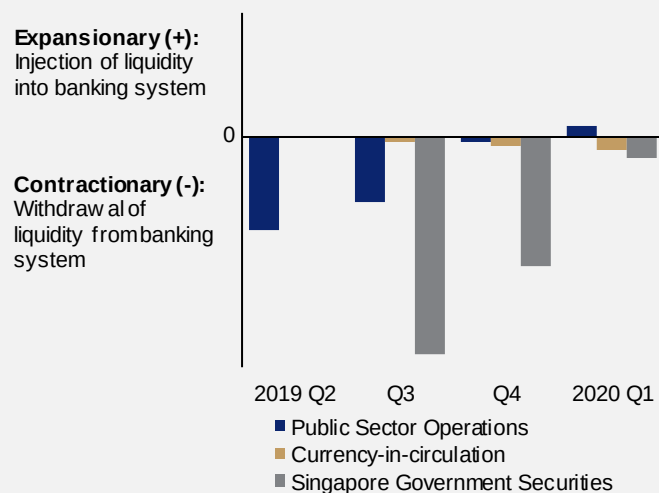
Chart C2 Daily effective cash balances as percentage of banks' liabilities base over a typical two-week maintenance period in FY2019/20



Money market factors

Chart C3 shows the liquidity impact of autonomous money market factors, which include: (i) public sector operations; (ii) currency in circulation; and (iii) Singapore Government Securities (SGS) and Treasury Bills (T-bills) issuance, redemption and coupon payments, over FY2019/20. Public sector operations include the Government's and CPF Board's net transfers of funds between their accounts with MAS and their deposits with banks. In FY2019/20, the liquidity impact of the autonomous money market factors was contractionary on a net basis, largely due to the withdrawal of funds through public sector operations and SGS.

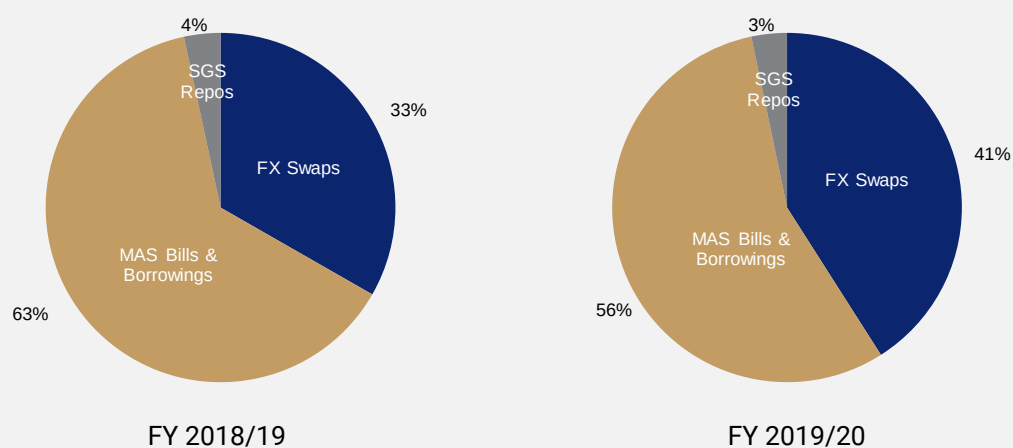
Chart C3 Liquidity impact of autonomous money market factors



Composition of money market operations

MAS relies on four money market instruments to manage liquidity in the banking system, namely: (i) FX swaps; (ii) SGS repos; (iii) clean borrowings; and (iv) MAS Bills. While the share of FX Swaps increased from FY2018/19 to FY2019/20, MAS Bills and clean borrowings continued to comprise the largest share of the total in both periods (**Chart C4**).

Chart C4 Composition of money market operations by instrument



Special Feature A

Asian Monetary Policy Forum 2020¹

1 Introduction

The 7th Asian Monetary Policy Forum was conducted virtually on 12 June 2020. As in past years, it was convened under the auspices of the Asian Bureau of Finance and Economic Research (ABFER) and co-organised by the University of Chicago Booth School of Business, the National University of Singapore (NUS) Business School and the Monetary Authority of Singapore (MAS). This year's presentations revolved around three key themes: (i) the economic impact of COVID-19 and macroeconomic policy response; (ii) international economic cooperation and coordination; and (iii) a safe-asset perspective to integrated macro policymaking.²

2 Welcome Remarks

The Forum was opened by Edward S. Robinson, MAS Deputy Managing Director and Chief Economist, with a characterisation of the extraordinarily sharp economic decline effected by the unique transmission of the COVID-19 shock compared to that of usual business cycle recessions. On the supply side, there has been a reduction in labour supply due to lockdowns and social distancing measures. On the demand side, the sharp fall in global consumption and investment demand, as well as disruptions to global trade, amplified the negative supply shock. The mutually reinforcing interactions of supply and demand shocks produced a sharper decline in economic activity than in conventional business cycle recessions and resulted in a “sudden stop”. This reflected the unique nature of the negative supply and demand shocks during the pandemic—which some have termed “Keynesian supply shocks” (Guerrieri *et al.*, 2020).

3 Opening Address: Gita Gopinath

Characterising the COVID-19 Shock

Gita Gopinath, the IMF's Economic Counsellor and Director of the Research Department, delivered the Forum's Opening Address, noting at the outset that COVID-19 represented the first truly global crisis since the Great Depression.

Simultaneous recessions for AEs and EMs represent a highly unusual feature of the current crisis, even compared to past shocks that have had global reach. For example, during the GFC, several large EMs, notably China and India, managed to largely avoid the severe crisis experienced by most AEs. Thus, Gopinath argued that the current crisis is significantly broader and deeper than the GFC. As countries attempt to reopen their economies,

¹ This article provides an overview of the AMPF 2020 discussions, based on the full documentation of proceedings by Chia Wai Mun, Associate Professor of Economics at the School of Social Sciences, Nanyang Technological University (NTU). It has benefitted from comments and inputs by Professor Bernard Yeung, President of ABFER and Stephen Riady Distinguished Professor at the NUS Business School. The views in this article should not be attributed to MAS, NTU or NUS.

² All videos of the presentations and accompanying materials are available on the ABFER-AMPF webpage, which can be accessed at <http://www.abfer.org/events/abfer-events/asian-monetary-policy-forum/187:e-ampf2020>.

heterogeneity in countries' success at containing the pandemic is already leading to a desynchronised phasing out of containment measures across countries, which will continue to dampen the global economic recovery.

Aside from the direct impact of the public health crisis on domestic economies, COVID-19 has also manifested as a multi-faceted external shock, disrupting commodities markets and portfolio flows across countries. In particular, the health crisis has led to a collapse in demand for transportation and hence a sharp decline in oil and commodity prices, which led to a further deterioration in economic conditions for commodity and oil exporters. Further, many EMs, including some Asian economies, experienced large reversals in portfolio flows at the beginning of the crisis. While flows have somewhat normalised, the risk of sharp withdrawals in external financing remains a prominent one as the crisis unfolds.

Unlike the GFC, there has been a disconnect between financial markets and the real economy in both AEs and EMs. Despite the crisis, there have been substantial increases in stock prices across the globe, beyond what could be explained by the outstanding performance of technology and pharmaceutical firms in stock indices. While borrowing spreads in EMs widened during the early phase of the COVID-19 crisis, they have been generally lower than during the GFC. Gopinath highlighted three Asian countries, namely Vietnam, Malaysia and India, where sovereign spreads were larger during the GFC than those seen so far during the COVID-19 crisis. She noted that given the projected scale of the hit to the global economy, one might expect these spreads to be significantly larger in the current crisis. Similarly, exchange rate depreciations among EMs and developing economies have been far more modest relative to the scale of the pandemic shock.

Policy Responses So Far

The relative resilience of financial markets reflects the scale and timeliness of monetary policy responses, via the cutting of policy rates and the infusion of liquidity. In this regard, Gopinath noted that central bank swap lines have been important for maintaining liquidity in global financial markets. Aside from monetary policy, some countries have also expanded fiscal spending on a much larger scale than during previous crises. However, many EMs, in particular some low-income Asian economies, face more constrained fiscal space. Another challenge has been the need for governments to disburse transfers to larger segments of the population that are usually out of reach of safety-net programmes. This is particularly challenging for low-income Asian economies with a large proportion of their populations in informal employment.

Outlook for Recovery and Policy Considerations

Gopinath highlighted some factors that may prove advantageous for Asian economies. First, they benefit from low global oil prices as net importers. Second, the region has had much better success in containing the spread of the virus. Third, Asian EMs generally have lower external and fiscal vulnerabilities in comparison to their peers.

Conversely, Asian countries are exposed to contractions in international trade, given their relatively high degree of openness. Beyond the crisis, ongoing geopolitical risks stemming from US-China tensions and the rise in protectionism may have spillover effects on Asian economies through their impact on global supply chains. In addition, the potential for high volatility in capital flows remains, even though it has so far been mitigated by central bank actions to ease monetary conditions via currency swap lines and emergency liquidity facilities.

As long as a medical solution to COVID-19 remains elusive, economic policymakers will have to continue finding ways to support incomes and revenues of workers and firms, in order to preserve job matches. However, as some activities become unviable, it may become necessary to shift the policy emphasis from preserving job matches to reallocating workers to growing sectors that can absorb them. Policymakers may also have to contend with difficult choices about allocating support to firms that have strategic importance. To complement economic policy support, public health policies that minimise health uncertainty, such as widespread testing, contact tracing (effective if the number of cases is low), and mask wearing (the least economically disruptive intervention) should continue. Effective communication to the public about the phased reopening will also be important for reducing uncertainty.

Maintaining financial stability and ensuring sufficient liquidity in international debt markets will also be crucial, as critical spending needs of developing economies have to be met. The IMF has so far implemented several policies to ensure that financing needs are met. These include making available emergency financing for countries that face difficulties undertaking health spending, providing debt service relief so that they can use their resources for local health spending needs, and putting in place a new short-term liquidity line.

Gopinath concluded by emphasising the importance of global cooperation, in view of real risks from rising protectionism and geopolitical tension. The benefits from globalisation will continue to be significant, even while efforts to mitigate some of its distortionary consequences continue.

4 Keynote Speech: Adam Posen

In his speech, Adam S. Posen, President of the Peterson Institute for International Economics (PIIE), considered the challenges of global cooperation and provided an evaluation of realistic international coordination and cooperation possibilities against the backdrop of the current global health and economic crisis.

Posen reflected that the experience of global policy coordination during the current pandemic has seen a mixture of successes and failures. On both monetary and fiscal policy fronts, there has been rapid convergence within the economic community on optimal policy responses to the pandemic. Posen attributed the ability to achieve such convergence to the lessons learned from the GFC.

Posen then shared his views on failings in international coordination that have characterised the current crisis. In particular, he highlighted the importance of political divisions, both domestic and international, in preventing international coordination that would have helped to reduce the severity of the public health crisis. At the root of these political divisions is geopolitical distrust.

Posen presented potential solutions to the problem of geopolitical distrust, drawing on his joint work with Maurice Obstfeld from the University of California, Berkeley, that emphasises a key principle for international policy coordination: agreement should be sought over establishing commonality in the actions and approach of governments, rather than trade-offs individual countries are required to make (Obstfeld and Posen, 2020). A salient example of the former is in the G20's agreement on currency issues in 2012, under which the world's major economies agreed to avoid competitive currency devaluations, which has by and large been adhered to. By requiring each country to adhere to the same broad standard

of behaviour that binds all other parties, the 2012 G20 agreement on currency devaluation avoided disputes over what constituted desirable target outcomes for individual countries.

This approach is in contrast to one where parties to an agreement are each required to make significant private trade-offs in pursuit of a target outcome, such as in the example of the Plaza Accord of 1985 between the US and its major trading partners. Countries that had large trade surpluses with the US, such as Japan and Germany, were required to appreciate their currencies against the US dollar, which led to subsequent unresolved disagreements over whether each country did enough to ensure desirable outcomes.

On the contrary, Posen argued that the recent international agreement to establish US dollar swap lines between the Federal Reserve and other central banks is an example of the desired approach, where agreement is reached on common behaviour for central banks to supply US dollar liquidity to other central banks in the event of market stress.

In assessing the finer practicalities of the current G20 agenda, Posen (in collaboration with his colleagues at PIIE) identified four crucial components around which international cooperation should be prioritised going forward. The first component is to increase peer pressure between governments to encourage compliance with best policy practice. The second is to take decisive action to prevent financial crises. The third is to prevent mutual economic aggression between economies who are already suffering from effects of the pandemic. The last and most crucial component of the G20's agenda should be to help the world's poor survive the current pandemic.

Returning to the subject of international policy coordination in the current crisis, Posen observed that the relative success of monetary policymakers so far in the response to COVID-19 can partly be attributed to a common analytical understanding among central banks about the symptoms and causes of financial crises. There is a shared recognition that financial crises can be prevented by timely interventions to provide market liquidity, via a combination of quantitative easing, credit swap lines and direct credit provision. This is in sharp contrast to the coordination failures among public health authorities around mutual reporting of disease data, coordinated tracking of border movements and sharing of scientific information during the pandemic. Posen attributed these failures of collective action to self-interested national governments who might have avoided data disclosures to avoid panic or faced political incentives to deny the severity of the disease.

Posen concluded on a positive note, reflecting on the successes of the G20 in fostering international coordination in monetary policy and, to some extent, fiscal policy in recent years. These successes give a measure of confidence that international coordination can be constructive during the current crisis. The nature of the COVID-19 crisis as a common threat with similar impacts across countries implies that effective frameworks for international coordination should rely on establishing common behaviour, rather than targeting outcomes.

5 Commissioned Paper

The background of this year's commissioned paper is the IMF's proposal for an integrated policy framework (IPF) for the joint use of monetary policy, macroprudential policies, foreign exchange interventions and capital controls to address the challenges of macroeconomic policymaking in a world of volatile capital flows and monetary policy spillovers (e.g., Basu *et al.*, 2020). Building on New Keynesian models, the IMF's IPF analysis typically motivates policy interventions based on frictions caused by price stickiness. The

AMPF 2020 Commissioned Paper, jointly contributed by Markus K. Brunnermeier from Princeton University, Sebastian Merkel from Princeton University and Yuliy Sannikov from Stanford University, proposes an integrated policy framework motivated by financial frictions that are particularly relevant for EMs. In his presentation, Brunnermeier emphasised that financial frictions, such as collateral requirements, create a demand for safe assets such as domestic money and government debt. The demand for the services provided by safe assets allows governments that issue them to borrow at lower rates, but EMs' ability to issue safe assets cannot be taken for granted as they have to compete with international safe assets denominated in foreign currency such as the US dollar.

Characterising a Safe Asset

The two distinguishing features of a safe asset can be captured by the “good-friend” analogy and the safe-asset tautology. The good-friend analogy means that a safe asset is like a good friend that is available when one needs it, especially in times of market stress. The safe-asset tautology means that an asset is safe because others perceive it as such. These features imply that safe asset values remain relatively stable after negative shocks, and that the asset has high market liquidity.

Safe assets provide services to their holders as they may loosen collateral constraints, facilitate trade when there is no double-coincidence of wants, and allow for insurance through re-trading. Because of these additional service flows, safe assets are worth more than their fundamental value, which is defined as the discounted value of their underlying stream of cash flows. In asset pricing theory, safe assets are said to have a bubble component.

Specifically, the total real value of domestic safe assets such as money and government debt consists of the expected present value of primary fiscal surpluses plus the convenience yield, which represents the value of transaction, collateral and insurance services flows provided by the safe asset. When risk in the economy increases, so does the convenience yield and the bubble component of safe assets.

Brunnermeier and his co-authors provide a simple condition to characterise the conditions for emergence of a “bubbly” component in the value of the safe asset:

$$r + p < g \quad (1)$$

Inequality (1) states that the sum of the real risk-free discount rate, r , and the safe asset risk premium, p , have to be smaller than the growth rate of the economy, g , for the bubble value to be sustainable. That is because, to a first approximation, the growth rate of the economy provides an anchor for the growth rate of the value of services provided by the safe asset for its use as insurance, collateral and in transactions. When US interest rates are low and growth is high, EM governments have “room” to increase the supply of safe assets by the gap between the two sides of the inequality, without increasing indebtedness relative to GDP.

The Three Phases of a Financial Cycle

Brunnermeier and his co-authors categorise the global financial cycle into three key phases. The initial phase is termed the *risk-off phase*, characterised by tight US monetary policy with high US interest rates. Households and firms in the EMs see the US dollar safe asset, namely US Treasuries, as an attractive investment. Thus, the domestic safe asset faces fierce competition from the US dollar safe asset and hence the value of EM government debt

is equal to the expected present value of fiscal primary surpluses. In this phase, there is no bubble.

Next comes the *temptation phase*, which starts when the US interest rate starts to decline. With a lower US interest rate, the domestic safe asset becomes more attractive relative to the US dollar safe asset. Households and firms borrow US dollars to loosen their collateral constraints or any restrictions as a result of macroprudential policy and use the domestic safe asset as a hedge for their risk. Cheap dollar funding leads to an investment boom which in turn boosts the growth rate of the economy. When the growth rate of the economy is larger than the value of services provided by the safe asset—the sum of real risk-free rate and safe asset risk premium—the safe asset acquires a bubble component. It is this “bubbly” value that tempts the EM’s government into increasing the supply of government-issued safe assets and hence “mine” the bubble. As long as the bubble term remains, the government can continue to issue new debt and hence generate a steady flow of revenue that does not have to be paid for by future taxes.

Finally, the *wobbly bubble phase* begins when the prospect of rising US interest rates makes it more difficult for the domestic safe asset to sustain the bubble. Specifically, Inequality (1) is increasingly binding. First, in order for the domestic safe asset to remain competitive with the US dollar safe asset, the real risk-free rate must be higher, making it harder to satisfy the bubble condition. Second, the possibility of the bubble bursting necessitates a positive risk premium, making the bubble condition harder to satisfy. When the bubble bursts, the value of safe assets falls back to its fundamental level and a reduction in asset prices and domestic investment results.

Policy Implications

How should EMs insulate their economies from the US monetary policy cycle and avoid the bursting of safe-asset bubbles? Brunnermeier and his co-authors suggest an interpretation of integrated policy frameworks as a menu of policy interventions to prevent the bursting of the EM’s safe-asset bubble and avoid the third stage of the cycle.

They analyse the macroeconomic policy considerations through the lens of Inequality (1). As long as Inequality (1) holds, the bubble value of the domestic safe asset remains intact. From this perspective, fiscal measures including tax hikes that shore up the EM government’s long-run fiscal position can reduce the risk premium associated with the EM asset and support the fundamental value of the safe asset. However, instituting tax hikes directly undermines the government’s ability to effect countercyclical fiscal policy, which is problematic as risk-off conditions in global financial markets are likely to pose a contemporaneous drag on growth.

Another set of policies aims to prop up the bubble component of EM safe assets, by ensuring that these assets maintain a stable value and high market liquidity. If implemented *ex-post* (after the risk-off transition), these policies may take the form of capital controls or exchange rate intervention. By preventing capital outflows, holders of the EM safe asset may be persuaded that there will not be a run on the safe asset, enabling it to maintain its value. It is also noted that such *ex-post* capital controls may raise the “bubbly” value of domestic asset from an *ex-ante* perspective. If agents know that the bubble will remain even after the increase in the US interest rate, they will be more willing to hold the domestic safe asset. Foreign exchange interventions, in the form of large purchases of the EM safe asset, can also help to maintain their value and market liquidity during the wobbly bubble phase.

Ex-ante macroprudential policy measures that restrict excessive leverage during booms can make the economy less vulnerable to the adverse amplification loop in the wobbly bubble phase, and hence help to preserve the safe-asset status of domestic public debt. Stricter macroprudential policy during booms allows central banks to accommodate capital outflows with a smaller stock of foreign reserves. Macroprudential policy that forces banks to hold more domestic government debt also implicitly imposes a restriction on capital outflows as it reduces the resources available to purchase foreign assets. Additionally, central banks can also accumulate reserves to credibly signal that they are committed to intervene in foreign exchange markets and impose losses on speculators attacking their currency.

The paper also explains why the Mundell-Fleming trilemma is realistically a dilemma. The conventional Mundell-Fleming trilemma states that countries may choose two out of three alternatives: fixed exchange rates, perfect capital mobility and monetary independence. The dilemma states that even if the exchange rate is fully flexible, competition between the domestic safe asset and US Treasuries curtails EMs' monetary independence. A reallocation towards US Treasuries leads to pressure on the domestic currency to depreciate and inflationary pressures. If the central bank chooses to tighten monetary policy to stabilise prices, bank capitalisation is impaired, potentially triggering a contractionary loop within the domestic economy. Conversely, if the central bank chooses to make monetary policy more accommodative, stress in the banking system is avoided, but lower domestic interest rates may cause the bursting of the bubble component of the domestic safe asset. Therefore, unable to pursue independent monetary policy, EMs face not a Mundell-Fleming trilemma, but a dilemma.

In summary, macroprudential policies and capital controls are substitutes while monetary policy is complementary to macroprudential policies and capital controls. Stricter *ex-ante* or *ex-post* macroprudential policies or both, possibly combined with capital controls, create more space for monetary policy.

How can we build a global financial architecture where EMs are less vulnerable to sudden stops? Brunnermeier and his co-authors suggest that the core problem is not a shortage of safe assets *per se*, but that safe assets are not consistently supplied to all countries. To solve this issue, they propose that EMs could issue two bonds, a senior bond and a junior bond with all the risk concentrated on the junior bond and no risk in the senior bond. As a result, the senior bond becomes a safe asset, making it easier and more sustainable to satisfy the bubble condition with no risk premium. Investors can reallocate assets towards the senior bond instead of US Treasuries, reducing the pressure on exchange rate and inflation.

In order to prevent the moral hazard problem of a country diluting its senior bonds by issuing super-senior bonds, the authors propose a system of international coordination. The idea is to create Global Safe Bonds (termed GloSBies), which pool liabilities from a group of countries tranching into senior and junior grades. The proposal calls for an international special purpose vehicle (SPV) that buys a fraction of EM sovereign bonds and requires commitment by participating EMs to service the portion of the debt sold as the senior tranche first. The senior tranche will then have safe-asset status, lowering overall funding costs for EMs. Under such a system, the authors argue that during risk-on periods, international investors will allocate a larger part of their portfolio to junior tranches, reversing the allocation during risk-off periods. Such a system would benefit from diversification of the pooled liabilities if the pool contains bonds from a sufficiently large group of EMs. Further, it can help to prevent large-scale capital flight from EMs, as they retain the ability to issue liabilities via senior tranches of GloSBies. The authors argue that eventually, EMs would not need the

Federal Reserve to intervene with swap lines or the IMF to provide short term liquidity, as the system is designed to be self-stabilising.

Comments and Discussion

Following Brunnermeier's presentation of the Commissioned Paper, Bernard Yeung, President of ABFER and Stephen Riady Distinguished Professor at the NUS Business School, engaged him in a dialogue on the paper, based on comments by Viral Acharya from New York University and Frank Smets from the ECB and KU Leuven.

Acharya argued that when government expenditures are myopic in motivation and wasteful in terms of long-run economic outcomes, expanding the provision of safe assets may lead to crowding out of private sector growth, as most domestic savings would remain parked in the safe asset, potentially increasing endogenous risk in the economy arising from the safe asset's bubble component. With regard to the paper's policy recommendations, Acharya highlighted some difficult trade-offs: while capital controls may be desirable in good times to limit the exposure to external shocks, they may choke the growth of the already crowded-out private sector and aggravate the endogenous risk to the safe asset bubble.

Smets questioned the empirical relevance of the dilemma characterised by Rey (2013), mentioning the findings by Dedola *et al.* (2017) that US monetary policy tightening is deflationary in EMs. He also raised concerns about moral hazard issues arising from cleaning (*ex-post* policies) instead of leaning (*ex-ante* policies). If agents realise that the central bank or other government authorities will intervene by satisfying the demand for safe assets and thereby short-circuit the financial bust and negative feedback loops, the size of the domestic safe asset bubble may grow further, increasing the amplitude of the financial cycle.

Brunnermeier concurred with the importance of governance quality to support the safe-asset bubble and curb endogenous risk. Ideally, the advantages of the ability to issue domestic safe assets may provide incentives for EMs to develop strong governance in capital markets. To maintain the safe asset, *ex-ante* policies are more desirable. EMs could accumulate reserves as a protection against speculative attacks, maintain fiscal space to support credibility and seek more resilient forms of external finance, such as foreign direct investment. As a last resort, capital flow measures could be used when the bubble is wobbly, but authorities should have a clear strategy about how to remove them because losing access to international capital markets would cause damage to long-term growth. He acknowledged that there is a risk, however, that restrictions on capital flows may allow authorities in countries with poor governance to use the safe asset bubble to finance wasteful spending.

Brunnermeier highlighted the importance of building an international financial architecture that is self-stabilising. He proposed that the senior tranche of a pool of EM bonds could become a resilient safe asset for EMs with good governance. No EM would be able to do it alone because they would face the temptation of diluting their senior bonds by issuing super-senior ones. The pooled structure, with membership set by a neutral party with strong governance, would mitigate that moral hazard.

In his conversation with Brunnermeier, Yeung explored in greater detail the paper's implications for the implementation of an IPF for EMs. Specifically, the conversation revolved around: (1) possible policy responses from the already low-growth high-debt EMs to deal with huge capital outflows that they are experiencing in the midst of the COVID-19 pandemic; (2) the challenges faced in developing domestic safe assets by EMs that have weak governance; (3) what EM governments can do to create a more stable financial system; (4) the

considerations between *ex-post* and *ex-ante* policies; and (5) how a self-stabilising global financial architecture can become a reality.

6 Sum-up

The Forum concluded with closing remarks delivered by Steven J. Davis, William H. Abbott Distinguished Service Professor of International Business and Economics at the University of Chicago Booth School of Business. He noted the rapid and severe deterioration of the economic environment caused by COVID-19, and cited the example of the US economy, where the unemployment rate had risen from the lowest level in 60 years to its highest in over 80 years within a very short span of time. Nevertheless, in Asia, countries seem to have coped better with the public health crisis and currency depreciations among EMs have been modest relative to the scale of the pandemic shock. This reflected in part the role of central bank swap arrangements, which was a notable example of constructive global economic policy cooperation, in contrast to the failures in international coordination in the public health arena, reflecting fundamental distrust between the key strategic players in the global economy. Davis noted that previous periods of cooperation to secure and support the liberal international system had led to tremendous human development in most of the world. The significant contribution of this year's commissioned paper was in the formalisation of an integrated policy framework for the joint use of monetary policy, macroprudential policies, foreign exchange interventions and capital controls, together with the proposed issuance of a global safe asset as a means to achieve a self-stabilising global financial architecture beneficial to EMs.

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Special Feature B

Issues and Challenges in the Fiscal Policy Response to COVID-19

COVID-19 has led to an economic crisis of historic proportions. While monetary policy has played an important role in stabilising financial markets and ensuring sufficient liquidity for corporates and households, many academics and policymakers had agreed at an early stage of the crisis that the larger burden for ensuring macroeconomic stability should be on fiscal policy. At the same time, economists have also pointed out that the COVID-19 shock differs in fundamental ways from those that have precipitated economic recessions over the past century, which complicates the application of traditional macroeconomic frameworks used to calibrate the optimal fiscal response.

This Special Feature begins by discussing key characteristics of the nature and transmission of the COVID-19 shock to the economy. It then reviews the academic and policy discussion on optimal fiscal policy responses to COVID-19. First, optimal design of the fiscal policy response is considered, taking into account the peculiarities of the shock. Second, possible long-term consequences of an aggressive fiscal response in the aftermath of COVID-19 are discussed.

1 The Nature of the COVID-19 Shock

Direct Supply and Demand Effects of a Pandemic

Pandemics, like other natural disasters, are typically regarded as examples of aggregate supply shocks. That is, spreading infection in the population reduces the amount of factor inputs available for production, leading to a temporary decline in potential output. In the current context, COVID-19 has also led to a significant negative aggregate demand shock; thus COVID-19 has induced negative shocks to both aggregate demand and aggregate supply.

The COVID-19 shock to aggregate supply has reduced the productive capacity of the economy via temporary reductions in factor inputs and factor productivity in several important ways.

- The spread of infection in the population reduces labour supply as workers fall ill, with further declines due to quarantining of those in close contact with infected persons. Closure of schools forces many parents of younger children to work from home while taking on additional childcare duties, also reducing the effective labour supply.
- Temporary closures of physical workplaces to reduce disease contagion also increase the stock of available physical capital that lies idle (e.g., factories and machinery).

- Trade disruptions may reduce the supply of imported intermediate inputs and/or increase import prices, exposing countries to cost-push shocks and reducing aggregate supply temporarily. By simulating the effects of country-specific lockdown measures in a global input-output model, Guan *et al.* (2020) show that the reduction of China's output due to lockdown measures in January and February had considerable indirect impact on other countries via global supply chain linkages. In the electronics sector specifically, the analysis finds that reduced production capacity in China had substantial effects on upstream suppliers, triggering production declines in South Korea's electronics sector, as well as in Japan's and Australia's production of metals (by about 21% in each case). In terms of effects on downstream electronic purchases, lower Chinese electronics output is estimated to have had the largest impact on the US, Japan, Mexico and France, reducing electronics purchases by an estimated 28% for each country.

The pandemic has also had direct negative impact on aggregate demand, via both external and domestic channels.

- Trade and mobility disruptions from cross-border movement restrictions designed to slow infection spread have external demand effects, which are particularly significant for countries that are highly dependent on trade and tourism.
- Distancing restrictions within countries also reduce consumer spending on categories associated with social activities. This effect has been only partially offset by increases in spending on other items, such as electronics.
- Uncertainty about the trajectory of the COVID-19 shock can also be a drag on aggregate demand. Facing uncertainty about their future income earning capacity, households and firms may increase their precautionary savings by scaling down their consumption and investment plans, which further reduces aggregate demand. Altig *et al.* (2020) find that broad measures of macroeconomic uncertainty rose to unprecedented levels globally in March. As of August, they remained elevated.

The simultaneous supply and demand effects of a pandemic are neatly illustrated in a simple macroeconomic model by Eichenbaum *et al.* (2020). The authors show that having a growing fraction of the population infected with the disease results in both aggregate supply shocks, from infected individuals being unable to work, and aggregate demand shocks, from households reducing consumption to avoid infection. In this framework, the foremost priority for governments is to aggressively reduce the infected share of the population via containment measures, in order to limit the impact of these simultaneous supply and demand shocks. In addition, the authors find that there are substantial public health and economic costs of easing containment measures too early; lifting containment measures before infections peak leads to a short-term surge in consumption by 17%, but also results in the death rate rising from 0.26% to 0.4% of the population and induces a second, persistent economic recession.

Interactions between Supply and Demand

The initial supply shocks may also negatively affect aggregate demand, leading to the large output gaps that are familiar from traditional crises. For example, Guerrieri *et al.* (2020)

demonstrate that in the COVID-19 context, an initial negative shock to aggregate supply has the potential to cause an even larger decline in aggregate demand. The supply shock induced by COVID-19 has affected some sectors disproportionately, especially contact-intensive industries that have seen forced closures in many countries. As workers from these sectors see their incomes decline (if social insurance against income shocks is incomplete), they may cut back on spending, reducing demand in sectors that did not experience a supply shock. The demand shortfall is compounded if demand in sectors that have shut down is not reallocated to those that remain open, possibly because sector outputs are poor substitutes. In aggregate, this implies that the demand shock may be larger than the initial supply shock, a dynamic that the authors call a “Keynesian supply shock”.

The sharp and broad-based decline in revenues across the real economy could result in disruptions to financial stability in the presence of liquidity constraints and other financial frictions. While the economic effects of COVID-19 did not emanate from the financial sector, the potential for financial sector disruptions that amplify the economic damage for the rest of the economy remains a threat. As seen during the GFC, a financial crisis that results in synchronised tightening of financial conditions and plunging asset prices can have devastating effects on aggregate demand.

Persistent Effects of the Shock

As long as the public health threat of COVID-19 remains significant, the dampening effects on economic activity will persist. Uncertainties over future waves of the disease in the absence of a vaccine, as well as over the long-term efficacy of any vaccine that is introduced, mean that the aforementioned supply and demand shocks may continue to stifle a nascent recovery.

Even after the public health risks dissipate, an extended period of income loss during COVID-19 may have severe scarring effects on the economy. As firm revenues continue to be depressed, many work stoppages that were initially temporary could turn into permanent job losses. Barrero *et al.* (2020) estimate that around the peak of US new unemployment claims in April, as much as 42% of job separations could lead to permanent job losses. This implies that even after the pandemic subsides, high unemployment may persist as the labour market struggles to absorb the large influx of jobless individuals. If COVID-19 induces persistent shifts in sectoral labour demand, an expedient reallocation of labour and reduction of unemployment may prove even more elusive, owing to mismatches between retrenched workers’ skills and the needs of expanding sectors.

Using data on 19 historical pandemics, Jordà *et al.* (2020) show some empirical evidence that they tend to induce labour shortages and deplete wealth, potentially reducing real interest rates for decades after the pandemic. While population losses experienced during past pandemics may not be as relevant today, their results suggest that a significant depletion of public and private wealth in the aggregate may limit the growth potential of economies in the medium term. Kozłowski *et al.* (2020) find that extreme adverse events like COVID-19 may persistently dampen economic growth by changing beliefs—after COVID-19, consumers and firms may revise their beliefs about the likelihood of economic tail risks, reducing incentives to invest and depressing the long-run natural rate of interest by up to 67 basis points.

2 The Role of Fiscal Policy in a Pandemic

Challenges for the Fiscal Policy Response

The nature of the COVID-19 shock has complicated the fiscal policy response to the crisis in two ways. First, the contemporaneous supply and demand shocks have led many economists to argue that traditional aggregate demand management via fiscal stimulus is ineffective and that the fiscal response should instead aim at maintaining the productive capacity of the economy. Second, in the absence of a readily available vaccine, the ongoing public health threat will continue to suppress economic activity, preventing a full economic recovery from taking hold. Maintaining fiscal support beyond the duration of a typical business cycle recession is very costly and societies will have to contend with the resulting excessive debt accumulation.

In a standard business cycle downturn, countercyclical fiscal policy is typically employed to mitigate aggregate demand shortfalls, working through a classic Keynesian multiplier mechanism. In addition to raising aggregate expenditures directly by increasing public spending, fiscal policy aims to boost private sector consumption expenditures indirectly via the consumption multiplier. These mechanisms increase aggregate demand and help to forestall a deflationary spiral, as well as the accompanying rise in labour market slack and unemployment.

However, many economists have argued that stimulating aggregate demand would be ineffective during a phase of the COVID-19 crisis where government-imposed measures are weighing on aggregate supply. In the AS/AD framework, standard aggregate demand stimulus in the presence of aggregate supply constraints is ineffective at raising output and may even be inflationary. Instead of boosting aggregate spending, fiscal support should aim at ensuring that the economy retains its productive capacity. Several prominent economists, including Krugman (2020) and Furman (2020), have favoured the analogy of placing the economy into an induced coma while the pandemic spreads—rather than invigorate the economy, government spending should keep the economy “alive” while it undergoes necessary treatment. In a similar vein, Lazear (2020) argued that the key objective for the fiscal response to the pandemic should be to prevent demand shortages during COVID-19 from causing widespread firm and household defaults.

The fiscal response by most AEs reflects a general adherence to these prescriptions, as they have focused on facilitating credit to the broader economy and incentivising firms to retain workers.

Credit policies, in the form of liquidity provision and debt deferment schemes, have been widely employed not just by central banks, but also by fiscal authorities. In effect, these policies ease the budget constraints of firms and households during periods when negative income shocks are likely to tighten them. As such, credit policies aim to reduce defaults among solvent households and firms that are facing temporary liquidity shortages.

Perhaps the policies that best embody the principle of maintaining the economy’s productive potential are furlough schemes that have mainly been employed in Europe, and which have accounted for a large portion of the budgetary outlay in these economies. Many furlough schemes essentially subsidise firms under two conditions: that they operate near normal operating capacity and that they retain workers on payrolls. Incentives to keep workers on furlough maintain the economy just under full capacity, while preserving the

worker-firm matches that would allow production to recover quickly when economic activity resumes. By keeping workers employed, furlough schemes also provide indirect cash transfers to households.

Gourinchas (2020) contends that, given the economy-wide nature of the current pandemic, the consequences for personal and corporate bankruptcies may be dire and governments should adopt a “whatever it takes” approach to liquidity provision and cash transfers. This view has been echoed by Furman (2020) in terms of providing support for unemployed workers and by Beck (2020) in the provision of financial sector liquidity. Most governments have generally adopted such an approach, with the fiscal response to COVID-19 reaching unprecedented levels, and countries like Germany pledging to give out unlimited low-interest liquidity support to corporates. According to estimates from the IMF, the global fiscal deficit will rise by 10% points in 2020, double the increase of 4.9% points in 2009 amid the GFC.

The Role of Stimulus in a Supply Shock

Given that a temporary reduction in economic activity may be necessary to contain the pandemic, many economists have argued that there is still a role for direct fiscal spending if it is targeted at sectors that bear a disproportionate share of the negative shock, or if aggregate demand declines by more than the “necessary” decline in aggregate supply. Indeed, acknowledging the inevitability of a larger output gap at the current economic juncture does not imply that policy intervention is undesirable. It is quite likely that the fall in aggregate demand disproportionately affects certain sectors of the economy, justifying the use of targeted fiscal measures.

The assessment that fiscal stimulus is inappropriate during a pandemic is typically associated with a generic AS/AD framework with one representative sector in the economy, which Woodford (2020) contends is an over-simplification of COVID-19 dynamics. With economic effects being concentrated in a few sectors, Woodford (2020) shows using a network model of the economy that reduced economic activity in these sectors will generate cashflow disruptions for sectors unaffected by the initial shock, leading to inefficient spillovers on overall demand, regardless of whether the initial disturbance was due to supply or demand deficiencies.

The dynamics underlying a “Keynesian supply shock” as described in Guerrieri *et al.* (2020) have similar implications, where large shortfalls in aggregate demand may occur in sectors that have experienced a relatively small supply shock. In their framework, curtailed spending on one product may not be fully transferred to an imperfect substitute when the first product becomes unavailable. Baqaee and Farhi (2020), using a realistic elaboration of the AS/AD model, provide empirical evidence to show that the impact of the aggregate demand shock has indeed significantly exceeded the aggregate supply shock in many sectors, even those heavily affected by COVID-19. They thus argue that fiscal stimulus targeted at sectors with negative output gaps remains the appropriate policy response.

While the primary aim of many fiscal policies in AEs might have been to maintain the economy’s productive potential, many have also indirectly stimulated aggregate demand. A strand of research has gathered increasing empirical evidence to show that cash transfers to households may have mitigated the effects of COVID-19 on incomes and significantly stimulated aggregate consumption. Benzeval *et al.* (2020) show that the UK furlough scheme has had significant positive impacts on household consumption, while Baker *et al.* (2020) show that cash payments to households in the US have led to strong consumption effects,

especially among lower-income households. Hence, in a crisis involving simultaneous demand and supply shocks, the difference between preserving productive potential and providing fiscal stimulus may have been somewhat overstated.

3 Potential Side Effects of the Fiscal Response

Economists are broadly in agreement that the outsized fiscal response to COVID-19 was crucial in preserving the economy's productive potential while government-imposed lockdowns and safe distancing measures suppressed economic activity on an unprecedented scale. As such, sharply raising current government outlays while accumulating public debt was an inevitable and indeed justifiable response to the supposed temporary nature of COVID-19.

Nevertheless, almost a full year since the first cases of COVID-19 made headlines, the pandemic is still running its course, with social distancing measures and expansionary fiscal policy remaining in place for many countries. In view of an extended suppression of economic activity, policymakers will increasingly have to contend with unintended side effects from the current fiscal response that could impinge on the eventual recovery.

Unwinding of Credit and Income Support

As continued fiscal largesse will be unviable even for countries whose public sector balance sheets were healthy before COVID-19, fiscal support must be gradually unwound. However, the process of withdrawing fiscal support is not trivial and must be conducted with care. A premature unwinding of official support measures—before the private sector is ready to take up the slack—could potentially set back the nascent recovery and, in some cases, may even lead to a deterioration in debt sustainability. At the same time, an extended period of public sector support is not only costly but could trap the economy in its pre-COVID configuration, delaying the adjustments that are necessary for businesses to adapt to the post-COVID world. As conditions, constraints and resources differ across countries, there is no one-size-fits-all solution.

Credit policies and income support are generally targeted at *liquidity* problems faced by households and firms during COVID-19. However, the prolonged nature of the negative income shock may have eroded household and firm balance sheets sufficiently to induce *solvency* problems.

Solvency problems are likely to be most prevalent for lower-wage workers and firms whose income streams have not recovered by the time fiscal support programmes expire. In these cases, continuing fiscal support through credit policies and short-term cash transfers may simply be postponing insolvencies. Thus, the cessation of fiscal support may lead to a sharp deterioration in balance sheet positions and a spike in defaults. A fundamental challenge facing policymakers is that in attempting to bridge the near-term revenue and liquidity strains of businesses to the recovered economy of the future, there is an acute degree of uncertainty regarding the impact of the pandemic on the longer-term operating capacities and viability of specific industries in the post-COVID era.

A World Awash with Liquidity

During this period of severe stress for private and public entities, central banks' efforts to keep interest rates low and financial conditions easy have led to an abundance of liquidity

in global financial markets. This has resulted in a situation similar to the aftermath of the GFC, when the world was awash with liquidity and interest rates reached record low levels.

Excess liquidity and low interest rates may drive investors with return mandates, such as pension funds, towards more risky investments in a search for yield. Low returns also slow down the accumulation of retirement savings by the middle-aged and impose significant strains on pension systems.

There are also concerns that low interest rates may affect the quality of investments, with negative consequences for productivity growth. This may occur because a decline in long-term interest rates triggers a stronger investment response by market leaders relative to market followers, thereby leading to more concentrated markets, higher profits and lower aggregate productivity growth (Liu *et al.*, 2020). Another possibility is that low interest rates reduce financial pressure on “zombie firms”, which crowd out investment in and employment at more productive firms (Caballero *et al.*, 2008; Banerjee and Hoffman, 2018).

Rising Public Debt

Even before the COVID-19 crisis, there was an intense debate about whether the prevailing low interest rate environment would allow governments to accommodate their increasing indebtedness without suffering negative consequences.

A fiscal deficit is said to impose a cost if the service of the accompanying debt generated necessitates either expenditure cuts or tax increases in the future. Deficits have fiscal costs if the interest rate r that the government pays on its debt is higher than the growth rate of the economy g . At present, $r - g < 0$ holds for most countries, and additional debt does not necessarily entail a fiscal cost. For the US in particular, Blanchard (2019) argues that the case of negative $r - g$ may hold even in the steady state of the economy, and should thus not be regarded as extraordinary. However, Blanchard (2019) cautions that $r - g < 0$ does not mean that governments should just pile up debt. Even if debt has no fiscal cost, it still crowds out private investment and large deficits may direct expenditure to less productive or even wasteful uses.

Cochrane (2020) argues that while $r - g < 0$ means that debt-to-GDP ratios may be brought down even without primary surpluses, this does not mean that the ratio could safely grow without bounds. There is likely to be a threshold beyond which the private sector would demand higher interest rates to hold government debt, which would trigger an explosive path for the debt-to-GDP ratio in the absence of primary surpluses.

Sovereign Debt Crises

In theoretical models, sovereign debtors service their debts by choice. At any point in time, they evaluate the costs and benefits of honouring their debt obligations. Debt service is costly but comes with the benefit of continued access to credit markets and avoids the penalties from defaulting or reneging on the debt. Sovereigns with a strong track record of honouring their obligations are charged lower interest when they need new borrowing. However, when debt grows too large, debt service becomes too costly and may dwarf the benefits from continued market access. When that happens, governments may choose to renege on or inflate away public debt, a path that has been taken on multiple occasions by some countries. In their seminal paper, Reinhart *et al.* (2003) argue that countries with a

history of serial defaults may have relatively low thresholds for debt sustainability, a phenomenon which they call debt intolerance.

While there is uncertainty about the precise level of debt that would trigger perverse debt dynamics for each country, history has shown many examples of how sovereign debt crises unfold. As debt rises, creditors understand that there is an increased risk of debt repudiation or monetisation, so they increase their assessment of the probability of higher inflation, caused by debt monetisation or outright default. This prompts perverse dynamics as domestic and foreign debt holders attempt to reduce their exposures to the overindebted sovereign, often reflected in reductions in government debt maturity and shifts in debt composition towards US\$-denominated bonds and exchange rate depreciation pressures.

Importantly, inflation can occur even before sovereigns actually resort to debt monetisation. Expectations of a debt crisis often trigger exchange rate depreciation, which is passed through to the domestic price of imported goods. Depending on the prevalence of price and wage indexation, inflation effects may be compounded via a wage-price spiral. Under high debt circumstances, monetary policy may be rendered ineffective as the government increasingly finances itself at short maturities, implying that a tighter monetary policy stance further worsens the fiscal situation and leads to even greater inflationary pressures. This mechanism underlies the unpleasant monetarist arithmetic described in the seminal Sargent and Wallace (1981) paper.

Facing a high marginal cost of finance, governments may follow several distortionary courses of action, such as delaying payments to payroll and contractors, forcing the private sector to hold government debt (financial repression) or reneging on its debt. Each one of these would impinge on economic recovery.

Recent experience has shown increased differentiation between EMs in terms of their capacity to issue sovereign debt. Unlike previous episodes such as the Russian default in the 1990s, which raised borrowing costs for almost all EMs, Argentina's recent debt restructuring had only a small impact on the borrowing spreads of other EMs. However, this state of affairs should not be taken for granted. As the rise in debt is set to be a global phenomenon, there is a risk that isolated sovereign defaults by large EMs could trigger tighter financial conditions for all other EMs. Although the world has seen increasing convergence of inflation rates among AEs and EMs, particularly after the GFC, this trend may reverse if EMs collectively face difficulties rolling over large stocks of sovereign debt.

A Resurgence of High Inflation

High inflation episodes are often associated with fiscal crises. Recent articles have considered the possibility that the fiscal response to the COVID-19 crisis could lead to a resurgence of high inflation episodes in selected countries. While regarding high inflation after the pandemic as highly improbable, Blanchard (2020) argues that high inflation may occur if the following three conditions come to pass: (i) high debt levels relative to GDP; (ii) large increases in the real neutral rate; and (iii) fiscal dominance of monetary policy. He argues that a debt-laden fiscal authority may be incentivised to maintain low interest rates, even when the neutral rate rises after the pandemic, potentially leading to high inflation.

In other words, while high debt levels are likely to be the end-result of the COVID-19 crisis for many countries, these are not inflationary as long as the real neutral rate is low (which supports debt sustainability) and monetary policy is dominant (which requires fiscal policy adjustment to maintain debt sustainability).

Private Debt Hangover

Increased private sector indebtedness is likely to pose a hurdle to the recovery of investment and productivity growth. This applies to both household and corporate debt. As households attempt to reduce their indebtedness, they would postpone purchases of durable or non-essential goods and this may pose a drag on demand for an extended period. As firms attempt to deleverage, they could either defer investments or take greater risks to ensure survival, leading to a drag on productivity growth. Further, the combination of low growth and high indebtedness may lead to elevated financial stability risks.

4 Sum-up

The COVID-19 shock, which has led to a combination of demand and supply contractions, poses particular challenges for macroeconomic policy. This Special Feature has reviewed key considerations that have informed the fiscal policy response in many AEs and EMs during the COVID-19 crisis. Alongside highly accommodative monetary policy, the deployment of fiscal support at unprecedented levels has been crucial for mitigating the severity of the global economic recession in the short term.

It is important, however, to appreciate that there will almost certainly be long-tailed side effects arising from the pandemic as well as countries' macroeconomic responses so far. It will be crucial for governments to invest in the capabilities of workers and firms, to ensure a robust resumption of growth and to avoid an extended period of high unemployment and capacity underutilisation. Such supply-side policies would also reduce the likelihood of a long-term impairment to the incomes of individuals.

Amid persistently elevated macroeconomic uncertainty, high public sector debt levels will lead to additional downside risks, while undermining the ability of both fiscal and monetary policy to respond to future crises. These conditions will present a new set of challenges for policymakers, demanding a different profile of interventions than those that have been successfully implemented so far.

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Special Feature C

Forecasting Singapore GDP Using SPF Data

Tian Xie and Jun Yu¹

In this Special Feature, we use econometric and machine learning (ML) methods, as well as a hybrid method, to forecast the GDP growth rate in Singapore based on the Survey of Professional Forecasters (SPF). We compare the performance of these methods with the sample median used by MAS. It is shown that the relationship between the actual GDP growth rates and the forecasts from individual professionals is highly non-linear and non-additive, making it difficult for all linear methods and the sample median to perform well. It is found that the hybrid method performs the best, reducing the mean squared forecast error by about 50% relative to that of the sample median.

1 Introduction

A very large body of applied work in economics has tried to forecast key macroeconomic indicators, including GDP growth rates, unemployment rates, and inflation rates, reflecting the vital importance of these macroeconomic variables to many decision makers in the economy. In this Special Feature, we focus our attention on predicting the GDP growth rate in Singapore with both conventional econometric and machine learning (ML) methods, using responses to MAS' Survey of Professional Forecasters (SPF).²

The SPF is a leading survey of macroeconomic forecast consensus in Singapore, which has been conducted by MAS since Q4 1999.³ The survey is conducted quarterly following the release of economic data for the previous quarter by the Ministry of Trade and Industry (MTI) and contains forecasts for 15 key economic indicators, including the y-o-y real GDP growth rate. It should be noted that the SPF results do not represent MAS' own views or forecasts.

Every quarter, MAS reports the sample median and the empirical density of the forecasts from respondents. In this Special Feature, we denote the sample median as the benchmark forecast whereas Genre *et al.* (2013) employ the sample mean as the benchmark in another strand of the literature. We find that the difference between the sample median and the sample mean is negligible in the SPF.

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² The SPF is made available to the public at <https://www.mas.gov.sg/monetary-policy/MAS-Survey-of-Professional-Forecasters>.

³ There are some similar surveys internationally with different starting dates. Two well-known examples are the SPF produced by the Federal Reserve Bank of Philadelphia since the late 1960s and the SPF collected by the ECB for the Eurozone since the late 1990s.

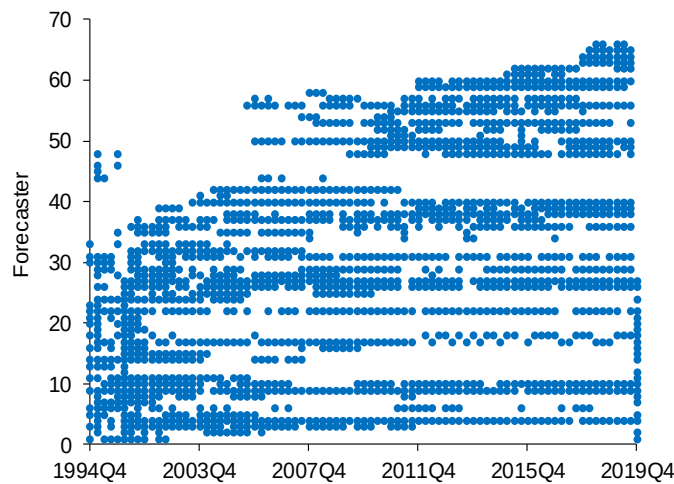
We first describe the data in Section 2. In Section 3, we introduce alternative methods for obtaining the forecasts and discuss the criteria used to evaluate those forecasts. Section 4 provides an empirical analysis to contrast the performance of alternative methods and the benchmark method. Section 5 concludes.

2 Data

In this Special Feature, we consider utilising individual forecasts from the SPF, denoted as $\{x_{1t}, \dots, x_{pt}\}$, where $i = 1, \dots, p$, to predict the real GDP growth rate, denoted as y_{T+1} . Here i represents the i^{th} forecaster, t represents the period t where $t = 1, \dots, T$. From Q4 1999 to Q4 2019, the SPF collected one-month-ahead predictions of the quarterly real GDP growth rate from 66 different forecasters.⁴ At period T , the sample median of $\{x_{1T}, \dots, x_{pT}\}$, which is the “middle” number of these numbers when they are listed in ascending order, acts as the final forecast of y_{T+1} .

However, an initial data cleaning is necessary since a specific forecaster may or may not submit a survey response each time throughout the whole period. **Chart 1** describes the entries and exits of individual forecasters over the survey period. A blue dot represents a specific forecaster (labelled in the vertical axis) if he or she submitted a survey response and a blank space indicates otherwise.

Chart 1 An illustration of the entries and exits of individual forecasters



The data clearly exhibit severe sparsity in the submission of forecasters. To avoid the issues caused by missing observations, we follow Genre *et al.* (2013) to remove irregular respondents if he or she misses more than 50% of the observations. In the end, we narrowed down to $p = 15$ qualified forecasters. Then the missing observations for each forecaster are filled using the approach suggested in Genre *et al.* (2013).

⁴ Take Q1 as an example. Questionnaires are sent out to forecasters in the middle of February and forecasting results must be submitted before the end of February.

3 Methods

Let $\mathbf{X}_t = [1, x_{1t}, \dots, x_{pt}]'$. If all the p forecasters are used in the prediction model, and the relationship between y_{t+1} and all the elements in $\mathbf{X}_t$ is linear and additive, the following linear model can then be presumed:

$$y_{t+1} = \boldsymbol{\beta}'\mathbf{X}_t + \varepsilon_t \quad (1)$$

where $\boldsymbol{\beta}$ is a vector of slope parameters and ε_t is the error term. There are $p+1$ slope parameters in Equation (1). In practice, p can be very large and therefore the estimation error can be large as well. If $p > T-2$, it is not viable to estimate $\boldsymbol{\beta}$ by the Least Squares method.

In practice, we do not know if all forecasters improve model projections. If most of the variables in $\mathbf{X}_t$ are not useful, which means there is sparsity in Equation (1), one needs to deal with the problem of variable selection and parameter estimation simultaneously. Furthermore, there is no reason to believe why the relationship between y_{t+1} and $\mathbf{X}_t$ should be linear and additive. Although it is theoretically possible to specify a general functional form to relate y_{t+1} and $\mathbf{X}_t$ as follows:

$$y_{t+1} = f(\mathbf{X}_t) + \varepsilon_t, \quad (2)$$

The nonparametric estimation of $f(\mathbf{X}_t)$ incurs the well-known problem of the curse of dimensionality even when p is of a moderate magnitude.

In this section, we review four methods to forecast Singapore's GDP based on SPF survey outcomes. Other than the benchmark method of the sample median, we also use the complete subset regression (CSR) of Elliott *et al.* (2013), the Elastic Net (EN) method of Zou and Hastie (2005), the Least Squares Support Vector Regression (LSSVR) method of Suykens and Vandewalle (1999) and the Mallows-type model averaging LSSVR method of Qiu *et al.* (2020). The first method is a conventional econometric method. The second method is a variable selection method. The third method is a ML technique. The last method combines an econometric method with a ML method. Most econometric methods impose prior assumptions on the data generating process (DGP), which is necessary for deriving useful statistical properties. On the other hand, many ML methods are data-driven and do not require assumptions on the DGP. For these methods, statistical properties are not the primary concern. A more extensive survey of both econometric and ML methods for a forecasting purpose can be found in Xie *et al.* (2020).

3.1 Complete Subset Regression (CSR)

The CSR of Elliott *et al.* (2013) is a method for mixing forecasts from all possible linear regression models, each of which uses only a subset of predictors. Specifically, each model has a fixed number of predictors from a given set of potential predictor variables. The weight assigned to each model can be the same or different.

To explain the idea, let the number of predictor variables be fixed at one, although we use five predictor variables in our empirical study, implying that there are p subsets of

predictors, and thus p possible linear regression models. In this case, the equally weighted forecast of y_{T+1} is given by:

$$\hat{y}_{T+1} = \frac{1}{p} \sum_{i=1}^p [\hat{\beta}_{0i} + \hat{\beta}_{1i} x_{iT}] \quad (3)$$

where $\hat{\beta}_i = [\hat{\beta}_{0i}, \hat{\beta}_{1i}]'$ is the Least Squares estimate of $\beta_i = [\beta_{0i}, \beta_{1i}]'$ from the following linear regression model:

$$y_{t+1} = \beta_{0i} + \beta_{1i} x_{it} + \varepsilon_t, \quad t=1, \dots, T-1 \quad (4)$$

One of the successful applications of CSR in economics and finance is Rapach *et al.* (2010) where each of the potentially informative predictors is used to predict stock returns.

3.2 Elastic Net (EN)

When the number of predictors p is large and a significant subset of predictors is not informative in predicting y_{t+1} , Equation (1) and the Least Squares method do not perform well out-of-sample. Many penalised regressions have been proposed to select predictors which can improve predictive precision. One of the successful methods is the EN of Zou and Hastie (2005). The idea of the EN is to shrink the slope parameter towards zero if the associated predictor is not significant. An insignificant predictor provides little explanatory power on y_{t+1} but may introduce a large variation on prediction outcomes. By shrinking the magnitude of the slope parameter, we reduce the prediction variance and therefore improve the prediction accuracy.

The EN imposes a constraint on the sum of squared coefficients excluding the intercept. That is,

$$\hat{\beta}^* = \arg \min_{\beta^*} \left\{ \sum_{t=1}^{T-1} \left[y_{t+1} - \beta_0 - \sum_{i=1}^p \beta_i x_{it} \right]^2 + \lambda \left[\alpha \sum_{i=1}^p |\beta_i| + (1-\alpha) \sum_{i=1}^p \beta_i^2 \right] \right\},$$

where $\beta^* = [\beta_0, \beta_1, \dots, \beta_p]'$, the second term in the curly bracket, is the penalty that contains two components (one is the L_1 -penalty and the other is L_2 -penalty), λ is a tuning parameter that determines the severity of the penalty and α is a mixing parameter that determines the trade-off between the two penalty terms. The penalty term is used to shrink the slope parameters to accommodate possible sparsity in potential predictors.

3.3 Least Squares Support Vector Regression (LSSVR)

Instead of locating a consistent estimator of $f(X_t)$ in Equation (2), most ML techniques try to find a good approximation to $f(X_t)$ so that the approximation leads to an accurate forecast of y_{t+1} .

The Support Vector Regression (SVR) of Drucker *et al.* (1996) approximates $f(X_t)$ by a set of basic elements, in which the ensemble of these elements mimics $f(X_t)$. In

mathematics, we call these basic elements basis functions. Denote $\{h_s(X_t)\}_{s=1}^S$ as basic functions that can be of infinite dimensions. Equation (1) can thus be rewritten in the following form:

$$y_{t+1} = f(X_t) + \varepsilon_t \approx \sum_{s=1}^S \beta_s h_s(X_t) + \varepsilon_t \quad (5)$$

To estimate $\beta = [\beta_1, \dots, \beta_s]'$, we minimise the following criterion:

$$H(\beta) = \sum_{t=1}^{T-1} V_e(y_{t+1} - f(X_t)) + \lambda \sum_{s=1}^S \beta_s^2 \quad (6)$$

where $V_e(\cdot)$ is the loss function. If $|\cdot| < e$, the loss takes a value zero as if its loss is “tolerated” by the method. If $|\cdot| \geq e$, the loss is defined to be $|\cdot| - e$.

Suykens and Vandewalle (1999) modified the SVR algorithm by replacing $V_e(\cdot)$ with a squared loss, which results in solving a set of linear equations. This method is known as LSSVR, which leads to the following expression for the optimal solution:

$$\hat{f}(X_t) = \sum_{t=1}^{T-1} \hat{\alpha}_t K(x, X_t) \quad (7)$$

where x is any given vector of values for predictors, $\{\hat{\alpha}_t\}_{t=1}^T$ are the estimated Lagrangian multipliers in the optimisation problem, and $K(\cdot, \cdot)$ is the predetermined kernel function. We consider the Gaussian kernel function given by:

$$K(x, X) = e^{-\|x - X\|^2 / (2\sigma_x^2)} \quad (8)$$

where σ_x^2 is a hyperparameter that users specify in advance.

3.4 LSSVR^{MA}

Most ML methods, including LSSVR, do not account for model uncertainty. While the CSR method accounts for model uncertainty, it assumes that the relationship between y_{t+1} and each x_{it} is linear. If the relationship between y_{t+1} and some x_{it} is non-linear and hence model uncertainty needs to be accounted for, then a reasonable approach is to apply the idea of forecast combinations to a set of ML strategies, as suggested in Qiu *et al.* (2020). Following Qiu *et al.* (2020), we blend the idea of forecast combination with the LSSVR method. The new method is denoted LSSVR^{MA}, where the superscript MA indicates model averaging.

Let $y = [y_2, \dots, y_T]'$. Suppose the m^{th} LSSVR strategy uses $X_t^{(m)}$, which is a subset of X_t , to forecast y_{T+1} with $m=1, \dots, M$. That is, in total there are M strategies. Denote $\hat{y}_{T+1}(m)$ as the forecast of y_{T+1} under the m^{th} LSSVR strategy. Qiu *et al.* (2020) show that LSSVR leads to $\hat{f}(X_t^{(m)}) = P_{(m)} y := P(X_{(m)}, X_{(m)}) y$, where $X_{(m)} = [X_1^{(m)}, \dots, X_{T-1}^{(m)}]$ for any

$m=1,\dots,M$. Qiu *et al.* (2020) then construct the weighted average forecast of y_{T+1} and choose the weights using an information criterion.

4 Empirical Results

We conduct forecasting exercises using the data described in Section 2. We list the five forecasting methods, the tuning parameters, and the model settings in **Table 1**.⁵

Table 1 Summary of the five methods to forecast Singapore's GDP growth

Method	Parameter
SPF median	Median of all available forecasts from SPF
CSR	5 predictors, 1000 models, equal weight
EN	$\lambda = 0.5$, $\alpha = 0.5$
LSSVR	Gaussian kernel, $\sigma_x = 10$
LSSVR ^{MA}	Gaussian kernel, $\sigma_x = 10$, full combination

A rolling window approach is implemented to obtain a one-quarter-ahead forecast of Singapore's GDP growth. The initial period for making the forecast is Q4 2009. The window length is set to 40. The out-of-sample performance of the five methods is evaluated by mean squared forecast error (MSFE) and mean absolute forecast error (MAFE) as defined by:

$$\text{MSFE} = \frac{1}{K} \sum_{k=1}^K (y_{T+k} - \hat{y}_{T+k})^2 \quad (9)$$

$$\text{MAFE} = \frac{1}{K} \sum_{k=1}^K |y_{T+k} - \hat{y}_{T+k}| \quad (10)$$

where K is the total number of quarters when we forecast the GDP growth, $\hat{y}_{T+k}$ is the one-step-ahead forecasted value of y_{T+k} at period $T+k$ by one of the five methods.

The values of MSFE and MAFE and their associated ranking for all the five methods are reported in **Table 2**. The lowest MSFE and MAFE are presented in boldface.

⁵ We also consider alternative settings of tuning parameters. The results are qualitatively intact.

Table 2 Out-of-sample forecasting comparison of five methods

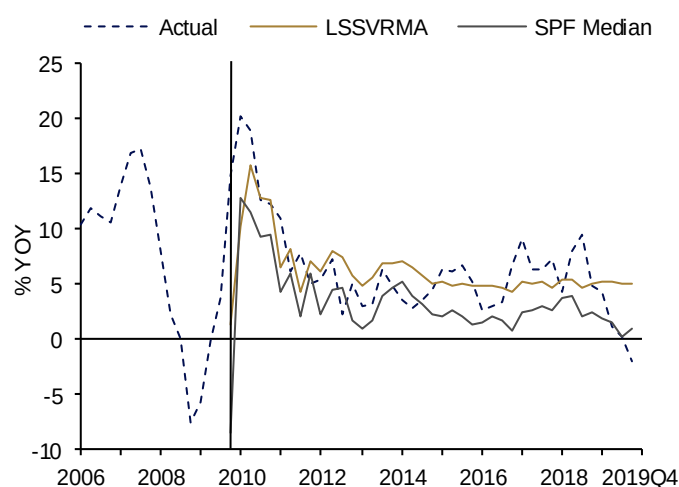
Methods	MSFE		MAFE	
	Value	Ranking	Value	Ranking
SPF Median	26.73	4	3.54	5
CSR	28.82	5	3.50	4
EN	25.70	3	3.27	3
LSSVR	14.24	2	2.74	2
LSSVR ^{MA}	13.96	1	2.69	1

A few conclusions can be drawn from **Table 2**. First, it can be seen that all methods tested improve on the SPF median forecast with the exception of the CSR, which is worse than the SPF median under MSFE.

Second, LSSVR^{MA} always performs the best followed by LSSVR. LSSVR^{MA} acknowledges model uncertainty by combining forecasts from different candidate models, whereas LSSVR ignores model uncertainty and relies on one single model to deliver the forecasts. The sound performance of LSSVR^{MA} relative to LSSVR suggests that there exists model uncertainty. Note that this does not necessarily imply that all the models considered in LSSVR^{MA} help to improve the GDP growth prediction (at least not equally). For example, it is possible that an accurate combined forecast is due to two highly biased forecasters, one of which overpredicts and the other underpredicts.

Third, the two LSSVR-based methods perform much better than the other three methods, implying a non-linear dependence between y_{t+1} and x_{it} 's. For example, compared to the benchmark median method, LSSVR^{MA} gains at reducing the MSFE value by almost 50%. If we fit a partially linear model, one could see a strong non-linear relationship between y_{t+1} and individual x_{it} . In the interests of brevity, the empirical results for the partially linear model are not reported here. Fourth, the fact that the EN slightly outperforms CSR and the sample median indicates that there is no strong evidence of sparsity in x_{it} 's. We also note that even the best method yields a high MAFE value of 2.69%. This is due to the fact that our evaluation interval (Q4 2009 – Q4 2019) overlaps with periods of high macroeconomic volatility such as the recent trade war between the US and China, which makes forecasting GDP growth unusually difficult.

To visually compare the forecast accuracy of the benchmark method and the LSSVR^{MA} method, we plot two forecasted series of these two methods against the actual data in **Chart 2**. It is apparent that the SPF median forecast often underestimates the actual values, especially from 2015–18. Although flatter than the actual values, the forecasts by the LSSVR^{MA} method captures the level and the trend reasonably well.

Chart 2 A comparison of two forecasts of Singapore GDP growth

To examine if the improvement in forecast accuracy is significant, we perform the Giacomini-White (GW) test of the null hypothesis that the method listed in the columns of **Table 3** performs equally well as the method listed in the rows in terms of absolute forecast errors (Giacomini and White, 2006). The p-values of the GW test for all pair-wise comparisons are reported in the table. The five methods can be divided into two groups. The SPF median, CSR, and the EN form the first group. There is no statistically significant difference in the forecasting performance of the methods in this group. LSSVR and LSSVR^{MA} form the second group. There is no statistically significant difference in the forecasting performance of the methods in the second group. However, the methods in the second group statistically significantly outperform the methods in the first group at either the 5% level or the 10% level.

Table 3 The p-values of the GW test in all pair-wise comparisons

Methods	SPF Median	CSR	EN	LSSVR
SPF Median	-	-	-	-
CSR	0.4345	-	-	-
EN	0.4931	0.6245	-	-
LSSVR	0.0345	0.0508	0.0870	-
LSSVR ^{MA}	0.0325	0.0589	0.0929	0.6881

5 Conclusion

We have considered five methods, including two conventional econometric methods, a variable selection method, a ML method, and a hybrid method, to forecast the GDP growth rate in Singapore based on the SPF data. The performance of these methods is then compared to the sample median of SPF forecasts. It is demonstrated that the hybrid method performs the best, reducing MSFE by about 50% over that of the sample median. The gain is verified to be statistically significant at the 5% level.

Our exercise suggests that it is possible to produce more accurate forecasts of the Singapore GDP growth rates than the median forecast of the SPF. Our results also show that the forecasts of most, if not all, of the professional forecasters contain useful information about the next-quarter Singapore GDP growth rate. Therefore, they should not be given a zero weight in models for forecasting GDP. Since the relationship between SPF forecasts of GDP growth and GDP outturns is potentially non-linear and complex, a ML method is helpful in this case. Moreover, the hybrid method leads to the most accurate forecasts, likely because it can accommodate model uncertainty.

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Statistical Appendix

Gross Domestic Product

Table 1	Real GDP Growth by Sector
Table 2	Real GDP Growth by Expenditure Components

Labour Market

Table 3	Wages, Value Added Per Worker and Unit Labour Cost
Table 4	Employment by Sector

Trade

Table 5	Imports and Exports by Category
Table 6	Non-oil Domestic Exports by Destination

Consumer Price Index and Inflation

Table 7	Consumer Price Index by Expenditure Category and MAS Core Inflation Measure
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Balance of Payments

Table 8	Current Account
Table 9	Capital and Financial Accounts

Exchange Rates

Table 10	Bilateral Exchange Rates
Table 11	Singapore Dollar Nominal Effective Exchange Rate (S\$ NEER)

Monetary Aggregates and Interest Rates

Table 12	Money Supply
Table 13	Interest Rates
Table 14	Domestic Liquidity Indicator (DLI)

Government Finance

Table 15	Government Operating Revenues, Expenditures and Transfers
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Table 1: Real GDP Growth by Sector

	2018	2019	2019				2020		
			Q1	Q2	Q3	Q4	Q1	Q2	Q3*
Year-on-year Percentage Change									
Overall Economy	3.4	0.7	1.0	0.2	0.7	1.0	-0.3	-13.3	-7.0
Manufacturing	7.0	-1.4	0.0	-2.7	-0.7	-2.3	7.9	-0.8	2.0
Finance & Insurance	7.2	4.1	3.1	5.1	4.1	4.0	8.3	3.4	
Business Services	2.4	1.4	1.8	1.0	1.1	1.7	-3.4	-20.2	
Construction	-3.5	2.8	1.4	2.3	3.1	4.3	-1.2	-59.9	-44.7
Wholesale & Retail Trade	2.8	-2.9	-2.7	-3.6	-3.5	-1.9	-5.6	-8.2	
Accommodation & Food Services	3.1	1.9	2.0	1.2	1.9	2.5	-23.8	-41.4	
Transportation & Storage	0.0	0.8	0.4	2.1	0.0	0.8	-7.7	-39.2	
Information & Communications	6.5	4.3	4.9	3.4	4.4	4.5	2.6	-0.5	
Quarter-on-quarter Percentage Change (Seasonally Adjusted)									
Overall Economy			0.6	-0.2	0.6	0.2	-0.8	-13.2	7.9
Manufacturing			-0.9	-1.0	1.2	-1.5	9.6	-9.1	3.9
Finance & Insurance			0.2	3.3	-0.5	0.9	4.3	-1.4	
Business Services			1.3	-0.3	0.3	0.5	-4.1	-17.4	
Construction			1.9	-0.1	0.9	1.3	-3.2	-59.5	38.7
Wholesale & Retail Trade			-0.8	-0.5	-0.3	-0.1	-4.7	-3.3	
Accommodation & Food Services			-0.6	0.7	1.2	1.1	-26.0	-22.6	
Transportation & Storage			0.3	0.8	-0.8	0.5	-8.1	-33.8	
Information & Communications			-1.4	0.7	2.6	2.1	-2.6	-2.3	

* Advance Estimates

Source: Singapore Department of Statistics

Table 2: Real GDP Growth by Expenditure Components

	2018	2019	2019				2020	
			Q1	Q2	Q3	Q4	Q1	Q2
Year-on-year Percentage Change								
Total Demand	6.3	-0.7	-0.6	-1.3	-2.1	1.1	0.5	-16.0
Domestic Demand	1.9	1.3	3.6	1.0	1.1	-0.2	0.8	-20.9
Consumption	3.9	3.5	4.9	2.7	3.5	3.0	0.2	-18.2
Private	4.2	3.7	5.4	3.2	3.8	2.6	-2.4	-28.2
Public	2.9	2.8	3.4	0.7	2.6	4.3	8.0	22.1
Gross Fixed Capital Formation	-3.4	-0.2	-0.6	-0.7	2.5	-1.7	3.9	-27.2
Private	-3.1	-0.5	-0.3	-1.7	3.3	-3.0	3.5	-25.6
Public	-4.7	1.3	-1.7	4.1	-0.9	4.5	5.3	-34.8
Exports of Goods and Services	8.1	-1.6	-2.2	-2.2	-3.4	1.6	0.4	-14.0
Imports of Goods and Services	7.3	-1.7	-2.4	-2.5	-3.3	1.4	2.4	-16.0

Source: Singapore Department of Statistics

Table 3: Wages, Value Added Per Worker and Unit Labour Cost

	2018	2019	2019				2020	
			Q1	Q2	Q3	Q4	Q1	Q2
Year-on-year Percentage Change								
Average Monthly Earnings	3.5	2.6	3.4	2.1	4.5	0.5	2.4	1.0
Value Added Per Worker								
Overall Economy ¹	2.7	-0.9	-0.4	-1.3	-1.0	-0.7	-1.6	-11.6
Manufacturing	8.3	-0.9	0.2	-2.4	0.2	-1.7	8.6	1.4
Construction	0.9	2.1	2.4	2.1	1.9	2.0	-3.5	-58.6
Wholesale & Retail Trade	2.6	-2.7	-2.8	-3.7	-3.1	-1.0	-3.9	-3.7
Accommodation & Food Services	2.2	-1.3	-0.2	-2.0	-1.9	-1.2	-24.3	-35.0
Transportation & Storage	-3.3	-0.9	-2.3	0.2	-1.2	-0.3	-8.3	-38.7
Information & Communications	1.7	-1.4	-1.2	-2.5	-1.1	-0.6	-1.5	-3.0
Finance & Insurance	4.7	1.3	-0.1	2.1	1.6	1.6	4.7	0.7
Business Services	0.1	-1.0	-0.2	-0.9	-1.7	-1.2	-6.6	-20.8
Unit Labour Cost								
Overall Economy	0.3	2.8	2.5	3.3	3.6	2.1	1.2	-18.6
Goods-producing Industries	-4.0	2.2	0.4	4.1	2.3	2.6	-6.3	-30.7
Manufacturing	-4.1	3.2	1.6	5.6	3.4	3.0	-8.8	-33.0
Services-producing Industries	1.5	3.0	3.2	3.0	3.9	1.8	4.1	-14.5

Source: Central Provident Fund, Singapore Department of Statistics and Ministry of Manpower

¹ Based on GDP at market prices in chained 2015 dollars. Value added per worker for sectors is computed using gross value added at basic prices in chained 2015 dollars.**Table 4: Employment by Sector**

	2018	2019	2019				2020	
			Q1	Q2	Q3	Q4	Q1	Q2
Year-on-year Change in Employment (Thousand)								
Overall Economy (SSIC 2015 Sectors)	45.3	69.8	13.9	6.8	27.6	21.5	-25.2	-113.2
Manufacturing	-2.4	-2.1	-3.1	-1.5	1.1	1.4	-3.2	-8.9
Construction	-7.1	12.6	0.1	2.8	5.4	4.2	-5.9	-13.6
Wholesale & Retail Trade	1.6	-4.0	-1.8	-2.8	-1.6	2.2	-8.5	-15.9
Accommodation & Food Services	1.3	6.2	0.4	0.7	2.1	3.0	-10.9	-27.4
Transportation & Storage	7.7	3.1	1.1	0.2	0.1	1.7	0.5	-4.3
Information & Communications	8.4	7.3	1.4	2.1	2.6	1.2	0.7	-0.7
Finance & Insurance	7.6	6.4	2.0	1.6	1.5	1.2	2.6	-0.7
Business Services	10.5	18.6	5.1	2.7	7.5	3.4	-0.8	-14.1
Other Services	17.8	21.9	8.6	1.5	8.8	3.0	0.1	-27.3
Others	-0.1	-0.1	0.1	-0.4	0.1	0.1	0.1	-0.5

Source: Ministry of Manpower

Table 5: Imports and Exports by Category

	2018	2019	2019				2020		
			Q1	Q2	Q3	Q4	Q1	Q2	Q3
Year-on-year Percentage Change									
Total Trade (At Current Prices)	9.2	-3.2	2.1	-2.2	-6.7	-5.3	0.5	-15.3	-6.3
Exports	7.9	-4.2	0.0	-4.6	-7.3	-4.3	-1.4	-14.0	-5.0
Domestic Exports	8.4	-10.5	-6.5	-10.6	-13.1	-11.5	-6.4	-21.6	-11.4
Oil	17.1	-12.9	-6.5	-2.9	-19.7	-21.5	-29.0	-67.7	-48.6
Non-oil	4.2	-9.2	-6.4	-14.7	-9.6	-5.7	5.4	5.9	6.5
Electronics	-5.5	-22.5	-17.4	-27.0	-25.0	-20.4	-2.3	10.6	9.5
Non-electronics	8.2	-4.5	-2.6	-10.6	-3.9	-0.3	7.7	4.6	5.7
Re-exports	7.4	2.3	6.8	2.0	-1.7	2.8	3.2	-6.8	0.4
Imports	10.6	-2.1	4.5	0.5	-5.9	-6.3	2.6	-16.6	-7.6
Total Trade (At 2018 Prices)	4.7	-2.1	-0.9	-3.0	-3.9	-0.7	3.8	-7.4	-0.4
Exports	4.2	-3.0	-2.4	-5.0	-4.9	0.4	1.3	-7.6	0.2
Domestic Exports	1.0	-7.3	-7.8	-9.2	-8.3	-3.9	-0.5	-8.7	-1.2
Oil	-4.7	-5.6	-8.3	1.4	-9.2	-6.6	-13.9	-36.3	-24.2
Non-oil	4.4	-8.2	-7.5	-14.7	-7.8	-2.4	7.2	8.2	10.4
Re-exports	7.8	1.5	3.5	-0.5	-1.7	4.6	3.1	-6.6	1.5
Imports	5.2	-1.2	0.7	-0.8	-2.7	-1.9	6.6	-7.2	-1.1

Source: Enterprise Singapore

Table 6: Non-oil Domestic Exports by Destination

	2018	2019	2019				2020		
			Q1	Q2	Q3	Q4	Q1	Q2	Q3
Year-on-year Percentage Change									
All countries	4.2	-9.2	-6.4	-14.7	-9.6	-5.7	5.4	5.9	6.5
ASEAN	4.5	-10.0	-4.5	-15.1	-18.2	-0.4	4.8	-13.3	-5.9
Indonesia	11.3	-12.3	-14.2	-12.0	-14.9	-7.6	-7.6	-25.9	-19.6
Malaysia	-0.9	-10.3	-3.8	-15.5	-18.4	-2.6	-9.3	-6.2	9.1
Thailand	-1.3	-4.3	1.2	-11.4	-9.9	4.5	46.9	-4.2	-15.0
NEA-3	-7.6	-14.3	-12.7	-21.3	-15.8	-7.3	6.2	9.1	2.4
Hong Kong	-3.9	-16.6	-1.3	-18.7	-22.9	-21.7	-15.9	-24.9	-17.8
Korea	-17.6	-14.5	-31.5	-18.4	-6.0	1.1	36.7	44.1	21.1
Taiwan	-4.5	-11.3	-11.7	-26.5	-12.5	5.7	17.4	29.1	13.0
China	-8.8	-1.0	-2.2	-14.7	17.1	-0.6	-12.5	-14.6	8.4
EU	7.6	-11.5	-9.1	-3.6	-22.6	-10.8	15.1	13.4	28.5
Japan	11.4	-28.6	-29.5	-29.2	-32.6	-22.4	29.2	61.0	8.5
United States	38.2	1.3	8.3	1.0	-5.0	1.4	23.1	63.0	42.6

Source: Enterprise Singapore

Table 7: Consumer Price Index by Expenditure Category and MAS Core Inflation Measure

	2018	2019	2019				2020		
			Q1	Q2	Q3	Q4	Q1	Q2	Q3
Year-on-year Percentage Change									
CPI-All Items	0.4	0.6	0.5	0.8	0.4	0.6	0.4	-0.7	-0.3
Food	1.4	1.5	1.6	1.5	1.4	1.6	1.6	2.2	1.9
Clothing & Footwear	1.4	-0.8	1.8	-0.8	-2.5	-1.6	-3.1	-3.6	-4.0
Housing & Utilities	-1.3	-1.0	-0.6	-0.8	-1.3	-1.3	-0.2	0.1	-0.7
Household Durables & Services	0.8	0.8	0.8	1.3	0.6	0.4	0.4	-0.2	0.4
Health Care	2.0	1.1	1.9	1.3	1.1	0.2	-1.5	-1.8	-1.9
Transport	-0.5	0.8	-1.3	1.4	0.8	2.3	2.0	-3.9	-0.8
Communication	-1.0	-0.9	-1.5	-1.1	-1.4	0.3	0.5	-0.3	1.8
Recreation & Culture	1.2	1.1	1.4	1.8	0.6	0.5	-1.0	-2.6	-1.6
Education	2.9	2.4	2.8	2.5	2.2	2.1	-0.6	-0.6	-0.5
Miscellaneous Goods & Services	1.0	0.4	0.8	0.2	0.2	0.3	-0.1	-1.4	-1.7
MAS Core Inflation Measure¹	1.7	1.0	1.8	1.3	0.6	0.5	0.0	-0.2	-0.3

Source: Singapore Department of Statistics and Monetary Authority of Singapore

¹ The MAS Core Inflation measure is the CPI-All Items excluding the accommodation and private transport expenditure categories.**Table 8: Current Account**

	2018	2019	2019				2020	
			Q1	Q2	Q3	Q4	Q1	Q2
S\$ Billion								
Current Account Balance	86.5	86.1	17.7	24.6	24.2	19.6	16.0	18.0
Goods Account Balance	140.3	133.7	31.1	36.9	33.8	31.9	26.6	29.9
Exports	621.1	601.3	143.7	154.3	150.0	153.3	142.6	124.5
Imports	480.9	467.6	112.7	117.4	116.2	121.4	115.9	94.6
Services Account Balance	2.8	7.9	1.7	1.5	3.3	1.3	1.9	3.8
Manufacturing Services	-7.0	-6.9	-1.6	-1.7	-1.8	-1.8	-1.7	-1.5
Maintenance & Repair Services	8.7	10.0	2.2	2.5	2.5	2.7	2.5	0.7
Transport	-2.8	-3.7	-1.0	-1.4	-0.5	-0.7	-0.8	-0.2
Travel	-7.9	-8.9	-1.8	-2.4	-1.7	-3.0	-2.1	0.3
Financial	29.6	29.7	7.3	7.5	7.7	7.3	7.4	7.2
Intellectual Property	-11.4	-10.5	-2.3	-2.8	-2.8	-2.7	-3.0	-2.9
Primary Income Balance	-48.3	-46.8	-13.2	-11.4	-10.7	-11.6	-10.6	-13.2
Secondary Income Balance	-8.3	-8.6	-1.9	-2.4	-2.2	-2.0	-1.9	-2.5
Current Account Balance (% of GDP)	17.2	17.0	14.1	19.7	18.9	15.2	13.0	17.5

Source: Singapore Department of Statistics

Table 9: Capital and Financial Accounts

	2018	2019	2019				2020	
			Q1	Q2	Q3	Q4	Q1	Q2
S\$ Billion								
Capital and Financial Account Balance	66.2	95.0	5.0	55.8	19.1	15.1	9.7	-26.5
Direct Investment	-82.6	-98.5	-22.5	-24.6	-25.7	-25.7	-13.3	-20.5
Portfolio Investment	48.2	137.8	4.9	82.3	23.7	26.9	1.6	7.2
Financial Derivatives	26.1	14.1	-0.1	2.7	6.2	5.3	4.4	7.1
Other Investment	74.7	41.6	22.8	-4.6	14.8	8.6	17.0	-20.4
Net Errors and Omissions	-3.3	-2.6	0.2	-0.9	-0.9	-1.0	0.7	0.8
Overall Balance	16.9	-11.4	12.9	-32.0	4.1	3.5	7.0	45.3
Official Foreign Reserves (End of Period)	392.1	375.8	400.7	370.6	376.5	375.8	397.5	436.0

Source: Singapore Department of Statistics and Monetary Authority of Singapore

Table 10: Bilateral Exchange Rates

	2018	2019	2019				2020		
			Q1	Q2	Q3	Q4	Q1	Q2	Q3
Singapore Dollar per Foreign Currency Unit (End of Period)									
US Dollar	1.3648	1.3472	1.3559	1.3535	1.3813	1.3472	1.4247	1.3932	1.3692
Pound Sterling	1.7318	1.7686	1.7714	1.7152	1.6971	1.7686	1.7583	1.7143	1.7576
Euro	1.5618	1.5094	1.5223	1.5383	1.5101	1.5094	1.5710	1.5658	1.6059
100 Swiss Franc	138.60	139.20	136.15	138.67	139.33	139.20	148.40	146.42	148.59
100 Japanese Yen	1.2359	1.2398	1.2245	1.2576	1.2796	1.2398	1.3142	1.2931	1.2965
Malaysian Ringgit	0.3298	0.3292	0.3322	0.3268	0.3299	0.3292	0.3311	0.3255	0.3292
Hong Kong Dollar	0.1743	0.1731	0.1727	0.1733	0.1762	0.1731	0.1837	0.1798	0.1767
100 New Taiwan Dollar	4.4655	4.4912	4.3991	4.3671	4.4511	4.4912	4.7085	4.7373	4.7237
100 Korean Won	0.1227	0.1166	0.1193	0.1170	0.1152	0.1166	0.1166	0.1164	0.1170
Australian Dollar	0.9636	0.9434	0.9607	0.9487	0.9334	0.9434	0.8794	0.9590	0.9739

Source: Monetary Authority of Singapore

Table 11: Singapore Nominal Effective Exchange Rate (S\$ NEER)

Period	2019			2020									
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Index (30 Sep–4 Oct 2019 Average=100)													
Average for week													
1	100.00	100.54	100.51	100.68	99.25	98.81	98.36	98.48	98.49	98.63	98.49	98.55	98.53
2	100.06	100.59	100.65	100.67	98.78	98.29	98.49	98.39	98.64	98.31	98.55	98.43	98.86
3	100.46	100.61	100.62	100.69	98.70	97.93	98.42	98.31	98.67	98.43	98.65	98.63	
4	100.58	100.62	100.66	100.70	98.84	98.06	98.37	98.31	98.70	98.42	98.60	98.51	
5		100.50		100.26			98.62			98.48			

Source: Monetary Authority of Singapore

Table 12: Money Supply

	2018	2019	2019				2020	
			Q1	Q2	Q3	Q4	Q1	Q2
S\$ Billion (End of Period)								
M1	188.8	195.7	192.1	193.0	191.7	195.7	213.0	238.3
M2	602.7	632.5	617.2	620.3	626.4	632.5	659.0	688.5
M3	615.3	646.7	629.9	634.0	640.4	646.7	673.3	702.2
Reserve Money	71.8	73.9	72.9	71.0	73.8	73.9	84.8	80.8
Year-on-year Percentage Change								
M1	0.1	3.6	-0.6	1.2	1.8	3.6	10.9	23.4
M2	3.9	5.0	4.9	5.4	4.8	5.0	6.8	11.0
M3	3.9	5.1	4.8	5.4	4.9	5.1	6.9	10.7
Reserve Money	5.4	2.9	3.3	1.1	5.9	2.9	16.2	13.8

Source: Monetary Authority of Singapore

Table 13: Interest Rates

	2018	2019	2019				2020	
			Q1	Q2	Q3	Q4	Q1	Q2
Percent per annum (End of period)								
Prime Lending Rate	5.33	5.25	5.25	5.25	5.25	5.25	5.25	5.25
3-month Singapore Interbank Offered Rate (SIBOR)	1.89	1.77	1.94	2.00	1.88	1.77	1.00	0.56
3-month London Interbank Offered Rate (LIBOR)	2.81	1.91	2.60	2.32	2.09	1.91	1.45	0.30
Banks' Rates								
Savings Deposits	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
12-month Fixed Deposits	0.45	0.57	0.55	0.57	0.57	0.57	0.60	0.52

Source: ABS Benchmarks Administration Co Pte Ltd and ICE Benchmark Administration Ltd

Table 14: Domestic Liquidity Indicator (DLI)

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Change from 3 Months Ago												
2012	0.140	0.602	0.699	0.641	0.331	0.115	0.282	0.464	0.711	0.385	0.307	0.210
2013	0.003	-0.089	-0.191	0.083	-0.053	-0.034	-0.076	0.094	0.418	0.446	0.554	0.224
2014	-0.054	-0.134	-0.247	0.143	0.137	0.365	0.195	0.096	0.038	0.002	-0.027	0.023
2015	0.011	-0.070	-0.125	0.356	0.699	0.746	0.165	-0.204	-0.115	0.006	0.267	0.252
2016	-0.069	-0.002	0.183	0.421	0.173	0.227	0.292	0.280	-0.219	-0.502	-0.404	-0.245
2017	0.065	0.181	0.343	0.318	0.093	-0.089	0.070	0.167	0.191	0.009	0.103	0.129
2018	0.103	-0.149	0.045	0.136	0.279	0.043	0.068	0.243	0.260	0.212	0.190	0.222
2019	0.277	0.168	0.138	0.076	0.065	0.136	0.049	-0.152	-0.129	0.049	0.297	0.168
2020	0.008	-0.539	-0.827	-0.847	-0.565	-0.294	-0.317	-0.058	-0.074			

Source: Monetary Authority of Singapore

Note: The DLI is a measure of overall monetary conditions, reflecting changes in the S\$NEER and 3-month S\$ SIBOR rate. A positive (negative) number indicates a tightening (easing) monetary policy stance from the previous quarter. Please refer to the June 2001 issue of the MAS ED *Quarterly Bulletin* for more information.

Table 15: Government Operating Revenues, Expenditures and Transfers

	Fiscal Year 2017	Fiscal Year 2018	Fiscal Year 2019 (Revised)	Fiscal Year 2020 (Revised)
S\$ Billion				
Operating Revenue	75.8	73.7	74.7	63.7
Tax Revenue	66.4	66.2	67.9	
Income Tax	32.1	30.8	32.4	
Asset Taxes	4.4	4.6	4.7	
Stamp Duty	4.9	4.6	4.3	
Goods and Services Tax	11.0	11.1	11.2	
Non-tax Revenue	9.5	7.5	6.8	
Expenditure	73.6	77.8	78.2	102.1
Operating Expenditure	55.6	57.6	59.5	85.3
Development Expenditure	18.0	20.3	18.6	16.8
Primary Surplus (+) / Deficit (-)	2.3	-4.1	-3.4	-38.3
Less: Special Transfers	6.1	9.0	15.3	54.5
Add: Contribution from Net Investment Returns	14.7	16.4	17.0	18.6
Overall Budget Surplus (+) / Deficit (-)	10.9	3.3	-1.7	-74.2
Percentage of Nominal GDP				
Operating Revenue	15.9	14.5	14.7	13.7
Tax Revenue	13.9	13.0	13.3	
Income Tax	6.7	6.1	6.4	
Asset Taxes	0.9	0.9	0.9	
Stamp Duty	1.0	0.9	0.8	
Goods and Services Tax	2.3	2.2	2.2	
Non-tax Revenue	2.0	1.5	1.3	
Expenditure	15.4	15.3	15.4	22.0
Operating Expenditure	11.7	11.3	11.7	18.4
Development Expenditure	3.8	4.0	3.7	3.6
Primary Surplus (+) / Deficit (-)	0.5	-0.8	-0.7	-8.2
Less: Special Transfers	1.3	1.8	3.0	11.7
Add: Contribution from Net Investment Returns	3.1	3.2	3.3	4.0
Overall Budget Surplus (+) / Deficit (-)	2.3	0.7	-0.3	-16.0

Source: Ministry of Finance