“Information and pure monetary policy shocks in monetary policy surprises: transmission of U.S. monetary policy to Emerging Markets and implications for the banking sector”

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Information and pure monetary policy shocks in monetary policy surprises: transmission of U.S. monetary policy to Emerging Markets and implications for the banking sector

by

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DEDICATION

To my family. Thanks for your constant love and support.

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ABSTRACT

Chapter 1 analyzes how monetary policy surprises in the U.S. affect emerging market economies (EMs) by focusing on the transmission through the real exchange rate (RER) and country spreads (EMBI). To do so, I disentangle U.S. interest rate movements between both a pure monetary policy shock and an information shock; while the former is constructed based on high-frequency movements of interest rates around Federal Open Market Committee (FOMC) announcements, the latter builds from employment releases. I quantify the relative impacts using a structural VAR (SVAR) model with external instruments. The results suggest that a pure monetary policy shock produces a persistent appreciation of the RER in the U.S. coupled with an increase of the EMBI, which induces contractionary effects in the real sector of EMs. In contrast, an information shock does not necessarily produce such contractionary effects in EMs. These results contribute to the literature by identifying the specific drivers behind Fed announcements and its transmission channels to EMs.

Chapter 2 analyzes how monetary policy surprises in Chile affects the real and financial sector separating between the same shocks related to monetary policy interest rate mentioned in Chapter 1. Using inter-day movements of futures of interest rate in the banking system, we identify an information shock when labor data is released and a pure monetary policy shock when the central bank reveals their interest rate decision, and their effects are quantified through an external vector autoregression model. Our results suggest that a pure monetary policy shock produce an appreciation of nominal exchange rate, and contractionary effects on the economy. However, an information shock does not necessarily produce adverse effects. This paper contribute to the literature in two dimensions: studying the effect of the main driver behind the central bank announcements, and their transmission to the banking sector and consequently to the real and monetary sector.

CHAPTER 1

Global Monetary Policy Surprises and Their Transmission to Emerging Market Economies: An External VAR Analysis

1.1 Introduction

Increases in the interest rate controlled by U.S. monetary policy (the federal funds rate) have important spillover effects in emerging economies, with sizable consequences in the financial and real sectors ([16], [12], [32]). In this context, the question of which specific drivers causes the federal funds rate movement and which transmission mechanisms is responsible for global financial tightness becomes crucial for emerging markets (EMs).

Interestingly, prior research has typically focused on the effect of a "general shock" to the U.S. federal funds rate and its aggregate transmission to EMs; nonetheless, there could be several alternative variables explaining the same identified "general shock" to monetary policy, with different effects depending on the original driver. Many studies suggest that the impact of a monetary policy rate hike driven by a booming economy is different than if the increase in this rate is originated by an inflation shock ([20], [29]). Additionally, regarding the transmission mechanism to EMs, the literature has focused on specific channels, such as mutual fund investments, capital flows, economic activity, among others, and only considering the "general shock". Therefore, without considering the relevant channels and impact of the effective drivers behind the Federal Reserve (Fed) announcements. Understanding these transmission mechanisms acquires greater relevance for EMs since as documented by [22], there has been a dramatic change pattern over time between the exchange rate and the risk aversion channel after aggressive U.S. rate hikes. They find that prior to the 1990s, the U.S. dollar appreciated in response to increases in the U.S. rate, with negative effects on the real and financial sectors, as predicted by textbook open economy models. However, in the past decades a shift has emerged. Specifically, increases in the U.S. interest rate depreciates the U.S. dollar but stimulates the global economy.

Research efforts to date to properly identify the impact of monetary policy shocks (in other words, "pure identification" of the drivers behind Fed announcements) have led to a renewed interest in proxy structural vector autoregressive (SVAR) models. These models make use of high-frequency movements of variables in response to these announcements to capture the specific driver behind the shock of interest (see [17], [23])[1]. However, a Fed announcement could reveal both a "pure monetary policy shock" (related to surprises in the market due to the private information of the central bank) and an "information effect" (related to exogenous information about the state of the economy) with mixed effects on other macroeconomic variables. Thus, both components need to be considered in the international transmission of U.S. monetary policy shock.

[1] In particular, [17], and [23] analyze the high-frequency movements in the current month's Fed Funds futures (FF1) and the three month ahead monthly Fed Funds futures (FF4).

This paper aims to analyze how monetary policy surprises in the U.S. affect emerging market economies – in particular, by separating the information to the pure monetary policy component behind the Fed announcement. To do so, I study how the market reacts in a daily window, after labor data releases (information shock) and FOMC announcements (monetary policy shock) using the three-month ahead monthly Fed Funds futures (FF4) as in [29]. I postulate that the effects of an unexpected monetary policy tightening may have different effects on domestic and foreign economies depending on the underlying reason for the shock.

Using an external instrument VAR approach for the U.S. and including an external block with EMs variables, two main results emerge. First, a monetary policy surprise related to a pure monetary policy shock has contractionary and persistent effects for EMs. This result is in line with other studies that argue that after a pure shock there is an increase in global uncertainty, risk aversion, fears of recession, and capital outflows from riskier economies to safe economies, with negative spillovers to EMs. Second, an information shock has less adverse effects on foreign economies, implying that when there is a global financial tightening related to the "good reasons", the effect on the country spread and activity on EMs can be favorable[2].

These findings are consistent with an "outlook-at-risk" quantitative approach (O@R). Applied to monetary policy surprises, an O@R approach should reflect different risks if the economy is affected by pure monetary policy shocks or information shocks. To quantify these risks, I analyze the GDP forecast dispersion of different analysts around FOMC announcements (pure monetary policy shock) and employment releases (information shock). I obtain that when pure monetary policy shocks occur, downside risks on the economic outlook are more pronounced compared to when information shocks occur, reflecting greater uncertainty and volatility about future economic outcomes in the case of monetary policy shocks.

Although various authors have tried to quantify this phenomenon relating to different shocks on EMs, their methodologies present challenges when isolating the drivers, generating a great dispersion in their results. Unlike previous research, this paper use external instruments to capture the main drivers of the Fed announcement. By including these two components (pure monetary policy shock and information shock) behind the U.S. federal funds rate movement, it is possible to avoid contaminating the analysis with different types of drivers behind the interest rate movement. In addition, the transmission channels to the real and financial sector are studied. In particular, I solve some counter-intuitive results found in previous research, like the dynamic effect of the U.S. dollar and financial variables after aggressive U.S. interest rate hikes. My method exploits the intuition that global fi-

[2] A number of contributions demonstrate that an upward revision to the current state of the economy or a positive news about U.S. employment has positive effects on the economy (see e.g. [20], [14]).

nancial tightness could have different effects on EMs depending on the specific origin of the shock.

This paper is organized as follows. Section 2 highlights the importance of monetary policy surprises to EMs, and present historical spillovers from global financial tightening associated with aggressive increases in the federal funds rate. Section 3 discusses the methodology, construction of the external instruments, and the data. Section 4 reports the result of the impulses response, and Section 5 discusses the key findings.

1.2 Recent developments and lessons from the past

1.2.1 A general view and stylized facts

Monetary policy related Federal Reserve announcements are events of great importance for EMs. For example, a significant episode occurred during the "Taper Tantrum" in 2013, when Federal Reserve Chairman Ben Bernanke spoke about the possibility of the central bank reducing its bond purchases. This announcement had a strong negative effect on financial conditions in emerging markets economies, leading to significant movements in their exchange rates, spreads, and stock prices and consequently affecting the real and monetary sector. The event itself, as other announcements of the Fed, help to explain why the U.S. monetary policy communication and market surprises issues have become more prominent in recent literature contributions and policy discussions (see [34], [9] and [33]).

The literature has documented that spillovers from increases in the federal funds rate in EMs occur, in general, through two main and related channels: risk aversion and the exchange rate. The risk aversion channel considers that, given uncertainty, investors will take refuge in safe assets to the detriment of riskier assets, generating movements in capital flows and, therefore, increasing EMs' country spreads, which is also considered as a leading indicator of the economic cycle ([37]). The exchange rate channel considers that an appreciation of the dollar, caused by the increase in interest rates in the U.S., would imply capital outflows from emerging economies, causing contractionary effects to the global economy. Although these channels feed back, local conditions or vulnerabilities could mitigate or accelerate the negative effects of tightening financial conditions ([21]).

In Figures 1.1 and 1.2 present data on historical spillovers to EMs'economies from global financial tightening associated with aggressive increases in the federal funds rate[3]. Two main stylized facts emerge with great importance to the U.S. and EMs. First, aggressive

[3]Say, of the order of more than 50 base points, which is an outlier on average U.S. monetary policy decisions.

U.S. interest rate hikes did not produce a clear appreciation or depreciation of the dollar. This is consistent with the findings of [22], who found that there is no clear pattern of the U.S. dollar after Fed rate hikes. In fact, contrary to conventional wisdom and textbook open economy models, there are some episodes where U.S. interest rate increases produced a depreciation of the dollar with positive spillovers to foreign economies. This is evidenced by events in 1988, 1994, 1999, 2004, and 2016 where aggressive rate hikes did not produce either a clear appreciation or depreciation (Figure 1.1).

Another counterintuitive result following U.S. interest rate increases is related to the risk aversion channel, as presented in Figure 1.2. Looking at the 2004 and 2016 episodes, the global uncertainty (VIX) and the country spread (EMBI) of Brazil, Colombia, and Mexico show a downside pattern after the Fed's aggressive rate hikes during those periods, which appears counterintuitive since the country spread reflects uncertainty and risk of an economy. This risk measure, as is widely used in the literature, corresponds to the difference in the average yield of the sovereign securities of a country compared to the yield of the U.S. Treasury bond, encompassing both the public and private sectors of a country. Thus, intuition indicates that an aggressive federal funds rate increase leads to riskier foreign economies since, in addition to experiencing capital outflows, they face a higher rate differential as a result of the Fed increase.

This evidence suggests that another factor (or factors) influencing the real exchange channel and risk aversion channel may still need to be accounted for.

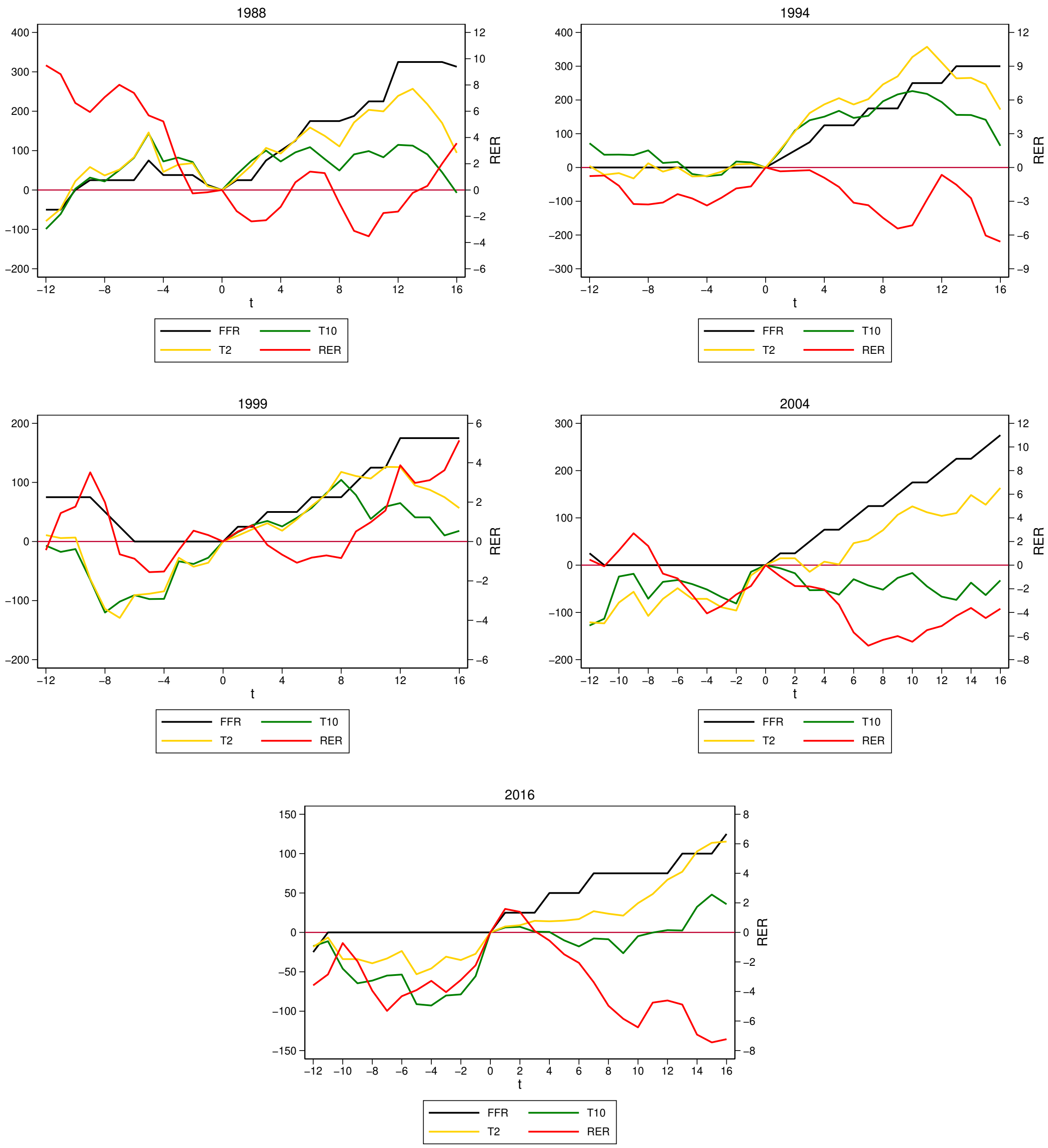

Figure 1.1: Fed-tightening-cycle effect on interest rates and real exchange rate

Notes: Fed-tightening cycle is between 8 and 12 months after the announcement. Solid lines represent the difference of the variable of interest and the period that the Fed cycle tightening starts (t). Variables included: Fed funds rate, 2- and 10-year Treasury, and real exchange rate. Interest rates and real exchange rate are measured in b.p. and p.p., respectively.

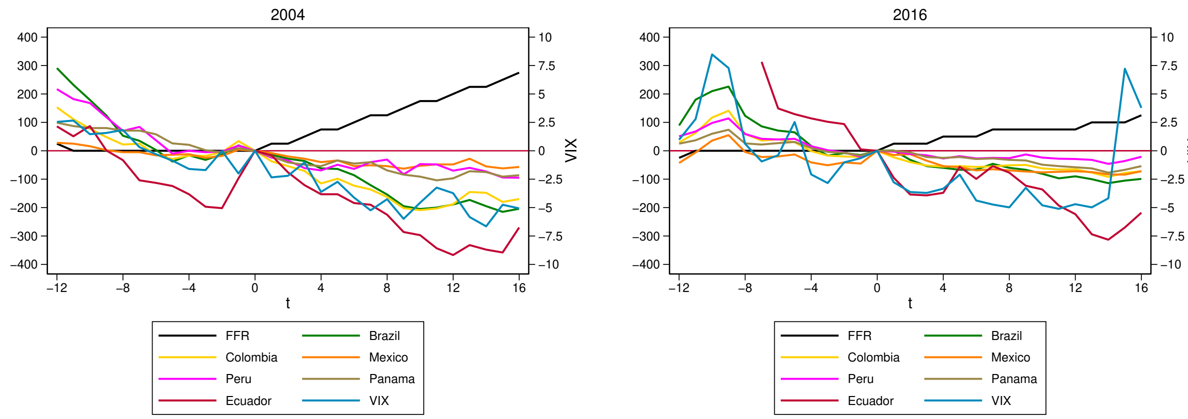

Figure 1.2: Fed-tightening-cycle effect on interest rates, VIX, and EMs spread

Notes: Fed-tightening cycle between 8 and 12 months after the announcement. Solid lines represent the difference of the variable of interest and the period that the Fed cycle tightening starts (t). Variables included: the Federal funds rate, VIX index, and EMBI. The Federal funds rate, EMBI, and VIX are measured in b.p. and p.p., respectively.

1.2.2 Recent evidence

Vector autoregressive models has been used regularly to investigates the international spillovers effects of U.S. monetary policy, which is a topic that has received increased attention in recent years. The seminal work on this subject is by [13], who analyzed the effect of conventional monetary policy on exchange rates.

Since the development of external macroeconomic instruments that capture the specific drivers of a shock, as in [35] and [27], the profession has begun to take advantage of these tools to capture the effects of conventional and unconventional policies. More recently, authors such as [12], [10], and [7] combine high-frequency identification techniques around major macroeconomic events (like monetary policy meetings) to identify structural VAR models to capture the effects of conventional and unconventional policy shocks on domestic and foreign interest rates, as well as other economic and financial variables. In these models, the details that matter are not the monetary policy decisions specifically but the new information about what the Fed is going to do in the future.

Numerous authors, such as [16], highlight the importance of U.S. monetary policy for emerging economies, partly explaining the fluctuations in the growth cycle as well as the financial effects. The literature generally documents that global spillovers not only have asymmetric effects on EMs but also that their effects depend on the type of shock that causes the contractive cycle of monetary policy – and specifically on whether the event generates a surprise in the market. If the monetary policy rate announcement is immediately accompanied by a significant reaction in the market (for example, through movements in rate futures or expectations associated with the monetary path) it would cause more persistent effects on emerging economies. In line with this phenomenon, [28] document the tendency of analysts to change their growth projections higher in response to unforeseen increases in real yields, which are interpreted as proof of the information effect.

Regarding specific channels of monetary policy transmission to EMs, [10] analyze international mutual fund investments and the effects of monetary policy surprises. Using partially least squares, they obtain a pure monetary policy shock (that captures a sudden shift in the monetary policy that is orthogonal to change in the economic outlook) and an informational shock (that captures the changes in the FOMC's economic outlook) and find that an increase in the interest rate driven by a pure shock leads to large and persistent outflows from EMs. On the other hand, increases in monetary policy driven by positive information about the current state of the economy do not cause outflows from EMs.

Similarly, [21] study the impact of monetary policy on activity in advanced economies (AEs) and EMs and find that EMs experience larger declines than AEs after pure monetary policy shocks. Yet, a rise in the monetary policy rate could have less adverse effects if the underlying driver is related to an upward revision of the current state of the economy. Using a sign restriction identification, the results of [20], [32], and [3] suggest that tightness of financial conditions due to increases in the federal funds rate imply a significant depreciation of currencies in EMs, with large effects on CDs, bond yields, stock prices, and the real sector. Yet, they find that higher U.S. rates in response to expectations of stronger U.S. growth have less adverse spillovers to EMs.

However, until now, very few studies have used external instruments to quantify the specific drivers behind Fed announcements and their effects on foreign economies. Moreover, so far, very little research has explored the counterintuitive movements of the real exchange rate and country spreads after aggressive U.S. interest rate hikes mentioned in the previous subsection. To the best of my knowledge, the specific drivers behind central bank announcements – information shocks and pure monetary policy shocks – still need to be examined for the U.S. interest rate spillovers to EMs. I fill this gap by proposing a methodology that captures both components by exploiting the fact that central bank announcements and employment data are released on different days within a month. This approach is described in the next section.

1.3 Methodology and data

1.3.1 Empirical model

The econometric framework I implement is based on a VAR model with two external instruments to capture the shocks related to monetary policy surprises[4]. The assumption of external instruments in a VAR is a variant of the methodology developed by [35] and [27]. My approach exploits the intuition about information from a variable that is external to the VAR but that is correlated with a particular shock of interest and uncorrelated with other shocks (the instrument). In this subsection, the procedure is described:

As in [17], consider Y_t a vector that contains economic and financial variables, A and C_j $\forall i \geq 1$ coefficient matrices and ϵ_t the shocks associated. Then, the structural form of the VAR model would be:

$$AY_t = \sum_{i=1}^{p} C_i Y_{t-i} + \epsilon_t \tag{1.1}$$

where I include an external block corresponding to the EMs variables. Then, if pre-multiplying by A^{-1} the reduce form is obtained:

$$Y_t = \sum_{i=1}^{p} B_i Y_{t-i} + u_t \tag{1.2}$$

where the residuals u_t contain both the information shock and pure monetary policy shock and are mean zero with covariance matrix Ω=E$[u_t u_t]$. Let's consider the column a of A^{-1}, which corresponds to the impact on each element of the structural policy shock ϵ_t^p (which also includes the monetary policy shock and the information shock). Since I am interested in the impulse response of the external instrument shocks, I need to estimate:

$$Y_t = \sum_{j=1}^{p} B_j Y_{t-j} + a_k^{-1} e_{k,t} \tag{1.3}$$

where the first column of a_k are the parameters of interest that quantify the impact of the monetary policy shock or the information shock (e_k).

In order to identify the parameters, as in [17], [27], and [24], two key assumptions need to be satisfied: a relevance and an exclusion condition. Let Z_t be a vector of instrumental variables and ϵ_t^{iv} a vector of shocks that only include the monetary policy shock. To obtain a valid instrument set for shock-related instrumental variables, Z_t must be correlated with

[4] Pure monetary policy shock and information shock, which are described in more detail in section 3.2.

ϵ_t^{iv} (relevance condition) but orthogonal to any other structural shock (exclusion condition):

$$E(Z_t \epsilon_t^{iv}) = \lambda \tag{1.4}$$

$$E(Z_t \epsilon_t^{q}) = 0 \tag{1.5}$$

where ϵ_t^q is a column vector that includes any other shock except the monetary policy one. Then, as we exclude days when labor data releases are coincident with FOMC announcements to obtain the impulse response to the information shock, the procedure is the same as in the single shock case.

Other approaches used in the literature to identify this phenomenon include the use of sign restrictions on the effect on the variables caused by the shock ([32], [20], [10]). However, there are two major disadvantages associated with this methodology when applied to this context and specific research question. First, a pure monetary policy (information) shock , which due to sign restrictions has negative (positive) effects on economic activity, may be due to a set of factors that generate the same phenomenon, including oil, foreign activity, or variables external to the model that are quantified in the shock. Second, depending on the vulnerabilities that an economy faces, an information shock that, by construction, has positive effects on the stock market would go against the literature associated with rate hikes leading to increases in the discounted interest rate for future dividends. Implying negative effects on the stock market even if this rate increase is for "good reasons". ([5], [21]).

The econometric framework that I use is not based on the assumptions mentioned above. Rather, it assumes that the monetary policy shock does not occur beyond the FOMC announcement. As in [29] and [24], this hypothesis allows for the use of changes in expected official rates measured close to the main macroeconomic event as an external tool for exogenous changes in the systematic component of monetary policy only. Then, a proxy SVAR approach allows for the isolating of the effect of FOMC information shocks from the effects of monetary shocks, both of which provide interest rate surprises around the FOMC announcement.

1.3.2 Identification method to extract monetary policy shocks

The first instrument used to extract pure monetary policy shocks is the change in the federal funds rate futures, three months out (FF4) in a one-day window around the FOMC announcement. As in [29], this instrument captures the change in the expected average banking system rate level over the third calendar month out from the day of the announcement – a horizon that typically also covers the following central bank meeting and thus captures near-term forward guidance (see [17] and [23]).

The second instrument is the same banking interest rate change (FF4), but it is calculated around the unemployment rate releases (information shock). In order to separate the information to the monetary policy shock and avoid biased results, we exclude the days where the unemployment rate release coincides with central bank announcements. The idea behind these external instruments is that in a small window of time around FOMC announcements or labor data releases there are unlikely to be other events that significantly affect the market expectations of future interest rates ([24]).

Equation 6 describes the construction of both instruments, where q_i corresponds to the pure monetary policy or information shock, "j'' is the day, and "t'' is the month.

$$iv_t^{q_i} = FF4_j - FF4_{j-1} \tag{1.6}$$

Figure 1.3 provides the time series of external instrument surprises, where clear episodes are observed when the FOMC announcement or unemployment rate releases shock market expectations. For example, in 2005 and 2008 episodes, our instruments fluctuated in the order of 20 basis points.

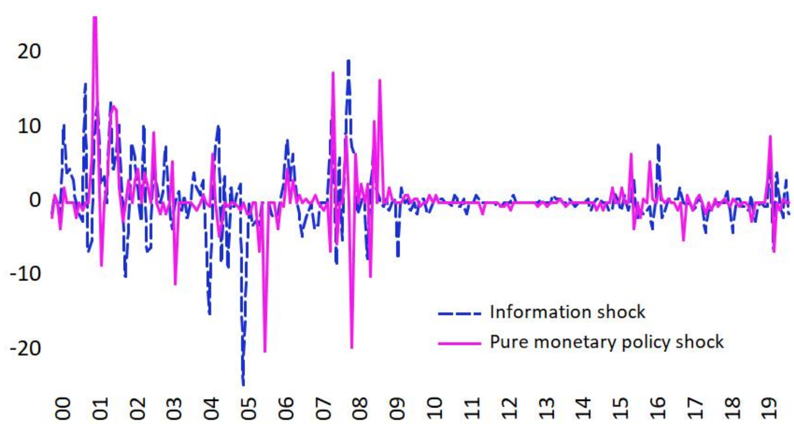

Figure 1.3: Historical instruments movements

Notes: The monetary policy and information shock are shown at monthly frequency (2000-2019) in basis points. The monetary policy shock corresponds to the change in the federal funds rate future, three months out (FF4) in a one-day window around the FOMC announcement. The information shock corresponds to the change in the federal funds rate futures, three month out (FF4) in a one-day window around unemployment rate releases

1.3.3 Data

The vector Y_t consider in my paper contain macroeconomic and financial variables for U.S. and EMs, between 2000 and 2019 at monthly frequency. The baseline model includes eight variables: for U.S., the fed fund rate (FFR), personal consumer expenditure (PCE), industrial production (IP), real exchange rate (RER), VIX, $S\&P$ 500 index, and for emerging market economies, the country spread (EMBI) and industrial production (EMsIP), both of are purchasing power parity weighted. We use a VAR model with two lags in natural logarithms of all variables except FFR and VIX. To maintain the assumption that monetary policy shocks do not enter into these labor-market-news-related interest rate surprises, we exclude the days where releases, FOMC meetings, and labor data coincide. The countries included in this research are Brazil, Colombia, Panama, Ecuador, Mexico, and Peru.

1.4 Results

In this section, I present the dynamic response to the federal funds rate shock for U.S. and EMs variables, which are divided in two topics. First, the aggregate results are presented estimating the domestic and foreign spillovers of monetary policy surprises, separating between the pure monetary policy and information shock. Second, I support my results by a robustness analysis that includes other interest rate surprises as instruments and a sign restriction identification to compare the main results.

1.4.1 Spillovers of U.S. monetary policy surprises to emerging market economies

Figures 1.4 and 1.5 show the impulse response over three years of personal consumer expenditure, real exchange rate, VIX, S&P500, country spread, and industrial production in EMs to a 10 b.p. pure Fed monetary policy shock and an information shock. I measure the dynamic response in the other variables in percentage points, and the dotted lines denote 68% confidence intervals that are based on robust standard errors following [27] and [28]. Also, to check that the instruments are relevant, I present the first stage F-statistic, which indicates that if the value is lower than 10, we are in the presence of a weak instrument ([36]).

As shown in Figure 1.4, the effect of a 10 b.p. pure monetary policy shock on personal consumption expenditure (PCE) and industrial production (IP) on the U.S. is contractive and significant over five months. These contractive effects on the economy are well documented by the profession and are consistent with the tightness of the Federal Reserve[5].

The monetary policy surprise shock decreases U.S. PCE inflation and IP by 0.03 and 0.1 p.p., respectively, with persistent effects. In addition, of key interest (and related to the counterintuitive movements of real and financial variables mentioned in Section 2), the real exchange rate suffers an appreciation of 0.5 p.p., which is accompanied by a considerable increase in global uncertainty (VIX) in the order of 0.6 p.p.. Implying that the stock market (S&P500) is also hit by the surprise of the Fed, with a drop of 1 p.p. approximately. In other words, if the increase in the fed fund rate is given by a pure monetary shock, I observe a negative impact on economic activity. As economic activity falls, global uncertainty associated with fears of recession and investors taking refuge in the dollar increases, implying outflows from riskier countries to safer ones. Consequently, for EMs, this result indicates a large and important increase in the spread (1 p.p.) that is accompanied by a contraction in the real sector (0.2 p.p.) and then a return to pre-shock levels after five months. Furthermore, the dynamic response is statistically significant for at least the first five months.

[5] See e.g. [17], [29].

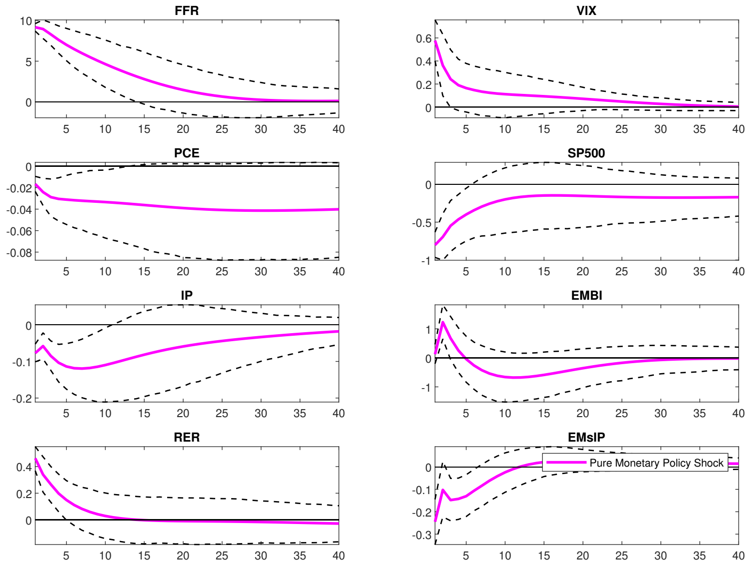

Figure 1.4: Pure monetary policy shock
(First stage F stats: 24.22)

Notes: The impulse response shows a 10 b.p. increase in the federal funds rate associated with a pure monetary policy shock with respect to a long-term trend, and 68 percent confidence interval bands. The first column shows the dynamic response to personal consumption expenditure, industrial production, and real exchange rate, while the second column indicates the response to VIX, $S\&P$ 500 index, spread, and EMs industrial production. All variables are expressed in p.p. except the federal funds rate. The VAR sample includes 2000-2019.

On the other hand, the information shock that reveals new information about the current state of the economy implies less adverse effects to the local economy and EMs (Figure 1.5). In this case, the PCE does not move much on impact and is not significant, while IP has the same negative impact as in the previous shock but with less persistence. The less adverse effect in the real sector is also reflected in lower global uncertainty, explained by upward revisions to the macroeconomic outlook by the Fed jointly with the optimism of the stock market, counterpose the effects of the appreciation of the USD (with a slightly lower increase than in the previous case of the order of 0.4 p.p.). The VIX exhibits a drop of 0.4 p.p., while the S&P 500 shows an increase of 0.2 p.p. over five months. For EMs, this also implies lower adverse effects on the spread and in the real sector. Contrary to the monetary policy shock where the spread increases, in this case of the information shock, the spread decreases by 1 p.p. after five months. Moreover, the EMs industrial production shows not only a minor drop (0.1 p.p.) but also less persistence.

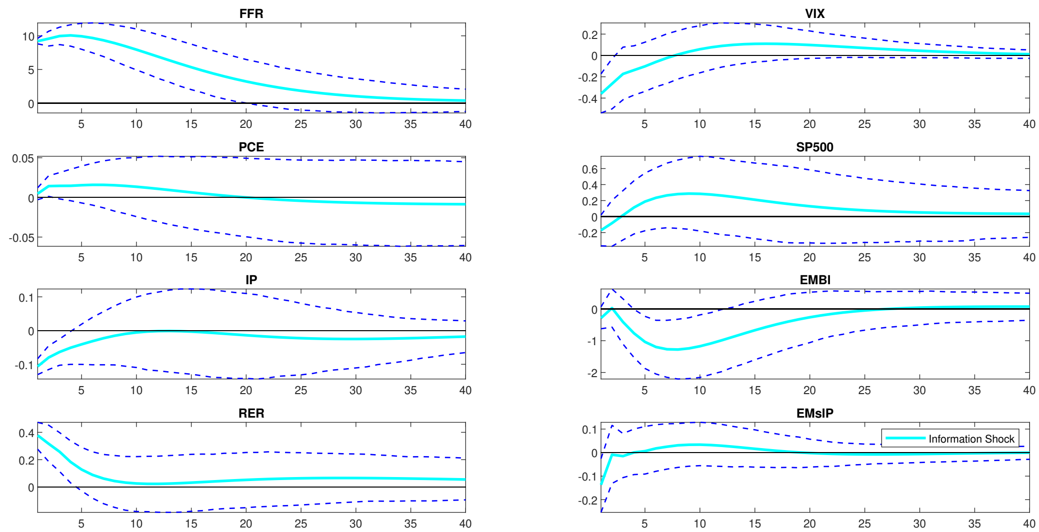

Figure 1.5: Information shock
(First stage F stats: 18.80)

Notes: The impulse response shows a 10 b.p. increase in the fed fund rate associated with the information instrument with respect to a long-term trend, and 68 percent confidence interval bands. The first column shows the dynamic response to the federal funds rate, personal consumer expenditure, industrial production, and real exchange rate, while the second column indicates the response to VIX, $S\&P$ 500 index, spread, and EMs industrial production. All variables are expressed in p.p. except the federal funds rate. The VAR sample includes 2000-2019.

Taking both shocks together, the results indicate that the fed fund rate increases have mixed effects depending on the driver, especially for EMs. A pure monetary policy shock has negative effects on the local economy and particularly, on EMs. In contrast, If the interest rate is linked to an upward revision in the macroeconomic outlook due to new information about the current state of the economy, investors tend to increase their risk appetite and shift towards riskier assets. This leads to capital outflows to other economies and results in less adverse effects compared to a pure monetary policy shock, which also are less persistent. For comparison, Figure A.1 shows a "general shock" case using Cholesky, which produces some counterintuitive results that my approach resolve. In particular, in terms of the exchange rate, and country spread dynamic, as the specific drivers behind the interest rate movements.

The mixed effects on domestic and foreign variables mentioned above are consistent with an "outlook-at-risk" quantitative approach, which provides a similar estimation in terms of risks around macroeconomic forecast, capturing how such risks evolve as financial conditions tighten [1]. Applied to monetary policy surprises, an "outlook-at-risk" approach should reflect different risks if the economy is affected by pure monetary policy shocks or information shocks. To quantify these risks, I analyze the GDP forecast dispersion of different analysts around FOMC announcements and employment releases.

Figure A.2 reports the probability density function (PDF) of the one-year forecast growth rate dispersion separating between a pure monetary policy shock and an information shock. The PDF of the pure monetary policy shock has greater dispersion and lower kurtosis than the distribution associated with the information shock; this indicates a significant probability of greater uncertainty and volatility about the future state of the economy. In contrast, as the economy is closer to its potential level (given an upward revision of the current state of the economy), the disagreement between market analysts about future economic outcomes tend to be smaller as the Fed maintains a stable economy in the information shocks.

These findings suggest that the main driver of the effect to foreign economies is the risk aversion and exchange rate channel, and my results are consistent with by [23], [32], and [10], who also explain that both shocks can have opposite effects on global risk appetite. However, these mixed shock effects for EMs could be amplified depending on their macroeconomic fundamentals. Some studies document that global monetary policy spillovers would have heterogeneous effects depending on the local conditions and vulnerabilities that the economy faces. EMs that exhibit a high fiscal debt, lending problems, high inflation, currency problems, among other economic woes, are more exposed to U.S. monetary policy spillovers. Yet, EMs with solid fundamentals exhibit less adverse effects ([2], [21]).

1.4.2 Robustness analysis

In this subsection, I perform two robustness checks. First, to study the sensitivity of my estimation to the instrument, the 3-month federal funds rate future is replaced with the 6-month and 1-year interest rate surprises when constructing monetary policy surprises in the benchmark VAR model. The results are presented in Figure A.3, A.4, A.5, and A.6. My findings indicate that the dynamic responses of both shocks using different instruments are similar to my results, and, in general, the relevance condition holds. Yet, as this new interest rate contains forward guidance elements to a larger degree and incorporates other news associated with the medium and long-term path of the economy ([19], [28]), the dynamic effects are more pronounced.

As a next step, employing a sign restriction approach (which is an alternative methodology commonly used in the literature to analyze the spillovers of global financial tightness), the main results are compared. In order to achieve a sign restriction identification, Table A.1 indicate some conditions that I take to simulate the pure monetary policy shock and the information shock. The main identifying assumption is that a pure monetary policy shock impacts negatively in the real sector and inflation, which is accompanied by an increase in the global uncertainty and a drop in the S&P Index. While an information shock (which as discussed above is associated with an upward revision to the current state of the economy) also implies a negative impact on the real sector. But an increase in inflation that is associated with better economic prospects, jointly with a drop in global uncertainty and a greater appetite for risk. As I am interested on the dynamic response to EMs, for both shock cases, I am agnostic about the impact on RER, EMBI and EMsIP, and I assume that the sign restriction effect is exclusively for one month. Given the fact that this paper uses exclusively high-frequency movements of the interest rate to capture the specific driver of the shock, the sign restriction methodology will capture this shock but in a broader sense.

In both cases, the results are not substantially different with the narrative described in the previous subsection: pure monetary policy shocks produce contractionary effects on EMS, while information shock produce less adverse effects. Figure A.7 exhibits a 10 b.p. increase in the federal funds rate associated with a pure monetary policy shock. Looking at the restricted variables, I obtain a decrease in economic activity and inflation in the order of 0.2 p.p. and 0.5 p.p, respectively, over five months. Global uncertainty increases by 2 p.p., while the stock market decreases by 3 p.p. over the same horizon. More importantly, the non restricted variables show a similar pattern as the external instrument identification with an appreciation of the RER, an increase in the spread, and a decrease of EMs IP (1 p.p., 7 p.p., and 0.8 p.p, correspondingly).

In regard to the information shock case, an increase in U.S. rates have favorable effects on the restricted variables, although with little significance (Figure A.8). As the interest rate hike is associated with a booming economy, inflation, and economic activity growth by 0.2 p.p., while the global uncertainty decreases by 2 p.p and the stock market exhibits a 2 p.p. increase. The dollar has no major movements, but the favorable global conditions imply a decrease in the EMs' risk as the spread falls by 5 p.p. and economic activity increases by 0.5 p.p.

1.5 Conclusion

Fed announcements are events of great importance for emerging market economies (EMs), leading to significant movements in real and financial variables. Accordingly, understanding the true drivers underlying the U.S. interest rates movements is an important issue to follow for policymakers when U.S. monetary policy spillovers are quantified towards foreign economies.

This paper sheds light on the relative importance of the specific drivers behind FOMC announcements and their spillovers to EMs, highlighting the heterogeneous effects on both domestic and foreign economies. To do so, I separate the U.S. federal funds rate movements between a pure monetary policy shock and an information shock based on high-frequency movements of the interest rate related to the monetary policy decision (pure monetary policy shock) and major macroeconomic releases (information shock). Using a proxy-SVAR, I determine that when the U.S. interest rate is driven by a pure monetary policy shock, it has a contractive effect on the U.S. economy, increasing global uncertainty, and consequently a depreciation in EMs currencies, as well as a higher country spread and lower economic activity. Yet, if the interest rate increase is driven by an information shock, this does not necessarily means bad news for emerging market economies.

These findings seek to respond to the counterintuitive effects related to the aggressive effects of the federal funds rate movements and their transmission to foreign economies. Such as the RER movements or EMs leading indicators that anticipate the economic cycle like the country spread. This analysis confirms the intuition that a monetary policy surprise to the market related to inflation expectations, or changing in perceptions of the Fed's reaction function are especially harmful to emerging market economies. However, if the federal funds rate increase is driven by an upward revision to the macroeconomic outlook, the impact on EMs could be more benign.

Further research is warranted in light of the significant vulnerabilities foreign economies face with respect to global financial tightness. In particular, countries that exhibit high inflation, high fiscal debt, currency problems, among other economic challenges could be disproportionately harmed by U.S. monetary policy surprises. To this end, the U.S. central bank's macroprudential tools and the forward guidance effect – which are not included as external instruments in this paper – could play an important role in quantifying the transmission mechanisms towards EMs. Overall, my results point to the need to fully understand the drivers underlying U.S. interest rate movements, so that both structural and semi-structural policymaker models incorporate these transmission mechanisms to better understand their effects on foreign economies.

CHAPTER 2

Monetary Policy Surprises on the Banking Sector: the Role of the Information and Pure Monetary Shocks

2.1 Introduction

Central bank announcements are relevant as these show the reasons and the underlying information for the decision-making process of policymakers. The literature on monetary policy primarily focuses on the effect of a general shock associated with surprises in the monetary policy rate (MPR) and its transmission to the rest of the economy. However, this approach may need to be revisited to understand the actual reasons behind the central bank reaction ([20]). In this paper, we attempt to disentangle the effects of two types of shocks behind the monetary policy surprise: a "pure" monetary policy component associated with the standard policy shock that negatively affects prices and activity; and an "informational" component of the shock, which responds to other macroeconomic data releases. We postulate that the effects of an unexpected monetary policy tightening may have different effects on the economy, depending on the underlying reason of the shock.

Lately, the literature has renewed its interest in these types of questions. One strand uses new identification methodologies that provide SVAR models with external instruments (also known as Proxy-SVARs). These papers use central bank statements and high-frequency variable movements around these announcements as an exclusion condition for identification of monetary policy shocks (see for example, [17] and [23]). Even though the literature has undoubtedly advanced in recent years, interest rate surprises can reflect deviations from a central bank's usual policy actions and simple reactions to the central bank's assessment of the economic outlook. In the first case, an expansionary surprise should positively affect activity. In contrast, in the second, it may be contractionary if the central bank forecasts a pessimistic economic outlook. The external instruments method commonly used in the literature needs to differentiate between these two channels, which can lead to conflicting effects on economic activity and may result in empirical puzzles.

This paper aims to add to the existing literature on the topic by exploiting information on changes in interest rate expectations around the time of both central bank announcements and macroeconomic data releases. Combining these two events allows us to distinguish between the pure monetary policy shock and information components within the same surprise. For this purpose, we use the Chilean economy as a case study and employ the movements of the 90-day banking lending rate around the releases of the Central Bank of Chile's statement and the employment data release provided by the National Bureau of Statistics as instruments. We use a similar econometric approach undertaken by [29], and [25]. The second objective of this paper is to understand the effects of these shocks on the financial sector. In particular, its effects on credit growth and non-performing loans. Depending on the origin of the shock, a pure contractionary monetary policy shock is expected to reduce the credit growth and worsen the measure of non-performing loans. On the other hand, if the contractionary shock is due to, say, a better outlook of future economic activity, it may not be as contractionary, or even it could be expansionary on the credit market activity.

In this paper, we use an extended version of a Proxy-SVAR model developed by [17], containing two instruments, one for each policy shock. The identifying assumption relies on the fact that monetary policy statements are generally announced on different days than macroeconomic data releases of employment, except for rare coincidences. In particular, we attribute the pure monetary policy component of the shock to those that can move the 90-day lending rate near the policy announcement. On the other hand, the information component is identified as those that affect the same 90-day lending rate but around the employment data release. Only in a handful of cases do both dates coincide, days in which we assign the full effect to the pure monetary policy shock.

Our results align with economic theory and solve some counter-intuitive results found in previous studies for Chile ([4]). First, a pure monetary policy shock has contractionary and persistent effects on activity, prices, and credit growth. At the same time, it appreciates the domestic currency against the US dollar and worsens non-performing loan risks. This finding is consistent with the standard macroeconomic theory for small open economies with free-floating exchange rates and minimal capital markets intervention. Second, the information component of the monetary policy shock has very different but expected results. A contractionary informational shock does not necessarily negatively affect the economy and, if any, has minimal effect. This evidence is consistent with the role of cyclical attenuation of the monetary policy and the findings of [28], which demonstrate the tendency for analysts to change their growth projections higher in response to unforeseen increases in real yields, which we interpret as proof of the information effect. When the central bank tightens its policy, which occurs for "good reasons", it contributes to offset, at least partially, the effects of demand shocks.

This paper is organized as follows. Section 2 considers recent literature and how we add to existing published works; section 3 shows the econometric methodology and the data used in this paper. Section 4 shows results and robustness checks for the analyses. Finally, section 5 summarizes and gives concluding remarks.

2.2 International evidence and the Chilean case

In the last few years, some authors have studied the effects of monetary policy surprises on the economy, but separating them between two components: an informational shock and a pure monetary policy shock (see, for instance [29], [20], [15], and [10]). The informational shock is a monetary policy surprise related to a revision to the macroeconomic outlook. Participants in the market might perceive announcements of restrictive (stimulative) monetary policy as the central bank's response to a better (deteriorating) economic prediction, potentially leading to increased optimism (gloominess) concerning the overall macroeconomic outlook. On the other hand, the pure monetary policy shock responds to the needed action from central banks to curve inflation. Both types of shocks are combined in the same surprise, but their effects may significantly differ. In this paper, we study the effects of monetary policy surprises, separating the effects of information and pure monetary policy shocks in the Chilean economy. In particular, our research differs from previous studies in that it focuses on the effects of these components on the banking market.

Even though plenty of papers study the effects of monetary policy on the Chilean economy, none of these make a case for this differentiation (for example, [6], [30], [8]). The present study postulates that disentangling both shocks may contribute to explaining facts that are difficult to comprehend. For instance, Figure 2.1 shows that there is generally no clear pattern to aggressive monetary policy interest rate movements on employment, nominal exchange rate, and inflation. In particular, except for the 2007 episode, the unemployment rate improves after aggressive interest rate hikes, which appears to be counter-intuitive. Moreover, the nominal exchange rate shows a downward trend, consistent with an appreciation pattern excluding the 2001 episode, while the consumer price index slowed down only in 2007. This evidence suggests another factor influencing the economy that may still need to be accounted for.

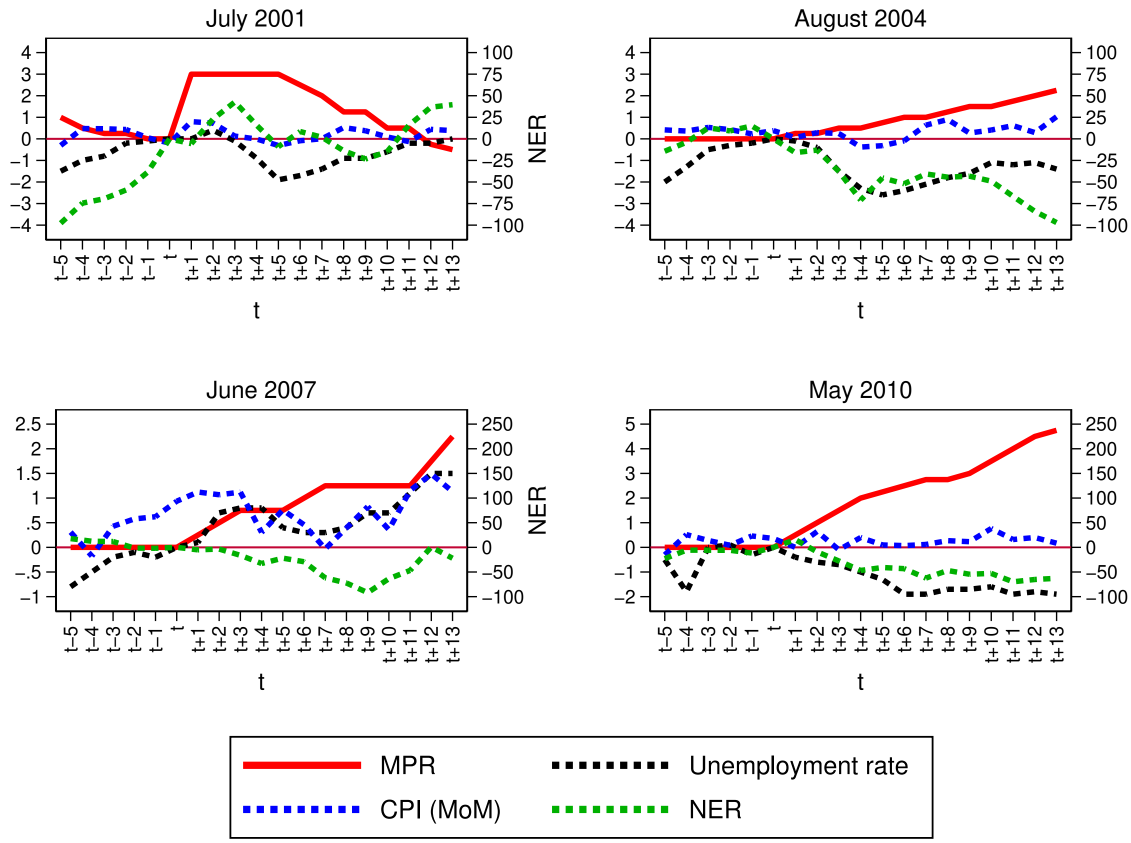

Figure 2.1: MPR hikes in Chile

Notes: Time is measured in months after (before) the MPR hikes starting at t. All variables are measured as simple differences with respect to their level at t (except CPI). MPR (Monetary policy rate) is the nominal interest rate set by the Central Bank of Chile. The unemployment rate is the percentage of unemployed people in the labor force. NER (Nominal exchange rate) is the nominal value of one USD in Chilean pesos. CPI (MoM) indicates a month-over-month change in the price of goods and services.

Most recently, there have been further efforts to identify the information channel of the monetary policy impacts in Chile. [31], for example, uses a proxy-SVAR identification approach and finds that monetary policy contractions through the communication channel of the central bank have exerted significant adverse effects on economic activity and produced appreciations of the exchange rate. In turn, [18] analyze the text in central bank press releases and constructs a sentiment score index that helps predict future monetary policy movements. Their results suggest that their index anticipates the movements of the interest rate by about twelve months but has yet to have a lasting impact on economic indicators. Finally, and most related to the empirical approach of this paper, [4] use a Bayesian VAR with external instruments, using monetary policy surprises based on a Bloomberg survey of financial market participants. They find that monetary policy surprises negatively affect activity, consumer prices, and funding costs but depreciate the domestic currency. The effect on the exchange rate is counter-intuitive, which could also be explained by an information shock of the monetary surprise.

To the best of our knowledge, the specific drivers behind central bank announcements: information, and pure monetary policy shocks, still need to be examined for the Chilean economy. We fill this gap by proposing a methodology that allows us to disentangle both components by exploiting the fact that central bank announcements and employment data are released on different days within a month. The identifying assumption is that the change in the 90-day lending rate the day after the announcement is only due to either the monetary policy statement for the pure monetary policy shock or the employment data release. This methodology avoids utilizing other measures of monetary policy surprises employed in previous studies, such as a two-week interval market expectations survey[1].

2.3 Methodology and data

2.3.1 Econometric approach

To estimate the dynamic response of real and financial variables to pure monetary policy and information shocks, we use a VAR model with external instruments. [35] and [27] were the first authors to use this method, which assumes that data from an external variable (the instrument) that is correlated with a specific shock of interest but uncorrelated with other shocks is available. In this subsection, we describe procedure:

As in [17], consider Y_t a vector, A and C_j $\forall i \geq 1$ coefficient matrices. Then, the structural form of the VAR model is given by:

$$AY_t = \sum_{i=1}^{p} C_i Y_{t-i} + \epsilon_t \tag{2.1}$$

The components of the error term ϵ_t are assumed to be orthogonal to each other and interpreted as structural shocks. Then, provided A is invertible, we pre-multiply by A^{-1} we have the reduced-form VAR given by:

[1] This type of measure could lead to biased conclusions as the time window it operates may contaminate the identification assumption of the instrument. In addition, surveys used to construct these come from sources such as Bloomberg or financial surveys from the central bank (i.e., Economic Expectation Survey and Financial Operators Survey); historical respondents constantly change, which could lead to responses that are not comparable over time.

$$Y_t = \sum_{i=1}^{p} B_i Y_{t-i} + u_t \tag{2.2}$$

Keep in mind that the residuals u_t contain both the information and pure monetary policy components and are both zero-mean with covariance matrix Ω=E[$u_t u_t$]. Since we are interested in the impact of each element of the structural shock, we need to focus on the elements of the first column of A^{-1}. To estimate the impulse-response function of the external instrument shocks, we need to estimate the following:

$$Y_t = \sum_{i=1}^{p} B_j Y_{i-j} + a_k^{-1} e_{k,t} \tag{2.3}$$

The first column of a_k contains the parameters of interest that quantify the impact of the pure monetary policy and the information shocks.

The essential requirements in the external instruments methodology are to find instruments that satisfy two conditions. First, the relevance condition, which states that the instrument must be correlated with the shock of interest (in this case, shocks related to the monetary policy actions). Second, the exclusion condition, which indicates that the instrument must be uncorrelated with other structural shocks (shocks to all the other variables except to the monetary policy) ([25]). Consider Z_t a vector of external instruments and ϵ_t^{iv} a vector of shocks that only includes the monetary policy shock. To obtain a valid instrument set for shock-related instrumental variables, Z_t must correlate with ϵ_t^{iv} but be orthogonal to any other structural shock:

$$E(Z_t \epsilon_t^{iv}) = \delta \tag{2.4}$$

$$E(Z_t \epsilon_t^{q}) = 0 \tag{2.5}$$

In the case of this paper, we use two instruments, one for each component of the shock. Since we exclude days when employment data releases coincide with central bank announcements, the procedure is the same as in the single-instrument case to obtain the impulse response functions.

There have been other approaches used in the literature to separate the two components of the monetary policy shock, such as VAR models with sign restrictions (see for example, [32], [20], [10]). However, two major disadvantages are associated with this methodology when applied to this context and specific research question. First, a pure monetary policy shock whose sign has been restricted to have negative effect on activity could also have been caused by several other reasons, such as movements in commodity prices, foreign activity, or variables omitted from the model but which are quantified by the shock. Second, an information shock that has been sign restricted to having a positive impact on the stock market would be contrary to the body of research showing that interest rate hikes cause increases in the discount rate for future dividends, which would harm the stock market, even if the rate increase is justified. ([5], [21]).

The identifying restrictions of our paper is based on a different set of assumptions. We assume the monetary policy shock exclusively occurs within a small time window after the central bank announcement. As in [29], this hypothesis allows us to use the changes in expected official rates measured close to the main macroeconomic events as an external instrument for exogenous changes in the systematic component of monetary policy only. Consequently, this methodology allows to isolate the effect of central bank information shocks from the effects of pure monetary shocks, both of which provide interest rate surprises around the announcement.

A valid concern about foreign variables interfering the purpose of identifying local shocks arises when instruments are also correlating with foreign variables. This is particularly relevant for small open economies such as Chile. However, for the purposes of this paper, which aims to isolate the effects of pure local monetary policy and (labor) informational shocks, foreign shocks become irrelevant. Methodologically, we assume that in the small window of time in which the instrument captures pure local shocks, foreign variables do not play a role in a systematic way. In other words, the only possible way in which foreign shocks invalidate this identifying assumption is when the instrument and the foreign variable systematically co-move. Since these instruments capture movements around local announcements in that very small window of time, we argue that these are largely exogenous of any other shock, including foreign shocks.

2.3.2 External instruments for pure monetary policy and information shocks

This first instrument is the bank interest rate change between 30-89 days in a one-day window around the central bank announcement. As in [29], this instrument captures the change in the expected average banking system rate level over the third calendar month out from the day of the announcement, a horizon that typically also covers the following central bank meeting and thus captures near-term forward guidance. The second instrument is also the bank interest rate change between 30-89 days in a one-day window but around the release of the employment data by the National Bureau of Statistics. Our choice of the bank interest rate change between 30-89 days as an external instrument is based on two reasons. As we are interested in the effects on the banking sector, the use of a short banking interest rate is the best proxy for similar literature that studies the effects of monetary policy surprises as is the case of the US (FF4) or the EU (3 month swap) ([17], [23]). Additionally, as [26] finds, there is a significant transmission between monetary policy and the 30-89 days banking interest rate.

To fully identify both shocks, we exclude days the employment data releases coincide with central bank monetary policy announcements, which occur on rare occasions.[2] Our identifying assumption is that in the small time window after the central bank announcement or labor data releases, it is unlikely to be other events that systematically affect the market expectations of future policy interest rates ([25]). Figure 2.2 provides the time series of monetary policy surprises[3]. Equation 6 provides how we construct monetary policy surprises, where t, d and p are month, day, and type of shock, respectively.

$$iv_t^p = B_{t,d} - B_{t,d-1} \tag{2.6}$$

[2]Out of the 221 employment data releases in our sample, monetary policy announcements have coincided only 7 times.

[3]For example, the biggest fall in the information shock case is in February 2009, where the unemployment rate reached almost 10%. In a context of global financial tightness and lower GDP, the Central Bank of Chile cut rates in 250 b.p. Additionally, the statement contained a phrase that rates would be kept even lower than in the previous monetary policy report. Given the reaction in rates the day after the employment report (-80 b.p.), market analysts interpreted it as bad news in terms of the current path of the economy, causing a revision in their forecasts. Regarding the pure monetary policy shock case, a considerable decrease is identified in September 2019, where the U.S. – China trade war reached its peak. At its Monetary Policy Meeting, the Board of the Central Bank of Chile decided to lower the monetary policy interest rate by 50 basis points, to 2%. Despite the improvements in the labor market and domestic activity, the statement contained a phrase that the most relevant aspect in his diagnosis was the deterioration of the medium-term prospects, largely linked to the escalation of the trade war.

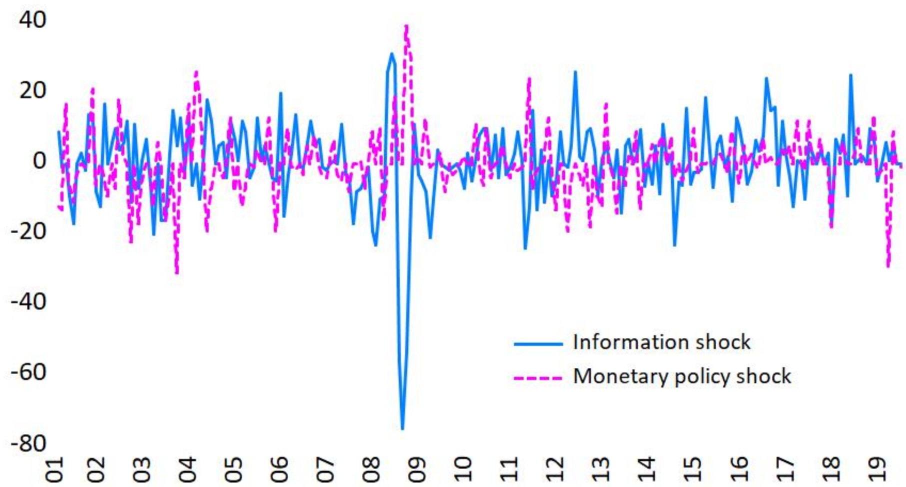

Figure 2.2: Historical movements of the instruments

Notes: The monetary policy and information shocks are shown at a monthly frequency (2001-2019) and in basis points. The monetary policy shock corresponds to the change in the banking interest rate between 30-89 days in a one-day window around the central bank announcement. The information shock corresponds to the change in the banking interest rate between 30-89 days in a one-day window around labor releases.

2.3.3 Data

We use monthly data from the Central Bank of Chile between September 2001 and December 2019. The baseline model includes seven variables: monetary policy rate (MPR), economic activity index (IMACEC), consumer price index (CPI), the nominal exchange rate (NER), total loans (LOANS), unemployment rate (U), and a non-performing loans indicator (NPL). We use a VAR model with two lags and natural logarithms of all variables except MPR and U. In order to maintain our assumption that monetary policy shocks are not contributing to these interest rate surprises resulting from labor market news, we exclude the days that coincide with central bank meetings and labor data releases.

2.4 Results

2.4.1 Impulse Responses

In this section, we estimate the dynamic response of consumer prices, economic activity, nominal exchange rate, loans, unemployment rate, and non-performing loans to a 10 basis point increase in the monetary policy rate. We measure the impulse response in the other variables in percentage points and the dotted lines represent 68% confidence intervals based on robust standard errors following [27] and [28].

Figure 2.3 shows the effect of a 10 b.p. increase in the reference rate related to a pure monetary policy shock, which has considerable and persistent effect on consumer prices, with a decrease of almost 0.15 p.p. over five months. In terms of the real sector, the monetary policy surprise has a faster effect on activity than the inflation reaction, falling in the first month 0.3 p.p and standing below its long-term level. Consequently, as activity suffers, unemployment rate instantly increases by 0.04 p.p and returns to its level after two years. In terms of the dynamic response of the exchange rate our results are congruent with the classical UIP framework, which in this case shows an appreciation of 0.3 p.p although not significant. Regarding the banking sector, our findings are consistent with international theory and literature. In other words, a monetary surprise has contractive effects on activity and employment, increases credit risk, which is a key determinant in the behavior of banks' loans and their provisions ([38] and [11]). Our findings suggest that loans decreases by 0.3 p.p, while non-performing loans increase by 0.4 p.p over five months. As the real sector is significantly affected, this overreaction can be explained because the loan loss provisions have a strong impact on the banks' cost income and they could have an immediate effect on the lending strategy in the short term. In addition to the classic effect of the unexpected increase in the monetary policy, the information revealed by the monetary authority in its decision amplifies the transmission to the economy, which also leads to a revision of agents expectations associated with the inflationary phenomenon [4]. These findings are consistent with similar research in advanced and emerging market economies ([17], [5], [25], [23], [20], [10]).

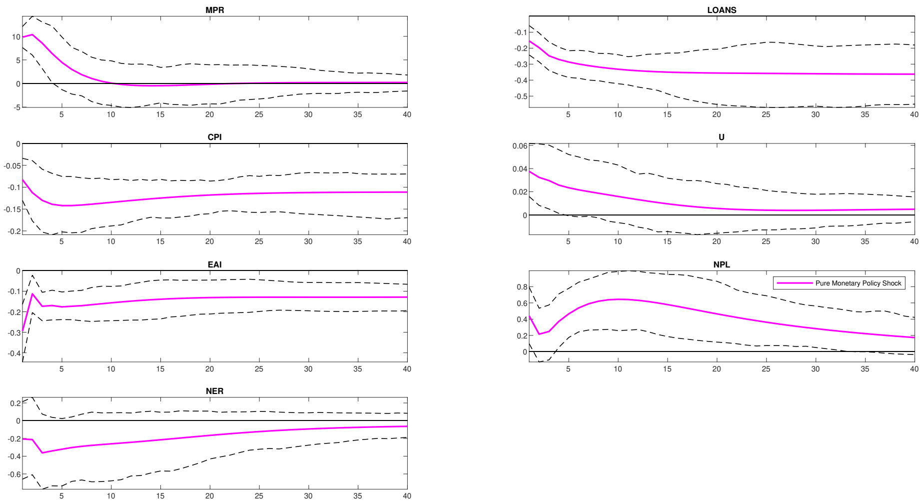

Figure 2.3: Pure Monetary Policy Shock

Notes: The impulse response shows a 10 basis points increase in the monetary policy rate associated with a pure monetary policy shock with respect to a long-term trend, and 68 percent confidence interval bands. The first column shows the dynamic response to consumer price index, economic activity index, nominal exchange rate, loans, unemployment rate and a non performing loans index. All variables are expressed in p.p except MPR. VAR sample includes 2001-2019.

More interestingly, as shown in Figure 2.4 an information shock, which is related to new information about the current state of the economy not necessarily has negative effects on the real and monetary sector. In particular, a 10 b.p. information shock decrease inflation almost in the same magnitude than the pure monetary policy shock in the first months, but with less persistence and returning to its level after two years. Also, the nominal exchange rate shows almost the same reaction than the previous shock case. In terms of the real sector, the information shock has favorable effects on activity and unemployment rate, with an increase of 0.05 p.p and a decrease of 0.04 p.p over two months respectively. These better conditions for the economy implies that the banking sector is less affected. The dynamic response of loans exhibit a decrease of 0.4 p.p over two months with also less persistence than the previous shock, while the non-performing loans exhibit a decrease of 0.4 p.p. In this case, as the information shock has more persistent effects on the monetary policy rate itself, the initial improvement in non-performing loans and output is offset by tighter financial conditions. These results are consistent with the role of cyclical attenuation of the monetary policy and the findings of [28], which demonstrate the tendency for market analysts to change their forecast higher in response to monetary policy surprises, which are interpreted as proof of the information effect. When the central bank tightens its policy, and this occurs for the "good reasons", it contributes to offset, at least partially, the effects of demand shocks.

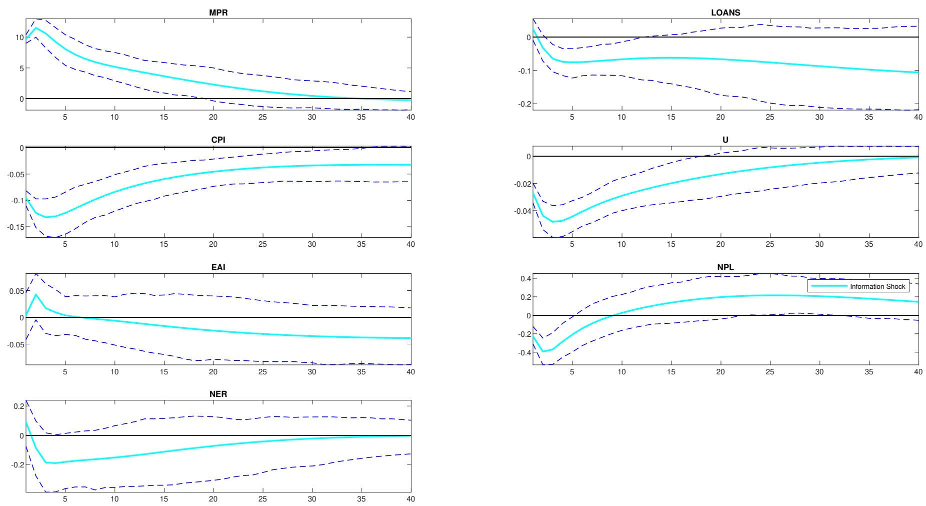

Figure 2.4: Information Shock

Notes: The impulse response shows a 10 basis points increase in the monetary policy rate associated with the information instrument with respect to a long-term trend, and 68 percent confidence interval bands. The first column shows the dynamic response to consumer price index, economic activity index, nominal exchange rate, loans, unemployment rate and a non performing loans index. All variables are expressed in p.p except MPR. VAR sample includes 2001-2019.

Overall, our results indicates that the monetary policy increase has heterogeneous effects depending on the driver. Inflation, output, and the banking industry are all negatively impacted by a pure monetary policy shock. However, an upward revision to the macroeconomic outlook given the new information about the current state of the economy has less adverse effects on the economy through an information shock. As the economic agents incorporate these better conditions in their decisions, the economy face less adverse effects given the financial tightness, which also are less persistent that the pure monetary policy shock. Our findings are consistent with [23], [25] and [32] who also postulate that pure monetary policy and information shocks can have different consequences to the real and financial sector. For comparison, Figure B.1 shows an estimation using Cholesky, which yields some counterintuitive results that can be addressed by our approach in term of drivers behind the Central Bank announcements. Specifically, the dynamic response of the economic activity index, unemployment and the non-performing loans.

2.4.2 Robustness

The main findings are contrasted using a sign restriction identification method that is frequently used to analyze the effects of pure monetary policy and information shocks. Similar to [10], [19], [20] SR-VAR model approach, and [15] identification for the Chilean case, we assume that a pure monetary policy shock has adverse effects on output, consumer prices, and unemployment rate, while an information shock decrease inflation and has favorable effects on activity and unemployment rate. We present our sign restriction assumptions in table B.1 to simulate both shocks. Furthermore, we assume that both shock events are just for one period. As we mentioned in the section 2.3.1, this methodology does not capture the specific driver behind the monetary policy increase, we will quantify the dynamic response of our variables but in a broader sense, reflecting other aspects of the economy that could be influencing the monetary policy announcement.

As by construction we imposed the dynamic effects on inflation, output, and unemployment rate, we are interested on the dynamic response on nominal exchange rate, loans and non-performing loans. Figure B.2 present a 10 b.p. pure monetary policy shock in the reference rate, which implies similar results to our external instrument identification. It means, an appreciation of the currency (0.8 p.p.), a decrease in banking loans (0.3 p.p) and an increase in non-performing loans (1 p.p.) over five months, although our responses are not significant. On the other hand, as shown in Figure B.3 an information shock produces less adverse effects, with the same appreciation pattern of the currency but an increase in loans and a decrease in non-performing loans over 12 months. Overall, our results are in the same direction that the sign restriction methodology.

2.5 Conclusion

Understanding the drivers behind the central bank announcements is important, as they provide information about the current state of the economy, as well as its outlook. However, the interest rate increase can reveal two components, one associated with the inflationary process observed by the monetary authority, and another associated with new information related to new macroeconomic data. Consequently, recent evidence highlights that monetary policy surprises can lead to heterogeneous and persistent effects on the economy depending on the driver behind the Central Bank announcement.

In this paper, we attempt to disentangle the effects of two types of shocks behind the monetary policy surprise: a "pure" monetary policy component, associated with the standard policy shock that negatively affects prices and activity; and an "informational" component of the shock, which responds to labor releases. Using 90-day banking lending rate movements around central bank announcements (pure monetary policy shock) and labor releases (information shock), we estimate a SVAR model with external instruments to measure the effect on the Chilean economy.

Our results are aligned with economic theory and international evidence. First, a pure monetary policy shock has contractionary and persistent effects on activity, prices and credit growth. At the same time, it appreciates the domestic currency, and decrease non-performing loans risks. This is consistent with the standard macroeconomic theory for small open economies with free floating exchange rates and very limited capital markets intervention. Second, the information component of the monetary policy shock has less adverse effects on the economy, and if any, it is very limited. This is consistent with the role of cyclical attenuation of the monetary policy and the findings of [28], which demonstrate the tendency for analysts to change their growth projections higher in response to unforeseen increases in real yields, which are interpreted as proof of the information effect. It means, when the interest rate increase is given by the "good reasons", it contributes to offset, at least partially, the effects of demand shocks.

Nevertheless, A number of questions regarding monetary policy surprises and their transmission to the economy remain to be addressed, like the role of the forward guidance effect and macroprudential tools of the Central Bank. Furthermore, foreign Central Banks could play a significant role in the global financial tightness, implying another relevant channel in the local economy. Overall, our results highlights the need to understand the true drivers behind Central Bank announcements, so policymakers incorporate these transmission mechanisms to better understand their effects on the economy.

APPENDIX A

Chapter 1

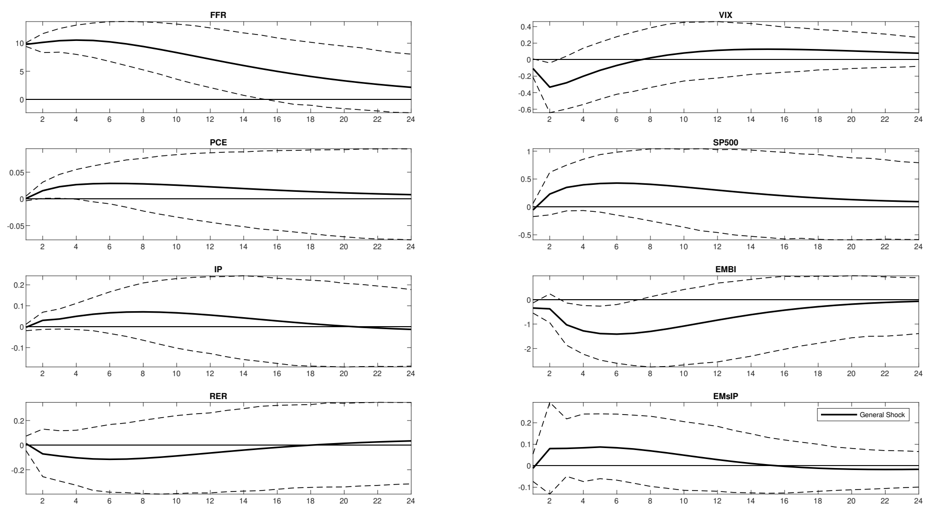

Figure A.1: General shock

Notes: The impulse response shows a 10 b.p. increase in the federal funds rate associated with a general shock using Cholesky with respect to a long-term trend, and 68 percent confidence interval bands. The first column shows the dynamic response to the federal funds rate, personal consumer expenditure, industrial production, and real exchange rate, while the second column indicates the response to VIX, $S\&P$ 500 index, spread, and EMs' industrial production. All variables are expressed in p.p. except the federal funds rate. The VAR sample includes 2000-2019.

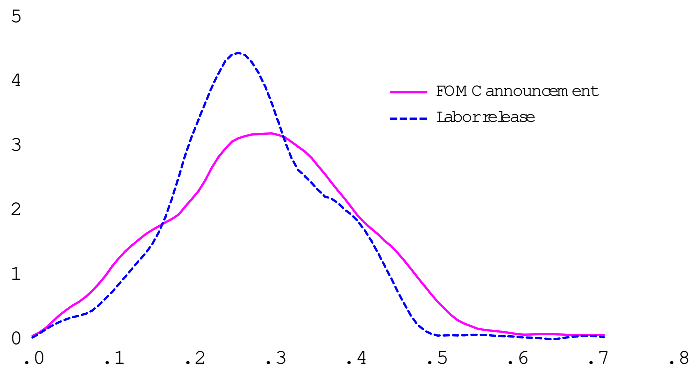

Figure A.2: Probability density function of one-year forecast growth rate dispersion

Notes: Probability density functions are estimated using kernel distribution, based on the standard deviation of 16 banks' growth rate forecast around FOMC announcements and labor releases. Includes: Bank of America Merrill Lync, Citigroup, Commerzbank, Deutsche Bank, Goldman Sachs, JP Morgan, Nomura Securities, UBS, Barclays, BNP Paribas, Credit Suisse, ING Groep, Morgan Stanley, Natixis, Scotia Capital, and Wells Fargo.

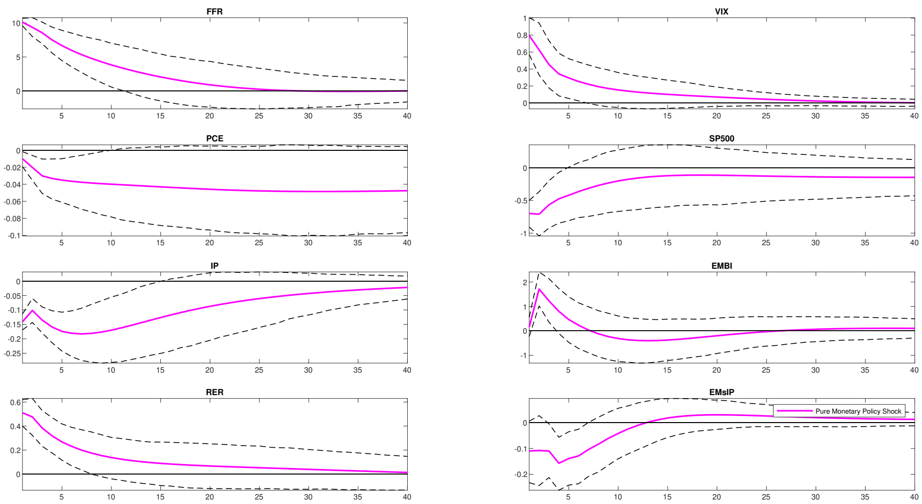

Figure A.3: Pure monetary policy shock using 6-month rate futures
(First stage F stats: 17.29)

Notes: The impulse response shows a 10 b.p. increase in the federal funds rate associated with the pure monetary policy shock with respect to a long-term trend, and 68 percent confidence interval bands. The first column shows the dynamic response to the federal funds rate, personal consumer expenditure, industrial production, and real exchange rate, while the second column indicates the response to VIX, $S\&P$ 500 index, spread, and EMs' industrial production. All variables are expressed in p.p. except the federal funds rate. The VAR sample includes 2000-2019.

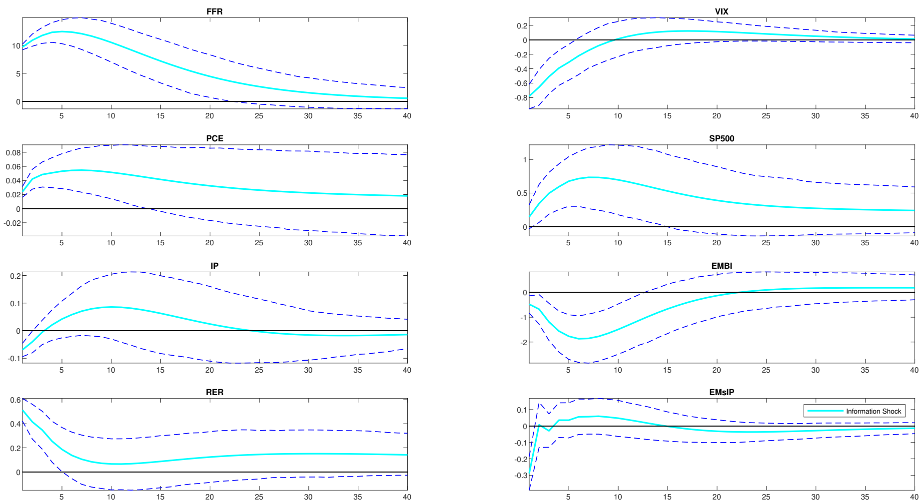

Figure A.4: Information shock using 6-month rate futures
(First stage F stats: 18.27)

Notes: The impulse response shows a 10 b.p. increase in the federal funds rate associated with the information instrument with respect to a long-term trend, and 68 percent confidence interval bands. The first column shows the dynamic response to the federal funds rate, personal consumer expenditure, industrial production, and real exchange rate, while the second column indicates the response to VIX, $S\&P$ 500 index, spread, and EMs' industrial production. All variables are expressed in p.p. except the federal funds rate. The VAR sample includes 2000-2019.

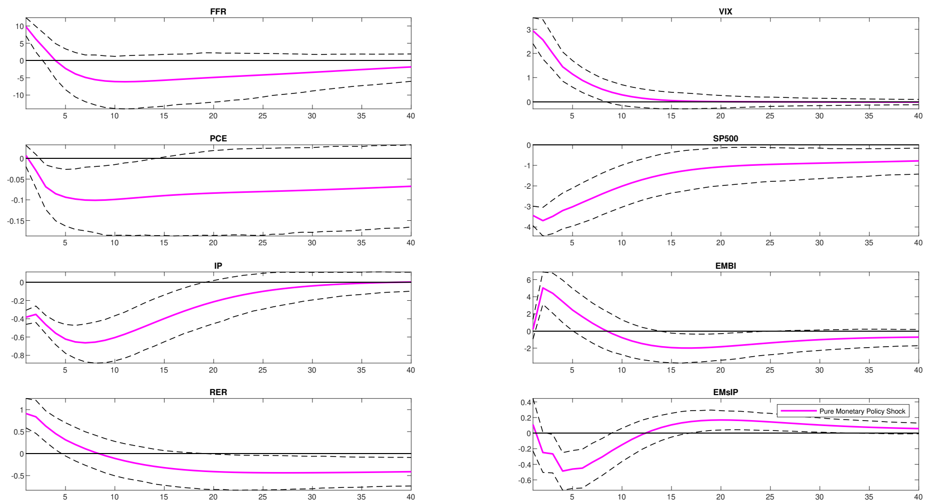

Figure A.5: Pure monetary policy shock using one-year rate futures
(First stage F stats: 2.14)

Notes: The impulse response shows a 10 b.p. increase in the federal funds rate associated with the pure monetary policy shock with respect to a long-term trend, and 68 percent confidence interval bands. The first column shows the dynamic response to the federal funds rate, personal consumer expenditure, industrial production, and real exchange rate, while the second column indicates the response to VIX, $S\&P$ 500 index, spread, and EMs' industrial production. All variables are expressed in p.p except the federal funds rate. The VAR sample includes 2000-2019.

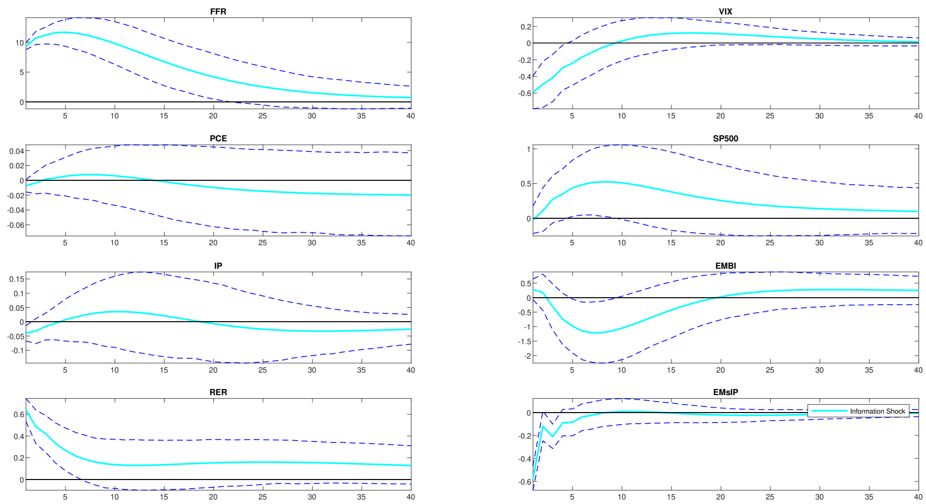

Figure A.6: Information shock using one-year rate futures
(First stage F stats: 14.34)

Notes: The impulse response shows a 10 b.p. increase in the federal funds rate associated with the information instrument with respect to a long-term trend, and 68 percent confidence interval bands. The first column shows the dynamic response to the federal funds rate, personal consumer expenditure, industrial production, and real exchange rate, while the second column indicates the response to VIX, *S&P* 500 index, spread, and EMs' industrial production. All variables are expressed in p.p. except the federal funds rate. The VAR sample includes 2000-2019.

Table A.1: Sign restriction identification for one period

	Pure MP Shock	Information Shock
FFR	positive	positive
PCE	negative	positive
IP	negative	negative
RER	?	?
VIX	positive	negative
SP500	negative	positive
EMBI	?	?
EMsIP	?	?

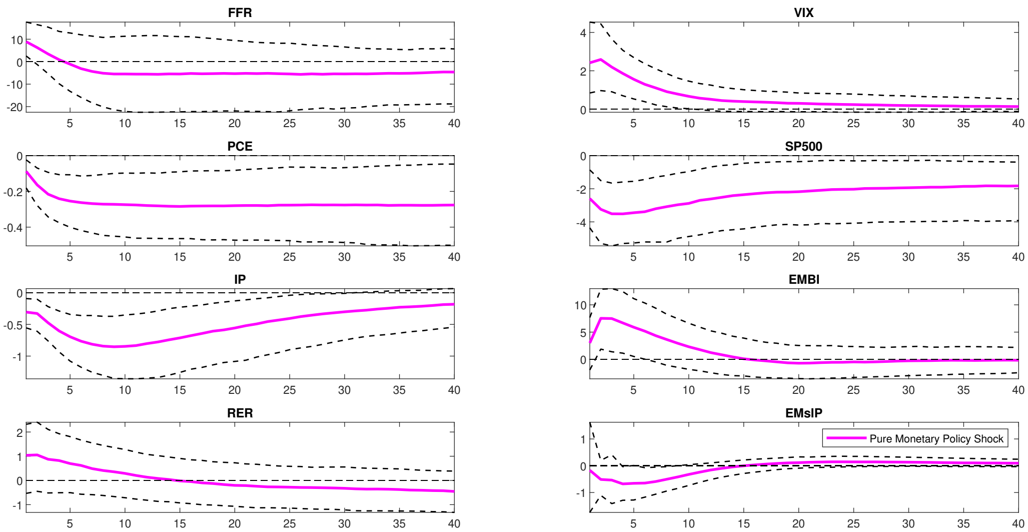

Figure A.7: Pure monetary policy shock using SR identification

Notes: The impulse response shows a 10 b.p. increase in the federal funds rate associated with a pure monetary policy shock with respect to a long-term trend, and 68 percent confidence interval bands. The first column shows the dynamic response to the federal funds rate, personal consumer expenditure, industrial production, and real exchange rate, while the second column indicates the response to VIX, $S\&P$ 500 index, spread, and EMs' industrial production. All variables are expressed in p.p except the federal funds rate. The VAR sample includes 2000-2019.

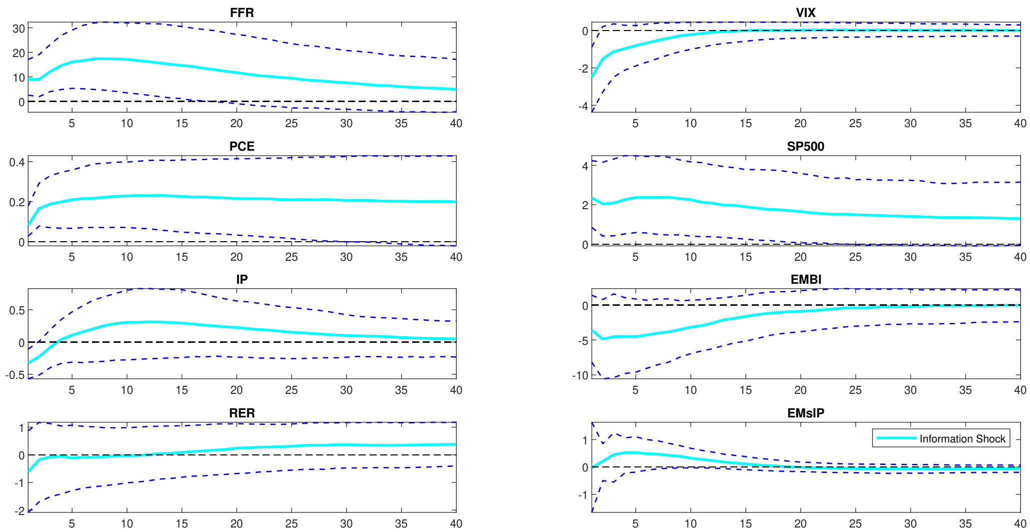

Figure A.8: Information shock using SR identification

Notes: The impulse response shows a 10 b.p. increase in the federal funds rate associated with an information shock with respect to a long-term trend, and 68 percent confidence interval bands. The first column shows the dynamic response to the federal funds rate, personal consumer expenditure, industrial production, and real exchange rate, while the second column indicates the response to VIX, $S\&P$ 500 index, spread, and EMs' industrial production. All variables are expressed in p.p. except the federal funds rate. The VAR sample includes 2000-2019.

APPENDIX B

Chapter 2

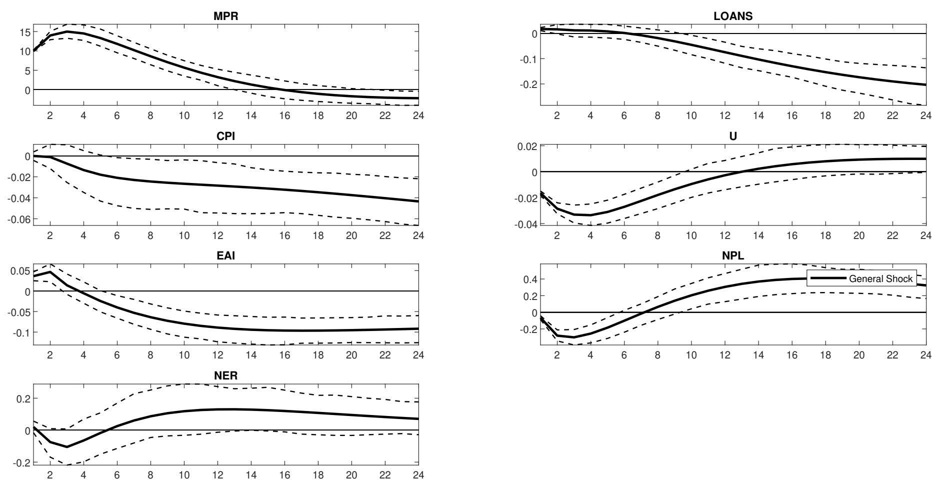

Figure B.1: General Shock using Cholesky

Notes: The impulse response shows a 10 basis points increase in the monetary policy rate with respect to a long-term trend, and 68 percent confidence interval bands. The first column shows the dynamic response to consumer price index, economic activity index, nominal exchange rate, loans, unemployment rate and a non performing loans index. All variables are expressed in p.p except MPR. VAR sample includes 2001-2019.

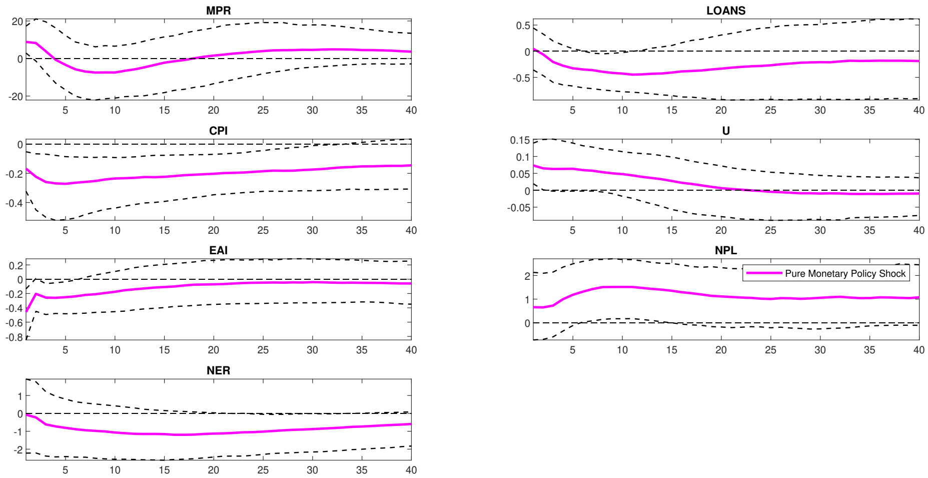

Figure B.2: SR Monetary Policy Shock

Notes: The impulse response shows a 10 basis points increase in the monetary policy rate due to a pure monetary policy shock with respect to a long-term trend, and 68 percent confidence interval bands. The first column shows the dynamic response to consumer price index, economic activity index, nominal exchange rate, loans, unemployment rate and a non performing loans index. All variables are expressed in p.p except MPR. VAR sample includes 2001-2019.

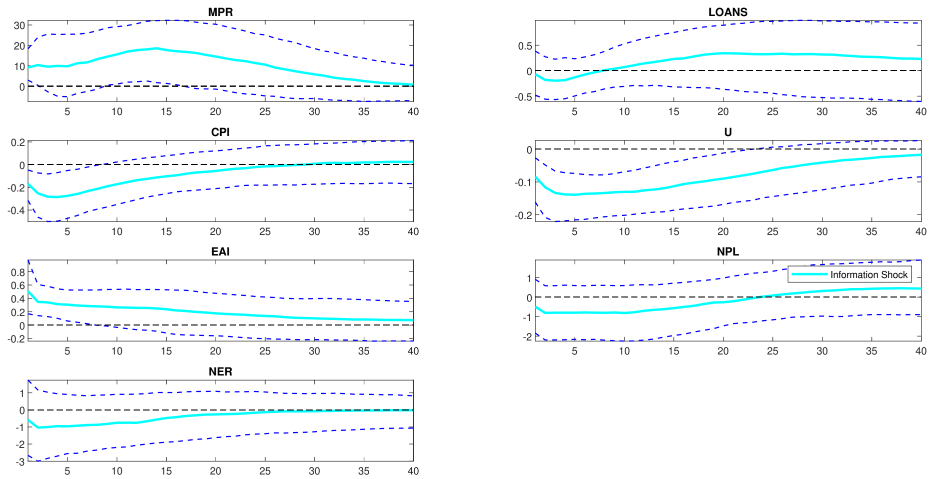

Figure B.3: SR Information Shock

Notes: The impulse response shows a 10 basis points increase in the monetary policy rate due to an information shock with respect to a long-term trend, and 68 percent confidence interval bands. The first column shows the dynamic response to consumer price index, economic activity index, nominal exchange rate, loans, unemployment rate and a non performing loans index. All variables are expressed in p.p except MPR. VAR sample includes 2001-2019.

Table B.1: Sign Restriction Identification for one period

	Pure MP Shock	Information Shock
MPR	positive	positive
CPI	negative	negative
EAI	negative	positive
NER	?	?
LOANS	?	?
U	positive	negative
NPL	?	?

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