The emerging market reaction to Fed tightening

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How did emerging markets react to Fed tightening?*

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Abstract

This paper provides one of the first comprehensive assessments of spillovers from 2015-2018 monetary policy tightening phase in the United States to emerging markets, as well as their determinants. It shows that the spillovers were concentrated in the fixed income markets, with a relatively small impact of Fed policy on foreign exchange and stock market price behaviour. The bulk of the impact on fixed income was channeled through rising interest rate expectations rather than an increase in term premia. The decisions on monetary policy tightening in the United States are found to be of less importance for EM pricing than the preceding speeches. The markets were differentiating across individual countries, yet, with exception of the Central and Eastern European economies, based not on macroeconomic fundamentals but the economic policies shaping them. On the top of that, the paper investigates the importance of economic and political risk perception as well as ECB policy for the magnitude of EM spillovers from the Fed tightening, finding both factors irrelevant.

JEL codes: E43, E44, E52, F31, F36, F65.

Keywords: unconventional monetary policy, central bank communication, international capital flows, emerging markets, open source software in support of policy analysis

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1 Introduction

2008-2018 saw unprecedented developments in the monetary policy in the United States (US; Figure 1). In late 2008, in response to the collapse of the Lehman Brothers and the widespread recession that followed, the US central bank's, the Federal Reserve's (Fed's), Federal Open Market Committee (FOMC), already advanced in the easing cycle, brought the fed funds rate target to the record low of 0.00-0.25 per cent (against 5.25 per cent a year before).

Following that, the FOMC turned to large-scale asset purchases (LSAP), commonly called quantitative easing (QE), purchasing mortgage-backed securities and Treasury securities worth a total of 3.3 billion US dollars by 2014, in four rounds of subsequent programmes (LSAP1, also referred to as QE1: January 2009 – March 2010, LSAP2, called QE2: November 2010 – June 2011, and Maturity Extension and Reinvestment Policy, labelled as "Operation Twist": October 2011 – June 2012, LSAP3, or QE3: September 2012 – November 2014). Preliminary studies suggest that the QE programmes provided accommodation equivalent to additional interest rate cuts of around 5 percentage points (Reynard 2016, Reynard 2018; Figure 2).

In May 2013, the FOMC members started to indicate that the monthly scale of asset purchases might be gradually reduced, marking the beginning of the so-called QE taper talk. The reduction in purchases, commonly referred to as QE tapering, started only in early 2014, and the Fed ultimately ceased to purchase financial assets in November 2014. Yet, the US central bank continued to reinvest the principal payments from its holdings and to roll over the maturing Treasury securities at auction, in order to keep the size of its balance sheet stable and, thus, maintain the scale of the accumulation unchanged. Slightly earlier, though, in September 2014, the Fed published a statement on policy normalisation principles and plans, paving a way for the communication of the upcoming tightening. The document outlined subsequent actions to be taken in the process of tightening monetary conditions. More specifically, it stated that the reinvestment and roll-over policy would be gradually wound down after the fed funds rate target was increased. In parallel, some FOMC members started to indicate that the increases in fed funds target could be expected in the near future.

After one year of this open debate, the FOMC increased the fed funds target in December 2015. Following a short pause in early 2016, the interest rate increase cycle was in full swing into the year. Starting from November 2016, it was bolstered with a gradual wrap up of reinvestment and roll-over policy, labelled as balance sheet winddown or quantitative tightening (QT).

The fed funds rate target was last increased in December 2018, to 2.25-2.50 per cent, taking the entire tightening phase to 2.25 percentage points. The Fed balance sheet, in turn, shrank by a total of 0.7 billion of US dollars by the end of July 2019 when the FOMC announced the end of the winddown. Assuming a symmetric impact of the balance sheet policy, this could be an equivalent of full four rate hikes by 0.25 percentage points each. Putting together, the

scale of monetary policy tightening an equivalent to 3.25 percentage points, i.e. only slightly less than during the previous rate hike phase in 2004-06 (4.25 percentage points).

Due to the central role played by the US in the global economy and the rise in global financial market integration over past two decades, the FOMC decisions have a significant impact on financial markets, not only in this country, but also internationally. This paper is one of the first attempts to assess the magnitude of this impact, and its determinants. It is an extended version of a preliminary study (Beniak 2019). Yet, contrary to its predecessor, it focuses solely on emerging market spillovers (EM spillovers) from the Fed policy. Both papers contribute to the existing literature in the following ways. First, to date, no papers exist providing an event study focusing solely on the Fed tightening. Second, both papers cover a relatively wide range of aspects (with respect to the geographical coverage, the events studied and determinants). Apart from Abagli et al. (2019), Kearns et al. (2019) and Mehrotra et al. (2019), there is no study focusing on such a wide range of countries, and literature studying the impact of speeches, which are key in signalling future monetary policy decisions in the US case, is, too, almost non-existent. Third, the papers consider a wide range of asset classes, including maturities across the EM yield curves, exchange rates and equities. Previous studies tended to concentrate on fixed income markets. Fourth, besides the macroeconomic and financial factors, the papers attempt to assess the importance of political, economic and legal risk perception, using the proceedings from the open-source software. Last, the paper takes into account that, at least in case of some EM, not only the Fed, but also the European Central Bank (ECB) monetary policy might potentially matter for some countries. Such an approach seldom appears in literature, with Kearns et al. (2019) being a notable exception.

The paper finds that the scale of the spillovers from the Fed tightening in 2015-2018 was relatively large for fixed income and limited for exchange rates and equities. In spite of QT in place, the impact on fixed income occurred almost exclusively through a rise in interest rate expectations, with almost non-existent role of term premia increases, which stands in contrast to most studies on spillovers from monetary policy in the United States after the global financial crisis. Similarly to previous phases of the 2008-2018 monetary policy cycle, communication that preceded decisions and operations was more important for the markets than the actions themselves. The markets were differentiating across individual countries. This differentiation, however, was based on monetary, macroprudential and, to a lesser extent, fiscal policies shaping the fundamentals, with a notable exception of the CEEMEA (Central and Eastern Europe, Middle East and Africa). Similarly to Kearns et al. (2019), the fundamentals are found to be of relatively little importance. The markets might have been surprised by the scale of tightening as shown by renewed responsiveness of asset prices and yields towards the end of the Fed tightening phase.

The remaining of the paper is organised as follows. Section 2 provides a brief summary of the existing literature on spillovers from Fed policy. Section 3 explains the data sources and the models applied for the purpose of the exercise being the subject of this paper. Section 4 presents the results. Section 5 summarises additional checks performed to confirm the robustness of the obtained results. Section 6 concludes.

2 Literature review

The literature provides some theoretical insight into several spillover channels from the US monetary policy. In spite of a large discrepancy in the notation across papers, the consensual description of these channels could be as follows.

First, the information channel (Amagli et al. 2019) or the expectation channel (Chari et al. 2017) are both labels for a mechanism in line with which the (expected) changes in monetary policy in the US affect the expectations regarding the interest rate differentials in the coming months. For emerging market economies (EM economies) where the interest rates are generally higher than in the US on average, this means heightened inflows, a fall in government bond yields, appreciation of EM currencies during monetary policy easing in the US, and the opposite in times of tightening.

Second, in line with the domestic monetary policy channel, the scale of the impact of Fed policy on EMs depends on the extent to which their central banks follow the former, thus containing or increasing the interest rate differential (Amagli et al. 2019 where this channel is referred to as exchange rate channel). Central banks that are reluctant to cut/raise their interest rates in tandem with the Fed are likely to see larger capital in-/outflows to/from their respective countries.

Third, the mechanism behind the confidence channel, changes in the Fed monetary policy affect confidence in the US and other economies. When the Fed eases its monetary policy, the confidence of agents improves. This squizes term premia and leads to an appreciation of EM currencies as well as a rise in equity prices. In case of the Fed tightening, however, the channel works in a more confusing way, particularly for equities. Tightening could be a signal that the expansion of the US economy as very likely for a prolonged time, which is a positive signal for the stock prices.

Last, in case of unconventional monetary policy in the US, the central role, particularly for bond markets, falls to the so-called portfolio balance channel. First elaborated on in a detail by Krishnamurthy and Vissing-Jorgenssen (2011), it was related to domestic effects of US Treasury purchases by the Fed. The channel was to operate as follows. The fall in the US Treasury yields resulting from lower amount of these securities available on the market would spill over into other assets similar in nature, to the extent the investors would be willing

to substitute for the latter. However, this mechanism concerns the government bonds of EM economies, too, as long as they are perceived as some substitutes of US Treasuries during the period of low risk aversion. For QT, the portfolio balance channel works in reverse, i.e. unwinding of the abovementioned flows triggers in a rise in yields of a wide range of debt securities, both in the US and globally.

The existence of the portfolio balance channel could be the reason why the impact of the Fed monetary policy on emerging markets is relatively large with the balance sheet policy in place, as shown by and Gilchrist et al. (2014), later on, by Kolasa and Wesolowski (2018) and Abagli et al. (2019).

The empirical studies on global spillovers from the Fed policy were quite extensive over past decade. The existing papers found the international spillovers from Fed policy economically and statistically significant. Yet, the bulk of the studies is focused around the easing phase of the 2008-2018 monetary policy cycle, including, to some extent, the QE taper talk.

Hofmann and Takats (2015) as well as Abagli et al. (2019) show that the spillovers from the US monetary policy easing existed and became stronger after the FOMC augmented its toolkit with large-scale asset purchases. Further studies point to adverse impact of QE taper talk and QE tapering on EMs, as well as the amplifying influence of weaker fundamentals. Mishra et al. (2014) as well as Rai and Suchanek (2014), based on an event study, found an evidence of EM reactions to publication of FOMC official communication and speeches, respectively. The authors of both found that the scale of the market impact had depended on the macroeconomic fundamentals and the financial market depth. Studies by Khatiwada (2017) and Mehrotra et al. (2019) provide further evidence that the scale of capital outflows during QE tapering was also associated with fundamentals of individual EM economies.

The events surrounding the Fed tightening were strikingly similar to QE taper talk, and in some cases the anecdotal evidence suggests that the magnitude was even larger this time (Figure 3). Most notably, Turkey and Argentina, which both had just emerged from a recession, were experiencing significant outflows and depreciation of their respective currencies. In the latter case, the country had to resort to the IMFs Stand-By Arrangement.

In contrast to QE taper talk, the Central and Eastern European economies (CEE economies) appear relatively calm places this time. Based on existing literature, this could be explained with stronger links with the euro area, where monetary policy has been relatively accommodative in spite of some reduction in the scale of easing (Jabłecki et al. 2016).

The literature focusing specifically on Fed tightening of 2015-2018 is almost non-existent at the time this paper is being drafted. In line with the simulation results based on Federal Reserve Board models in Kamin (2016), the Fed tightening should result in higher market interest rates and currency depreciation in the largest EM economies, yet the impact was projected to be

limited. Dahlhaus and Vasishtha (2014) ran a simulation of a policy normalisation shock, and found that the flows to the EM economies should be affected to a similar, rather small, extent compared to that during the QE taper talk episode. Beckword and Crowe (2017) provided evidence that this market reaction could have been associated to some degree with safe haven flows, thereby hinting at macroeconomic fundamentals of individual EMs as a likely driver of capital outflows. Koepke (2016) argues that EM asset prices react to surprising rather than expected announcements. There are also a couple of papers discussing developments more specifically, eg. in fixed income markets, such as Avdijev and Hale (2018), Abagli et al. (2018 and 2019) or Kearns et al. (2019). Avdiyev and Hale (2018) show that the Fed monetary policy impacted the international lending flows. Abagli et al. (2018 and 2019) suggest, in turn, that this policy influenced bond market pricing to a larger extent than its local equivalents did. Kearns et al. (2019) indicate in addition that local EM fundamentals played a relatively small role in shaping Fed policy spillovers to these economies, pointing to significant impact of financial market integration.

3 Data and methodology

The study in this paper has two stages: the event study and identification of market impact determinants. In the first stage, I conduct a series of event studies for 15 EM small open economies with flexible exchange rate regimes, Polands peers, as well as Poland itself. This stage is meant to identify the scale of market reaction to events associated with Fed tightening across time. The second stage is regressing the output of the event study against a wide set of macroeconomic, financial and other variables to determine which of them drove the market most.

3.1 Event study

The event study is carried out on daily market data provided by Bloomberg. The event studies concerned 2-, 5- and 10-year government bond yields (if unavailable, the maturities closest to those; changes in basic points), MSCI stock market indices (per cent changes) and exchange rates against the US dollar (per cent changes; for data sources see Table 1).

Furthermore, I performed event studies for 5-year term premia estimated based on zero-coupon bond prices. The methodology for was the same as in Cochrane and Piazzesi (2005), i.e.:

$$\frac{1}{4}\sum_{n=2}^{5} rx_{t+1}^{(n)} = \rho_1 y_t^{(1)} + \sum_{n=1}^{5} \rho_n f_t^{(n)} + \overline{\zeta_{t+1}}, \tag{1}$$

where:

$$y_t^{(n)} = -\frac{1}{n} p_t^{(n)} \tag{2}$$

is the log yield for n-year discount bond at time t,

$$f_t^{(n)} \equiv p_t^{(n-1)} - p_t^{(n)} \tag{3}$$

is the forward rate, where:

$$rx_{t+1}^{(n)} \equiv r_{t+1}^{(n-1)} - p_t^{(n)} \tag{4}$$

is the excess return, where:

$$r_{t+1}^{(n)} \equiv p_{t+1}^{(n-1)} - p_t^{(n)} \tag{5}$$

is the holding period return.

The estimates shown in Figure 4 suggest that term premia were following a moderately downward trend in 2014-2018, with the exception of the CEE economies where term premia were broadly stable.

The event study window is 2-days wide, meaning that the market reaction around the event is defined as a two-day change, between the day after and the day before the event. This is in line with most papers studying the market impact of unconventional monetary policies, eg. Chen et al. (2014), Mishra et al. (2014) and, most recently, Abagli et al. (2019). Previously, this approach was chosen by Krishnamurthy and Vissing-Jorgensen (2011) or Gagnon et al. (2011). A 2-day window is narrow enough not to capture the effects of other shocks but large enough to capture market reaction across different time zones.

The event study time span is framed by the announcement of the statement on policy normalisation principles and plans in September 2014 mentioned in Section 1 and end-2018, i.e. just after the last fed funds rate target hike in the 2008-2018 monetary policy cycle.

Three various types of events are studied: the FOMC members speeches, the FOMC official communication (press releases and minutes), and the operations related to QT. The last type of events are the days of outright sales of System Open Market Account (SOMA) assets available on the New York Fed website.

The speeches associated with Fed monetary policy tightening are selected with the help of Python Counter, based on the presence of the following keywords: "normalization", "tightening", "balance sheet", or their equivalents and grammatical variations, all solely in relation to the Fed monetary policy. If at least one of these words appears in a speech, it is considered in further steps of the study. If "balance sheet" appears in the speech and is related to the Fed balance sheet, the speech is classified as related to the balance sheet adjustment. If it does not but tightening is elaborated on, it is assumed that the speech referred to the fed funds rate hike. Table 2 shows the general statistics of speeches studied, while Figure 5 depicts the frequency with which these words appeared in individual speeches. All speeches come from https://www.stlouisfed.org/fomcspeak.

I checked if the abovementioned events were market movers, or policy shocks, in the US, following the methodology presented in Chari et al. (2017). Namely, monetary policy shocks

are defined as market reactions in 5-year Treasury futures that significantly exceeded the average. The alternative approach, taken by Abagli et al. (2019), would be to define market movers as those who caused a change in 2-year government bond yields, yet, this would imply scrapping the front-end of the yield curve from the scope of the study.

Then I checked the scale of market reactions to each of the events for all asset classes considered. Next, I clustered the reactions in the monthly data (cumulative reaction for yields, averages for the exchange rates and equities), and created two separate panels, for all EMs and the CEEMEA (which included Poland, Czechia, Hungary, Turkey and South Africa). Last, I performed a mean test for all financial instruments, thereby checking the statistical significance of a change in yield or price.

3.2 Methodology for identifying market determinants

The second stage of the study was to regress the market reactions clustered in monthly data against various macroeconomic, financial and other fundamentals of respective economies in the corresponding months.

Influenced by the methodology introduced in Mishra et al. (2015) and, later on, in Abagli et al. (2019), I structured the equation used for regression as follows:

$$\begin{aligned} m_i^{t-1,t+1} = \alpha_i^t + \theta_i^t * T_i^{t-1,t+1} + \lambda_i^t * L_i^{t-1,t+1} + \beta_i^t * T_i^{t-1,t+1} * Y^t + \\ + \gamma_i^t * L_i^{t-1,t+1} * Y^t + \delta_i^t * Y^t + \epsilon_i^t, \end{aligned} \tag{6}$$

where: $m_i^{t-1,t+1}$ is a 2-day change in yields, rates or prices for the i-th asset (where i assumes values from 1 to 5 for 2-, 5- and 10-year government bonds, term premia, exchange rates and stock market prices, respectively),

$$T_i^{t-1,t+1} = \begin{cases} 1, & \text{if the change is like for tightening,} \\ 0, & \text{otherwise,} \end{cases} \tag{7}$$

$$L_i^{t-1,t+1} = \begin{cases} 1, & \text{if the change is like for loosening,} \\ 0, & \text{otherwise,} \end{cases} \tag{8}$$

Y^t is a macroeconomic, financial or other fundamental variable.

Tightening-like changes are defined as a rise in government bond yields and term premia, depreciation of EM currencies and a fall in stock market prices. Loosening-like changes are characterised by the opposite.

The data used for Y^t is the latest available at the beginning of the month the event took place. Most of the characteristics are common to other studies about the market impact of

QE taper talk, with a couple of modifications aiming to increase the frequency and thus the number of observations:

1. macroeconomic variables: (a) forecasts of GDP growth (GDP^t), (b) forecasts of CPI inflation (CPI^t), (c) forecasts of fiscal balance to GDP ($FISC^t$), and forecasts of current account balance to GDP (CA^t) for the current year (for the last quarter of the year, a weighted average of forecasts for the current year and the following year), as well as (e) the log level of foreign exchange reserves in relation to GDP (RES^t),

2. financial variables: (f) log lending to non-financial sector, per cent of GDP (a measure of financial integration, INT^t), as well as (g) one-month change in the macroprudential index based on Carreras et al. (2018), measuring macroprudential policy stance ($MACROPRU^t$) and (h) one-month interest rate measuring local monetary policy stance, with the exception of India, Thailand and Korea for which, due to limited data availability, I used the central bank reference rates (IR^t),

3. other variables: (i) risk perception index encompassing political, economic and legal factors ($RISK^t$), calculated based on Google Trends results for searches of the following (as in Baker et al. 2016): "economic", "economy, "uncertain", "uncertainty", "deficit", "parliament", "legislation", "regulation" and "conflict", as well as, additionally, "war" (given the military tensions in eastern Ukraine which could impact the CEE markets at the time of 2015-2018 Fed tightening), for local domains and local languages, and (j) ECB's monetary policy stance (ECB^t), measured with the frequency of Google search for "ECB tightening" and "ECB tapering".

All forecast and interest rate data come from Bloomberg. Data on foreign exchange reserves, lending, foreign assets and liabilities have been proceeded from central banks. Information about macroprudential policies have been extracted from the IMF's Macroprudential Policy Survey, central banks and financial authorities. Due to limited financial data availability, particularly on macroprudential policy measures, I excluded Peru and Philippines from the second stage of the study.

The above specification differs slightly from that in Beniak (2019) where only one symmetrical dummy was considered which made the results hard to interpret. After distinguishing a separate dummy for tightening-like changes in financial assets yields or prices, the estimates for β_i^t should be viewed as the measures of the macroeconomic, financial and other determinants of the Fed policy impact on asset prices or yields in EMs.

The data sources for all financial data are the statistical offices and central banks. Whenever data frequency was less than one month, I used cubic spline for approximation. For frequencies greater than one month, I used averages. The macroeconomic forecasts come from Bloomberg.

The rationale for picking up forecasts for GDP growth, CPI inflation as well as fiscal and current account balances instead of the actual number was to increase the frequency of data (to monthly from quarterly), and to use slightly more forward-looking data that was followed by the market participants. Monthly data on industrial output could have been used instead of GDP growth forecasts, yet, particularly given a relative rise in importance of services in EM economies, with such an approach, I would not have captured the developments in the entire economies well enough.

Risk perception index was included in this study because the 2015-18 phase of the Fed tightening coincided with a rise in political and economic risk both globally, due to the unexpected outcome of the US presidential elections or the Brexit referendum, and locally, for instance given the abovementioned military tensions in eastern Ukraine or parliamentary and judiciary disputes in Poland. Anecdotal evidence might suggest that at least the latter could have exacerbated the outflows resulting from the Feds tightening (Figure 7). The risk perception indices calculated in line with the abovementioned methodology are depicted in Figure 8. In case of countries for which data based on the original methodology by Baker et al. (2016) was available, i.e. Brazil and Chile, the correlation coefficients were 0.54 and 0.38, respectively. For Poland, the correlation with the risk index calculated by Hołda (2019) is 0.55.

The reason for including the ECB monetary policy stance in this study (Figure 9), in turn, was to check if the widespread belief among the CEE economists of the shielding impact of relatively mild monetary policy stance of this central bank was still valid at the time of the Fed tightening in 2015-2018. As indicated in Jabłecki et al. (2016), thanks to the ECB easing, the impact of QE taper talk and QE tapering was limited in Poland. The authors pointed to a relatively high correlation between Polish and German term premia (Table 3), with the former surprisingly turning negative in early 2010s. However, the ECB policy could have been an amplifier of adverse impact rather than dampener this time, given the ECB slowing down the pace of its monetary policy as the Fed proceeded with tightening. The importance of ECB policy was worth investigating also because a very recent study by Kearns et al. (2019) finds that the impact of ECB monetary policy on EM is quite low on average, and, more importantly, it is almost non-existent for European EMs.

Before running the main regressions, in order to make sure that the events studied here have not resulted from the macroeconomic surprises to the markets, I ran a regression for changes in surprise indices for macroeconomic data, provided by UBS for the EM panel.

The equation used for this regression was similar to the basic one (6), yet it was estimated on daily data:

$$m_i^{t-1,t+1} = \aleph_i^t + \tau_i^t * T_i^{t-1,t+1} + \upsilon_i^t * L_i^{t-1,t+1} + \psi_i^t * T_i^{t-1,t+1} * S^t + \\ + \phi_i^t * L_i^{t-1,t+1} * S^t + \mu_i^t * S^t + \eta_i^t, \tag{9}$$

where:

$$S_i^{t-1,t+1} = \begin{cases} > 0, & \text{if more data releases around the event were better than expected,} \\ < 0, & \text{if more data releases around the event were worse than expected,} \\ 0, & \text{otherwise.} \end{cases} \tag{10}$$

Changes in $S^{t-1,t+1}$ are defined according to the same time window as for $m_i^{t-1,t+1}$.

Similarly to the main equation (6), the coefficient ψ_i^t is the one that should be viewed as the measure of the scale of macroeconomic surprises' impact on tightening-like changes in financial asset yields or prices.

Due to the size of datasets, equations (6) and (9) were estimated with ordinary least squares. The panel data had been normalised.

4 Results

This section discusses the results from the exercises performed with methodology outlined above. The section is divided in two subsections, according to the stages of the study. Subsection 4.1 discusses the event study results, while subsection 4.2 identifies the market impact determinants.

4.1 Event study results

Event study results (Table 4, Figures 10-12) imply that during the Fed tightening phase the EMs reacted rather to speeches than the actual monetary policy decisions or sale operations. Given a greater response to speeches overall compared to speeches on rates, it appears that the EM response was getting greater once balance sheet policy was mentioned.

The reaction to official communication was, with a notable exception of Turkey and Mexico, either non-existent, or in the opposite direction than the theory or intuition would imply (Table 3, Figure 12). This may mean that the FOMC members were successful in signalling their policy plans. Namely, when the actual decisions were taken, they were largely expected by the markets, at least initially.

The scale of tightening, mainly the pace of QT, must have surprised the markets at some point, given the renewed rise in fixed market response after balance sheet winddown was launched, and more significant response of some EM economies to QT operations compared to the official documents. This phenomenon was observed particularly in Latin American economies, most of which which had proven surprisingly resilient when tightening was only spoken of. In contrast, the CEE economies which were relatively impacted by the FOMC member speeches, showed resilience to the Fed market operations.

Across asset classes, the greatest response occurred in the fixed income market, growing with maturities for the CEEMEA and Asian economies, and peaking at 5-year maturity in the remaining country groups (Table 4). However, contrary to the commonly shared view (see for instance Jab/lecki et al. 2016, Kolasa and Wesołowski 2018 or Abagli et al. 2019), and in line with observations in Mehrotra et al. (2019), the increase in long-term government bond yields seems to have resulted from the rise in the interest rate expectations rather than a pick-up in bond term premia. In most economies, term premia hardly responded to any events. This happened in spite of QT which potentially could have triggered a rise in term premia. Lack of term premia response was most probably because the bulk of the Fed tightening was effected with increases in fed funds rate target rather than QT.

Exchange rates depreciated on average in reaction to Fed tightening, with a notable exception of the days surrounding the Fed operations. Contrary to fixed income market, the reaction was the strongest for documents, not speeches. However, the average number clouds a

large divergence in terms of scale and even direction of forex market impact across EMs. Latin American currencies did not respond to Fed tightening at first, but as the operations proceeded, the response of exchange rates for these economies became stronger. For other country groups, there was not much variation in terms of the scale of response across 2015-2018.

The reaction of the equity market, in turn, is puzzling. Contrary to the intuition, which would imply a fall in share prices, the stock indices rose across virtually all markets. This could mark a shift of investors towards equities, worsening profitability of fixed income investment, or, in line with the confidence channel, that the fact that the Fed was tightening was a proof of good economic conditions in the US and globally.

On average, the market reactions were muted in all countries that were hardest hit during QE taper talk, i.e. Latin America and Asia (Table 4). With a notable exception of Mexico, Latin American markets were left rather unscathed for the most of the Fed tightening phase, even if, as the tightening proceeded, they became more responsive (Figure 12). At the same time, market reactions were quite significant in the CEE economies (almost unaffected by QE taper talk) at first. This might indicate that still relatively accommodative policy of the ECB and good economic conditions could not cushion the negative market sentiment in the early stages of the Fed tightneing. Yet, conversely to Latin American economies, the CEE markets seem to have become more resilient to the Fed tightening with time.

4.2 Identification of market impact determinants

Before turning to the results from the second stage of analysis, I checked to what extent the events identified above could be associated with surprises in macroeconomic releases. To do this, I estimated equation (9). Note, however, that, due to a lack of data, Asian economies could not be included in the panel used for this estimation.

The estimation results of equation (9) are included in Table 6. The results for ψ imply that around the time of the events studied, the changes in the UBS macroeconomic surprise index were not a statistically significant reason for tightening-like changes in yields or prices of any financial asset around the events associated with Fed tightening.

Turning to the core of the study, estimations of equation (6) on panel data for all EM deliver yield results that stand in a partial contrast to those available in the literature so far (Table 7). Market depth, degree of financial integration and the size of international reserves play relatively little role in determining the scale of changes in financial asset yields or prices associated with the Fed tightening.

The only macrofundamentals that matter for EM asset pricing are the expected inflation and current account balance, with no role for GDP growth predictions. The estimates are in line with the economic theory and intuition. The higher the expected inflation and the

deeper the forecasted current account deficit, the larger the increase in government bond yields, depreciation of the currency and a fall in stock prices in EMs resultant from the Fed tightening.

At the same time, the role of policies shaping the fundamentals turned out to be central to EM impact of the Fed tightening. However, there were large discrepancies with respect to the degree of their influence on market behaviour.

In case of fixed and stock income markets, tighter monetary policy was associated with a larger impact of the Fed tightening. Coupled with the significant impact of high inflation on Fed market impact, this may imply that Fed followers, who had been forced to hike their respective interest rates due to higher inflation, were experiencing higher outflows. This also stands in contrast to literature, particularly the description of the functioning of domestic monetary policy channel.

For the exchange rates, in turn, the mechanism works in reverse. The lower the expected inflation, the weaker the exchange rate. Along with no impact of current monetary policy decisions on the exchange rate, this could point to somewhat more forward-looking approach of forex investors compared to fixed income market participants.

Macroprudential policy was the second largest policy determinant of the Fed EM impact, particularly for the exchange rates and stock prices. More specifically, exchange rate depreciation and a fall in equity prices were associated with looser macroprudential policy. Less tight macroprudential policy would have led to higher yields at the front end of the curve. This market behaviour could have been explained by the investors substituting financial assets for banking products and real estate which would have become more affordable as a result of loosening macroprudential requirements. Meanwhile, the macroprudential policy was being tightened in EMs during the entire Fed tightening phase (Figure 6), and so the opposite was true, particularly for stock markets. Contrary to assumptions provided in Sections 2 and 4.1, GDP growth expectations, in turn, did not play any role in shaping the magnitude of EM equity price reaction to Fed tightening.

Fiscal policy also played some, yet rather minor role, in shaping the impact of the Fed tightening. The influence of the expected general government deficit was statistically significant in determining the scale of the rise in long-term government bond yields around the events associated with the US monetary policy tightening. Expectations of deeper general government deficit were amplifying the rise in these yields.

Contrary to fears expressed in Section 2, political, a rise in risk perception, at least according to the measure applied for the purpose of this paper, does not seem to have exacerbated the adverse impact of Fed policies in EMs.

For the CEEMEA economies, the estimation results were quite similar as for all EMs (Table 7), with four reservations.

The first and most important reservation is that macro- and financial fundamentals played a relatively large role in shaping the Fed market impact in the CEEMEA economies. In contrast to all EMs, the level of reserves and, to a lesser extent, the stock of lending to the economy or the financial market integration played a statistically significant role in the CEEMEA countries. Most notably, a greater rise in the government bond yields at the front end of the curve and larger depreciation of the currency was associated with a lower level of reserves. In addition, a rise in 5-year government bond yields was amplified by a lower level of financial integration and depth.

The second reservation regards a slightly different composition of policies shaping the scale of the Fed policy impact on the CEEMEA economies. In this region, fiscal policy plays absolutely no role in this respect. Monetary policy, in turn, is even more important than for all EMs, while the role of macroprudential policy shifts away from the stock market towards the fixed income market. Larger rises in 5-year government bond yields are associated with looser macroprudential policy while for 2-year government bond yields the opposite relationship, observed for all EMs, persists.

The third reservation is that none of the macroeconomic and financial variables, apart from the short-term interest rate, seem to explain the stock market behaviour in the CEEMEA around the Fed tightening events. The reason for this may relatively more random behaviour of stock market prices in these countries resulting from a low level of turnover in these markets following a reduction in the size of open pension funds in two of the CEE economies just before the start of the observation period.

The fourth reservation is that, contrary to all EMs, risk perception mattered for the Fed market impact in the CEEMEA. The significance of this factor, however, was limited to the exchange rate. For the remaining asset classes, the importance of risk perception was non-existent.

5 Robustness check

I performed four types of robustness checks. The first one was checking what the estimation output look like if, instead of using one variable as a regressor, I used all at once:

$$m_i^{t-1,t+1} = \alpha_i^t + \theta_i^t * T_i^{t-1,t+1} + \lambda_i^t * L_i^{t-1,t+1} + \boldsymbol{\beta_i^t} * \boldsymbol{T_i^{t-1,t+1}} * \boldsymbol{Y^t} + \\ + \boldsymbol{\gamma_i^t} * \boldsymbol{L_i^{t-1,t+1}} * \boldsymbol{Y^t} + \boldsymbol{\delta_i^t} * \boldsymbol{Y^t} + \epsilon_i^t, \tag{11}$$

where $\boldsymbol{Y^t}$ is a vector of macroeconomic, financial or other fundamental variables.

In line with the results, shown in Table 8, the short-term interest rate and, to a lesser extent, inflation would still be the most important drivers of the Fed tightening impact. However, macroprudential policy disappeared from the picture, replaced in part with the financial depth, in line with Kearns et al. (2019).

The second robustness check was running regressions excluding regressors individually, and determining the specification with the best fit (the largest R^2). With these specifications, the interest rate and/or inflation still play a predominant role, followed by macroprudential policy which is equally important as financial market depth and the degree of financial integration in these specifications, also confirming the observations in Kearns et al. (2019). The exchange rates, again, reacted to the expected inflation rather than to current macroeconomic policies. Other policies also play a role in shaping the market impact, yet mostly in fixed income market, at the front end of the yield curve. Similarly to estimates for (6), political and economic risk, or the ECBs policy, do not influence the scale of the Feds market impact (Table 9).

The third approach to check if the results were robust was to simplify the equation used for estimation, by not including the dummy associated with loosening-like market behaviour:

$$m_i^{t-1,t+1} = \alpha_i^t + \theta_i^t * T_i^{t-1,t+1} + \beta_i^t * T_i^{t-1,t+1} * Y^t + \delta_i^t * Y^t + \epsilon_i^t, \tag{12}$$

This specification yields interesting results where estimates for almost all variables are statistically significant for the EM asset yield or price behaviour around the Fed tightening episodes (Table 10). Still, however, the interest rate and inflation appear to be the most important factors, and the risk factor plays no role.

The importance of macroprudential and fiscal policies for the scale of the Feds tightening impact is statistically significant for most asset classes. Similarly to estimations of equation (6), the role of macroprudential policy is the largest at the front end of the yield curve and for the exchange rates and equities. The role of fiscal policy is slightly larger than in estimates of (6), yet still non-existent for the exchange rates.

The main differences compared to the estimation results for equation (6) are, again, a relatively large role of financial market depth and integration. In addition, with this specification,

GDP growth forecasts are found to be of statistically significant relevance for the behaviour of yields or prices of all asset classes. With a notable exception of 5-year government bond yields and equity prices, the impact is in line with the intuition – the lower the expected growth, the larger the rise in government bond yields or depreciation of the currency. Equity prices, however, rise as the expected GDP growth is slower, proving a lack of relevance of expected higher growth for the increase in stock market prices amid the Fed tightening.

The ECB policy is found to be of statistical significance for behaviour of the EM exchange rates and equity prices during the Fed tightening. A fall in stock market prices was exacerbated by the ECB tightening. Depreciation in EM exchange rates versus the US dollar was associated with looser rather than tighter ECB policy, confirming that the ECB could not have shielded EMs during the Fed tightening phase.

Last, I estimated the equation for the modules of event study results, leaving only the tightening dummy in place:

$$|m_i^{t-1,t+1}| = \alpha_i^t + \theta_i^t * T_i^{t-1,t+1} + \beta_i^t * T_i^{t-1,t+1} * Y^t + \delta_i^t * Y^t + \epsilon_i^t, \tag{13}$$

The results are broadly in line with the previous robustness checks (Table 11). The role of fundamentals shaping the degree of Fed impact, with a notable exception of GDP growth expectations, was concentrated at the front end of the yield curve. GDP growth expectations were important only for long-term government bond yields. Monetary policy is still important for asset pricing across the yield curve. Like in the bulk of the previous excercises, the fundamentals played no role in case of exchange rates, and risk perception and ECB policy are of no relevance for pricing of any EM assets during Fed tightening.

6 Conclusions

The paper provided evidence of a market impact of the Feds monetary policy tightening, as well as the identification of the underlying determinants.

The main finding of the paper is proving that the degree of the Fed tightening of 2015-2018 impact on markets was largely dependent on policies, with the predominant role of mostly monetary policies, followed by macroprudential and, to a way lesser extent, fiscal policies. The role of fundamentals, in turn, limited for all EMs, proved relatively large for the CEEMEA economies. In addition, for CEEMEA, there is some evidence, yet very limited, of an impact of political and economic risk on the scale of depreciation of currencies resulting from the Fed tightening. At the same time, the policies of others, in this case the ECB, were irrelevant for market developments. This notwithstanding, there is some evidence that it might have contained the scale of the stock price increases in some EMs.

The scale of reaction to the Fed actions toward the end of the cycle was also quite large, showing that the pace of tightening surprised the markets, particularly in Latin America. The response of Latin American economies was initially muted, yet, as the Fed proceeded with the reducing its balance sheet size, it became stronger. The CEEMEA markets, conversely, responded strongly at first to take the Fed policy decisions and operations related to tightening that followed quite calmly.

These results provide a good starting point for further studies. Most notably, in terms of methodology for identifying the events associated with the Fed tightening among FOMC members speeches, I intend to apply more sophisticated contextual text mining techniques. In addition, the risk and ECB policy measures could be improved to confirm or reject the importance of both for EM asset pricing during the Feds tightening phase of 2015-2018. With the improved methodology, I aim to investigate EM market reaction during the entire policy cycle of 2008-2018. The latter extension may also include the data on actual capital flows, apart from market pricing, thereby providing a more comprehensive assessment of the investors motivation and behaviour over the entire cycle.

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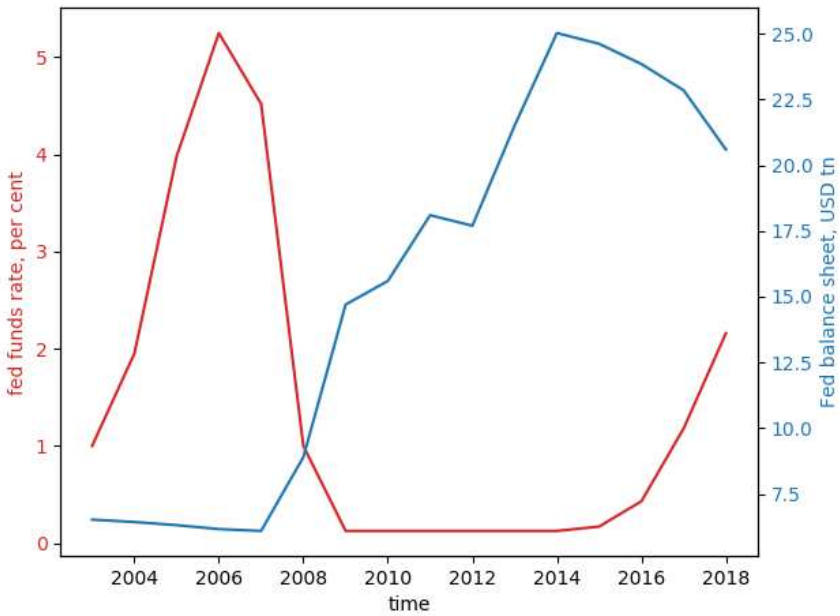
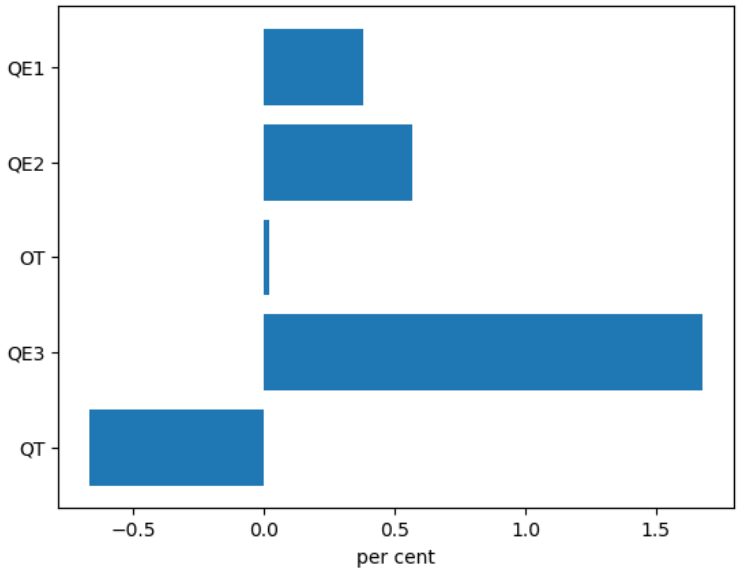
A Figures

Figure 1: Use of monetary policy tools by the Fed in 2004-2019



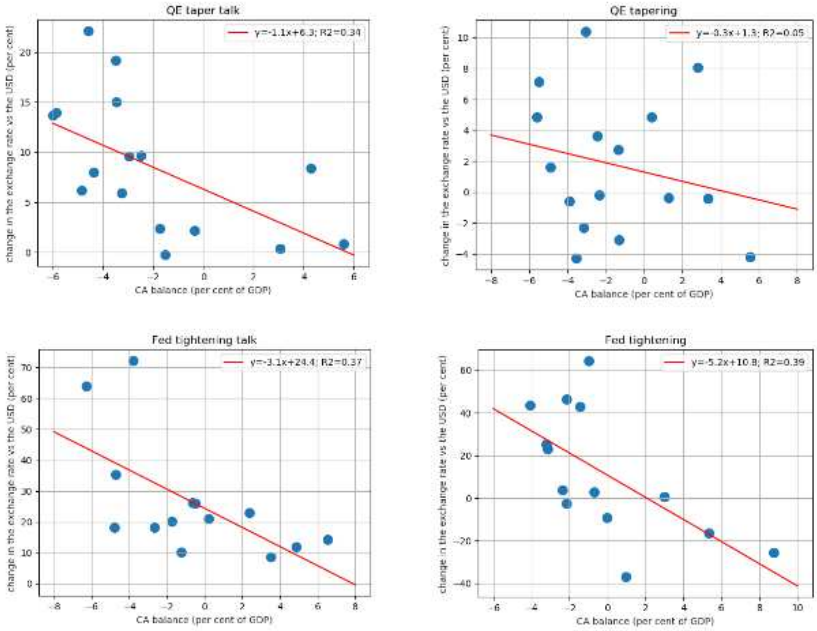
source: Fed.

Figure 2: Interest rate changes equivalent to monetary policy accommodation in the subsequent phases of the Fed unconventional monetary policy



source: Fed, calculations based on Reynard (2018).

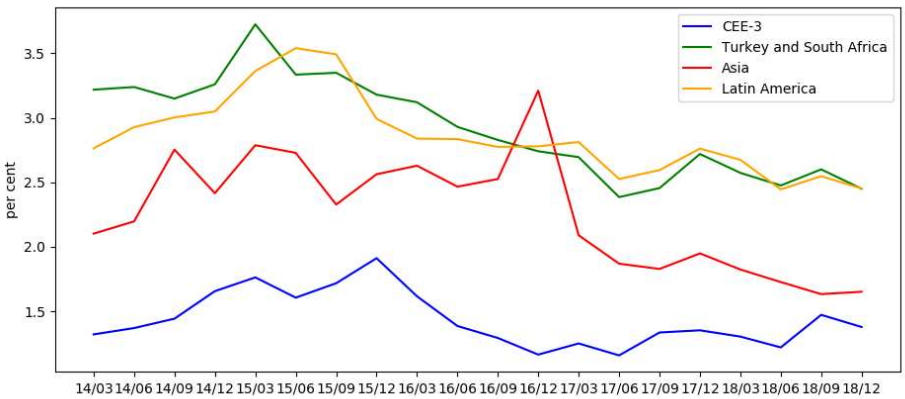
Figure 3: Change in EM exchange rates against their respective current account balances



Note: *for the exchange rates, the positive numbers denote depreciation. This applies to the remaining of the paper.*

Source: Bloomberg.

Figure 4: 5-tear term premia estimates



Note: *CEE-3 – Poland, Czechia and Hungary, Asia – India, Indonesia, Philippines, South Korea and Thailand, LATAM – Brazil, Chile, Colombia, Mexico and Peru. This applies to the remaining of the paper.*

Source: Bloomberg, calculations based on Cochrane and Piazessi (2005).

Figure 5: Characteristics of speeches studied

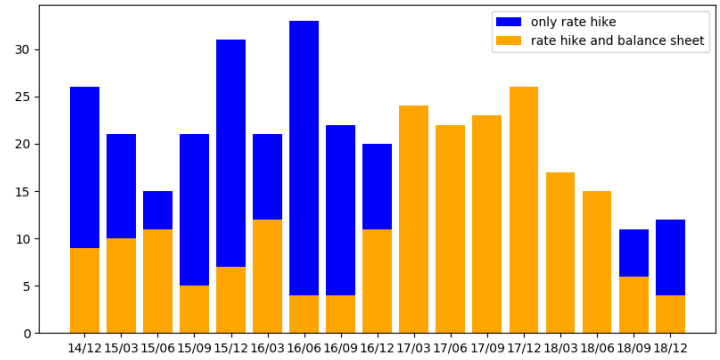
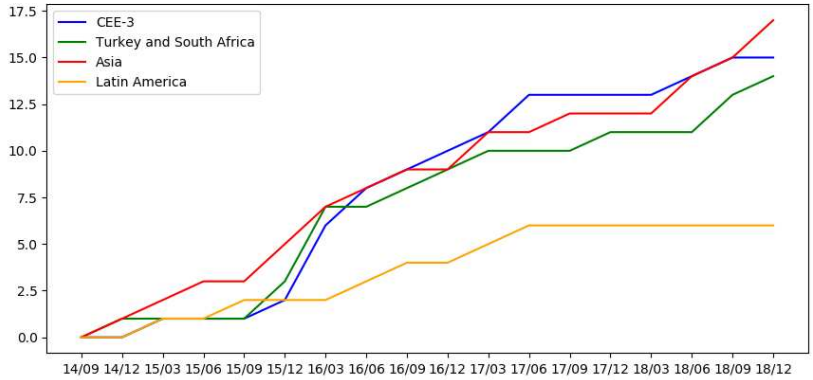
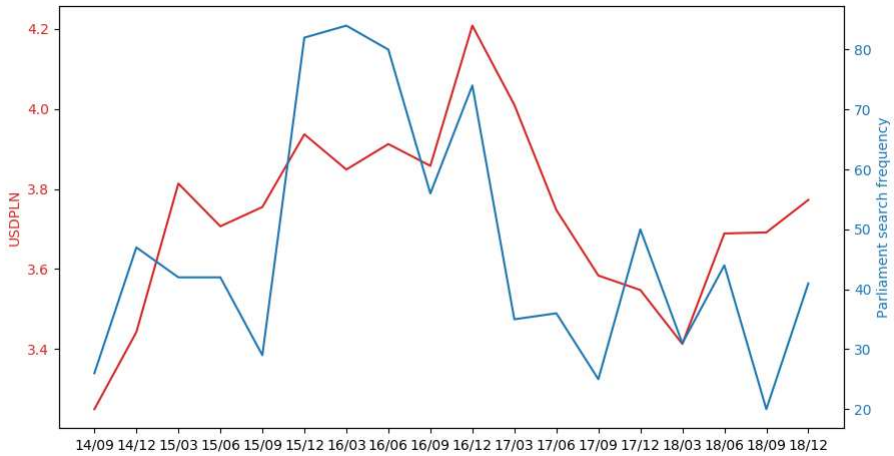


Figure 6: Macroprudential policy indices by country groups



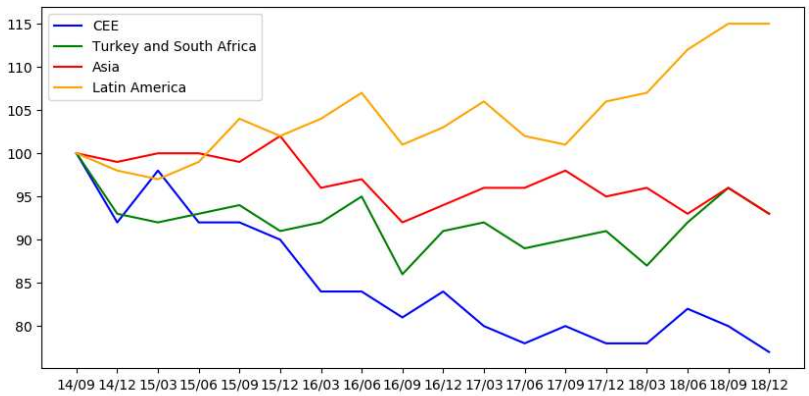
Source: IMF, central banks and financial regulators, calculations based on Carreras et al. (2018).

Figure 7: Frequency of search for *parliament* phrase in Poland and the exchange rate of the Polish zloty versus the US dollar



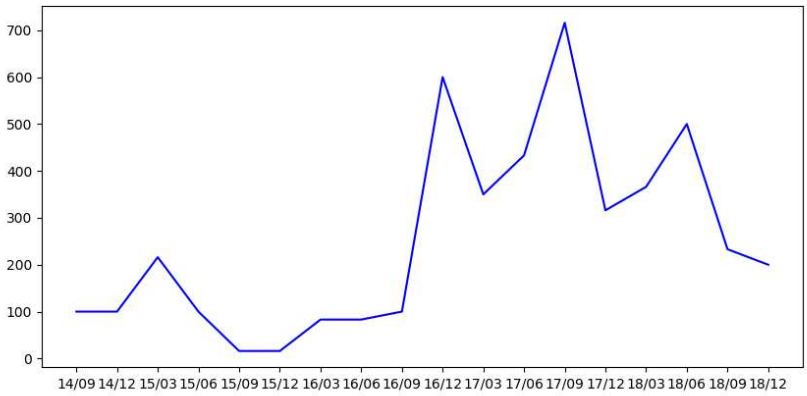
Source: Bloomberg, Google Trends.

Figure 8: Risk perception indices $RISK^t$ by country groups, September 2014 = 100



Source: Google Trends, calculations based on Baker et al. (2016).

Figure 9: ECB monetary policy stance ECB^t, September 2014 = 100



Source: Google Trends.

Figure 10: Event study results for fixed income market across time (monthly averages)

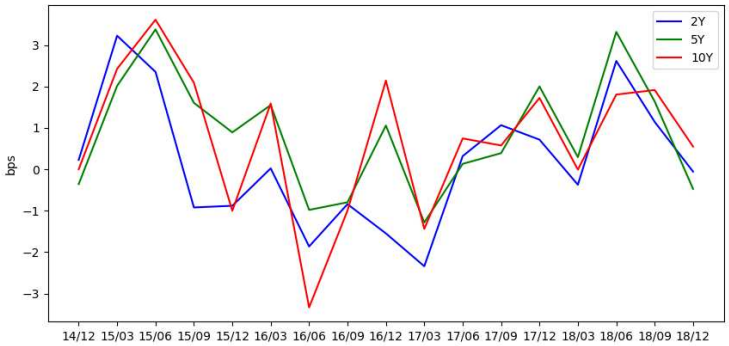


Figure 11: Event study results for the exchange rates and equity prices across time (monthly averages)

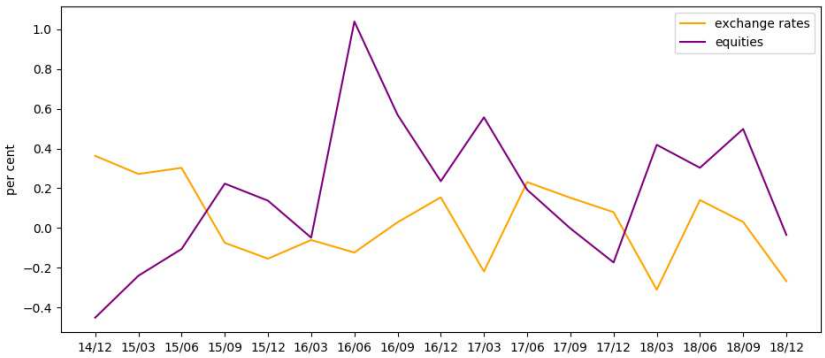
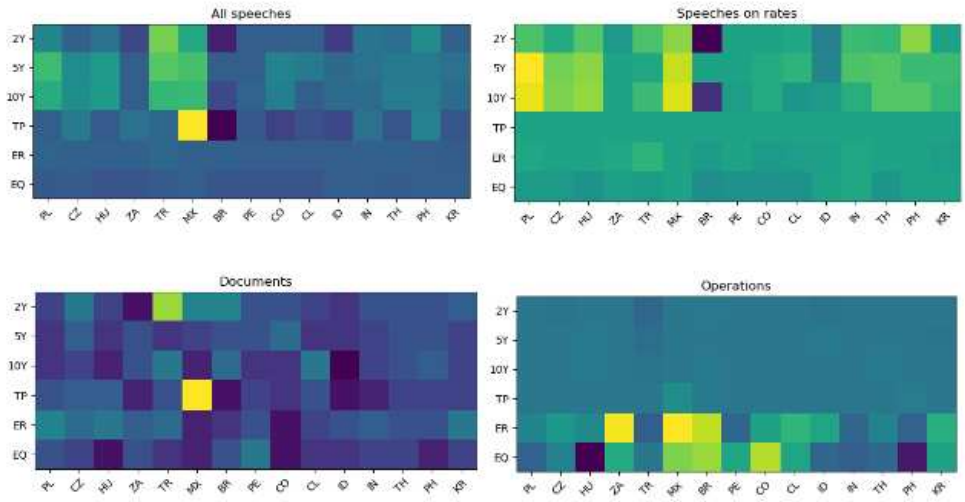


Figure 12: Event study results (in number of standard deviations)



Note: Yellower hue indicates a larger impact of Fed tightening, while bluer – smaller. This means that the yellower the colour, the greater the rise in yields, depreciation of the currency or fall in stock market prices in response to Fed tightening.

B Tables

Name of variable	Source	Adnotation
2Y gvt bond yields	Bloomberg	NA for Colombia
5Y gvt bond yields	Bloomberg	NA for Brazil and S. Africa
10Y gvt yields	Bloomberg	not available for S. Africa
term premia	own calculations	-
exchange rates	Bloomberg	-
stock indices	Bloomberg	-

Table 1: Financial data sources and limitations

Speaches overall	859
mentioning tightening	505
of which market movers	209
mentioning only rates	292
of which market movers	134
Documents overall	69
statements	35
of which market movers	18
minutes	34
of which market movers	17
Operations	6
of which market movers	3

Table 2: Characteristics of speeches, documents and operations studied

EM economy	US	Germany	Japan
Poland	0.46	0.86	0.82
Czechia	0.64	0.91	0.89
Hungary	0.32	0.80	0.79
Turkey	0.60	0.47	0.55
S. Africa	0.60	0.37	0.41
India	0.13	0.39	0.23
Indonesia	0.57	0.64	0.70
Philippines	0.42	0.57	0.52
Thailand	0.57	0.73	0.80
S. Korea	0.69	0.96	0.92
Brazil	0.10	0.24	0.28
Chile	0.53	0.88	0.76
Colombia	0.67	0.79	0.81
Peru	0.37	0.32	0.38
Mexico	0.52	0.31	0.42

Table 3: Correlation coefficients between 5-year term premia

	CEE-3	TR+ZA	LATAM	ASIA	speeches	docs	oper.
2Y	0.48	0.86	-0.08	-0.27	1.03	0.53	0.73
5Y	1.19	1.20	0.84	0.12	2.20	-0.63	-0.90
10Y	1.23	1.16	0.33	0.34	2.25	-0.93	0.00
TP	0.00	-0.01	0.00	0.00	0.00	-0.03	-0.12
ER	0.06	0.09	0.02	-0.03	0.12	0.29	-0.25
EQ	0.31	0.28	0.06	0.23	0.28	0.06	1.38

Table 4: Event study average results across country groups and events

	2Y	5Y	10Y	ER	EQ
$\aleph$	0.00	0.00	0.00	0.00	0.00
	(0.01)	(0.02)	(0.02)	(0.74)	(0.70)
τ	0.07***	0.07***	0.08***	0.97	1.29
	(0.01)	(0.02)	(0.02)	(0.75)	(0.70)
υ	-0.06***	-0.06***	-0.07***	-0.85	-0.91
	(0.01)	(0.02)	(0.03)	(0.75)	(0.69)
ψ	0.57	0.24	0.54	-0.11	-0.28
	(1.25)	(2.78)	(2.40)	(2.47)	(2.75)
ϕ	0.44	-0.11	-0.65	0.15	-0.73
	(1.28)	(2.79)	(2.44)	(2.49)	(2.76)
ϕ	0.00	0.00	0.00	0.00	0.00
	(1.19)	(2.75)	(2.32)	(2.34)	(2.69)

Table 5: Estimation results for equation (9)

	2Y	5Y	10Y	ER	EQ
GDP^t	-0.19	-0.48	-0.02	0.00	-0.08
	(0.01)	(0.28)	(0.47)	(0.02)	(0.06)
CPI^t	0.81***	0.75***	0.75***	-0.04***	-0.06*
	(0.15)	(0.17)	(0.22)	(0.01)	(0.04)
$FISC^t$	-0.13	-0.38	-0.78*	0.01	0.06
	(0.30)	(0.50)	(0.42)	(0.02)	(0.05)
CA^t	-0.52***	-0.41	-0.41*	0.00	0.06*
	(0.17)	(0.50)	(0.21)	(0.01)	(0.03)
RES^t	-1.08	-0.96	-1.07	0.00	0.18
	(1.03)	(1.02)	(1.37)	(0.07)	(0.19)
$LOAN^t$	-1.05	-1.30	-2.43	-0.03	0.16
	(1.38)	(1.19)	(1.62)	(0.09)	(0.23)
INT^t	-0.06	0.13	-0.17	0.07	-0.02
	(0.61)	(0.74)	(1.04)	(0.04)	(0.12)
$MACROPRU^t$	0.08*	0.06	-0.04	0.07**	0.02**
	(0.04)	(0.04)	(0.05)	(0.01)	(0.01)
IR^t	0.52***	0.59***	0.54***	-0.02	-0.05***
	(0.36)	(0.08)	(0.11)	(0.01)	(0.02)
$RISK^t$	-0.40	-1.34	2.64	0.13	-0.39
	(3.59)	(3.99)	(5.42)	(0.29)	(0.75)
ECB^t	0.00	-0.02	-0.02	0.00	0.01
	(0.03)	(0.03)	(0.05)	(0.01)	(0.01)

Table 6: Estimates of β_i^t for equation (6) – all EMs

	2Y $R^2 = 0.52$	5Y $R^2 = 0.52$	10Y $R^2 = 0.52$	ER $R^2 = 0.46$	EQ $R^2 = 0.40$
GDP^t	0.20	-0.08	0.26	-0.02	0.05
	(0.35)	(0.52)	(0.59)	(0.03)	(0.07)
CPI^t	-0.54	-1.13	-1.29*	-0.07	0.02
	(0.56)	(0.65)	(0.81)	(0.05)	(0.12)
$FISC^t$	0.72	-0.51	0.09	0.01	-0.02
	(0.43)	(0.57)	(0.55)	(0.03)	(0.08)
CA^t	-0.13	0.11	0.16	-0.01	0.03
	(0.23)	(0.27)	(0.36)	(0.02)	(0.04)
RES^t	-1.23	-0.46	-0.62	-0.03	-0.02
	(1.20)	(1.38)	(1.74)	(0.09)	(0.38)
$LOAN^t$	3.06*	0.91	-0.95	-0.17	-0.02
	(1.87)	(1.79)	(2.55)	(0.14)	(0.38)
INT^t	0.25	1.81	1.72	0.07	-0.09
	(0.71)	(1.23)	(1.73)	(0.05)	(0.14)
$MACROPRU^t$	0.03	0.05	0.01	0.00	0.00
	(0.05)	(0.05)	(0.07)	(0.01)	(0.01)
IR^t	1.09***	1.59	1.62	0.00	-0.05
	(0.37)	(0.44)	(0.52)	(0.02)	(0.08)
$RISK^t$	-1.65	0.47	-1.26	0.18	-0.37
	(4.52)	(4.52)	(6.49)	(0.31)	(0.83)
ECB^t	0.00	-0.01	-0.01	0.00	0.01
	(0.03)	(0.03)	(0.05)	(0.01)	(0.01)

Table 7: Estimates of β_i^t for equation (10) – all EMs

	2Y	5Y	10Y	ER	EQ
GDP^t	1.17	0.16	2.69	0.07	-0.07
	(0.97)	(1.49)	(2.47)	(0.08)	(0.14)
CPI^t	1.28***	0.39	0.90**	-0.06***	-0.04
	(0.20)	(0.29)	(0.35)	(0.02)	(0.04)
$FISC^t$	-0.34	-0.83	-1.45	0.03	0.00
	(0.96)	(0.80)	(1.70)	(0.07)	(0.13)
CA^t	-0.98***	-0.42	-0.84	0.04*	0.05
	(0.29)	(0.30)	(0.53)	(0.03)	(0.05)
RES^t	-5.24***	-2.78	-5.01	0.29*	0.34
	(1.94)	(1.63)	(3.21)	(0.53)	(0.31)
$LOAN^t$	-6.99	-6.49*	-8.19	0.52	0.30
	(4.61)	(3.65)	(7.92)	(0.34)	(0.66)
INT^t	-1.11	-3.62*	-5.75	0.15*	0.05
	(1.10)	(2.04)	(4.09)	(0.07)	(0.15)
$MACROPRU^t$	1.19***	-0.17***	0.10	0.01*	0.00
	(0.07)	(0.06)	(0.11)	(0.01)	(0.01)
IR^t	0.93***	0.31***	0.72***	-0.04***	-0.05*
	(0.11)	(0.11)	(0.18)	(0.01)	(0.02)
$RISK^t$	-2.02	0.68	6.48	0.94*	-0.10
	(7.70)	(5.62)	(12.03)	(0.57)	(1.12)
ECB^t	0.00	-0.03	-0.02	0.00	0.01
	(0.01)	(0.04)	(0.11)	(0.01)	(0.01)

Table 8: Estimates of β_i^t for equation (6) – CEEMEA economies
Note: *CEEMEA – Poland, Czechia, Hungary, South Africa and Turkey.*

	2Y $R^2 = 0.51$	5Y $R^2 = 0.50$	10Y $R^2 = 0.52$	ER $R^2 = 0.37$	EQ $R^2 = 0.58$
GDP^t			0.20 (0.49)		
CPI^t	0.95*** (0.35)				
$FISC^t$	-0.12 (0.21)				
CA^t	-0.12 (0.21)			-0.02 (0.02)	0.02 (0.03)
RES^t	-0.82 (1.10)				
$LOAN^t$	2.52* (1.50)			-0.17 (0.14)	
INT^t	-0.06 (0.61)	1.48** (0.67)	1.17 (1.06)	0.06 (0.05)	-0.06 (0.11)
$MACROPRU^t$	0.08* (0.04)		0.01 (0.07)		
IR^t	1.02*** (0.34)	1.54*** (0.41)	1.49*** (0.46)		-0.04 (0.02)
$RISK^t$					
ECB^t					

Table 9: Estimates of β_i^t for equations with optimum fit – all EMs

	2Y	5Y	10Y	ER	EQ
GDP^t	-0.51***	0.24	-1.49***	-0.02*	-2.37***
	(0.18)	(0.29)	(0.29)	(0.01)	(0.13)
CPI^t	0.81***	1.11***	1.27***	0.07***	1.22***
	(0.35)	(0.15)	(0.19)	(0.01)	(0.12)
$FISC^t$	-0.62***	-0.57*	-0.78*	0.00	-1.05***
	(0.19)	(0.34)	(0.42)	(0.01)	(0.12)
CA^t	-0.73***	-0.61***	-0.72***	0.01	0.03
	(0.12)	(0.10)	(0.14)	(0.01)	(0.04)
RES^t	-0.68	1.27*	-1.30	-0.04	-1.58***
	(0.67)	(0.68)	0.93	(0.05)	(0.07)
$LOAN^t$	2.90***	-2.69***	3.84***	-0.09	2.67***
	(0.97)	(0.83)	(1.13)	(0.06)	(0.68)
INT^t	-0.06	-0.09	-0.04	0.10***	-0.99*
	(0.61)	(0.51)	(0.06)	(0.03)	(0.47)
$MACROPRU^t$	0.08*	0.06	-0.04	0.02*	1.73***
	(0.04)	(0.04)	(0.06)	(0.01)	(0.09)
IR^t	0.67***	0.80***	0.84**	-0.03***	-1.23***
	(0.08)	(0.09)	(0.11)	(0.01)	(0.10)
$RISK^t$	0.85	-2.18	8.65	0.13	1.35
	(2.48)	(2.91)	(3.61)	(0.18)	(1.81)
ECB^t	-0.01	-0.02	-0.04	-0.02***	-1.85***
	(0.02)	(0.02)	(0.03)	(0.01)	(0.10)

Table 10: Estimates of β_i^t for equation (10) – all EMs

	2Y	5Y	10Y	ER	EQ
GDP^t	0.12	0.31	-0.53*	-0.02	0.07**
	(0.20)	(0.27)	(0.29)	(0.05)	(0.04)
CPI^t	0.54***	-0.08	0.23	0.02	0.02
	(0.13)	(0.13)	(0.19)	(0.01)	(0.03)
$FISC^t$	-0.54***	-0.22	-0.18	0.00	-0.08**
	(0.20)	(0.25)	(0.28)	(0.05)	(0.04)
CA^t	0.16*	-0.10	-0.11	0.01	-0.01
	(0.10)	(0.08)	(0.14)	(0.01)	(-0.02)
RES^t	-1.17*	-0.48	-0.83	0.09	-0.10
	(0.64)	(0.49)	0.93	(0.10)	(0.12)
$LOAN^t$	1.63**	-0.05	1.03	0.11	0.09
	(0.80)	(0.59)	(1.13)	(0.22)	(0.15)
INT^t	-0.66*	-0.38	-0.04	0.03	-0.06
	(0.40)	(0.41)	(0.06)	(0.04)	(0.08)
$MACROPRU^t$	0.14***	-0.01	-0.04	0.00	0.00
	(0.05)	(0.08)	(0.06)	(0.01)	(0.01)
IR^t	0.35***	-0.01	0.31**	0.01	0.02
	(0.08)	(0.09)	(0.12)	(0.01)	(0.02)
$RISK^t$	1.64	-0.53	-3.36	0.54	0.02
	(2.55)	(2.21)	(3.61)	(0.37)	(0.49)
ECB^t	-0.01	-0.02	0.00	0.00	0.00
	(0.02)	(0.02)	(0.03)	(0.01)	(0.00)

Table 11: Estimates of β_i^t for equation (11) – all EMs