Essays on macroeconomic policies after the crisis

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Chapter 2

Capital Flows Spillovers of U.S. Macroeconomic News: the Role of Fed's Policies

2.1 Introduction

In the early months of 2018, some emerging market economies (EMs) experienced rising financial stress, with Argentina even turning to the International Monetary Fund for assistance. According to data from EPFR, in May 2018 EMs-focused investment funds experienced the first monthly outflow since December 2016. Some commentators have linked these jitters to expectations of firming monetary policy rates in the United States (U.S.) (Authers, 2018; FT View, 2018).

A rich literature offers evidence that U.S. monetary policy actions do have effects on EMs asset prices (Aizenman, Binici, and Hutchison, 2016; Eichengreen and Gupta, 2015) as well as capital flows from advanced economies (Ahmed and Zlate, 2014; Fischer, 2015). However, the reassessment of expected U.S. monetary policy of early-2018 seems to have been caused by a string of positive news regarding the U.S. economic outlook rather than new announcements. This paper contends that domestic macroeconomic news are an important driver of cross-border flows and that their effect crucially depends on the stance of the Federal Reserve (Fed). Quite surprisingly, these two issues have been largely ignored by the literature.

We focus on the post-Great Financial Crisis (GFC) period and employ the local projection method to trace out the dynamic (4-week) effects of U.S. employment announcements on portfolio capital flows from the U.S. to EMs. We show that when the Fed complemented its zero rate policy with time-based forward guidance positive news induced inflows. Conversely, as the Fed progressively switched to a more data-based guidance, positive news led investors to move capital away from EMs. In a second step, we uncover the channels underlying these non-linear responses. The Fed's reliance on time-based guidance deprived macroeconomic releases of any risk-free rate information content. Instead, positive news boosted stock prices and depressed the VIX (a measure of volatility), which explains the flows of capital towards EMs. By contrast, in the lead-up to the rate liftoff, the Fed put increased

emphasis on incoming data to decide the timing of normalization. Positive news fueled expectations of firmer policy and led to a tightening of financial conditions, inducing investors to repatriate capital.

Unlike most previous studies of portfolio capital flows, we do not carry out the analysis using aggregate, country level, data. Rather, we rely upon micro data at the investment fund-level as put together by EPFR. This source has been widely used in the literature. However, most contributions only employed its country flow database (Fratzscher, 2012; Fratzscher, Lo Duca, and Straub, 2018; Koepke, 2018; Li, Haan, and Scholtens, 2018). Through the EPFR's fund flow database we obtain information on investors' allocations into more than 750 investment funds — totaling about $400 billion of assets — legally domiciled in the U.S. and investing in emerging, frontier and other market economies (for simplicity we collectively refer to them as EMs).

The key advantage of the fund-level data is that it allows distinguishing between mutual and exchange-traded funds (ETFs). Through a difference-in-differences (diff-in-diff) analysis, we show that ETFs play an essential role in the international transmission of shocks. Flows in and out of ETFs account for almost all of the response to U.S. employment announcements described above. Likely, this is due to ETFs being used by more short-term oriented and less risk-averse investors, who find in them an easy way to hold liquid positions in different sets of markets. Given their rising popularity as an investment vehicle, our results suggest that ETFs might have made the financial markets in EMs more sensitive to external shocks, potentially amplifying the global financial cycle.[1]

This analysis builds upon recent advancements in the capital flows literature. IMF, 2011 highlighted a new wave of capital flows after the GFC, to which portfolio flows had contributed for about 50 percent, much more than previous historical episodes. This study inspired a burgeoning literature. Fischer, 2015 and Koepke, 2018 document the expected level of the U.S. policy rate to have adverse effects on flows. The role of financial market volatility as a global push factor driving flows in and out of EMs is emphasized in Miranda-Agrippino and Rey, 2015 and Forbes and Warnock, 2012 among others. Rey, 2015 shows the existence of a global financial cycle, which is driven by monetary policy in the U.S. and in which asset prices co-move. Li, Haan, and Scholtens, 2018 study fund flows surges and find that these depend on global factors, including U.S. equity returns and the VIX index.

Many studies analyze the effects of the Fed's unconventional policies. For instance, Ahmed and Zlate, 2014 find large positive effects of such policies on portfolio flows. Using EPFR data, Fratzscher, Lo Duca, and Straub, 2018 find that the Fed's quantitative easing policies triggered outflows from bond funds and inflows into EMs equity funds. These authors also argue that unconventional monetary policies in advanced economies have generally magnified the procyclicality of capital flows.

Only Fratzscher, 2012 touches upon the role of U.S. macroeconomic news. This author focuses on the November 2005 to October 2010 period and also finds coefficients

[1] The asset share of ETFs in the overall U.S. industry is now at over 50 percent.

of opposite sign, positive for the GFC period and negative for the rest of the sample. Fratzscher, 2012 explains this non-linearity arguing that in crisis times negative U.S. news reduce investors' risk tolerance and cause a flight-to-safety reaction, with capital fleeing EMs. Differently from Fratzscher, 2012 the non-linearities that we uncover are not typical of crises, cannot be explained by flight-to-safety behaviors, and can only be rationalized looking at changes in the Fed's stance. Non-linear effects of global push factors are also emphasized in Nier, Sedik, and Mondino, 2014 who find that the importance of the VIX in driving capital flows increases in its level.

Finally, the behavior of ETFs is only investigated by Converse, Levy-Yeyati, and Williams, 2018, who are also among the few researchers to conduct the analysis using data at the investment fund-level. These authors study the response of flows towards EMs to changes in global volatility and find that flows through ETFs respond about 1.5 times more than those through mutual funds.

This paper makes two novel contributions. First, it documents large and non-linear effects of U.S. macroeconomic news on cross-border portfolio capital flows and relates them to changes in the Fed's stance. This uncovers new specificities of the global financial cycle and highlights a further dimension through which U.S. monetary policy influences it. Second, it sheds some light on the role of ETFs in the transmission of shocks across borders. These funds have witnessed an exponential growth since their inception in 1993, and their high responsiveness to global factors might explain the increasing importance of portfolio flows as a share of total capital flows observed after the GFC (IMF, 2011).

The non-linearities uncovered in our analysis are consistent with recent papers showing that forward guidance has improved the agents' understanding of the central bank's reaction function (see Femia, Friedman, and Sack, 2013 and Engen, Laubach, and Reifschneider, 2015). Following the GFC — with policy rates at the effective lower bound (ELB) — forward guidance was meant to signal the persistence of large economic slack, which warranted a much slower policy normalization relative to previous historical episodes (Kohn, 2018). That contributed to a lower and more stable expected path of future policy rates (Swanson, 2017) and dampened the sensitivity of market interest rates to news (Feroli et al., 2017). On the other hand, the communication stance adopted by the Federal Reserve during the normalization period was more data-dependent. It was not meant to stabilize market expectations and conveyed the importance of 'under what circumstances' rather than 'when' interest rates would have moved.

The rest of paper is structured as follows: Section 2.2 briefly illustrates the rationale for central banks to adopt forward guidance policies, reviews the Fed's experience in this context and draws some implications for the current analysis. Section 2.3 presents the dataset used to carry out the empirical analysis. Section 2.4 is dedicated to the baseline fund-level analysis. It presents the methodology, discusses the results and presents some extensions. Section 2.5 zooms in on the role of ETFs in the transmission of shocks. Section 2.6 concludes by outlining some avenues for future research.

2.2 Forward Guidance: Rationale, Practice and Implications

This section is divided into three parts. The first one starts by briefly recapping the basic principles behind the usage of forward guidance as a monetary policy tool, while the second reviews how it has evolved in the U.S. after the GFC. The third part wraps things up by discussing how forward guidance might affect the response of capital flows to macroeconomic news and draws some implications for the empirical analysis.

2.2.1 Forward Guidance as a Monetary Policy Tool

Monetary theory holds that the central bank should target a certain level of the market real interest rate at which savings equal investments (defined as the equilibrium rate). Before the GFC, central banks in advanced economies used to set the policy rate to steer the market nominal rate towards a level that would be conducive to the estimated equilibrium rate.

To see that, it is useful to recall the expectation theory of the term structure of interest rates. This posits that in absence of default risks the market interest rate depends on the current and expected future policy rate according to the following formula:

$$i_{k,t} = \frac{i_t + i^e_{t+1} + i^e_{t+2} + ... + +i^e_{t+k}}{k} + l_{k,t} \tag{2.1}$$

where $i_{k,t}$ is the interest rate with maturity k prevailing at time t; i_t is the policy rate set by the central bank; i^e_{t+i} (with $i = 0,\ 1, .., n$) is the expectation at time t for its future level in period $t + i$; and $l_{k,t}$ is the term premium (that is the premium that investors require to hold long-term assets rather than rolling over short-term assets).

By changing the level of the policy rate the central bank directly influences the market interest rate through i_t. In exceptional circumstances, because either expected inflation, the equilibrium rate or both are very low, the central bank might desire to set a policy rate below zero. However, this is complicated as agents would rather hoard cash than lending at a negative rate. Hence, central banks have recently experimented with other ways to steer market interest rates lower without setting a negative interest rate. Specifically, they started sending rather explicit signals about the direction of future monetary policy (that is, acting on i^e_{t+i}), and affecting the quantity of long-term assets held by the private sector (that is, acting on $l_{k,t}$). These two 'unconventional' policies are commonly referred to as forward guidance and quantitative easing (QE) respectively.

Through QE, the central bank buys debt securities from the private sector in exchange for central bank reserves. To the extent that debt securities and reserves are not perfectly substitutable, the reduction in supply contributes to lower the liquidity

premium $l_{k,t}$ that investors require to hold debt securities, thus depressing their yields (see Gagnon et al., 2011, among others, for evidence of this so-called portfolio balance channel of QE). QE might also affect the expected future short-term policy rate (i^e_{t+i}). The mere fact that the central bank decides to carry out QE may convey implicit signals about its assessment of the state of the economy and consequently about future monetary policy. In other words, QE may indicate that monetary policy will remain accommodative for a long period (see Bauer and Rudebusch, 2014 for evidence).

Forward guidance consists instead of giving explicit signals about future policy through official statements and speeches. There exist two main types of forward guidance: about the likely future path of the policy rate (policy rate forward guidance) and about the future evolution of the central bank's balance sheet (balance sheet forward guidance). Since QE partly works by lowering the expected future policy path, balance sheet forward guidance can itself have significant effects on the expected future policy rate.

The Bank of England and the Federal Reserve are two major central banks to have adopted QE. Importantly, Christensen and Rudebusch, 2012 find that the signaling channel of QE was stronger in the U.S. relative to the United Kingdom and claim that this might be due to the different forward guidance given by the two respective central banks. As it announced QE, the U.S. Federal Reserve also provided policy rate forward guidance. Market participants might have seen QE announcements as reinforcing this guidance, thus strengthening the idea of 'low rates for long.' In contrast, the Bank of England refrained from issuing rate guidance when announcing its debt purchase program. That might have dampened the strength of the QE's signaling channel. More concrete examples of the Fed's forward guidance policies are given in the next section.

2.2.2 The Experience of the Federal Reserve

Here we briefly review the evolution of forward guidance in the U.S. following the GFC. Table 2.1 provides a summary of the key statements made by the Federal Reserve, while a more in-depth review is given in Feroli et al., 2017.

In December 2008, the Federal Open Market Committee (FOMC) lowered the target range for the federal funds rate (its policy rate) to 0-0.25 percentage points, essentially its lower bound. It also introduced *open-ended* forward guidance for the first time. Precisely, it stated that "*economic conditions [were] likely to warrant exceptionally low levels of the federal funds rate for some time*" (FOMC, 2008). This open-ended guidance was modified in March 2009, as the FOMC replaced the expression 'some time' with "*an extended period*" (FOMC, 2009). The Fed reiterated this statement until July 2011.

In March 2009, the FOMC also announced an expansion of its QE program, which it had introduced in December 2008. The combination of the 'extended period' language and the announcement of QE's expansion lowered the expected path of

policy rates. Conversely, the repetition of the 'extended period' language in later statements and the announcement of another round of QE (November 2010) did not seem to have had major effects on market expectations (Kohn, 2010).

Forward guidance experienced a quantum leap in the summer of 2011. Survey as well as market-based data were suggesting that market participants expected an increase of the policy rate in about a year ahead. The FOMC instead planned not to raise the policy rate for a much longer period. To realign expectations, the Fed stated that "*economic conditions [... were] likely to warrant exceptionally low levels for the federal funds rate at least through mid-2013*", thus providing an exact calendar date for the possible duration of its zero-rate policy (FOMC, 2011). The exact wording was subsequently modified in January and September 2012 to keep a guidance indicating likely low rates for about two years (see Table 2.1 below). Moessner, 2013 estimated that each of these announcements had an average depressing effect of 14 basis points on 3-year ahead future policy rates.

In September 2012 the Fed also announced the third phase of QE and committed to buying securities worth about $40 billion each month for an indeterminate period, thus reinforcing the calendar-based guidance. The open-ended nature of this round of QE led market participants to nickname it as Q-infinity, and some seemed to lose sight of the conditions for ending it (Feroli et al., 2017).[2]

In December 2012, the FOMC removed calendar-based guidance and introduced the so-called 'threshold-based' guidance. It stated that the zero-rate policy would have been appropriate at least until the unemployment rate had remained above 6.5 percentage points (1.4 points less than the actual rate). Although the Fed dropped the time-based dimension, it stated that it viewed this threshold "*as consistent with its earlier time-based guidance*" (FOMC, 2012a). The FOMC just wanted to communicate its determinacy to achieve its goals. In line with this interpretation, it announced an expansion of QE worth an additional $45 billion of monthly purchases.

It was only in May 2013 that market expectations began to change. As economic conditions continued to improve, the FOMC first stated that it was "*prepared to increase or reduce the pace of its purchases to maintain appropriate policy accommodation as the outlook for the labor market or inflation changes*" (FOMC, 2013a). That set the stage for a key speech given by Ben Bernanke later in the month (the taper tantrum speech). The then Fed's chairman declared that "*in the next few meetings, [the FOMC] could take a step down in [the] pace of [bond] purchase*" (Bernanke, 2013). In subsequent meetings, the FOMC fine-tuned its balance sheet forward guidance to clarify that QE would continue "*until the outlook for the labor market [had] improved substantially in a context of price stability*" (FOMC, 2013b). In the end, the beginning of the reduction of QE was formalized in December 2013.

[2] In November 2008, the FOMC announced the purchase of $600 billion in agency mortgage-backed securities (MBS) and agency debt. That constituted the first round of QE (QE1), and it was expanded on 18 March 2009 to include additional purchases of $750 billion in agency MBS and agency debt as well as $300 billion in U.S. government bonds. QE1 ended in March 2010. In November 2010, the FOMC announced the second round of QE (QE2), worth $600 billion of longer-dated Treasury purchases.

Table 2.1: Federal Reserve's policy rate forward guidance – a timeline

	OPEN-ENDED
12/16/2008	"economic conditions are likely to warrant exceptionally low levels of the federal funds rate for **some time**" (FOMC, 2008)
03/18/2009	"economic conditions are likely to warrant exceptionally low levels of the federal funds rate for an **extended period**" (FOMC, 2009)
	CALENDAR-BASED
08/09/2011	"economic conditions [...] are likely to warrant exceptionally low levels for the federal funds rate at least **through mid-2013**" (FOMC, 2011)
01/25/2012	"economic conditions [...] are likely to warrant exceptionally low levels for the federal funds rate at least **through late 2014**" (FOMC, 2012b)
09/13/2012	"exceptionally low levels for the federal funds rate are likely to be warranted at least **through mid-2015**" (FOMC, 2012c)
	THRESHOLD-BASED
12/12/2012	"this exceptionally low range for the federal funds rate will be appropriate at least **as long as the unemployment rate remains above 6-1/2 percent**, inflation between one and two years ahead is projected to be no more than a half percentage point above the Committee's 2 percent longer-run goal" (FOMC, 2012a)
12/18/2013	"it likely will be appropriate to maintain the current target range for the federal funds rate **well past the time that the unemployment rate declines below 6-1/2 percent**" (FOMC, 2013a)
	NORMALIZATION
03/19/2014	"it likely will be appropriate to maintain the current target range for the federal funds rate for a **considerable time** after the asset purchase program ends" (FOMC, 2014)
01/28/2015	"based on its current assessment, the Committee judges that it can be **patient** in beginning to normalize the stance of monetary policy" (FOMC, 2015c)
04/29/2015	"The Committee anticipates that it will be **appropriate** to raise the target range for the federal funds rate when it has seen further improvement in the labor market" (FOMC, 2015a)
	POST-LIFTOFF
12/16/2015	"In light of the **current shortfall of inflation** from 2 percent, the Committee will carefully monitor actual and expected progress toward its inflation goal." (FOMC, 2015b)
03/15/2017	"The Committee will carefully monitor actual and expected inflation developments relative to its **symmetric inflation goal.**" (FOMC, 2017)

Notes: in the periods between older and newer sentences, the FOMC repeated older sentences.

At the same time, the FOMC changed its policy rate forward guidance to convey the idea that any increase in the policy rate would have only happened following the tapering of QE. First, it stated that it would have likely maintained the zero-rate policy "*for a considerable time*" after the end of QE (FOMC, 2014). When bond purchases were completely halted (October 2014), it stated that it would have been "*patient*" in beginning to normalize policy (FOMC, 2015c). In April 2015, it spelled out some conditions for when it would have been "*appropriate*" to raise the federal funds rate. These crucially included a reference to "*further improvement in the labor market*" (FOMC, 2015a). The first increase in the policy rate finally materialized in December 2015. At that point, the U.S. economy had created 6.5 million jobs since Bernanke's taper tantrum.

Concurrently to the first policy rate hike since the GFC, the FOMC signaled a partial shift away from the labor market in its policy reaction function. Precisely, it qualified the distance of inflation from its objective as a "*shortfall*" and added that going forward it would have "*carefully monitor[ed] actual and expected progress toward its inflation goal*" (FOMC, 2015b). The Fed increased the policy rate in five more occasions from the time of the first liftoff until the end of May 2018, one in 2016, three in 2017 and one in early 2018.

The next section discusses how forward guidance may affect the sensitivity of cross-border capital flows to macroeconomic announcements and focuses on the experience of the Federal Reserve to draw some implications for the empirical analysis.

2.2.3 Implications for the Analysis

How can forward guidance affect the response of capital flows to macroeconomic announcements? Consider a world where each country operates its independent monetary policy and investors shift capital across borders to chase the highest returns. To the extent that domestic releases reveal new information about inflation and/or output, in normal times they should affect the market expectations of future policy. News indicating higher inflation or consumer demand increase the probability that the central bank will raise the policy rate. That reduces the foreign-to-domestic rate differential and leads investors to shift their portfolios towards domestic assets. Forward guidance is relevant in that it informs investors on how the central bank will respond to fluctuations in economic activity.

Under time-based guidance, the central bank conveys the idea of low rates for long. If it is credible, market expectations for the future policy rate should not be affected by new macroeconomic data. Capital flows should then be less sensitive, or not sensitive at all, to domestic announcements. Conversely, under data-based guidance, incoming data is important to assess future policy. Signals of a stronger domestic economy should lead to a higher expected rate and repatriation of capital from foreign markets.

The Fed made extensive use of communication in the aftermath of the GFC. It started with a soft form of time-based guidance by stating that the policy rate

would have remained close to zero for an undetermined period (March 2009). This was successively backed up by a quasi-promise to keep interest rates low for about two calendar years (August 2011). The FOMC started transitioning from time- to data-based guidance when it switched to threshold-based guidance (December 2012). The switch was completed when it conditioned the phasing down of QE on improvements in the labor market (September 2013).

Based on this narrative we distinguish between the following four different Fed's policy regimes:

A. the open-ended forward guidance regime (March/18/2009 to August/8/2011)
B. the calendar-based forward guidance regime (August/9/2011 to May/22/2013)
C. the normalization guidance regime (May/23/2013 to December/12/2015)
D. the post-liftoff regime (December/13/2015 to May/30/2018).[3]

A and B are both periods of time-based guidance. We analyze them separately since calendar-based guidance might have had stronger effects on market expectations. As cutoff between periods B and C, we opt for Bernanke's taper tantrum. Finally, we distinguish among a normalization and a post-liftoff regime since capital flows may display an extra sensitivity to monetary policy during liftoff periods (Ahmed, 2015).

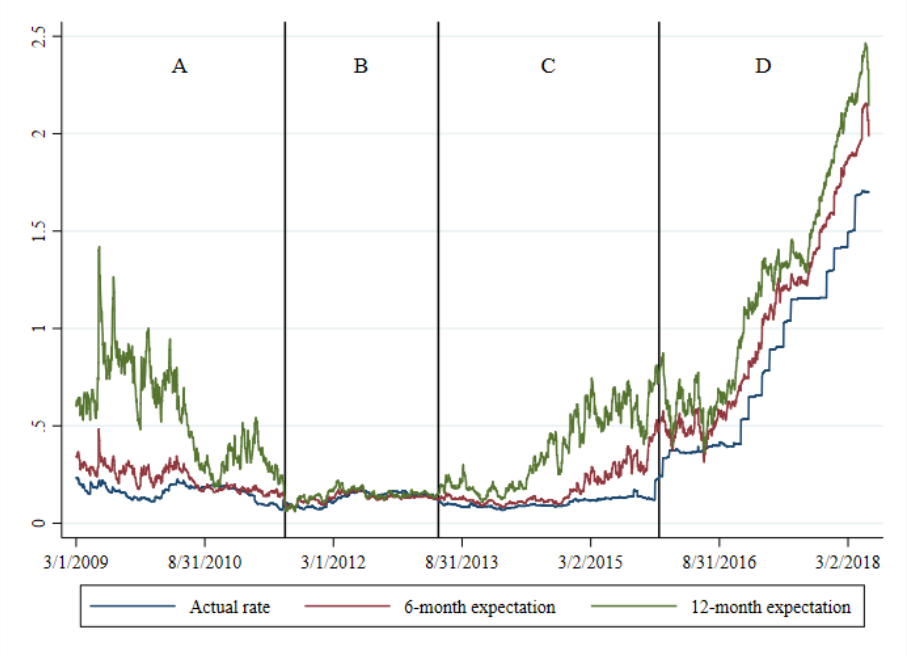
Figure 2.1 provides anecdotal evidence that the Fed did manage to affect market expectations through forward guidance. It plots the level of the federal funds rate as well as the 6- and 12-month ahead expected value during the post-GFC period. Vertical lines denote the key changes in the Fed's communication framework identified above. Strikingly, in the calendar-based period (denoted by B) market participants did not expect any increase in the policy rate for at least one year. Following Bernanke's taper tantrum, first the 12-month ahead and then also the 6-month ahead future rate started to increase relative to the actual rate. In the rest of the paper, we will investigate whether the response of capital flows to news was also affected by these events.

2.3 Dataset

We now explain the construction of the dataset. The section starts with the data used to measure capital flows. It proceeds with the macroeconomic announcement that we focus on and finishes with a description of further country-specific variables used to carry out some extensions.

[3] Although the Federal Reserve issued forward guidance already in November 2008, we choose the introduction of the extended-period language (March/18/2009) as the starting date of the analysis. In this way the sample entirely excludes the GFC period.

Figure 2.1: Evolution of the actual and future expected federal funds rate during different Fed's guidance regimes



Notes: the figure shows the federal funds rate as well as its 6-month and 12-month ahead expected future rate during the March 2009 to May 2018 period. Vertical solid lines denote key Fed's guidance changes. The first, second and third leftmost vertical lines denote the introduction of calendar-based forward guidance (August/9/2011), the taper tantrum (May/22/2013) and the first rate liftoff (December/13/2015) respectively. The windows denoted by A, B, C and D respectively indicate the open-ended guidance, calendar-based guidance, normalization guidance, and post-liftoff regimes.
Sources: Thomson Reuters Datastream

2.3.1 Cross-border Portfolio Flows

To proxy for cross-border portfolio flows, we rely on data about investors' allocations into EMs bond and equity investment funds compiled by EPFR. The two main variables of interests are fund flows ($f_{i,t}$) and initial assets ($a_{i,t}$). The former gauges the net \$ purchase of shares in fund i at time t, while the latter measures the fund's assets under management at the beginning of the period. We also collect data on funds' return, meaning the percent period-on-period change in net asset value (NAV), to be used as a control.[4]

The data are available at different frequencies (daily, weekly and monthly). We opt for the weekly frequency.[5] That permits to identify relatively well the effect of macroeconomic news, while at the same time its coverage is still fairly representative of the overall fund industry. The sample ranges from January 2007 to May 2018. The panel is unbalanced, with funds entering and leaving the sample as they are established or liquidated.

[4] The net asset value change excludes asset changes due to new inflows.
[5] The week is defined as to start on Thursday at the beginning of the U.S. trading day.

Although funds are not required to report to EPFR, the platform has rather good coverage. Open-ended investment funds managed more than $49 trillion in assets at the end of 2017, which was about 23 percent of all worldwide debt and equity markets (ICI)). The funds reporting to EPFR had a total of $30.7 trillion of assets. EPFR's coverage of US-domiciled funds is even larger, with assets managed by reporting funds being 92 percent of the total. Not all funds report at the weekly frequency, however, but those that do still account for a sizable share of the overall industry's assets (about 42.5 percent).

Using the EPFR dataset has other advantages. Being it at the fund-level, it allows observing important fund-specific characteristics such as the geographical investment destination as well as the legal domicile. The latter is particularly important since by selecting only funds that are domiciled in the U.S. we obtain a good proxy of bilateral (gross) capital flows from the U.S. to EMs. Another useful information concerns the type of funds, whether they invest in equity or debt and whether they are exchange-traded or mutual funds (the main difference being that the former are traded continuously throughout the day on secondary markets, which make them more liquid).

We clean the data following standard procedures. We exclude funds that have life of less than one year. We also drop funds with less than $10 million assets under management on average.[6] Finally, we exclude observations with abnormal jumps, defined as having flows larger or smaller than one-third of assets. After cleaning, we are left with a panel comprising 753 US-domiciled funds and about 250 thousand observations. Appendix A.1 discusses relevant descriptive statistics and provides some stylized facts.

A concern with using EPFR data to measure portfolio capital flows is that they only capture flows through investment funds. For a sensitivity analysis, we also collect weekly data on all types of cross-border portfolio capital flows to EMs as compiled by the IIF. Another methodological difference relative to EPFR is that, while fund flows are a gross measure of cross-border flows, the IIF estimates net flows (that is, gross flows from country A to country B minus gross flows from B to A). The main limitation relates to country coverage. IIF provides overall, rather than bilateral, capital flow data. Moreover, destination countries are just a few large EMs.

[6] For all the funds that enter the panel after the starting date of the sample, we exclude the first four observations. New funds typically raise capital for a period lasting from some weeks to a few months before starting to invest. Hence, when a fund enters the panel, EPFR records assets as being equal to 0 and flows equal to the capital raised. This causes unreasonably large outliers in our variable of interest (which is flows as a share of the beginning of period assets). Similarly, when a fund leaves the panel, EPFR records negative flows equal to the assets under management at the end of the preceding period. Therefore, we also exclude the last four observations of the funds exiting the sample.

2.3.2 Macroeconomic Releases and Other Data

To study the reaction of flows to macroeconomic news, we focus on one specific announcement: the net change in non-farm payroll (NFP) employment, released the first Friday of every month by the BLS. Existing literature has found this to be the most important macroeconomic announcement for financial markets worldwide. The reason is that NFP employment figures are closely watched by the FOMC when making monetary policy decisions. This is epitomized by a famous quote by former Chairman Alan Greenspan: "*Everything we've looked at suggests that it's the payroll data which are the series which you have to follow*" (2004). Below we discuss why this is the case.

The Federal Reserve has three main objectives, maximum employment, stable prices, and moderate long-term interest rates. Therefore, the NFP release provides direct information on how far the Federal Reserve is from reaching the employment-related part of its mandate and gives hints about the likelihood of future changes in monetary policy. Moreover, the less is the degree of labor market slack the more workers are likely to demand higher wages, which should ultimately lead to higher inflation. Hence, NFP data can also be useful to gauge the strength of domestic price pressures.[7]

NFP releases are relevant also for other reasons. First, the NFP series moves very close to the overall economy (at this respect see the evolution of NFP over the January 2011 to May 2018 period depicted in Figure A.5 in Appendix A.2). Thus, its importance goes beyond the labor market, and indeed the NFP series is one of the key indicators used by the NBER to determine whether the economy is in an expansion or a recession. Second, as they are released with just a few days lag relative to the end of the month, NFP announcements are very timely. As shown in Gilbert et al., 2017 this property is crucial to determine the financial market relevance of a macroeconomic announcement. These authors find that NFP data explain about 25 percent of the variation in U.S. government bond yields in days they are released, whereas other macroeconomic news have barely any effect. Their importance is also confirmed in earlier empirical studies (Beber and Brandt, 2009; Faust et al., 2007; Swanson, 2017).

[7] The unemployment rate is another important labor market-related release. Crucially, however, NFP data are considered by Federal Reserve's officials to provide a more accurate picture of the state of the labor market. The unemployment rate is derived from a 60 thousand households survey, which counts the number of employed individuals, whereas NFP data come from a 400 thousand business establishments payroll survey and count the net number of jobs created. The difference between employed individuals and jobs is important as the former includes self-employment and unpaid family workers. In most cases, these are low-paying alternatives to wage and salary work and therefore tend to behave counter-cyclically. That is, they increase during recessions as the prospects of finding a job is lower, and they decrease during expansions as the same likelihood goes up. Hence, changes in the number of employed individuals might send mixed signals about the labor market strength (for a more in-depth review see Wu, 2004).

Since market participants form expectations about upcoming announcements, we follow standard practice in the literature and identify the 'surprise' component by relying on Bloomberg, which surveys economic analysts about their forecast. We then subtract the median response from the actual release to obtain a measure of the unexpected component. In practice, we construct the following variable:

$$news_t = \frac{(r_t - E[r_t])}{\sigma_R}$$

with r_t being the actual release; $E[r_t]$ the median survey response; and σ_x the unconditional standard deviation of the surprise component $r_t - E[r_t]$.

Since the analysts surveyed by Bloomberg can update their answer until the day of the announcement, it is unlikely that they receive new information between the moment in which they report (update) their forecast to the moment in which the release takes place. Confirming this, the NFP surprise series (plotted in Figure A.6 in Appendix A.1) behaves as white noise, suggesting that it effectively captures the unanticipated component. We formally verify that this is the case by regressing it on the Bloomberg's median expectation ($E[r_t]$). The result from this simple test indicates that the forecast error is indeed orthogonal to the analysts' information set.[8] Another potential concern is that macroeconomic announcements tend to have less impact on asset prices when analysts' disagreement is higher (Pericoli and Veronese, 2015). We therefore collect data on the forecast standard deviation for a sensitivity analysis.

Besides NFP, we also collect data on other U.S. as well as foreign macro releases. For the U.S., we consider the ISM PMI manufacturing index, the unemployment rate, the consumer price index, and retail sales. As for foreign releases, we focus on those from other largest advanced economies, namely the U.K., Japan, Germany, and the Euro Area. Table A.3 in Appendix A.2 contains a list of all the macroeconomic news we consider, together with relevant descriptive statistics and data sources.

Macroeconomic announcements may affect attitude towards risk, for instance, by altering perceptions about the state of the economy. Since the literature has identified risk appetite as an important capital flows driver (Miranda-Agrippino and Rey, 2015 and Forbes and Warnock, 2012), we collect additional data on the VIX (a measure of volatility) to investigate this potential channel. For similar reasons, we source data on the value of the U.S. stock market and the 6-month ahead expected future federal fund rate. All series are retrieved from Datastream.

[8] In practice, we estimate the following regression: $news_t = \alpha + \beta E[r_t] + \varepsilon$. The F-test statistics is 1.27, thus rejecting the null hypothesis that $\alpha = \beta = 0$.

2.4 Baseline Analysis

We carry out the empirical analysis in two stages. We start by estimating how flows into the average investment fund respond to U.S. employment news. We then zoom in on the role of ETFs through a difference-in-differences (diff-in-diff) analysis.

2.4.1 Methodology

For the econometric analysis, we rely on the local projection method (Jordà, 2005). This is similar in spirit to the event study approach (usually used to investigate the static effects of macroeconomic announcements on financial variables). But it allows exploring dynamic effects in a rather compact format. The horizon considered is a 4-week window, including the week of the release and the following three. Another advantage of the local projection method is that it suits very well the estimation of non-linearities. We will exploit this feature in the next section.

Employing local projections entails regressing the cumulative flows over the $t+k$ horizon onto the surprise series at time t. Specifically, for each $k = 0, 1, 2, 3$, we estimate the following equation:

$$100 * \frac{\sum_{j=0}^{k} f_{i,t+j}}{a_{i,t}} = \sum_{r=1}^{4} \beta_k^r d_t^r news_t + A_k D_t + B_k Z_{i,t} + \gamma_i + \varepsilon_{i,t} \tag{2.2}$$

where $f_{i,t}$ denotes investors' \$ allocations into fund i at time t; $a_{i,t}$ is the volume of assets under management by fund i at beginning of period t (also in \$); d_t^r, with $r = 1, .., 4$, are four dummy variables each taking value 1 during a different Fed's guidance regime and 0 otherwise; $news_t$ is the NFP variable, taking value equal to the surprise component in weeks in which there is a release and 0 otherwise; D_t is a vector with the four d_t^r dummies (to allow for regime-specific intercepts); $Z_{i,t}$ is a vector comprising twelve lagged values of the one-period flows and net asset value change, both in percentage of fund's assets; γ_i are investment fund fixed effects; and $\varepsilon_{i,t}$ is the error term, assumed to be uncorrelated to the regressors.

The β_k^rs are the coefficients to be estimated. Each of them measures the average response of fund flows over the $t+k$ horizon to a standard deviation NFP surprise in regime r. The estimation is done through OLS. Standard errors are clustered at the fund-level to control for heteroskedasticity and potential autocorrelation within each cross-section. To show the results, we plot impulse response functions (IRFs) using the $\hat{\beta}_k^r$ coefficients for the point estimates and their standard errors to derive confidence bands.

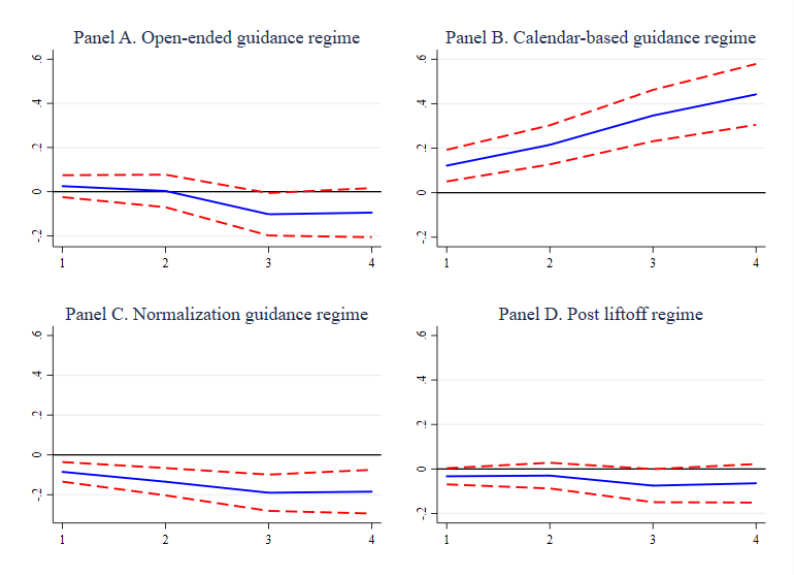
2.4.2 Results

Figure 2.2 below shows IRFs obtained estimating Equation 2.2. Blue solid lines report the estimated responses. Red dotted lines are 90 percent confidence intervals. Flows are measured as a percentage of funds' assets. Each panel reports the IRF

corresponding to a different regime. Panels A and B contain results for the open-ended and calendar-based guidance regimes respectively, while Panels C and D focus on the normalization and post-liftoff periods (refer to Section 2.2.3 for an exact definition). The same abbreviations will be followed in the rest of the analysis.

The results point to stark non-linearities. Whereas during the calendar-based regime positive news caused U.S. investors to pour money into EMs-focused funds, the same announcements had the opposite effect during the normalization regime. In the former period, the effect of one standard deviation surprise is estimated to be 0.1 percent at impact (week 1) and to get stronger over the time, until reaching about 0.4 percent in the fourth week (still statistically significant). Conversely, during the normalization regime, the sensitivity is estimated to be slightly more than -0.1 percent at impact and more than twice as negative in the second week. The effect levels off at about -0.2 percent in the third week (still statistically significant).[9]

Figure 2.2: Fund flows sensitivity to employment announcements during different Fed's guidance regimes



Notes: the Figure shows the estimated responses to U.S. employment announcements of allocations into investment funds. The funds considered are legally domiciled in the U.S. and invest in emerging, frontier and other market economies (as defined by MSCI). Sensitivities are measured in percentage of beginning of period assets. The y-axis denotes the cumulated effect of a one standard deviation surprise in the U.S. non-farm payroll data release. The x-axis denotes the horizon of the response (in weeks), with 1 being the week of the announcement. The blue solid line shows the β_k^r coefficients obtained estimating Equation 2.2. Red dotted lines are 90 percent confidence bands obtained using respective standard errors, clustered at the fund-level. The open-ended guidance, calendar-based guidance, normalization guidance, and post-liftoff regimes range, respectively, from March/18/2009 to August/8/2011, from August/9/2011 to May/22/2013, from May/23/2013 to December/12/2015 and from December/13/2015 to May/30/2018.
Sources: Bloomberg, Emerging Portfolio Fund Research and own calculations.

The results for the open-ended guidance and post-liftoff regimes are similar to those for the normalization period but smaller in absolute value and statistically

[9] The results are robust to using a different lag structure and, as expected since the surprise series behaves as white noise, also to including forward surprises ala Teulings and Zubanov, 2014.

significant only in week 3. When the Federal Reserve was issuing open-ended guidance, a positive surprise had adverse lagged effects on flows, equal to about a tenth of a percentage point. Flows were still negative following good news during the post-liftoff regime, but the estimates are even smaller.

When the horizon is extended further, the response of flows during the calendar-based regime keeps increasing until the sixth week to then finally level off at about 0.6 percent (results available upon request). Importantly, neither the effect estimated for this period neither that for the normalization regime is found to reverse over a longer horizon.

What can explain the positive response of flows during the calendar-based regime? We argue that the strong time-based guidance provided by the Fed stabilized the market expectation for the future policy rate, thus making interest rates insensitive to economic releases. Absent implications for future monetary policy, positive news bolstered the investment outlook and decreased risk aversion, as agents gained confidence that the economic recovery was gaining strength. Given that the U.S. is the largest economy in the world, these factors had positive spillovers for the rest of the global economy, including EMs.[10] On the other hand, after the Fed hinted at the beginning of normalization employment announcements recovered their risk-free rate information content. The prospect of a stronger labor market brought forward the expected exit from unconventional monetary policies, which itself had contributed to decreasing volatility (Bekaert, Hoerova, and Duca, 2013). That would explain the outflows from EMs observed following positive news.[11]

We next test whether these explanations are correct. We first carry out an event study to analyze how U.S. monetary policy expectations (proxied by the 6-month future federal funds rate), equity prices and risk aversion (proxied by the VIX) reacted to employment announcements during different forward guidance regimes. Second, we include these variables in the baseline specification (Equation 2.2) and check how the results are affected.

For the event study, we consider both a 1-day and a 1-week window. The latter is useful to check whether the effects of employment releases persisted over a relatively long horizon. The estimation is done by OLS. Standard errors are heteroskedasticity (white) robust. Results are shown in Table 2.2 below. Each column reports estimates for a different forward guidance regime. Bold numbers indicate statistical significance at the 90 percent confidence level.

[10] Notice that positive effects for capital flows to EMs do not exclude that positive news also led to more investment in US-dedicated funds.

[11] The link between U.S. macro-financial conditions and growth in EMs is likely to be heterogeneous among countries, but for a typical open EM it may be substantial. As an example, Solmaz, 2015 study the impact of external shocks, proxied by the oil price, U.S. industrial production, and U.S. credit spreads, on Turkey through a Bayesan vector autoregression model and find that about 60 percent of the variance of output can be explained by external factors. Moreover, some commodity exporters-EMs would arguably benefit from better U.S. growth prospects through higher commodity prices (see Reinhart and Reinhart, 2008 for evidence on the relationship between commodity prices and capital flows to EMs).

Table 2.2: Sensitivity of key U.S. financial variables to employment announcements during different Fed's guidance regimes

		(A)	(B)	(C)	(D)
1-day	6-month fed fund future	**1.79**	0.09	**1.19**	**1.17**
	MSCI U.S. stock index	**0.37**	**0.75**	-0.02	0.25
	CBOE VIX volatility index	-0.16	**-3.55**	-0.39	-1.80
1-week	6-month fed fund future	0.36	0.17	**0.68**	1.13
	MSCI U.S. stock index	0.35	**1.07**	**-0.77**	-0.14
	CBOE VIX volatility index	-0.27	-5.16	**7.13**	-1.76

Notes: the Table shows the estimated responses to a one standard deviation surprise in the U.S. non-farm payroll data release of (i) the 6-month ahead federal fund future rate, (ii) the growth rate of the MSCI U.S. stock index, and (iii) the growth rate of the CBOE VIX U.S. equity volatility index. The response of (i) is measured in basis points, that of (ii) and (iii) in percentage points. The leftmost column reports the horizon considered. "1-day" refers to daily responses. "1-week" refers to weekly (5-trading-day) responses. Columns denoted by (A), (B), (C), and (D) report estimates for different Fed's guidance regimes: respectively the open-ended (March/18/2009 to August/8/2011), calendar-based (August/9/2011 to May/22/2013), normalization (May/23/2013 to December/12/2015) and post-liftoff (December/13/2015 to May/30/2018). Estimates are obtained from estimating the following specification: $100 * (y_{t+n} - y_{t-1}) = \sum_{r=1}^{4} \left(\alpha_k^r d_t^r + \kappa_k^r d_t^r news_t \right) + \varepsilon_t$, where y_t is either the federal funds 6-month future rate, the log of the MSCI U.S. stock index, or the log of the VIX index; t denotes time (in days); ε_t is an error term, assumed not to be correlated with the regressors; and the rest of the notation is as in Equation 2.2. Bold numbers indicate statistical significance at the 90 percent confidence level, based on heteroskedasticity (white) robust standard errors.
Sources: Bloomberg, Thomson Reuters Datastream and own calculations.

The estimates confirm that the effect of NFP announcements on the 6-month ahead fed fund rate was highly conditional on the Fed's communication stance. During the open-ended guidance regime (Column A), a one standard deviation surprise increased it by 1.8 basis points at impact. When the FOMC switched to calendar-based guidance, employment releases had no effect (Column B). This changed again after the taper tantrum, as the fed fund future rate was on average 1.2 basis point higher following a one standard deviation surprise (Column C). A similar effect is also found for the post-liftoff period (Column D). Looking at the other variables, U.S. stock prices rose and expected volatility fell at impact after better than anticipated employment data during the calendar-based guidance regime. After the taper tantrum, these effects disappeared.[12]

[12] These results are reminiscent of those in Boyd, Hu, and Jagannathan, 2005, who study how U.S. government bond and stock prices respond to unemployment announcements in different stages of the business cycle. These authors find that bonds normally do not react in contractions, which indicates that labor market announcements do not carry relevant information on the risk-free rate in that stage of the cycle. On the other hand, they find equity prices to respond negatively to news of rising unemployment, thus suggesting that these signal either deteriorating earning prospects, increasing risk premia or both. Boyd, Hu, and Jagannathan, 2005 also show that both equity and bond prices rise following higher than expected unemployment during expansion. To the extent that equity valuations depend on the risk-free rate through the discount rate, their increase following bad news indicate that new information on the policy rate dominates that on earnings and risk premia, as the latter should push equity prices in the opposite direction.

Focusing on the larger window reveals other interesting patterns. The response of the federal fund future rate was statistically different from zero only during the normalization regime. The reaction of the MSCI and VIX indexes was respectively equal to -0.8 and +7.1 percent during the same period (both significant). These effects suggest that stock market investors, many of whom are retail, might need some time to digest all the implications of the employment report fully. In line with this observation, the 5-day effect of NFP announcements on both equity prices and volatility during the calendar-based regime was larger than the 1-day estimate (although just borderline significant for the latter, with p-value of 0.11).[13]

Next, we formally investigate whether the observed sensitivity of portfolio flows to NFP releases can be explained by the effects that these had on U.S. domestic financial conditions. We complement Equation 2.2 including the U.S. stock market and the VIX indexes (both in log-differences), as well as the federal fund 6-month future rate, all interacted with the forward guidance dummies. These variables are introduced first separately one at a time and then jointly in the same regression. Table 2.3 below reports the results.

The estimates for the calendar-based guidance regime (Column B) are qualitatively in line but quantitatively different from the baseline. Conditioning on the same stock market growth rate decreases the magnitude of the estimated coefficients by about 30 percent. The inclusion of the VIX does have qualitatively similar albeit smaller effects. Instead, not surprisingly as this did not react to employment releases during this period, including the fed funds future rate does not affect the results. These findings indicate that when the Fed issued calendar-based guidance positive domestic news propagated abroad through, at least partly, improved equity prospects and decreased risk aversion.

Turning to the normalization period (Column C), including either the fed fund future rate, the stock market, or the VIX has similar dampening effects on the baseline estimate. The coefficients are reduced by about 25 percent at impact (week

[13] The effects of employment announcements on the U.S. stock market during the calendar-based regime and on the expected federal fund rate during the normalization regime survive even when considering a larger, 4-week, window (results available upon request).

Table 2.3: Fund flows sensitivity to employment announcements – conditioning on key U.S. financial variables

		(A)	(B)	(C)	(D)
1-week ($k = 0$)	Unconditional (baseline)	0.03	**0.12**	**-0.09**	-0.03
	6-month fed fund future	0.02	**0.12**	**-0.07**	-0.02
	MSCI U.S. stock index	0.02	**0.10**	**-0.06**	-0.03
	CBOE VIX volatility index	0.02	**0.11**	**-0.07**	**-0.04**
	All	0.01	**0.09**	**-0.05**	-0.03
2-week ($k = 1$)	Unconditional (baseline)	0.00	**0.22**	**-0.13**	-0.03
	6-month fed fund future	-0.02	**0.21**	**-0.10**	-0.01
	MSCI U.S. stock indexh	-0.05	**0.15**	**-0.09**	-0.03
	CBOE VIX volatility index	-0.02	**0.18**	**-0.08**	-0.02
	All	-0.06	**0.14**	-0.05	0.02
3-week ($k = 2$)	Unconditional (baseline)	**-0.10**	**0.35**	**-0.19**	**-0.07**
	6-month fed fund future	**-0.14**	**0.34**	**-0.13**	-0.05
	MSCI U.S. stock index	**-0.18**	**0.27**	**-0.12**	**-0.08**
	CBOE VIX volatility index	**-0.15**	**0.3**	**-0.12**	-0.06
	All	**-0.21**	**0.25**	-0.07	-0.01
4-week ($k = 3$)	Unconditional (baseline)	-0.09	**0.44**	**-0.18**	-0.06
	6-month fed fund future	**-0.15**	**0.44**	-0.1	-0.04
	MSCI U.S. stock index	**-0.19**	**0.34**	-0.09	-0.07
	CBOE VIX volatility index	**-0.15**	**0.38**	-0.11	-0.04
	All	**-0.23**	**0.31**	-0.03	0.02

Notes: the Table shows the estimated responses of allocations into investment funds to a one standard deviation surprise in the U.S. non-farm payroll data release, conditioning for key U.S. financial variables. The funds considered are legally domiciled in the U.S. and invest in emerging, frontier and other market economies (as defined by MSCI). Sensitivities are measured in percentage of beginning of period assets. Estimates are obtained from Equation 2.2. The leftmost column reports the horizon considered (k). Rows denoted by "Unconditional" reports coefficients from the baseline regression (Figure 2.2). Rows denoted by "6-month fed fund future" report coefficients estimated including the 6-month ahead federal fund future rate. Rows denoted by "MSCI U.S. stock index" report coefficients estimated including the growth rate of the U.S. stock price index. Rows denoted by "CBOE VIX volatility index" report coefficients estimated including the growth rate of the VIX index. Rows denoted by "All" report coefficients estimated including the 6-month ahead federal fund future rate as well as the growth rates of the U.S. stock index and the VIX index. Columns denoted by (A), (B), (C), and (D) report estimates for different Fed's guidance regimes: respectively the open-ended (March/18/2009 to August/8/2011), calendar-based (August/9/2011 to May/22/2013), normalization (May/23/2013 to December/12/2015) and post-liftoff (December/13/2015 to May/30/2018). Bold numbers indicate statistical significance at the 90 percent confidence level, based on clustered standard errors (at the fund-level).
Sources: Bloomberg, Datastream, EPFR and own calculations.

1) and up to 50 percent over the full horizon. When the three variables enter the regression jointly, the effect of employment announcements is negligible and never statistically significant, except in week 1. These results constitute evidence that announcements of a healthier than anticipated U.S. labor market led to portfolio

capital outflows from EMs due to their tightening effects on Fed's policy expectations. Such news also induced selling in the stock market and contributed to increasing risk aversion, which in turn had further adverse effects on fund flows. These channels are consistent with the finding in Miranda-Agrippino and Rey, 2015, Forbes and Warnock, 2012 and others that increases in the VIX are associated with capital outflows from EMs.

In Appendix A.3 we report and discuss extensively some robustness checks performed on the baseline analysis (Figure 2.2). Summarizing, we verify that the results are not driven by employment release outliers, that they are robust to giving a lower weight to the releases in which forecaster uncertainty was higher (see Pericoli and Veronese, 2015), and that they do not depend on the exact cutoff date chosen to distinguish between the calendar-based and normalization regimes. We also show that the main dynamics survive when using a broader measure of portfolio capital flows (sourced by the IIF) and when considering other macroeconomic announcements. Finally, we check that the results for the calendar-based guidance regime do not capture flight-to-safety effects (that is, they are not driven by negative surprises).

Could the link envisaged so far between the Fed's policies and the flow sensitivity to U.S. employment news be spurious? It might be that investors correctly understand the FOMC's reaction function. Then the almost null response of the federal funds future rate to employment releases during the calendar-based period could be due to the market participants correctly assessing that the large negative output and inflation gaps warranted low rates for a long time. However, this argument does not seem to be valid since these gaps were less negative when the FOMC introduced calendar-based guidance than they had ever been since the start of the GFC.[14] Hence, the same patterns uncovered for the calendar-based guidance regime should have also been observed for the open-ended guidance period.

To recap, this section has provided evidence that the stance of the Federal Reserve is crucial to explain how shocks in the U.S. propagated abroad through portfolio capital flows in the aftermath of the GFC. Announcements of higher than expected employment growth led to flows of capital towards EMs when the Fed flagged extremely low policy rates going forward, as investors digested the positive implications for the global economy. On the other hand, when the Fed signaled upcoming normalization, the same announcements pushed investors to repatriate capital in the U.S., as the tightening of financial conditions induced by the expectation of higher policy rates more than counterbalanced the real economy spillovers of a stronger U.S. labor market.

[14] The output gap was equal to -4.7 percentage points on average between April 2009 and September 2011, while it was -3.1 percentage point when the Federal Reserve introduced calendar-based forward guidance and -1.4 on average between October/2011 and June/2013 (Fred).

2.5 The Role of Exchange-traded Funds

Do flows to all funds respond to macroeconomic announcements in the same way? This section explores potential heterogeneities. The primary focus is on the differential flow sensitivity to news of exchange-traded-funds (ETFs) relative to mutual funds.

2.5.1 Background

ETFs experienced exponential growth since they were first established in 1993. Their asset share in the overall U.S. fund industry rose from 5 to 18 percent between 2007 and 2017 (ICI). Among the equity funds considered in the analysis, ETFs increased their share from 46 to 53 percent over the March 2009 to May 2018 period. The rise of bond ETFs was even larger, going from less than 5 to more than 40 percent in the same period (see Figures A.3 and A.4 in Appendix A.1).

Why have ETFs become so popular? The short answer is that they offer a cheap way to acquire liquid positions in a broader set of markets. Liquidity depends on the fact that ETFs, like stocks, are traded continuously throughout the day on secondary markets. That is different from mutual funds, which trade exclusively on the primary market, and for which transactions only take place at the end of the trading day (with prices also being determined only then). As ETFs usually track an index, its inverse, or their multiples, investors can quickly gain exposure or bet against an overall market. Their passive nature, meaning that managers do not actively select companies, also permits to charge lower fees relative to mutual funds.

These characteristics make ETFs likely to attract a different pool of investors, more short-term oriented and more reactive to changes in broader market sentiment, relative to mutual funds. Backing this intuition, 52 percent of ETF-holding U.S. households were willing to take substantial or above-average risk for substantial or above-average gain in 2017, compared to just 34 percent of mutual fund-holding households (ICI). We therefore analyze whether the flow responses to employment releases observed above were more relevant for ETFs than mutual funds. The rest of this section describes the empirical methodology, presents the baseline results and finally carries out some extensions to disentangle further heterogeneities within ETFs, concerning their asset size and type of investment (whether equity or debt).

2.5.2 Methodology

To investigate the differential response of flows to ETFs relative to mutual funds, we carry out a difference-in-differences (diff-in-diff) analysis. In practice, we create a dummy variable d_i^E, taking value 1 for ETFs and 0 otherwise, and estimate the following regression:

$$100 * \frac{\sum_{j=0}^{k} f_{i,t+j}}{a_{i,t}} = \sum_{r=1}^{4} \lambda_k^r d_t^r d_i^E news_t + B_k Z_{i,t} + \gamma_i + \tau_{f,t} + \varepsilon_{i,t} \tag{2.3}$$

where $\tau_{f,t}$ denotes investment destination-specific time fixed effects; d_i^E is the ETF dummy and the rest of the notation is as in Equation 2.2. Note that the time effects absorb any common variation in ETFs and mutual funds flows. Therefore the λ_k^r coefficients measure the differential (extra) effect of employment releases on flows to ETFs relative to mutual funds.

This specification has a further advantage in that it accounts for the two sets of capital flow drivers identified the literature, namely global push, and local pull factors. The former are global developments affecting investors' risk appetite and are beyond the scope of influence of individual EMs. The latter are country-specific characteristics driving capital towards some countries rather than others. The inclusion of time fixed effects at the investment destination means to account for local pull factors (allowed to be time-varying).[15] U.S. employment surprises are instead thought as a global push factor. The estimation is done through OLS. Standard errors are clustered at the fund-level.

2.5.3 Results

Figure 2.3 below shows IRFs of the differential effect of employment announcements on flows to ETFs relative to mutual funds, obtained plotting the $\hat{\lambda_k^r}$ coefficients estimated from Equation 2.3 and the respective confidence bands. In line with the baseline analysis, we do not find significant differential responses during the open-ended guidance and post-liftoff regimes (Panels A and D). Instead, IRFs for the calendar-based and normalization guidance periods (Panels B and C respectively) are statistically significant and qualitatively similar to those presented in Figure 2.2. These estimates — derived from a richer specification including time-by-investment-destination fixed effects — adds robustness to the previous results and confirms the intuition that ETFs attract a pool of investors that respond more strongly to global shocks than mutual funds.

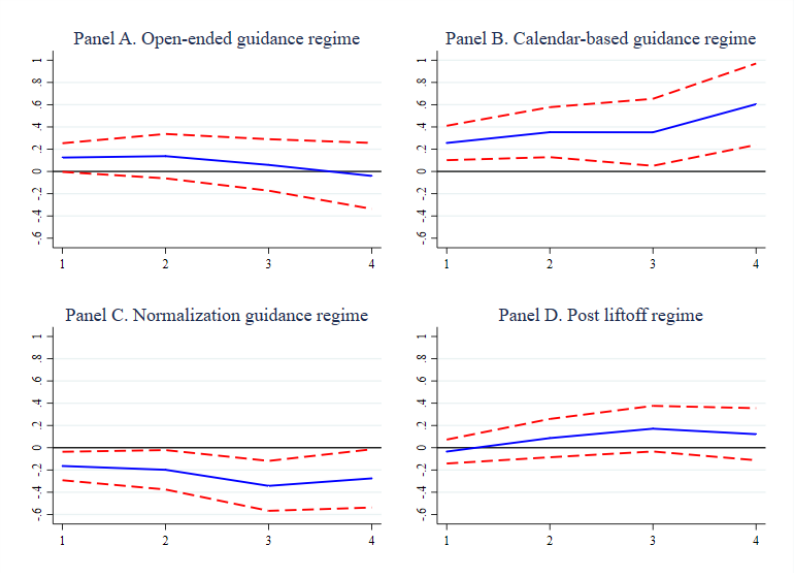
The 4-week response of ETFs to a standard deviation surprise was about +0.6 (-0.3) percentage points higher (lower) than that of mutual funds during the calendar-based (normalization) regime. Using these coefficients, those obtained from Equation 2.2, and the share of ETFs, we calculate the 4-week cumulated response of flows into mutual funds to have been approximately 0.3 and -0.1 percent during the calendar-based and normalization regimes respectively. Accordingly, those into ETFs were about 0.9 and -0.4 percent in the same periods. This analysis suggests that ETFs and mutual funds exhibited similar responses to NFP releases, but the sensitivity of ETFs was three to four times larger. This is qualitatively in line to Converse, Levy-Yeyati, and Williams, 2018, who study whether ETFs respond more than mutual funds to changes in risk aversion and find that that is indeed the case. However, they estimate ETFs to be only up to 50 percent more sensitive.

[15] Saying that the destination-by-time fixed effects account for local pull factors assumes that ETFs and mutual funds respond to them in the same way (that is, ETFs are not more sensitive). Converse, Levy-Yeyati, and Williams, 2018 show that this is indeed the case.

Appendix A.4 reports some sensitivity analyses showing that the results presented here are robust to the inclusion of other U.S. as well as foreign macroeconomic news as controls. The rest of the section explores the presence of heterogeneities within different ETFs. In the interest of brevity, the focus will be on the calendar-based and normalization regimes only.

We start by exploring heterogeneities in size. The dataset used in the analysis comprises 753 funds, and their asset distribution is highly skewed to the left (see Figure A.1 in Appendix A.1). Funds in the upper quartile of the ETFs (mutual funds) distribution make up 92 (85) percent of assets. Above we showed that flows to ETFs react more to employment releases than mutual funds. If the reason is that ETFs can be traded continuously and are used as instruments for short-run investment strategies, then larger ETFs should be expected to be even more sensitive as they are more liquid.

Figure 2.3: Differential sensitivity of ETFs relative to mutual funds



Notes: the Figure shows the estimated differential responses to U.S. employment announcements of allocations into exchange-traded relative to mutual funds. The funds considered are legally domiciled in the U.S. and invest in emerging, frontier and other market economies (as defined by MSCI). Differential sensitivities are measured as a percentage of beginning of period assets. The y-axis denotes the cumulated differential effect of a one standard deviation surprise in the U.S. non-farm payroll data release. The x-axis denotes the horizon of the response (in weeks), with 1 being the week of the announcement. The blue solid line shows the λ_k^r coefficients obtained estimating Equation 2.3. Red dotted lines are 90 percent confidence bands obtained using respective standard errors, clustered at the fund-level. The open-ended guidance, calendar-based guidance, normalization guidance and post-liftoff regimes range, respectively, from March/18/2009 to August/8/2011, from August/9/2011 to May/22/2013, from May/23/2013 to December/12/2015 and from December/13/2015 to May/30/2018.
Sources: Bloomberg, EPFR and own calculations

We check whether the higher responsiveness exhibited by ETFs relative to mutual funds is driven by large ETFs. We divide funds into three categories: small medium and large. The former are those in the lower quartile of the asset distribution (less than $29.8 million in assets), while the latter are in the upper quartile (more than $358.5 million in assets). Medium-sized funds are all the rest. We then extend

Equation 2.3 to allow for different λ^r coefficients based on size. Results for the calendar-based and normalization regimes are reported in Table 2.4 below, together with those obtained from Equation 2.3.[16] The new estimates should be interpreted as the mean differential response of small/medium/large ETFs relative to the typical mutual fund. Stars indicate that the coefficient is statistically different from at least one of the two others (as informed by a Wald test).

Table 2.4: Differential sensitivity of ETFs relative to mutual funds - distinguishing by funds' size

		(B)	(C)
1-week	All ETFs (baseline)	**0.26**	**-0.16**
	Small ETFs	0.19	0.17*
	Medium ETFs	0.12	-0.01*
	Large ETFs	**0.45**	**-0.51***
2-week	All ETFs (baseline)	**0.35**	**-0.2**
	Small ETFs	0.09*	0.31*
	Medium ETFs	0.15*	-0.01*
	Large ETFs	**0.71***	**-0.65***
3-week	All ETFs (baseline)	**0.35**	**-0.34**
	Small ETFs	-0.16	0.11
	Medium ETFs	0.18	-0.25
	Large ETFs	**0.77**	**-0.64**
4-week	All ETFs (baseline)	**0.6**	**-0.28**
	Small ETFs	-0.09*	0.25*
	Medium ETFs	0.44	-0.26
	Large ETFs	**1.07***	**-0.48***

Notes: the Table shows the estimated differential responses to U.S. employment announcements of allocations into exchange-traded relative to mutual funds, distinguishing between small, medium and large exchange-traded funds. The funds considered are legally domiciled in the U.S. and invest in emerging, frontier and other market economies (as defined by MSCI). Differential sensitivities are measured in percentage of beginning of period assets. The leftmost column reports the horizon considered (k). Rows denoted by "All ETFs (baseline)" report the $\hat{\lambda}_k^r$ coefficients estimated from Equation 2.3. Rows denoted by "Small ETFs", "Medium ETFs" and "Large ETFs" report respectively the $\hat{\lambda}_k^{s,r}$, $\hat{\lambda}_k^{m,r}$ and $\hat{\lambda}_k^{l,r}$ coefficients estimated from the following Equation $100 * \frac{\sum_{j=0}^{k} f_{i,t+j}}{a_{i,t}} = \sum_{r=1}^{4} \left(\lambda_k^{s,r} d_i^s d_t^r + \lambda_k^{m,r} d_i^m + \lambda_k^{l,r} d_i^l d_t^r\right) d_t^r d_i^E news_t + B_k Z_{i,t} + \gamma_i + \tau_{f,t} + \varepsilon_{i,t}$, where d_i^s, d_i^m, and d_i^l are dummy variables for respectively small, medium and large funds, and the rest of the notation is as in Equation 2.3. A * next to the coefficient indicates that this is statistically different from at least one of the other two at the 90 percent confidence level, according to a Wald test for equal coefficients. Columns denoted by (B) and (C) report estimates for different Fed's guidance regimes: respectively the calendar-based (August/9/2011 to May/22/2013) and normalization (May/23/2013 to December/12/2015). Bold numbers indicate statistical significance at the 90 percent confidence level, based on clustered standard errors (at the fund-level). *Sources:* Bloomberg, EPFR and own calculations.

[16] Results for the open-ended and post-liftoff regimes are available upon request

Focusing on the calendar-based regime and the 4-week horizon, we find that the response of flows into large ETFs following a one standard deviation surprise was 1.1 percentage point higher than that of the average mutual fund. This is significantly more than the differential response of small ETFs (which instead is not statistically different from zero). Similarly, the response to the same surprise during the normalization regime was about -0.5 percentage points lower for large ETFs. This coefficient is statistically different from the one estimated for small ETFs, which is not significant. These results could be a byproduct of large funds in general (not only large ETFs) reacting more to global factors. We verify that this is not the case by estimating an extension of Equation 2.2 allowing for size-dependent effects. The results are shown in Table A.8 in Appendix A.4. The null hypothesis of equal coefficients cannot be rejected, thus indicating that the higher responsiveness of large funds is only a prerogative of ETFs.

Miranda-Agrippino and Rey, 2015 study how U.S. monetary policy affects the joint dynamics of international financial variables and find that when the Fed tightens policy, global risky asset prices tend to go down, while cross-border credit is significantly reduced. They point to global banks as the main channel of transmission (see also Bruno and Shin, 2014 and Correa et al., 2016). The results presented in this section suggest that (large) ETFs are another important vehicle through which shocks in the U.S. are transmitted to EMs. Next, we will extend the analysis to distinguish between equity and bond funds.

We argued above that during the calendar-based regime fund flows responded positively to better than expected employment news due to improved prospects for the U.S. and the global economy. As equity is more dependent on growth than debt, equity flows should have been more substantial during that period. Turning to the normalization regime, the expectation of tighter Fed's policies following positive news should have had larger adverse effects on bond flows. On the other hand, the results presented in Tables 2.2 and 2.3 suggest that the sensitivity of flows to employment releases partly depended also on the response of the VIX, which should have similar effects for both bond and equity funds.

As before, we again estimate an extension of Equation 2.3 allowing for different λ^r coefficients based on size. This time the estimation is carried out separately for the restricted equity and bond fund samples. Table 2.5 shows the results.

Focusing on the calendar-based guidance regime, the estimates for equity ETFs are qualitatively and quantitatively similar to those reported in Table 2.4. The 4-week extra response of flows to large ETFs was 1.3 percentage point larger relative to the typical equity mutual fund. Except in one case, the coefficients for the bond sample are not statistically different from zero. Turning to the normalization period, both large equity and large bond ETFs generally experienced significantly higher outflows than the respective typical mutual fund. The extra sensitivity estimated for large ETFs range between -0.5 and -0.9 percentage points depending on the horizon and sample considered. For the bond sample, medium-sized ETFs also experienced significant outflows (quantitatively similar to large ETFs).

Table 2.5: Differential sensitivity of ETFs relative to mutual funds – distinguishing by funds' size and type of investment

		Equity sample		Bond sample	
		(B)	(C)	(B)	(C)
1-week	All ETFs (baseline)	**0.29**	-0.11	0.08	**-0.44**
	Small ETFs	0.24	0.22*	-0.01	0.02*
	Medium ETFs	0.16	0.06*	-0.25	**-0.44**
	Large ETFs	**0.48**	**-0.48***	0.32	**-0.55***
2-week	All ETFs (baseline)	**0.39**	-0.1	0.03	**-0.65**
	Small ETFs	0.14*	0.36*	-0.01	0.19*
	Medium ETFs	0.12*	0.1*	0.22	**-0.6***
	Large ETFs	**0.85***	**-0.57***	-0.15	**-0.89***
3-week	All ETFs (baseline)	**0.37**	**-0.28**	(0.11)	**-0.59**
	Small ETFs	-0.15	0.14	-0.06	0.16*
	Medium ETFs	0.09	-0.16	0.71	**-0.59**
	Large ETFs	**0.97***	**-0.59**	**-0.37**	**-0.69**
4-week	All ETFs (baseline)	**0.64**	-0.28	0.31	-0.15
	Small ETFs	-0.03*	0.14*	-0.16	**1.00***
	Medium ETFs	0.38*	-0.26	1.05	-0.17*
	Large ETFs	**1.30***	**-0.46***	-0.22	-0.45*

Notes: the Table shows the estimated differential responses to U.S. employment announcements of allocations into exchange-traded relative to mutual funds, distinguishing between small, medium and large exchange-traded funds. The funds considered are legally domiciled in the U.S. and invest in emerging, frontier and other market economies (as defined by MSCI). Differential sensitivities are measured in percentage of beginning of period assets. The leftmost column reports the horizon considered (k). Rows denoted by "All ETFs (Equation 2.3)" report the $\hat{\lambda}_k^r$ coefficients estimated from Equation 2.3. Rows denoted by "Small ETFs", "Medium ETFs" and "Large ETFs" report respectively the $\hat{\lambda}_k^{s,r}$, $\hat{\lambda}_k^{m,r}$ and $\hat{\lambda}_k^{l,r}$ coefficients estimated from the following Equation $100 * \frac{\sum_{j=0}^{k} f_{i,t+j}}{a_{i,t}} = \sum_{r=1}^{4} \left(\lambda_k^{s,r} d_i^s d_t^r + \lambda_k^{m,r} d_i^m + \lambda_k^{l,r} d_i^l d_t^r\right) d_t^r d_i^E news_t + B_k Z_{i,t} + \gamma_i + \tau_{f,t} + \varepsilon_{i,t}$, where d_i^s, d_i^m, and d_i^l are dummy variables for respectively small, medium and large funds, and the rest of the notation is as in Equation 2.3. A * next to the coefficient indicates that this is statistically different from at least one of the other two at the 90 percent confidence level, according to a Wald test for equal coefficients. Columns denoted by (B) and (C) report estimates for different Fed's guidance regimes: respectively the calendar-based (August/9/2011 to May/22/2013) and normalization (May/23/2013 to December/12/2015). Bold numbers indicate statistical significance at the 90 percent confidence level, based on clustered standard errors (at the fund-level).
Sources: Bloomberg, EPFR and own calculations.

This section started off noticing that the popularity of ETFs among U.S. investors in EMs has increased considerably since their inception (just looking at the period of the analysis, the ETFs asset share rose from about 42 to over 51 percent). It then argued that due to their higher liquidity, lower fees, and capacity to grant exposure to a broad set of markets, ETFs are likely to be used by more short-term oriented and less risk-averse investors. The analysis carried out afterward showed (large) ETFs to be significantly more responsive to U.S. employment announcements than mutual

funds, suggesting that their rising popularity might have contributed to making the global financial system more synchronized. In line with expectations, the higher sensitivity of ETFs was driven by equity funds during the calendar-based regime, while bond and equity flows were equally important during the normalization regime.

2.6 Conclusions

This paper has analyzed the impact of U.S. employment announcements on portfolio capital flows from the U.S. to EMs in the post-GFC period. Employment news are important because they reveal new information about the health of the U.S. economy, the largest in the world, and might inform about future U.S. monetary policy. The latter has global importance given that the $ is the world's reserve currency.

When the Federal Reserve issued time-based forward guidance to convey the idea of low rates for long, employment announcements did not affect monetary policy expectations. Instead, positive news boosted the domestic stock market and lowered risk aversion, thus leading to positive (equity) flows to EMs. Conversely, when the Federal Reserve hinted at forthcoming normalization, good news increased the expected future policy rate, depressed equity prices, and increased risk aversion. All these factors pushed U.S. investors to withdraw capital from EMs.

The second part of this paper focused on the role of exchange-traded funds (ETFs). These have an important role in the international transmission of U.S. news. Flows in and out of large EMs-dedicated ETFs displayed a substantial extra sensitivity to developments in the US. Likely, this is due to ETFs being used by more short-term oriented and risk-seeking investors who find in ETFs a cheap way to gain exposure to different sets of markets. Given their rising popularity as an investment vehicle, the dynamics documented in this paper suggest that ETFs might have made EMs more synchronized with the global financial cycle.

Future work should aim at assessing the quantitative importance of the dynamics uncovered in the current analysis for recipient countries. Preliminary analyses — carried out in this respect and reported in Appendix A.5 — suggest that there exists a great heterogeneity in the magnitude of flows across countries. More work should aim at assessing potential determinants of such cross-country differences in magnitudes of flows.