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Inflation dynamics and expectations in Singapore

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Abstract Inflation dynamics in Singapore have primarily been shaped by foreign factors, including global inflationary pressures and external macroeconomic shocks. More recently, the normalisation phase of the Covid-19 pandemic crisis has led to domestic price pressures from pent-up demand and supply chain disruptions. Meanwhile, the Ukraine war has resulted in a hike in global prices of food, energy and industrial commodities. Using inflation forecasts from the MAS Survey of Professional Forecasters as our measure of inflation expectations, we show that short term inflation expectations have shifted up recently. Moreover, greater disagreement amongst survey respondents in the more recent surveys suggests individual short term inflation expectations may also be slipping. The Monetary Authority of Singapore (MAS) has promptly responded to the elevated price pressures by repeatedly tightening monetary policy. Such forceful policy responses reveal the central bank's resolve to maintain price stability, which will help to ensure that inflation expectations in Singapore remain anchored.

Keywords: Inflation Expectations, Singapore Monetary Policy, Pandemic crisis

1. Singapore Inflation Dynamics and Key Drivers

In this chapter, we focus on the Singapore headline inflation which is the year-on-year percentage change in the all-items consumer price index (CPI). The core inflation, which the Monetary Authority of Singapore (MAS) refers to for monetary policy formulation, excludes two components from the all-items CPI. These are the costs of private road transport and accommodation costs. The prices of these two items are more volatile and they are much influenced by government administrative policies. Nonetheless, the central bank and others also closely monitor the headline inflation which is based on the whole consumption basket to better capture the overall price pressures in Singapore. The chart in Figure 1 plots the monthly CPI-All Items inflation,[1] which we refer to henceforth as the inflation rate, from January 1975 to May 2022. Its trend-cycle extracted using the Hodrick Prescott filter is displayed alongside the inflation rate. Even though the inflation data series is available from 1962, we focus our analysis from the mid-1970s when the Singapore dollar exchange rate was used at least as one of the monetary policy instruments. Besides, including the first oil shock in the early 1970s in the chart will dwarf the fluctuations in the inflation rate in subsequent years.

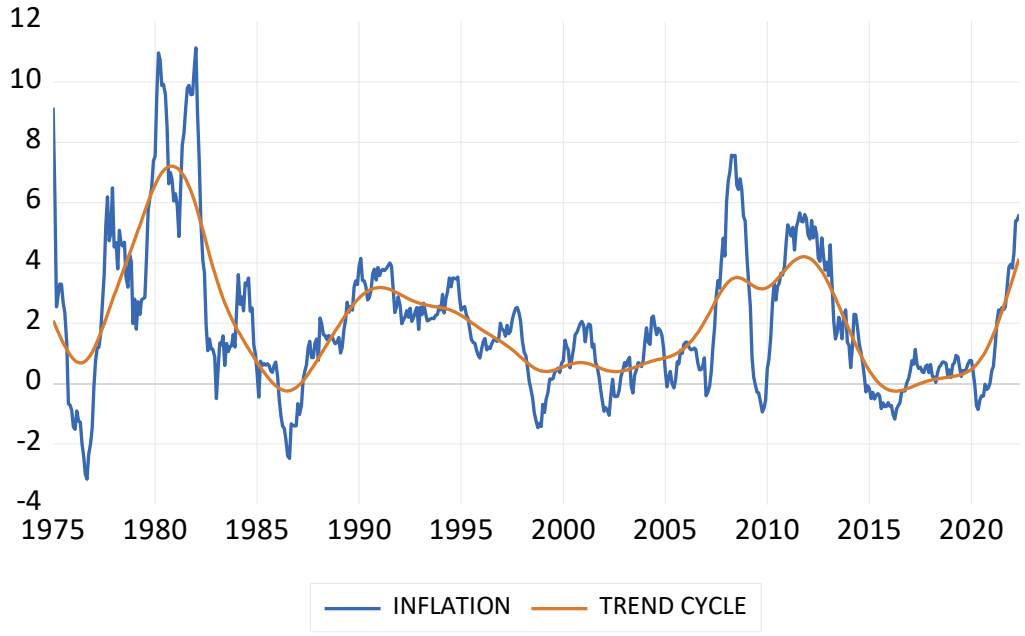

Fig. 1 Monthly Singapore Consumer Price Inflation (year-on-year percentage change)

Data Source: CEIC database

[1] See MAS (2021) for a review of Singapore year-on-year inflation rate but on a quarterly basis over the past fifty years.

As a consequence of the oil price shock in the late 70s, Singapore experienced cost-push inflation which rose to a peak of almost 11% in April 1980. Inflation moderated in the first half of the 1980s as global oil prices declined and various domestic industries were liberalized. In August 1986, inflation turned negative with a trough of -2.5% in the immediate aftermath of a recession in 1985. Then it rose to nearly 4% in January 1990 alongside a strong economic recovery and a tightening labour market. In the period between 1991 and 1997, inflation recorded less volatility and averaged around 2.3%. The Singapore economy then suffered a series of negative shocks including the Asian financial crisis, the burst of the dot-com bubble and Severe Acute Respiratory Syndrome that resulted in the two dips of inflation at -1.5% and -1.1% in October 1998 and April 2002 respectively.

In the latter half of the 2000s, inflation accelerated to a spike at 7.6% in April 2008 driven by a hike in global commodity prices, rising business costs and an increase in Goods and Services Tax from 5% to 7%. Inflation fell to -0.9% in October 2009 at the global financial crisis (GFC) outbreak, but it escalated to a high of 5.7% in August 2021. The latter can be attributed to a tightening labour market resulting from more restrictive foreign workers policies as well as a low interest rate environment leading to a boom in property and car prices. Inflationary pressures were dampened in the 2010s as macroprudential measures targeting the housing sector and car loan restrictions reined in demand in these markets. In tandem with low commodity prices, the inflation rate fell to -1.6 in May 2012 and remained subdued at an average of 0.4% thereafter till the outbreak of the Covid-19 pandemic.

The imposition of movement restrictions in the wake of the Covid-19 pandemic curtailed demand bringing inflation to a low of -0.8 in May 2020 but price pressures have since recovered to 4% in January 2022 spurred in part by the unleashing of pent up demand as well as supply chain disruptions. More recently, the Ukraine war escalated the global prices of food, energy and industrial commodities, causing consumer price pressures to broaden and inflation to rise further to 5.6% in May 2022. In particular, global oil prices jumped to USD124 per barrel in early March 2022 as the Russia-Ukraine conflict resulted in an unanticipated supply shock. Besides, the resident unemployment rate has declined to pre-Covid levels by February 2022. Going forward, Singapore's unit labour cost is expected to rise due to the tight labour market and policies to increase the wages of low-wage resident workers (MAS, 2022). Domestic consumer price pressures are expected to intensify in the near term as reflected in the upward revision of MAS' inflation forecast.

Over the past decades, inflation dynamics in Singapore have been shaped mainly by external factors. For instance, the trend-cycle in inflation tends to comove with the broad movements in global commodity markets. Another prominent driver of inflation is the level of aggregate economic activity that presents both demand pull and cost push factors. In particular, business costs determined largely by import prices, wages and rentals play a significant role in pushing up inflation during an economic upturn. Nevertheless, Singapore's business cycle is significantly influenced by the global economic environment reflecting its integration with external markets. The small open nature of the Singapore economy also means it is vulnerable to external macroeconomic shocks, as evidenced by the past recessions these shocks have induced.

We can discern from Figure 1 that the long-term trend in inflation remains low and stable since the start of the 1980s. This could be attributed to various structural factors such as China's integration into world trade and more generally to the effects of globalization. For example, the exposure to external competition tends to depress prices. Further, the participation in global value chains or regional production networks exerts downward pressure on production costs. Other explanations for the secular decline in inflation include better policy frameworks, liberalization of domestic industries, diversification of import sources, as well as widespread technological advances that provide new digital platforms and services (MAS, 2018). However, there appears to be evidence that some of these structural forces of disinflation may be fading. For instance, the recent supply chain disruptions and consequent product shortages can lead to a shift from efficient just-in-time manufacturing to a less risky just-in-case strategy which will increase production costs. Moreover, the pace of globalization may slow with rising protectionist sentiment and geopolitical risks.

2. The Role of Monetary Policy

Foreign prices feature prominently as a driver of domestic inflation as Singapore is a price-taker in global markets and has a high import content in its final demand. This explains the adoption in 1981 of an unusual monetary policy framework whereby the exchange rate instead of the benchmark interest rate is used as the policy operating tool. The MAS manages the Singapore Dollar Effective Exchange Rate (S$NEER), which is the value of the Singapore dollar against a trade-weighted basket of several foreign currencies. Under the basket-band-crawl system, the S$NEER can fluctuate within a policy band to accommodate small, temporary shocks. As part of its monetary policy implementation, the MAS intervenes

in the spot foreign exchange markets to ensure the S$NEER does not breach the band limits. Meanwhile, the policy band "crawls" at a rate consistent with core inflation being close to under 2% in the medium term.

A tightening (loosening) of monetary policy is brought about through an appreciation (depreciation) of the Singapore dollar. Various monetary policy transmission channels explain how monetary policy works through its impact on aggregate demand.[2] First, an appreciation of the Singapore dollar will lead to a fall in net external demand. When the Singapore dollar appreciates, domestic imports become cheaper, lowering the competitiveness of local import-competing industries and encouraging a switch to foreign-produced goods and services. Meanwhile, the local producers of exports lose competitiveness as the foreign price of domestic exports rises. Second, an induced appreciation by the central bank through currency intervention would entail buying of Singapore dollar in the foreign exchange market. Unless the operation is completely sterilised, the reduced supply of the domestic currency tends to drive up the interest rate thereby dampening domestic demand. A fall in aggregate demand will in turn reduce domestic costs such as wages, and alleviate price pressures. Moreover, an appreciation of the Singapore dollar lowers import prices, thereby directly easing domestic inflationary pressures.

As discussed in Chow and Wong (2020), the central bank publicly announces its monetary policy stance in April and October each year. Adjustments to the policy stance can take the form of a single or combination of changes to the slope of the appreciation path, the level of S$NEER and the width of the policy band. For example, to tighten monetary policy, the MAS may steepen the slope of the policy band to allow for greater appreciation of the S$NEER. Conversely, the MAS may reduce the rate of the appreciation path to as low as 0% to ease monetary policy. The central bank has never adopted a downward trajectory for the policy band to avoid a self-reinforcing market sell-off of the Singapore dollar. If a more significant monetary easing is required, the MAS sets the mid-point of the policy band to a lower level instead. Finally, the policy band's width is widened to accommodate greater S$NEER volatility when there is a marked increase in market uncertainty.

[2] See Chow (2005) for a detailed discussion on the monetary transmission mechanism in Singapore.

Do past data reveal changes to the monetary policy stance are associated with movements in Singapore's inflation rate? Ideally, we should compare the fluctuations of the domestic inflation rate with the levels of the S$NEER which is the monetary policy instrument managed by the MAS. However, the S$NEER series published by the MAS has been publicly available only since 1999. We cannot construct the S$NEER series because neither the constituent currencies nor their weights are publicly disclosed. Instead, we use Singapore's nominal effective exchange rate compiled by the International Monetary Fund (IMF) which we denote as the NEER variable. The IMF computes the value of the Singapore dollar against a weighted average of various foreign currencies, using weights that are updated every three years to reflect changes in trade patterns in merchandise trade, tourism, and manufacturing.[3] The NEER variable, which starts from January 1980, is defined such that an upward movement means an appreciation of the domestic currency.

Figure 2 displays the evolution of both variables S$NEER and NEER in the same chart, up till April 2022. It is clear from Figure 2 that the pace of appreciation and depreciation in the IMF-compiled NEER data series is approximately in sync with those of the policy instrument S$NEER. Hence, the NEER variable generally reflects the monetary policy stance taken by the central bank.

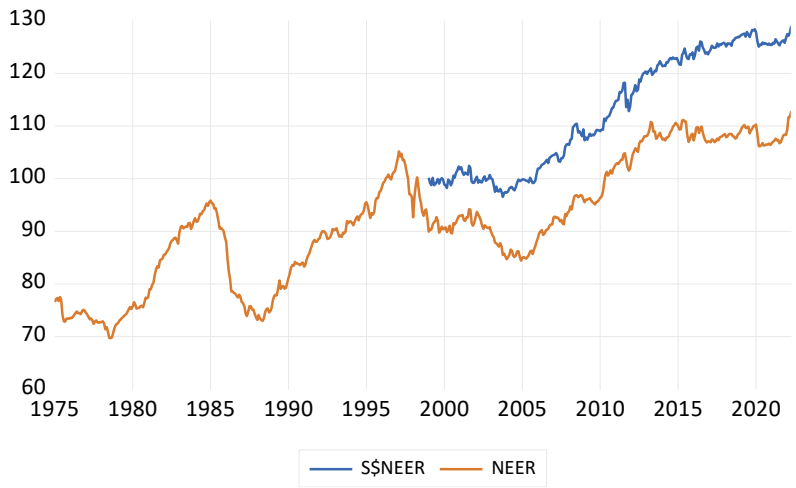

Fig. 2. MAS Policy Instrument S$NEER versus IMF-compiled NEER

Data Source: CEIC database; MAS website

[3] Bayoumi et al. (2005) describes the methodology used in computing the trade weights.

Figure 3 plots the Singapore nominal effective exchange rate alongside the headline inflation from January 1980 to May 2022. The chart in Figure 3 reveals a steep appreciation of the Singapore dollar in the first half of the 1980s in response to the high inflation in its key trading partners during that period. Another episode of strong appreciation from the late 1980s to the late 1990s contributed to the moderation of inflation amid robust economic growth in that period. The Singapore dollar also appreciated steadily between 2005 and the mid-2010s which helped to mute domestic price pressures arising from the then prevailing high aggregate demand as well as supply constraints.

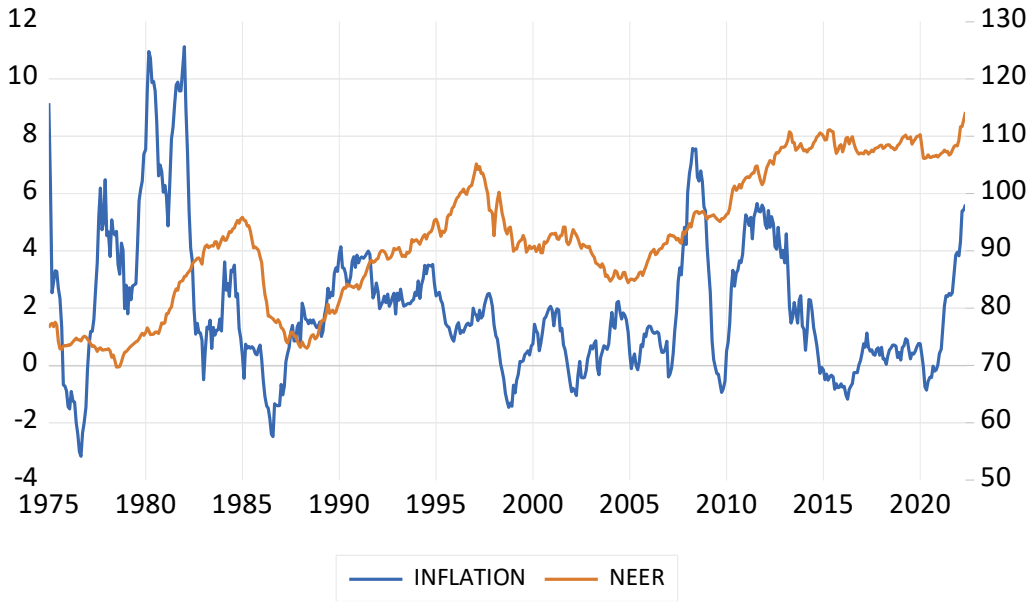

Fig. 3. Singapore Headline Inflation and Nominal Effective Exchange Rate

Data Source: CEIC database

Conversely, we observe from Figure 3 the depreciation of the Singapore dollar during the 1985 recession. The currency trended sideways when the economy was hit by successive negative external shocks from 1998 to the early 2000s, as well as during the low inflation period since the mid-2010s. Indeed, empirical estimation of the monetary reaction function by the central bank reveals a forward-looking rule that aims at stabilising expected changes in core Inflation and minimises deviations from the potential output, with the former having relatively greater weight, see MAS (2021). The findings are consistent with those from previous studies, such as Parrado (2004) and IMF (2018).

In the wake of the Covid-19 crisis, Singapore went into a partial lockdown and severely affected the economy. The MAS promptly adopted an accommodative policy stance while the government responded with ample fiscal support to mitigate the crisis' impact on jobs, businesses and households (Chow and Ho, 2021). During its half-yearly monetary policy review in April 2020, the central bank decided to reduce the rate of appreciation of the S$NEER policy band to 0 percent and lower the band's center to the then prevailing S$NEER level. The width of the policy band was kept the same since there was no excessive volatility in the international financial markets. This announcement marks the first instance when both the slope and the level of the policy band were adjusted to ease monetary policy.

In the following two successive monetary policy reviews, in October 2020 and April 2021, the MAS did not make changes to the policy band but maintained the same accommodative monetary policy stance. Meanwhile, the domestic three-month interbank rate (S$ SIBOR) followed the decline in US$ LIBOR falling from 1.8% in October 2019 to 1.0% in late March 2020; then dropping further to 0.4 percent in October 2020 and staying broadly the same at 0.4% in April 2021. To ensure the funding markets function smoothly, the central bank conducted money market operations to provide ample liquidity in the domestic banking system. Consequently, there was an unprecedented increase in domestic liquidity at the outbreak of the crisis. However, domestic liquidity reverted to its normal magnitudes since late 2020 reflecting the tightening of monetary conditions at that time.

Indeed, the MAS tightened its policy stance pre-emptively in October 2021 at its semi-annual monetary policy cycle in response to rising external and domestic cost pressures. The monetary policy statement (MPS) says:

"MAS will therefore raise slightly the slope of the S$NEER policy band, from zero percent previously. The width of the policy band and the level at which it is centred will be unchanged. This appreciation path for the S$NEER policy band will ensure price stability over the medium term while recognising the risks to the economic recovery." (MAS 2021)

Hence, monetary policy was tightened in Singapore even though prevailing economic prospects were somewhat uncertain and most other central banks were maintaining a loose monetary policy stance.

In January 2022, MAS made an off-cycle monetary policy announcement to raise the appreciation rate of the S$NEER further as external and domestic cost pressures accentuated. However, domestic inflationary pressures were driven up further by the spike in global energy, food and commodity prices resulting from the Ukraine war and the pandemic. Hence, in the review of the monetary policy stance in April 2022, the MAS tightened monetary policy yet again not only by increasing the rate of appreciation of the S$NEER but also by re-centring the mid-point of the policy band upwards to the prevailing level (MAS, 2022). Since 2001, there has only been one other time that adjustments are made both to the slope and the level of the S$NEER. Another off-cycle monetary policy statement was issued in July 2022 on the upward shift in the S$NEER policy band to the prevailing level to lean against persistent price pressures. Notably, it is unprecedented for two off-cycle adjustments in monetary policy settings to occur in such close succession.

These forceful monetary policy responses reflect MAS' resolve to maintain price stability and are also targeted at maintaining well-anchored inflation expectations in Singapore. After all, inflation expectations play an important role in shaping inflation dynamics in advanced and emerging countries (IMF, 2016). Moreover, Choy (2016) confirmed this to be the case for Singapore. Both studies employ a short run Philips curve augmented with import prices. A short-run Phillips curve typically shows the tradeoff between inflation and unemployment in the short term. Specifically, lower levels of unemployment in the economy tend to be associated with higher domestic inflation rates. The Phillips curve is augmented with import prices in the two aforementioned studies to allow for the sensitivity of domestic prices to external factors. The findings provide evidence of the key role played by inflation expectations in determining domestic inflation rates.

3. Evolving Inflationary Expectations

Despite the absence of an explicit commitment to an inflation target, the transparent monetary policy formulation procedure and the explanations provided to justify announced policy settings have led to the effectiveness of monetary policy in Singapore. This is evidenced by the record of generally low and stable inflation over the past decades, which helped to anchor inflationary expectations. Gupta (2016) found inflation expectations in Singapore to be stable, attributing that to strong institutions and a pragmatic approach to macroeconomic management. When inflation expectations are well anchored, they tend not to be affected by new information, stabilizing domestic inflation despite external shocks.

Nonetheless, the successive inflationary shocks from the Covid-19 crisis and the Ukraine war could have induced an upward shift in inflationary trends that may heighten inflationary expectations.

To trace the external shocks' impact on Singapore's inflationary expectations, we monitor its evolution over time. It is well recognised that expectations are difficult to measure since they are based on personal beliefs that are not directly observable. We use the inflation forecasts taken from the MAS Survey of Professional Forecasters (SPF) as our measure of inflationary expectations. After all, studies such as Berge (2018); Aruoba (2020), amongst others, found that predictions by professional forecasters serve as a more accurate measure of inflation expectations than other survey-based measures. Hence, we do not use another survey that collates inflation forecasts from Singapore households, as responses in that survey appear to be subject to the influence of cognitive biases (Clark et al. (2018)).

The participants of the quarterly SPF are mostly professional economists working in the financial sector and provide short-term predictions of Singapore's key macroeconomic variables.[4] Our focus is on their outlook for the annual CPI inflation rate which is the change in the all-items CPI from one year to the following year. In terms of the forecast time horizons, each survey polls inflation forecasts for the next quarter, for the current year outcome and for the next year's outcome which we refer to as the one-quarter ahead, one-year ahead and two-year ahead projections respectively. The first type of projection is a rolling horizon forecast while the second and third are fixed event forecasts. For instance, the actual forecast horizons for the current year projections of the 2022 inflation rate corresponding to the surveys conducted in March, June, September and December in 2021 range from four to one quarters respectively. In the same way, the next year’s projections of the 2022 inflation rate from the March, June, September and December surveys conducted in 2020 would have actual forecast horizons ranging from eight to five quarters respectively.

In the case of the current and next year projections, the survey participants provide the point forecasts and the forecast probability distributions in the form of histograms with intervals pre-assigned by the central bank. The location and spread of these forecast probability distributions convey the central tendency of the survey respondents' beliefs and the uncertainty they feel respectively. The MAS quarterly survey report does not provide individual forecasters’

[4] A description of the SPF dataset is available at: **Survey of Professional Forecasters Data Documentation**

histograms but presents the mean probability distribution. The latter is obtained by averaging the probabilities from the individual forecasters' histograms within each survey. Figure 5 displays the mean probability distributions of the 2022 Inflation forecasts taken from the four latest SPF surveys. For each survey, the horizontal axis provides the forecast intervals so that a larger abscissa reflects a higher forecast range for the 2022 inflation rate. Meanwhile, the vertical axis is the probability assigned to a particular forecast interval averaged across survey respondents. A larger ordinate thus indicates a higher chance that survey respondents, on average, think the 2022 inflation rate will fall into that interval.

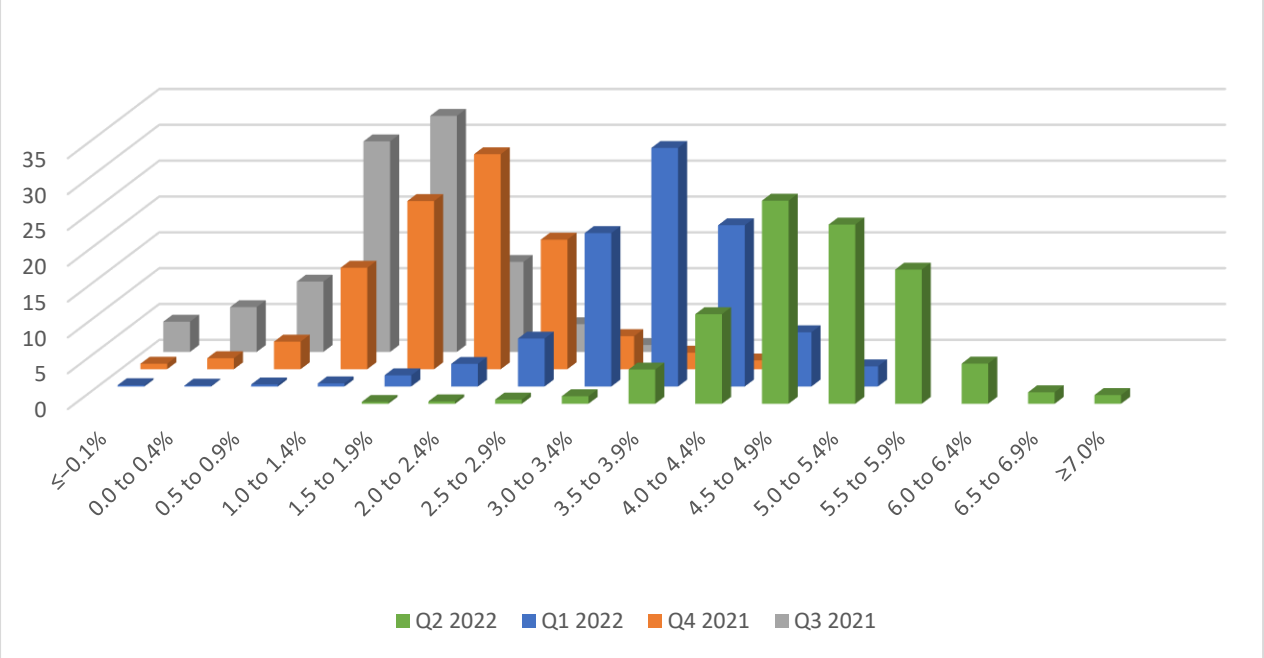

Fig. 4 Mean Probability Distributions of 2022 Inflation Forecasts

Data Source: MAS website

We observe from Figure 5 the rightward shifts in the mean probability distributions over the past four quarters, with the shift between December and March being particularly sharp. This means the overall projection for inflation in 2022 average across the survey respondents has been rising persistently. The professional forecasters assigned the highest probability to the 1.5% to 1.9% range in the September 2021 survey; then to the 2.0% to 2.4% range in the December 2021 survey; then to the 3.5% to 3.9% range in the March 2022 survey and finally to the 4.5% to 4.9% range in the June 2022 survey. That is, the forecast interval deemed most likely for the 2022 inflation rate rises with each subsequent survey. In terms of magnitude, the median of these distributions increased from the previous quarter by 0.23%, 0.58%, 1.6% and 1.3% latest four surveys.

To capture longer term views of inflation, we examine the projections for the current year and next year's outcome taken only from surveys conducted in the first quarter. In particular, we use the median of the mean probability distributions of the one-year ahead and two-year ahead forecasts as our gauge of very short term and short term inflation expectations respectively. Hence, the timeframes for very short and short term expectations are four and eight quarters respectively. These are plotted against the realized annual inflation numbers in Figures 5 and 6 respectively.

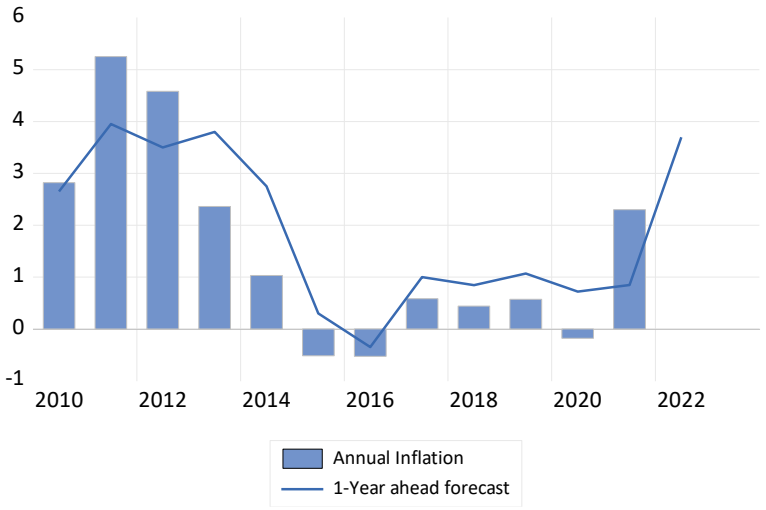

Fig. 5 Very Short Term Inflation Expectations

Data Source: CEIC database; Author's calculation

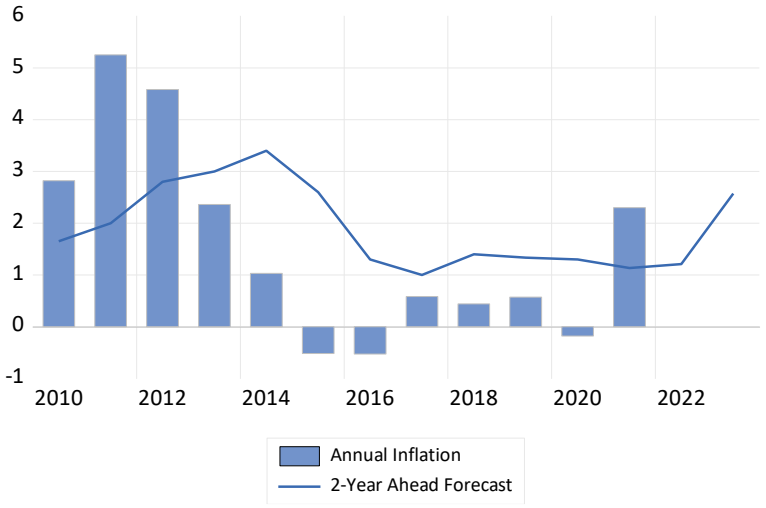

Fig. 6 Short Term Inflation Expectations

Data Source: CEIC database; Author's calculation

We start our sample period from 2010 even though the survey began in the last quarter of 1999 since the data for the two-year ahead inflation forecasts are not available between 2005 and 2009. It is evident from Figure 5 that very short term inflation expectations tend to respond to prevailing inflation rates. Hence, it is unsurprising that the very short-term inflation outlook has recently shot up to nearly 4%, as in the early 2010s. While the short term inflation outlook is more stable, we see from Figure 6 that it has also increased to almost 3%.

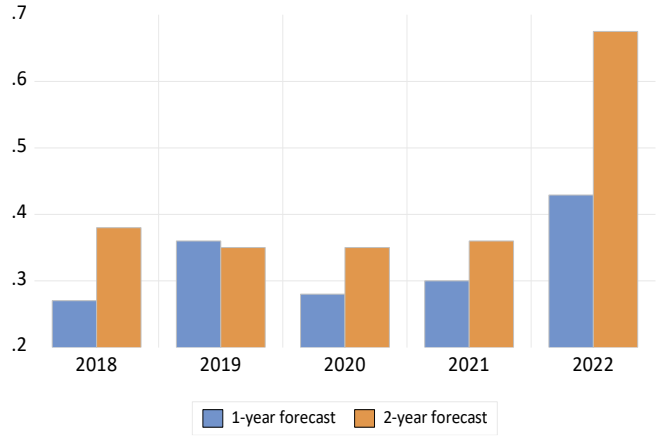

Fig. 7 Disagreement on Current and Next Year Inflation forecasts

Data Source: Author's calculation

In addition to examining the median of the mean forecast distribution, we consider the size of forecast disagreements and its evolution over time. Following Chow and Choy (2022) we measure the degree of disagreement (*D*) amongst forecasters in a particular survey by the standard deviation of the median of their individual probability distributions. Figure 7 plots the level of disagreement computed from the projections of the current year and next year's inflation outcome taken only from surveys conducted in the first quarter. We observe from Figure 7 an obvious jump in the levels of disagreement for both one-year and two-year ahead forecasts in the 2022Q1 survey. The hike is particularly sharp for the two-year ahead projections, meaning there is less consensus amongst the survey respondents on the future path of inflation. Hence, the short term inflation expectations of the individual forecasters have become much more varied and are not as well-anchored compared with those in previous years. To halt the slippage in inflation expectations, the MAS has to remain watchful and nimble to prevent the momentum of price increases from becoming entrenched.

4. Conclusion

As a small open economy, Singapore is subject to many external shocks on the inflationary front. Major fluctuations in the inflation rate in the past were mostly driven by import costs and the occurrence of crises. More recently, the normalization phase from the Covid-19 pandemic crisis presents both a demand pull and supply push shock to domestic inflation, while the Ukraine war has also set energy and food prices soaring. As a result, short term inflation expectations have shifted up and the individual forecasters disagree more on their projections. These findings suggest that short-term inflation expectations of the individual forecasters are not as well-anchored as in previous years.

The MAS, which takes pride in its record of maintaining low and stable inflation in Singapore over the past decades, has promptly responded by repeatedly tightening monetary policy to show its commitment to maintaining price stability. We think such aggressive tightening is necessary to ensure economic agents do not lose faith in the central bank's determination to maintain stable prices., thereby anchoring inflation expectations. Moreover, other measures taken by the government, such as further diversification of import sources and encouraging more widespread use of digital platforms and services, help to stabilise prices. Apart from arresting the rise in the cost of living, a non-inflationary environment provides firms with a more stable environment to operate in. The purchasing power of the domestic currency and savings value would also be maintained. Furthermore, Singapore's attractiveness as a location for financial transactions and long term investment would be enhanced.

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ABBREVIATIONS

CEIC: Computer and Enterprise Investigations Conference

CPI: Consumer Price Index

GFC: Global Financial Crisis

IMF: International Monetary Fund

LIBOR: London Interbank Offered Rate

MAS: Monetary Authority of Singapore

MPS: Monetary Policy Statement

NEER: Nominal Effective Exchange Rate

SIBOR: Singapore Interbank Offered Rate

SPF: Survey of Professional Forecasters

USD: US dollar