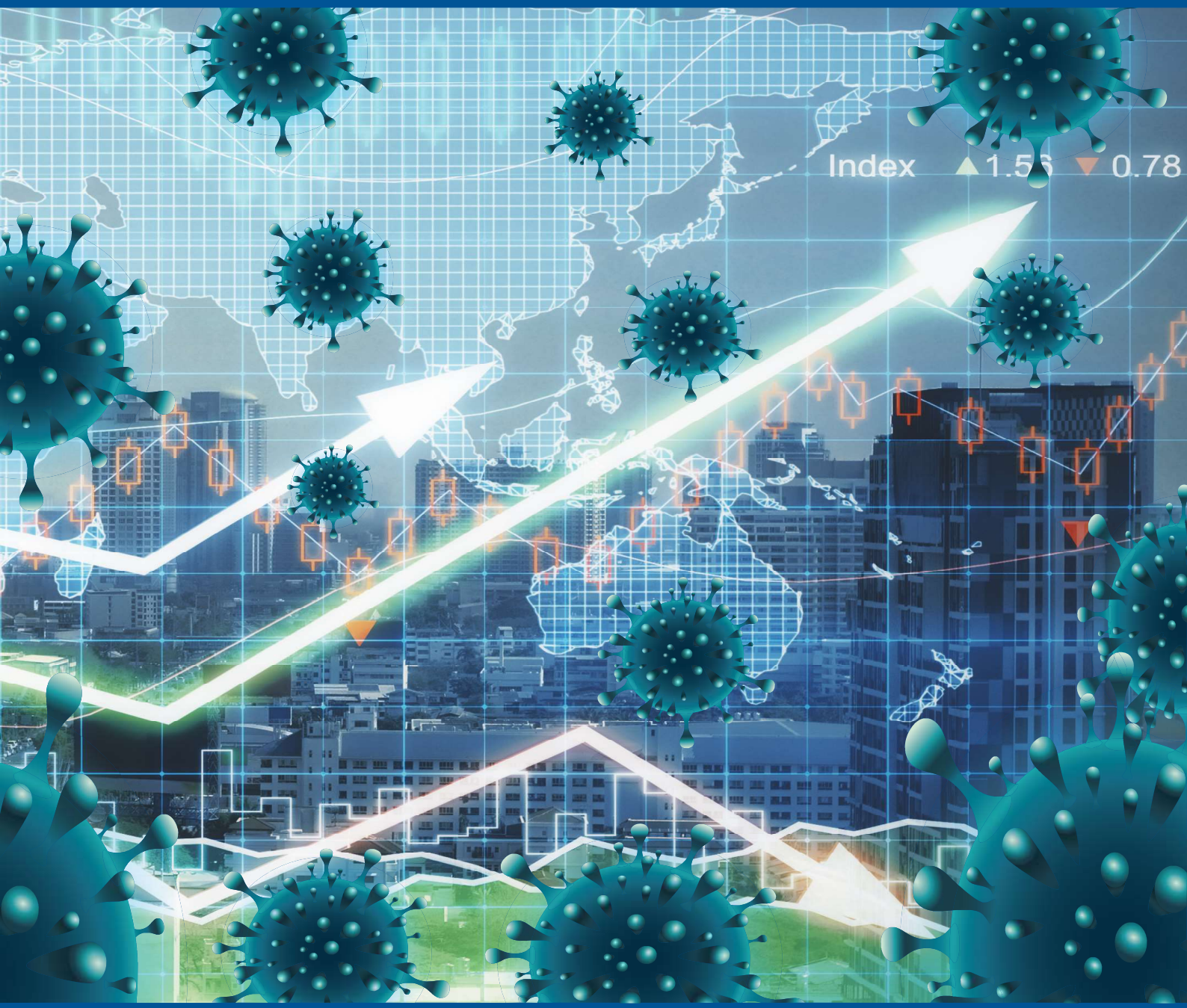
# ASSET PURCHASE PROGRAMMES IN THE ASIA-PACIFIC REGION DURING COVID-19: DESIGN AND IMPACT

Laura E. Kodres

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**Asset Purchase Programmes in the Asia-Pacific Region During Covid-19: Design and Impact**
by Dr. Laura E. Kodres

This research publication, prepared by The SEACEN Centre, does not necessarily reflect the views and policies of the SEACEN member central banks and monetary authorities.

*Notes:*

- The SEACEN Centre recognises "China" as People's Republic of China; "Hong Kong" as Hong Kong SAR, China; and "Korea" as Republic of Korea.
- USD and US$ refer to US dollar.

# FOREWORD

Large-scale asset purchase programmes (APPs) were used extensively as a part of advanced economies' (AE) central bank unconventional monetary policy toolkit during the Global Financial Crisis of 2008 and 2009. The unprecedented turmoil following the collapse of Lehman Brothers on 15 September 2008 called for unconventional central bank measures once the policy rate reached the effective lower bound and APPs, which were pioneered by the Bank of Japan in 2001, seemed an appropriate tool. Since then, APPs have not only been used as the monetary policy measure of first choice when lowering the policy rate is not possible, but their use has expanded from advanced to emerging markets and developing economies (EMDEs). When the COVID-19 pandemic spread after March 2020, APPs were used liberally.

With governments supplying massive fiscal support for households and businesses during the ensuing lockdown period, central banks formed a critical line of defence to prevent a potential financial collapse from making things worse. On top of cutting the policy interest rate aggressively, many central banks in EMDEs implemented APPs to reduce financial stresses due to rapidly evaporating market confidence. These central banks purchased assets that had come under selling pressure, including their home-country government bonds. Alleviating volatility in government bond markets was an important motivation for APP implementation, although the motivations for APPs were diverse across the region, including aiding effective monetary policy transmission across segmented markets, particularly in EMDEs.

The novelty of these measures required EMDE central banks to draw on the experience of past APP implementation in advanced market economies. The APP design took on many traits of other advanced economies although it was new for nearly all emerging and developing economies. While central banks are now shifting to a hawkish mode, there may be an expectation that some central banks may continue to keep yields in check by continuing their APPs. In fact, if there are clear channels for which APPs could be effective, there will be a tendency for their repeated use. Since this unconventional measure may become conventional over time, it is more critical than ever to closely evaluate the impact of APP execution and examine the potential future use of these policy tools.

The central focus of this research paper is an evaluation of the effectiveness of APP design and the overall impact of their implementation in the Asia-Pacific region. Evidence so far identifies transmission channels through which asset purchases affect the real economy, as well as the potential long-term risks and limitations of such programmes. Additionally, effective communication of APPs, particularly the programme objectives, startup timing, and operational implementation details, is crucial to guide market expectations during uncertain times and maintain public trust in the central bank. While

central bank announcements of APPs can, by themselves, calm markets, the paper offers empirical evidence on how the signal from APP announcements lowered and stabilised benchmark government debt yields, even controlling for the macroeconomic environment in which they were initiated.

In addition, several other unconventional monetary policy tools, such as central bank swap arrangements and emergency liquidity assistance, were also employed by some central banks. The interaction of these policies with APPs helped to provide broader support to the financial system and aided the effectiveness of the programmes, although identifying their stand-alone contribution is beyond the scope of the paper. A simultaneous loosening of policy rates – especially by the Federal Reserve – and other accommodative external factors helped to stabilise the local currency movement in some countries during the period of increased risk aversion. Furthermore, supportive domestic macroeconomic conditions pre-COVID-19 and a healthy banking system provided a conducive environment that increased the chances of providing credit, an indirect goal of APPs.

As it turned out, APPs implemented in the Asia-Pacific region during the pandemic were successful in lowering yields on government debt and reducing volatility, hence helped to restore market confidence. While APPs have showcased their effectiveness, usage of APPs going forward, including smooth unwinding strategies, must be carefully planned so as to not harm the path to market recovery. Central banks' policy toolkits should continue to expand and adjust to navigate more challenging times ahead. This research paper also underscores the importance of coherent sequencing and clear central bank communication strategies to achieve a safe unwinding of APPs. We are grateful to Dr. Laura Kodres for elucidating not only the initial impact and effectiveness of APP policies, but also providing a blueprint for their future use, both in terms of implementation as well as termination. It is our hope that SEACEN member central banks and monetary authorities will benefit from the analysis of the design and impact of APPs in achieving their monetary policy objectives.

**Mangal Goswami**
Executive Director
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# SUMMARY

Asset purchase programmes (APPs) were implemented by central banks in a number of countries as the COVID-19 pandemic took hold in March and April 2020. These programmes sought to purchase assets that had come under selling pressure as market participants perceived the various securities' risks as rising alongside uncertainty about the economic implications of the pandemic. This study examines their use by central banks in the Asia-Pacific region with the objective of examining their design, implementation and impact. Overall, the eight countries chosen for this study were successful in accomplishing their stated goals: to keep yields on government debt low, lower the yield volatility and ameliorate dysfunction in these (and related markets), and attempt to ensure the continuation of monetary policy transmission. The study places these countries' APP use within the general context of their pre-COVID-19 economic and financial conditions. Fortunately, these countries were in a relatively comfortable position, which supported a successful APP implementation. The study additionally provides guidance on two elements which appear key to the current (and possible future) success of APPs — communication strategies and exits. The possible strategies for the repeated use, implications, and ultimate wind-down of APPs is an important topic in the region, particularly because the use of APPs are likely to influence central banks' perceived independence and their ability to carry out their monetary policy and financial stability mandates.

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# ASSET PURCHASE PROGRAMMES IN THE ASIA-PACIFIC REGION DURING COVID-19: DESIGN AND IMPACT

**Laura E. Kodres***

## 1. Introduction

Asset purchase programmes (APPs) were implemented by central banks in a number of countries as the COVID-19 pandemic took hold in March and April 2020. These programmes sought to purchase assets that had come under selling pressure as market participants perceived the various securities' risks as rising alongside uncertainty about the economic implications of the pandemic. The most common programme involved the purchase of home-country government debt. A number of countries established programmes to purchase municipal and government-sponsored entities' debt, corporate debt, commercial paper, and, in some rare cases, equities or equity-like instruments, such as exchange-traded funds (ETFs). For advanced economies, some of these programmes mirrored or, in several cases, re-activated programmes that their central banks had used during the Global Financial Crisis (GFC) in 2008 and 2009. For nearly all emerging and developing economies, these programmes were new.

While many of the motivations of the APPs implemented during the COVID-19 pandemic were common across both advanced economies (AEs) and emerging and developing economies (EMDEs), some were different. Of the similarities, both AEs and

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EMDEs were keen to maintain domestic financial stability when the COVID-19 pandemic began to take hold in March 2020 and financial markets roiled. It is a well-accepted axiom that a resilient financial system provides a solid basis for a fast recovery after a shock. With a global recession on the horizon, central banks around the world stepped in to try to minimise the fallout from volatile financial markets. Moreover, the massive fiscal support for households and businesses during the COVID-19 pandemic, and the corresponding increase in government debt, provided another rationale for the APPs aimed at government debt purchases — to keep yields on government debt low, allowing their governments to finance the supportive policies more cheaply than otherwise.

Aside from supporting the fiscal stimulus and attempting to quell financial market dysfunction, EMDEs had additional reasons for using APPs. One reason stems from the less accurate monetary transmission mechanisms in many EMDEs. Segmented markets, including across maturities of government debt, due to specific clienteles or their still-developing stage, regular issuance calendars mean that transmission from short-term policy rates to longer-term credit markets *via* credit spreads off of the government yield curve is uneven. Hence, EMDE's goal of repairing monetary transmission, or at least ensuring its continuity as policy rates were lowered, was an important motivation for APPs, particularly those involved in buying government debt.

Another feature of EMDE's use of APPs stems from their more active use of foreign exchange policies, which is particularly salient for members of the South East Asian Central Banks (SEACEN) Research and Training Centre. As financial markets became unhinged and investors became more risk averse, large capital outflows were experienced by EMDEs, including many SEACEN members. Such outflows exerted downward pressure on the exchange rate as well as the prices of the assets being sold. Foreign exchange intervention is one way to support the currency and maintain stability in the foreign exchange market when rapid outflows occur. But an APP adds another layer of support — by providing a floor under the prices of the instruments being sold by foreigners — a central bank can limit fire sales and lessen exchange rate pressure. This may be a cheaper and more effective method of stemming capital outflows than either directly intervening in the foreign exchange market (and depleting reserves) or using capital flow management (CFM) tools.

Having established that EMDEs may have additional motivations for using APPs, this study first summarises some of the existing, general studies of effectiveness of APPs across all EMDEs. Then it focuses on SEACEN members' APP performance, in light of their goals. It is important to recognise that even if there was no or little market response or low take-up, it does not mean the policy was a failure since its presence alone could have provided a stabilising influence. The study then examines whether the macroeconomic and financial conditions in SEACEN members prior to COVID-19 were conducive to the effective use of this tool. Moreover, it attempts to determine whether it is the APPs alone or used in conjunction with other monetary and financial policies, that makes asset purchases effective (or not). By examining the impact of APPs, controlling for a subset of other policy measures, the study may be able to shed light on how to improve their

effectiveness if used again by other SEACEN members. Of course, given how many other events transpired during the APP's usage, this task is extremely difficult, so only broad guidance is provided.

Additionally, the study seeks to provide guidance on two elements which appear key to the current (and possibly future) success of APPs — communication strategies and exit strategies. The COVID-19 pandemic and the variety of EMDE's communications about their APPs — their motivation, their startup timing, and their operational implementation, including their size and frequency, all appear to have influenced the outcomes. Since one of the main channels through which APPs operate is a "signalling" or expectations channel, that is, a change in the behaviour of investors and intermediaries based on a "signal" from the central bank, communication is important.

A relevant second area for their repeated use, or to minimise any long-term adverse implications after their initial motivation has dissipated, is how a central bank exits its APP. An exit comprises both the cessation of purchases (tapering) but also the unwinding of acquired positions from the central bank's balance sheet. In EMDEs, there may be an expectation by the government (or the financial market) that a central bank may continue to keep yields in check by continuing their purchases of debt. This is termed "fiscal dominance" or "monetary financing". How exit is accomplished has important implications for the credibility and independence of the central bank, and how it handles its role in maintaining financial stability without instilling the expectation that central banks will always be there to support prices during a downdraft. Such an expectation would be a dangerous precedent for any country, but especially for countries attempting to develop the depth and resiliency of their financial markets.

Hence, the study will attempt to analyse the following general questions:

- Did APPs accomplish their goals?
- Are they useful independent of other monetary policy tools?
- Are there ways to use them more effectively?
- Can better communication aid their effectiveness?
- How does one exit an APP?
- Are there unintended consequences to their use?
- Should they be part of the monetary policy toolkit going forward?

More detailed questions include:

- Were EMDEs' use of APPs, in general, and use by SEACEN members, in particular, successful in lowering government yields after their announcement?

- Did SEACEN members' use of APPs improve market functioning by lowering bid-ask spreads on relevant bonds?
- Did APPs lower exchange rate volatility in SEACEN economies and were exchange rate depreciation expectations judged to be lessened?
- Was credit growth enhanced after the implementation of APPs, compared to what it might have been without them?
- Can one say more definitively that APPs lowered yields, after controlling for other factors that may influence APP effectiveness (notably, domestic policy interest rate cuts, the US Federal Reserve (Fed) policy rate cuts, global risk appetite, exchange rate changes, etc.)

## 2. Scope of the Study

The study will cover the following countries within the (broad) SEACEN membership: Australia, India, Indonesia, Korea, Malaysia, New Zealand, Philippines, and Thailand. These countries all used a "traditional" APP by purchasing their own sovereign's securities. Additionally, Korea and Thailand set up methods to purchase corporate debt with Korea purchasing commercial paper as well. These eight countries can be compared with countries outside the region and against each other as both advanced economies and EMDEs in the region used APPs during this time period, with roughly similar goals and to similar degrees.

Due to different data availability across the SEACEN countries, most of the study focuses on the direct impact of the APPs on government debt yields of the benchmark securities, in light of the macroeconomic environment in which they were initiated. Other measures of financial market functioning — bid-ask spreads and term spreads — are examined as data allow. The study attempts to examine longer-term effects of the APPs on credit growth, keeping in mind that isolating the APP's impact will be difficult.

The study does not explicitly test the effectiveness of other policies, notably traditional monetary policy and exchange rate interventions, although potential interactions of these policies with APPs is discussed. Moreover, the study does not attempt to identify which of the various transmission channels was activated by the APP, if effective in achieving its goals.

# 3. Background

## 3.1 Theoretical Underpinnings

In the advanced economies, an APP is generally designed to focus on portions of the yield curve that influence investment in the real economy and influence future expectations, particularly inflation expectations. Although a similar goal is present for EMDEs, because these countries have more segmented yield curves and less accurate monetary transmission mechanisms to long-term interest rates, their more immediate concern was to quell market dysfunction and alter potential risk aversion that may disrupt monetary transmission. By directly intervening in the portions of the yield curve, or in specific long-term benchmarks, the central bank hopes to reduce asymmetric information or uncertainty that may be keeping markets from functioning normally. In some cases, the rationale for an APP is more directly centred on providing monetary stimulus by lowering wholesale and retail interest rates that are based on yields of various government securities. And in a few cases during the COVID-19 pandemic, the rationale for an APP was stated as supporting increased fiscal spending by allowing the government to finance itself at lower interest rates.

*Preconditions.* Under the assumption that the ultimate purpose of an APP is to boost demand in the real economy following an unexpected shock — that is, to ensure agents in the economy can borrow at "normal" rates and that financial intermediaries are willing and able to distribute credit — several preconditions are required.

First, the central bank needs to be clear about what the APP intervention is meant to accomplish as well as how it will be evaluated afterward. If the central bank is viewed as providing funding to the government and that funding is mis-handled or inefficiently deployed, market participants may believe that a period of "fiscal dominance" or "monetary financing" will ensue.[1] If inflation expectations are simultaneously unsettled, such government spending combined with monetary loosening may un-anchor inflationary expectations and threaten central bank credibility, disrupting future monetary transmission.

Second, the purchase of securities by the central bank naturally increases liquidity in the economy as well as lowers government yields. This alteration could result in unwanted currency movements and a local currency depreciation.[2] To offset this impact, a central bank may sterilise their interventions, but by withdrawing the liquidity they would also

1. In this study, "fiscal dominance" refers to various forms of pressure on the central bank to subordinate its objectives to those of the government. This could include pressure to not raise interest rates to counter inflation or could include forcing central banks to finance the government by purchasing its debt in the primary market at a subsidised rate, or by maintaining an overdraft facility. "Monetary financing" is a narrower concept that can be used to describe the acquisition of claims by the central bank on the government. If used in concert with fiscal dominance that restrains policy rate adjustment, it can result in "excessive" money growth and inflationary pressure (that is, relative to levels consistent with price stability). See Adrian et al. (2021) for a broader discussion of these concepts.

2. A depreciation of local currency will make exports more attractive (relative to imports) and hence could have an offsetting effect on GDP.

be limiting the funds available for credit extension. Hence, the central bank will need to balance these effects and decide how much of their intervention will be sterilised. This will depend on the type of currency regime, its credibility, the openness of the economy, other countries' interest rate policies, global financial conditions, and the potential for destabilising capital outflows or a halt in foreign investment. If the currency regime is free-floating or floating, the central bank will need to be especially careful to communicate any intervention strategy to avoid giving the impression of altering the exchange rate regime. During the COVID-19 pandemic, the stated concern of central banks was predominantly related to currency volatility rather than a change in their exchange rate regime.

Assuming these preconditions are satisfied — that is, there is clear communication about the purpose and expected duration of the APP and this information is absorbed by the market participants *and* that any foreign exchange interventions are limited and do not threaten to unseat expectations regarding the currency regime — an APP has the opportunity to be effective.

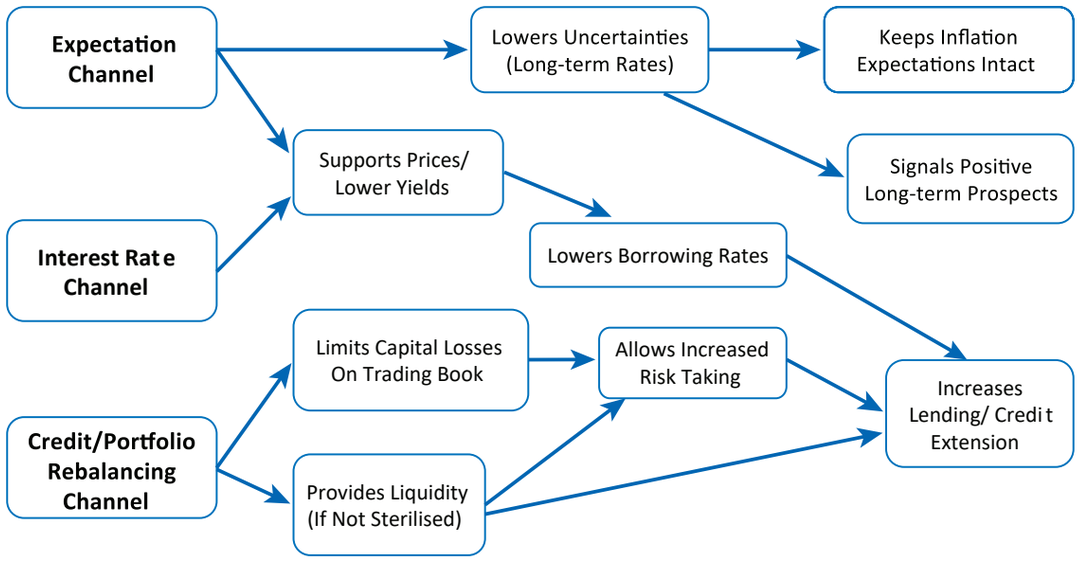
*Channels to the real economy.* Effectiveness of an APP on the real economy likely works through several monetary policy channels (Figure 1).

- Interest rate channel. By supporting prices and lowering yields of long-term government securities, the yield curve is lower and more stable, directly transmitting monetary policy interest rate objectives from short- to long-term lending rates, bypassing the usual, less precise transmission *via* inflationary expectations and risk aversion.

- Expectations channel. By providing a support price on long-term government securities, the central bank can lower uncertainty about long rates and signal it is prepared to keep inflation expectations intact as its own balance sheet would suffer losses if inflation were to pick up. Moreover, the central bank is providing a signal about its belief that longer-term prospects are more positive than those of markets.

- Credit channel. The effectiveness of this channel depends on the health of the banking system, its portfolio composition, and the degree of sterilisation. Central bank purchases of government debt limits bank capital losses, preserves their capital on their government holdings. If purchased from banks an APP directly provides liquidity, allowing them more leeway to lend, assuming it is not completely sterilised. If the government or central bank also provides loan guarantees or other credit support programmes, the chance that intermediation through banks continues unimpaired is higher. Sometimes this channel is referred to as the portfolio rebalancing channel when the preservation of capital and the extra liquidity improves the willingness to accept greater credit risks that can be redistributed to other parts of the bank's balance sheet — namely, lending to households and corporations.

**Figure 1. Potential Transmission Channels**




Source: Author's elaborations.

A formal test of which of the channels are operating and their relative degree of effectiveness is beyond the scope of this study. But at the most basic level, one would expect to see lower yields on long-term government securities and a flattened yield curve, that is, the term spread should decline. A rebound or stabilisation of private sector credit and a rapid recovery of private investment would also be key indicators of success, but, of course, hard to directly link to an APP in light of other policies being implemented to affect the real economy.

*Impact on financial stability.* Another frequently stated purpose of an APP during the COVID-19 pandemic was to reduce the prospects for financial instability in markets — government securities markets, but as well, those markets that are tied to the government securities market. Financial stability will enhance intermediation and hence support the real economy. In many advanced and developing countries, the government yield curve is the benchmark on which other assets are priced, so it is important to ensure a smooth and stable set of prices. Segmentation of the different maturities across the yield curve due to different types of investors (say, institutional investors or financial institutions) is often ironed out by arbitrageurs and other financial institutions, which require the ability (funding liquidity) and willingness (assurance of market depth and low levels of uncertainty) to be able to carry out this role. Additionally, several countries announced buying programmes for corporate bonds (e.g., Korea and Thailand) and commercial paper (Korea) to directly put a floor under the prices of these instruments so as to facilitate new debt and the rollover of existing debt.

During the initial stages of the COVID-19 pandemic, uncertainty pervaded financial markets and market liquidity and depth dropped. Most countries noted in their APP announcements the potentially market stabilising role of the programmes. The central

bank's purchase of government securities adds liquidity to the market, at least in the short-run during the period of illiquidity, and hence lowers volatility of prices and tightens bid-ask spreads. This allows government dealers and other intermediaries to more comfortably provide market-making activities and more accurately price other securities that use the government yield curve as their base rate. Hence, measures of the effectiveness of an APP in calming financial markets would include less volatile prices or yields of securities (government and others), lower bid-ask spreads, and higher volumes.

## 3.2 Existing Literature

Until 2020, most of the literature regarding the effectiveness of APPs had focused on the large-scale asset purchases of advanced economies implemented as part of their unconventional monetary policy (UMP) in the GFC. The analysis took two general forms to assess effectiveness. The first set of studies, using mostly event studies and similar regression modelling, analysed whether APPs influenced asset prices and risk premia as would be expected in the short-run. The general results were predominately positive: these programmes lowered long-term bond yields and lessened tail risks.[3] The second set of studies used calibrated modelling and vector autoregressive (VAR) exercises to examine overall macroeconomic outcomes over the longer term. Again, most of these showed a temporary rise in real GDP growth and inflation for countries at the zero lower bound.[4]

With the use of APPs by some 20 EMDEs for the first time during the COVID-19 pandemic, the number of studies of their effectiveness is small, but growing.[5] These studies are more diverse, both in terms of implementation and in their results, given a dispersion of goals across countries and differences in execution of their APPs. In terms of short-run impact, the general conclusion is that EMDEs' use of APPs lowered domestic government yields[6] and, to a lesser extent, flattened the yield curve. A bit more surprising is that the APPs did not induce a depreciation of the exchange rate, as might have occurred if the purchases were viewed as risking monetary financing. The APPs also appeared to have lowered exchange rate volatility — again evidence of the market stabilising role of the purchases. Other variables, such as communication strategies, non-residential investment share, exchange rate regime, size of programme, coincidence with other announcements, and exchange rate interventions (where data was available) showed varying impacts. Annex 1, Table A1.1 provides a summary of some of the studies.

3. See Gagnon et al. (2011), Krishnamurthy and Vissing-Jorgensen (2011), and Swanson et al. (2011) for the United States and Briciu and Lisi (2015) for the ECB, all on various yields and spread variables. Roache and Rousset (2013) for the results on tail risks associated with exchange rates and commodities.
4. See MacDonald and Popiel (2017), Gambacorta et al. (2012), and Weale and Wieladek (2016) for the long-run impact of APPs on macroeconomic variables.
5. See Fratto et al. (2021) and Arslan et al. (2020).
6. See Rebucci et al. (2021) for 10-year bond yields.

# 4. Description of APPs as Implemented

## 4.1 Design Features

The design of an APP in the Asian region shows both similarities and differences to those in other regions, depending on whether the country is an advanced or emerging economy (Table 1).

**Table 1. Design Characteristics of Government Bond APPs by Country**

| Country | Announce-ment date | Primary or secondary market | Mention of size of total envelope or amount of auction | Counterparties | Number of days between announcement and purchase | Post-purchase information | Rationale |
|---|---|---|---|---|---|---|---|
| Australia | 19 March 2020 | Secondary market | Yes, ex ante | Same as for OMOs | 20 March 2020 (+1 day) | | Market dysfunction and price control |
| India | 18 March 2020 | Secondary market | Yes, ex ante | Same as for OMOs | 20 March 2020 (+2 days) | Yes | Boost market confidence and reduce market dysfunction |
| Indonesia | 1 April 2020 | Primary market | Yes, ex post | Same as for OMOs | | Yes, quantities and yields | Support government finance if private market purchases are insufficient |
| Korea | 24 March 2020 | Secondary market | Unlimited size | Extended beyond regular repo counterparties | 1 April 2020 (+8 days) | Yes, quantities and fixed rate (Base rate + 10bp) | Ensure market stability and support government's Financial Support Package |
| Malaysia | 25 March 2020 | Secondary market mostly, some primary market | Yes, ex post | Same as for OMOs | | | |
| New Zealand | 20 March 2020 | Secondary market | Yes, ex ante | Same as for OMOs | 25 March 2020 (+5 days) | Yes | Boost confidence, reduce market dysfunction and provide monetary stimulus |
| Philippines | 8 April 2020 | Primary market (repo) | Yes, ex ante | Government | | | Support government's programs to fight COVID |
| Thailand | 19 March 2020 | Secondary market | Yes, ex post | Not stated | 13 March 2020 (-6 days) | | Stabilize market and ensure normal functioning |

Note: OMO refers to Open Market Operations; for blank cells no information was found.
Sources: Country central bank websites; India (Fratto et al., 2021).

### *4.1.1 Advanced Asian Economies*

For the advanced economies in Asia, the design takes on many of the traits of other advanced economies. In particular, the programmes are generally announced in advance of implementation and the terms of the purchases are disclosed, both *ex ante* and *ex post*. The operational implementation rules are spelled out within an envelope to assure some flexibility in case conditions change.

In particular, the AEs addressed the following key areas.

- Purchases are to be made using auctions from the private sector in secondary markets and not directly from the government in the primary market.
- The targets differ with Australia targeting the yield of their 3-year benchmark and others targeting a quantity of bonds.
- The purchases take place within one to two days of the announcement.
- Announcements state that the frequency of the purchases and the amounts will be adjusted as market conditions dictate.

The three advanced economies examined in this study — Australia, Korea, and New Zealand — are open economies and unlike the Euro area, the United States, and Japan with their reserve currencies, are subject to currency fluctuations that could add to financial and economic instability. Hence, even if they share some operational methods with the APPs of reserve currency AEs, they need to pay more attention to the issue of sterilisation and oversight of their currencies. Public descriptions of their concerns and responses in this area are, by necessity, more vague. All three countries provided information along these lines, with Korea's statements the most explicit.

- Foreign exchange (FX) intervention will be undertaken to stabilise unexpected and excessive volatility in exchange rate movements.
- Capital flow management policies for macroprudential purposes will be considered, but only if needed.
- Monitoring of capital flows will intensify.

### *4.1.2 Emerging Asian Economies*

Most emerging market economies in the region used the advanced economies as their mentors in their design of APPs. However, due to the level of financial development, cultural norms, and degree of independence of the central banks in the region, modifications in the design of APPs to assure the maximal degree of effectiveness were common. Of the five EMDE countries examined for this study, there was different emphasis on different design elements for their APPs. Common elements were:

- All announced publicly, in advance of operations, the pursuit of an APP.
- All utilised their normal method of intervening to purchase government securities (either an auction or a tender), aiming for amounts, rather than prices.

- All, except two (Indonesia and the Philippines), purchased in the secondary market using the same criteria for counterparties as they normally used.[7]
- All noted in their announcement the need to be flexible about the timing and that future purchases would be dependent on market conditions.
- All (except India) avoided specifically indicating which bonds (maturity) they intended to purchase.
- Some, but not all, avoided providing information after the purchase as to what and how much was purchased.

As these countries have open economies and are highly dependent on maintaining a relatively stable exchange rate against their trading partners, the considerations related to FX interventions were relatively more important than other emerging market countries that instituted APPs in 2020. In this regard, some of the key differences were:

- An explicit mention of the need to monitor FX developments and intervene as needed to avoid excessive volatility, though without mentioning what would be viewed as "excessive" under these conditions.
- An acknowledgement that capital flow measures may be required if capital outflows were deemed to be too rapid and destabilising.
- The absence of public information about how much or how frequently FX interventions were undertaken during or around the purchases.

Emerging market countries have, in general, paid more attention to the implications of the COVID-19 pandemic on foreign exchange markets. Given their openness and non-reserve currency status, this is not surprising. Several countries in the region announced that they would attempt to limit exchange rate volatility at the same time as their APP announcement. Others, while not announcing this formally, have indicated in other public statements their attention to this issue.

The dual attention to stabilising government debt markets and keeping yields from rising dramatically alongside exchange rate stabilisation policies make judging the effectiveness of the APP policies more difficult. This is made doubly difficult in the empirical work below because the dates and sizes of any exchange rate interventions are not publicly available. Official reserve changes, which would indicate the size of any transactions, are aggregated across intervention days and are released weekly or monthly.[8] In theory, intervention that is aimed to prevent a currency from depreciation will mute

7. Primary market purchases for the Philippines refer to a repurchase operation between the Bangko Sentral ng Pilipinas with the central government. The central bank also arranged secondary market purchases with their regular bank counterparties.

8. India and Thailand report weekly, Malaysia reports bi-weekly, and Australia, Indonesia, Korea, New Zealand, and the Philippines all report monthly.

the effectiveness of the APP. But if the intervention stabilised the exchange rate (lowered volatility but did not alter its trend or level), then the policy could be viewed as aiding the APP in stabilising financial markets in general. The use of sterilisation, whereby bank reserves resulting from the bond purchases are taken out of the system through other means, would make it clearer that central banks were not attempting to influence the overall liquidity in the system or the exchange rate. But without more information to be able to parse the various effects, a conclusion about the effectiveness of the APP alone is not possible.

# 5. Methodology and Impact of APPs

## 5.1 Discussion of the Pros and Cons of Various Methods

The wide variety of design characteristics and underlying economic and financial conditions under which the APPs were initiated make it difficult to select an empirical methodology that will accommodate all the countries in the sample. By far the easiest to implement and the one that is most commonly employed in a setting whereby an "event" can be distinguished is an event study. Its advantages are that it is relatively straightforward to set up and the basic results are easy to interpret. The researcher looks before and after the "event" and determines whether the variables of interest changed significantly in the hypothesised direction. Judging the statistical significance can be somewhat more difficult if the number of events is small and the dispersion of outcomes too little. For the purposes of this study, the number of countries is small and hence the power of the statistical tests may be compromised to some degree, making it less likely to find significant results.

A significant concern with the event study methodology is that there may be other "events" affecting the outcome variable (government bond yields, bid-ask spreads, and term spread) during the same time frame as the event in question. This implies that one cannot conclude that it was the event, and only the event, that resulted in the outcome. To control for these other factors requires a more complicated empirical structure. Hence, a projection (a regression) method is employed where other variables that may affect the outcome variable are "controlled for" by introducing them alongside a dummy variable indicating the date of the event. This method is not failsafe either, however, since if these other variables are correlated with the event, which in March 2020 is likely, the statistical significance may be affected — and the bias depends on how all the right-hand side variables of the regression are correlated with each other.

## 5.2 Event Study

Two sets of event studies are conducted. The first looks at the five SEACEN emerging market countries in the sample that initiated APPs during the initial stages of the COVID-19 pandemic. They include India, Indonesia, Malaysia, the Philippines, and Thailand. The second event study examines the three SEACEN advanced economies in the sample: Australian, Korea, and New Zealand. The "event" is the date of the announcement that assets were to be purchased by each central bank, their first such announcement,

though in a couple of cases the formal announcement was preceded by a market reaction suggesting that the financial markets were expecting the formal announcement shortly. Even if market reactions are visible before the press release, the formal date is taken as the announcement date for the purposes of evaluation (Table 2). The variables of interest are: (1) the yield on the most liquid, long-term government security as discerned by volume of transactions; (2) the bid-ask spread of that security; and (3) the yield curve slope, the term spread, as measured by the difference between the 10-year maturity bond and the short-term security used most often in the country to conduct policy. The hypotheses are: the yield on the most liquid long-term security should decline upon the announcement of government purchases; the bid-ask spread is expected to narrow and stabilise; and the yield curve slope (the term spread) should flatten (that is, the difference between the long- and short-term bond yields should decline).

**Table 2. Announcement Dates and Benchmark Securities Specification**

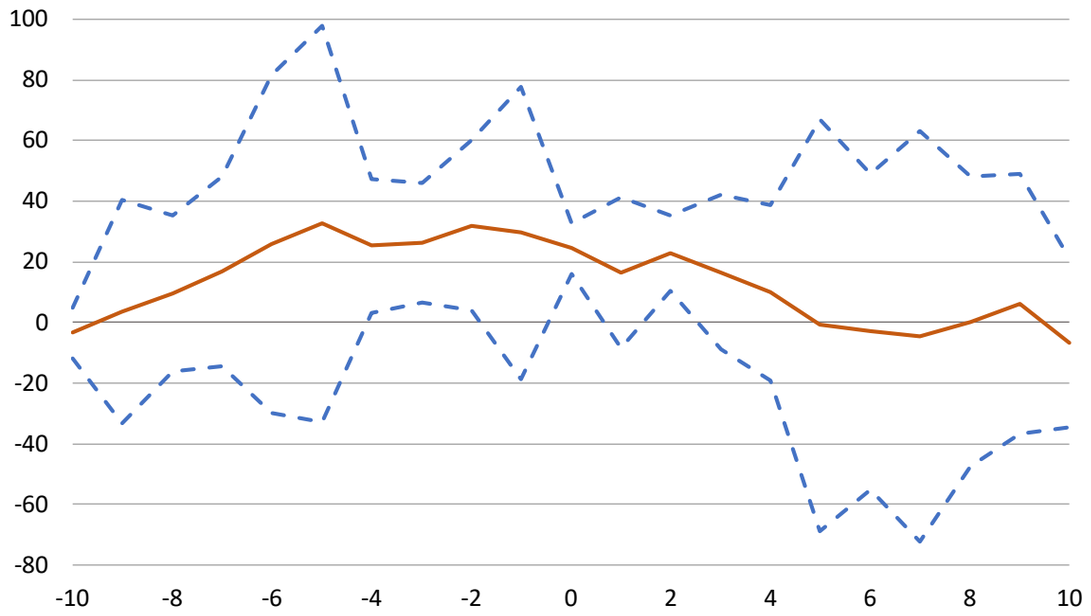
| Country | Announcement Date | Government Security: Long-Term | Government Term Spread | Bid-Ask Spread |
|---|---|---|---|---|
| **Emerging Market** | | | | |
| India | 18 March 2020 | 5-year | 10-year – 3-month | 10-year |
| Indonesia | 1 April 2020 | 10-year | 10-year – 3-month | 10-year |
| Malaysia | 25 March 2020 | 5-year | 10-year – 3-month | 10-year |
| Philippines | 8 April 2020 | 10-year | 10-year – 3-month | 10-year |
| Thailand | 19 March 2020 | 10-year | 10-year – 1-year | 12-year |
| **Advanced Market** | | | | |
| Australia | 19 March 2020 | 10-year | 10-year – 1-year | 10-year |
| Korea | 24 March 2020 | 10-year | 10-year – 1-year | 10-year |
| New Zealand | 20 March 2020 | 10-year | 10-year – 3-month | 10-year |

Source: Central bank websites.

The study "lines up" the different announcement dates across the countries and assigns them a date of t = 0 and then looks at alterations in the three variables during the ten days before and ten days after the announcement. Since there are multiple countries in each sample, it is possible to construct the inter-quartile range that indicates whether the average change is significantly different from zero, suggesting that the event had more impact than random noise. The dotted lines in the charts below signify the interquartile range — that is, plus and minus the difference between the first and third quartiles of the distribution of changes across the underlying countries in the sample.

Overall, the results in Figure 2 for the benchmark securities in EMDEs show a consistent decline of about 31 basis points in the ten days following the announcement of the asset purchases, much of it between days 2 and 7.

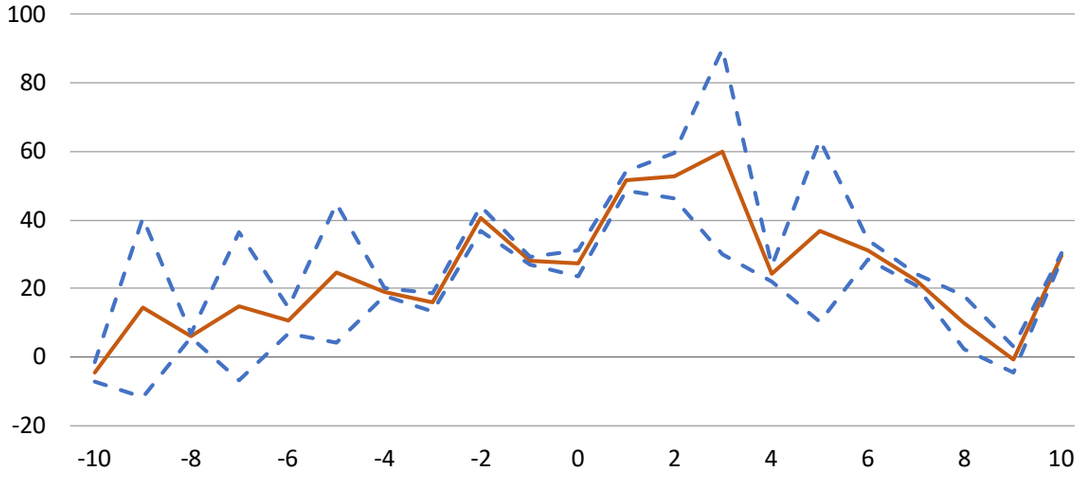
**Figure 2. Average Cumulative Change in Selected Emerging SEACEN Countries: Bond Yield**




Note: The y-axis is in basis points (of yield). The x-axis measures the number of trading dates surrounding the announcement event at t = 0. The sample includes India, Indonesia, Malaysia, the Philippines and Thailand. Dashed lines refer to average cumulative change plus and minus interquartile range. See Table 2 for the event dates and the specific securities used as the benchmarks.
Source: Author's calculations.

Looking at the bid-ask spreads, the results are not as clearly linked to the event day (Figure 3). The bid-ask spreads fall between day 3 and day 9. Overall, the results partially support the notion that central bank intervention calmed markets and encouraged their functioning, but with a lag. This is likely due to the poor data quality on bid-ask spreads of these securities. Data collected from Refinitiv often show no movement in bid-ask spreads for large periods of time for some countries and even when movements occur they appear to be in fixed multiples of each other at random days. It is unlikely that these data accurately reflect the actual market liquidity, but a decline is evident even though the number of observations is insufficient to provide a formal statistical test.

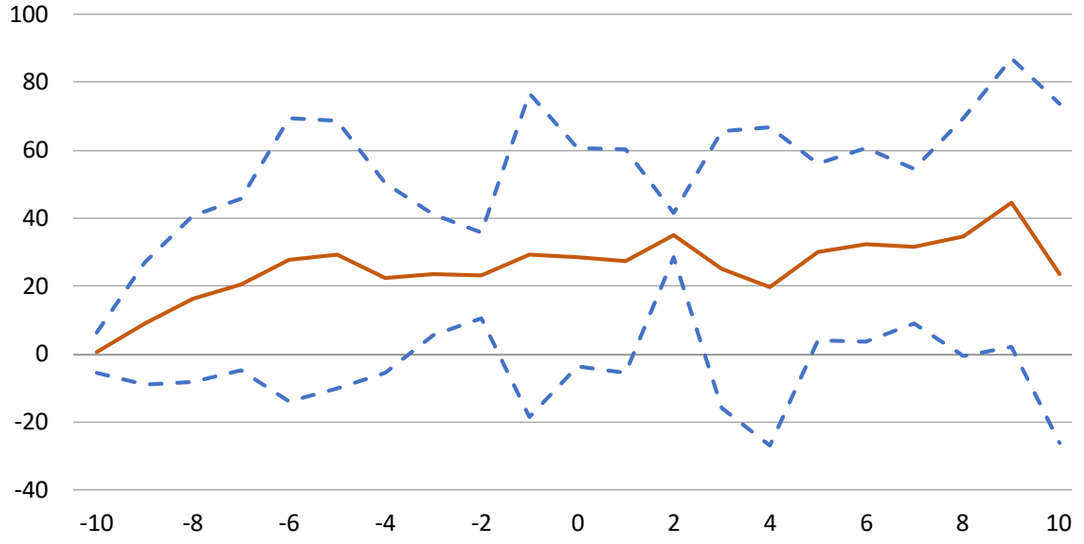
**Figure 3. Average Bid-Ask Spread in Selected Emerging SEACEN Countries**




Note: The y-axis is in basis points (of yield). The x-axis measures the number of trading dates surrounding the announcement event at t = 0. The sample includes India, Indonesia, Malaysia, the Philippines and Thailand. See Table 2 for the event dates and the specific securities used as the benchmarks.
Source: Author's calculations.

Lastly, the results regarding the yield curve slope (Figure 4) suggest some lagged and short-lived impact from the announcements. Recall the asset purchase programmes were targeting the purchase of longer-maturity securities to lower the yields that are most used for borrowings by corporates to spur investment. The impact of the announcement only lasted two days, from days 2 to 4, with the term spread widening over the remaining days.

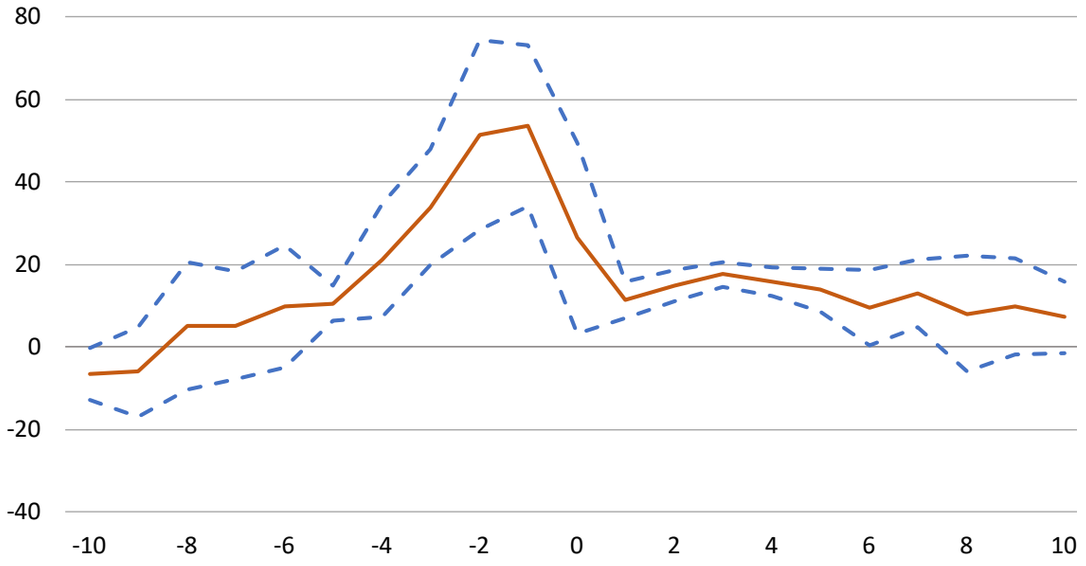
**Figure 4. Average Cumulative Change in Selected Emerging SEACEN Countries: Term Spread**




Note: The y-axis is in basis points (of yield). The x-axis measures the number of trading dates surrounding the announcement event at t = 0. The sample includes India, Indonesia, Malaysia, the Philippines and Thailand. See Table 2 for the event dates and the specific securities used as the benchmarks.
Source: Author's calculations.

For the advanced economies of Australia, Korea, and New Zealand, the direct impact on yields (Figure 5) suggest that the APPs are more effective in that their impact is more consistent across the countries (given the tighter interquartile range). The initial drop in the cumulative average yield for the long-term maturity bonds is about 46 basis points from its peak a day before the announcement day, suggesting that for some countries their markets anticipated the announcement. Most of the move occurred rapidly and the yields remain low for the ten days following the announcement.

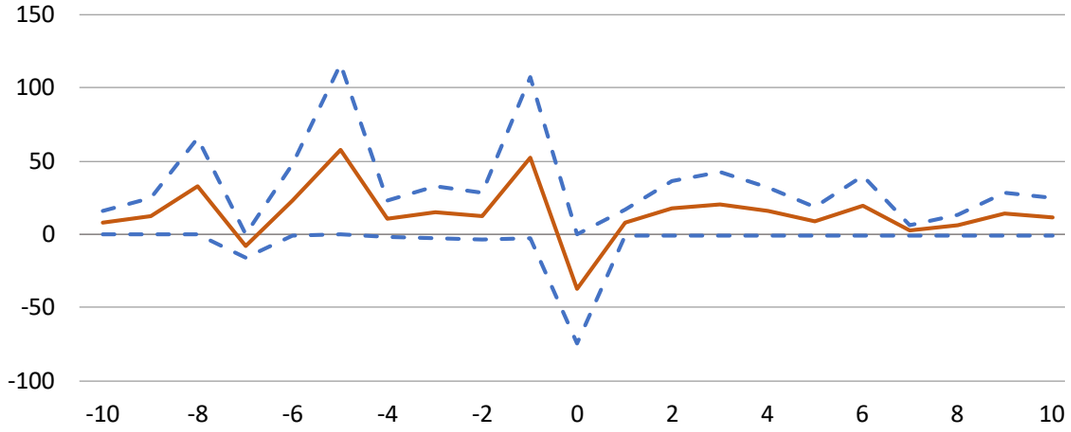
**Figure 5. Average Cumulative Change in Selected Advanced SEACEN Countries: Bond Yield**




Note: The y-axis is in basis points (of yield). The x-axis measures the number of trading dates surrounding the announcement event at t = 0. The sample includes Australia, Korea and New Zealand. See Table 2 for the event dates and the specific securities used as the benchmarks.
Source: Author's calculations.

The results for the bid-ask spreads are again difficult to interpret as they only include Australia and New Zealand (Figure 6). Korean data on bid-ask spreads was unavailable on Refinitiv. Better data would likely show more distinctive results. Nonetheless, the impression of lower and less volatile bid-ask spreads following the announcement is clear, suggesting markets were calmed by the central bank's purchases for these two countries.

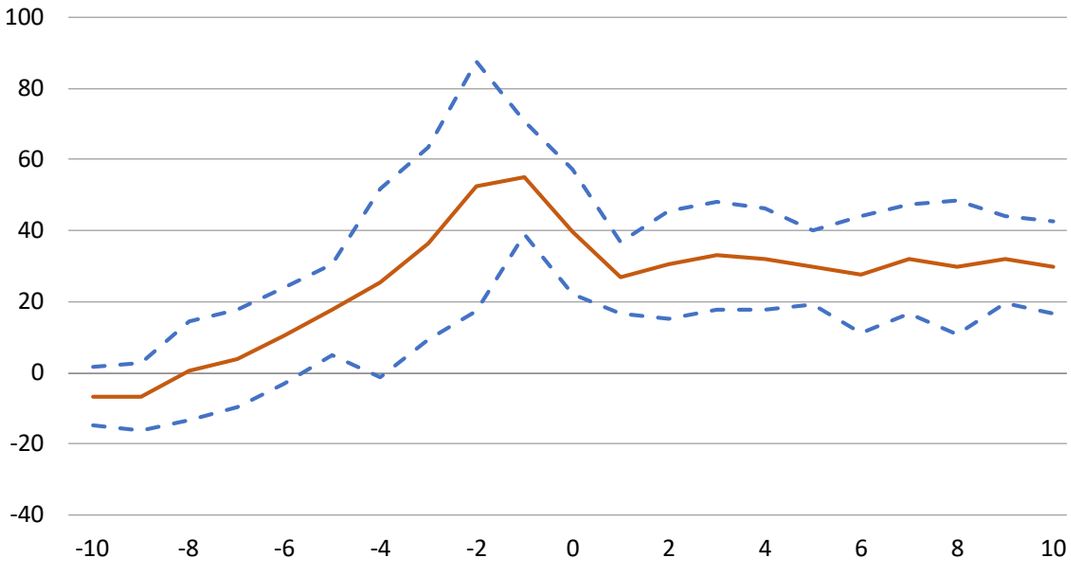
**Figure 6. Average Bid-Ask Spread in Selected Advanced SEACEN Countries**




Note: The y-axis is in basis points (of yield). The x-axis measures the number of trading dates surrounding the announcement event at t = 0. The sample includes Australia and New Zealand. See Table 2 for the event dates and the specific securities used as the benchmarks.
Source: Author's calculations.

As regards the cumulative change in the term spread between long-term maturity yields and short-term ones, the results are more distinctive for the advanced economy countries than for emerging markets. The yield curve slope decreases and remains lower for the ten-day window following the announcement (Figure 7). Note, however, that while lower than its peak just prior to the announcement day, the term spread remains higher than in the runup to the announcement.

**Figure 7. Average Cumulative Change in Selected Advanced SEACEN Countries: Term Spread**




Note: The y-axis is in basis points (of yield). The x-axis measures the number of trading dates surrounding the announcement event at t = 0. The sample includes Australia, Korea and New Zealand. See Table 2 for the event dates and the specific securities used as the benchmarks.
Source: Author's calculations.

Overall, the event studies provide some initial evidence that the asset purchase programmes of central banks in both the EMDEs and AEs in the Asian region were effective in meeting their goals. Other event studies (some of which involve these countries) also show that APPs were effective. Of course, neither these results (nor the other event studies) adequately control for the financial conditions and other events that occurred during this tumultuous time and hence one cannot definitively conclude that it was the announcements of APPs, in and of themselves, that resulted in lower yields, somewhat diminished bid-ask spreads, and flatter term spreads. More refined methods will now be employed to evaluate the impact on bond yields.

## 5.3 Regression/Projection Approach

To refine the event study to attempt to isolate the impact of APPs on government yields, one needs to include other factors that could have influenced the yields during this period. Two types of variables are chosen: global and domestic factors. For global ones, the evidence is nearly incontrovertible that the Fed's actions during crises (and even in "normal times") affect financial markets in both AEs and EMDEs. Hence, the study uses changes of the Fed Funds Rate as the relevant policy rate. As another measure of global financial conditions, we include the VIX (the implied volatility of options on the S&P500 index), which is measured in percent. As for domestic variables, the daily change in the domestic policy interest rate is of primary concern and would imply a change in the yield in the same direction (and hence a positive coefficient). Indeed, announcements of policy rate cuts were often close to those of the APP announcements and thus warrant inclusion as a control variable. Exchange rates are also important to consider since the APP interventions and any impact on yields (including from relative changes in the Fed Funds rate and domestic policy rates) may alter exchange rates. Barring sterilisation, a lowering of domestic yields (relative to foreign ones) would imply depreciation and hence a hypothesised positive coefficient on this variable.

A panel regression using all eight countries is conducted. The variable of interest is the daily change in the benchmark government yield, typically of a 5- or 10-year maturity, following the first announcement of the APP. A cumulative change in yields over a 10-day subsequent (future) period is also used to examine the conjecture that it may take several days for the impact on yields to be felt. The panel regression utilises a "fixed effect" model to accommodate the differences across countries that may not be captured by their domestic policy rates and exchange rates.[9] The announcement day is represented by a dummy variable taking on the value of '1' for the day following the announcement to account for a late-day announcement and the time for the market to digest the news.

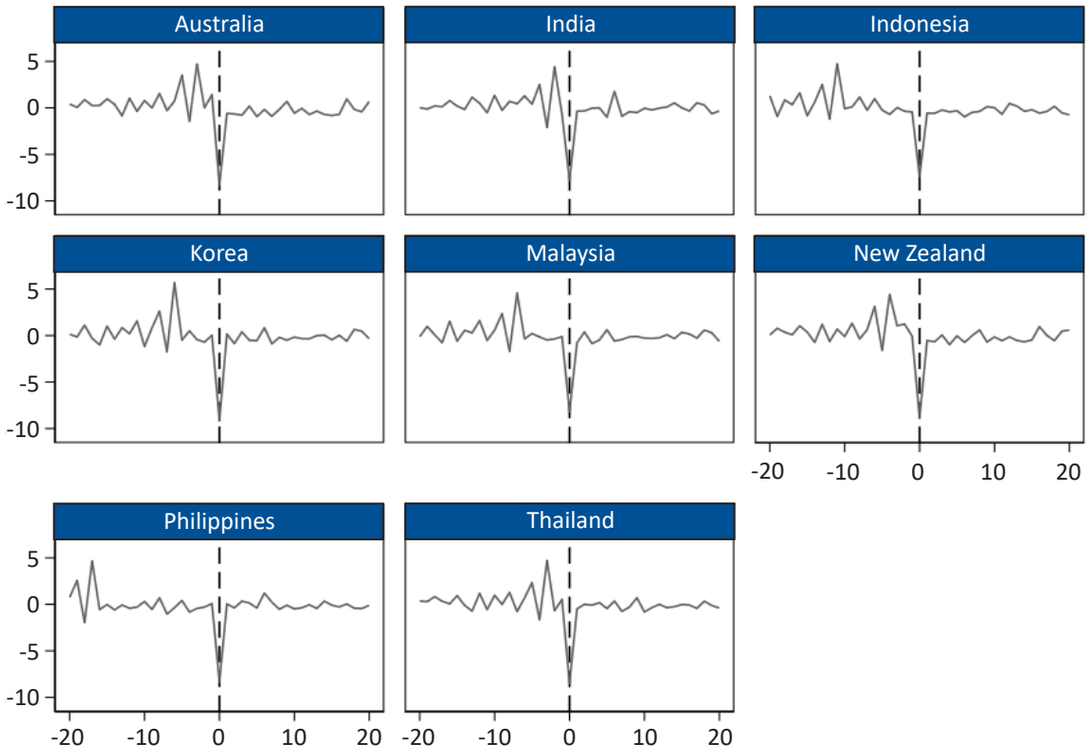
The results for estimations of the daily yield change and ten-day future cumulative change in yields confirm a statistically negative coefficient on the announcement day dummy, as is hypothesised. See Annex 2, Table 2.1 for the complete results. For the daily change in yield, the exchange rate and the VIX are also statistically significant with

9. The use of a fixed effect model (rather than a random effect model) was verified through the Pesaran and Breusch-Pagan LM tests for cross-sectional correlations and an examination of the relative $R^2$ of the cross-section and time series residuals. A test for heteroskedasticity was also performed, which rejected the null of no heteroskedasticity, consequently the standard errors have been corrected for both cross-sectional correlation and heteroskedasticity.

correctly hypothesised signs (positive). By contrast, the domestic policy rate is statistically insignificant. In the forward, ten-day cumulative yield regression, the announcement day dummy remains highly statistically significant. The Fed's policy rate becomes marginally significant (though with the "wrong" negative sign). The exchange rate variable is no longer significant although the VIX remains statistically significant in this specification.

Figure 8 shows the predicted (fitted) values of the daily change in yield for each of the countries. The large and abrupt dip on the announcement day shows its impact in basis points for each of the countries (taking into account their country specific domestic policy rate changes and their exchange rate changes as well as the Fed Funds policy rate change and the VIX). Figure 9 shows the predicted (fitted) values for the forward cumulative ten-day yield change.[10] For both figures, the predicted values of these variable show the abrupt impact on the announcement day and, additionally, reveal less volatility post-announcement. In general, this suggests that the APPs dampened volatility as well as lowered yields.

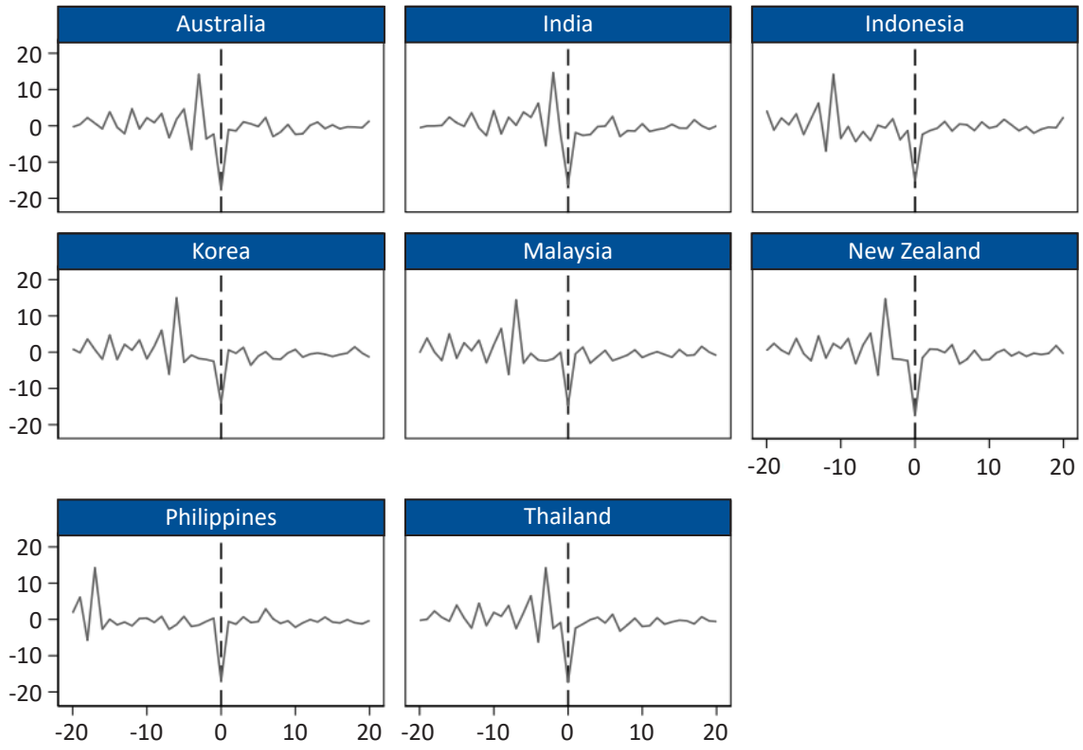
**Figure 8. One-day Impact of Initial Asset Purchase Programme Announcement on Ten-year Government Debt Yield (Predicted Value in Basis Points)**




Note: The y-axis represents basis point changes. The x-axis is centred around the initial announcement date for that country. The panel regression model is executed for trading day data from 6 August 2019 to 9 October 2020. Further information can be found in Annex 2.
Source: Author's calculations.

10. Implementation days are not publicly available except for India and Thailand so these results use the announcement day only. Regressions with a dummy variable that is '1' for all remaining days of the sample was also separately run, with similar results (a negative and statistically significant coefficient on the dummy variable) suggesting the impact was lasting.

**Figure 9. Ten-day Impact of Initial Asset Purchase Programme Announcement on Ten-year Government Debt Yield (Predicted Value in Basis Points)**



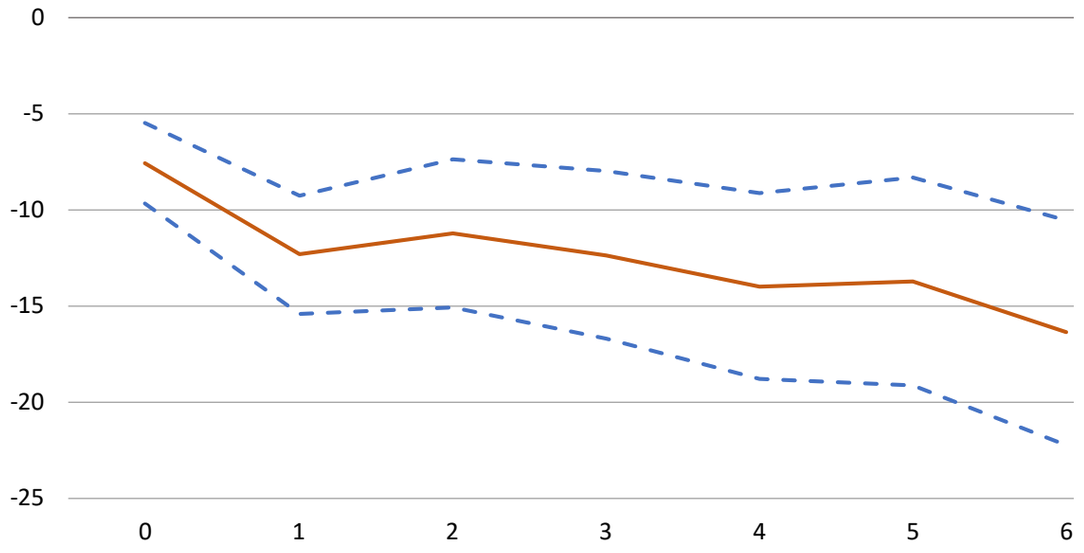

Note: The y-axis represents basis point changes. The x-axis is centred around the initial announcement date for that country. The panel regression model is executed for trading day data from 6 August 2019 to 9 October 2020. Further information can be found in Annex 2.
Source: Author's calculations.

The regression results attempt to control for, contemporaneously, various other factors that may affect the effectiveness of APPs. These results are in line with other studies that perform the same type of analysis including Arslan et al. (2020), Sever et al. (2020), Fratto et al. (2021), and Rebucci et al. (2021). But to further hone the size and sustainability of the reaction, a regression that controls for the dynamics of the explanatory variables can be used. Since the eight countries initiated their APPs on slightly different days and altered their domestic policy rates differently over this time frame as well, it is worth controlling for this timing by introducing leads and lags of the explanatory variables, including the dummy announcement variable. Controlling for these dynamic changes over eleven days (six leads and four lags and the contemporaneous changes) helps identify both the size and persistence of the impact of the announcement on daily yields. Hence, this allows us to capture the full dynamics of the daily yield changes in the aftermath of the announcements.[11]

11. As before, and for the same reasons, a fixed-effect model is employed. The standard errors for the coefficients are corrected for cross-sectional correlation and heteroskedasticity. For more information on how these regressions are conducted see Annex 3. The model follows the corrections made by Teulings and Zubanov (2014) to Jordà's (2005) projection model.

The results corroborate the earlier ones. The coefficient on current and subsequent announcement dates are all statistically significantly negative. The size of the yield impact increases over time, going from 7.6 basis points the day after the announcement to 16 basis points by the sixth day (Figure 10). Although not a large amount, these estimates are more precise due to the attention to the dynamics across countries and the control variables. The VIX remains statistically significant at the 10 percent confidence level for days 1, 3, 4 and 5, but its forward (lead) coefficient is noticeably significant in several specifications, suggesting its role as a leading indicator. The Fed Funds rate remains statistically significantly negative, rather than the hypothesised positive coefficient, for days 2 through 4 and day 6 post announcement although its magnitude is small. The exchange rate impact is no longer statistically significant. Annex 3, Table 3.1 contains the complete results.

**Figure 10. Impact (Size of Effect) of Initial Asset Purchase Programme Announcement on Ten-year Government Debt Yield Over the Next Six Days (Percentage Point Change in Yield)**




Note: The y-axis percentage point changes in yields in basis points. The x-axis is days from initial announcement date. The sample covers all eight countries from 6 August 2019 to 9 October 2020. Further details about the methodology and complete results can be found in Annex 3.
Source: Author's calculations.

All three of these empirical exercises point to the overall success of the APPs in lowering daily long-term Treasury yields and, to a lesser extent, lowering their volatility. The panel regression results show that the impact of the APP announcements across the eight countries is not just a single day impact but lasts for several days. A more long-lasting impact is very difficult to measure given the dramatic changes in other variables besides those directly associated with these markets, and most studies, including this one, do not attempt in-depth exercises.

That said, a dummy variable assigned '1' to all days after the announcement day in the sample period was found to be statistically significant for the 10-day cumulative yield change. This suggests long-lasting effects are possible.

## 5.4 The Impact of APPs on Trading Volume

The impact of APPs on the volume of trading in government securities' markets, and by extension confidence in the depth of other related securities' markets, is difficult to gauge. Of the countries in the sample, not all have direct information about trading volume in the affected government securities while the data frequency varies across the countries, with only two countries reporting on a daily basis. Despite these limitations, a cursory examination suggests that volume dipped during the advent of the COVID-19 pandemic and then either stabilised or improved after the announcement of the APPs.

## 5.5 Impact on FX Volatility

Although the panel regression model suggests that the inclusion of FX rates matter for isolating the impact of APPs on yields (in that the coefficient on the local currency vis-à-vis the US dollar is positive and statistically significant), a closer look at the impact of the announcement of the APP and the volatility of FX rates is mixed. Using the same sample period as the regressions and examining the standard deviations of the individual country exchange rates for the pre- and post-announcement periods shows that only two countries experienced a decline in volatility — Korea and India (Table 3). Indeed, Indonesia and Australian experienced a more than doubling in FX volatility in the six months surrounding the APPs. Admittedly, the reasons for such moves were more likely to due to these two countries' exposures to volatile commodity prices rather than the impact of APPs. Keeping in mind the very short sample, looking at ten days on either side of the announcement day shows six of the eight countries experienced a decline in volatility — with Indonesia and India experiencing an increase instead. Other event studies of EMDEs have found a decline in FX volatility the days following the announcement of APPs, though these studies have not controlled for other factors either.

**Table 3. Foreign Exchange Volatility**
**(Standard Deviation: Local Currency/US Dollar)**

| | Australia | India | Indonesia | Korea | Malaysia | New Zealand | Philippines | Thailand |
|---|---|---|---|---|---|---|---|---|
| 6 Months Pre-Announcement | 0.043 | 0.963 | 184.921 | 22.119 | 0.072 | 0.044 | 0.511 | 0.556 |
| 6 Months Post-Announcement | 0.091 | 0.934 | 660.563 | 18.520 | 0.075 | 0.072 | 0.853 | 0.619 |
| Percent Change in Volatility | 112% | -3% | 257% | -16% | 4% | 64% | 67% | 11% |
| | | | | | | | | |
| 10-Days Pre-Announcement | 0.077 | 0.510 | 214.556 | 29.920 | 0.075 | 0.066 | 0.184 | 0.400 |
| 10-Days Post-Announcement | 0.037 | 0.561 | 252.721 | 9.040 | 0.016 | 0.027 | 0.181 | 0.156 |
| Percent Change in Volatility | -52% | 10% | 18% | -70% | -79% | -59% | -2% | -61% |

Sources: Author's calculations, Refinitiv.

## 5.6 Caveats

The factors introduced above are unable to fully capture any alternative or indirect goals of the APPs. The following are some of the other goals that are associated with an APP but are not incorporated into the econometric results.

- *Fiscal cost reductions due to the impact of lower yields accomplished by the APP.* Such lower government yields in the secondary market would affect the fiscal cost of debt (both rolled over debt and new issuances). Without a counterfactual assessment, the fiscal savings are difficult to measure.

- *Discouraging or controlling capital outflows.* There are at least two possible scenarios related to APPs. First, by putting a floor under local currency government securities prices, foreign investors that own such debt may be less likely to sell during a period of stress. They may also be less apt to sell foreign-denominated government debt. Second, if financial markets, including the government securities market, appear more stable as a result of the APP, then outflows on other types of assets may be less likely to occur. To the extent that the APP works in tandem with foreign exchange intervention to calm markets, the joint policies may also inhibit capital outflows. But in this case, one cannot attribute lower capital outflows to APPs alone.

- *Support monetary transmission and its impact on credit provision.* APP programmes, as unconventional monetary policy, are meant to aid other more conventional monetary policy tools. Although changes in the policy interest rate are included in the empirical work above, other tools, such as the lowering of bank reserve requirements and government or central-bank provided credit support policies, including to small- and medium-sized enterprises (SMEs) or other industries, are not included. Overall private credit, or bank credit to specific targeted sectors either stabilised or improved, but such policies are conflated with those of the APP.

- *Complementarity with a loosening of prudential policies.* In addition to extensive use of monetary policy tools, prudential policies applied to banks (and in some cases non-banks) were loosened. The APPs were designed in part of provide liquidity to banks to enable them to continue to lend and support businesses and households. Prudential liquidity requirements, such as the liquidity coverage ratio (LCR), the net stable funding ratio (NSFR), and other country-specific liquidity ratios were loosened. In addition, some types of capital requirements (e.g., the counter-cyclical capital buffer and the capital conservation buffer) were released or lowered to allow banks to absorb loan losses without violating their capital requirements. Other rules regarding accounting for non-performing loans and interest deferrals were granted to keep households and businesses from defaulting and lending intact. The relaxation of prudential policies plays a complementary role to APPs — that of maintaining low borrowing rates and credit flowing, and hence cannot be easily separated.

# 6. Other Considerations Influencing APPs

## 6.1 Domestic Monetary Policy Interactions

In addition to the traditional tools of monetary policy used in the region such as changes in a policy interest rate and monetary targeting, there are other liquidity provision tools available, some of which might be considered indirect monetary policy tools. These would include alterations in reserve requirements and short-term liquidity requirements as noted above. Others are broader support to the financial system (in addition to banks) and would include use of repurchase arrangements (both repos and reverse repos) and the associated collateral and haircut arrangements, swap arrangements, and emergency liquidity assistance (ELA). During the first and second quarters of 2020, a number of these tools were employed (Table 4).

**Table 4. Asian Central Bank Measures During COVID-19 (By Tool)**

| Type of Tool | Type of Measure | Australia | India | Indonesia | Korea | Malaysia | New Zealand | Philippines | Thailand |
|---|---|---|---|---|---|---|---|---|---|
| Interest Rate | Policy rate cut | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Lending Operation | Liquidity Provision | ■ | ■ | ■ | ■ | | ■ | ■ | ■ |
| | Targeted Lending | ■ | | ■ | ■ | ■ | ■ | ■ | ■ |
| Asset Purchase Programme (1) | Government Bonds | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | Commercial Paper | | | | ■ | | | | |
| | Corporate Bonds | | | | ■ | | | | ■ |
| Foreign Exchange | USD Swap Line | ■ | | | ■ | | ■ | | |
| | Swaps (2) | | ■ | ■ | | | | | |
| | Spot Intervention | | ■ | | | ■ | | | ■ |
| Reserve Policy | Remune-ration | ■ | ■ | | | | ■ | | |
| | Requirement Ratio | | ■ | ■ | | ■ | | ■ | |
| | Compliance | | | | | ■ | | ■ | |

Notes: Green box denotes the tools implemented. (1) Includes operations conducted with assets of different maturity or risk profile (i.e., operation twist and swap operations). (2) Includes non-deliverable forwards.
Sources: Central bank websites, Bank for International Settlements.

During the initial stages of the COVID-19 pandemic, several countries in the region required US dollar liquidity in addition to their local currencies. While not formally related to the APP, the goal of keeping credit flowing also meant that US dollar-denominated

debt for domestic financial and non-financial firms needed to be rolled over. The APPs, by stabilising and lowering borrower rates, in conjunction with the central bank's ability to obtain US dollars through various swap arrangements, allowed credit to *US dollar-based* borrowers to be extended. The most important, by far, were the re-established cross-currency swap arrangements with the Fed (e.g., Korea, Australia, New Zealand) and potentially more extensive use of the Fed's foreign and international monetary authorities (FIMA) Repo Facility, whereby central banks with US Treasuries stored at the Federal Reserve Bank of New York could obtain temporary US dollar funding using their US Treasuries as collateral. Just the existence of these swap arrangements (whether used or not) calmed markets and aided the effectiveness of the APPs.[12]

## 6.2 Foreign Monetary Policy and External Factors/Influences

None of the countries in this study are immune from the monetary policy actions of countries with which they are interconnected — either through trade or financial linkages. The actions of the Fed are the most potent, not least because of the increase in dollar-denominated debt taken on by borrowers in SEACEN countries, but other countries' policies are also relevant for the region. This includes the monetary policy actions taken by the ECB and the Bank of Japan, as well as other countries in the region.

Nearly all relevant countries' central banks lowered their policy rates and pumped liquidity into their economies in early 2020. Many lowered regulatory requirements (such as the LCR and the requirements for holding provisions on non-performing loans). The simultaneous loosening implied that the impact on exchange rates was less than they would have been otherwise, perhaps explaining the results above showing little effect. Still, as risk aversion increased (as reflected in the VIX and other metrics), large capital outflows were common across the region and attention to exchange rates and other macroeconomic fundamentals was acutely needed. In general, foreign policy rate declines, additional liquidity (including especially the dollar through formal Fed swap arrangements or the FIMA facility) supported the same goals as the APP. Even after controlling for some of these features, the APPs in the region were successful in lowering domestic government bond yields and stabilising their markets, achieving their main purpose.

## 6.3 Domestic Macro Conditions Prior to APP

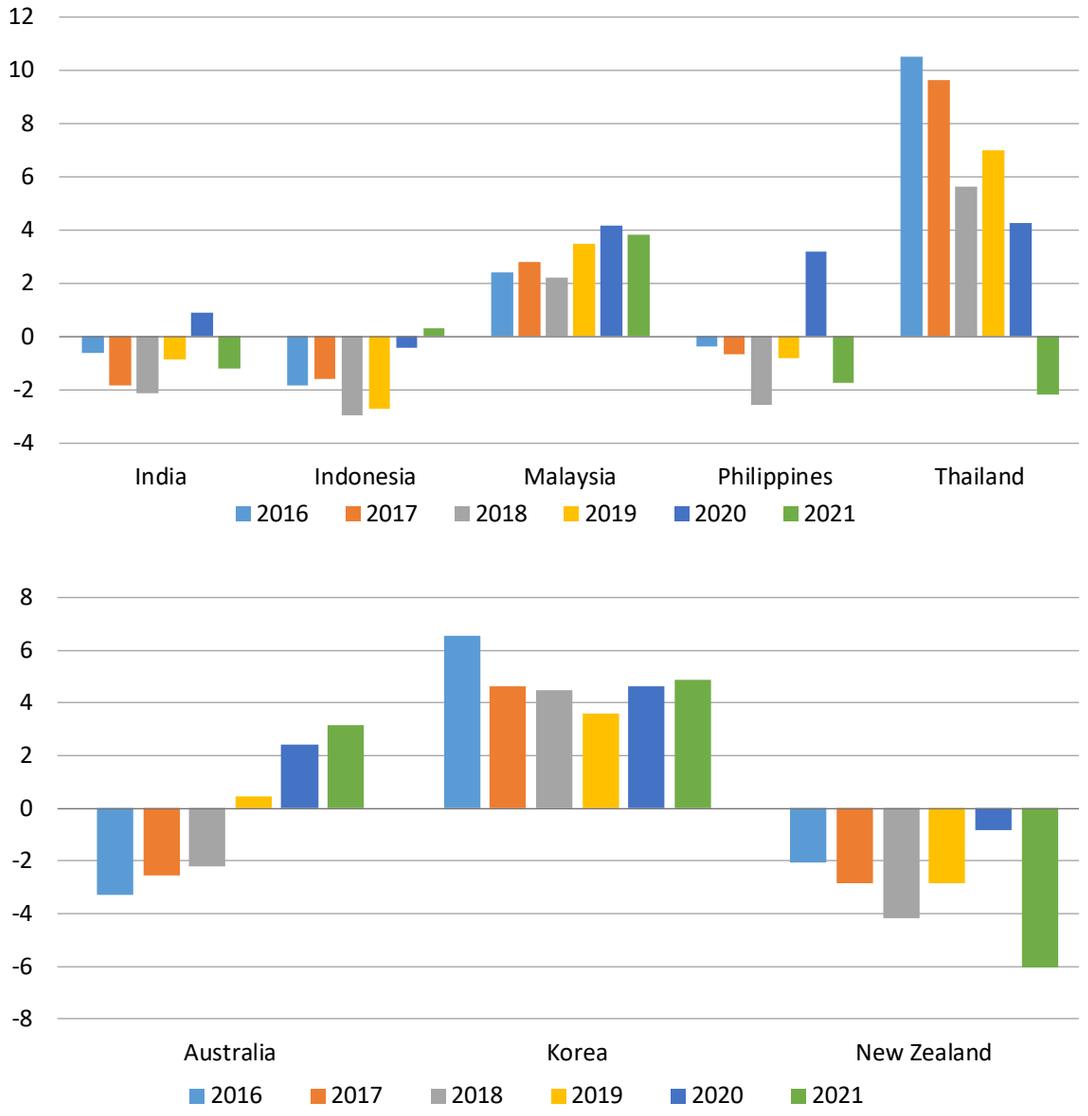
To some extent, the effectiveness of an APP will depend on the underlying macroeconomic environment in which it is undertaken. This includes both the external and domestic circumstances. For the countries in the region that instituted an APP, those that had low vulnerabilities going into the COVID-19 pandemic could expect to fare better than those with more elevated vulnerabilities.

12. Korea announced its swap arrangement with the Federal Reserve on 19 March 2020. It used the swap arrangement intermittently from 31 March through 6 May 2020. Indonesia announced its ability to use the FIMA account on 7 April 2020. Detailed information about Indonesia's use is not available from the Federal Reserve.

### 6.3.1 *Impact of External Conditions on APP Effectiveness*

An examination of external balances to detect vulnerabilities to exchange rate and capital flow volatility suggests that most countries in the sample were in relatively good shape. Emerging market countries' current account balances were either positive or were not of immediate concern even if negative (less that 3 percent of GDP) before the COVID-19 pandemic hit (Figure 11). Only New Zealand had a current account deficit of note. It has run current account deficits for many years and, due to its other macroeconomic policies, has not suffered previous capital outflow difficulties tied to them. The large deficit in 2021 was due to a one-off weather-related disruption and the diminution of tourism and transportation, which are expected to recover as COVID-19 pandemic fears dampen.

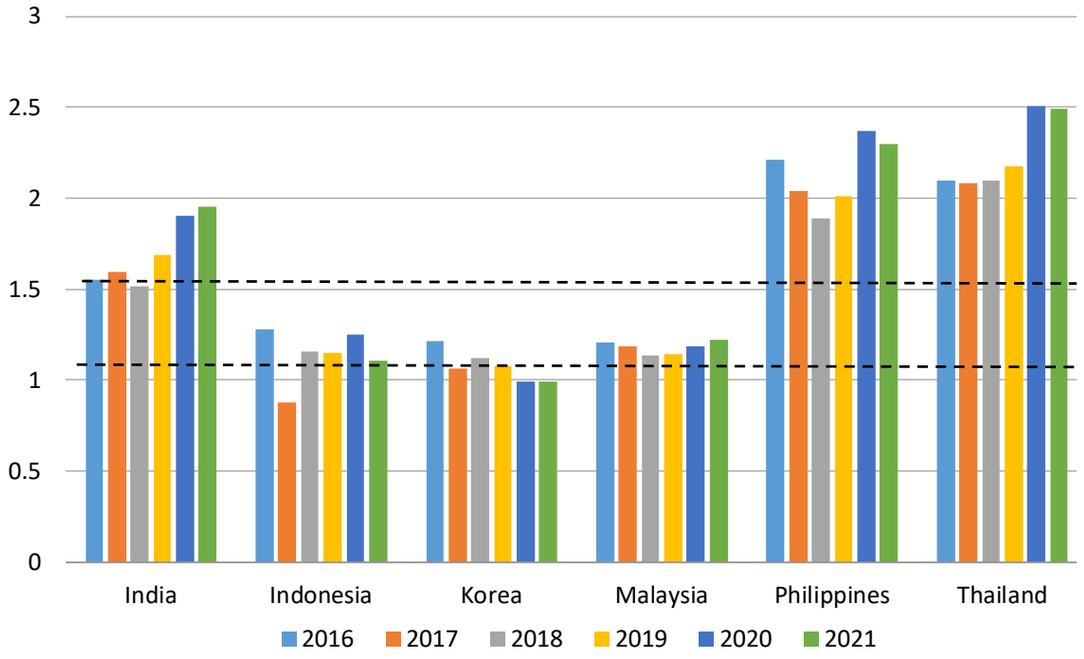
**Figure 11. Current Account Balance**
**(Percent of GDP)**




Source: International Monetary Fund, World Economic Outlook Database, October 2022.

Reserve adequacy measures were also within the normal range (1 to 1.5), according to the IMF's Assessing Reserve Adequacy (ARA) metric, although two countries (Korea and Indonesia) were only marginally above the "rule of thumb" minimum (Figure 12).[13]

**Figure 12. Assessing Reserve Adequacy Metric**

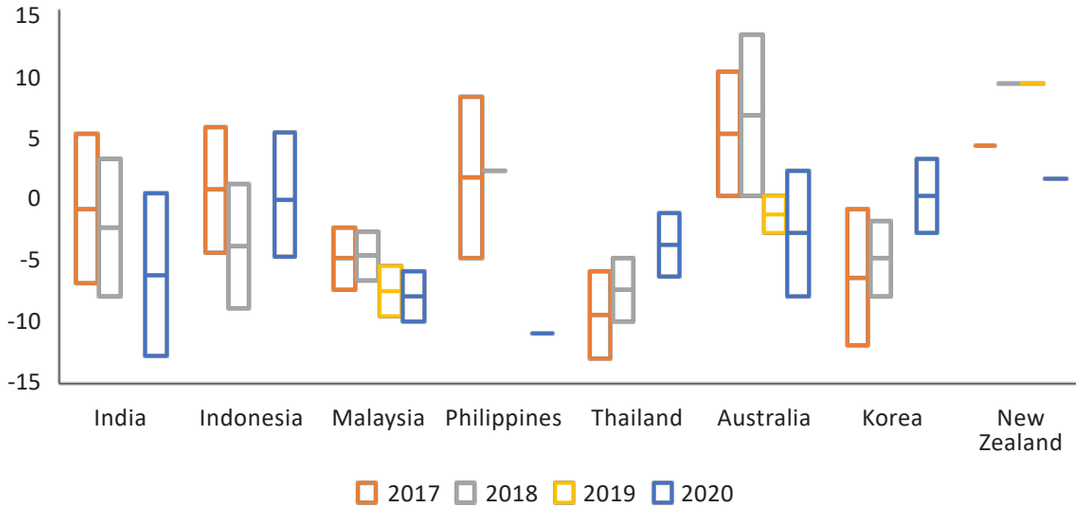



Notes: A ratio between 1 and 1.5 is considered adequate. See IMF (2014) for the definition of the ARA metric.
Source: International Monetary Fund, Assessing Reserve Adequacy, April 2022.

Exchange rates were mostly assessed as within ranges that did not require alterations of fiscal or monetary policies, again using the IMF's multi-pronged over- and undervaluation techniques (Figure 13). Even so, several countries had external debt levels that were deemed by the IMF to be risky, if a depreciation were to occur (or an undervaluation gets worse). From the perspective of exchange rates, Malaysia's undervaluation made it the most vulnerable, although it was protected by a relatively stable and positive current account. Still, it felt the need to use foreign exchange interventions during the COVID-19 pandemic to stabilise the exchange rate and provide sufficient FX liquidity. Even if Malaysia could be viewed as the most vulnerable (by this metric), other countries in the region also used foreign exchange interventions and also experienced large capital outflows — larger than in recent crises.

13. See IMF (2014) for a discussion on the interpretation of the Assessing Reserve Adequacy (ARA) metric in various types of countries.

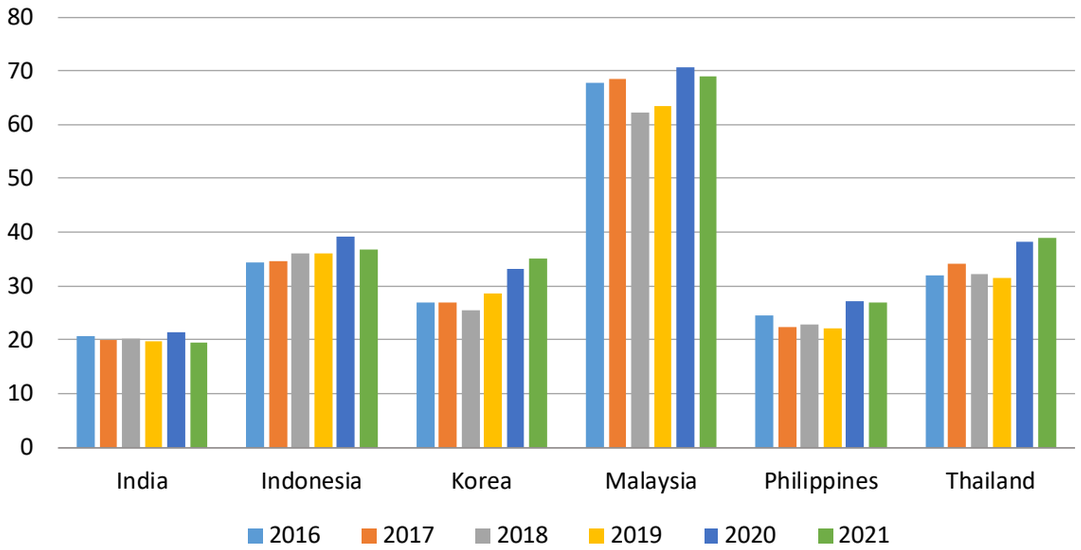
**Figure 13. Over- and Undervaluation of Exchange Rates (Percent)**




Notes: Box refers to lower bound and higher bound estimates. Midpoint line refers to midpoint estimates.
Source: International Monetary Fund, Article IV: External Sector Assessment of each country.

Another vulnerability associated with an increase in central bank purchases of government debt is a risk of capital outflows. As noted above, most of the region experienced outflows during the initial stages of the COVID-19 pandemic. Of the five emerging market countries, Malaysia was again the most vulnerable with the highest proportion of total external debt relative to GDP (Figure 14). This measure of external debt includes all components, not just government debt held abroad, and is one of the most watched measures by foreign investors.

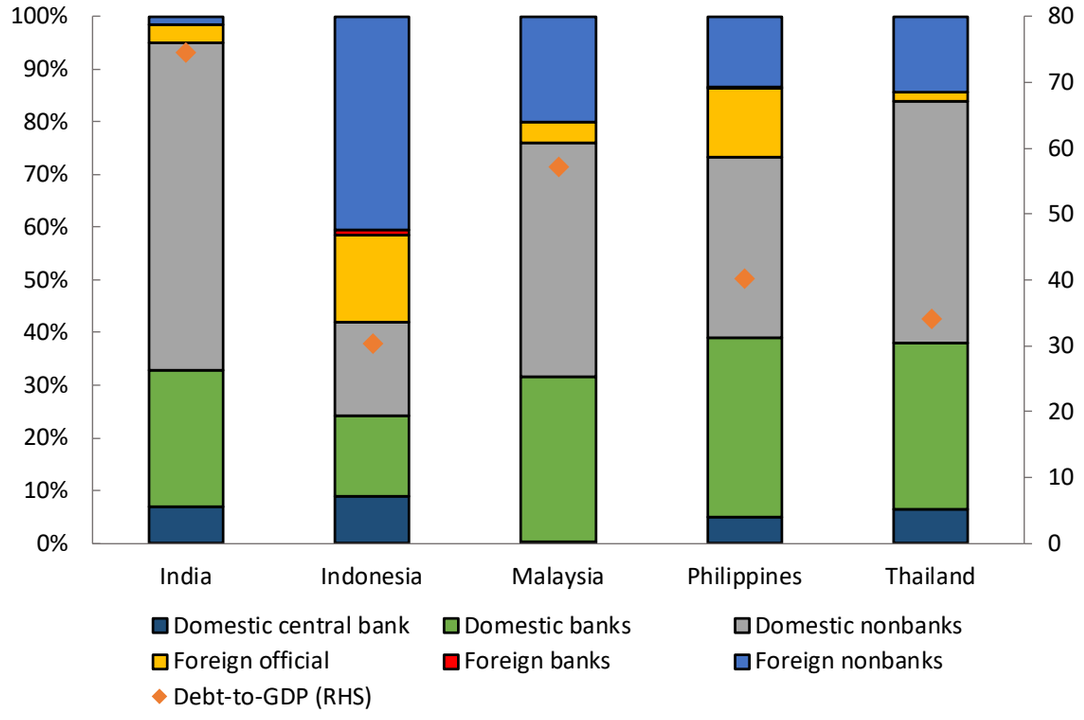
**Figure 14. Extent of Total External Debt (Percent of GDP)**




Sources: International Monetary Fund, Article IV Reports 2021 and 2022. India, Indonesia, Korea and Malaysia are estimates for 2021; Thailand and Philippines are final.

Given the flight to quality (and the dash for cash in US dollars), several countries in the region looked vulnerable to a shortage of dollars in the pre-COVID-19 period. Korea maintained a relatively large need for US dollars, as its banks and private sector had issued significant amounts of dollar-denominated debt. The Korea/Fed swap line relieved some of these stresses. But recent foreign purchases of *local currency* debt were also a worry. Although the external debt of most countries has not been considered extraordinarily high, many countries' local currency debt has been purchased by foreigners in the years following the GFC, increasing the possibility of capital flight of these relatively new investors. On the eve of the COVID-19 pandemic, general government debt held by foreign non-banks was the highest for Indonesia and the lowest for India (Figure 15).

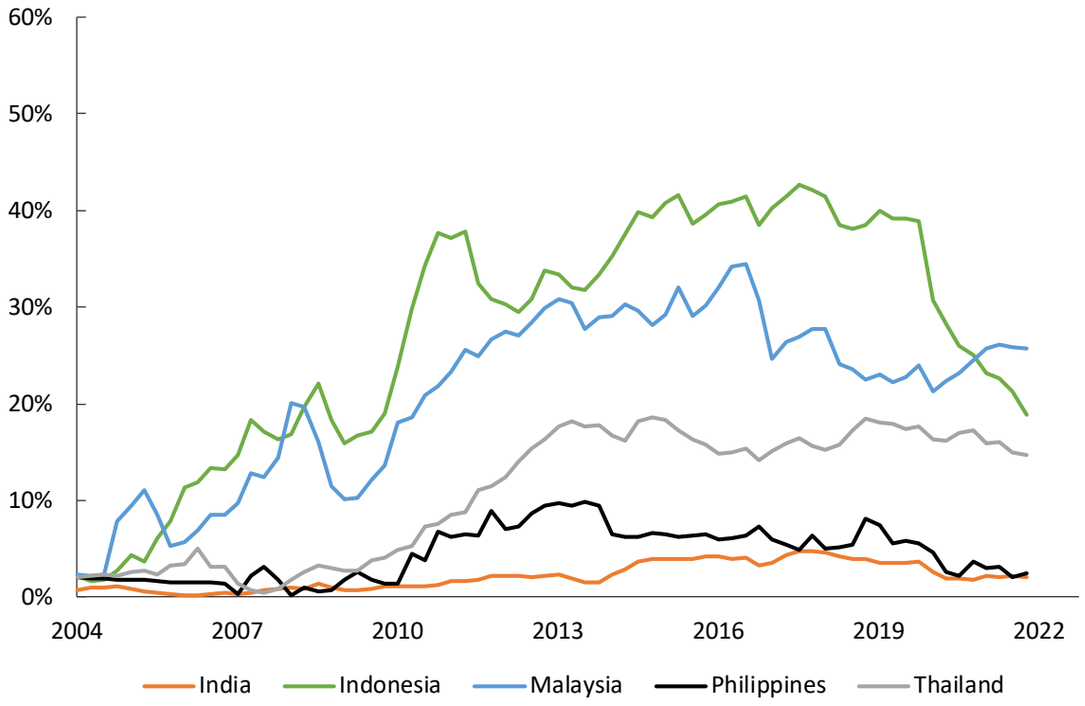
**Figure 15. Investor Base of General Government Debt at 2019 Q4**
**(Percent of Total)**




Source: International Monetary Fund, Sovereign Debt Investors Base for Emerging Markets.

Indonesia and Malaysia (and, to a lesser extent, Thailand) are countries for which ownership of central government debt in local currencies had risen since the GFC (Figure 16). In 2019 Q4, the proportion of local currency debt held by foreigners in Indonesia was 39 percent — the highest of the five emerging market countries in the sample — and hence the most vulnerable to pullbacks from abroad. While Malaysia's and Thailand's foreign ownership was more or less stable (or slightly rising in the case of Malaysia), Indonesia saw a relatively large reduction over 2020 to some 25 percent by the end of 2020 and a further decrease to 19 percent of GDP at the end of the 2021. During this time, Bank Indonesia was continuing to buy central government debt in the primary market, suggesting fears that monetary financing could be affecting foreign interest.

**Figure 16. Foreign Holdings of Local Currency Central Government Debt Securities (Percent of Total)**



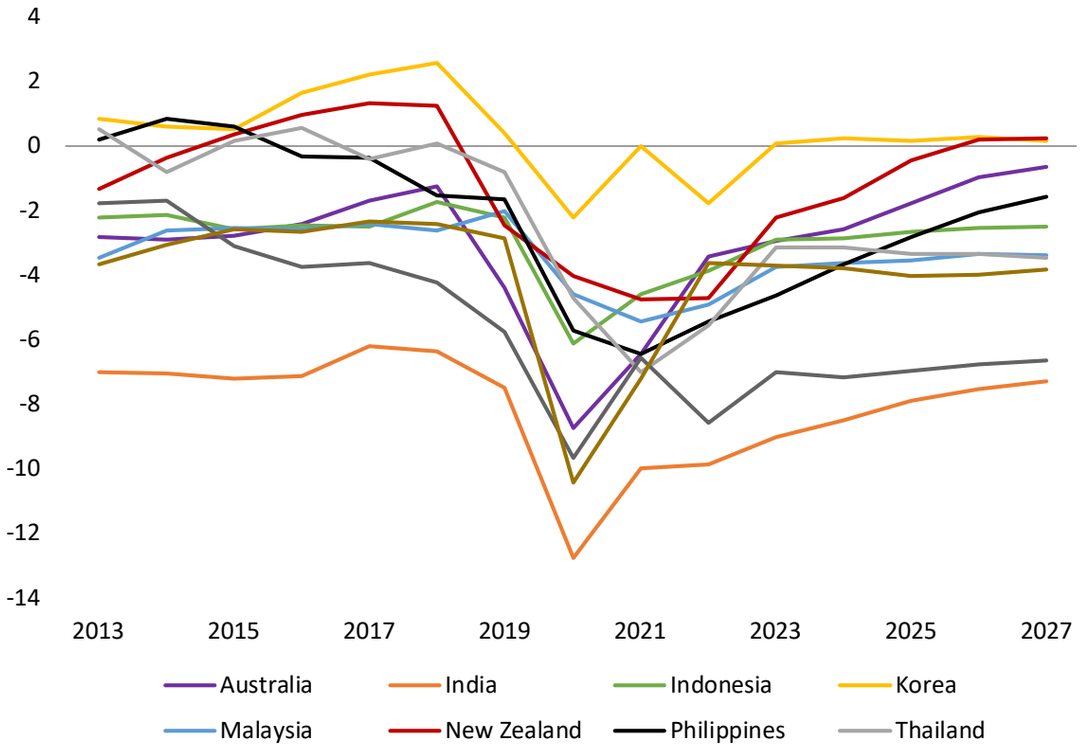

Source: International Monetary Fund, Sovereign Debt Investors Base for Emerging Markets.

### *6.3.2 Impact of Domestic Macroeconomic Conditions on APP Effectiveness*

Looking at the domestic macroeconomic environment, countries that have strong fiscal positions are likely to have more successful APPs. One of the concerns in using APPs is that what may begin as a method to lower yields and stabilise the benchmark government yield curves may morph into a means for the central bank to finance the government. The risk of monetary financing will be highest for those with high, cyclically adjusted, fiscal deficits, high debt levels, poor efficiency of public expenditures, narrow tax bases, and undiversified revenue bases. By these metrics, countries such as India and Indonesia could expect markets to react negatively to an APP as it would harbour concerns for the longer run.

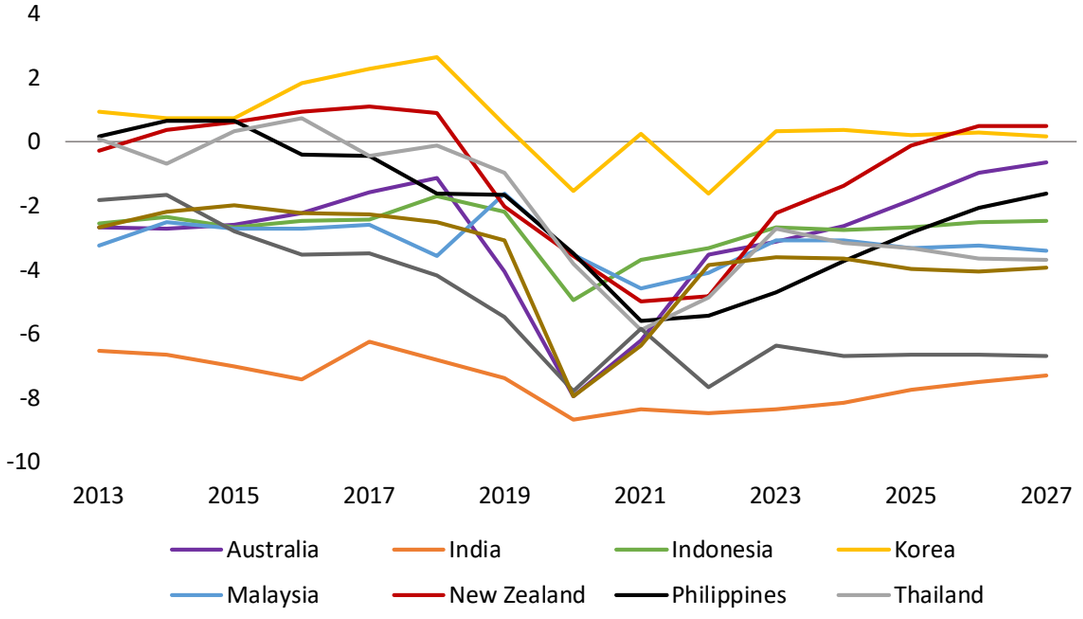
While most countries entered the COVID-19 pandemic year with relatively stable fiscal positions, India and Australia had overall fiscal balances that had deteriorated in the run-up to the pandemic and India had run relatively large fiscal deficits for a long time (Figure 17). Even when cyclically adjusted, these two countries entered the pandemic years with a weakening fiscal deficit position. During 2020, *all* countries in the region increased their fiscal spending to counter the impact of COVID-19 on their populations while revenues stagnated, and even on a cyclically adjusted basis, fiscal balances deteriorated dramatically (Figure 18).

**Figure 17. Fiscal Deficit**
**(Overall Deficit in Percent of GDP)**




Note: Estimates in 2022 and forecast values begin in 2023.
Source: IMF Fiscal Monitor 2022.

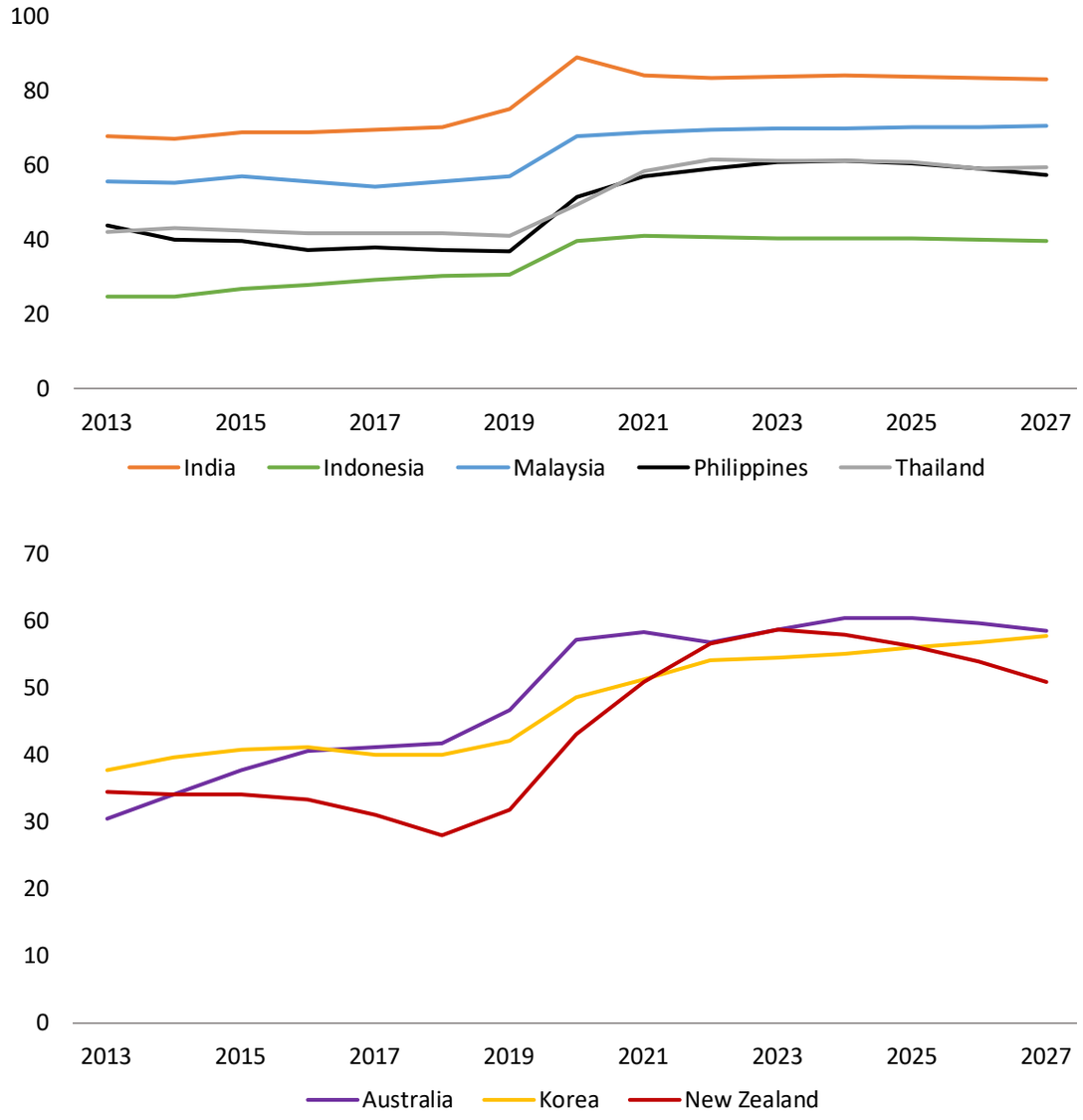
**Figure 18. Cyclically-adjusted Deficit in Percent of GDP**




Note: Estimates in 2022 and forecast values begin in 2023.
Source: IMF Fiscal Monitor 2022.

Accompanying the deterioration of overall and cyclically-adjusted fiscal balances is an increase in central government debt. All eight countries saw a rise in their gross debt.[14] India maintains the highest debt levels but is also the country for which most of the debt is held domestically, and as such, unlikely to imply capital outflows. Malaysia has the next highest level of gross debt and was somewhat more vulnerable to capital outflows. Even though this vulnerability was in the background, foreigners did not abandon its local currency government debt (Figure 19).

**Figure 19. Central Government Gross Debt in Percent of GDP**




Note: Forecast values begin in 2023.
Source: IMF Fiscal Monitor 2022.

14. It is worth noting that Australia's debt levels, both gross and net debt, are considered quite low for an advanced country. In general, what is considered a "safe" level of debt to GDP is much lower for EMDEs than for AEs.

Other domestic macroeconomic fundamentals also influence the effectiveness of APPs. For instance, if overall economic growth is weak and unemployment high, then APPs may help (by spurring domestic demand and investment), but might also indicate the need for additional fiscal spending. Assuming it would be debt financed, the central bank's purchases (especially in the primary market), may raise questions about monetary financing, even if the fiscal conditions were stable before the COVID-19 pandemic. For the most part, the sample countries entered the COVID-19 pandemic with healthy, though moderating, overall growth. Unemployment rates were generally stable and close to their averages in recent years (although increasing in India). None of the countries were in a recession.

If the central bank had previously been unable to control inflation and inflationary expectations — one of its key goals — it might be viewed as more likely to allow any new, larger fiscal debt levels to be "inflated away". Its credibility as an inflation-fighting central bank may be impaired and could be eroded further by an APP. If the central bank has only recently established itself as independent from the government, it may have somewhat more difficulty ensuring an APP is viewed as supporting the functioning of the government securities market rather than financing the government. In the years following the height of the COVID-19 pandemic, headline inflation has picked up in all countries in the region and central banks are diligently attempting to control both inflation and inflationary expectations. So far, it appears that central banks are eager to maintain their hard-earned credibility and financial market participants, overall, also appear to believe they will do so.

### *6.3.3 Influence of the Financial Structure on APP Effectiveness*

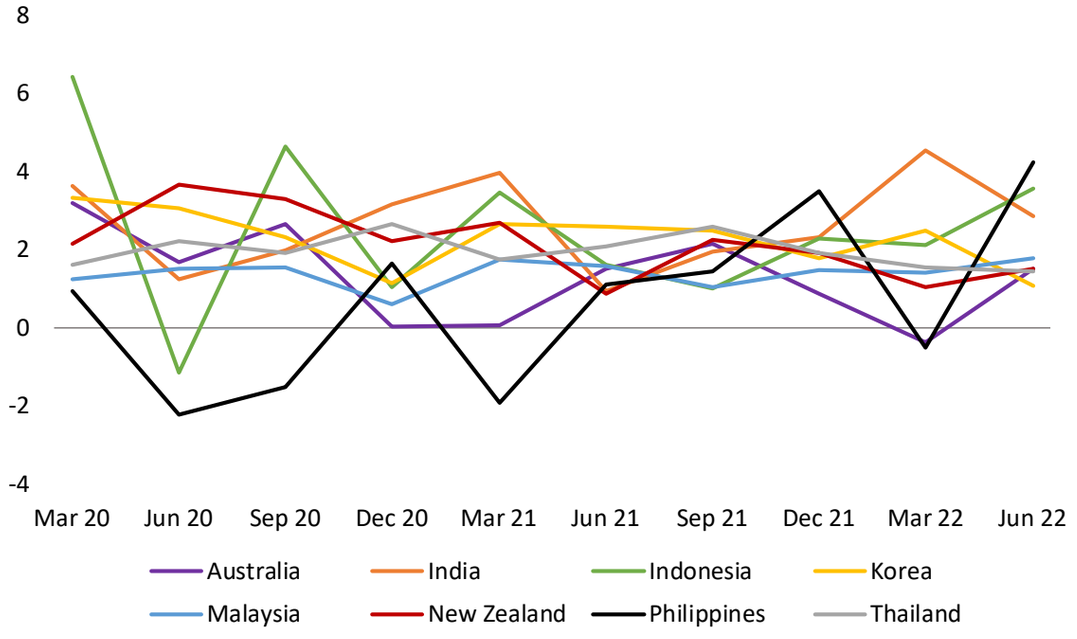
The effectiveness of APPs is also influenced by the underlying structure of the financial system. For instance, if monetary transmission occurs through the banking sector and the sector is competitive, then an APP has a higher chance to reach its goals of providing households and SMEs with credit. If the financial system is dominated by public banks that are uncompetitive and maintain lending rates at spreads unconnected to government yields, an APP may be less likely to reach the targeted borrowers. Similarly, if there is a growing non-bank sector that supplies credit but is not influenced by government yields, there again, an APP could be less effective. The issue can be summarised as follows: how well do monetary transmission mechanisms work through the current structured financial system during "good" times and could the goals of the APP be attained during stressful times?

In advance of the COVID-19 pandemic, banking systems of the eight countries were considered well-capitalised, with sufficient liquidity to surpass standard stress tests. Financial soundness indicators for the five emerging and three advanced economies did not show significant deficiencies. While individual countries had various issues that needed attention, monetary transmission through the banking system was considered operational, even if not perfect. In general, for EMDEs, the degree to which intermediate monetary targets (e.g., policy interest rates) provide stimulus to the real economy (through lending rates and credit provision) and the timing of impact is more variable than for advanced economies. But some countries have been using reserve requirements as a prominent monetary policy tool (e.g., Philippines) albeit with less success.

Despite the generally healthy banking systems, some countries' banks appeared vulnerable to short-term liquidity shocks (Australian, India, and Thailand) with others more exposed to the corporate sector where foreign exchange borrowing was elevated (Indonesia, Korea, and the Philippines). These types of vulnerabilities could portend more difficulty in effectively using APPs if such interventions were viewed as interrupting the normal use of monetary policy instruments or exacerbating the nervousness of foreign investors. Foreign investors may simultaneously pull out of government debt markets and reduce their funding of banks and corporates if the APP is viewed negatively. Overall, neither the operations nor the usefulness of APPs appears to have been impeded by the health of the financial system in the sample countries, although other policies (such as central banks' provision of liquidity and regulatory loosening) are inseparable from the direct impact of APPs.

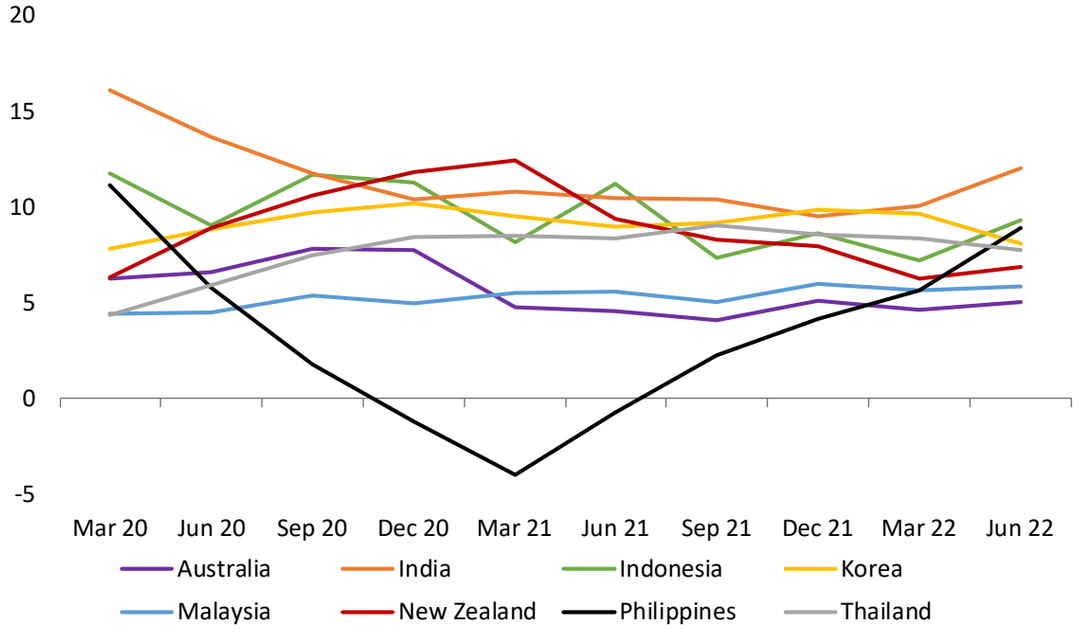
The financial sector's overall health did not appear to adversely affect subsequent credit growth. In two countries, quarterly private sector credit growth dipped into negative territory (Indonesia and the Philippines) and fell in most of the others during the first or second quarter of 2020. However, it rebounded in all countries even if only to relatively low rates of growth (Figure 20). Examining year-on-year data suggests relatively steady credit growth, except for the Philippines. All countries in the sample introduced some type of credit support policies (loan guarantees, subsidised rates, lengthened maturities, and so on). Hence, one cannot attribute the reasonable second half rebound in private credit growth to the introduction of the APPs *per se*.

**Figure 20. Quarterly Non-financial Credit Growth**
**(In Percent)**




Sources: The Philippines credit data is from Department of Supervisory Analytics, Financial Supervision Sector, Bangko Sentral ng Pilipinas and includes only bank-supplied credit. All other data from BIS total credit statistics and includes credit supplied by all financial institutions.

**Figure 21. Year-on-Year Non-financial Credit Growth**
**(In Percent)**




Sources: The Philippines credit data is from Department of Supervisory Analytics, Financial Supervision Sector, Bangko Sentral ng Pilipinas and includes only bank-supplied credit. All other data from BIS total credit statistics and includes credit supplied by all financial institutions.

## 7. The Influence of Communication on APP Effectiveness

An important component of the APP's effectiveness is how the goals, execution, and outcomes are communicated to financial markets and the public at large. Appropriate and effective communication of monetary policy decisions is a well-studied issue, even though in practice, it continues to be very difficult for central banks to accomplish. The use of a policy, such as APPs, that attempt to influence market conditions during crises — both to calm dysfunctional markets and, in essence, directly support prices of specific securities — has additional, difficult components. Although there are some lessons from "normal" monetary policy communications and those during the GFC for unconventional policies that are applicable, the specific situation in a country and its use of an APP deserves particular attention.

In reviewing regular monetary policy communications, it is notable that it tends to be very different from the communications that accompany a financial crisis. The main goal of public press releases during normal periods is to convey information relating to the current state of the economy and inflation and any change (or not) in the (intermediate) target, such as a raising or lowering of the policy interest rate to signal a tightening or loosening of monetary policy. For the most part, the dates of such announcements are known as well as the general content of the statement, and hence how a central bank is aiming to affect longer-term growth and inflation expectations. The idea is to indicate to market participants any potential policy moves and the positions it may take to implement the intermediate target goal in the short- to medium-term.

Best practice guidelines on monetary policy communications indicate that regular press conferences or press releases following monetary policy committee meetings, with release dates stated well in advance, are best. Clear language about the economic rationales for any alteration in monetary policy help the audience to interpret the changes and formulate views about its likely effects. Although some central banks have practiced "constructive ambiguity" with regard to when they would intervene in markets, this practice has been viewed with scepticisms for regular monetary policy communications. By contrast, best practices for communicating APPs are still being assessed, but breaking down some of the elements can be a useful exercise to understand the commonalities and differences.

- Announcement of the programme

*How comprehensive should the announcement be?*

Most APP press releases provide a short statement of the motivation and vague goals (e.g., "calm markets", "provide support for lending") without specifying any clear indication of how success would be measured. Providing only broad objectives allows a central bank to deem the programme as successful more easily and thus maintain credibility. In a situation of uncertain outcomes to the first-time usage of a policy, this provides some room for experimentation and flexibility for adjustment. However, if the APP is used for an extended period of time, some market participants will begin to question its efficacy and how the central bank is determining success. More comprehensive information may be needed later on to (re)establish credibility for the programme.

*Should the announcement be made jointly with the government or just by the central bank?*

Joint announcements were made in Thailand, China, and Indonesia. In Indonesia, the second announcement of the APP was the result of a Presidential Decree and was jointly announced by Bank Indonesia and the Ministry of Finance. In situations of crisis, a clear statement that both fiscal and monetary policies are working together can help calm markets and the populace at large. Again, continuation of an APP that begins to look as if the central bank is beholden to the government risks an impression of a lack of independence, so joint communications could backfire after the crisis has subsided.

*When should the programme begin operation relative to the announcement?*

Countries that began operations shortly after the announcement were able to affect the outcome variables faster than those that separated the announcement and operations by a number of days or weeks. The impact, however, is dependent in part on the degree of dysfunction in markets in the lead-up to the programme. Situations of high volatility and a rapid rise in yields and a prompt execution of plan operations, provide a more concentrated time-frame for market participants to see the cause

and effect and hence, the stronger the signal's impact. Controlling for this pre-programme volatility, the shorter the time between announcement and execution, the more effective the outcome.

A downside of moving quickly is that central banks may come under criticism for doing too much when it was not necessary. A reaction to any crisis carries this risk and the ability to accomplish a counterfactual is usually difficult. It appears that doing "too much, too early" is better than "too little, too late" in most crises. If "too much" can be detected soon after stability returns, then a quick withdrawal from the programme is in order.

- Execution of the programme

*How many details should be released in advance of purchases? Should information about the types of bonds and their quantities be released in advance?*

The degree to which such information biases the amounts that are transacted and prices at which the central bank obtains the securities is unknown, *ex ante*. Studies during "regular" market conditions show that when one side announces the amounts and say, a price range of a large trade, attempting to minimise price impact, the entire amount offered is typically bid for at the least advantageous price for the party attempting the trade.[15] However, for a central bank that is attempting to put a floor under prices, this "gaming" of the interaction is less relevant. Indeed, the success of the operation is dependent on buying at a price that is above the "equilibrium" price, that is, where the market would settle without the intervention. At a minimum, information about the quantity and type of security should be provided to market participants with enough time to ensure they can provide firm offers and execute the other side of the transaction. This amount of time will depend on the market structure, the specific securities that the central bank will buy, and the type of participants the central bank wants to attract to the transaction. If the central bank uses their usual set of counterparties, then providing the same information as for "regular" monetary policy interactions should suffice.

In Indonesia and Thailand, the central banks bought bonds and conducted repo transactions in the primary market. Indonesia stated that the (second round of) purchases were to be a source of funding for the government in the context of national economic recovery, specifically to "maintain stability and support national economic recovery".[16] Its third agreement (SBN KB III) with the government was accompanied by language indicating that the support for the government's budget was meant for dealing with humanitarian and health issues during the COVID-19

15. See Admati and Pfleiderer (1991) on "sunshine trading" in the futures markets.

16. Quote from Antaranews.com, where Bank Indonesia Governor Perry Warjiyo was present at a working meeting with the House of Representatives' (DPR's) Commission XI, 21 November 2022.

pandemic. Communicating clearly about why the central bank is avoiding use of the secondary market is important so it does not come under fire for "monetary financing".

For generic government bonds used regularly for open market operations, identifying a specific bond, or a set of them, would not seem to provide any additional information about the intentions of the central bank beyond the programme's stated goals. But if the programme includes the purchase of corporate bonds or commercial paper, then the situation is different. Usually, when such an APP is announced there are more details provided. Given that corporate securities introduce credit risk to the central bank's balance sheet, there are typically some constraints — for instance, only consideration of highly rated bonds, those with enough outstanding amounts that they are representative of the corporate bond sector, an upper threshold of the proportion of outstanding that could be bought within the programme, and so on. In some cases, central banks have designated a third-party dealer the job of choosing the bonds or commercial paper to be purchased, so as to distance themselves from criticism of picking favourites (either industries or specific companies). In the case of non-domestic government bond purchases, more details on the choice of bonds can usefully be released to counter concerns about the central bank's inability to manage credit risk and the increased potential for losses. If credit risk is not managed well, the reputation and independence of the central bank could be damaged.

- Follow-up to execution

*How much communication should occur after execution?*

Transparency about what has been purchased, how much, and at what price is clearly preferable if the goal is to signal that the central bank is serious about supporting prices. If the amounts were not large enough to affect a containment of yields, communication that larger amounts will be purchased appears warranted. The central bank thus conveys the intensity with which it intends to accomplish its goal and that it will do "whatever it takes". The downside to this is that it can be very expensive to execute.

If the goal is less about signalling and more about keeping prices above an (undisclosed) floor and the central bank wishes to spend as little as possible to attain this goal, then less information could be released. This is analogous to many foreign exchange interventions whereby the central bank prefers to be anonymous so that if the interventions affect the exchange rate, there is no information about how much was needed to do so. The use of multiple dealers helps to hide the size of the interventions and the lack of *ex post* information also keeps market participants guessing. This strategy works well for continuous operations and has worked in some cases for currency crises. But if the central bank is unable to stem problems that are deeper than the currency attack itself (e.g., macroeconomic policies that are inconsistent with the level of the exchange rate) such a strategy tends to backfire in

the sense that reserves are spent without attaining the goal. Overall, the academic evidence on the effectiveness of exchange rate intervention to change the course of the exchange rate or stop a dramatic fall is mixed. For emerging market economies, successful intervention depends on country-specific factors with some countries able to limit short-term volatility but not alter longer-term trends (Pontines (2018), Pontines et al. (2021), and Chamon et al. (2019)).

*Should the central bank communicate information about the use of off-balance sheet (SPVs, Investment Funds) entities?*

To guard against risks that may affect the central bank's credibility, including whether credit risk taken onto the central bank's balance sheet can adversely affect its profitability or ability to carry out its other duties, central banks sometimes set up entities at "arm's length" to house riskier assets. In some cases, such as the United States and the United Kingdom, these entities may be provided with capital (or an explicit backstop) from the government to absorb the losses if the securities lose value. In March 2020, Korea set up a SPV with joint support from several government entities to purchase private securities on its behalf. If the purchase of the assets is also conducted by staff in an entity not directly controlled by the central bank, it also allays fears of favouritism of counterparties or of issuers of securities that are eligible to be purchased.

In general, there is little reason to avoid communicating about an off-balance sheet entity setup and spelling out the legal separations (if any). On balance, it should give more comfort to prospective counterparties of the central bank and provide more confidence in the fair and equitable treatment of market participants.

## 8. Usage Going Forward and Exit Strategies

### 8.1 Extended APP Usage for Other Purposes

EMDEs have additional risks when they decide to continue APPs after financial markets return to normal, perhaps to assist in monetary transmission or to keep government borrowing costs low. First, in general, EMDEs have less credible public institutions and less monetary, exchange rate, and fiscal flexibility. In particular, inflationary expectations are less anchored and so central banks have less capacity to monetise fiscal debt without running the risk of higher inflation. Signals that the government is attempting to "inflate away" the real value of its debt by having the central bank purchase it may trigger large capital outflows and a depreciation of the currency. To counter these prospects the central bank may be prompted to raise domestic interest rates, short-circuiting a recovery.

In advanced economies, where public institutions are more credible, the extended use of APPs can be used to alter yields at different maturities, thereby transmitting monetary policy along the yield curve directly rather than allowing market forces to do so. The risk of interpreting the APP as a funding mechanism for the government is lower, but

not absent. Even in the United States, where the Fed is considered credible, discussions abound about whether it is appropriate for it to purchase long-term Treasuries with the objective of keeping yields down after a recovery has ensued. In addition, due to the large size of the Fed's holdings, some are questioning whether the US Treasury secondary market is becoming illiquid and subject to larger swings in prices and yields. In addition, the issue of moral hazard is a discussion topic: if a central bank continues to be act as the "buyer of last resort" will investors' believe that they will step in the next time and prevent investors from realising losses? This is considered by many commentators as a bad precedent to set.

In Asia, this discussion is also present. Indonesia's new "Development and Strengthening of Financial Sector" bill, passed in December 2022, has received criticism in the financial press. It provides for primary market purchases in future crises, where the determination of a crisis is made by the President. The fear is that this provides an avenue for Bank Indonesia to be pressured whenever the government's deficit is too high. Other commentators view this development as codifying the emergency measures for potential future crises and hence foresightful. The financial markets originally viewed the Indonesian APP with some suspicion and its effectiveness was short lived (if viewed as stabilising yields on the benchmark security and downward shift in the yield curve). In addition to questions about the central bank's role is a lingering doubt about the efficacy of the government's additional spending to protect the economy and its citizens from the COVID-19 pandemic.

## 8.2 Exit Strategies

### *8.2.1 In Combination with Monetary Policy Tightening*

As part of the overall normalisation of monetary policy following a crisis (both the global financial crisis and the COVID-19 pandemic), the advanced economy playbook has been to: (1) taper and then halt purchases of assets; (2) raise the policy interest rate; and (3) unwind the previous purchases and shrink the central bank's balance sheet gradually. This playbook is coming into question as it does not account for which part of the yield curve a rise in the yields will be the most harmful for the recovering economy. Several commentators have noted that raising the short-term policy rate first will hurt households with credit card debt and SMEs that have borrowed at short-term, floating rates. Raising longer rates, by selling long-maturity government debt, will affect loans based on long rates, such as mortgages. This may be helpful in a number of countries experiencing elevated and rising house prices as a means of reining in what could become a housing bubble. Hence, the impact (the likely size, speed, and impact on households or businesses) of raising rates at the short-horizon, as with the normal monetary policy action as a recovery takes hold, *or* raising rates at longer-horizons by direct sales of government debt from the central bank's balance sheet, should be examined before an exit strategy is communicated.

### 8.2.2 How Unwinding Communications May Differ from Emergency Communications

Assuming the sequencing with other monetary policy tools has been decided, what are the ways in which a central bank could unwind its larger balance sheet? A positive market response that indicates success of the programme is not necessarily an indication of how easy it will be to exit. That said, ineffective programmes should be removed first. Even if a programme appears to have little impact on prices or yields and little take-up, it may still be serving as a backstop. Hence its removal could be accompanied by a renewal of volatility or dysfunction, necessitating a "go slow" or even a "stop and go" approach.

It is important to develop an internal game plan for the disengagement of the APPs and have a communication strategy in place. Coherent sequencing and clear communication based on the relevant metrics are needed. Examples where central banks have signalled their intentions early and followed through with predictable and consistent execution of their exit strategy include the Fed and the Bank of England (Box 1). In particular, the unwinding should be linked to the reasons the policies were put in place to begin with. For instance, if they were to support economic growth and quell financial market dysfunction, a recovery should be firmly underway and financial markets should be back to normal. Judging how firm the recovery is and how long normalised financial market functioning should be in place will require several metrics, possible thresholds, and a good dose of "expert judgement". Given that the COVID-19 pandemic was the proximate cause of the disruption, linking the removal of APPs to metrics regarding the cessation or lessening of COVID-19 transmission, illness, and deaths also makes some sense as these are correlated with the economic recovery. COVID-19 transmission and intensity have differed across countries, making economic recoveries more difficult to forecast and hence exits from APPs difficult to time.

Emphasising the goal of smoothly unwinding the APPs and watching for signs of excessive withdrawal of liquidity from the financial system is key. Several countries have experienced volatile liquidity conditions in their money markets, requiring re-engagement of their APPs. Korea experienced volatile conditions in its money market and the corporate bond market in October 2022 and had to extend the entities and types of securities eligible for its Bank Intermediated Lending Support Facility, BILSF (Box 2). The United Kingdom also needed to step in to buy gilts in order to stem fire sales resulting from an adverse market reaction to the budget announcement of its Treasury. In the event, it limited the time frame for the purchases to 13 days so as to encourage market participants to solve the underlying liquidity issues (Box 3).

Controlling liquidity through more normal channels (e.g., open market operations and repos) rather than the outright purchase of assets can help moderate any recurrence of illiquidity. Many AE central banks have chosen to let the assets run off at maturity, avoiding the need to sell them outright into markets. If run-offs are not too "lumpy" (such that any rollover of debt that needs to be purchased by the private sector cannot be easily absorbed), then this strategy has the advantage of not influencing market prices directly.

However, to the extent that the central bank has purchased longer-term assets that will not mature soon enough to be considered as part of the unwinding strategy, a direct sale or exchange will be necessary. If liquid markets exist for the purchased securities, proceeding to sell them in quantities that allow for undisrupted absorption in public markets is best. If not, then the central bank should consider bilateral sales with third-party valuations. If the assets have incurred losses, then the withdrawal is more difficult as previous profits passed to the government (or absorbed internally) will fall. It is obvious, but bears repeating, that when central banks hold government debt, sales into markets should be undertaken without government involvement, demonstrating respect for the independence of the central bank. Specifically, such sales should avoid dumping an excess supply of government bonds into the market at the same time as the government is auctioning new debt.

The interaction between outright sales of government debt and banks' reserve balances is also important to take into effect. The sale of previously purchased assets will lower liquidity in the financial system, potentially increasing reserves posted by banks. Countering this with a decrease in reserve requirements or paying lower returns on reserves left at the central bank, could alleviate a situation where a tightening of liquidity occurs too quickly. However, if the economy is on the mend and inflation is viewed as exceeding its target, then a tightening through a removal of liquidity in this form may be appropriate. Indeed, this "natural" tightening is now termed "quantitative tightening" or "QT". Inflation in Asia is picking up in a cyclical tightening phase and a removal of debt from the central bank's balance sheet may support a tightening of monetary conditions above and beyond a rise in policy interest rates. Overall, a conscious effort is needed to ensure an unwinding is undertaken in coordination with other, more normal, tools of monetary policy.

In contrast to AE central banks that can hold extra assets on their balance sheets for long periods of time, EMDEs may be questioned about their intentions if they continue to hold assets, particularly government debt. Issues of "financial dominance" may arise more easily and questions about independence will likely ensue. These issues are even more likely if the central bank purchased government securities in the primary rather than secondary market. Hence, if sales rather than holding the debt to maturity is chosen, executing the sales in the secondary market would help to offset any criticism of financial dominance.

### *8.2.3 Influence of an Unwinding on Exchange Rates and Capital Flows*

Unlike large, advanced economies with reserve currencies, EMDEs need to consider the impact of exit from their APP on exchange rates and capital flows. If the sale of government securities from the central bank's balance sheet is accompanied by a rise in yields, it may lead to an appreciation of the currency and capital inflows — assuming differentials with other countries' interest rates widen and foreign interest in sovereign debt returns. Just like the depreciation pressures from the initial purchases, an opposite impact on the current account could be expected, making exports more expensive and imports cheaper. The terms of trade effect may weigh on the current account, subtracting from GDP growth.

Other currency interventions could accompany the unwinding phase of the APPs. Whether these are publicly communicated or behind the scenes will be a country-specific choice. The reasons for secrecy are the same as for other FX interventions. The considerations for secrecy in this case should be balanced against market conditions and the transparency of the unwinding of the APP. Pairing the announcement of the two types of market interventions (sales of debt and purchases of foreign exchange) could be beneficial to ensure stability of both markets.

If the sales of government debt from the central bank's balance sheet are made abruptly or without adequate public communication, then markets may become unhinged and an accompanying increase in exchange rate volatility may outweigh any normalisation of capital inflows that would otherwise take place. As with any policies that are connected to the external sector, understanding the global environment is important. If many countries are raising interest rates and are in a tightening phase, exchange rate repercussions will be lessened, just as they appear to have been when APPs were put into place.

Needless to say, if global conditions are unsettled and a path to a smooth unwinding is unclear, the best course of action may be to wait until conditions improve. If the delay is communicated well, and there are no further government bond purchases being undertaken, the suspicion of continued financing of the government (and a question about the independence of the central bank) will be less likely to be instilled in financial markets.

## 9. Summary and Main Takeaways

Before summarising the results of this study, it is useful to recall that the use of APPs resulted from a shock that came from outside the financial system — a medical emergency. This has a bearing on how to interpret the results and whether APPs will be useful, particularly if used in the future to thwart a "home grown" financial shock as was the case for advanced economies during the GFC. In general, if used for a "home grown" financial shock, the status of the domestic financial sector, the domestic macroeconomic setting and the global financial environment will matter more for its effectiveness. For instance, if banks are weak and vulnerable, government debt levels high and rising, and external debt is in foreign currency and unhedged, then the effectiveness of an APP will likely be lessened or may have to be sizeable to make a difference. The goals — the stabilisation of the government debt market, the lowering of benchmark yields, or support for normal monetary policy transmission — will also matter.

This paper shows that eight SEACEN member countries successfully used APPs during the COVID-19 pandemic to lower yields on long-term government debt and lessen their volatility, thereby stabilising their government debt markets. In part, the success lay in the relatively benign macroeconomic and financial conditions present at the beginning of the COVID-19 pandemic. Even after controlling for external factors (the Fed's policy rate and global financial uncertainty proxied by the VIX) and domestic factors (exchange rate changes vis-à-vis the US dollar and domestic policy rate changes), the APP programmes were successful in lowering yields.

Although generally beneficial, there are still lessons that can be learned from the variation in the programme design and in communication strategies.

- The three advanced economies were more successful than the five emerging market economies in keeping yields low, bid-ask spreads contained, and the term structure flatter. Although difficult to tie to design characteristics, these three countries were quite transparent about what they intended to buy, when, and followed up with information about the outcomes. All purchased in their secondary markets.

- Communication strategies varied across the sample countries, although it appears that more precise communication of goals, strategies, and amounts and timing led to better outcomes.

Many countries in the sample used foreign exchange interventions during the time period to keep their currencies from depreciating (alongside a decline in policy rates and use of APPs) and to dampen volatile exchange rates. The absence of data on the exact amounts purchased under the asset purchase programmes and the possible simultaneous foreign exchange interventions do not permit an assessment of whether the impact of APPs on exchange rates was negligible. Other studies have shown that the expected

depreciation did not materialise.[17] The empirical work in this paper shows that after controlling for exchange rate movements vis-à-vis the US dollar, the impact of APPs on yields is still statistically and economically significant, implicitly suggesting that APPs can have an independent impact.

Having used APPs, central banks in the region naturally want to know how to return their bloated balance sheets back to normal — and to better understand what "normal" is. The paper explores some options for lowering the central bank's holdings of government debt, noting that purchases should halt when the objectives have been attained. Central banks across the world are taking slightly different approaches, but most did not start the process of reducing their government holdings until after raising the domestic policy rate. For countries at the zero lower bound, this signalled the central bank's desire to normalise monetary policy before addressing the after-effects of APPs. For countries that kept rates well above zero, the choice is less clear. Still, most have emphasised that monetary policy tools, such as the policy interest rate and reserve requirements, are still the main means of executing monetary policy and that the APPs were used as "unconventional" policy tools. As such, the balance sheet acquisitions derived from the APPs can be addressed over time.

After signalling that monetary policy will be conducted using the usual tools, central banks have two choices for lowering their holdings of government debt: (1) let the bonds mature and naturally "roll off" the balance sheet; or (2) conduct outright sales of the bonds. If the bonds are long-term and a faster decline in the balance sheet is desired than roll-offs would imply, outright sales may be used. If the purchased bonds' maturities are sufficiently short-term or callable, a roll-off would be less likely to disrupt the secondary markets. It is also worth contemplating the impact on the yield curve. If long-term bonds are sold outright, this may raise these yields which could in turn affect certain types of borrowers more than others (say, those with mortgages tied to long-term bonds). Central banks should be aware of such differential impacts and provide transparency about their wind-down strategies and rationales.

In sum, APPs were successful in the eight SEACEN countries examined in this paper in lowering government yields and generally stabilising the government bond market. Going forward, the unwinding process should be undertaken carefully and a restart of the APPs should be conducted only under similar conditions of distress (as demonstrated by Korea and the United Kingdom). It appears that APPs could usefully remain in the arsenal of a central bank's tools as an unconventional means of maintaining financial stability and effectiveness of monetary policy transmission.

17. Sever et al. (2020) also find no systematic effect of APP announcements on exchange rates for a sample of 18 EMDEs. Arslan et al. (2020) find that APP announcements interrupted depreciation trends.

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## Box 1. Announcements of Unwinding Policies in the United States and the United Kingdom

Central banks in both the United States and the United Kingdom used their APPs aggressively in the reaction to the COVID-19 pandemic, increasing their balance sheets to a peak of approximately 37 percent and 38 percent of their respective nominal GDPs. In the United States, this was the highest proportion since World War II. With financial conditions more stable and inflation rising, both central banks have outlined their strategies of returning their balance sheets to a lower level.

The Fed began to prime market expectations with the release of a paper "Principles for Reducing the Size of the Federal Reserve's Balance Sheet" in January 2022.[18] These principles outlined a number of key elements to the unwinding of the asset purchases. First, the Fed reinforced that its primary instrument was the policy rate and its primary goal to assure maximum employment and price stability. Second, the Fed wrote that any unwinding would attempt to be predictable and by adjusting the amounts re-invested (hence, using roll-offs). Third, the Fed wrote that eventually it intended to hold primarily Treasury securities and avoid holdings that alter the allocation of credit across sectors. Lastly, it left the door open for adjusting its approach in light of economic and financial conditions.

After announcing its "principles", in May 2022, the Fed put forth its "Plan for Reducing the Size of the Federal Reserve's Balance Sheet".[19] This plan took the principles and outlined the maximum amounts to be unwound, starting in June 2022. For Treasury securities, the cap was initially set at $30 billion per month and after three months would increase to $60 billion per month. The decline in holdings of Treasury securities began with longer term Treasury coupon securities and, to the extent that coupon maturities were less than the monthly cap, Treasury bills (those without coupons) would be used. For agency debt and agency mortgage-backed securities, the cap was initially set at $17.5 billion per month and after three months would increase to $35 billion per month. The minutes released from the December 2022 Federal Open Market Committee (FOMC) indicated that runoff has "proceeded smoothly" and the Committee voted to continue to follow the plan as initially conceived in May.

An interesting component of the Principles and the Plan is that no final size of the balance sheet is provided. The plan is "to slow and then stop the decline in the size of the balance sheet when reserve balances are somewhat above the level it judges to be consistent with ample reserves".[20] What constitutes "ample reserves"

18. Federal Reserve Board, "Principles for Reducing the Size of the Federal Reserve's Balance Sheet".
19. Federal Reserve Board, "Plan for Reducing the Size of the Federal Reserve's Balance Sheet".
20. Ibid.

is never exactly elaborated, though the Fed has provided some guidance on how implementation of an "ample reserves regime" needs to account for a number of factors that affect its ability to conduct open market operations to keep the policy rate within the range it has established.

In August 2021, the Bank of England outlined its strategy for delivering tighter monetary policy.[21] Like the Fed, it stated its preference for continuing to use their policy rate, the Base Rate, as its active policy tool. And, similarly, it stated that any unwinding of the balance sheet purchases would take place after the Base Rate was raised from its then low rate of 0.1 percent. Unlike the Fed, however, the Bank of England expressly stated that it would not cease reinvesting maturing assets until after the Base Rate has reached 0.5 percent. Also, only when the Base Rate had reached 1 percent would it consider actively selling their stock of government bonds. At the 0.5 percent threshold, the Bank of England would also consider ceasing reinvestment and (potentially) selling the corporate bonds it had acquired. The portfolio of corporate bonds, however, was only £20 billion, far smaller than the stock of UK government bonds of some £895 billion, both in absolute terms and as a proportion of their respective markets. The Monetary Policy Committee (MPC) therefore "judged that the impact on monetary conditions of unwinding the stock of corporate bonds, at a time when markets were functioning normally, was likely to be relatively small".[22]

In February 2022, the conditions were met to commence the cessation of reinvestment of the proceeds of maturity government bonds and to consider the wind down of the corporate bond portfolio of the Asset Purchase Facility (APF). The MPC voted unanimously to halt the reinvestment of government bonds and put in place a programme to unwind the corporate bonds (including through outright sales) to be completed no earlier than towards the end of 2023. In September 2022, the MPC set a target of £80 billion stock reduction per year, noting that this would entail about £45 billion of outright sales.

In September and October 2022, with the disruption in the gilt market requiring additional purchases of long-dated gilts and index-linked gilts, the outright sales of gilts were postponed. But the MPC stated its annual target of an £80 billion stock reduction was unaffected and unchanged. The first gilt sale operations were to take place on 31 October and proceed thereafter. In its November 2022 report on activities of the APF, the Bank of England stated that the stock of gilts was still assumed to decline by a total of £80 billion in the year to September 2023, including £45 billion from sales. For the following years, the MPC has stated it will set an amount for

21. Bank of England, "Monetary Policy Report – August 2021", Box A.

22. Bank of England, "Monetary Policy Summary and minutes of the Monetary Policy Committee meeting ending on 2 February 2022".

the reduction in the stock of purchased gilts over the subsequent 12-month period as part of an annual review. By 13 December, 40 percent of the gilts purchased in September and October had been sold. By 13 January 2023, all of the accumulated stock of gilts from the autumn 2022 episode had been sold.

The Bank of England, unlike the Fed, has not indicated the exact amounts by month, but indicated the amounts over longer spans, providing more flexibility in execution of the policy. This turned out to be beneficial when the gilt market experienced turmoil in September and October 2022 and the unwinding needed to be halted temporarily. Like the Fed, the Bank of England has not stated the amount to be wound down after September 2023 but intends to completely remove its holdings of corporate bonds. Both central banks appear uncomfortable holding the credit risk of the corporate sector.

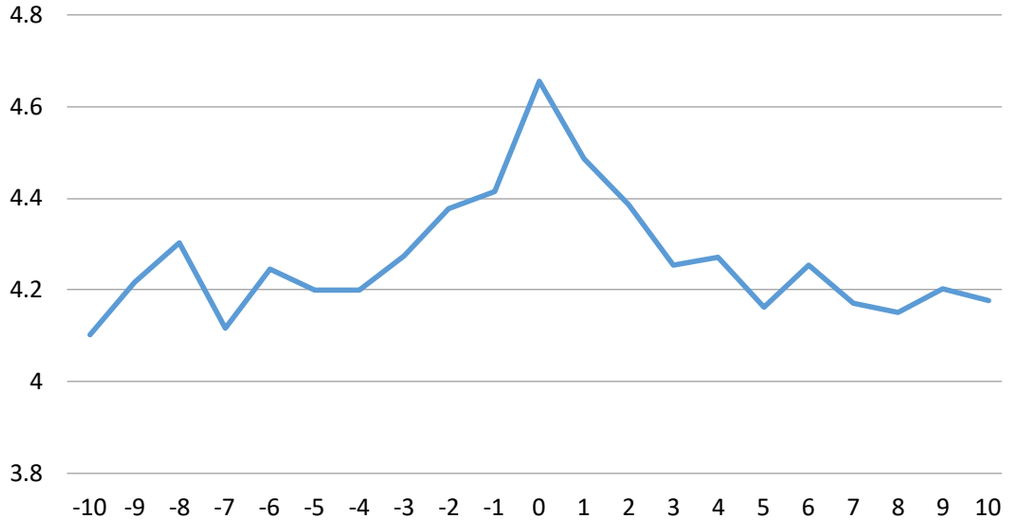
Moreover, both central banks are retaining flexibility to alter their plans in case economic or financial conditions deteriorate. Interestingly, the Bank of England's MPC has indicated that they prefer to be uninvolved with the decisions regarding the execution of the unwinding policy, while the FOMC votes at every meeting on the exact amounts of US Treasuries and agencies that are to be rolled off each month. So far, the different strategies have not led to demonstrably excess volatility associated with either unwinding policy.

Common features that follow similar exit strategies to those pursued after the GFC include early communication regarding the principles that will be followed and the criteria for beginning the execution of a reduction in balance sheet. This is followed by explicit details about how the strategy will be executed — sometime with specific amounts, but always with goals and time frame for the reduction. The central banks have kept close to their stated reduction path. Both central banks built in the option of halting or altering their strategy based on economic and financial conditions. The Bank of England needed to use that flexibility in September and October 2022, after which it resumed the original plan.

## Box 2. Korea's Resumption of APPs

On 23 October 2022, the Korean government announced that due to "multi-faceted factors at home and abroad" affecting the volatility and liquidity in the corporate bond and short-term money markets, it would provide a host of market stabilisation measures.[23] Among them was a further expansion of the funds available to purchase government, quasi-government, and corporate bonds as well as commercial paper (CP).[24] Specifically, the government highlighted the need to support the CP refinancing difficulties experienced by project-financing asset-backed commercial paper (PF-ABCP) and the other institutions that provide such financing. Additional support measures for the PF-ABCP and CP markets (11 November), and additional market stabilisation measures (28 November) were also initiated. The initial reaction to the 23 October announcement was a decline in government yields, a stabilisation of the commercial paper markets, and a gradual rise in the stock market.

**Figure 22: Ten-year Korean Mid Yield (Ten Days Surrounding the Event Day)**

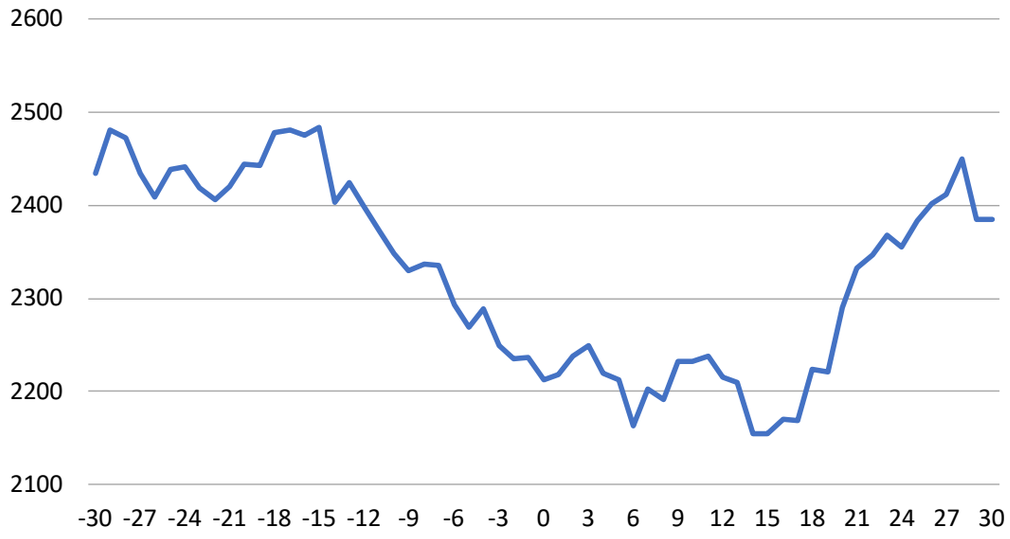



Notes: The event day, t = 0, is 23 October 2022.
Source: Refinitiv.

23. Press release of the Ministry of Economy and Finance, 23 October 2002, "Government Works to Stabilise the Corporate Bond Market and Short-Term Money Market".

24. Source: https://www.bok.or.kr/eng/main/contents.do?menuNo=400028

**Figure 23: Korea Stock Market Index (Thirty Days Surrounding the Event Day)**




Notes: The event day, t = 0, is 23 October 2022.
Source: Refinitiv.

Importantly, eligible collateral at the Bank of Korea's lending facilities was extended to include quasi-government bonds and financial bonds, in addition to government bonds. The Bank's Intermediated Lending Support Facility (BILSF) added the debt of nine public institutions[25] and bank debentures as eligible collateral for loans. The liquidity support for these new entities was through the end of January 2023, which was then extended until the end of April. Other public entities in Korea also have the ability to post their debt or mortgage-backed securities (in the case of the Korea Housing Finance Corporation). The clear intention is that liquidity provided through all these entities would be used to aid those corporations and SMEs suffering from an inability to obtain loans or rollover their debt, with particular attention to the real estate market.

The expansion in October 2022 of these various facilities and of the funds dedicated to the support of other financial market participants (for instance, securities firms) through the Korea Securities Financial Corporation is a recognition that support for financial stability needs to be broader than merely support for the functioning of the domestic government bond market. The extension through the end of April 2023 suggests that the uncertainty around the ability to access

25. These include KEPCO (Korea Electric Power Corporation), Korea Expressway Corporation, Korea Gas Corporation, Korea Land & Housing Corporation, Korail, Korea National Railway, K-Water, Korea SMEs & Startups Agency, and Korea Deposit Insurance Corporation. Other public institutions that can continue to post collateral include the Korean Development Bank, the Industrial Bank of Korea, the Export-Import Bank of Korea, and mortgage-backed securities issued by the Korea Housing Finance Corporation.

liquidity for some market participants did not fully dissipate by the initial deadline.[26] Although Korea was one of relatively few countries in the region to directly support corporate bond markets, it is notable that the government has tried to protect the Bank of Korea's balance sheet from credit risk by ensuring the posted collateral is at arms-length from the intended audience, through other governmental entities viewed as having a fiscal backstop or supervised banks.

It appears that some of the affected users of PF-ABCP are attempting to lengthen their CP maturities and issue longer term debt. But continued use of the extended facility may lead to undue dependence on the Bank of Korea in future market disruptions and could lessen the incentive to address the underlying weakness in those institutions that are suffering refinancing difficulties.

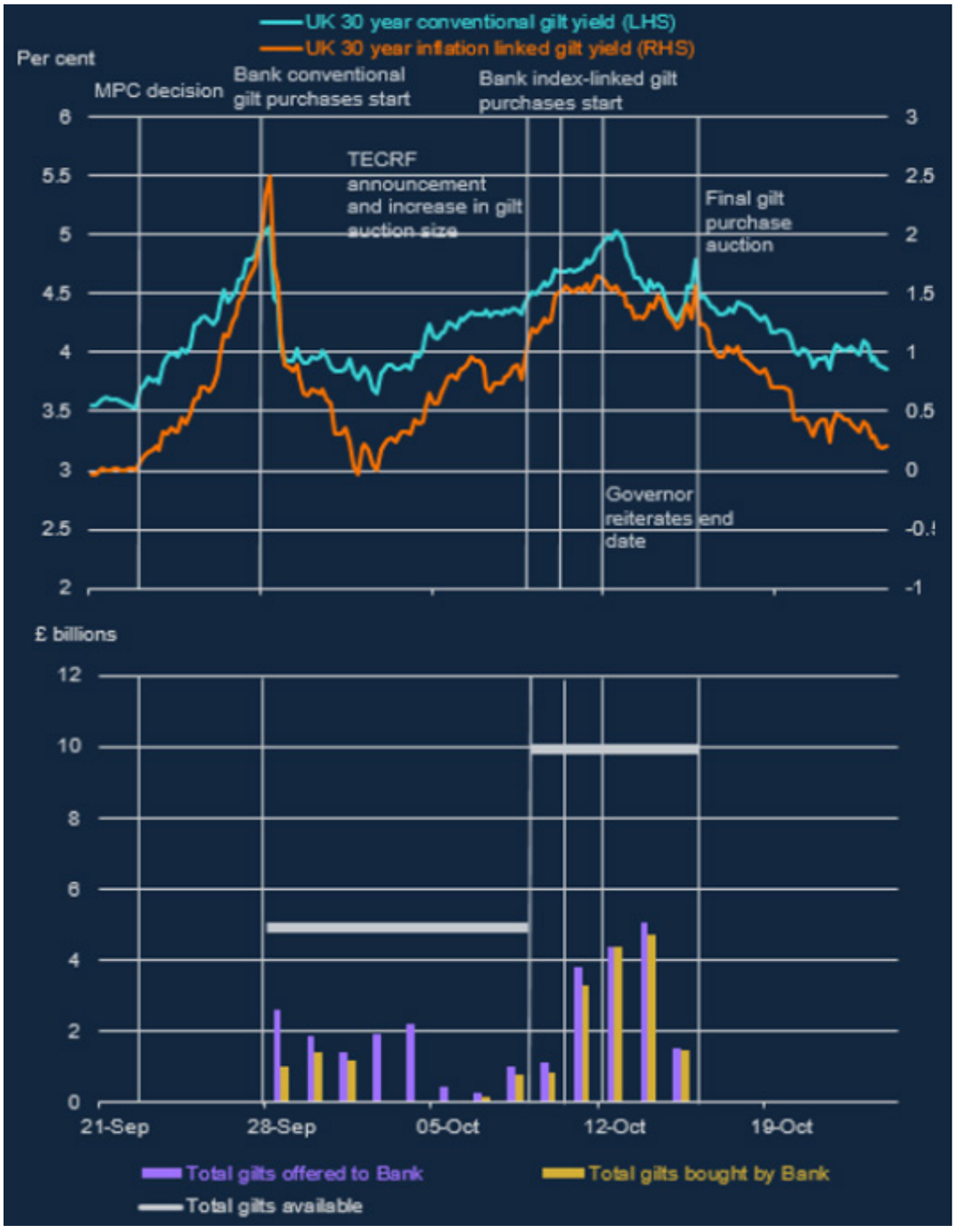
26. See Box 3 of the Bank of Korea's December 2022 Financial Stability Report for an initial assessment of the programme.

## Box 3. Bank of England's Re-use of APP in September and October 2022

Following an abrupt increase in yields and gilt market volatility in late September 2022, the Bank of England re-opened its Asset Purchase Facility (APF) for temporary and targeted asset purchases that ran for 13 days between 28 September and 14 October 2022. Its goal was to stem the falling prices of gilts and prevent fire sale conditions from establishing themselves. A precursor to this event was the announcement of a new budget (a "Growth Plan") from HM Treasury, which was viewed by financial markets as leading to elevated government borrowing rates. Thirty-year gilt yields rose dramatically (twice the increase ahead of the COVID-19 lockdown in Spring 2020, and three times larger than any other historical move over a similar period) with prices plummeting following the announcement (Figure 24).

Although the reaction of government yields to fiscal announcements is not unusual, what made the Bank of England respond with asset purchases was the impact the rapid fall in prices had on a set of pension plans that were using a strategy called "liability-driven investment" (LDI). This strategy, typically provided by specific LDI managers hired by defined benefit pension funds, is meant to better manage the maturity structure between fixed-income assets and the future pension liabilities of the funds that employ it. Over the past decade or so, many UK pension funds have struggled to fund their commitments to pensioners (that is, they are under-funded using conventional measures) and hence have needed to improve their returns. The LDI strategy has helped them do this by using their existing long-term gilt portfolios as collateral for repurchase agreements, and then taking the cash provided by the repo to invest in more long-term gilts, other higher-return assets, or derivative contracts, rolling over their repurchase agreements regularly to hold these instruments This leveraged strategy comes with some liquidity risks in that the holders of the collateral in the repurchase agreements adjust their margin requirements with the pension funds based on the value of the gilt collateral. As gilt prices fell, the LDI managers overseeing the strategy for the pensions needed to post more margin with their over-the-counter counterparties, since the collateral underlying the repos was worth less. In turn, the LDI managers requested payment (in cash) from the pension funds. Unfortunately, the pensions did not have enough cash and hence needed to sell their existing gilts into a falling market to make their margin calls. This exacerbated the gilt price declines and forced additional margin calls. To circumvent what could have become a systemic event, the Bank of England agreed to buy gilts to support their prices until the LDI managers and their pension funds could find other assets to sell or otherwise obtain the cash required to make the margin calls.

**Figure 24: Yield Moves and Bank of England Operations**




Source: Bank of England, Bloomberg Finance L.P.

The Bank of England was conscious that it had planned to start outright sales of its previously-obtained APF assets in early October and now was providing support to the market to stabilise it. To avoid the perception that this would be an ongoing occurrence, it indicated its specific intention: "The Bank will carry out purchases of long dated gilts in a temporary and targeted way. The purpose of these purchases is to restore orderly market conditions".[27] And: "In line with the Bank's financial stability objective and in order to avoid dysfunction in core funding markets, the purpose of these operations is to enable liability driven investment (LDI) funds to address risks to their resilience from volatility in the long-dated gilt market".[28] The design features included purchases of those assets most closely related to market disfunction (initially, long-dated gilts and then expanded to inflation-linked gilts) and pricing was "positioned as a genuine backstop, aimed not at purchasing a set amount of assets, or at achieving a particular level of yields, but instead at purchasing only as many assets as required to resolve the financial stability issue and re-catalyse the market".[29]

The Bank of England eventually bought £19.3 billion of gilts associated with this programme, three-quarters of which took place in the final week of operations. This was much less than originally envisaged because the design and time frame for the programme provided LDI managers the incentives to obtain cash from the pension funds and in the secondary market once volatility was lowered. On 23 November 2022, the Bank of England announced how it intended to unwind the purchases of index-linked and long-dated gilts acquired in this period of distress, noting that sales would be executed in a timely and orderly way. They announced that the process would be "demand driven" with flexibility to accept more or fewer bids on the gilts depending on market conditions. Moreover, they stated that they were co-ordinating with the UK's Debt Management Office to "ensure that the portfolio can be unwound in a timely but orderly fashion, while minimising interference with the DMO's own issuance programme". Subsequently, on 12 January 2023, the Bank of England announced that it had fully unwound the purchases and would be continuing on their earlier-stated path to execute outright sales of the COVID-related purchases. As of 16 January 2023, the assessment by the Bank of England was: "The Bank's action was successful in restoring market functioning and giving LDI funds time to build their resilience in the near-term to future volatility in the gilt market".[30]

27. Press Release: "Gilt Market Operations—Market Notice 28 September 2022".
28. From Press Release, "Bank of England announces additional measures to support market functioning", 10 October 2022.
29. From speech "Thirteen days in October: How central bank balance sheets can support monetary and financial stability", by Andrew Hauser, 4 November 2022.
30. From Press Release, "Exchange of Letters between the Governor and the Chancellor on the Asset Purchase Facility – January 2023".

## Annex 1. Results of APP Studies

**Table A1.1. Summary of APP Studies**

| Study | Countries Covered | Technique | Variables of Interest | Results |
|---|---|---|---|---|
| Arslan et al (June 2020) | Chile, Colombia, India, Indonesia, Korea, the Philippines, South Africa, Thailand, and Turkey | Event study and regression (with controls) | 10-year Treasury yields; nominal bilateral exchange rate vs US dollar | EM yields fell within five days; local currencies stabilised or appreciated; various control variables in regressions did not alter results, though more variation across countries |
| Sever et al. (December 2020) | Chile, Colombia, Hungary, Malaysia, Indonesia, India, South Africa, Poland, Turkey, and the Philippines | Event study and regression (with controls) | 10-year Treasury yields, (constructed) term premia; nominal bilateral exchange rates vs US dollar, equity price indices | EM yields fell within six trading days; local currencies appreciated; equity markets were unaffected in short run, though APPs supported equity markets after five days; Fed policy rate declines lowered EM yields, VIX increases raised EM yields; local policy rate declines did not impact EM yields |
| Fratto et al. (January 2021) | Five small AEs (Sweden, Canada, Australia, New Zealand, and Korea) and six EMs (Colombia, India, Thailand, Hungary, Croatia, and Poland) | Event study and panel regressions | 6-months, 2-year, 5-year and 10-year Treasury yields; bilateral exchange rates vs US dollar, EMBI spreads, equity indices | Both AE and EM yields fell across maturities, stronger for EM yields; no statistical effect on exchange rates, EMBI spreads, or equity indices; some variation in results with other controls |
| Rebucci et al. (February 2021) | Nine AEs (including Korea) and twelve EMs (Colombia, Croatia, Hungary, India, Indonesia, Israel, Mexico, Philippines, Poland, Romania, South Africa, Turkey) | Event study, and GVAR model | 10-year Treasury yields; bilateral exchange rates vs US dollar | Both AE and EM yields fell over three days, with stronger impact for EMs; exchange rate effects were varied across EMs, with larger depreciations in AEs than in EMs<br>Only Korea and South Africa in GVAR model with positive impact of long-term interest-rate shock on output and opposite effects in the two countries on exchange rates |

## Annex 2. Panel Regression Results

Table A2.1 shows the regression results for the panel regression model. The model was executed with all eight countries from 6 August 2019 through 8 October 2020, encompassing approximately six months before the earliest initial announcement of an APP made by a country and six months after that latest APP initial announcement.

The announcement is a dummy variable taking the value "1" on the day of the announcement (see Table 2 in the paper) and "0" otherwise. The daily change of the domestic government bond yield uses the mid-point of the daily yield from day t to day t+1. The benchmark bond used for each country is presented in Table 2. The cumulative change in yield is taken from day t to day t+10. The Fed Funds rate change is the change from day t to day t+1 of the Fed's policy rate, similarly for the domestic policy rate. The exchange rate is the percentage change from day t to day t+1 in local currency per US dollar. The VIX change is the change in the level of the VIX (which is already in percent).

Standard errors are corrected for both autocorrelation and heteroskedasticity as the tests for the violation of these two assumptions indicated their presence. The use of a fixed effect model (rather than a random effect model) was verified through the Pesaran and Breusch-Pagan LM tests for cross-sectional correlations and an examination of the relative $R^2$ of the cross-section and time series residuals.

**Table A2.1**
**Panel Regression Results**

| ***Dependent Variable: Daily Yield Changes*** | | | | | |
|---|---|---|---|---|---|
| | APP Announcement Dummy | Fed Funds Rate Change | Domestic Policy Rate Change | Exchange Rate Change | VIX Change |
| Coefficient | -8.094 | -0.019 | -0.015 | 0.354 | 0.098 |
| Z | -6.900 | -1.770 | -0.920 | 2.570 | 4.290 |
| Prob > \|z\| | 0.000 | 0.076 | 0.360 | 0.010 | 0.000 |
| | | | | | |
| ***Dependent Variable: Cumulative Yield Changes*** | | | | | |
| Coefficient | -15.678 | -0.068 | -0.023 | -0.576 | 0.332 |
| Z | -4.380 | -2.030 | -0.480 | -1.360 | 4.720 |
| Prob > \|z\| | 0.000 | 0.042 | 0.634 | 0.173 | 0.000 |

Source: Author's calculations.

## Annex 3. Projection Methods and Results

To accommodate the dynamic relationships among the variable of interest — the cumulative impact of government yields — a local projection method is employed.[31] This method captures both the size and persistence of the impact. Note that by controlling for the forward values of the APP announcement (leads of the dummy variable), we are able to observe the effect of the announcement over the time frame for which we cumulate the effect, in this case six trading days.

The basic specification is as follows:

$$\Delta y_{c,t\to t+p} = \sum_{r=0}^{p} \alpha_1^{p,r} APP_{c,t+p-r} + \sum_{r=0}^{p} \alpha_2^{p,r} Global_{t+p-r} + \sum_{r=0}^{p} \alpha_3^{p,r} Local_{c,t+p-r}$$

$$+ \sum_{l=1}^{4} \beta_1^l APP_{c,t-l} + \sum_{l=1}^{4} \beta_2^l Global_{t-l} + \sum_{l=1}^{4} \beta_3^l Local_{c,t-l} + \mu_c + e_{c,t+p},$$

where c stands for country and t stands for day. The dependent variable $\Delta y_{c,t\to t+p}$ is the cumulative change in the yield from day t to day t+p. The variable APP represents the dummy variable for the day of the announcement of the asset purchase programme and is country specific. We use two global variables, 'Global' (that is, they are not country specific and so have no 'c' subscript): the change in the Fed Funds rate for the United States and the change in the VIX. Hence, there are two parameters associated with both the second and fifth term in the equation and two associated parameters. There are also two local variables, 'Local': the change in the country's policy rate and the change in the percentage change in the country's exchange rate vis-à-vis the US dollar. Similarly, there are two coefficients implicitly identified there as well. Note that the first three terms are forward looking (for six days) and the next three terms are backward looking (by four days). Teulings and Zubanov (2014) show that the original local projections methodology by Jordà (2005) may generate biased estimates if the lead values of explanatory variables are not controlled for. There are two error terms: one for country-fixed effects, $\mu_c$, and one for the time series to match the time period over which the cumulative yield change is calculated, $e_{c,t+p}$, per country.

The model was executed with all eight countries from 6 August 2019 through 8 October 2020, encompassing approximately six months before the earliest initial announcement of an APP made by a country to six months after the latest APP initial announcement. This regression is run for each p of interest, so for the cumulative yield across six days, there are six regressions. The coefficient of most interest is $\alpha_1^{p,p}$, which represent the overall impact of the announcement on the cumulative yield for each of the six trading days (p = 1, 2, …, 6) across all eight countries in the panel regression. These are plotted in Figure 10 and are presented below in Table A3.1 along with their robust standard errors, corrected for both serial correlation and heteroskedasticity. As

31. See Sever et al. (2020) for a similar formulation of the local projections model.

noted in the text, the impact of the announcements is negative and highly statistically significant for all 6 trading days. The coefficients on the two global variables and the two local variables are also of interest and are presented.

**Table A3.1. Projection Method Results**

| | Day 0 | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 |
|---|---|---|---|---|---|---|---|
| **Effect of announcement on** | | | | | | | |
| Daily yield changes | -7.576 | -12.335 | -11.201 | -12.365 | -13.992 | -13.708 | -16.380 |
| Standard error | 1.079 | 1.574 | 1.966 | 2.228 | 2.460 | 2.762 | 2.978 |
| P>\|z\| | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | | | | | | | |
| **Effect of Fed Funds rate change on** | | | | | | | |
| Daily yield changes | 0.008 | -0.062 | -0.161 | -0.108 | -0.108 | -0.081 | -0.167 |
| Standard error | 0.017 | 0.025 | 0.033 | 0.039 | 0.045 | 0.051 | 0.056 |
| P>\|z\| | 0.651 | 0.013 | 0.000 | 0.006 | 0.016 | 0.110 | 0.003 |
| | | | | | | | |
| **Effect of VIX change on** | | | | | | | |
| Daily yield changes | 0.088 | 0.035 | 0.127 | 0.240 | 0.197 | 0.083 | -0.090 |
| Standard error | 0.034 | 0.052 | 0.072 | 0.092 | 0.105 | 0.118 | 0.135 |
| P>\|z\| | 0.009 | 0.501 | 0.079 | 0.009 | 0.061 | 0.482 | 0.506 |
| | | | | | | | |
| **Effect of local policy rate change on** | | | | | | | |
| Daily yield changes | -0.011 | -0.004 | 0.044 | 0.104 | 0.047 | 0.042 | 0.033 |
| Standard error | 0.013 | 0.019 | 0.024 | 0.027 | 0.029 | 0.033 | 0.000 |
| P>\|z\| | 0.425 | 0.835 | 0.068 | 0.000 | 0.110 | 0.203 | 0.358 |
| | | | | | | | |
| **Effect of exchange rate change on** | | | | | | | |
| Daily yield changes | -0.111 | -0.153 | -0.230 | 0.078 | 0.176 | 0.020 | 0.396 |
| Standard error | 0.212 | 0.297 | 0.375 | 0.431 | 0.480 | 0.529 | 0.573 |
| P>\|z\| | 0.599 | 0.606 | 0.539 | 0.856 | 0.714 | 0.970 | 0.489 |

Note: All variables are daily changes except the exchange rate, which is the percentage change in US dollar versus local currency. Standard errors are below coefficient estimates and p-values are below the standard errors.
Source: Author's estimates.

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