European Department

Asset Purchase Programs in European Emerging Markets

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ABSTRACT: Several emerging market central banks in Europe deployed asset purchase programs (APPs) amid the 2020 pandemic. The common main goals were to address market dysfunction and impaired monetary transmission, distinct from the quantitative easing conducted by major advanced economy central banks. Likely reflecting the global nature of the crisis, these APPs defied the traditional emerging market concern of destabilizing the exchange rate or inflation expectations and instead alleviated markets successfully. We find evidence that APPs in European emerging markets stabilized government bond markets and boosted equity prices, with no indication of exchange rate pressures. Examining global and domestic factors that could limit the usability of APPs, in the event of renewed market dysfunction we see a potential scope for scaling up APPs in most European emerging markets that used APPs during the pandemic, provided that they remain consistent with the primary objective of monetary policy and keep a safe distance from the risk of fiscal dominance. As central banks in the region move toward monetary policy tightening, the tapering, ending, and unwinding of APPs must also be carefully considered. Clear and transparent communication is critical at each step of the process, from the inception to the closure of APPs, particularly when a large shock hits and triggers a major policy shift.

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Acknowledgments

1 Introduction

Governments around the world have taken unprecedented policy actions to meet the challenge posed by the coronavirus disease (COVID-19) pandemic, ranging from imposing nationwide lockdowns to extending lifelines to individuals. Broadly, the policy actions have been larger in scale and more comprehensive in scope than in any crisis in living memory, including the global financial crisis (GFC) more than a decade ago. To cope with a virus that is blind to national or other boundaries, staple economic policies on fiscal and monetary fronts have been significantly enlarged and transformed in advanced economies (AEs) and emerging market economies (EMs) alike.

A particularly novel development in monetary policy has been the widespread adoption of asset purchase programs (APPs) by EM central banks, including in Europe. When international financial market turbulence led to financial outflows and upward pressure on bond yields in the weeks following the outbreak of the pandemic in March 2020, some 20 EM central banks launched APPs, most of them for the first time. In Europe, six EM central banks (Croatia, Hungary, Poland, Romania, Serbia, Turkey) began engaging in APPs during the March to May 2020 period. The stated primary goals were to alleviate the dysfunction in the financial markets, furnish liquidity, and repair impaired monetary transmission mechanisms. In the cases of Hungary and Poland, where APPs have continued beyond the initial financial market turbulence in early 2020, the objectives of APPs have since been tilted more toward supporting monetary policy transmission over a longer period. We observe that at an extraordinary time when government bond markets exhibited significant stress and large fiscal financing needs loomed, the APPs to some degree contributed to the smooth financing of government expenditures. In contrast, the APPs that were introduced in AEs following the GFC were mainly aimed at providing additional stimulus, as policy rates had reached the effective lower bound.

Until the pandemic, APPs had largely been the domain of reserve currency central banks, mainly because it was feared that APPs in EMs could de-anchor inflation expectations and trigger exchange market pressures. The global crisis, caused by a virus rather than policy mishaps, however, led EM central banks to deploy APPs successfully. To date, APPs in EMs have not resulted in the feared disruption and, instead, have stabilized markets since the initial lockdowns were put in place and improved monetary transmission channels (IMF 2020a).

This paper attempts to understand what has made the so-far successful use of APPs in European EMs possible and ascertain whether these "new" tools can be extended beyond the initial pandemic response. A close examination of country and global factors as well as institutional aspects, which allow for a case-study-type approach, distinguishes this paper from several other recent econometrics-based studies of EM APPs.

The paper asks the following questions and offers some preliminary answers:

- *What distinguishes APPs in EMs from those in AEs?* The scale of APPs introduced in European EMs ranges from small (Romania, Serbia, Turkey) to more sizable (Croatia, Hungary, Poland), though all have been smaller in magnitude compared to those conducted by the Federal Reserve and the European Central Bank (ECB). The APPs have generally been fully or partially sterilized by various means. The generally smaller size and the use of some sterilization have set these APPs apart from the large-scale asset purchases, or quantitative easing (QE), adopted by the larger central banks since the GFC.

- *Have APPs achieved their aims in European EMs?* They were successful in alleviating market dysfunction in the immediate aftermath of the global shock in March and April of 2020—a key shared reason for their deployment. Using event studies, we find some evidence of easing of liquidity pressures and a reversal in surge in term spreads, with no indication of foreign exchange market pressures. APPs seem to have had some economy-wide effects, with positive spillovers into equity markets.

- *Will EMs face tighter limits to their use of APPs? If so, what will determine such limits?* EM monetary policy is influenced by global conditions, and APPs are no exception. Intertwined with global conditions, domestic factors will affect the extent to which APPs can be utilized as a policy tool in European EMs. For the EU members, the structure and discipline provided by membership make the oft-stated fiscal dominance risk less acute. Monetary policy frameworks in these countries enjoy credibility, and fiscal policy is anchored in medium-term sustainability.

- *When should APPs be terminated? How should the exit be managed?* Slowing down and exiting from APPs remain a challenge, with little guidance available from the existing experience of the large central banks. APPs should stop when initial objectives have been met, are no longer relevant, or when their limits have been reached. The exit, especially the unwinding of purchased assets, should attempt to minimize market disruption and would likely be a long-term process.

- *What is the role of communication in using APPs?* The novel nature of APPs in EMs makes effective communication particularly important. Central banks should communicate clearly at the inception of APPs, during operation, and at the time of exit and unwinding.

- *What should be the role of APPs in these European EMs going forward?* With market conditions quite different than at the time of their introduction and success at alleviating market dysfunction in 2020, the initial goals of APPs have been met and several APPs have concluded. For the APPs that continue, it will be important to consider the role of APPs going forward and their interaction with eventual monetary policy tightening. It would be appropriate to complement an increase in policy rates with a tapering or discontinuation of APPs, which would support the transmission of higher policy rates to the longer end of the yield curve, supporting the monetary policy transmission mechanism.

The rest of the paper is organized as follows. Chapter 2 provides an overview of the characteristics, goals, and operations of APPs in EM Europe. Chapter 3 analyzes the effectiveness in meeting the stated goals. Chapter 4 studies the factors that could constrain the scope for APPs, including the risk of fiscal dominance. Chapter 5 tackles the questions of how to exit APPs and the importance of communication. Finally, Chapter 6 summarizes the lessons and offers some thoughts on how APPs might be used in future as part of the monetary policy toolkit for EM central banks in Europe.

2 Characteristics of Asset Purchase Programs in European Emerging Markets

The widespread implementation of APPs in EM economies has been a novel aspect of the policy response to the COVID-19 crisis. Large-scale APPs became more common in AEs in the aftermath of the GFC in 2008, including in the form of QE, when policy rates already were close to the effective lower bound. While EMs did use some unconventional policy measures to provide liquidity after the GFC and the Taper Tantrum in 2013, the COVID-19 pandemic has led to the first broad EM foray into APPs in local currency bond markets (Arslan, Drehmann, and Hofmann 2020; Sahay and others 2014).

EMs implemented APPs to alleviate market dysfunction at the beginning of the pandemic. During the initial weeks of the pandemic, bond spreads spiked, and investors offloaded local currency EM instruments (Figure 1). It was widely believed that liquidity stress in the banking system could affect nonfinancial corporations, households, and the government, which would be facing shortfalls in income and revenue but were still expected to meet expenditures. In the event, some EM central banks began purchasing local currency bonds in a bid to restore the functioning of domestic government bond markets, as APPs are believed to be able to ease market liquidity (Christensen and Gillan 2019). Importantly, in contrast to APPs in AEs, EM APPs were generally not aimed at providing macroeconomic stimulus (IMF 2020a; Hofman and Kamber 2020; Ha and Kindberg-Hanlon 2021).

Conceptual Underpinnings

The theoretical underpinnings of APPs are vague and still evolving (see Annex 1). While conventional monetary policy is effective in the short term because it exploits near-term price rigidities, APPs are viewed to be effective by exploiting segmentation of the yield curve. This could in turn be

Figure 1. Emerging Market Bond Fund Flows
(Billions of USD)
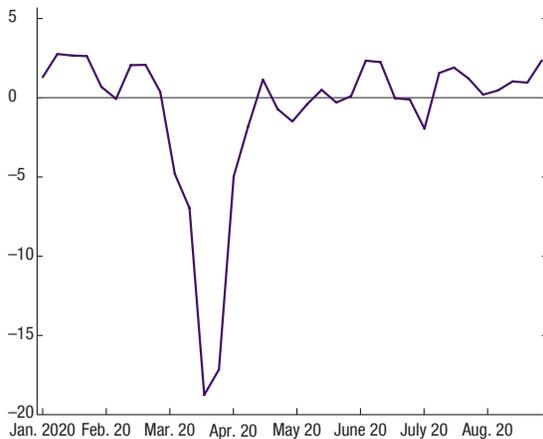
Source: Emerging Portfolio Fund Research.

attributed to asymmetric information after a shock and imperfect arbitrage, until consensus about a new equilibrium has emerged. Generally, APPs can (1) influence quantity by easing liquidity constraints—depending on the degree of sterilization—and by reducing segmentation among institutions and along the yield curve; (2) smooth the yield curve, including by mitigating the overshooting in a highly segmented yield curve; and (3) anchor expectations, mainly by conveying information about intended policies.

APPs can influence agents' ability and willingness to borrow and lend, and thus help stabilize aggregate demand in the short term. How effectively APPs can influence the yield curve hinges on country- and shock-specific factors. What would matter initially is whether markets believe that APPs can effectively alleviate the shock by easing the aforementioned constraints. If APPs are mainly used to finance higher public spending, the efficiency of such spending, and the degree to which it is appropriately sterilized, will matter.[1] Otherwise, APPs could trigger macroeconomic instability, if inflation expectations become de-anchored. Over the long term, monetary policy is considered neutral, and it is difficult to persistently influence the yield curve, as deviations from market perceptions will in principle be arbitraged.

Scale and Timing

The APPs implemented by European EMs during the pandemic can mostly be characterized as small-scale, in line with other EMs. In total, some 20 EM central banks adopted APPs, including six in EM Europe: Croatia, Hungary, Poland, Romania, Serbia, and Turkey (IMF 2020a). Among EMs, the scale of assets purchased from March 2020 to June 2021 varies widely (Figure 2). Some European EMs implemented smaller-scale APPs (Romania, Serbia, Turkey), while others (Croatia, Hungary, Poland, 5 to 7 percent of GDP) implemented APPs that were at the higher end of those of EMs, globally.[2] More broadly, the size of APP in EMs has been significantly smaller than

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[1]The context and objectives of the APP would also be relevant. For example, an increase in inflation expectations in response to the use of APPs to finance higher public spending may be welcomed should inflation be significantly below the target.

[2]The market value of securities purchased by the Croatian National Bank is 5.5 percent of GDP.

that conducted by the Federal Reserve and ECB, which purchased 23 and 14 percent of GDP in assets, respectively.[3]

The bulk of EM central bank asset purchases in Europe had paused by the mid-2020, Hungary and Poland being notable exceptions. Asset purchase activity peaked in April and May 2020 and then fell off sharply. By June/July 2020, purchases in Croatia, Serbia, and Turkey are known to have ceased.[4] The National Bank of Poland (NBP) has continued asset purchases in 2021, initially at a very slow pace after July 2020. In March to May 2021, however, the NBP again increased the pace of asset purchases in the context of a global increase in long-term bond yields. Romania's central bank also made small additional purchases in March 2021 after having stopped in August 2020. In contrast, the Hungarian National Bank's (MNB's) purchases accelerated in the second half of 2020 and remained at a high level in 2021 (Figure 3).[5]

Figure 2. Asset Purchases by Central Banks During Pandemic
(Percent of 2020 GDP; end-February 2020 to end-June 2021)
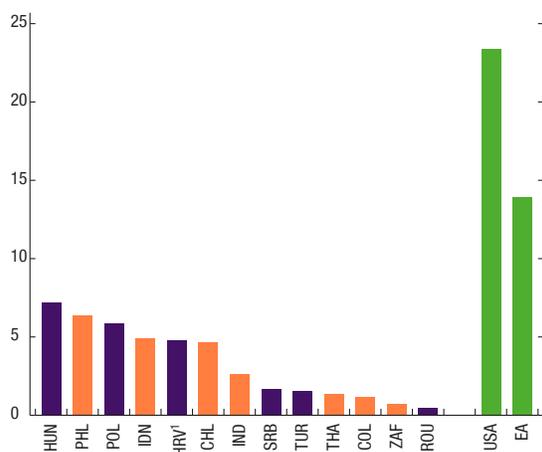
Sources: Haver Analytics; IMF, International Financial Statistics database; national central banks; and IMF staff calculations.
Note: The figure uses International Organization for Standardization (ISO) country codes.
[1]The market value of securities purchased by the Croatian National Bank is 5.5 percent of GDP.

Goals

A common objective of European EM APPs was the mitigation of financial market dysfunction, provision of liquidity, and repairing impaired monetary transmission mechanisms early in the pandemic. During the financial market shock at the beginning of the pandemic, European EM central banks recognized a liquidity squeeze, likely to be compounded by capital outflows and higher long-term yields. They quickly provided additional liquidity, including through intervention in government securities markets. Once calm was

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[3]These figures refer to assets purchased since the beginning of the pandemic through the end of June 2021.

[4]The Croatian National Bank has disclosed specific dates of asset purchases, and the Central Bank of the Republic of Turkey and National Bank of Romania have disclosed the amounts purchased. Purchase amounts for Serbia are estimated from central bank balance sheets, but purchases appear to have stopped after May 2020.

[5]See Box 1 for a case study of the MNB's APP.

Figure 3. Asset Purchases in Emerging Market Europe by Month

1. European EM Central Bank Asset Purchases
(Purchases per month as a percentage of 2020 GDP)

2. Cumulative Central Bank Asset Purchases
(Percent of 2020 GDP)
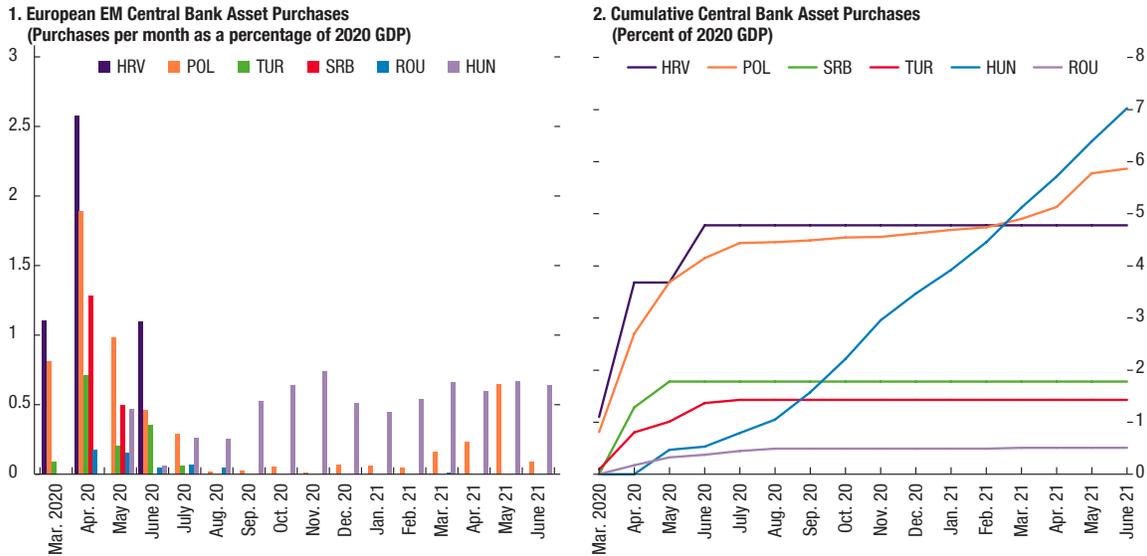
Sources: IMF, International Financial Statistics database; national central banks; and IMF staff calculations.
Note: The figure uses International Organization for Standardization (ISO) country codes.

restored to financial markets, most regional central banks paused or significantly scaled back APPs.

The Polish APP has aimed to support the monetary policy transmission mechanism beyond the initial pandemic financial market shock. Following large purchases during the first months of the pandemic, the central bank purchased additional assets at a slow pace from August 2020 to February 2021. However, from March to May 2021, the central bank significantly increased the scale of APPs. As this period coincided with a global increase in long-term bond yields driven by expectations of economic recovery, particularly in the United States, the increased purchases appear to have been an effort to prevent a premature tightening of long-term yields in Poland. In other words, the purchases aimed to contain long-term bond yields and bolster the transmission of monetary easing. These actions were consistent with the initially stated goals but were unique from most other EM European APPs in that they occurred well past the period of financial market turbulence.

The MNB has also revised the goals of its APP (Box 1). Hungary was unique in that the MNB had implemented APPs even before the pandemic, particularly for private securities, with the goal of promoting market development. At the start of the pandemic, the MNB initially cited market dysfunction and a desire to lower long-term interest rates upon introducing the APPs. The pace of asset purchases was then increased later during the pandemic.

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Figure 4. Asset Purchase Programs, Capital Flows, and Budget Deficits, 2020

Bond and equity outflows from end-February to end-April 2020 have generally reversed.

1. ETF and Mutual Funds Bond and Equity Flows, 2020
   (Percent of GDP)
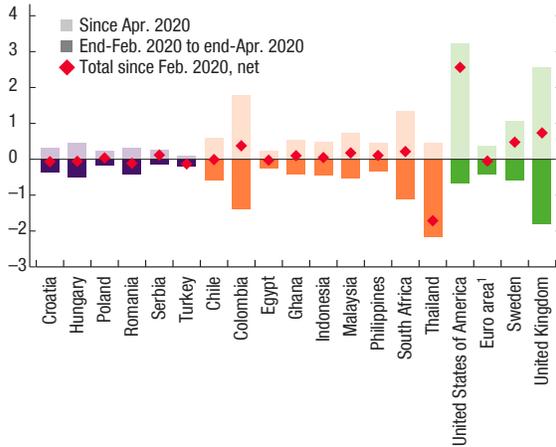
There is no obvious correlation between size of selected capital flows and asset purchase programs since end-February 2020.

2. Asset Purchase Programs and ETF and Mutual Funds Bond and Equity Flows, 2020
   (Percent of GDP)
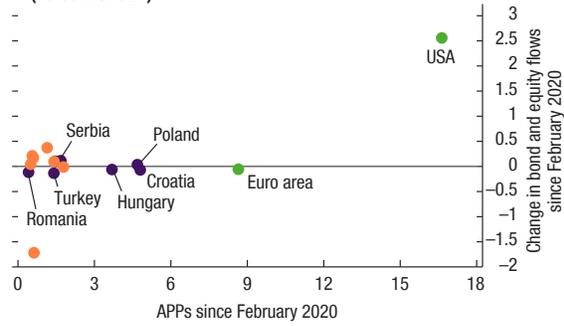
COVID-19 triggered much larger budget deficits, including in countries that introduced, or enhanced, their asset purchase programs.

3. Budget Deficits
   (Percent of Normal GDP)
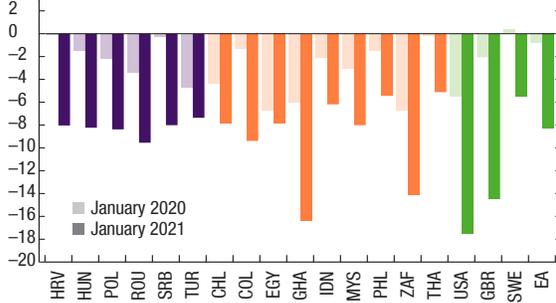
There appears to be some correlation between the size of the increased budget deficits and the asset purchase programs.

4. Asset Purchase Programs and Budget Deficits, 2020
   (Percent of GDP)
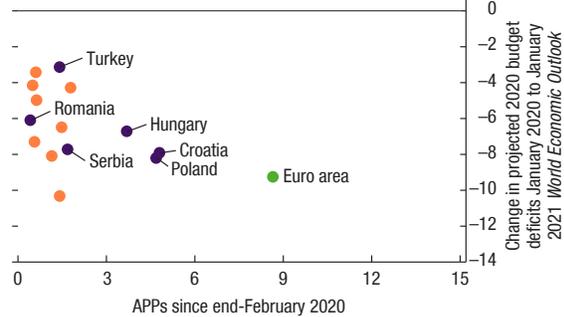
Sources: Emerging Portfolio Fund Research; IMF, World Economic Outlook database; and national authorities.
Note: The figure uses International Organization for Standardization (ISO) country codes. APPs = asset purchase programs; ETF = exchange-traded fund.
[1]Excluding Cyprus, Estonia, Latvia, Luxembourg, Malta, Slovakia, and Slovenia.

The purchases of government securities may also have eased financing costs and lowered refinancing risks of the government. Initially, the long-term collateralized credit facility introduced at the beginning of the pandemic played a relatively large role in promptly providing liquidity. Later, the APP partially took over this role, as the MNB found that purchases of government securities were more efficient in influencing the transmission to long-term interest rates.

APPs also have facilitated the smooth financing of anticrisis fiscal expenditures. There appears to be some correlation between the size of the increase in budget deficits and size of APPs (Figure 4). It may be fair to conclude that

Figure 5. Poland: Cumulative Issuance of Securities and Central Bank Purchases
(Billions of PLN)
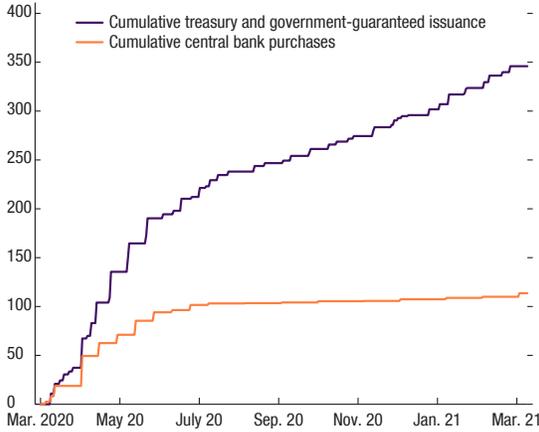
Sources: National Bank of Poland; Polish Development Fund (PFR); and Polish National Development Bank (BGK).

central bank demand for domestic Treasury instruments may have eased the placement of new securities in the markets, lowering both funding costs and rollover risks. For example, in Poland, the NBP cumulatively purchased about 36 percent of the combined issuance of domestic Treasury bonds/bills and state-guaranteed debt between March 15 and end-2020 (Figure 5). In Croatia, the central bank made five large bond purchases early in the pandemic, and markets quickly calmed thereafter, assuaged by the EUR 2 billion swap agreement with the ECB in mid-April 2020, and the authorities' strong commitment to the exchange rate anchor and envisaged ERM II membership (which happened on July 10, 2020).

Operational Aspects

As in other EMs, assets purchased in EM Europe mostly consist of local Treasury bonds. In Poland, the central bank's purchases have been evenly split between local Treasury securities and government-guaranteed securities issued by Polish development banks.[6] In Hungary, the MNB has also purchased a sizeable amount of mortgage-backed securities and corporate bonds (Figure 6). These purchases of private securities affect long-term yields and can thus enhance the monetary policy transmission mechanism.[7] Such purchases, however, pose additional challenges for central banks, including assessing the perceived maturity and credit risk. They may also create governance risks if the central bank is seen as favoring some corporates over others, particularly if securities are acquired in the primary market.

Central banks have purchased government securities primarily at the long end of the yield curve. Granular information on bond-by-bond purchase of Treasuries is available for Poland and Hungary only. The data show that the NBP concentrated its purchases on 5- to 10-year bonds, while the MNB

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[6]Poland's pandemic fiscal response was partly financed off the state budget through a fund financed by government-guaranteed securities issuance by the Polish Development Fund and BGK (state development bank).

[7]The MNB had introduced programs to purchase mortgage-backed securities and corporate bonds before the pandemic, with the aim of developing these markets. The programs were reintroduced (mortgage bonds) or enhanced (corporate bonds) at the time of the pandemic to reduce volatility of spreads against local Treasuries.

Figure 6. Asset Purchases by European EM Central Banks
(Percent of 2020 GDP; from end-February 2020 to end-June 2021)

Sources: Haver Analytics; IMF, International Financial Statistics database; national central banks; and IMF staff calculations.
Note: Figure uses International Organization for Standardization (ISO) country codes. EM = emerging market.
[1]Market value of securities purchased by Croatian National Bank is 5.5 percent of GDP.

Figure 7. Maturity Composition of NBP and MNB Asset Purchases
(Percent of total Treasury security purchases, March 2020 through June 2021)
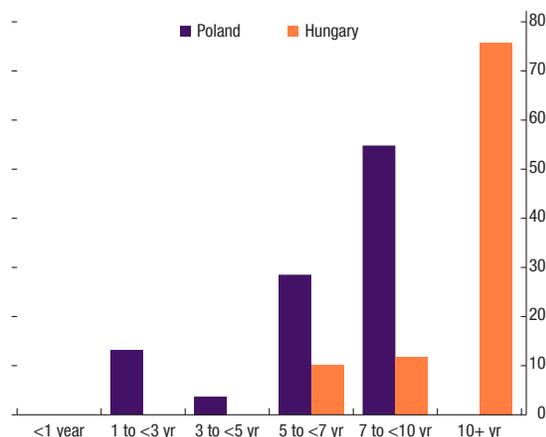
Sources: Hungarian National Bank; National Bank of Poland; and IMF staff calculations.
Note: MNB = Hungarian National Bank; NBP = National Bank of Poland.

overwhelmingly purchased Treasury securities with greater than 10-year maturity (Figure 7).

Most purchases were in the secondary market. EU central banks with APPs are required to buy government securities only in the secondary market.[8] In principle, such practices minimize the impact of central bank participation on price discovery in the market. In Hungary, the MNB bought mortgage bonds and corporate bonds, initially in both the primary and secondary markets. It later decided to pause purchases of mortgage bonds and announced that it would only buy green mortgage bonds.

Purchase methods have varied, but a quantity-based approach was preferred. In Croatia, the central bank conducted five large ad hoc tenders. In Hungary, regular auctions are conducted, but a smaller part are over-the-counter transactions depending on market conditions. In Poland, biweekly or monthly tenders are conducted. In Romania, only targeted bilateral purchases are conducted with a view to alleviate the liquidity position of specific counterparts. In line with good practices (Adrian and others, forthcoming), the APPs were generally quantity based to influence interest rates rather than price based, which could effectively result in interest rate caps.

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[8]Article 21 of the Statutes of the European System of Central Bank prohibits direct lending to the government.

Figure 8. Central Bank Policy Interest Rates
(Percent)
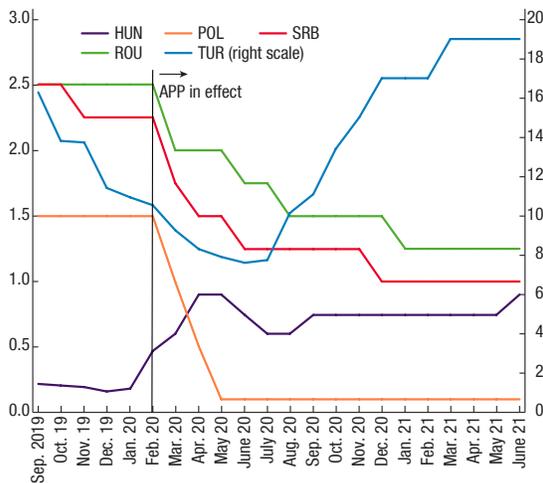
Sources: Haver Analytics; and national central banks.
Note: Short-term money market rate shown for Hungary through April 2020, after which one-week deposit facility rate is shown as the effective policy rate. Figure uses International Organization for Standardization (ISO) country codes. APP = asset purchase program.

Interaction of Asset Purchase Programs with Other Monetary Policy Tools

APPs have been implemented alongside conventional monetary easing, though the scope for conventional interest rate easing may not have been fully exhausted. In the aftermath of the GFC, several AE APPs (such as the Federal Reserve's Large-Scale Asset Purchase Program) aimed to further ease monetary conditions once conventional monetary tools had been largely exhausted (that is, with rates near the effective lower bound). In contrast, the implementation of APPs in EM Europe preceded the full use of conventional monetary policy space (Figure 8). In Hungary, monetary operations were revamped at the beginning of the pandemic to effectively increase the money market rates to support the currency, while initially maintaining the policy rate, which later was lowered. In Poland, the NBP reduced its policy rate to near zero, but only after initiating the APP. In Turkey, asset purchases were initially accompanied by policy rate reductions, but the policy rate increased later in 2020 in response to currency pressures and declining foreign exchange reserves. In June and July 2021, the Hungarian Central Bank increased its policy interest rate and began to phase out some of its crisis measures but continued its purchases of government securities and commercial bonds. Upon raising rates again in August 2021, the Hungarian Central Bank also announced that it would begin to gradually reduce its purchases of government bonds (see Box 1).

Collateralized lending arrangements have also been employed alongside APPs. In Poland, the NBP provided repo transactions to provide liquidity to banks and also introduced a discount credit facility to refinance bank loans extended to firms, though both facilities were used only sparingly. The Hungarian Central Bank has been active in expanding lending facilities, introducing a long-term collateralized lending facility with a maximum five-year maturity to support banks' liquidity management as well as broadening the scope of eligible collateral.

Asset purchases are not the only factor explaining the expansion of EM Europe central bank balance sheets. Earlier in the pandemic (end-June 2020),

the overall size of the balance sheet of the Croatian and Romanian central banks had stayed broadly stable, as domestic asset purchases were offset by the sale of foreign exchange reserves (Figure 9). By end-May 2021, these central banks' foreign exchange reserves had recovered, and asset purchases did coincide with overall balance sheet expansions.[9] In the case of Hungary, significant central bank collateralized lending to the banking sector was also a major factor in balance sheet expansion. From the beginning of the pandemic to end-May 2021, the expansion of MNB's balance sheet has also been

Figure 9. Change in Central Bank Assets
(Percent of 2020 GDP; change from end-February 2020 to end-June 2020/end-May 2021)
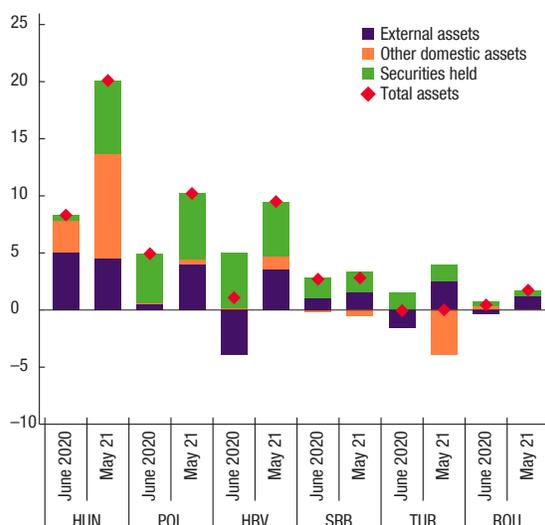
Sources: Haver Analytics; and national central banks.
Note: Figure uses International Organization for Standardization (ISO) country codes.

large (20 percent of GDP), at par with the expansion in the Federal Reserve and ECB (18 and 26 percent of GDP, respectively). Only about one-third of MNB's balance sheet expansion can be tied to securities purchases.

For the central banks in EM Europe, which do not issue reserve currencies, sterilization of APPs has been a prominent feature, ostensibly helping with anchoring inflation expectations. In contrast to QE by reserve currency issuing central banks, most of the APPs in EM Europe have been accompanied by some sterilization—through which the additional bank reserves resulting from purchases are drained through other operations. Sterilization has taken several forms. The purchase of new domestic assets (that is, bond purchases) was offset by the sale of foreign assets in Croatia, thus preventing the central bank's balance sheet from growing. Alternatively, some central banks issued their own securities (Poland; Figure 10) or used a deposit facility to drain bank reserves. In these cases, the central bank's balance sheet grows, but there is a substitution of liabilities to reduce bank reserves.[10] Sterilization is consistent with the narrow goals of the APPs, which are to alleviate mar-

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[9]The increase in foreign exchange reserves in some countries is not necessarily the result of foreign exchange purchases but could also be driven by currency depreciation (increasing the local currency value of reserves) and efforts to increase reserves such as through swap arrangements.

[10]The substitution of liabilities on the central bank's balance sheet does not reverse the increase in net domestic assets but does constitute sterilization by way of a reduction in bank reserves.

Figure 10. Poland: Central Bank Bills and Asset Purchases
(PLN billion; cumulative from March 15, 2020, to July 2, 2021)
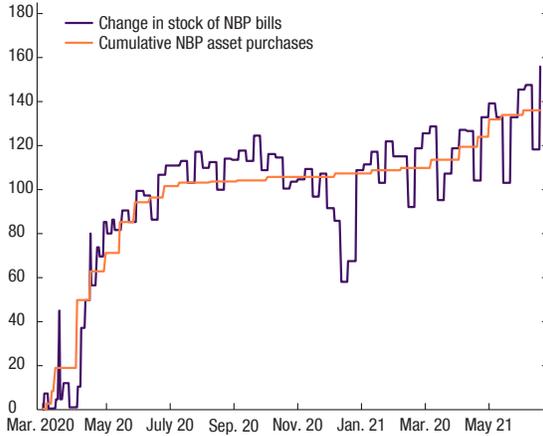
Sources: National Bank of Poland (NBP); and IMF staff calculations.

Figure 11. Central Bank Holdings of Local Treasury Securities
(Percent of Treasury securities outstanding)
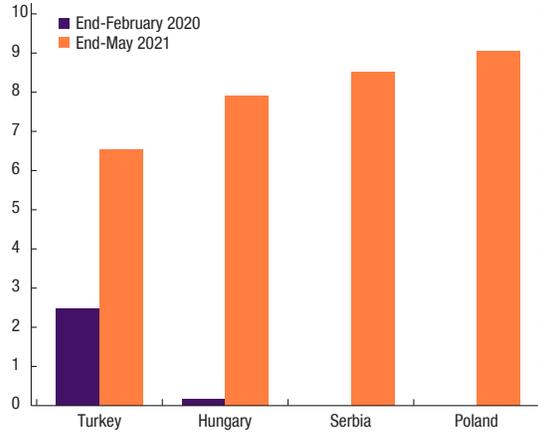
Sources: Central Bank of the Republic of Turkey; Haver Analytics; IMF, International Financial Statistics database; ministries of finance; and IMF staff calculations.

ket dysfunction but not to ease overall monetary conditions. Sterilization may also be intended to signal a continued commitment to primary monetary policy objectives, including medium-term price stability, which can be important for EM central banks employing new tools. This point underlines that the purpose of APPs is not always to increase the provision of overall liquidity, but rather to overcome segmentation in the money market or repair the impaired transmission mechanism.

Impact on Target Markets

APPs have greatly expanded central bank holdings in domestic government bond markets, cushioning outflows from investment funds in some cases. Prior to the pandemic, central banks in the region played a limited role in local Treasury markets. They generally held little or no Treasury securities on their balance sheets, except as collateral for underlying instruments for repos. By May 2021, however, their market share of outstanding local Treasury securities had increased to between 6 percent in Turkey and 9 percent in Poland (Figure 11). These purchases played an important role in stabilizing markets in the context of a large increase in new issuance during the pandemic. In Poland and Turkey, the scale of central bank purchases broadly offset outflows from foreign investors. Central bank purchases supplemented continued strong demand from domestic banks in Serbia and other domestic investors in Hungary (for example, special retail bonds for households; Figure 12).

Figure 12. Change in Domestic Treasury Bond Holdings
(Cumulative change; percent of 2020 GDP)

1. Poland: Change in Domestic Treasury Bonds Holdings
(Cumulative change; percent of 2020 GDP)

Legend: Central bank; Domestic banks; Other domestic; Foreign investors

2. Turkey: Change in Domestic Treasury Bonds Holdings
(Cumulative change; percent of 2020 GDP)

Legend: Central bank; Domestic banks; Other domestic; Foreign investors

3. Serbia: Change in Domestic Treasury Bonds Holdings
(Cumulative change; percent of 2020 GDP)

Legend: Central bank; Domestic banks; Other domestic; Foreign investors

4. Hungary: Change in Domestic Treasury Bonds Holdings
(Cumulative change; percent of 2020 GDP)

Legend: Central bank; Domestic banks; Other domestic; Foreign investors

Sources: Central Bank of the Republic of Turkey; Haver Analytics; IMF, International Financial Statistics database; Poland Ministry of Finance; Serbia Ministry of Finance; and IMF staff calculations.

APPs may affect the market liquidity of the targeted securities. The liquidity premium of a financial asset, like a bond, reflects how easily it can be traded without large price movements not merited by new information. The higher daily trading of a bond, the more liquid it typically is. If central banks purchase large amounts of a particular bond, they could potentially become less liquid and thus instead increase funding costs of the government. Both Croatia and, initially, Hungary stated that they would not buy more than a third of each bond series,[11] but Hungary later abandoned this limitation. On the other hand, the presence of a committed large buyer (like the central bank) improves "price discovery," which may be reflected in smaller bid-ask spreads.

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[11]This should be seen in context with the ECB decision to increase the share limit to 33 percent (Draghi 2015).

Box 1. The Evolution of the Asset Purchase Programs of Hungary

Hungary is particularly interesting because the central bank (Hungarian National Bank [MNB]) has continued to expand its APPs. Hungary is also unique in that it had employed asset purchase programs (APPs) prior to the pandemic, although not in government securities. The communication has evolved from a cautious beginning with a view to mainly mitigate market dysfunction and lower long-term interest rates,[1] to more focus on funding costs and refinancing risks of the government, as financial markets stabilized.

On April 7, 2020, the MNB announced that it would (1) introduce an APP for government securities, (2) reactivate its mortgage bond purchase program used in 2018, and (3) ease conditions of its prepandemic purchases of corporate bonds. The main objectives of the APPs were "to restore the stable liquidity position of the government securities market" (MNB 2020b) and "to strengthen monetary policy transmission" (MNB 2020d).

In August 2020, the MNB explicitly mentioned "the higher government financing needs" and that it would "continue to make purchases in the long segment to support an extension in the maturity structure of government debt" (MNB 2020c). The MNB has clearly communicated and done so-called technical reviews before the envelopes of the APPs were expanded. While the MNB launched its APPs of government securities later than peers, it has continued and intensified its purchases, while others have slowed them.

In January 2021, the MNB stated that it would gradually reduce its long-term collateralized lending facility and rely more on its APP in government securities—as its transmission appeared to be more effective—as well as to buy government securities with less than 10 years maturity (MNB 2021a). In April 2021, the MNB announced that it would include so-called green bonds issued by the government in its asset purchases. In June and July 2021, the Hungarian Central Bank increased its policy interest rate and began to phase out some of its crisis measures but continued its purchases of government securities, which is considered "crucial in its set of monetary instruments" (MNB 2021b). The next review of the APP of government securities will take place when the current envelope is close to HUF 3000 billion (about 5.7 percent of projected GDP), which is likely to happen in mid-August 2021. On August 24, 2021, the Monetary Council decided to "begin gradually withdrawing the government securities programme

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[1]The MNB tried to lower long-term yields in 2017–18. In 2018, it introduced *unconditional* interest swaps—by swapping long-term interest rate risk of banks with short-term interest rate risk. The announcement in the fall of 2017 had an immediate impact: long-term interest rates of Hungarian government bonds declined vis-à-vis peers. The impact gradually evaporated, as auction procedures were amended to restrict participation to Hungarian licensed banks. The program was stopped at end-2018.

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Box 1. The Evolution of the Asset Purchase Programs of Hungary *(continued)*

while considering aspects of maintaining market stability," noting that it would not set a limit applicable to the entire stock purchased but rather "set a target amount for weekly purchases" (MNB 2021c).

3 Effectiveness of Asset Purchase Programs

Did the APPs implemented by European EMs succeed, in line with their goals of alleviating financial market dysfunction and improving market liquidity and monetary policy transmission? This section studies effectiveness by assessing the impact of APPs on domestic financial markets in early 2020 by focusing on government bond yields, term spreads, and liquidity conditions. We also assess the extent of spillovers from these programs into other asset classes, including exchange rate, equity markets, and corporate credit default swaps. The empirical analysis uses event study and local projections analysis to assess the presence of systematic responses across the sample countries. The assessment is limited to quantifying overall impacts rather than identifying specific transmission channels that could explain the findings.

Related Literature

The emerging literature on APPs in EMs in response to the COVID-19 crisis finds that the programs had an immediate positive impact. Central banks' purchases of government bonds reduced long-term government bond yields immediately after APP announcements (see Table 1). Some of the papers find that APPs also reduced term spreads. Regarding spillovers to other asset prices, some papers find that APPs did not induce exchange rate depreciations, and one paper finds that equity markets in EMs improved a few days after the announcements. These recent studies build on a large body of literature that has analyzed the effectiveness of unconventional monetary policies (UMP) mainly focusing on the experience of AEs (Bhattarai and Neely 2016, forthcoming) over the last decade.

Table 1. Summary of Recent Studies of Asset Purchase Programs' Impact in Emerging Markets

Author(s)	Sample	Impact on 10-year Government Yields	Window of Time	Other Asset Prices		Controlling for Other Variables	
Hartley and Rebucci (2020)	13 EMs	$[-0.28, -0.43]$ bps	1–3 days	No		No	
Arslan, Drehmann, and Hofmann (2020)	9 EMs	$[-10, -50]$ bps	1–5 days	Yes	The announcements appear to have shored up the exchange rate.	Yes	Estimated immediate announcement effect on yields is very similar while the estimated negative effect after five days is somewhat smaller, at 25 basis points. Exchange rate results also hold in a panel regression setup.
Sever and others (2020)	11 EMs	-35 bps	Next few days after the announcement	Yes	Median-term premiums reduced by almost 20 bps in a week after the announcement. The impact on currencies was relatively limited. EM equity markets also improved a few days post the announcements.	Yes	Yield was 35 bps lower than the preannouncement level, even on the sixth day after the announcement. APP announcements were not followed by significant depreciations in local currencies. Domestic APP announcements did not have much impact in the very short term but started to have somewhat a statistically significant positive effect in later days.
Fratto and others (2020)	15 EMs	On average, the estimated effect is statistically significant and broadly consistent with that found in the papers listed previously. Results continue to hold when the authors exclude from the sample the announcements that coincide with a policy rate cut.		Yes	Impact on the exchange rate depends on whether the APP announcement was made within a few days of a policy rate cut. APP announcements have predominantly a positive and statistically significant effect on the EMBI, although with a significant heterogeneity across the sample.	Yes	The event study with control variables as well as the panel regression, presented in Annex 4, broadly confirm the previous findings.

Source: Authors.
Note: APP = asset purchase program; bps = basis points; EM = emerging market; EMBI = Emerging Market Bond Index.

Findings of Event Study Analysis

Our event study analysis documents the high-frequency evolution of the variables of interest around the APP announcement dates in European EM countries. Event study methodology has been commonly used to study the impact of UMP in AEs and EMs alike. We examine all publicly available APP

Table 2. Initial Announcement Dates for Sample Emerging European Countries

	Initial APP announcement date	Policy rate cut	Expanded liquidity facilities	Reduction in bank reserves	Macropru loosening	FXI
HRV	13-Mar	no	yes	yes	no	yes
POL	16-Mar	yes	yes	yes	yes	no
ROM	20-Mar	yes	yes	no	no	yes
HUN	7-Apr	no[1]	yes	no	no	no data
TUR	31-Mar	no	yes	yes	no	no data

Sources: Croatian National Bank; National Bank of Poland; National Bank of Romania; Hungarian National Bank; and Central Bank of the Republic of Turkey.

Note: For Hungary, 3M money market rate used to assess policy rate. For Serbia, no data on announcement or implementation dates were available. The table uses International Organization for Standardization (ISO) country codes.

[1]The base rate was later reduced in two steps (June 24, 2020, and July 22, 2020) from 0.90 to 0.60 percent.

announcements in European EM economies from March 2020 onwards (see Annex 3 for details). The content of announcements differed across countries and over time (see Table 2). Initial APP announcements were commonly a part of a broader policy package with policy rate cuts, new and/or expanded liquidity facilities, and foreign exchange interventions as accompanying measures.[1] There were also differences in the scope of the announced APPs (see Chapter 2). The event window is defined as three days around the announcement date. Impact on the government bond market is assessed by studying bond yields with maturities of 1, 3, 5, and 10 years. For spillovers into other asset prices, we focus on exchange rate and equity price channels. Findings are reported in terms of the median response and corresponding interquartile range for the 11 announcement events. In addition, the median response based on the initial announcement event in each country is highlighted separately to assess the difference between initial versus all announcements.[2]

We find that APP announcements significantly improved conditions in the government bond markets. The period leading up to initial announcements saw a systematic increase in long-term bond yields.[3] Liquidity conditions in the bond market, as proxied by bid-ask spreads on government bonds, also tightened prior to initial announcements (Figure 13, panel 4). Following the announcements, long term yields fell for the median response by 0.3 ppts by t=1 and remained below the t=0 levels in subsequent days (Figure 13, panel 1). Given that APPs tended to target bonds with longer maturities, term spreads and changes in the slope of the yield curve can be more directly linked to the impact of APP purchases. Consistently, the yield

[1]Assessing the foreign exchange interventions is complicated by lack of official (high-frequency) foreign exchange intervention data.

[2]Turkey is excluded from the limited initial announcement sample, as its yields and term spreads—the key variables of interest—behaved very differently from the other countries in the sample (see Annex 3 for details on responses to individual announcement events). Both variables were increasing throughout the announcement event window, with the increase accelerating after the APP announcement.

[3]Specifically, in the three days preceding the APP announcements 10-year bond yields increased by 0.20 percentage points with a comparable increase in term spreads between 10-year and 1-year bond yields (Figure 13, panels 1 and 3).

Figure 13. Government Bond Market Response to the Asset Purchase Program Announcements

Following APP announcements, long-term bond yields declined, more so for initial announcements, ...

1. Median Response of 10-year Bond Yields
(Percentage point change)

... and the yield curve flattened.
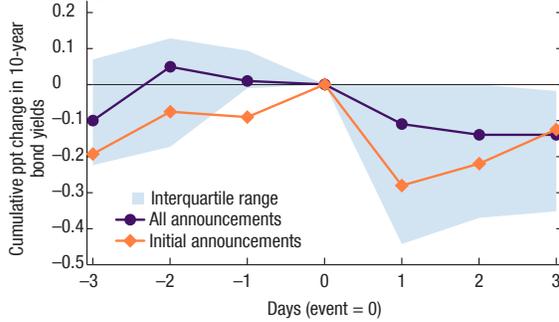
2. Median Change in Yield Curve at *t* = 1
(Percentage point change)
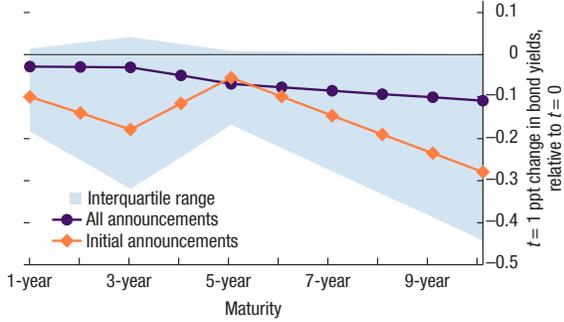
Term spreads declined following the initial announcements, but the decline was short-lived and did not extend to subsequent announcements.

3. Median Response of Term Spread
(Percentage point change)

Liquidity conditions in the bond market, as captured by bid-ask spreads, temporarily improved.
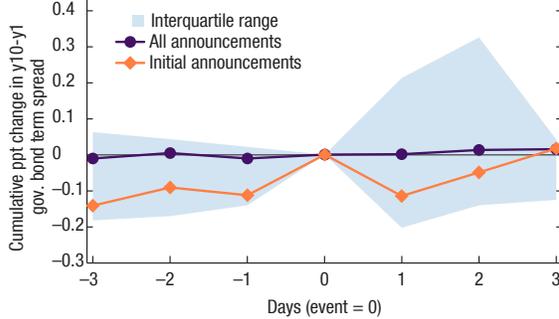
4. Median Response of Government Bond Bid-Ask Spreads
(Percentage point change)
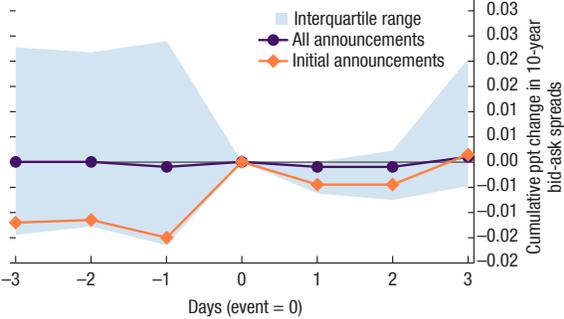
Sources: Bloomberg, L.P.; and IMF staff calculations.
Note: APP = asset purchase program; ppt = percentage point.

curve flattened following the initial APP announcements (Figure 13, panel 2), while bond yields declined across the yield curve—the median decline in yields for the 1-year maturity was 0.1 ppts, compared to the 0.3 ppts decline for the 10-year bond. Term spreads and bid-ask spreads also declined (Figure 13, panels 3 and 4), although the gains in this regard were smaller in magnitude and less persistent. Broadening the analysis to all announcements confirms the decline in yields, the flattening of the yield curve and a temporary improvement in liquidity conditions. However, the size of the median response shrinks and the impact on term spreads disappears, consistent with the heightened role played by the initial announcement in each country. Additional results from the impact of APPs on government bond markets are provided in Annex 3.

Figure 14. Spillovers from Asset Purchase Program Announcements into the Broader Macroeconomy[1]

APP announcements did not weaken the exchange rate ...

1. Median Response of EUR Exchange Rate
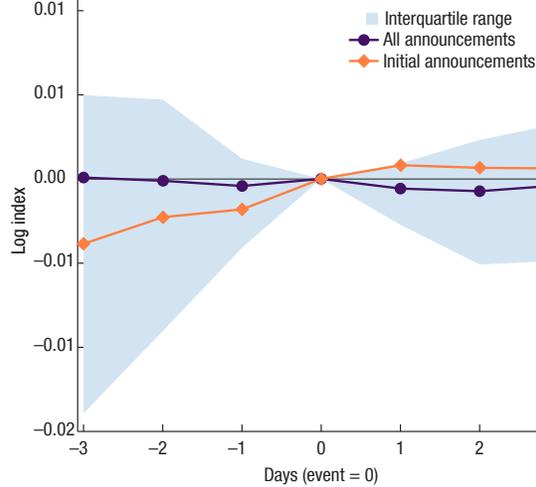
... and appear to have boosted to domestic equity prices.

2. Median Response of Equity Prices
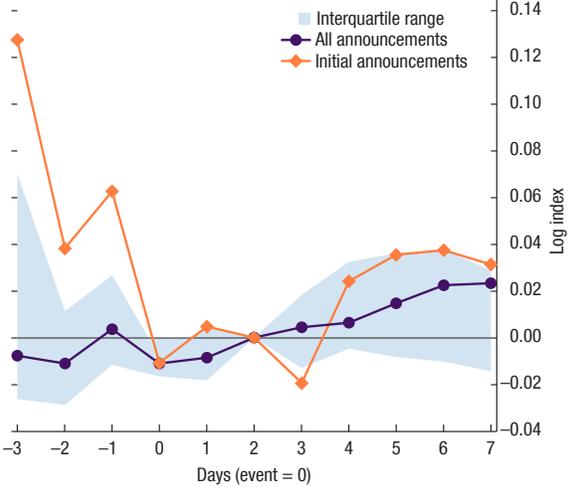
Sources: Bloomberg, L.P.; and IMF staff calculations.
Note: APP = asset purchase program.
[1]Increase in the exchange rate index represents a depreciation.

APPs did not induce a significant exchange rate response. Following the announcements, the median exchange rate response, including for initial announcements, stayed broadly stable (Figure 14).[4] This finding could partly reflect the foreign exchange interventions and other forms of monetary policy sterilization that mitigated depreciation pressures around the APP announcement dates.[5] Lack of exchange rate depreciation is more notable, given the accompanying reductions in policy rates in the case of Poland and Romania (see Table 2).

Stock markets responded positively to APP announcements. The response of equity prices to the announcement events is gauged by examining the dynamics of main stock market index in each country. Results reveal a gradual increase in equity price indexes, reaching 2 percent by the fourth day following the announcement. For the initial APP announcements, the median response was more pronounced at 4 percent. Analysis of corporate credit default swaps (not reported) did not reveal any systematic impact from APP announcements, which could be due to the novelty of APPs in EMs and the uncertainty about the transmission mechanism of APPs. Annex 3 reports

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[4]Sever and others (2020) also find no systematic effect of APP announcements on exchange rates for a sample of 18 EMs. Arslan, Drehmann, and Hofmann (2020) find that APP announcements interrupted depreciation trends.

[5]Unfortunately, lack of high-frequency foreign exchange intervention data does not allow us to investigate these relationships in further detail.

Figure 15. Impact of Asset Purchase Programs Announcements on Domestic Government Bond Yields
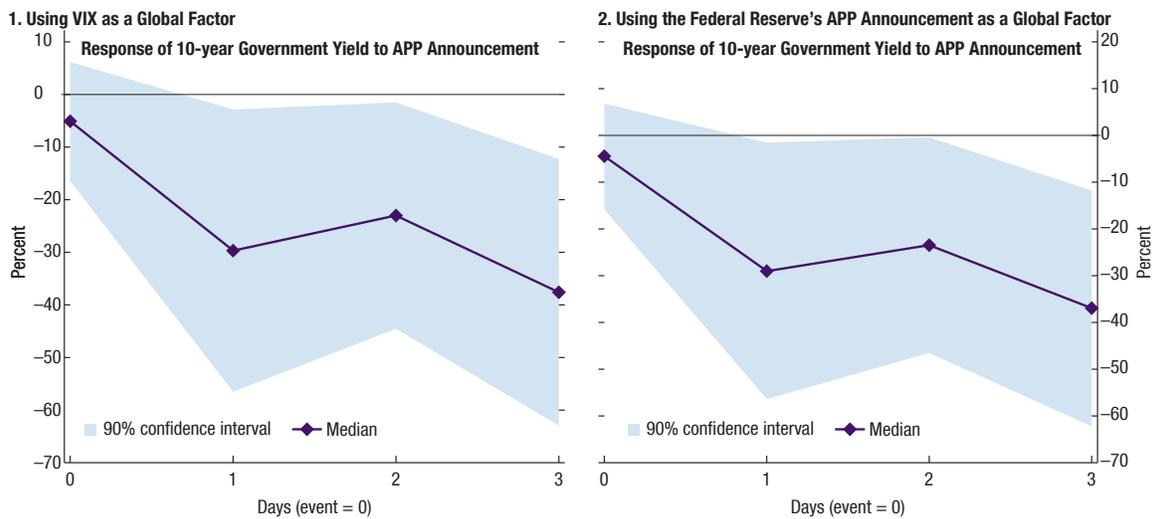
1. Using VIX as a Global Factor

Response of 10-year Government Yield to APP Announcement

2. Using the Federal Reserve's APP Announcement as a Global Factor

Response of 10-year Government Yield to APP Announcement

90% confidence interval   Median

Days (event = 0)

Percent

Source: Bloomberg; and IMF staff calculations.
Note: APP = asset purchase program; VIX = Chicago Board Options Exchange Volatility Index.

sectoral results for the stock market response to the crisis, zooming in on the financial sector and small-cap companies.

Local Projections Analysis

Local projection analysis allows us to assess if the findings of the event study are robust to potential influences from other domestic or external factors. A key shortcoming of the event study analysis is its lack of control for factors other than the APP announcements in explaining the APP impact. In this section, we control for an additional domestic variable—domestic policy rate cuts—and global factors—namely, the Chicago Board Options Exchange Volatility Index (VIX) or the APP announcement by the Federal Reserve (see Arslan, Drehmann, and Hofmann 2020; Sever and others 2020). Details of the econometric specification are provided in Annex 3.

The results suggest that after controlling for other factors, APP announcements in European EM countries were associated with drops in bond yields, though we did not find systematic impact on term spreads. There was a statistically significant impact on the 10-year government bond yield one to three days after the announcement of around –35 basis points (Figure 15). The results are similar when using the Federal Reserve APP announcement. We also used the model to assess the effect of domestic APP announcements on term spreads, used as a proxy for term premiums—the dependent variable in this case is the cumulative change in the difference between the 10-year

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Figure 16. Impact of Asset Purchase Programs Announcements on Domestic Term Spread

1. Using VIX as a Global Factor

Response of Term Spread to APP Announcement

2. Using the Federal Reserve's APP Announcement as a Global Factor

Response of Term Spread to APP Announcement

Source: Bloomberg; and IMF staff calculations.
Note: APP = asset purchase program; VIX = Chicago Board Options Exchange Volatility Index.

government yield and the 1-year government yield.[6] This finding for the sample of 11 announcement events is consistent with the event study results, which revealed no systematic deviations in the term spread following the announcements (Figure 16; see Figure 13, panel 3).

The estimated impact of APP announcements on equity prices is consistent with the event study results, but its statistical significance varies with the control used (Figure 17). Our local projection analysis uses cumulative change in the country's equity price index as the dependent variable. The magnitude of the estimated response—at 1–3 percentage points over the three-day horizon—and its lagged nature—with the impact increasing in days two and three—are consistent the results from the event study. However, the response is not statistically significant when we employ VIX as the control for global factors.

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[6]For Croatia, we use the difference between the 10-year government yield and the 2-year government yield.

Figure 17. Impact of Asset Purchase Programs Announcements on Equity Prices
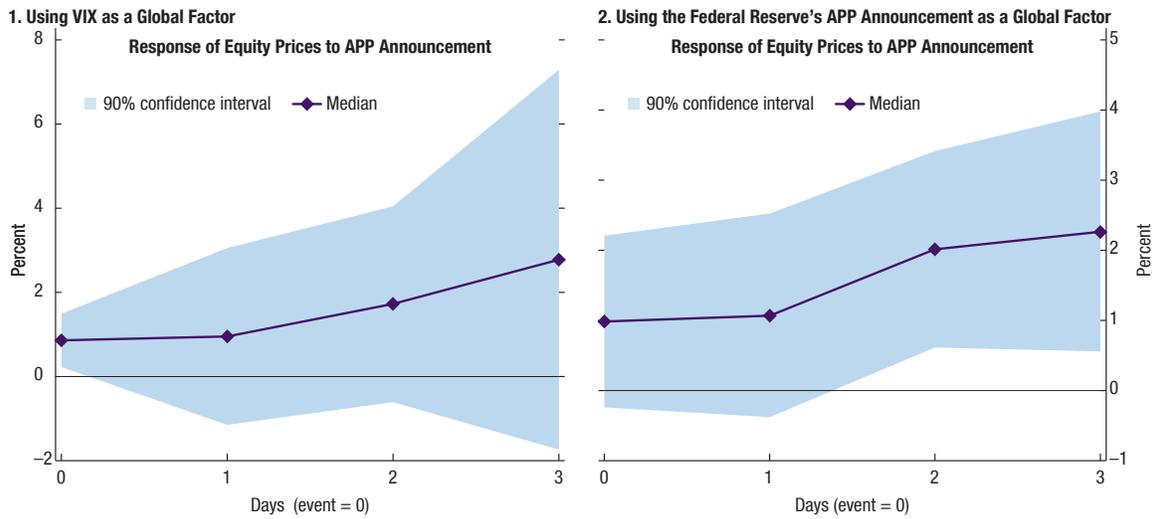
1. Using VIX as a Global Factor

Response of Equity Prices to APP Announcement

2. Using the Federal Reserve's APP Announcement as a Global Factor

Response of Equity Prices to APP Announcement

Source: Bloomberg; and IMF staff calculations.
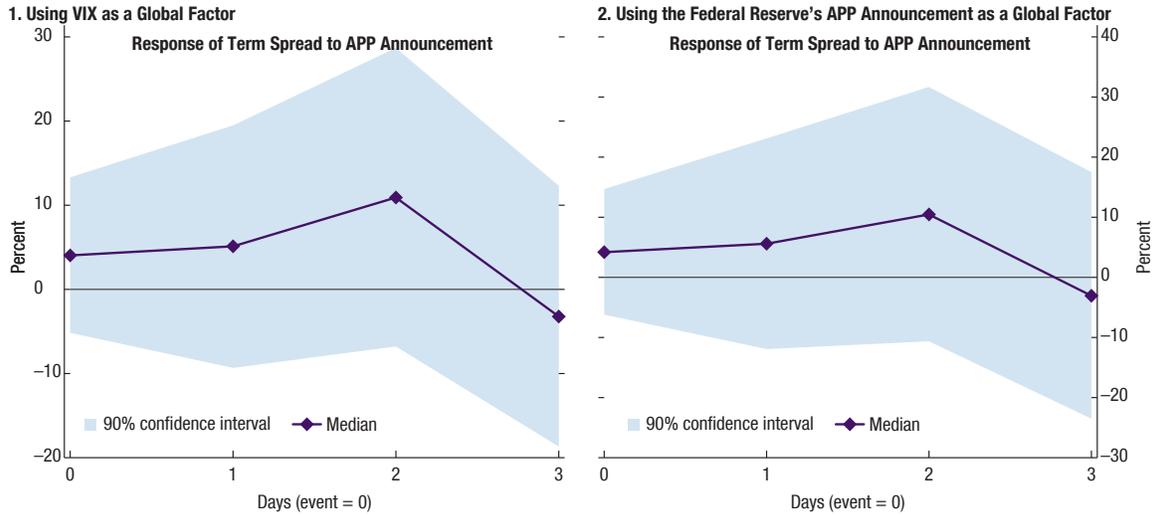Note: APP = asset purchase program; VIX = Chicago Board Options Exchange Volatility Index.

4 Limits to Emerging Market Asset Purchase Programs

As EMs have employed APPs since the outbreak of the pandemic, a natural question arises regarding the limits of APPs in EMs. In the aftermath of the GFC, similar questions were frequently raised in AEs, including the extent to which central banks could expand balance sheets without risking a large future increase in inflation. Such fears have not materialized. Unlike AEs, EMs do not issue reserve currencies or benefit from global demand for reserve assets, and they do face the risk of currency substitution. Given the mixed past experiences of some EMs with monetary financing—for example, the instability associated with prices, exchange rate, and economic stability— the risks and limits of APPs in EMs are worth exploring.

Rather than attempting to quantify specific limits to APPs in EMs, this chapter analyzes the factors that may act as constraints on individual central banks' ability to employ this tool. The constraints on the utility of APPs as a monetary policy tool are likely to vary over time and across countries. The nearly universal easing of monetary policies during the deep, synchronized global recession resulting from the pandemic created more conducive market conditions for EMEs to employ such tools than during normal times. For example, asset purchases that reinforce a synchronized push to lower global bond yields are not likely to elicit negative market reactions such as currency depreciation. Similarly, individual country circumstances are likely to affect market perceptions of APPs, making them a more feasible tool for some countries than others. The apparent effectiveness of APPs in EMs during the pandemic—a relatively short period with somewhat exceptional circumstances—does not guarantee a similar experience on an open-ended basis or under different conditions.

Fiscal Dominance as a Constraint on Asset Purchase Programs

The risk of fiscal dominance acts as a general constraint on APPs in EMs. Broadly defined, fiscal dominance refers to pressure on the central bank to subordinate its objectives to those of the government (Adrian and others, forthcoming). In the extreme, fiscal dominance can take the form of a central bank financing the government directly over an extended period, but it can also refer to explicit or implicit limitations on a central bank's ability to adjust monetary policy to meet its objectives. APPs could facilitate fiscal dominance if they help support fiscal deficits that cannot be met by conventional means, including borrowing at market rates, growth in economic activity, and/or future fiscal reforms.

The past experiences of macroeconomic instability in some EMs during episodes of monetary financing of governments serve as a reminder of how APPs can run astray. Large fiscal deficits in several large EMs in the 1980s were financed in part by their central banks and eventually led to high inflation, contributing to a prolonged period of macroeconomic instability and depressed growth (Ha and Kindberg-Hanlon 2021).

The Importance of Macroeconomic Fundamentals

The significant improvement in macroeconomic fundamentals in EMs over the past couple of decades has helped lower the risk of APPs supporting fiscal dominance. The instability of the 1980s and 1990s, including high levels of inflation, had largely been surpassed by the early 2000s, partly because of improved macroeconomic policies and institutions (IMF 2001). The enhanced track record of macroeconomic stability and strengthened economic institutions have bolstered the scope for APPs in many EMs. Specific factors include the following:

- *Fiscal sustainability:* Fiscal sustainability is key to achieving and maintaining macroeconomic stability. Large and persistent fiscal deficits in combination with high levels of public debt have often preceded debt monetization.

- *Domestic financial market development:* EMs with deep, broad, and well-functioning domestic bond markets provide central banks with a larger pool of securities to purchase, potentially expanding the scope for secondary market APPs. On the other hand, a sizable presence of state-owned banks may undermine the scope for market-based APPs, raising concerns about coordination between the finance ministry, state banks, and the central bank to bypass market-based placement of debt in the primary market and subsequent secondary market asset purchases.

Figure 18. Indicators of Fiscal Sustainability

1. General Government Fiscal Deficit, 2019
(Percent of GDP)

2. General Government Debt, 2020 and 2026
(Percent of GDP)
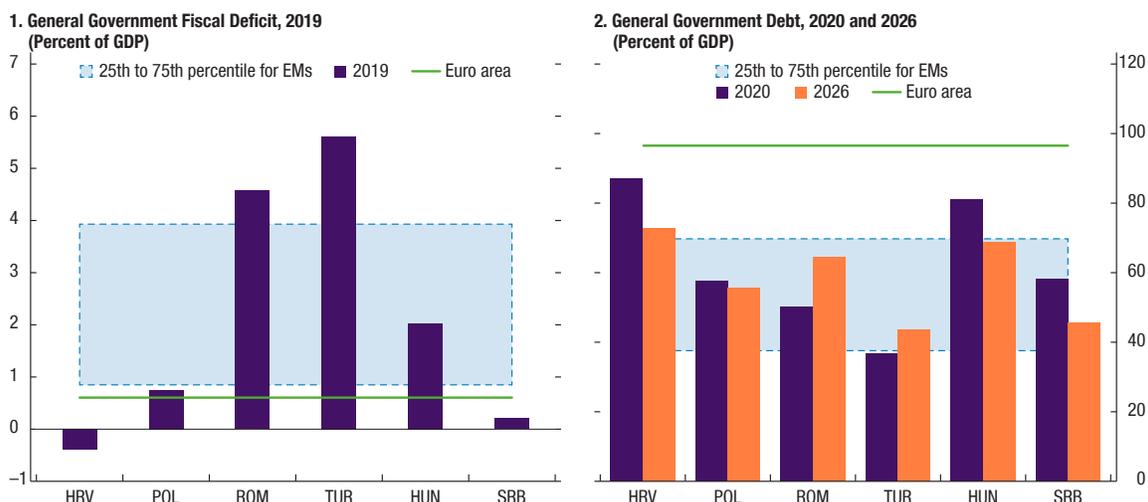
Sources: IMF, World Economic Outlook database; and IMF staff calculations and projections.
Note: Figure uses International Organization for Standardization (ISO) country codes. EMs = emerging markets.

- *Monetary policy frameworks and credibility:* Well-anchored inflation expectations, underpinned by a credible monetary policy regime, expand the room for central banks to engage in APPs without de-anchoring inflation expectations or triggering capital outflows/currency depreciation. Specific legal provisions in the central bank mandate, such as prohibitions on direct financing of governments, can further bolster credibility. At the same time, painstakingly established credibility can be lost, if APPs are perceived as conflicting with well-established monetary policy objectives.

- *Growth prospects and external balance:* Strong economic growth prospects facilitate the stabilization or reduction of government debt without the need for leaning on the central bank for support. The absence of large current account deficits and strong foreign exchange reserve coverage also reduce vulnerability to capital flow volatility. Such strong macroeconomic fundamentals may increase market participants' confidence that APPs will not be associated with excessive pressures on the exchange rate, thus increasing the scope for APPs.

Macroeconomic Fundamentals in European Emerging Markets with Asset Purchase Programs

Underlying fiscal strength varies among the European EMs that have implemented APPs during the pandemic. European EMs are benchmarked against a sample of 22 EMs worldwide and the euro area average, where applicable (Figure 18). Prior to the crisis, Romania and Turkey stood out with relatively

Figure 19. Indicators of Domestic Financial Market Development

1. Local Currency Government Debt, 2019
   (Percent of GDP)

2. State Ownership of Banking Sector, 2016[1]
   (Percent)

Sources: IMF, World Economic Outlook database; World Bank; and IMF staff calculations.
Note: Figure uses International Organization for Standardization (ISO) country codes. APP = asset purchase program; EMs = emerging markets.
[1]State ownership defined as government owning more than 50 percent of equity in a bank. In Hungary, Poland, and Romania, the state's share of subscribed banking sector capital has increased since 2016.

large fiscal deficits in 2019. On the other hand, the relatively low level of general government debt in Turkey and Romania, compared to peers, partly attenuates concerns about fiscal sustainability. While general government debt is relatively high in Croatia and Hungary, it is projected to decline over the medium term. EU membership, with its fiscal rules and institutions, as well as the availability of additional fiscal resources to members, is an additional factor that bolsters fiscal sustainability.

The level of domestic financial market development may also affect the scope for APPs. Domestic government securities markets are sizable in Croatia, Hungary, and Poland relative to EM peers, whereas they are relatively thin in Romania, Serbia, and Turkey (Figure 19), suggesting a limited scope for APP expansion in the latter set of countries. However, with the implemented size of APPs reaching only a fraction of outstanding domestic government securities, none of these countries currently faces a binding constraint from the supply of domestic securities available to purchase.[1] On average, the degree of state ownership of the banking sector in the sample of EM European countries is limited and compares favorably with the EM benchmark. Nevertheless, the relatively heavy state ownership of the banking sector in Poland and Turkey could trigger unease among market participants should APPs expand

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[1]This metric provides an alternative measure of the APP size, confirming significant heterogeneity ranging from 2.7 percent in Romania to 14.3 percent in Poland.

Figure 20. Inflation and Expectations

1. Consumer Price Inflation, December 2020
(Year-over-year percent change)

2. Ten-Year Inflation Expectations
(Year-over-year percent change)

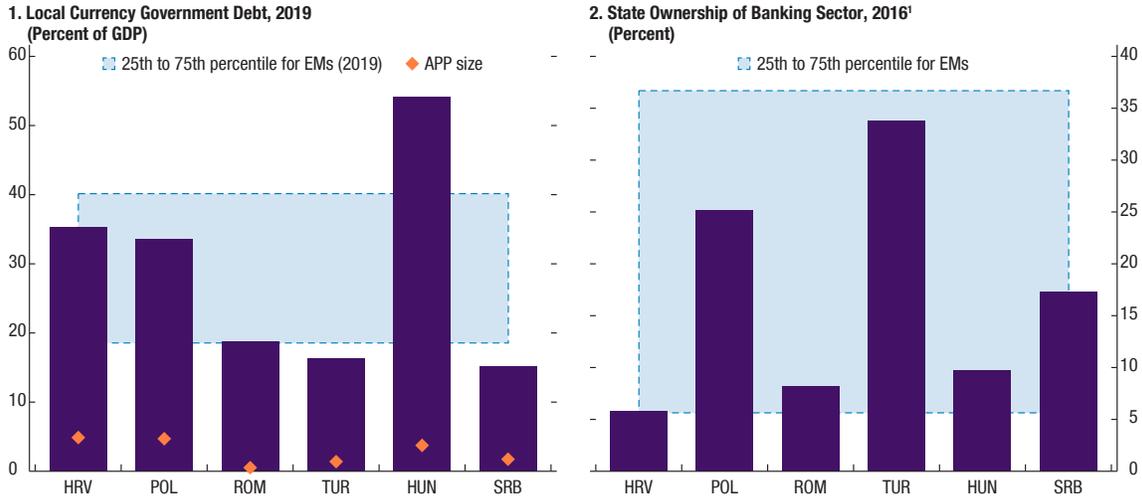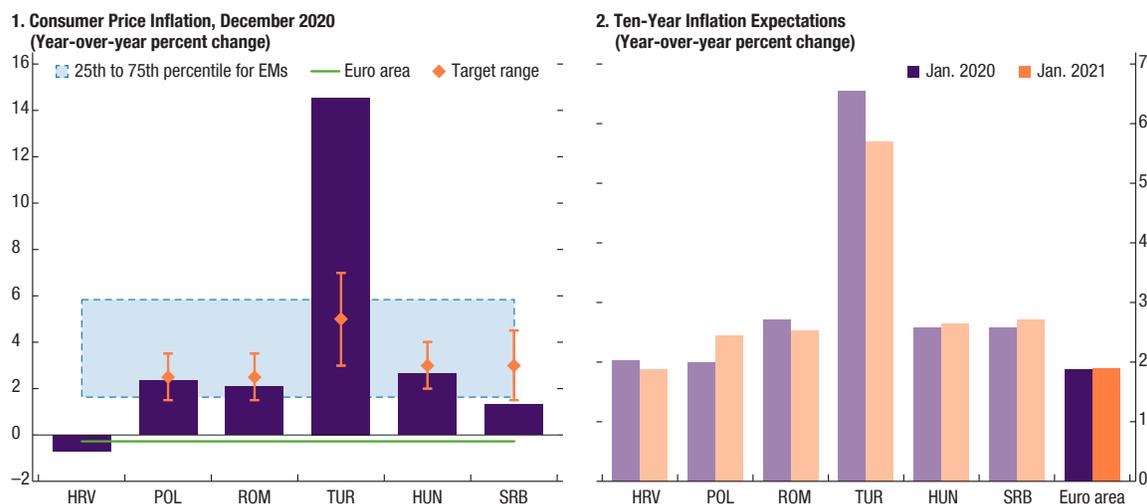Sources: Consensus Forecasts; Haver Analytics; IMF, World Economic Outlook database; and IMF staff calculations.
Note: Figure uses International Organization for Standardization (ISO) country codes.

significantly, if the involvement of state banks in the APPs was perceived as less than transparent.

Inflation expectations remain well anchored in the region. End-of-period inflation in 2020 fell within target ranges and was below the EM average, except for Turkey, where inflation significantly exceeded the target range at 14.6 percent (Figure 20). As of end-2020, there is no systematic evidence that long-term inflation expectations have increased in the wake of APPs, relative to prepandemic levels. European EM central banks' decisions to sterilize APPs may have helped maintain the credibility of monetary policy frameworks. The central banks of EU members in the sample, along with Serbia, may have also benefited from implementing institutional safeguards, such as de jure central bank independence and prohibitions on direct financing of government entities.[2]

For most of the European EMs that have undertaken APPs, good medium-term growth prospects and strong external positions point to low precrisis vulnerabilities. Economic growth prospects over the medium term

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[2]Article 21 of the Statutes of the European System of Central Banks and the ECB prohibits direct central bank lending to the government. The EU framework also ensures that EU central banks are autonomous, have adequate authority, and are accountable for transparently achieving their mandated objectives, tasks, and functions. These standards support good practices for APPs, which include (1) purchases being done at the initiative of the central bank in order to achieve its mandate(s), (2) central bank responsibility for rate setting, (3) central bank control of its balance sheet, and (4) purchases done in the secondary market to reflect market prices (Adrian and others, forthcoming).

Figure 21. Indicators of Medium-Term Growth and Macroeconomic Stability

1. Medium-term Growth Prospects
(Percent)

2. Current Account Balance, Average 2017–19
(Percent of GDP)

3. Net Portfolio Investment Capital Inflows, 2017–19
(Percent of GDP)

4. Net Other Investment Capital Inflows, 2017–19
(Percent of GDP)

5. Foreign Reserve Coverage to IMF ARA Metric, 2020
(Percent of IMF ARA Metric)

6. Nominal Effective Exchange Rate
(December 2019 = 100)
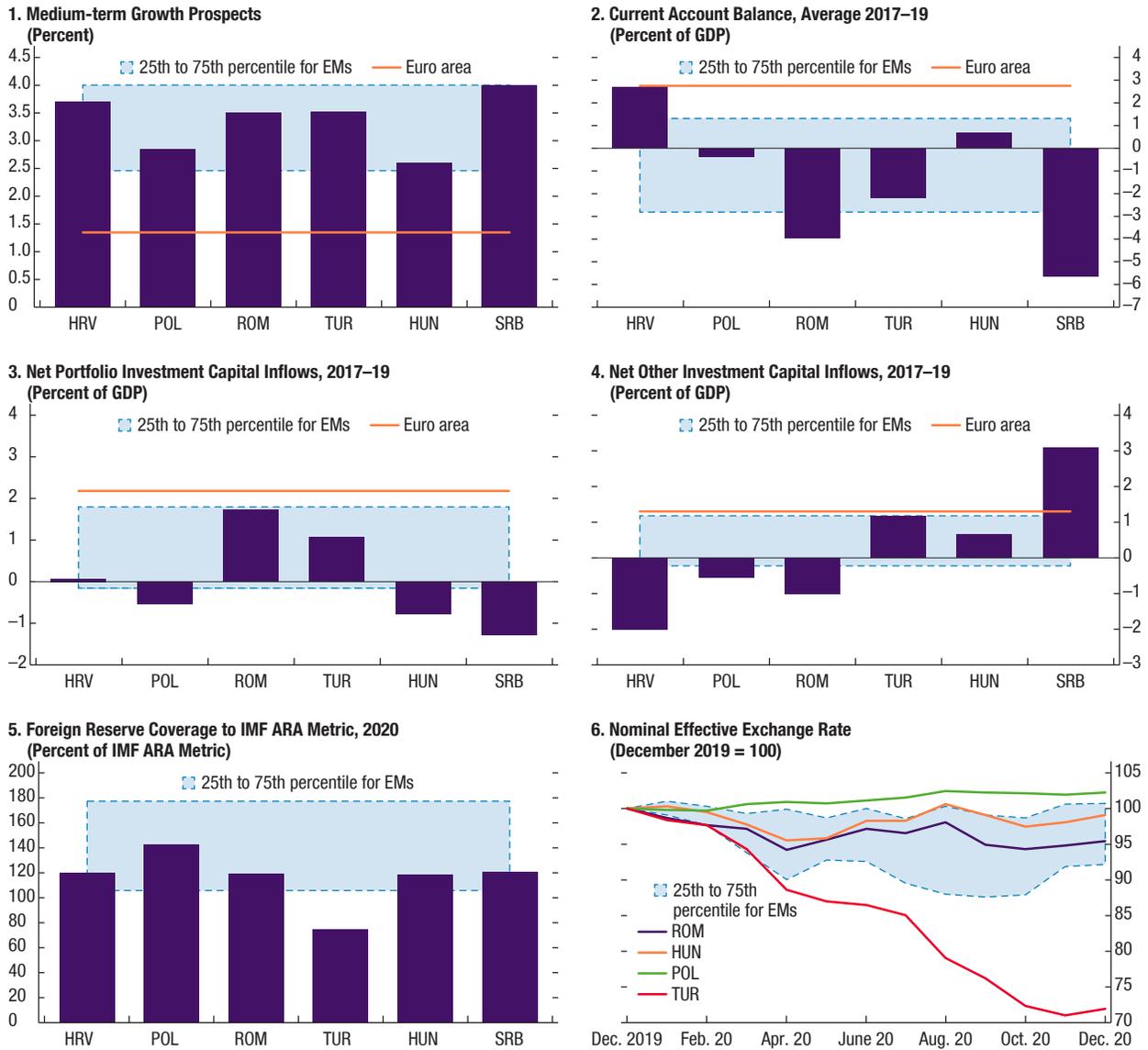
Sources: IMF, Balance of Payments database; IMF, International Financial Statistics database; IMF, World Economic Outlook database; and IMF staff calculations.
Note: Figure uses International Organization for Standardization (ISO) country codes. ARA = assessing reserve adequacy; EMs = emerging markets.

for these countries are sound, with lower projected growth in Hungary and Poland correlated with their higher income levels (Figure 21). External imbalances and associated vulnerabilities vary. While Romania and Serbia (and Turkey prior to 2019) exhibited relatively large prepandemic current account deficits, financing sources differed. Romania and Turkey depended more on portfolio inflows, whereas Serbia received large other investment

Figure 22. Indicators of Scope for Asset Purchase Programs[1]

Multiple factors affect the feasible scope, with substantial variation among countries.

		Poland	Croatia	Hungary	Romania	Serbia	Turkey
Fiscal	Precrisis fiscal balance (2019) versus EM average	green	green	orange	red	green	red
	General government debt (2020) versus EM average	light orange	red	red	light orange	orange	green
Local Market Development	Local market government debt (2019) versus EM average	light orange	light orange	green	orange	red	red
Central Bank Credibility	Central bank institutional safeguards[2]	green	green	green	green	green	red
	Inflation deviation from target (2017–20 average)[3]	green	(omitted)	green	light orange	light orange	red
Macroeconomic Stability	CA balance (2017–19 average versus EM average)	light orange	green	light orange	red	red	orange
	FX reserve coverage as percent of ARA metric	green	green	light orange	green	green	red

Source: IMF staff calculations.
Note: ARA = assessing reserve adequacy; CA = current account; EM = emerging market; FX = foreign exchange.
[1]Heatmap is defined such that colors indicate the relative scope for APPs, going from green (countries in the top quartile of the EM sample) to light orange (second quartile) to orange (third quartile) to red (bottom quartile), unless noted otherwise.
[2]Refers to de jure central bank independence and prohibition of direct financing to government entities, with green indicating presence of both factors and red indicating neither factor.
[3]Calibrated as the absolute value of the deviation of average inflation over 2017–20 from the target. Croatia is omitted as the central bank does not have an inflation target.
[4]FX reserves (FXR) as a percentages of the IMF's ARA metric (denoted by foreign exchange rate) as defined in IMF (2015), where green corresponds to FXR >120; light orange: 100 < FXR < 120; orange: 80 < FXR < 100; and red: FXR < 80.

inflows. Both sources can be volatile and subject to reversal during crises. Foreign reserve coverage is robust, though foreign reserves in Turkey fall short of the IMF's reserve adequacy metric. EU member states may also benefit from potential access to swap or repo lines with the ECB. Turkey's vulnerabilities have been apparent through the depreciation of its currency during the pandemic, in contrast to other EMs in the region.

In summary, the degree to which macroeconomic fundamentals likely constrain the scope for APPs varies within the region (Figure 22). Based on a combination of external vulnerabilities, precrisis fiscal weakness, and relatively high inflation, Turkey is likely to find its use of APPs as an ongoing policy tool more constrained than others in the region. In comparison to most other EMs, several European EMs have more developed policy frameworks and institutions, bolstered by EU members. Inflation-targeting frameworks also have a strong track record. Nevertheless, the risk of fiscal dominance is not completely eliminated and should be monitored.

5 Complementary Policies and Communication

Additional Unconventional Monetary Tools

Adjusted Lending Operations

Beyond APPs, liquidity constraints can also be effectively mitigated through lower reserve requirements, broadened eligible collateral, and adjusted lending operations. European EMs that implemented APPs also took other complementary measures to overcome liquidity stress. Some lowered the reserve requirement ratio (Croatia from 12 to 9 percent and Poland from 3.5 to 0.5 percent), or temporarily waived sanctions for noncompliance with reserve requirements (Hungary from March to September 2020). The MNB also promptly broadened eligible collateral (by almost 5.5 percent of GDP) to include performing corporate bank loans with a standard haircut of 30 percent, irrespective of maturity and currency. To the extent the concern was lack of adequate long-term liquidity, Croatia conducted a five-year structural repo transaction, Poland introduced a credit rediscount facility, and Hungary began to conduct regular tenders of collateralized long-term loans with maturities of 3, 6, and 12 months, and three and five years at the policy rate. However, APPs differ from most other liquidity providing tools by the central bank becoming more prone to maturity and interest rate risk due to the longer maturities of the purchased assets, and even credit risk for mortgage bonds but particularly for corporate bonds.

Negative Policy Rates

Negative interest rate policies (NIRPs) aim to lower the level of the yield curve but may have limited use in European EMs. The first AEs to introduce NIRPs did so to mitigate appreciation pressures (Brandão-Marques and others 2021). Hungary has long maintained a negative overnight deposit rate

Figure 23. Real Interest Rates, 2015–21
(Percent, three-month moving average: one-year government bond yield deflated by CPI[1])
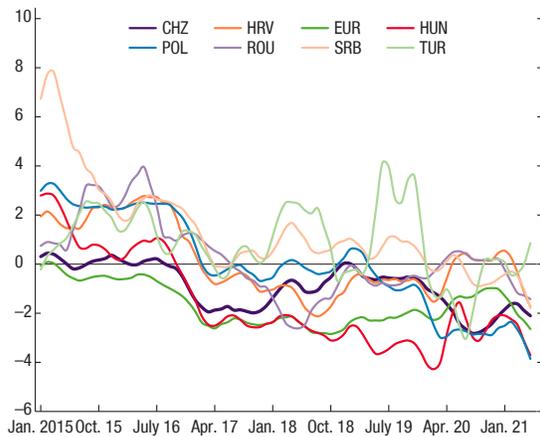
Sources: Haver Analytics; and IMF staff calculations.
Note: Figure uses International Organization for Standardization (ISO) country codes. CPI = consumer price index.
[1]Due to data availability, the one-year offer money market rate was used in the Czech Republic and the three-month money market rate was used in Poland and Serbia.

(–5 basis points), Croatia at zero, whereas Poland lowered the deposit rate to 0.1 percent in late May 2020. Interestingly, most of our sample countries have had rather low or even negative *real* interest rates (Figure 23). A host of factors argue for there being a higher risk premium in EMs than in reserve currency issuing AEs and thus a more limited role for NIRPs without adversely affecting the exchange rate. EMs are typically reliant on foreign funding and their households and even firms tend to have a stronger preference for currency in circulation compared to bank deposits. Many EMs typically have a relatively shorter track record of good macroeconomic policy implementation compared to AEs.

Forward Guidance

Forward guidance is now an intrinsic part of monetary policy, but there are limits. Forward guidance firms up expectations by reducing the noise about both the future discount factor as well as expected future cash flow. This is particularly relevant at low interest rates where there is little scope for conventional tools. However, EM reliance on volatile capital flows and the attendant exchange market pressures tend to limit the effectiveness of forward guidance as a commitment device, mainly because the central bank may need to break "its promise" (the "time-inconsistency" challenge) on adjusting the interest rate.

APPs can be seen as akin to forward guidance, but one where the central bank puts its money where its mouth is. APPs may be more credible than forward guidance, as they alleviate the time-inconsistency challenge that central banks face. If a central bank, despite its previous guidance, changes policy in such a way that long-term rates increase, it will in principle realize a loss (for example, Clouse and others 2003; Bhattarai, Eggertsson, and Gafarov 2015), depending on how the securities are booked.[1] Evidently, the better the communication, the more APPs can reduce risks and uncertainties and ultimately smooth the adjustment to the new equilibrium. The Euro-

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[1]Provided the purchased bonds are booked in the trading book. More importantly, in principle central banks should solely focus on their stipulated objectives, tasks, and functions instead of maximizing profits. Unless the central bank has an explicit backing rule, a central bank does, in principle, not need equity (Stella 1997). However, most central bankers feel that remaining solvent and especially being able to regularly transfer profits to the government help ensure their autonomy.

pean EMs that employed APPs have generally provided both sound guidance and information about the APPs, including in the form of press releases and inflation reports.

Complementary Policies

Capital flow management (CFM) and prudential measures could complement APPs in alleviating market dysfunction, but there are limits to deploying them. In principle, capital will flow to where it is most needed (highest expected returns). Moreover, free capital mobility is really the litmus test of whether the policy mix is sustainable. Nevertheless, special conditions—such as an uneven playing field or asymmetric shocks—could validate temporary CFM measures, provided that they are temporary, transparent, and do not discriminate by residency status (1) to contain capital inflows, when options for macroeconomic policy adjustments are limited; and (2) to contain disruptive outflows in case of crisis and imminent risk of a crisis (but without delaying any needed macroeconomic policy adjustments) (IMF 2012, 2018). Macroprudential measures are distinct to CFMs, as they are motivated by ensuring financial stability to mitigate capital flow cycles. Temporary release of buffers to absorb losses or to tighten limits on foreign exchange exposures are appropriate (IMF 2017; Nier and Olafsson 2020). Hungary, for instance, tightened foreign exchange funding limits of banks in March, which were reversed in September 2020. Regardless, the use of CFMs in European EMs is circumscribed—EU members are prohibited from deploying capital controls except in case of a national emergency.[2]

APPs and fiscal policies are interdependent. First, to the extent that APPs swiftly and successfully stabilize dysfunctional markets, and lower long-term yields of government securities, they obviously reduce funding costs and rollover risks of the government. Second, in principle, this permits a larger short-term fiscal boost than would otherwise be the case, provided the economy is below capacity. For instance, the government can accept risks that individuals may not be willing or able to take at times of distress. In principle, if the spending is perceived as being efficient, a larger deficit should be easy to finance, either with higher taxes[3] or debt without increasing yields. In contrast, if spending is perceived as inefficient, then the risk of fiscal

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[2]According to the EU Treaty (Article 63, Title IV), members are prohibited from introducing capital controls except if justified on grounds of public policy or public security (Article 65) or threats to cause serious difficulties for the operation of economy (Article 66). Exemptions have previously been temporarily granted to Cyprus and Greece.

[3]The classical balanced budget multiplier stipulates that the same increase in taxes and expenditures will increase GDP. The government will fully spend the tax income, while taxpayers' propensity to consume that is less than one.

dominance becomes more important and limits the scope of APPs (as discussed in Chapter 4).

In principle, structural and institutional reforms also matter, both for the need and for the effectiveness of APPs. Good governance practices, which ultimately are reflected in the trust in the state, tend to reduce the risk of market dysfunction and noise in the financial transmission mechanism.[4] Country-specific factors are thus critical for the choice of APPs, their potential effectiveness, and the needed communication. Structural and particularly governance reforms are often ignored because their positive impact is gradual, and their benefits are widely dispersed and difficult to internalize.

Communication

A transparent and well-informed approach can better mitigate and prepare for any potential losses associated with the exit process and potential "taper tantrums." In the initial stage of implementation of APPs in European EMs, the communication of central banks and the resulting benign market perception have helped in containing perceived risks of bond yield volatility, currency weakness, or, more broadly, fiscal dominance. Nevertheless, APP announcement communication has been varied when it comes to reporting on purchases, explanation of how potential adverse effects will be handled, and the timely reporting of amendments of APPs. For instance, Croatia has explained that they only intend to reactivate their APP if similar stress reemerges. Hungary, which has gradually increased purchases, has clearly communicated any changes and the motivation for such changes, including when the envelope has been increased.

Central banks should clearly communicate at the introduction, during operation, and the exit of APPs with a view to reduce speculative panics, enhance trust, and facilitate normalization. APPs could carry substantial risks, including for central bank credibility and independence. Worse, they could create the perception of monetary financing, particularly if the sterilization strategy is not clearly conveyed. Honest and transparent communication, including the publication of conditions governing future actions, are key for a smooth exit.[5] The IMF's "Central Bank Transparency Code" (2020b) offers relevant

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[4]Jarmuzek and Lybek (2020) found that net interest margins of banks are significantly lower, if a broad range of governance indicators are better due to less risk and uncertainty. Based on a panel of over 100 countries spanning the period 1996 to 2015, countries below the top 10 percent governance threshold could, if they improved their governance quality to this level, on average potentially be able to save about 0.3 percent of GDP per year.

[5]Some market observers have argued that if it is clearly communicated that APP adjustments do not signal a shift in the broader accommodative stance, then the adverse impacts of exiting may be negligible. The effectiveness of APPs in achieving their stipulated objective(s) should be continuously evaluated vis-à-vis other con-

guidance for the setup of the communication strategy. As Unsal and Garbers (forthcoming, 1) note: "Exceptional times need exceptional communication to safeguard credibility."

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ventional and unconventional monetary tools as well as other policies. This would help (1) ensure a continued optimal policy mix—both from an economic and political perspective, (2) reduce the risk of overexploiting APPs to the detriment of sustainable growth, and (3) reduce the consequences of potential misdiagnosis by diversification of instruments.

6 Strategies for Exiting Asset Purchase Programs

Exit Strategies

Exiting APPs is a process that involves a number of steps, the full cycle of which has rarely occurred in practice. Conceptually, the exit would start with tapering (slowing the pace of purchases), progressively moving to stopping purchases, maintaining the stock of purchased assets by rolling them over, and finally reducing the stock in a passive or active manner. Thus far, however, exit experiences are only available for the case of large-scale APPs in AEs, and even many of those have not been completed. Some evidence from Japan argues for the following steps, although not necessarily in this sequence: (1) halting extraordinary interventions; (2) downsizing and unwinding the central bank balance sheet; (3) selling the purchased assets, if necessary, while keeping country-specific factors in mind; and (4) raising short-term interest rates (Yamaoka and Syed 2010; Agostini and others 2016). The Bank of England (2018), for instance, announced that it did not intend to start reducing the stock of purchased assets until the bank rate reached about 1.5 percent, a level from which it could be cut materially if needed to react to shocks. The Bank of England also stressed that any reduction in the stock of purchased assets would be conducted at a gradual and predictable pace. More recently, the Bank of England governor has indicated that unwinding QE might instead be a first tightening step (House of Lords 2021).

The decision of when to stop or taper purchases should be driven by several factors—not least the impact on central bank credibility in achieving its objectives, tasks, and functions. There may be key differences between large-scale APPs in AEs and smaller-scale ones in EMs, as their primary purposes often differ. The former often issue a reserve currency and have a longer credible policy track record than the latter, hence enjoying more flexibility. In

contrast to large-scale APPs in AEs that aimed at significant monetary stimulus to achieve the inflation target, the EM APPs have typically been smaller in scale and primarily aimed at alleviating market dysfunction. Tapering could thus be a simpler process for EMs, but given their typically thinner markets, smaller amounts could have a relatively larger impact. Consideration should be given to stopping purchases when:

- *The initial condition(s) causing the APPs are no longer relevant.* Thus, if the market dysfunction, originally caused by exogenous factors, dissipates and normalcy is restored, then continuing with APPs may raise questions about their need and effectiveness.

- *The initially stated objective(s) have been achieved.* If an APP continues after the stated objective of stabilizing dysfunctional government bond markets has been achieved, but with a view to serving other objectives, say, to lower government funding costs in a nontransparent manner, then credibility may be eroded quickly.

- *Excess limits are in danger of being reached.* Going further may endanger both de jure and de facto central bank independence as well as statutory and real fiscal limits (see Chapter 4).

Stopping or scaling down purchases (that is, tapering) requires careful management. A firm understanding of all the financial and fiscal risks associated with prematurely stopping purchases and scaling down is critical. For instance, a narrow focus on inflation—although well-intended as the primary objective of monetary policy—could still trigger temporary market turbulence. A combination of carefully calibrated and clearly communicated unconventional tools may help smooth an otherwise segmented transmission mechanism until the new information is fully disseminated. The latter may be even more important in EMs with shallower financial markets. Hence, a thorough understanding should also help in the calibration of communication and reduce the risk of market overreaction.[1] A particularly important issue arises if the stopping signals a major policy shift. In such cases, an "announced" stop accompanied by a coherent and well-communicated policy package may be necessary.

The unwinding of central bank asset purchases should be flexible and viewed as a long-term objective. The perceived steady-state level of central bank holdings is specific to the country, its policies, and the situation it faces. Nevertheless, within the monetary anchor, two aspects of unwinding should always be kept in mind: preserving central bank independence and reducing the risk of excessive market fluctuations. First, a firm understanding of

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[1]The 2013 "Taper Tantrum" episode illustrates the risk of market overreaction.

the fiscal and financial risks should be a precondition for any unwinding (Agostini and others 2016). Second, the unwinding should be transparent and undertaken in coordination with the Treasury. In principle, central banks should solely focus on their stipulated objectives, tasks, and functions instead of maximizing profits. In practice, however, most central bankers feel that remaining solvent and especially being able to regularly transfer profits to the government help ensure their autonomy. Although depending on the accounting of the purchased securities—whether held for trading or kept until maturity—a transparent and well-informed approach can better mitigate and prepare for any potential balance sheet losses associated with an increase in long-term interest rates. In most cases, a passive exit may be appropriate. Subject to market conditions, the central bank should consider letting its portfolio mature without rolling it over (as Japan did in 2006). However, it should not hesitate to use its government securities for repos or outright sales if it needs to tighten.

Spillovers from the actions of major central banks can confound exit, and "pausing" should be an option. The QE implemented by the Federal Reserve and ECB has spilled over to EMs, and such actions affect capital flows, asset prices, and the exchange rate. Whether these spillovers have been stronger than the ones related to conventional monetary policy during the pre-COVID period is still debatable.[2] While spillovers to EMs are highly likely, their magnitude is difficult to ascertain ex ante. The extent to which markets react to major central bank actions, or "tantrum episodes," would be key. Whether European EMs choose a passive or an active (exit) unwinding strategy, their central banks should stand ready to "pause" if spillover effects are deemed to be abrupt, especially for the exchange rate.

Exit Options in European Emerging Markets

Circumstances are maturing for an exit from APPs in European EMs. The region's APPs were generally deployed with the primary goal of alleviating financial market dysfunction. Despite the severity of the economic shock, financial market dysfunction quickly abated after the initial weeks of the

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[2]Chen, Mancini-Griffoli, and Sahay (2014) find that spillovers effects from the United States are different and stronger during the unconventional monetary policy phase relative to the phase of the conventional monetary policy (January 2000–July 2007). In contrast, Curcuru and others (2018) find that changes in short rates (associated with conventional monetary policy) and term premiums (associated with unconventional policies) had similar effects on foreign yields. Antal and Kaszab (2021) find that spillovers from ECB APP announcements (2014 to end-February 2017) impacted medium-term bonds (one to five years) by about 1 to 6 basis points in a two-day window for six non-euro EU countries (Bulgaria, Croatia, Czech Republic, Hungary, Poland, Romania). The announcements also appear to have correlated with a modest reduction in the credit default swap spreads and appreciation of the exchange rate, while they hardly have any impact on the stock market indices.

pandemic. An economic recovery appears to be well underway, and relatively elevated levels of inflation in the region have sparked discussion about the timing for the exit from policy stimulus and monetary policy tightening.

Where the goals of APPs remained relatively limited to alleviating market dysfunction, APPs have stopped, while the unwinding, if needed, can be managed quite flexibly. Barring another episode of exogenously driven market dysfunction, there is no need to resume APPs. The relatively limited holdings that remain on central bank balance sheets may be maintained for a prolonged period until they mature; if needed, they can be unwound gradually with a view to limit the market impact in the process. However, the monetary tightening phase may provide an expedient opportunity to unwind the holdings.

In countries where prolonged APPs have tackled more diverse objectives, exiting from APPs should be weighed against those expanded objectives and the interaction with conventional monetary policy adjustment. If the expanded objectives warrant continuation of APPs, an efficiency comparison should be made between APPs and other potentially more adequate means to meet the expanded objectives. For example, the Hungarian Central Bank later decided to scale back its long-term collateralized credit facility and partially substitute it with continued purchases of government securities, arguing that the APP may ensure more effective transmission to long-term interest rates. Where APPs have continued throughout the pandemic with the objective of supporting monetary easing through transmission to the longer end of the yield curve, it would be appropriate to taper or stop APPs, as central banks move toward increasing policy interest rates. Given the heterogeneity, country-specific conditions, and clearly communicated changing states objectives of APP, any action should be state-contingent and specific to each country. However, outright unwinding of acquired assets should be managed (and paced) in consideration of the size of outstanding positions and their likely effects on the objectives for which APPs were deployed.

7 Conclusions and Policy Lessons

APPs have served several European EMs well during the pandemic. Their main goal was to alleviate market dysfunction, and in that regard, they have been quite distinct from QE used by the major AE central banks following the GFC. In Poland and Hungary, APPs have also aimed to support the monetary policy transmission mechanism beyond the initial period of market turbulence, as evidenced by their prolonged use compared to others in the region. Focusing on the initial period of market turbulence, we find evidence of a stabilizing impact on government bond markets. APP announcements had an immediate positive impact on the functioning of the government bond markets in European EM countries that pursued such programs. APPs reduced 10-year government bond yields and compressed bid-ask spreads for government bonds. Initial announcements in March and April 2020 also halted the increase in term spreads. In doing so, APPs also helped facilitate smooth fiscal financing at an extraordinary moment. At the same time, we find little evidence of systematic currency depreciation. In terms of spillovers to other asset prices, equity prices increased by around 2 percent two to three days after the APP announcements.

The success of APPs so far in EM Europe comes with some caveats. First, our results are silent about the potentially important longer-term impacts of the APPs, identification of which should be pursued when sufficient time has elapsed since initiation. Second, due to data limitations, our high-frequency analysis does not control for all domestic policy actions around APP events, including the impact of foreign exchange intervention on exchange rates. Finally, our analysis focused on direct impacts of the APP announcements but did not attempt to construct the counterfactual case of no APP announcements, which could potentially modify the quantitative findings.

In case of renewed market dysfunction, there is potential scope to scale up APPs in most of the European EMs we examined, provided they remain

consistent with primary monetary policy objectives with the risk of fiscal dominance well contained. The macroeconomic fundamentals of this group of countries are generally strong, though with some variation that may affect the feasible scope for APPs in each country. The relatively small scale of APPs as a generally time-bound tool during the pandemic has posed little risk of fiscal dominance. Nevertheless, the availability and usefulness of APPs as a larger-scale tool is likely to vary among countries, including based on the perceived risks of fiscal dominance. EM central banks should be mindful of the limits for their APPs, the breach of which may endanger both de jure and de facto central bank independence as well as statutory and real fiscal limits.

Central banks need to plan for the role of APPs in eventual monetary policy tightening. Inflation has recently increased in many European EMs, in large part due to temporary factors, including base effects, pent-up demand, and supply bottlenecks. Setting aside the question —which is beyond the scope of this paper—of whether the current increase in headline inflation merits immediate policy tightening, as national vaccination programs proceed and a durable recovery appears increasingly possible, central banks should begin to plan for monetary policy normalization, including the future of APPs.

An increase in policy interest rates should be accompanied by a tapering or discontinuation of APPs. Where APPs were concentrated at the beginning of the pandemic or have effectively ended (Croatia, Romania, Serbia, Turkey), these APPs would play little role in monetary policy tightening, which should be done through conventional instruments. The Polish and Hungarian APPs have continued, arguably influencing the yield curve over a longer period. When these central banks tighten monetary policies, it would be appropriate to complement tightening at the short end of the curve (policy rates) with a tapering or discontinuation of APPs to support the transmission of higher policy rates to the longer end of the curve. Furthermore, when the government securities market has largely regenerated following a major shock and is thus no longer illiquid or segmented, continued central bank intervention in this market could be perceived as monetarization of budget deficits and ultimately increase risk premiums. The pace of tapering should be tailored to country circumstances, avoiding a greater-than-desired tightening of overall monetary conditions. Unwinding of purchased securities could be done gradually, as they mature or to absorb liquidity as part of a tightening, with a view to limit market disturbances. However, raising interest rates does not necessarily preclude further exceptional asset purchases during circumstances of exogenous, significant, and temporary market disruptions.

Whether central banks use conventional or unconventional monetary policy tools, clear and transparent communication at each step of the process is critical. This is important for the central banks to remain credible and is

particularly important when a large shock hits and triggers a major policy shift. Effective communication will also facilitate information dissemination, thereby reducing asymmetric information and ensuring a faster and smoother adjustment to a new equilibrium.

Annex 1. Conceptual Underpinnings of Central Bank Asset Purchase Programs

This annex reviews the theoretical underpinnings for why APPs can be effective under certain circumstances, including in EMs.[1]

APPs can work to stimulate aggregate demand and alleviate market dysfunction; that is, complement conventional policies, when the standard transmission is impaired.[2] A number of factors can weaken the standard transmission channel after an unexpected shock: (1) heterogenous financial assets (liquid central bank reserves versus less liquid longer bonds); (2) diverse economic agents with specific time preferences (that is, they may favor specific maturities) or have specific risk tolerances (for example, appreciate liquid assets in safe havens after a shock); and (3) financial frictions, meaning that financial intermediaries cannot (say, liquidity constrained) or will not (increased uncertainty) arbitrage the yield curve after a rare shock, until consensus has emerged about the new equilibrium. APPs can ease liquidity constraints, both overall (depending on the sterilization) and along the yield curve; smooth price adjustments, for example, by reducing overshooting due to rigidities; and help anchor expectations. In short, APPs can influence both the *ability* and *willingness* to borrow/lend and thus, in principle, to more smoothly stabilize aggregate demand following a shock. We discuss the channels by which APPs can be effective from two viewpoints: their immediate effects on the yield curve and their effects on the overall economy.

The shape of the yield curve reflects market expectations, arbitrage along the curve, and not least central bank policies. A yield curve thus reveals today's

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[1]In 2014, Ben Bernanke, considering AEs, said: "Well, the problem with QE is it works in practice, but it doesn't work in theory" (14). In 2020, he noted: "in retrospect it has become evident that the costs and risks attributed to the new tools, when first deployed, were overstated" (95).

[2]After the deregulation in the 1980s, the mantra was to only use *indirect* monetary policy instruments (for example, Baliño, Enoch, and Alexander 1995). The transmission through, respectively, the interest, exchange rate, asset price, credit, and expectation channels was considered stable.

time preferences and is normally upward sloping, given some risk aversion about the future. A declining yield curve is often considered a harbinger of a recession, as it implies that future short-term interest rates are expected to be lower.[3] A central bank *determines* the short money market rates that anchors the yield curve, but it only *influences* the long rates by informing about its intended future policies. Previously, inflation expectations were the dominant driver of the level and slope. With these expectations well anchored in many countries, other factors have come to play a larger role. Greater financial deepening has not just affected the level and slope, but also the smoothness, or bumpiness, of the curve. (Say, the arbitrage between different maturities is suddenly impeded if uncertainty increases.) It may thus have become more sensitive to the ability and willingness of financial intermediaries to smooth the curve after and unexpected shock, like COVID.

- According to the "expectation theory," APPs will have no impact on the yield curve. This theory is often attributed to Lutz (1940), building on Fisher's (1930) relationship between short and long interest rates under perfect foresight. It hinges on the "no-arbitrage condition," namely that any intervention will effortlessly and immediately be neutralized by other market participants.[4] The *liquidity preference theory* (Hicks 1939) adds that the general public prefer shorter securities due to their general risk aversion, causing a positively sloping yield curve. Nevertheless, the yield curve will promptly adjust to any unexpected shock, while the market will immediately render government intervention, like APPs, impotent.

- In contrast, the "segmentation" and "preferred habitat" theories suggest that APPs can have, at a minimum, a temporary impact on the curve, which may be reduced to the extent the financial sector finds it profitable to smooth the duration risk. These theories are often attributed to Culbertson (1957) and Modigliani and Sutch (1966). They assume that buyers

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[3]Yield curve inversion has been a solid predictor of recessions. But the rather flat yield curve in many AEs after the GFC has triggered some reinterpretation. Engstrom and Sharpe (2018) noted that the difference between the *spot* money market rate and the near-term short forward rates are better predictors of central bank policies. Bauer and Mertens (2018) argue that the fear of a recession and the expected success of QE should be separated. The distinction between term spread and term premium has thus become more important. *Term spread* is the difference between the long and short interest rates. It can be split into (1) an expectation component and (2) a term premium. The former reflects expectations on inflation and the real economy, which can be captured by near-term interest rates. The *term premium* reflects the premium on (1) inflation risk and (2) real economy risk, which are assumed to be dominated by long-term risks (Rosenberg and Maurer 2008). The term premium must be estimated, as, for instance, done by Adrian, Crump, and Moench (2013) or Cohen, Hördahl, and Xia (2018).

[4]Its micro foundations are based on a neoclassical phantom world, where monetary policy is "Wallace neutral" (Wallace 1981) and all the other "irrelevance theorems" apply (Ricardo's equivalence, Modigliani, and Miller I and II, etc.). They presume a complete set of state-contingent markets, nicely behaved demand and supply functions (still "nice" when aggregated), and no market failures, where instantaneous adjustments ensure a Pareto efficient resource allocation and homogeneous information (Varian 1978).

and sellers of bonds are mainly interested in a specific maturity. Accordingly, there is no substitution (segmentation theory) or only very limited substitution (preferred habitat theory) between maturities. The curve is thus uneven or "bumpier," but remains positively sloped because investors generally prefer to be liquid.

- Reality likely lies between these two classical yield curve theories. However, APPs could have a more lasting impact, if the impact on the information set is fully acknowledged. If APPs do *not* affect the information set, they will only have a temporary impact, until other market participants neutralize the effects of asymmetric information, rigidities, including time preference rigidities along the yield curve, and other potential market failures. However, if the APPs change the information set, they could have a more permanent impact (for instance, if the central bank has propriety information, which it conveys to the market via its APPs[5]). Specifically, APPs could help reduce asymmetric information. They may even diminish risk and uncertainty.[6] Moreover, to the extent that APPs permit liquidity-constrained stakeholders with well-founded information to participate in the market, this could also shift the net demand. In short, if APPs make even small initial changes by easing rigidities, they could potentially permanently shift the trajectory of the nonlinear and complex dynamic demand and supply functions.

The literature describes several overlapping channels through which APPs may both affect and stabilize growth and inflation and thus simultaneously influence the shape of the yield curve.

The *portfolio rebalancing channel* works via various subchannels by influencing relative prices and wealth (budget constraints). This line of thinking goes back to Tobin with more recent contributions from, among others, Andrés, López-Salido, and Nelson (2004), and Vayanos and Vila (2009, 2021).

- *APPs can bring about portfolio adjustment by influencing the duration risk of risk-averse investors with preference for specific maturities (for example, Krishnamurthy and Vissing-Jorgensen 2011).* When central banks buy longer bonds from the private sector, particularly institutional investors may want to rebalance their portfolios by increasing their relative demand for such

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[5]Sherif (1937) describes a now classical experiment on how the power of suggestion can influence expectations. A group is let into a completely dark room with some distance to a single light. They are told to describe how much the light moves. One person is in on the game and begins to announce how she sees the movement. The light is not moving, but the others begin to describe "what they see," often depending on the perceived prestige of the person commentating.

[6]This is following Knight's (1921) definition of *risk* as something where a probability can reasonably be assigned, which implies that it can be traded in state-contingent markets; *uncertainty* reflects more rare and irregular events that cannot be assigned a probability.

maturities. This lowers long yields further (that trigger an additional capital/wealth gain). If the APP is done in government securities, other types of bonds, and even shares, may become more appealing. APPs thus affect the quantity and mix of the financial assets of the private sector and ideally boost the willingness to accept more credit risk. However, lower treasury yields could also cause extremely risk-averse savers to instead enhance their precautionary savings and thus suppress aggregate demand.

- APPs can provide additional liquidity, hence easing liquidity constraints of economic agents, which obviously depends on the degree of sterilization (for example, Christensen and Krogstrup 2018). Particularly after an unexpected shock, some investors may be relieved to unload their long bonds for more liquid bank deposits without large discounts (avoid fire sales). In case the asset purchases from banks are fully sterilized, the liquidity channel may be almost mute, but it could still alleviate both the slope—as for instance intended by "operation twist"[7]—and the bumpiness along the curve.

The *expectation—signaling or confidence—channel* primarily influences the information set. This channel becomes more important with heightened uncertainties. Enhanced and credible information about the outlook and policy path can reduce risks and uncertainties by better anchoring expectations (for example, Bauer and Rudebusch 2011; Christensen and Rudebusch 2012). Consequently, APPs can complement the traditional Taylor rule by further lowering the long-term interest rates (Eggertsson and Woodford 2003). For instance, APPs may alleviate the time-inconsistency challenge of central banks, as they will face a loss, if long-term rates later increase (for example, Clouse and others 2003; Bhattarai, Eggertsson, and Gafarov 2015).[8] In short, the better the authorities' communication track record, the more the APPs can sustainably reduce risks and uncertainties.

The *intermediation channel* focuses on financial intermediaries. Various subchannels affect their ability and willingness to lend, thus easing financial frictions, including by smoothing the yield curve.

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[7]In 1961, the Federal Reserve initiated its first "Operation Twist." It bought long-term Treasuries against a similar amount of short-term Treasuries, while maintaining the Federal Reserve funds rate. The purpose was to reduce the long-term rates and increase the short rates with a view to contain capital outflows related to the US dollar/gold peg. It was combined with the Treasury issuing more short-term and fewer long-term treasuries. Modigliani and Sutch (1966) argue that the impact of Operation Twist was limited and likely related to other factors. In contrast, Swanson (2011) used an event-study approach using high-frequency data and found a more significant impact on long Treasury yields, while he noted that the spillovers to corporates were less due to their limited substitutability.

[8]Provided the purchased bonds are booked in the trading book. More importantly, in principle central banks should solely focus on their stipulated objectives, tasks, and functions instead of maximizing profits. Unless the central bank has an explicit backing rule, a central bank does, in principle, not need equity (Stella 1997). However, most central bankers feel that remaining solvent and especially being able to regularly transfer profits to the government help ensure their autonomy

- *Affects the ability of intermediaries to on-lend to liquidity constrained entrepreneurs, households, and governments.* This part of the channel depends on the degree of sterilization. But as previously mentioned, even if fully sterilized, targeted APPs could—particularly, if combined with extended lending facilities and enhanced collateral frameworks—still enhance intermediaries' ability to transform deposits to longer-maturity loans.[9] Secondly, APPs can result in capital gains (limit losses in case APPs mitigate an adverse shock) on the trading book for long bonds that are valued at mark-to-market, which should ease capital constraints.

- *Affects the willingness to lend.* It primarily works by firming expectations, which make banks more willing to take risks, or at least not to overreact to adverse shocks. The magnitude of this channel obviously depends on both (1) the size of existing cushions vis-à-vis prudential requirements and (2) the risk aversion of the intermediaries. New empirical evidence suggests that the slope of the yield curve may matter more for bank lending than previously thought, as it influences the willingness to convert bank deposits to longer-maturity bank lending.[10]

- *APPs have two main counteracting effects on market movements.* First, they reduce the number of securities available for trading and thus the future turnover. In contrast, the presence of a committed large buyer (the central bank) improves the "price discovery" and diminishes informational frictions, which may be reflected in smaller bid-ask spreads, as mentioned by, for example, Duffie, Gârleanu, and Pedersen (2007); Gagnon and others (2011); and Christensen and Gillan (2019).

The importance of the *fiscal channel* hinges on (1) the purpose of the APP and (2) the perception of the efficiency of the government. If markets perceive that the APPs mitigate financial market instability (Christensen and Gillan 2019) and acknowledge that the temporary measures benefit most participants and future growth, APPs can indeed lower the interest payments as well as the rollover risks of the government. In case of lack of trust in government efficiency and fairness, APPs could instead be perceived as monetarization of unsustainable budget deficits and quickly result in higher risk premiums and inflation.[11]

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[9]Paludkiewicz (2018) found that banks facing a larger decline on their portfolio of long-term government securities, due to unconventional policies in the euro area, tended to further increase their lending to the private sector.

[10]Paul (2020) analyzed US banks since the early 1960s and found that: "On monetary policy announcement days, banks' stock prices fall in response to an increase in expected future short-term interest rates but rise if term premia increase. These effects are . . . amplified for institutions with a large maturity mismatch."

[11]Not every action that increases central bank balance sheets or reduces funding costs of the government is monetarization. Gürkaynak and Lucas (2020, 1) remind us that "monetisation occurs when a government funds its expenditures by issuing intrinsically worthless claims that the public is compelled to accept."

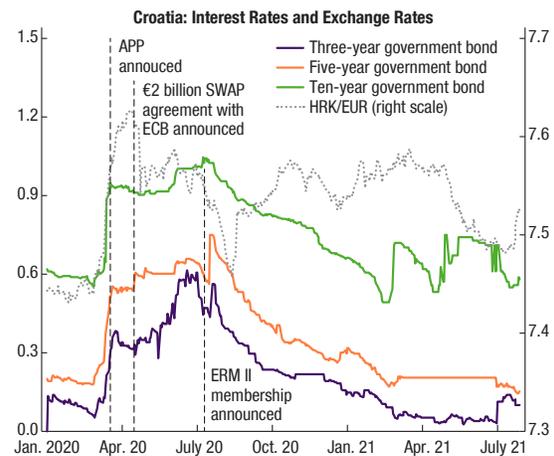# Annex 2. Details of Country Asset Purchase Programs

The various APPs are unique, reflecting different country characteristics and conditions.

Croatia

The Croatian Central Bank was the first in the region to introduce an APP during the pandemic. The APP was part of a series of measures to simultaneously (1) maintain exchange rate stability, (2) increase domestic liquidity to ensure continued bank lending at low interest rates, and (3) support the stability of the government securities market.[1] The Croatian Central Bank conducted its first auction on March 13, 2020.[2] Initially, only banks could participate. In the context of investment funds facing large outflows, procedures were quickly amended

Annex Figure 2.1. Croatia: Exchange Rate and Government Bond Yield Developments
(Percent)

The APP, together with other measures, contained the increase in bond yields and depreciation pressures.

Croatia: Interest Rates and Exchange Rates

Sources: Bloomberg Finance L.P.; Country Authorities; and Haver Analytics.
Note: APP = asset purchase program; ECB = European Central Bank; ERM II = Exchange Rate Mechanism II; HRK = Croatian kuna.

[1]For details, see Box 5 in Croatian National Bank (2020).

[2]For details of the transactions, see https://www.hnb.hr/en/core-functions/monetary-policy/instruments/bond-purchase-programme-bpp-.

so that licensed nonbank financial institutions could also participate in the subsequent four auctions from March 18 to June 30. In total, the Croatian Central Bank bought government securities worth 4.9 percent of GDP (nominal value, or 5.5 percent of GDP at market value). Market tensions quickly abated (Annex Figure 2.1). The later purchases appear to have coincided with the issuance of new long-term government bonds to refinance maturing debt as well as to cover the increasing financing needs related to COVID-19. While long-term interest rates increased after end-February 2020, they would likely have increased more without the APP. Probably related to the authorities strong repeated commitment to enter the euro area, bond yields have largely returned to pre-COVID levels.

Hungary

Annex Figure 2.2. Hungary: Exchange Rate and Government Bond Yield Developments
(Percent)

Financial turbulence at the beginning of COVID-19 was mitigated by various measures, including an APP
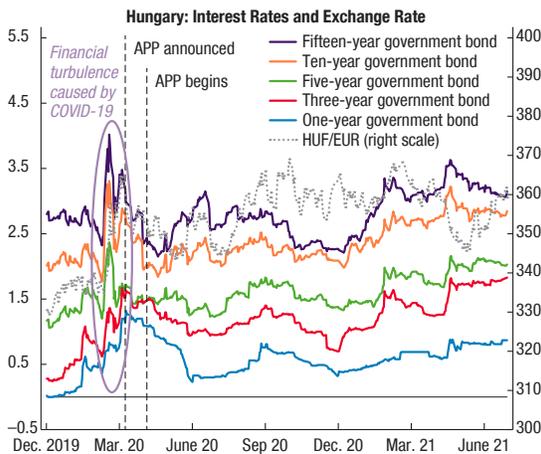
Sources: Country authorities; and Haver Analytics.
Note: APP = asset purchase program; HUF = Hungarian forint.

The MNB revamped its monetary operational framework at the start of the pandemic. The MNB stated three objectives: (1) to provide adequate liquidity to ensure price and financial sector stability, (2) to allow more flexibility of short-term money market rates, and (3) to enhance the MNB's ability to influence long-term yields (MNB 2020a). In mid-March 2020, the MNB revamped its operations to increase the money market rate to support the exchange rate, but without changing the policy rate, and provide amble liquidity to the banking system. The MNB announced an APP for government securities on April 7, 2020, and made its first purchase in early May. After a modest beginning, the use of this program has since intensified and is still ongoing. As long interest rates began to increase again, larger amounts were purchased.

By end-June 2021, the MNB had bought 7.2 percent of GDP in securities. In recent months, despite persistent purchases, long yields have increased further, but it is partially related to global trends (Annex Figure 2.2). In addition to the MNB purchases of government securities, the MNB also reactivated its mortgage bond purchase program from 2018, which was paused in November 2020, and eased conditions for its purchases of corporate bonds, which began in mid-2019. But this was both to support these markets as well as to provide long-term funding.
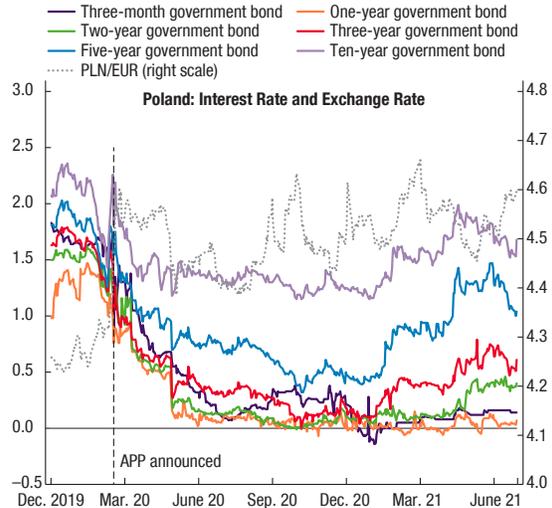
Poland

On March 16, 2020, the NBP announced that it would begin purchasing government securities. In April 2020, the NBP also began to buy government-guaranteed securities issued by the Polish Development Fund and development bank BGK, which had issued securities to finance the government's pandemic response. The stated goals were to (1) ensure liquidity in second markets for purchased securities, (2) strengthen the monetary policy transmission mechanism, and (3) change the long-term liquidity structure in the banking sector. The purchased amounts have largely been sterilized. After a rapid pace of purchases through July 2020, new purchases were more modest, though auctions continued. The pace of purchases increased in March to May 2021 before subsiding again in June 2021. As of end-June 2021, purchased government bonds and guaranteed bond purchases amounted to 5.9 percent of GDP. The initial purchases coincided with a noticeable decline in long bond yields (Annex Figure 2.3). Particularly short-term money market rates, but also longer bond yields, are currently below pre-COVID levels, which relate to domestic monetary policy easing as well as global factors.

Annex Figure 2.3. Poland: Exchange Rate and Government Bond Yield Developments
(Percent)

Interest rates declined following measures to alleviate COVID, while the exchange rate has depreciated somewhat.

Sources: Bloomberg Finance L.P.; Haver Analytics; and National Bank of Poland.
Note: APP = asset purchase program; PLN = Polish zloty.

Romania

The Central Bank of Romania announced a comprehensive package to alleviate the impact of COVID-19 on March 20, 2020. It included purchases of leu-denominated government securities "with a view to consolidating structural liquidity in the banking system that should contribute to the smooth financing of real economy and the public sector" (NBR 2020). The purchases were done bilaterally to facilitate banks' liquidity management. The purchases were mainly done at the beginning of the pandemic and effectively stopped in August 2020. According to market observers, in March 2021 after a seven-month pause, the Central Bank of Romania purchased small amounts

Annex Figure 2.4. Romania: Exchange Rate and Government Bond Yield Developments
(Percent)

Interest rates have declined and the exchange rate has depreciated modestly since COVID-19

Romania: Interest Rate and Exchange Rate
- Three-month government bond
- One-year government bond
- Two-year government bond
- Three-year government bond
- Five-year government bond
- APP announced
- Ten-year government bond
- RON/EUR (right scale)
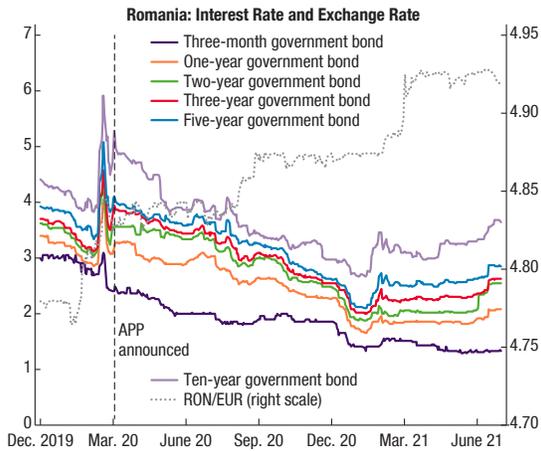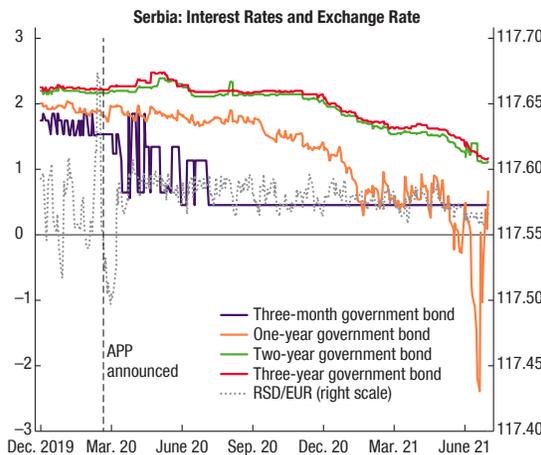
Sources: Bloomberg Finance L.P.; Haver Analytics and; National Bank of Romania.
Note: APP = asset purchase program; RON = Romanian leu.

Annex Figure 2.5. Serbia: Exchange Rate and Government Bond Yield Developments
(Percent)

Serbia: Interest Rates and Exchange Rate
- Three-month government bond
- One-year government bond
- Two-year government bond
- Three-year government bond
- APP announced
- RSD/EUR (right scale)

Sources: Bloomberg Finance L.P.; Haver Analytics; and National Bank of Serbia.
Note: APP = asset purchase program; RSD = Serbian dinar.

of long-term lei-denominated bonds to contain increasing bond yields. The total program is relatively modest compared to peers at about 0.4 percent of GDP. Currently, both short and long interest rates are well below pre-COVID levels, which relate to other domestic as well as global factors (Annex Figure 2.4).

Serbia

The National Bank of Serbia took additional measures to alleviate pandemic effects but without announcing an APP.[3] During March 2020, the policy rate was cut and additional liquidity to the banking system was provided by regular and additional foreign exchange liquidity swaps as well as repos in government securities.[4] The National Bank of Serbia has not disclosed information on its asset purchases, but it performed outright bilateral transactions in government securities with banks. Its balance sheet shows that National Bank of Serbia holdings of central government securities increased from zero before the pandemic to 1.7 percent of GDP, with apparent purchases occurring in April and May 2020. While these purchases have not been comparatively large as a share of GDP, the small size of Serbia's domestic Treasury market make the purchases relatively sizable at about 9 percent of outstanding local government securities, similar in scale to purchases made by the Hungarian and Polish central banks as a share of outstanding local government securities. Short and long interest rates remain below pre-pandemic levels (Annex Figure 2.5).

[3]For details, see Box 1 in National Bank of Serbia (2020).

[4]Local-currency-denominated corporate bonds were made eligible for open market operations and as collateral for short-term liquidity loans to banks from the National Bank of Serbia.

Turkey

The Central Bank of Turkey announced on March 31, 2020, an APP to curb the fallout of the pandemic, specifically "to enhance the effectiveness of the monetary transmission mechanism via increasing the market depth, enabling sound asset pricing and providing banks with flexibility in liquidity management" (CBRT 2020). Government securities have been bought in secondary markets, including from the Unemployment Insurance Fund. (This fund is excluded from the open market operation limit, which was increased from 5 to 10 percent of the analytical assets of the bank on April 14.) There have been no additional purchases since July 2020. The total purchases amounted to 1.6 percent of 2020 GDP. The initial asset purchases coincided with declining bond yields. Yields have since reversed and are currently above pre-COVID levels, which likely is related to a range of domestic and global factors (Annex Figure 2.6).

Annex Figure 2.6. Turkey: Exchange Rate and Government Bond Yield Developments
(Percent)

Bond yields initially declined but have since recouped, while the exchange rate has depreciated.

Turkey: Interest Rate and Exchange Rate
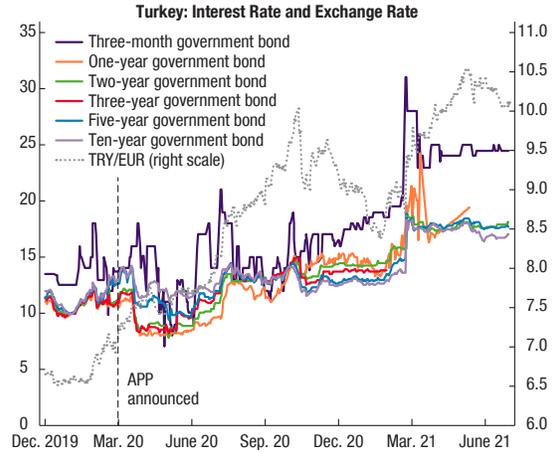
Sources: Bloomberg Finance L.P.; Central Bank of the Republic of Turkey; and Haver Analytics.
Note: APP = asset purchase program; TRY = Turkish lira.

Annex 3. Event Study and Local Projection Analysis: Specification and Additional Results

Event Study

Event study analysis documents the high-frequency evolution for the variables of interest around the APP announcement dates in European EM countries. As discussed in Chapter 3, two topics are of interest: the direct impact of APPs on the functioning of the government bond market, particularly yields; and the spillovers from APPs to the broader macroeconomy. The event study methodology has been commonly used to study the impact of UMP in AEs and EMs alike.
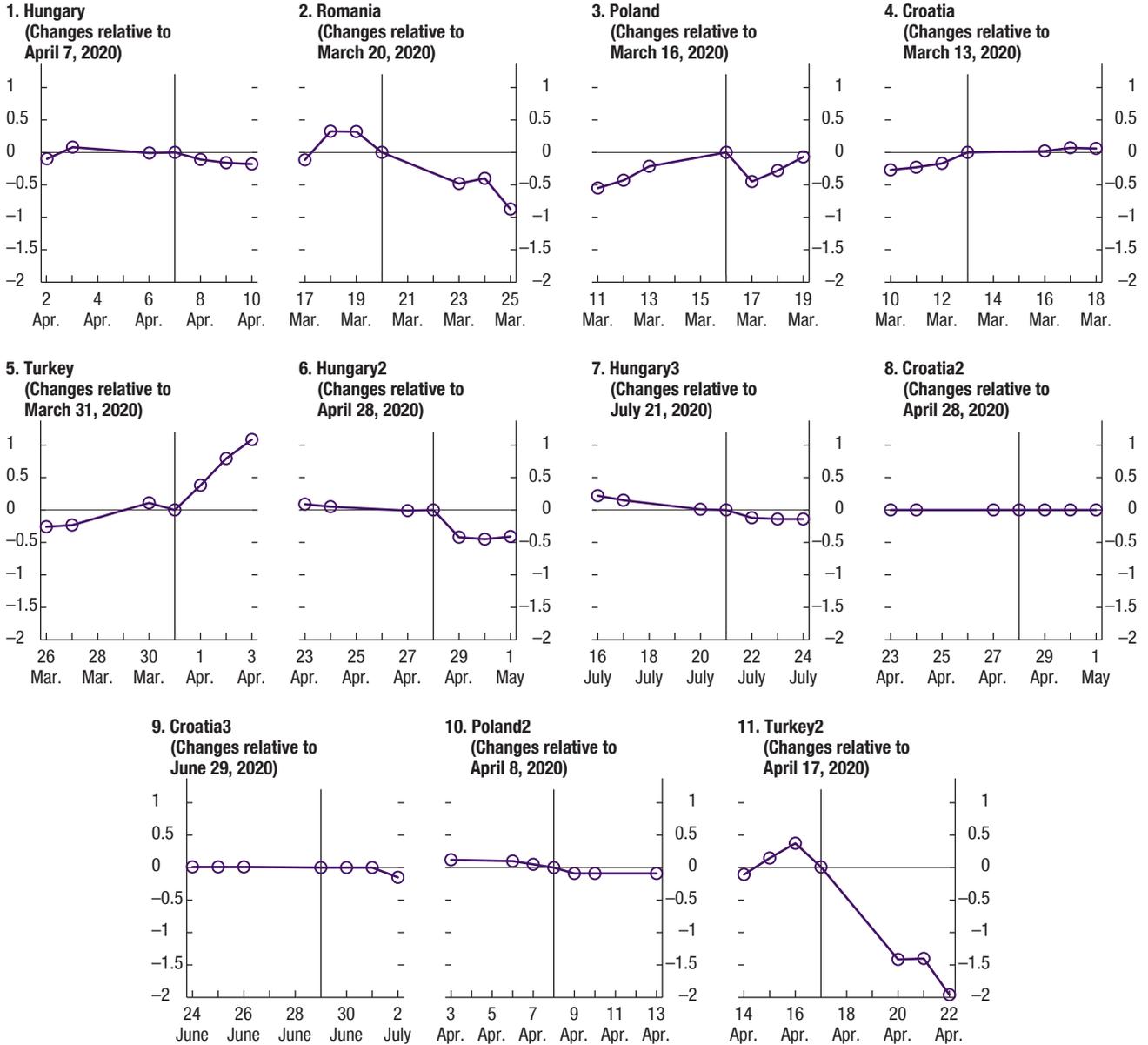
Asset Purchase Program Announcements

The analysis examines all publicly available APP announcements in European EM economies from March 2020 onward. Altogether, 11 such announcement events are identified in five European EM countries: March 20 in Romania; March 16 and April 8 in Poland; April 7, April 28, and July 21 in Hungary; March 13, April 28, and June 29 in Croatia; and March 31 and April 17 in Turkey. APP in Serbia is excluded from the sample due to lack of publicly available announcement dates.

Event-by-Event Results for Key Variables

Annex Figures 3.1 and 3.2 present responses for government 10-year bond yields, as well as the change in 10-year to 1-year yields for all 11 announcement events that underlie the results reported in the main text. The initial announcement event in each country is indexed with "1" in the chart title (for example, POL1 refers to the initial announcement in Poland). For countries with subsequent announcements, such announcements are indexed

Annex Figure 3.1. Cumulative Change in 10-Year Government Bond Yields around 11 Individual Asset Purchase Program Announcement Events
(Percentage points)

1. Hungary
(Changes relative to April 7, 2020)

2. Romania
(Changes relative to March 20, 2020)

3. Poland
(Changes relative to March 16, 2020)

4. Croatia
(Changes relative to March 13, 2020)

5. Turkey
(Changes relative to March 31, 2020)

6. Hungary2
(Changes relative to April 28, 2020)

7. Hungary3
(Changes relative to July 21, 2020)

8. Croatia2
(Changes relative to April 28, 2020)

9. Croatia3
(Changes relative to June 29, 2020)

10. Poland2
(Changes relative to April 8, 2020)

11. Turkey2
(Changes relative to April 17, 2020)

Sources: Bloomberg Finance L.P.; and IMF staff calculations.

in the chart title with "2" and for some countries also "3." All daily government bond yield data is from Bloomberg Finance L.P. Weekends are omitted in event window calculations. Missing data for working days is linearly interpolated.

Annex Figure 3.2. Cumulative Change in the Difference between 10-Year and 1-Year Government Bond Yields around 11 Individual Asset Purchase Program Announcement Events
*(Percentage points)*
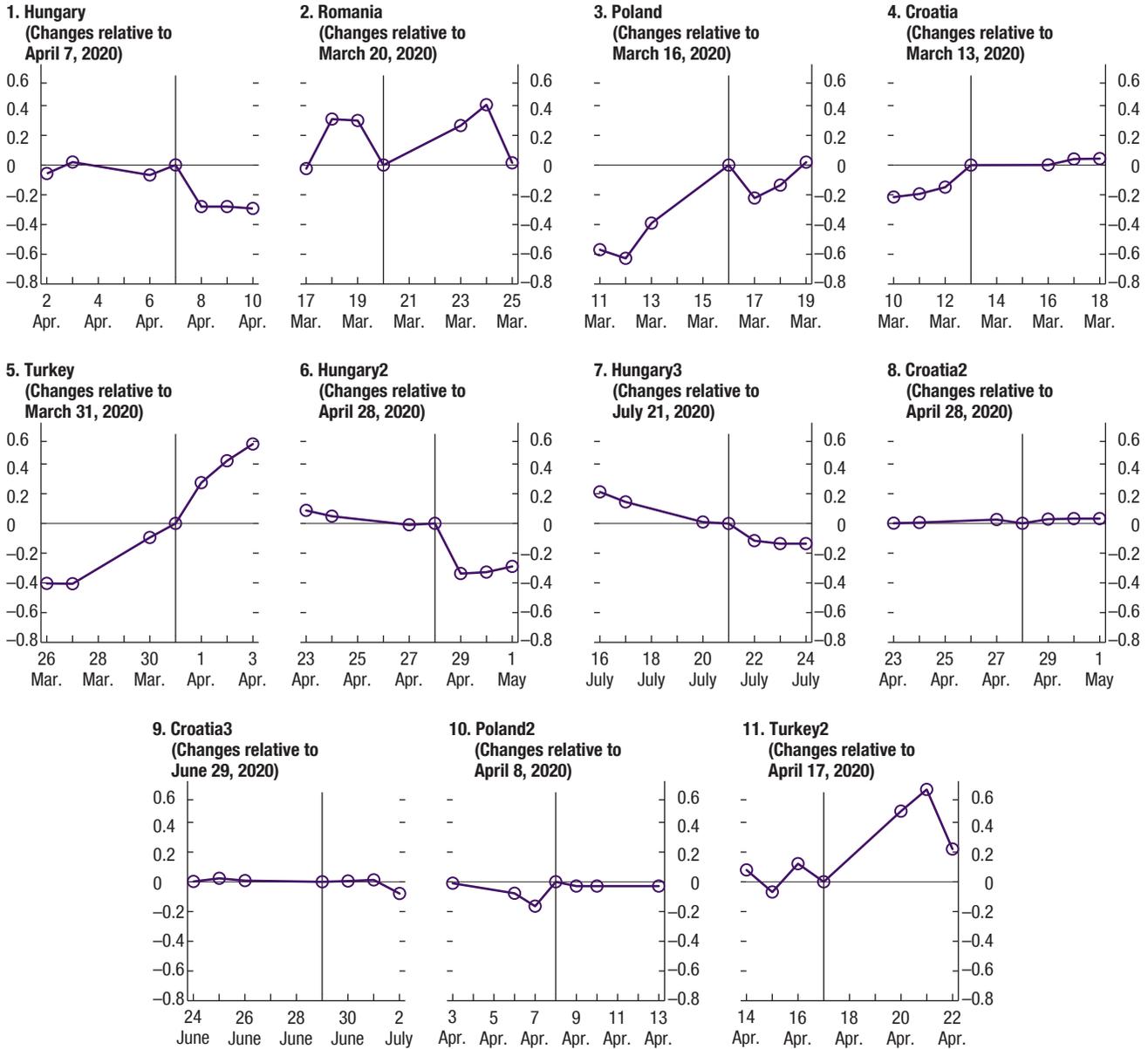
Sources: Bloomberg Finance L.P.; and IMF staff calculations.

Stock Market Response to Asset Purchase Program Announcements

This section explores in more detail the drivers of the equity price response to the APP announcements by zooming in on sectoral indexes for the banking/

Annex Figure 3.3. Response of Sectoral Equity Price Indexes to Asset Purchase Program Announcements

1. Median Response of Equity Prices—Financial Sector

2. Median Response of Equity Prices—Small Cap
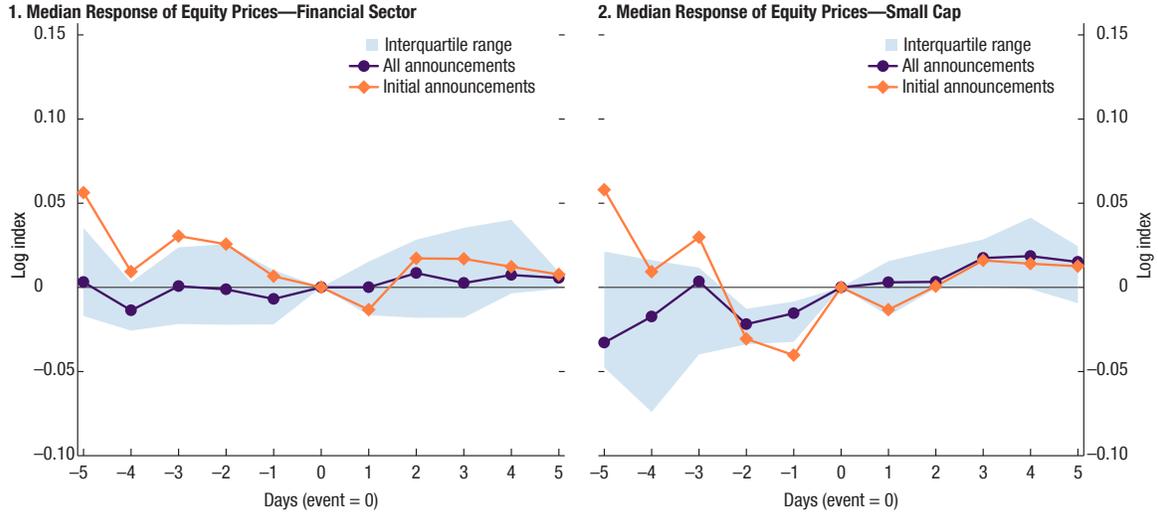
Sources: Bloomberg Finance L.P.; and IMF staff calculations.

financial sector as well as small cap companies, where coverage for all sample countries was available.[1] Results show that the median price index increase for the banking/financial sector is around half of that of the main stock index (see Annex Figure 3.3). Furthermore, by $t = 3$, it is also smaller than the response of the small cap index, indicating that improvements in economic outlook, as captured by the equity price changes, following the APP announcements were more pronounced in the nonfinancial sector. All daily equity price and index data was obtained from Bloomberg Finance L.P.

Local Projection Analysis

The specification is as follows:

$$\Delta Y_{c,t-1 \to t+p} = \mu_c + \sum_{l=0}^{3} \alpha_l^p \, Announcement_{t-l} + \sum_{l=0}^{3} g_l^p \, Global\,factor_{t-l}$$
$$+ \sum_{l=0}^{3} i_l^p \, \Delta Policy\,rate_{t-l} + e_{c,t+p}$$

where c stands for country and t stands for day. The dependent variable is the cumulative change in local currency 10-year government bond yields from day $t-1$ to day $t+p$ and the main variable of interest is the APP announce-

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[1]Banking index for Croatia was constructed as a simple average of top three listed banks by capitalization.

64

ment days. We implement two empirical specifications to control for global factors: one specification uses the APP announcement by the Federal Reserve and another the VIX as a proxy for global risk appetite. Both specifications control for domestic policy rates.[2] The coefficient α_l^p is plotted for three trading days (p = 0, 1, 2, 3 and l = 0) where 0 is the day of the event.

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[2]The sample period for the estimation is January to September 2020.

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