The US, Economic News, and the Global Financial Cycle*

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Abstract

We provide evidence for a causal link between the US economy and the global financial cycle. Using intraday data, we show that US macroeconomic news releases have large and significant effects on global risky asset prices. Stock price indexes of 27 countries, the VIX, and commodity prices all jump instantaneously upon news releases. The responses of stock indexes co-move across countries and are large—often comparable in size to the response of the S&P 500. Further, US macroeconomic news explains on average 23 percent of the quarterly variation in foreign stock markets. The joint behavior of stock prices, bond yields, and risk premia suggests that systematic US monetary policy reactions to news do not drive the estimated effects. Instead, the evidence points to a direct effect on investors' risk-taking capacity. Our findings show that a byproduct of the United States' central position in the global financial system is that news about its business cycle has large effects on global financial conditions.

JEL Codes: E44, E52, F40, G12, G14, G15

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1 Introduction

> *The global financial cycle appears in co-movements of gross flows, asset prices, leverage, and credit creation, which are all closely linked to fluctuations in the VIX. But what are its drivers?*
>
> — Rey (2013)

In an influential speech at the Jackson Hole Symposium in 2013, Rey (2013) provides evidence for the global co-movement of capital flows, risky asset prices, credit growth, and leverage. According to Rey, this co-movement—which she calls the *global financial cycle*—constitutes an external source of financial and macroeconomic volatility for countries with open capital accounts. In episodes of favorable international financial conditions, these countries experience capital inflows, buildups of credit and leverage, and appreciations in risky asset prices, ultimately resulting in macroeconomic expansion. In episodes of retrenchment, however, capital flows reverse, credit and leverage contract, and risky asset prices plummet. Historically, these episodes of retrenchment are often associated with economic crises.

Some observers, however, have challenged Rey's interpretation of the global financial cycle. Since the observed co-movements of capital flows, risky asset prices, credit growth, and leverage across countries are ultimately correlations, alternative interpretations are also possible. Bernanke (2017) discusses several of these alternatives and notes, among other things, that the global financial cycle could be driven by common shocks—shocks that directly affect multiple countries simultaneously. In addition, even if the global financial cycle reflects the transmission of shocks across countries, it is generally not clear where these shocks originate and which mechanisms govern their transmission.

In this paper, we show that US business cycle shocks are important drivers of the global financial cycle. We do so by studying the effects of US macroeconomic news releases on international asset markets. These news releases have large effects on international equity prices and the VIX—a close proxy of the global financial cycle.[1] They also induce the co-movement characteristic of the global financial cycle and explain a sizable fraction of its variation. Identifying this novel driver allows us to narrow the set of possible interpretations of the global financial cycle. In particular, we provide evidence that common shocks are unlikely to play an important role in this context. Rather, the estimated effects predominantly reflect the transmission of US-specific shocks to foreign economies. Further, the systematic conduct of US monetary policy is not the main mechanism through which US news affects foreign asset prices. The evidence instead points to a direct effect on the risk-taking behavior of international investors. Our paper complements prior work by Miranda-Agrippino and Rey (2020). Whereas they emphasize the contribution of US monetary policy shocks to the global financial cycle, we document that non-monetary US news also plays a central role in driving the global financial cycle.

Establishing a causal link between any potential driving force and the global financial cycle

[1] The VIX is the 30-day option-implied volatility index of the S&P 500.

is econometrically challenging. By its very nature, the global financial cycle is characterized by fast-moving financial variables such as risky asset prices and capital flows. At this point, it is well understood that identification strategies can fail at isolating the true underlying disturbances, if they do not account for the fact that financial markets respond quickly to new information (e.g., Gertler and Karadi, 2015; Ludvigson, Ma, and Ng, 2021).[2] In this paper, we resolve this identification problem by implementing a high-frequency event study. In particular, we analyze the intraday effects of US macroeconomic news surprises such as those associated with the nonfarm payroll employment release published monthly by the Bureau of Labor Statistics. While surprises about US macroeconomic variables are not structural shocks and care must be taken when interpreting their effects, this research design allows us to causally attribute asset price movements to these surprises. Of course, this research design also limits us to study asset prices as outcomes. Since the VIX has been shown to be a close proxy of the global financial cycle and since the co-movement of risky asset prices is a defining feature of the global financial cycle (Miranda-Agrippino and Rey, 2020), we view this research design nonetheless as a natural step to better understand the global financial cycle. Prior work has established that scheduled macroeconomic announcements are a unique source of variation to study asset price movements (e.g., Faust et al., 2007).

We begin our analysis with studying the effects of US macro news on major stock indexes of 27 countries from 1996 to 2019. Within a 30-minute window, these stock indexes show a statistically significant response and strongly co-move across countries. For instance, a positive surprise about nonfarm payroll employment generates a statistically significant increase in stock prices in all but one of the countries in our sample. We also document significant effects on the VIX and other implied volatility measures as well as commodity prices, which are often interpreted as indicators of risk appetite (Etula, 2013; Miranda-Agrippino and Rey, 2020).

High-frequency analyses often face the limitation that it is difficult to assess the economic importance of the identified relationship. We address this concern and demonstrate that the effects of US macroeconomic news on risky asset prices are both large and constitute an important driving force. The effects are large in the sense that international stock prices respond by a similar magnitude as the US stock market. Using the method by Altavilla, Giannone, and Modugno (2017), we further show that US macro news explains a sizable fraction of the variation in international stock prices at lower frequencies. On average, US macro news explains 23 percent of the quarterly variation in foreign equity prices once non-headline news is taken into account (Gürkaynak, Kısacıkoğlu, and Wright, 2020). This magnitude is comparable with its explanatory power for the S&P 500. US macroeconomic news further explains around 15 and 25 percent of the quarterly variation in the VIX and commodity prices, respectively. The concern that effects identified with high-frequency methods dissipate quickly therefore does not apply in our context.

The remainder of the paper interprets these findings and sheds light on the underlying mechanisms. We start by proposing a test for the presence of global common shocks to

[2] Miranda-Agrippino and Rey (2020) resolve this simultaneity problem by identifying monetary policy shocks from high-frequency asset price responses around Federal Reserve monetary policy releases.

address Bernanke's (2017) observation discussed above. Intuitively, if global common shocks drove international business cycles and stock markets, news releases in other countries should also be informative about the global state. Consequently, market participants should observe foreign macroeconomic news releases—even in small countries—and the US stock market should respond to this news. Our analysis shows that this is not the case. The S&P 500 essentially does not respond to foreign news releases. The evidence thus suggests a limited role of global common shocks and instead points to the transmission of US-specific shocks.

More generally, the same evidence highlights a striking asymmetry: While US news has strong effects on foreign stock markets, foreign news has essentially no effects on the US. We carefully demonstrate that this asymmetry can neither be explained by lower timeliness of foreign news nor by lower measurement quality of foreign macroeconomic data. Since some caveats about our preferred interpretation remain, we confirm—as an additional check—a similar asymmetry in the effects of monetary policy shocks. Unlike macroeconomic news releases, monetary policy shocks are known to be country-specific, that is, they have no common component. Thus, their effects are ideal for corroborating our interpretation of the asymmetry results for macro news. We find that US monetary policy shocks have effects on international equity markets that are approximately three times as large as equally sized shocks of the European Central Bank and the Bank of England.[3] These findings underscore the US' central position in the global monetary and financial system.

Lastly, we relate our findings to two mechanisms emphasized by prior work on the global financial cycle: US monetary policy and risk-taking behavior. To understand the role of monetary policy, we study the joint response of bond yields and stock prices to US news, both for US and foreign markets. While US and foreign bond yields do respond to US macroeconomic news, the observed stock-bond co-movement is generally inconsistent with systematic US monetary policy reactions being the dominant channel. Instead, the analysis suggests that US monetary policy reactions partially offset the overall effects of US macro news. Further, the joint responses of stocks and bond yields as well as additional evidence from the VIX and other measures indicate that the effect on risk-taking is particularly pronounced and potentially dominant. Hence, our findings are consistent with theories of the global financial cycle that have a risk-taking mechanism at their core.

Related literature Our paper relates to various topics in international finance and macroeconomics. First, our paper relates to work studying the global financial cycle. Important antecedents of Rey's (2013) seminal work include Diaz-Alejandro (1983, 1984), Calvo, Leiderman, and Reinhart (1993, 1996), Reinhart and Reinhart (2008) and many others. These papers suggest a role for external and/or common drivers of countries' financial conditions. Following Rey (2013), several papers emphasize increased financial synchronization over recent decades, and discuss their implications (e.g., Bruno and Shin, 2015b; Obstfeld, 2015; Jordà

[3]For related findings, see Brusa, Savor, and Wilson (2020), Miranda-Agrippino and Nenova (2022), and Ca'Zorzi et al. (2023), among others.

et al., 2019).[4] Prior work has also shown that US monetary policy shocks affect global financial conditions. Bruno and Shin (2015a) provide evidence that US monetary policy affects the risk-taking behavior of international banks, Jordà et al. (2019) argue that US monetary policy drives global risk appetite and equity prices, and Miranda-Agrippino and Rey (2020) demonstrate that contractionary US monetary policy shocks worsen global financial conditions by affecting risky asset prices, leverage of global financial intermediaries, and international credit flows. We show that US macroeconomic news is a second causal driver of the global financial cycle, and that the outsized role of US-specific shocks is a broader phenomenon, not limited to monetary policy.[5]

More broadly, our paper relates to work studying the central role of the US in the international monetary and financial system—as reviewed in Gourinchas, Rey, and Sauzet (2019). Gourinchas and Rey (2007) emphasize the role of the US as world banker (or venture capitalist), Maggiori, Neiman, and Schreger (2020) document a dollar bias of international investors, and Goldberg and Tille (2008), Gopinath (2015), and Gopinath et al. (2020) document and study the importance of the US dollar as the dominant currency of trade invoicing. Our results show that an additional byproduct of the US' central position in the global financial system is that US macroeconomic news has large and persistent effects on global financial conditions while other countries' macro news has, if any, much smaller effects.

Lastly, our paper relates to prior work studying the high-frequency effects of US macroeconomic news releases on international financial markets.[6] Andersen et al. (2007) and Faust et al. (2007) analyze the effects of US news on financial markets in Germany and the United Kingdom. Ehrmann, Fratzscher, and Rigobon (2011) identify shocks through heteroscedasticity and study the interdependence of asset markets between the US and the Euro Area for multiple assets. We contribute to this literature in multiple ways. First, our sample contains a broader set of countries, including developing ones, while using intraday variation in asset prices. Second, we document the synchronized nature of foreign stock price responses in this large sample of countries and thereby establish a link between the US economy and the global financial cycle. Third, building on Altavilla, Giannone, and Modugno (2017) and Gürkaynak, Kısacıkoğlu, and Wright (2020), we show that US macroeconomic news has persistent effects on international stock markets and explains a sizable fraction of their quarterly variation. Fourth, we document new properties of the transmission mechanism of US news to foreign markets.

[4] Cerutti, Claessens, and Rose (2019) argue that common factors explain a relatively small fraction of the variation in international capital flows. Monnet and Puy (2019) study a broad sample of countries since 1950 and find that co-movement has increased for asset prices, but not for credit. They also study the effects of US monetary, fiscal, uncertainty, productivity shocks on the global financial cycle—with mixed results.

[5] Additional recent papers on the global financial cycle include Kalemli-Özcan (2019); Acalin and Rebucci (2020); Bekaert, Hoerova, and Xu (2020); Davis and Van Wincoop (2021); Miranda-Agrippino and Rey (2022); Chari, Dilts-Stedman, and Forbes (2022); Di Giovanni et al. (2022); Jiang, Krishnamurthy, and Lustig (2024).

[6] A large set of papers study the effect of US macroeconomic releases on domestic financial markets (McQueen and Roley, 1993; Balduzzi, Elton, and Green, 2001; Gürkaynak, Sack, and Swanson, 2005b; Boyd, Hu, and Jagannathan, 2005; Rigobon and Sack, 2008; Beechey and Wright, 2009; Swanson and Williams, 2014; Gilbert et al., 2017; Gürkaynak, Kısacıkoğlu, and Wright, 2020; Kroner, 2023; Elenev et al., 2024). See Gürkaynak and Wright (2013) for a survey on high-frequency event studies in macroeconomics.

Roadmap The remainder of the paper is structured as follows. The next section introduces our research design and discusses how to interpret the relationship between the measured surprises, the observed asset price responses, and the unobserved structural shocks. Section 3 introduces the data. We analyze the high-frequency effects of US news on international asset markets in Section 4. In Section 5, we demonstrate that the effects of US news on international asset prices are persistent and explain a sizable fraction of their quarterly variation. In Section 6, we document the asymmetric effects of US and foreign macro news, and discuss the role of global common shocks. Section 7 discusses the underlying channels through which US macro news affects stock prices and Section 8 concludes.

2 Research Design

We are interested in assessing the effects of shocks, which drive the US business cycle, on global financial conditions. Since identifying structural disturbances is difficult and often requires strong assumptions, we instead study the effects of surprises about US macroeconomic news releases. This section discusses how to interpret these surprises and their effects on international asset prices.

Surprises Consider the release of US macroeconomic variable y at time t. For instance, the Bureau of Labor Statistics publishes nonfarm payroll employment typically at 8:30 am on the first Friday of each month. In this example, nonfarm payroll employment is the macroeconomic series of interest (y), and the announcement time t is 8:30 am on a given day. We construct surprises by subtracting from the US macroeconomic series y its forecast, that is,

$$s^y_{US,t} = \frac{y_{US,t} - E\left[y_{US,t}|\mathcal{I}_{t-\Delta^-}\right]}{\hat{\sigma}^y_{US}}, \tag{1}$$

where $y_{US,t}$ is the released value and $E\left[\cdot|\mathcal{I}_{t-\Delta^-}\right]$ is the expectation conditional on information available just prior to the release. To make the magnitudes of surprises comparable across macroeconomic series y, we also divide by the sample standard deviation of $y_{US,t} - E\left[y_{US,t}|\mathcal{I}_{t-\Delta^-}\right]$, denoted by $\hat{\sigma}^y_{US}$.

As equation (1) makes clear, macroeconomic surprises are by construction forecast errors and thus—up to a first order—linear combinations of structural shocks. Our research design therefore differs from common macroeconometric approaches, which attempt to directly identify structural disturbances: It is silent on the precise nature of structural shocks that generate the surprise.

Estimating equation Let i index countries and let $q_{i,t}$ denote the log of country i's asset price of interest. We study the effects of US macroeconomic surprises on a variety of international asset prices by estimating equations of the form

$$\Delta q_{i,t} = \gamma^y_i s^y_{US,t} + \varepsilon_{i,t}, \tag{2}$$

where we omit the constant and controls for simplicity. In this specification, Δ denotes a 30-minute change around the announcement time t. The error term $\varepsilon_{i,t}$ includes the effects of unmeasured news and/or noise on the asset price of interest.

The coefficient γ_i^y captures the effect of surprise $s_{US,t}^y$ on asset price $q_{i,t}$. It can be consistently estimated by Ordinary Least Squares (OLS) if the error term $\varepsilon_{i,t}$ is uncorrelated with the surprise. A large literature in macroeconomics and finance has argued that for sufficiently narrow windows around the release, this is likely the case. In this section, we proceed under the assumption that this condition holds. We will return to this question in Sections 3 and 4.

Interpretation of γ_i^y Under the identification assumption, the estimate of γ_i^y measures a causal effect. It is causal in the sense that we can unambiguously attribute systematic asset price responses to the surprises. Since surprises are not structural shocks, but linear combinations of structural shocks, the question arises how to interpret the coefficient γ_i^y.

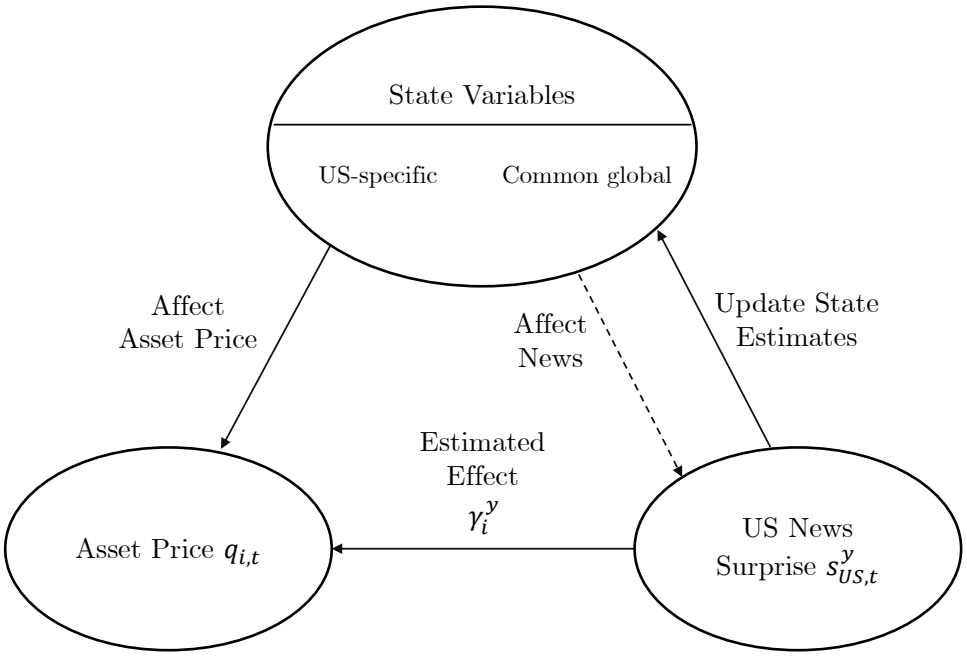
Building on Faust et al. (2007), we present a simple conceptual framework in Online Appendix A, which delivers estimating equation (2). In this framework, the coefficient γ_i^y captures the following intuition, which is illustrated in Figure 1. First, upon observing the surprise, market participants update their estimates of all state variables that generate economic fluctuations in the model. The solid arrow from the surprise to the state variables depicts this updating in the figure. Second, asset prices then respond to surprises because they depend on market participants' state estimates. This dependence is indicated by the solid arrow from state variables to the asset price $q_{i,t}$. The coefficient γ_i^y thus reflects both the updating of the state estimates and the dependence of the asset price on the state variables.

To build intuition, consider the following example. Suppose that shocks to total factor productivity (TFP), among other shocks, drive the US business cycle. Suppose further that market participants observe a positive surprise about US nonfarm payroll employment. Since this surprise may reflect a positive innovation to TFP, market participants may revise their estimate of TFP upwards upon observing the surprise. Higher expected productivity, in turn, may indicate greater expected future cash flows and thus lead to an increase in stock prices. Hence, the stock price responds to the news release because market participants update their TFP estimate and the stock price depends on TFP. We emphasize that the framework in Online Appendix A is agnostic on the set of structural disturbances that drive business cycle fluctuations and requires minimal assumptions on economic behavior.

If all underlying structural disturbances that drive the surprise $s_{US,t}^y$ originated in and were specific to the US, estimates of γ_i^y would reflect the *transmission of US-specific shocks* to country i's asset price $q_{i,t}$. However, the framework also makes clear that this need not be the case. It is also possible that the US and other countries are subject to *global common shocks*.[7] By directly affecting all countries' macroeconomic outcomes, including the US',

[7]Shocks are defined as global common if they are *exogenous structural disturbances directly affecting all countries*. This definition is equivalent to modeling countries' shocks as being contemporaneously correlated (this is the definition adopted in Canova and Marrinan, 1998). In contrast, country-specific shocks are uncorrelated across countries. As an example, suppose that all countries in a model produce with production functions, which have a common productivity component. Exogenous fluctuations in this common productivity component would constitute an instance of such a global common shock (e.g., the baseline calibration in Backus, Kehoe, and Kydland (1992) has contemporaneously

Figure 1: Interpretation of Country's i Asset Price Response to US News



Notes: This Figure illustrates the discussion in the text. Solid arrows display relevant relationships at the time of the news release, as captured by equation (2). The dashed arrow indicates that the relationship is predetermined at the time of the release.

such shocks could be reflected in the measured US surprises (see Figure 1). Foreign stock markets may respond to these surprises, because they reveal information about global common fundamentals (the common state vector). Prior work has acknowledged that global common shocks could drive business cycle co-movement (e.g., Canova and Marrinan, 1998; Canova, 2005; Huo, Levchenko, and Pandalai-Nayar, 2024). Further, Bernanke (2017, p. 23) notes that common shocks could drive the global financial cycle.[8]

Why is the distinction of global common shocks from US-specific shocks important? If global common shocks drove the global financial cycle, macroeconomic and financial variables would be correlated across countries even in a counterfactual world in which all countries operated in economic autarky. The reason is that each country's variables would still be driven by common exogenous driving forces. By contrast, US-specific shocks spill over to foreign countries through economic and financial ties. Cutting these ties would therefore eliminate these spillovers and alter the resulting cross-country correlations. Hence, to assess whether policies that aim to insulate countries from the global financial cycle have the potential to be effective, it is important to understand the role of global common shocks for the global

correlated productivity disturbances). Note that global common shocks generally differ from common pricing factors as frequently studied in the empirical asset pricing literature. In general equilibrium models, such pricing factors need not be exogenous.

[8]Online Appendix A discusses the possibility that shocks that are specific to countries other than the US drive US macroeconomic aggregates. To the extent that other countries are *small* relative to the US, such shocks are unlikely to play an important role.

financial cycle in general and for the effects of US macro news in particular.

The role of monetary policy For the interpretation of our results below, we briefly discuss the role of monetary policy *shocks* and monetary policy *reactions* to observed surprises.

Even though we can generally not infer structural shocks from observed surprises, we can rule out that monetary policy *shocks* are reflected in macroeconomic surprises. Any US monetary policy news is usually assumed to be fully revealed by Federal Open Market Committee (FOMC) announcements (Kuttner, 2001; Gürkaynak, Sack, and Swanson, 2005a), or other communication channels such as speeches by Fed officials (Cieslak, Morse, and Vissing-Jorgensen, 2019). Our macroeconomic surprises should therefore not reveal any new information about monetary policy. Since macroeconomic announcement times generally differ from Fed release times, our narrow 30-minute window also rules out that monetary policy news and macroeconomic news are conflated in our analysis. Hence, macroeconomic surprises should not reflect monetary policy *shocks*.

Expected systematic monetary policy *reactions*, however, as implied by a Taylor-type rule will affect how asset prices respond to surprises. For instance, upon observing a positive surprise about CPI inflation, the stock price response will depend on how aggressively market participants expect the Federal Reserve to respond to higher inflation. All else equal, the greater the expected increase in the policy rate, the more US stock prices should fall. We provide a more detailed discussion of this channel in Section 7.

Summary In summary, surprises are forecast errors and hence linear combinations of structural shocks. While our research design allows us to causally attribute asset price movements to these surprises, we can generally not identify the underlying structural shocks. Further, US macroeconomic surprises need not reflect US-specific structural shocks. It is also possible that foreign asset prices respond to US news releases because they reveal information about the global common state.

Relative to previous work on the global financial cycle, the key advantage of our research design is that it isolates conditional variation—from US macroeconomic surprises. We will use this variation (i) to show that shocks which drive the US business cycle also drive global financial conditions, and (ii) to study the mechanisms through which these shocks affect international asset prices. We will also propose a test for the presence of common shocks, which is specific to this research design. This test suggests that global common shocks are unlikely to be important in our context, and that the estimated effects predominantly capture the transmission of shocks from the US.

3 Data

In this section, we provide a brief overview of the data used for our main analysis.

3.1 US Macroeconomic News

The data on macroeconomic news releases comes from Bloomberg's US Economic Calendar (Bloomberg Economic Calendar, 1996-2019). For each macroeconomic release, Bloomberg

Table 1: Overview of Major US Macroeconomic News

Announcement	Release Time	Frequency	Category	Observations
Capacity Utilization	9:15 am	Monthly	Real Activity	274
CB Consumer Confidence	10:00 am	Monthly	Real Activity	273
Core CPI	8:30 am	Monthly	Price	275
Core PPI	8:30 am	Monthly	Price	275
Durable Goods Orders	8:30 am	Monthly	Real Activity	266
GDP A	8:30 am	Quarterly	Real Activity	91
Initial Jobless Claims	8:30 am	Weekly	Real Activity	1166
ISM Mfg Index	10:00 am	Monthly	Real Activity	277
New Home Sales	10:00 am	Monthly	Real Activity	267
Nonfarm Payrolls	8:30 am	Monthly	Real Activity	274
Retail Sales	8:30 am	Monthly	Real Activity	275
UM Consumer Sentiment P	10:00 am	Monthly	Real Activity	247

Notes: This table displays the 12 major macroeconomic series we focus on in most of the paper. Online Appendix Table B1 shows the full set of series considered in the paper. The sample ranges from October 1996 to December 2019. *Frequency* refers to the frequency of the data releases and *Observations* to the number of observations (surprises) of a macroeconomic series in our sample. *Category* specifies if the news release is predominantly informative about real activity or prices. Abbreviations: A—advanced; P—preliminary; Mfg—Manufacturing; CB—Chicago Board; UM—University of Michigan; ISM—Institute for Supply Management.

reports, among other things, release date and time, released value, and the median market expectation prior to the release. Table 1 provides an overview of the 12 major macroeconomic news series we focus on in Sections 4 and 7. This selection is inspired by previous studies in the literature (e.g., Faust et al., 2007; Rigobon and Sack, 2008; Gürkaynak, Kısacıkoğlu, and Wright, 2020). We treat different releases for the same macroeconomic variable—for instance, the advanced, second, and third release of GDP—as separate news series. For the interpretation of our results, it is often instructive to group the 12 major series into those providing information on US real economic activity and those providing information on prices (Beechey and Wright, 2009).[9]

When studying the explanatory power of US macroeconomic news in Section 5 we use *all* available US macroeconomic news series. These are listed in Online Appendix Table B1. As discussed below, we will also use this broader set of announcements as controls. For more details on the macro news data, see Online Appendix B.1.

We use the median market expectation of the release as our measure of $E\left[y_{US,t}|\mathcal{I}_{t-\Delta^-}\right]$ when constructing surprises based on equation (1). Since Bloomberg allows forecasters to update their prediction up until the release time, these forecasts should reflect all publicly available information at the time. As noted above, surprises are standardized so that the coefficient γ_i^y measures the effect of a one standard deviation surprise. For ease of interpretation, we flip the sign of Initial Jobless Claims surprises. A positive sign thus corresponds to positive news about real economic activity—consistent with the other releases.

[9] As discussed in Section 2, it is possible that both categories provide information about the same underlying macroeconomic shocks. The classification into price and real activity news should therefore be regarded as pragmatic rather than conceptual. It turns out that this grouping is useful for summarizing and interpreting our findings.

Online Appendix Figure C1 shows the resulting time series of standardized surprises for each macroeconomic variable. Reassuringly, all series of surprises are centered at zero. Further, there is no discernible pattern of autocorrelation, and there is no systematic trend in the standard deviation of surprises. Some series such as Initial Jobless Claims and Retail Sales display somewhat higher volatility during recessions. In contrast, other series such as Core PPI and New Home Sales, have lower volatility during downturns. Overall, there is no indication that using these surprises as our identifying variation is econometrically problematic.

3.2 Financial Data

The data on asset prices comes from the *Thomson Reuters Tick History* dataset and is obtained via *Refinitiv* (LSEG Tick History, 1996-2019). We use intraday data for most analyses. As shown by prior work—mostly in a domestic context—moving from daily to intraday data leads to lower risk of confounding by other news releases, and to increased precision by mitigating noise. Using intraday data is likely even more important when studying the effects on international markets since most countries are more open than the US. A country's stock market is driven by domestic *and* foreign news, making US news releases just one among many sources of information throughout the trading day.

Our primary outcomes of interest are minute-by-minute series of 27 countries' major stock indexes. Table 2 provides an overview of these. The table also shows the sample periods over which these indexes are available to us. For Canada, Chile, the Czech Republic, Denmark, Italy, and Russia, the stock indexes change their ticker symbols during the sample period. In these cases, we merge the series with their predecessors in a consistent fashion. We inspect each data series for potential misquotes, and remove them if necessary. Throughout the paper, we use a country's 3-digit ISO code to refer to its stock index (e.g., DEU instead of DAX). Besides the data on international stock markets, we use intraday data on various other asset prices. We defer a more detailed discussion to the relevant sections below. Online Appendix B.2 provides an overview of all financial instruments employed throughout the paper.

Our intraday analysis of international equity markets requires that the time window around a particular news release lies within the trading hours of the respective foreign stock market. The country composition of our sample reflects this constraint. For instance, Asian and Australian equity markets are closed during almost all release times and are thus not included in our sample. When comparing US and foreign stock price responses, we rely on data on E-mini S&P 500 futures, which are traded outside of regular trading hours. Hence, we do not need to limit our analysis to announcements for which US markets are open. Figure 2 visualizes the timing of news releases and trading hours for the stock markets in our sample. Further, Online Appendix Table B4 summarizes which countries' equity markets are open for each of the 12 main announcements.

Table 2: Intraday Data on International Stock Markets

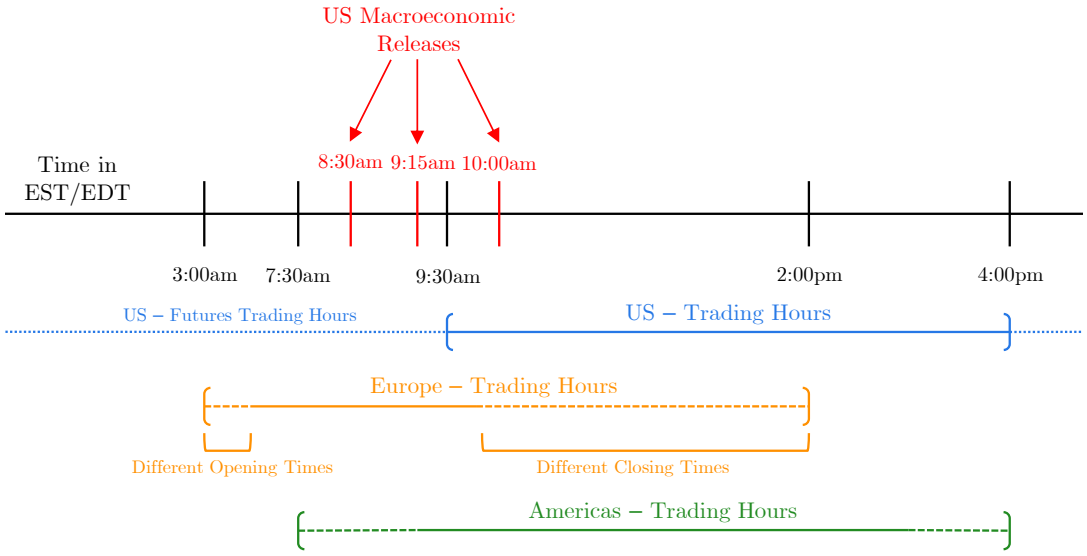
Name	Ticker	Sample	Country	ISO
MERVAL	.MERV	1996–2019	Argentina	ARG
ATX	.ATX	1996–2019	Austria	AUT
BEL 20	.BFX	1996–2019	Belgium	BEL
Bovespa	.BVSP	1996–2019	Brazil	BRA
S&P/TSX	.GSPTSE*	2000–2019	Canada	CAN
SMI	.SSMI	1996–2019	Switzerland	CHE
IPSA	.SPIPSA*	1996–2019	Chile	CHL
PX	.PX*	1999–2019	Czech Republic	CZE
DAX	.GDAXI	1996–2019	Germany	DEU
OMX Copenhagen 20	.OMXCXC20PI*	2000–2019	Denmark	DNK
IBEX 35	.IBEX	1996–2019	Spain	ESP
OMX Helsinki 25	.HEX25	2001–2019	Finland	FIN
CAC 40	.FCHI	1996–2019	France	FRA
FTSE 100	.FTSE	1996–2019	United Kingdom	GBR
FTSE/Athex Large Cap	.ATF	1997–2019	Greece	GRC
BUX	.BUX	1997–2019	Hungary	HUN
ISEQ	.ISEQ	1996–2019	Ireland	IRL
FTSE MIB	.FTMIB*	1996–2019	Italy	ITA
S&P/BMV IPC	.MXX	1996–2019	Mexico	MEX
AEX	.AEX	1996–2019	Netherlands	NLD
OBX	.OBX	1996–2019	Norway	NOR
WIG20	.WIG20	1997–2019	Poland	POL
PSI-20	.PSI20	1996–2019	Portugal	PRT
MOEX Russia	.IMOEX*	2001–2019	Russia	RUS
OMX Stockholm 30	.OMX	1996–2019	Sweden	SWE
BIST 30	.XU030	1997–2019	Turkey	TUR
FTSE/JSE Top 40	.JTOPI	2002–2019	South Africa	ZAF

Notes: The table shows the stock market indexes used in our analysis. The data is from *Thomson Reuters Tick History*. For all series, the sample period ends in December 2019. *For Canada, Chile, the Czech Republic, Denmark, Italy and Russia, the ticker of the stock index changes over our sample period. Hence, we also use the previous tickers, which are .TSE300 for Canada, .IPSA and .SPCLXIPSA for Chile, .PX50 for the Czech Republic, .KFMX for Denmark, .MIB30 and .SPMIB for Italy, and .MCX for Russia. *Ticker* refers to the Reuters Instrument Code (RIC), and *ISO* denotes the 3-digit ISO country code.

4 High-Frequency Effects of US Macro News

In this section, we implement a high-frequency event study and estimate the effect of US macroeconomic releases on risky asset prices. Due to their importance for the global financial cycle, we are interested in the effects on international stock indexes, the VIX and other implied volatility measures, as well as commodity prices. We show that all of these asset prices strongly respond to US news. Importantly, we document that US news releases induce co-movement of international equity markets.

Figure 2: US Macroeconomic Releases and International Stock Market Trading Hours



Notes: This figure shows the times of US macroeconomic releases as well as the trading hours of stock markets in our sample. Note that the trading hours of South Africa and Turkey are represented by the European trading hours. *US - Futures Trading Hours* refer to the trading hours of the E-mini S&P 500 futures.

4.1 International Stock Markets

4.1.1 Pooled Effects

We begin our empirical analysis with demonstrating that international stock indexes respond to the release of news about the US economy. As discussed in Section 2, we estimate pooled regressions of the form

$$\Delta q_{i,t} = \alpha_i + \gamma^y s^y_{US,t} + \sum_{k \neq y} \gamma^k s^k_{US,t} + \varepsilon_{i,t}, \tag{3}$$

where $\Delta q_{i,t} = q_{i,t+20} - q_{i,t-10}$ is the 30-minute log-change of country i's stock market index.[10] Further, $s^y_{US,t}$ is the surprise of interest and $\varepsilon_{i,t}$ captures the effects of unmeasured news and/or noise. Note that the pooled effect γ^y is informative about the *average* effect on international stock markets. It masks, however, potential heterogeneity in the responses of the 27 stock indexes in our sample. Since such heterogeneity (or the lack thereof) is of interest for our research question, we study the country-specific effects below.

We include other surprises about US macroeconomic variables, $s^k_{US,t}$, which are published within the time window we study, as controls. For instance, the Bureau of Labor Statistics publishes Nonfarm Payrolls together with the Unemployment Rate (and other macroeconomic variables) as part of the US employment report. Attributing asset price changes solely to the surprise about Nonfarm Payrolls could therefore be misleading. Note that we consider all 66

[10] More precisely, $\Delta q_{i,t} = \log((Q_{i,t+15} + ... + Q_{i,t+25})/11) - \log((Q_{i,t-15} + ... + Q_{i,t-5})/11)$, where $Q_{i,t}$ is country i's stock market index. We then express this change in basis points.

announcements as listed in Online Appendix Table B1 as controls, except for those, which by construction convey the same information as the release of interest.[11]

The identification assumption for the consistent estimation of γ^y holds that, conditional on controls, error $\varepsilon_{i,t}$ is uncorrelated with the surprise $s^y_{US,t}$. To account for the fact that surprises on the right-hand side are US-specific and thus perfectly correlated across foreign countries, we two-way cluster standard errors by announcement and by country.

Table 3 shows the estimates of γ^y for the 12 major macroeconomic releases. Two results emerge from the table. First, all announcements have a significant effect at the one percent level with the exception of the Capacity Utilization announcement, which is significant at the five percent level. Second, positive news about US real activity leads to an increase in stock prices. As we will discuss in Section 7 below, this effect is consistent with increased risk-taking of international investors and/or higher expected future dividends after such surprises.[12] In contrast, inflation surprises—as captured by positive surprises in the Core CPI and Core PPI—lead to a decrease in stock prices. We argue in Section 7 that this result is at least in part driven by higher interest rates.[13]

Kurov et al. (2019) have documented that some asset prices drift prior to certain US macroeconomic news releases. Such drifts may reflect information leakage or superior forecasting ability relative to the median forecast and cast doubt on market efficiency—which our analysis relies on. As Online Appendix Figure C2 shows, international equity prices do not drift prior to the news releases we study (at least not during the time window relevant for our analysis). This is in line with Lucca and Moench (2015) who also do not find evidence for pre-announcement drifts around US macro releases.

4.1.2 Cross-country Heterogeneity

We next study country-specific effects and show that US macroeconomic news induces comovement across markets. In particular, we estimate

$$\Delta q_{i,t} = \alpha_i + \gamma^y_i s^y_{US,t} + \sum_{k \neq y} \gamma^k_i s^k_{US,t} + \varepsilon_{i,t}, \tag{4}$$

[11] For instance, Capacity Utilization is constructed by dividing Industrial production by a slow-moving estimate of capacity. When studying the effect of Capacity Utilization on international equity markets, we therefore exclude Industrial Production from the set of controls. Including Industrial Production as a control would make the coefficient on Capacity Utilization difficult to interpret—due to collinearity problems. To avoid such collinearity problems, we choose the set of controls as follows: For Core CPI and Core PPI, we exclude CPI and PPI, respectively. For Durable Goods Orders, we exclude Durable Goods Orders Excluding Transportation (Durable Ex Transportation). For Nonfarm Payrolls, we exclude Private and Manufacturing Nonfarm Payrolls (Private and Mfg Payrolls). For Retail Sales, we exclude Retail Sales Excluding Autos (Retail Sales Ex Auto).

[12] This finding does not conflict with those by Hoek, Kamin, and Yoldas (2022), who document that interest rate changes associated with growth news have no sizable effects on emerging market equity prices. Their study uses the change in the 2-year US Treasury yield to proxy for the announcement surprise. As a result, their analysis does not (and is not intended to) capture the full effect on risk premia, which we find to be important for explaining the observed stock price changes.

[13] In Supplementary Appendix S1, we extend our analysis and allow for time-varying effects of US news on foreign stock prices. Consistent with prior work, we find that the effect sizes often increase during bad times. We also show, however, that the effects reported in Table 3 are present in normal times and not driven by large effects in the extreme episodes of our sample period.

Table 3: Effects of US News on International Stock Markets

	Capacity Utilization	CB Consumer Confidence	Core CPI	Core PPI	Durable Goods Orders	GDP A
Stock Index (bp)						
News	5.36**	12.35***	-8.84***	-4.87***	5.63***	17.60***
	(2.28)	(2.02)	(1.89)	(1.29)	(1.60)	(3.36)
R^2	0.04	0.13	0.10	0.15	0.10	0.26
Observations	6054	6041	5717	5828	5610	1911
	Initial Jobless Claims $\cdot(-1)$	ISM Mfg Index	New Home Sales	Nonfarm Payrolls	Retail Sales	UM Consumer Sentiment P
Stock Index (bp)						
News	4.89***	11.71***	4.23***	17.06***	10.52***	5.61***
	(0.73)	(2.24)	(1.40)	(2.99)	(1.68)	(1.54)
R^2	0.09	0.12	0.03	0.13	0.15	0.04
Observations	24334	5548	5908	5688	5786	5726

Notes: This table presents estimates of γ^y of equation (3) for each of the 12 macroeconomic announcements. The stock index changes are expressed in basis points. Standard errors are two-way clustered by announcement and by country, and reported in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent level.

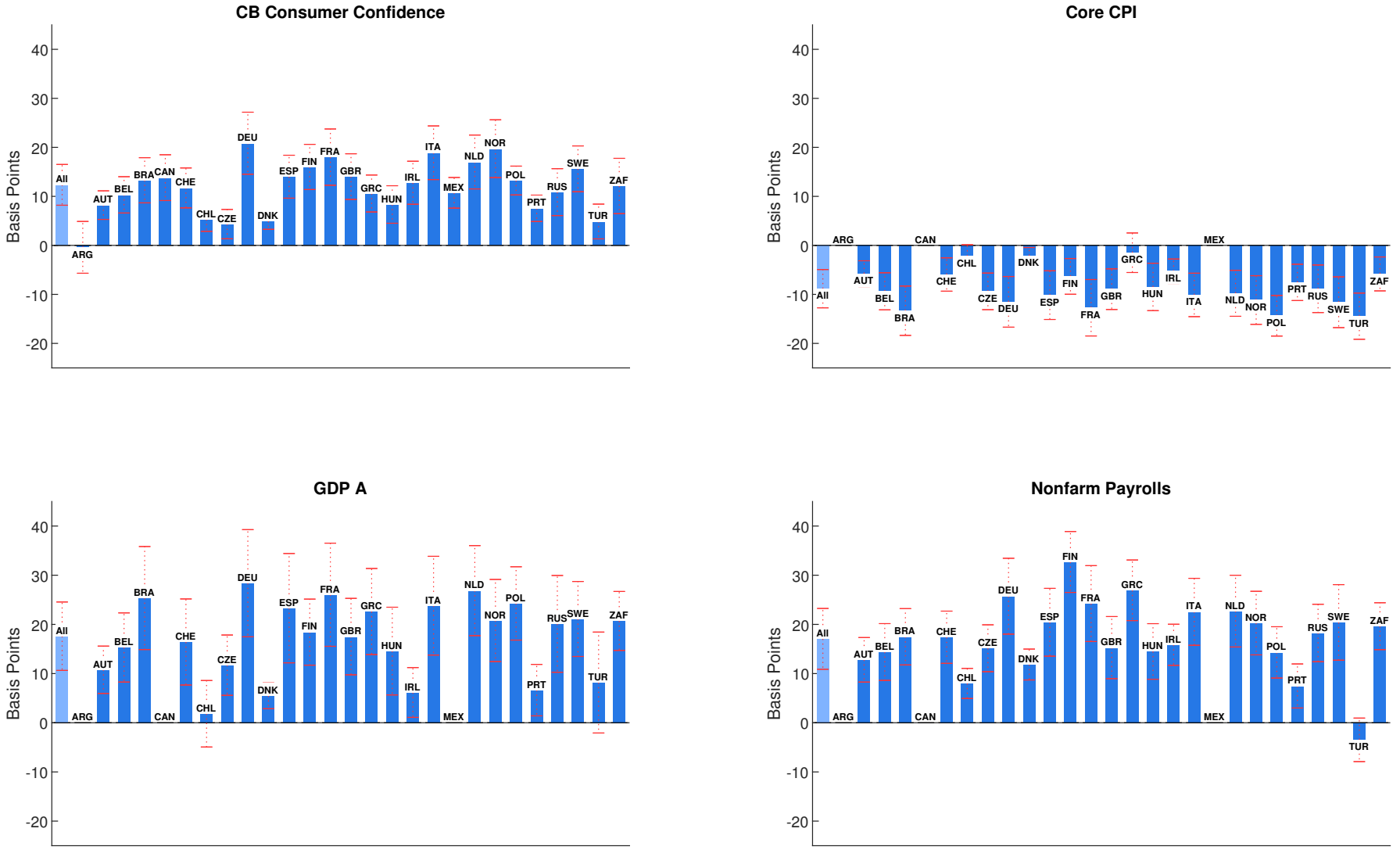
where $\Delta q_{i,t} = q_{i,t+20} - q_{i,t-10}$. Different from equation (3), the coefficients γ_i^y and γ_i^k are now specific to each country.

Figure 3 illustrates countries' stock index responses for four of the 12 announcements. Strikingly, for a given announcement the sign of the response is identical for all countries whenever statistically significant. That is, US macroeconomic news not only affects international stock markets but they also lead to *correlated* asset price responses. This co-movement of risky asset prices is a defining feature of the global financial cycle (Miranda-Agrippino and Rey, 2020).

Figure 4 summarizes this finding for all 12 announcements by plotting the country-specific effect $\hat{\gamma}_i^y$ relative to the pooled effect $\hat{\gamma}^y$ (estimated from equation (3)). Circles above zero indicate cases in which the country-specific effect has the same sign as the pooled effect. The fact that almost all circles are positive confirms the results of Figure 3. Figure 4 also illustrates systematic heterogeneity in responsiveness across countries. While the Netherlands, for example, responds more strongly than the average country for all 12 announcements, countries such as Austria, Denmark, and Portugal always respond less than the average.[14]

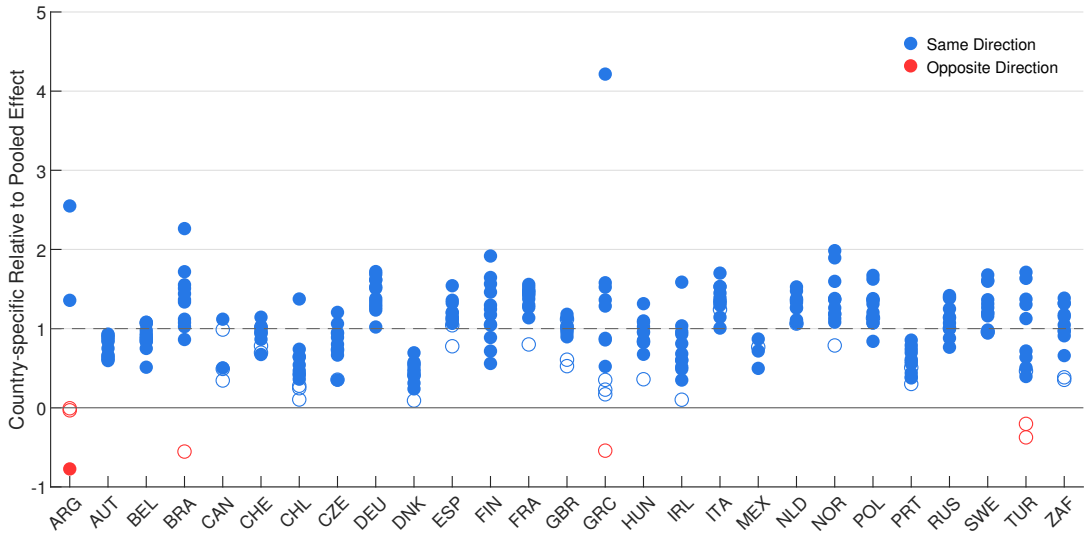
[14] In Supplementary Appendix S2, we examine whether these differences in responsiveness correlate with observables. Perhaps surprisingly, we find no robust correlation of the effect size with (i) a measure of financial integration, (ii) a measure of trade integration, (iii) a measure of industry dissimilarity, or (iv) an exposure measure to dollar valuation effects—once we control for other determinants of the effect size.

Figure 3: Effects of US News on International Stock Markets by Country



Notes: This figure shows the stock index responses for four selected announcements. The stock index changes are expressed in basis points. The light blue bar shows the pooled effect, i.e., the estimate of common coefficient γ^y of equation (3), while the dark blue bars show the country-specific effect, i.e., the estimate of γ_i^y of equation (4). Missing country bars depict cases in which the country is dropped because it had less than 24 observations for a given announcement. The red error bands depict 95 percent confidence intervals, where standard errors are two-way clustered by announcement and by country. Analogous bar charts for all news releases are shown in Online Appendix Figure C3.

Figure 4: Countries' Stock Market Responses Relative to Pooled Response



Notes: The figure plots the country-specific stock index responses relative to the pooled response for all 12 announcements, or formally, $\hat{\gamma}_i^y/\hat{\gamma}^y$, where the estimates are obtained from estimating equations (3) and (4). Blue (red) circles indicate that the country's response has the same (opposite) sign as the pooled effect. Filled circles indicate significance at the 5 percent level while an empty circle indicates an insignificant effect. For a given announcement, country-specific estimates obtained from fewer than 24 observations are dropped.

4.1.3 Assessing the Magnitude

While our high-frequency event study above allows us to establish a causal relationship between US news and foreign stock markets, it comes at the cost that the economic significance of this finding is not immediately obvious. To shed light on this question, we next assess the effect size by comparing it to a benchmark. In particular, we compare the foreign stock price response to the response of the S&P 500.

To do so, we estimate equation (3) after replacing the left hand side with $\Delta q_{US,t} - \Delta q_{i,t}$, where $\Delta q_{US,t}$ is the 30-minute log-change in the front-month E-mini S&P 500 futures contract, and $\Delta q_{i,t}$ is the 30-minute log-change of country i's stock market index as above. A positive coefficient γ^y now indicates that the response of the S&P 500 is greater than the response of the foreign stock price index. We follow earlier studies and use E-mini S&P 500 futures contracts for this analysis (e.g., Hasbrouck, 2003). These are highly liquid, traded outside of regular hours, and thus available for all announcements.

Table 4 shows the estimates. Strikingly, we find evidence that the US stock market responds differently from foreign stock markets for only 3 out of 12 announcements. In absolute terms, the US response is greater for the CB Consumer Confidence, the Core CPI, and the ISM Manufacturing Index. (Recall that stock markets respond negatively to Core CPI announcements.) In the remaining cases, we can neither reject the null hypothesis of equally-sized responses, nor do the insignificant point estimates suggest a greater response of the S&P 500. For news about real activity, the insignificant point estimates are often negative, if at all hinting at greater responses of foreign equity markets. In sum, foreign stock price responses to US news are often comparable in magnitude to the response of US stock prices.

Table 4: Effects on US Stock Market Relative to International Markets

	Capacity Utilization	CB Consumer Confidence	Core CPI	Core PPI	Durable Goods Orders	GDP A
Stock Index Diff. (bp)						
News	-0.44	3.45**	-4.67***	-0.73	-1.01	-0.95
	(1.10)	(1.34)	(1.18)	(0.81)	(0.87)	(2.00)
R^2	0.00	0.04	0.05	0.02	0.04	0.05
Observations	5535	5953	5575	5668	5610	1871
	Initial Jobless Claims $\cdot(-1)$	ISM Mfg Index	New Home Sales	Nonfarm Payrolls	Retail Sales	UM Consumer Sentiment P
Stock Index Diff. (bp)						
News	0.59	4.13**	-0.58	2.83	-1.13	-1.68
	(0.44)	(1.88)	(0.90)	(2.28)	(1.16)	(1.15)
R^2	0.01	0.06	0.01	0.03	0.03	0.01
Observations	24122	5432	5893	5578	5593	5087

Notes: This table presents estimates of γ^y as defined in equation (3) after replacing the left hand side with $\Delta q_{US,t} - \Delta q_{i,t}$ for each of the 12 macroeconomic announcements. The stock index changes are expressed in basis points. Standard errors are two-way clustered by announcement and by country, and reported in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent level.

4.2 The VIX and Other Risky Asset Prices

In this section, we estimate the effects of US macro news on the VIX, a measure of risk aversion and uncertainty, as well as other risky asset prices. Declines in the VIX are typically interpreted as signalling increasing willingness of investors to take risk. Various papers highlight the important role of the VIX for international financial markets. Rey (2013) shows that the VIX is a close proxy of the global financial cycle, Forbes and Warnock (2012) emphasize the correlation of the VIX with international capital flows, and Bruno and Shin (2015a) link it to global banks' leverage.

Analogous to specification (3), we estimate the effect of US news on the 30-minute log-change in the VIX:

$$\Delta q_t = \alpha + \gamma^y s^y_{US,t} + \sum_{k \neq y} \gamma^k s^k_{US,t} + \varepsilon_t, \tag{5}$$

where $s^y_{US,t}$ is the announcement surprise of interest, $s^k_{US,t}$ are other surprises released in the same time window, and $\Delta q_t = q_{t+20} - q_{t-10}$ is the 30-minute log-change in the VIX. If the stock market is not open at the announcement time, we instead use changes in the front-month VIX futures contract.[15] Since VIX futures are available for the relevant trading hours only since 2011, the sample sizes are often smaller than before (see Online Appendix Table B3). Due in part to the small samples sizes for the VIX, we also study the VSTOXX, which is the implied volatility index for the Euro Area stock index STOXX 50. As shown in Miranda-Agrippino and Rey (2022), this index is also highly correlated with the global financial cycle and high-frequency data is available for all announcements from 2005 onwards.

[15] In our sample, the correlation of the daily returns of the VIX and the front-month VIX futures contract is 78 percent.

Table 5: Effects of US News on VIX and VSTOXX

	Capacity Utilization	CB Consumer Confidence	Core CPI	Core PPI	Durable Goods Orders	GDP A
VIX (bp)						
News	-15.66	-65.29***	37.14***	-5.21	-5.42	-45.65***
	(11.59)	(12.55)	(13.24)	(8.50)	(5.74)	(16.20)
R^2	0.03	0.13	0.21	0.40	0.26	0.35
Observations	108	270	105	108	108	36
VSTOXX (bp)						
News	-25.61**	-50.99***	46.23***	24.82**	-23.13**	-94.80***
	(12.24)	(12.17)	(11.80)	(10.47)	(11.06)	(20.19)
R^2	0.07	0.07	0.15	0.30	0.12	0.32
Observations	175	175	175	175	174	59
	Initial Jobless Claims $\cdot(-1)$	ISM Mfg Index	New Home Sales	Nonfarm Payrolls	Retail Sales	UM Consumer Sentiment P
VIX (bp)						
News	-15.09**	-66.21***	-25.38*	-118.04***	-75.13***	-40.81***
	(6.38)	(18.08)	(13.35)	(27.15)	(18.79)	(14.95)
R^2	0.13	0.13	0.06	0.27	0.32	0.05
Observations	464	270	264	107	106	230
VSTOXX (bp)						
News	-26.51***	-101.65***	-36.83**	-158.09***	-61.44***	-41.84***
	(4.89)	(19.46)	(16.65)	(19.80)	(10.27)	(12.85)
R^2	0.14	0.27	0.12	0.32	0.30	0.07
Observations	754	163	174	171	175	176

Notes: For all 12 announcements, this table shows estimates of γ^y obtained from equation (5), where the left-hand side is the 30-minute log-change in the front-month VIX futures contract or the VSTOXX, expressed in basis points. For CB Consumer Confidence, UM Consumer Sentiment P, ISM Mfg Index, and New Home Sales, we are able to use the VIX instead of the VIX futures due to the late announcement time. Heteroskedasticity-robust standard errors are reported in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent level.

Table 5 reports the estimates of these regressions. 9 out of 12 announcements show a strong and significant effect on the VIX. Positive news about real economic activity leads to a reduction in the VIX, confirming that US macroeconomic news drives the global financial cycle. A comparison to the estimates in Table 3 makes clear that after most announcements stock prices co-move negatively with the VIX. The estimates for the VSTOXX confirm this co-movement (and are significant throughout). To the extent that the implied volatility indexes serve as a rough proxy for the equity premium (Martin, 2017), this negative co-movement suggests that changes in the equity risk premium drive part of the stock price response. We discuss more evidence on the role of risk premia in Section 7. In Online Appendix Table C1, we also report results for the implied volatility indexes of Germany (VDAX), the United Kingdom (VFTSE), and France (VCAC). The effects of US macro news are robust across

these measures.[16]

Lastly, in Supplementary Appendix S3, we study the effects on commodity prices as additional measures of risky asset prices. For the majority of news releases, we find a significant effect on a common factor extracted from several commodity prices. The signs are as expected. Positive (negative) news about real activity leads to an increase (decrease) in commodity prices. Thus, our findings for other risky asset prices confirm that US macro news drives the global financial cycle.

5 Explanatory Power of US Macro News at Lower Frequencies

In this section, we demonstrate that the effects of US news on international stock markets are persistent and explain a sizable share of their variation.

Headline news We apply Altavilla, Giannone, and Modugno's (2017) method to assess the explanatory power of US macro news and thus switch from our earlier intraday event study approach in the previous section to a daily time series analysis. In a first step, we estimate the specification

$$\Delta q_{i,d} = \alpha_i + \sum_k \beta_i^k s_{US,d}^k + \varepsilon_{i,d}. \tag{6}$$

Here, d indexes time in days and $\Delta q_{i,d}$ is the daily return of country i's stock price index as measured by the log-difference from market closing to market closing. The sum on the right-hand side now includes *all* available announcements as listed in Online Appendix Table B1. By focusing on daily log-returns, we circumvent the problem that some foreign markets are closed for some announcements. Hence, the set of US news releases that drive foreign asset prices in specification (6) is identical for all countries.[17] Note that all coefficients are country-specific. A surprise $s_{US,d}^k$ takes the value 0 if no news is released on a given day. Since the coverage of news releases is incomplete in the late 1990s, the sample period now ranges from January 1, 2000 to December 31, 2019.

Next, we define the daily headline news index $hni_{i,d}$ as the fitted value from equation (6), and aggregate this predicted value to the desired time horizon h (in days), $hni_{i,d}^{(h)} = \sum_{j=0}^{h-1} hni_{i,d-j}$. Letting $\Delta q_{i,d}^{(h)} = q_{i,d} - q_{i,d-h} = \sum_{j=0}^{h-1} \Delta q_{i,d-j}$ denote the h-day log-return of stock index q_i, we estimate in a second step the specification

$$\Delta q_{i,d}^{(h)} = \alpha_i^{(h)} + \beta_i^{(h)} hni_{i,d}^{(h)} + \varepsilon_{i,d}^{(h)}. \tag{7}$$

The statistic of primary interest is the R-squared of regression (7). It measures the explanatory power of the headline US macroeconomic news releases at aggregation horizon h and is therefore informative about how persistent the effects of macroeconomic news are relative to residual driving forces. Additionally, if the coefficient $\beta_i^{q,h}$ is greater (smaller) than one,

[16] In unreported robustness checks, we have confirmed that the results in Table 5 do not change fundamentally when we drop the zero lower bound episode from the sample.

[17] Relative to Altavilla, Giannone, and Modugno (2017), our set of announcements includes more macroeconomic news releases. However, we exclude news about monetary policy.

macroeconomic news exerts a delayed (mean-reverting) effect. As in Altavilla, Giannone, and Modugno (2017), we consider aggregation to the monthly and quarterly frequency.

Non-headline news Following Gürkaynak, Kısacıkoğlu, and Wright (2020), we also incorporate the effects of "non-headline news" into our measurement of explanatory power. This news describes a part of macro releases, which is not captured by the surprises we have studied so far. Non-headline news is therefore latent, that is, it is not observed by the econometrician. However, as market participants observe such news, it can affect asset prices. For example, the Bureau of Labor Statistics publishes the nonfarm payroll employment number as part of the US employment report, which varies in length between 20 and 40 pages over our sample period. These pages contain additional macroeconomic data, for which no survey expectations exists, as well as text to provide context and details. All of this information potentially qualifies as non-headline news.

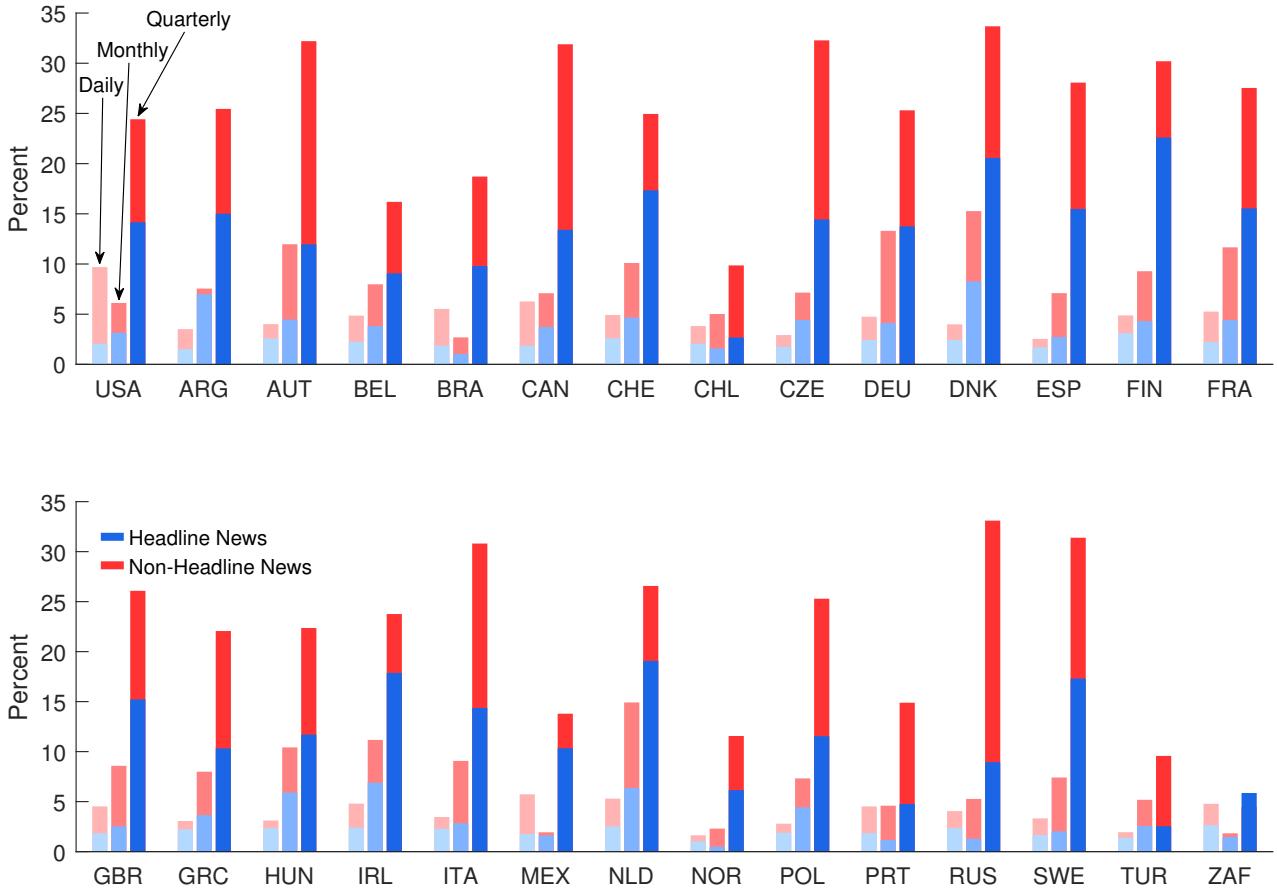
Gürkaynak, Kısacıkoğlu, and Wright (2020) propose an estimation procedure to recover non-headline news factors using the Kalman filter and demonstrate that they are important for explaining the observed asset price reactions around macroeconomic announcements. We closely follow their procedure. With the estimated non-headline news factors in hand, we can add them as additional regressors into equation (6). The fitted value is then a daily *broad news index*, and we can obtain the combined explanatory power of headline and non-headline news from a modified version of equation (7). Details on the estimation as well as robustness checks are available in Supplementary Appendix S4.

Results Figure 5 shows the daily, monthly, and quarterly R-squared for the foreign stock indexes by country. The blue bars display the contributions of headline news while the red bars display the contributions of non-headline news. The figure shows that the explanatory power of US news for foreign stock indexes increases at lower frequencies for both headline and non-headline news. In an overwhelming number of cases, the R-squared values at the quarterly frequency exceed the R-squared values at the monthly frequency, which in turn, exceed the R-squared values at the daily frequency. The explanatory power of US news is sizable at the quarterly frequency, often explaining between 15 and 35 percent of the variation. On average, US news explains 23 percent of the quarterly variation. For comparison, we repeat the analysis for the S&P 500, and report the R-squared first in Figure 5. US macroeconomic news explains an even greater share of stock price movements in several foreign countries than it does in the US.

The increased R-squared values at lower frequencies imply that the effects of US macroeconomic news are more persistent than residual driving forces of international stock prices. Online Appendix Table C2 reports the monthly and quarterly estimates of $\beta_i^{(h)}$ from equation (7), and shows that at least part of this persistence is due to delayed effects of the macroeconomic news. For several countries, we can reject the null hypothesis that $\beta_i^{(h)} = 1$.

Overall, the explanatory power of US macro news for international stock markets at lower frequencies is striking. Reassuringly, our estimates for headline news and the US market are similar to those by Altavilla, Giannone, and Modugno (2017). We also repeat this exercise

Figure 5: Daily, Monthly, and Quarterly R-Squared for Stock Indexes



Notes: For each country's stock index, this figure plots the R-squared of equations (6) for the daily frequency, and the R-squared of equations (7) for the monthly and quarterly frequency. The left, middle, and right bar for each country indicate, respectively, the R-squared of the daily, monthly, and quarterly regression. For a given country and frequency, the blue bar represents the R-squared of the headline surprises of US macroeconomic news, whereas the red bar displays the increment in R-squared once non-headline news is included. The sample runs from January 1, 2000 to December 31, 2019.

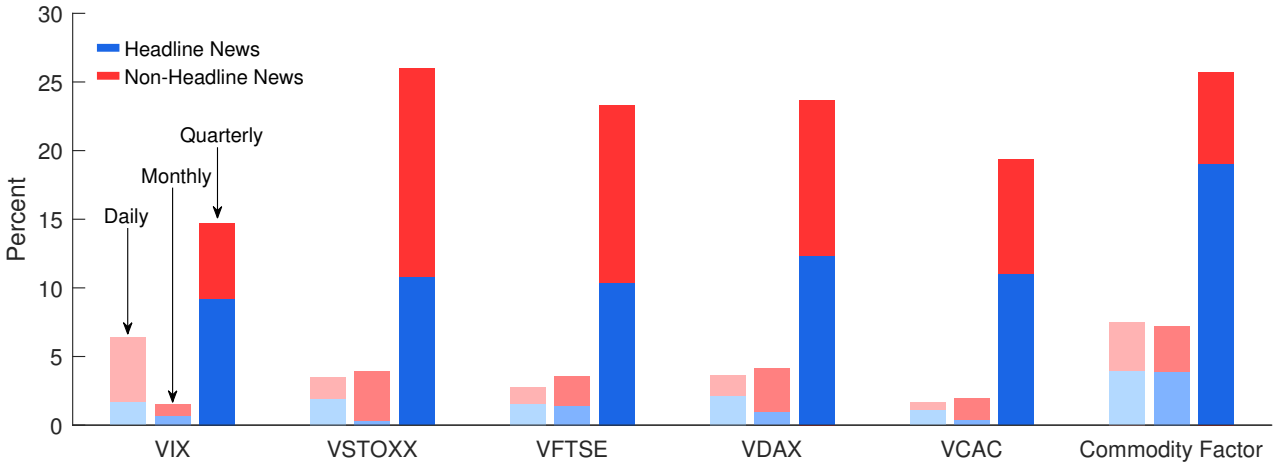
for US dollar-denominated foreign exchange rates. The results, shown in Online Appendix Figure C4, make clear that the methodology does not mechanically lead to an increase in the R-squared at lower frequencies. The explanatory power for exchange rates is typically very small.[18]

We further repeat the analysis for the VIX, the international VIX analogues (VSTOXX, VDAX, VFTSE, VCAC), and the commodity price factor (constructed as described in Supplementary Appendix S3).[19] To do so, we simply replace $q_{i,d}$ in equations (6) and (7) with the respective index or commodity price factor. Figure 6 shows the resulting daily, monthly, and quarterly R-squared. Similar to the estimates for stock indexes, the explanatory power

[18] Also note that we have sufficiently many observations for all news releases that overfitting concerns should not apply when estimating equation (6). Observation counts for all announcements are shown in Online Appendix Table B1. See also the out-of-sample check in Altavilla, Giannone, and Modugno (2017, pp. 40-41).

[19] To improve the sample coverage, we obtain daily data from Bloomberg for the VDAX, VFTSE, and VCAC.

Figure 6: Daily, Monthly, and Quarterly R-Squared for Volatility and Commodity Indexes



Notes: This figure plots the R-squared of equations (6) for the daily frequency, and the R-squared of equations (7) for the monthly and quarterly frequency, where we now use log-returns of the volatility indexes or the commodity factor instead of country i's stock index. The left, middle, and right bar indicate the R-squared of the daily, monthly, and quarterly regression, respectively. For a given country and frequency, the blue bar represents the R-squared of the headline surprises of US macroeconomic news, whereas the red bar displays the increment in R-squared once non-headline news is included. The sample runs from January 1, 2000 to December 31, 2019 for the volatility indexes, and from May 7, 2007 to December 31, 2019 for the commodity factor.

increases at lower frequencies. At the quarterly frequency, US macroeconomic news explains typically between 15 and 25 percent of the variation in the implied volatility measures, as well as 25 percent in the commodity factor.

To interpret our findings below, it is useful to ask whether the explanatory power of US macro news comes mostly from real activity news or from price news. To answer this question, we re-run the explanatory power exercise separately for both types of news.[20] Online Appendix Figure C5 shows that around 80 percent of the quarterly explanatory power of US and foreign stock prices comes from news about US real activity. This contrasts with price news, which only accounts for a relatively small fraction of this explanatory power. Hence, news about US real activity is a major driver of foreign stock markets.

Lastly, we note that while incorporating non-headline news leads to a sizable increase in explanatory power, our estimates should be interpreted as conservative. The reason is that as in Gürkaynak, Kısacıkoğlu, and Wright (2020), we extract our non-headline news factor exclusively from the US yield curve.[21] International stock or bond market data likely captures additional information that could raise the explanatory power of non-headline news, but we do not use this information here.

[20] For a classification of all news releases into the real activity and price category, see Online Appendix Table B1.

[21] We only use US data in our estimation to keep our factors close to those extracted by Gürkaynak, Kısacıkoğlu, and Wright (2020) who provide extensive evidence that they are well identified. Also note that yields are preferred for the factor estimation (in comparison to stock returns), since the assumption of a time-invariant announcement effect, which is key for the identification of the factor, is more likely to hold for yields.

6 The Asymmetric Effects of US and Foreign Macro News

In this section, we study the effects of foreign macroeconomic news releases on the US stock market. We show that the estimated effects are much smaller than the effects of US macro news on foreign markets and that they are often statistically insignificant. The effects of countries' macro news are therefore highly asymmetric. We then argue that under plausible assumptions this asymmetry rules out that common shocks drive the results in Sections 4 and 5. Instead, these results are more likely to be driven by the transmission of US-specific shocks to foreign stock markets.

6.1 Effects of Foreign Macro News on the US

We begin with estimating the effects of foreign macroeconomic news releases on the US stock market. To do so, we consider macroeconomic news releases in each of the non-US G7 countries (i.e., Canada, France, Germany, Italy, Japan, and the United Kingdom). These countries are *a priori* the most likely to have high-quality macroeconomic measurement—a property needed for the high-frequency research design we use. Further, data to construct the surprises is available for sufficiently long sample periods. As for the US, the data comes from Bloomberg. We study 10 major news releases per country. Online Appendix Table B2 provides more information on the foreign macroeconomic announcements.

We study the effects of foreign macro news on the US stock market rather than a third country for two reasons. First, the US is considerably larger than any of the other G7 countries. As it turns out, this size difference makes the exercise informative about the nature of shocks generating the measured macro news surprises. For example, since Canada is small relative to the US, one would expect that macroeconomic shocks *specific to Canada* will not affect the US economy. However, if the shocks driving Canadian macro news are instead common to both Canada and the US, then Canadian news should affect the US stock market as this news provides information on a shock that also drives US aggregates. If we then estimate that Canadian macro news has no effect on the US stock market, we can conclude that Canadian macro news is not driven by shocks that are common to Canada and the US. We return to this point in the next section. The second reason we study the US stock market is data availability. With its liquid futures market, the US is the only country for which high-frequency information on stock prices is available around all news releases in the non-US G7 countries for sufficiently long time periods.

The specifications we estimate are analogous to equation (3), now with the 30-minute log-change in the S&P 500 (as measured by the front-month E-mini S&P 500 futures contract) on the left-hand side and the foreign macroeconomic surprise on the right-hand side. As before, we control for other macro news released within the same time window, including US news. Again, all surprises are standardized so that the coefficients measure the effect size of a one standard deviation surprise.

The results in Table 6 reveal a striking asymmetry. Foreign news releases have essentially no effect on the US stock market. Out of 60 news releases, 8 have statistically significant effects

Table 6: Effects of Foreign News on US Stock Market

Canada	Capacity Utilization	Core CPI	GDP	Housing Starts	Intl. Trade	IPPI	Mfg Sales	PMI	Retail Sales	Unemployment Rate
S&P 500 (bp)										
News	0.82	1.69*	1.31	-1.96	0.64	1.19	-1.16	2.23	0.64	0.09
	(2.12)	(0.87)	(1.36)	(1.22)	(1.52)	(1.13)	(1.95)	(2.50)	(1.04)	(1.18)
Observations	78	220	81	230	259	253	264	193	263	264
Effect on Exchange Rate	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
France	BoF Industry Sentiment	Consumer Confidence	CPI P	GDP P	Industrial Production	Mfg Confidence	PPI	Production Outlook	Trade Balance	Unemployment Rate
S&P 500 (bp)										
News	2.75**	-0.06	0.57	-0.74	-0.93	-0.63	1.67	-0.12	0.18	0.28
	(1.20)	(0.70)	(0.58)	(1.57)	(1.12)	(0.87)	(1.34)	(0.97)	(0.80)	(0.81)
Observations	135	229	231	84	246	214	153	179	243	150
Effect on Exchange Rate	Yes	Yes	No	No	No	No	No	No	No	No
Germany	CPI P	GDP	GfK Consumer Confidence	IFO Business Climate	Industrial Production	PPI	Retail Sales	Trade Balance	Unemployment Change	ZEW Survey Expectations
S&P 500 (bp)										
News	-0.69	3.49**	0.69	0.98	2.25*	1.29	0.53	0.46	1.22	2.42***
	(1.69)	(1.49)	(0.90)	(1.44)	(1.26)	(0.88)	(0.75)	(0.85)	(1.11)	(0.87)
Observations	240	78	159	253	256	236	229	238	261	211
Effect on Exchange Rate	No	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes

Continued on next page.

Italy	Consumer Confidence	CPI P	GDP F	Industrial Production	Industrial Sales	Mfg Confidence	PPI	Trade Balance	Retail Sales	Unemployment Rate
S&P 500 (bp)										
News	-0.38	-0.44	-0.91	0.78	4.24*	-0.70	-0.10	0.68	0.92	-0.47
	(1.02)	(0.70)	(1.55)	(0.89)	(2.37)	(1.22)	(1.52)	(1.51)	(0.82)	(0.99)
Observations	218	243	77	236	62	231	175	75	171	141
Effect on Exchange Rate	No	No	Yes	No	Yes	No	No	No	No	No
Japan	BoJ Mfg Index	BoJ Mfg Outlook	Consumer Confidence	CPI	Exports	GDP P	Industrial Production P	PPI	Retail Sales	Unemployment Rate
S&P 500 (bp)										
News	1.01	-3.51	-0.31	-0.22	-0.94	1.03	0.23	-0.90	0.34	0.20
	(1.12)	(3.06)	(0.49)	(0.36)	(1.11)	(1.54)	(0.44)	(0.76)	(0.65)	(0.42)
Observations	80	59	150	204	129	79	230	226	195	224
Effect on Exchange Rate	Yes	Yes	No	No	No	No	Yes	No	No	Yes
United Kingdom	Core CPI	Core PPI	Exports	GDP A	GfK Consumer Confidence	House Price Index	Industrial Production	Jobless Claims	Retail Sales	Unemployment Rate
S&P 500 (bp)										
News	0.94	-0.15	-0.18	4.42**	0.03	0.39	-0.27	0.48	1.78**	-1.18
	(0.99)	(1.00)	(1.34)	(1.75)	(0.54)	(0.67)	(0.91)	(0.70)	(0.74)	(0.90)
Observations	172	168	59	85	205	187	256	217	118	211
Effect on Exchange Rate	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table presents the response of the S&P 500 to foreign macroeconomic news releases. For each non-US G7 country, this table shows estimates of ζ^y obtained from specification

$$\Delta q_{US,t} = \alpha_i + \zeta_i^y s_{i,t}^y + \sum_{k \neq y} \zeta_i^k s_{i,t}^k + \sum_w \zeta_{US}^w s_{US,t}^w + \varepsilon_{i,t},$$

where $s_{i,t}^y$ is the surprise of interest, $s_{i,t}^k$ and $s_{US,t}^w$ are other surprises of country i and the US released in the same time window, and $\Delta q_{US,t}$ is the 30-minute log-change of the front-month E-mini S&P 500 futures contract, expressed in basis points. *Effect on Exchange Rate* indicates whether the news release has a significant effect on the US dollar exchange rate at the 10 percent level. Online Appendix Table C3 shows the associated estimates. Online Appendix Table B2 provides details on the foreign news releases. Note that the observations reported in Online Appendix Table B2 can differ from those reported here, because the E-mini S&P 500 futures data is not always available. Heteroskedasticity-robust standard errors reported in parentheses. ***, **, and * indicate significance at the 1, 5, and 10 percent level.

on the S&P 500 at the 10 percent level—just 2 more than predicted by chance. In addition, the effect sizes are approximately an order of magnitude smaller than those of US news on foreign markets. The largest estimated effect in Table 6 suggests that a one standard deviation surprise in the UK's advance release of GDP moves the S&P 500 by 4.42 basis points. In comparison, the pooled effect of the US advance GDP release on foreign countries is 17.60 basis points (see Table 3), with some countries responding by nearly 30 basis points (see Figure 3).

6.2 Explanations for the Asymmetry

Our findings this far show that US macroeconomic news has large effects on foreign stock markets, while foreign macro news has almost no effect on the US stock market. This asymmetry highlights the unique position of the US economy in the global financial system. As we explain in the section, it is also indicative of the types of shocks that drive the estimates in Sections 4 and Section 5 and therefore the global financial cycle. Specifically, we argue that the asymmetry suggests a small role for common shocks and instead points to transmission of US-specific shocks to foreign countries. We also explore alternative interpretations, in particular, whether differences in the timeliness between US and foreign news releases or differences in measurement quality can explain the asymmetry. We find that this is not the case.

6.2.1 Transmission of country-specific Shocks

Recall from Section 2 that in a regression of the change in the stock price on a macro news surprise, the estimated coefficient captures (i) how the stock price depends on the underlying unobserved state variables and (ii) how agents update their state estimates in response to observing the news. (Details on this are available in Online Appendix A.) With this intuition in hand, we further argued that two classes of shocks are likely to be the main driving forces behind the effects estimated in Section 4. First, it is possible that these effects reflect the transmission of US-specific shocks to foreign countries. This is the case if US macroeconomic news releases are most informative about US-specific state variables and changes in these state variables affect foreign asset prices. In addition, it is possible that macroeconomic and financial variables are driven by global common shocks and that US macro news is informative about these. In this case, foreign asset prices would respond to US news because it reveals information about the global common state and not necessarily because shocks are transmitted across countries.

While these two classes of shocks are not distinguishable by studying the effects of US news on foreign markets, they have different predictions for how foreign macroeconomic news releases will affect the US stock market. Since the non-US G7 countries are substantially smaller than the US, it is unlikely that shocks specific to these countries transmit to a significant degree to the US. This contrasts with common shocks, which by definition will affect the US. Therefore, if countries' macroeconomic and financial variables were driven by common global state variables and these countries' macroeconomic releases were informative about the common state, then the S&P 500 and other international asset prices should respond to

foreign macroeconomic surprises—even to news releases in arbitrarily small countries. We show formally in Online Appendix A.3 that the effect of foreign news on the US stock market reflects the presence of common shocks under minimal assumptions.[22]

In summary, if global common shocks are important, the prediction is that news releases in small countries should have an effect on the US stock market. As a result, there should be no large asymmetry between the effects of US and foreign news. If instead global common shocks are unimportant, news releases in small countries will not affect the US stock market and hence the asymmetry should be large.

This test for the presence of common shocks requires that macroeconomic series and their releases in foreign countries are similar to those in the US (hence the focus on the non-US G7 countries). Specifically, they (i) should be released in a similarly timely fashion, they (ii) need to be of comparably high measurement quality, and (iii) information leakages prior to the official release should be limited. If either of these criteria were violated, news about foreign macroeconomic aggregates would be of questionable use to learn about *any* state variable and asset prices should respond less strongly or not at all. Hence, in order to interpret the observed asymmetry as evidence against the presence of common shocks, we need to confirm that properties (i), (ii), and (iii) hold. We will do so in the next section. To preview the results, there is no indication that foreign news releases are less timely, of lower measurement quality, or leaked to insiders prior to the official release.

With these considerations in mind, we return to the estimates in Table 6. The evidence suggests virtually no role for common shocks. Of the 8 significant coefficients 3 are for German macroeconomic news releases. Since Germany is closely integrated with the US and not necessarily small in comparison, these effects are more likely to reflect the transmission of shocks than the presence of common shocks. Further, the largest coefficient estimate is the advance GDP release in the UK. Since the UK is a major financial center, it is plausible that this significant effect also reflects the transmission of shocks. Taken together, these results suggest a very limited role for global common shocks. The large and persistent effects of US macro news on foreign countries documented in Sections 4 and 5 are therefore more likely to be driven by US-specific shocks.

6.2.2 Alternative Explanations

We next check alternative explanations for the asymmetric effects of US and foreign macroeconomic news releases. First, as noted above, one would expect less timely news releases and releases with lower measurement quality to lead to smaller effect sizes (Gilbert et al., 2017). Further, information leakages could imply that measured surprises only contain outdated or

[22] As we discuss in Online Appendix A.3, the estimated coefficient could also reflect that market participants learn about the US state vector by observing macroeconomic news in country i. Since the US is large relative to country i, shocks in the US are likely to have an effect on country i's macroeconomic outcomes. As a result, country i's surprises could be informative about US-specific shocks. While this possibility cannot be ruled out *a priori*, we don't view it as particularly plausible either. Since US shocks presumably affect foreign macroeconomic outcomes with a lag and many indicators of US macroeconomic performance become available in a timely fashion, it is rather unlikely that this indirect channel of learning about the US state is active in practice. Further, if it was active, we would expect to find an effect of foreign news on US stock prices whereas our results above show that this is not the case.

irrelevant information, which should not move financial markets. Hence, if foreign surprises were less timely, of low measurement quality, or subject to leakages, their effects on the S&P 500 could be small despite the presence of common shocks.

Second, we discuss additional reasons that may explain the observed asymmetry and could therefore lead to a failure of our test for the presence of common shocks. In Supplementary Appendix S5, we present a stylized two-country economy with a representative global investor who uses the Kalman filter to estimate the unobserved state. With this model in hand, we spell out a concrete set of assumptions under which our test for the presence of common shocks is valid. While we view the modeling assumptions as conventional, they could be violated in practice. For instance, departures from optimal signal extraction or investor heterogeneity may invalidate our test for the presence of common shocks.

Timeliness We first ask whether a lack of timeliness can explain the small effects of foreign news releases. To do so, we use the reporting lag of a macroeconomic series, a widely used proxy of timeliness (e.g., Fleming and Remolona, 1997). The smaller the reporting lag, the more timely is the release. More specifically, and following Gilbert et al. (2017), we define the reporting lag of a series as the difference between the announcement day and the last day of the reference period averaged over the sample.[23] Negative reporting lags exist for releases for which the reference period is in the future.[24] The data for this measure comes from Bloomberg, see Online Appendix B for details.

The left panel of Figure 7 plots estimated effect sizes (i.e., in absolute value) for the twelve US and 60 foreign releases against the measure of timeliness. The figure shows that most foreign news releases are approximately as timely as US releases and hence US releases are not special in terms of their timeliness. Further, while greater timeliness correlates positively with the price impact (or effect size) of news releases in the US as shown by other research (e.g., Fleming and Remolona, 1997), timeliness cannot explain much of the differences in effect sizes between US and foreign news releases. The magnitudes of US releases are clear outliers. The fact that many foreign news releases in our sample are relatively timely is consistent with Cascaldi-Garcia et al. (2024) who also show this for Germany, France, and Italy.

Measurement quality A second potential explanation of our findings is that US statistical authorities measure macroeconomic outcomes with greater precision than their foreign counterparts. To check this concern, we follow Gilbert (2011) and construct a proxy of measurement quality as the difference between the initial released value (used to construct the surprises) and its final revised value (a proxy for the true value of the macroeconomic series).

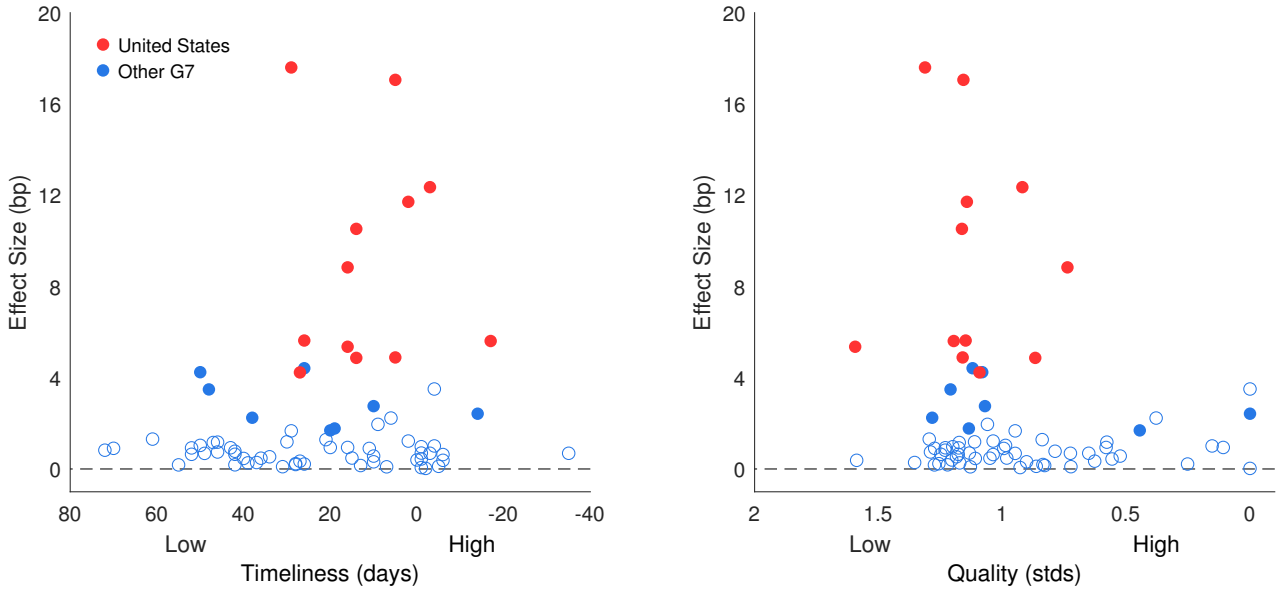
[23] Specifically, the reporting lag of series y in country i is

$$rl_i^y = \frac{1}{N_i^y} \sum_{n=1}^{N_i^y} \left(ann_{i,n}^y - ref_{i,n}^y \right), \tag{8}$$

where $ann_{i,n}^y$ and $ref_{i,n}^y$ refer to the announcement day and the last day of the reference period of the n^{th} release in our sample, and N_i^y denotes the total number of announcements for series y.

[24] Such negative reporting lags arise for several surveys. For instance, the preliminary release of the University of Michigan Consumer Sentiment Index has a negative average reporting lag (of 17 days), because the results are published before the end of the reference period.

Figure 7: Relation of Effect Size to Timeliness and Quality of Releases



Notes: This Figure shows how the effect size of a release relates to its timeliness (left panel), as well as its quality (right panel). Timeliness is measured by the reporting lag as defined in equation (8) and is in units of days. Quality is proxied by the revision magnitude as defined in equation (9) and is in units of standard deviations. For the US releases (red), the effect size corresponds to the absolute value of the coefficients shown in Table 3. For the foreign releases (blue), the coefficients in Table 6 are used. Filled circles correspond to effects, which are significant at the 10 percent level.

A greater average revision magnitude suggests lower measurement quality of the initial release.[25] As the right panel of Figure 7 shows, US news releases do not have a higher average quality than foreign news releases. Further, this measure of quality cannot explain much of the differences in effect sizes between US and foreign news releases. These findings are in line with Gilbert et al. (2017) who come to a similar conclusion for US releases.

Information leakages As a third check, we estimate the effects of foreign macroeconomic surprises on their respective domestic financial markets. Specifically, we study the effects on the local currencies' US-dollar denominated exchange rate.[26] A significant effect of a foreign macroeconomic news release on the local exchange rate implies that the news release in question contains market-relevant information and suggest that information leakages are not a major concern. Table 6 shows that out of the 60 foreign macroeconomic surprises under consideration 30 have a significant effect on the exchange rate at the 10 percent level. We

[25] Following Gilbert (2011), we define the revision magnitude as the average absolute value of the difference between final revised and initial released number in the sample. To be precise, the revision magnitude of series y in country i is

$$rm_i^y = \frac{1}{N_i^y} \sum_{n=1}^{N_i^y} \frac{|y_{i,n}^F - y_{i,n}|}{\sigma_{|y_{i,n}^F - y_{i,n}|}}, \tag{9}$$

where $y_{i,n}$ and $y_{i,n}^F$ refer to the initial and final revised number of release n, $\sigma_{|y_{i,n}^F - y_{i,n}|}$ refers to the standard deviations of the absolute value of the difference. In Online Appendix Figure C6, we show that our results are robust to an alternative measure of revision magnitude.

[26] We perform this check on exchange rates rather than alternative financial instruments due to their extended trading hours, liquidity, and data availability.

report details on these estimates in Online Appendix Table C3.

Behavioral biases When interpreting the observed asymmetry of US and foreign macro news as evidence against the presence of common shocks, we maintain the assumption that agents update their state estimates if the observed signal contains information about the unobserved state (i.e., the signal is correlated with the state). If this assumption is substantially violated, our test for the presence of common shocks may fail. A potential violation of this assumption could arise if investors display behavioral biases as has been documented by prior work (see Hirshleifer, 2015, for a review). As a consequence of such biases, market participants could place substantially less weight on foreign macro news than is warranted by its fundamental information content. While we cannot rule out this possibility entirely, our evidence on exchange rates just discussed demonstrates that market participants at least pay attention to foreign news releases. As noted above, we discuss a stylized two-country economy in Supplementary Appendix S5. Whether a particular behavioral bias invalidates our interpretation of the observed asymmetry can be checked by modifying this model.

Investor heterogeneity A further assumption we maintain for our preferred interpretation is that agents are homogeneous. In practice, however, investors could differ along several dimensions—for example, in terms of their beliefs about the economy or in their preferences over specific assets (Fama and French, 2007). Such heterogeneity could be important for international markets and it could potentially invalidate our interpretation of the observed asymmetry. It is also not clear how to rule out this possibility. Again, whether a specific form of heterogeneity changes the interpretation can be checked by modifying the model in Supplementary Appendix S5.

Summary Taken together, the checks in this section suggest that concerns about measurement quality, timeliness, and information leakages do not explain the differences in the estimated effects documented above. However, we cannot rule that substantial deviations from our framework driven by behavioral biases and/or investor heterogeneity invalidate our interpretation.

6.3 Transmission of US versus Foreign Monetary Policy Shocks

We next contrast the international transmission of monetary policy shocks of the Federal Reserve (Fed) with that of other central banks—where we focus on the European Central Bank (ECB) and the Bank of England (BoE). The rationale behind this exercise is that these shocks are well-identified, they are country-specific and therefore not contaminated by a global common component, and they contribute to business cycle fluctuations similar to other macroeconomic disturbances. There are also no concerns about differences in timeliness or measurement quality relative to the US. Hence, this exercise allows us to provide further evidence on the comparatively strong transmission of US-specific shocks. The evidence we present is based on an analogous set of event study regressions where we now use measures of central bank's policy surprises instead of the macroeconomic surprises as the right-hand-side variable of interest.

Critical for this exercise is the construction of comparable monetary policy shocks for

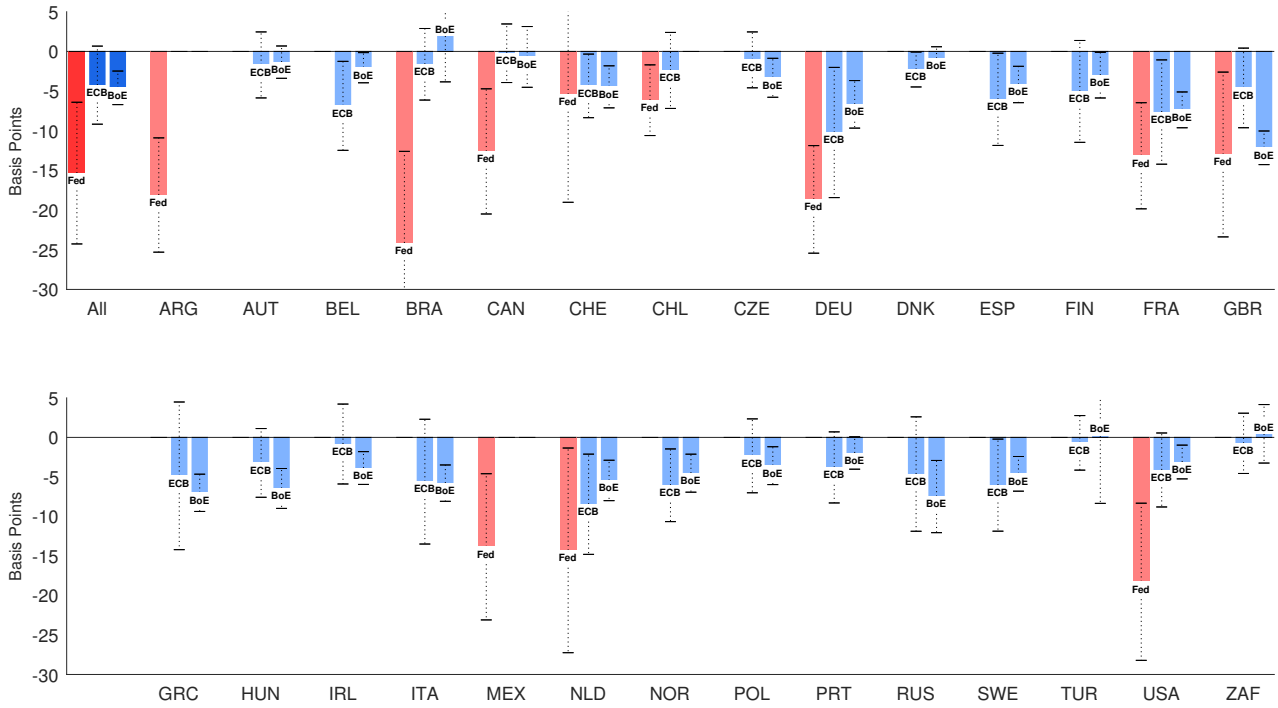
the Fed, the ECB, and the BoE. To capture the different dimensions of monetary policy, we focus on three types of shocks: shocks to the *target rate*, *forward guidance* shocks, and *quantitative easing* shocks. The construction of the three shocks closely follows Swanson (2021) and is based on 30-minute changes in the yield curve around central bank announcements. Supplementary Appendix S6.1 provides details on the construction of each series. There, we also verify that our shocks for the Fed are highly correlated with those by Swanson (2021) and our ECB shocks with those by Altavilla et al. (2019). Since Fed announcements occur outside of the trading hours for many countries in our dataset, we switch out the stock indexes with the corresponding front-month futures contracts, which are traded outside of regular trading hours, where possible. This is the case for Brazil, Canada, Switzerland, Germany, France, United Kingdom, and the Netherlands.[27] We also include the S&P 500 so that we have domestic responses for all three central banks in the sample.

Figure 8 shows the pooled and country-specific effects of an increase in the target rate for each central bank. All shocks are measured in standard deviations of the respective series to ensure comparability of the magnitudes across central banks. Consistent with standard theory, the pooled effects are negative. An unexpected increase in the target rate leads to a decrease in stock markets for all three central banks. Quantitatively, however, the Fed's target rate shocks have an effect that is more than three times as large as the corresponding effects of the ECB and the BoE. Further, the pooled effects of the Fed's and the BoE's target rate shocks are significant at the 5 percent level, while the ECB's effect is estimated with less precision. The country-specific effects reported in the figure reveal that there is no instance in which for a given country the effect size of the ECB or the BoE exceeds that of the Fed. This point implies that the pooled effects shown first in the figure are not driven by the composition of countries. Overall, the results in Figure 8 show that US monetary policy shocks have a substantially larger impact on international stock markets, and hence are consistent with our previous interpretation that the outsized effect of US macro news is driven by the transmission of US-specific shocks as opposed to the presence of common shocks.

Supplementary Appendix Figure S6.4 presents the results for the forward guidance and quantitative easing shocks. The figure demonstrates that the transmission of unconventional monetary policy shocks is also substantially greater for the Fed than for the ECB and the BoE. The effects, however, are less precisely estimated. Further, we present several robustness checks in Supplementary Appendix S6.3. First, we show that the asymmetry documented above is robust to normalizing the shocks by their effects on the domestic yield curve as opposed to the standard deviation of surprises. Second, the results hold when purifying the shocks of information effects, i.e., the idea that an observed tightening might signal good news about the economy if the central bank in question has superior information. The results also indicate that information effects are potentially responsible for the noisy estimates in the case of unconventional monetary policy shocks. Lastly, our main findings are robust to using alternative shock series from the literature.

[27] Note that stock index futures are available for more countries. However, only those we switched out are traded at Fed announcement times over a sufficiently long period of our sample.

Figure 8: Effects of Monetary Policy Shocks on International Stock Markets



Notes: The figure shows the effects of contractionary target rate shocks by the Federal Reserve (Fed), the European Central Bank (ECB), and the Bank of England (BoE) on international stock markets. The leftmost bars in the first row show the pooled effects for each central bank. The remaining bars represent the effects of a given central bank's shock on a given country's stock market. Missing country bars depict cases in which the country is dropped because it had less than 24 observations for a given shock. The coefficients are estimated analogously to equations (3) and (4). Stock index changes are expressed in basis points. The shocks are in standard deviations. The black error bands depict 95 percent confidence intervals, where standard errors are two-way clustered by announcement and by country. Analogous bar charts for forward guidance and quantitative easing shocks are shown in Supplementary Appendix Figure S6.4.

These results are broadly consistent with those of prior research. To our knowledge, the most closely related papers are Brusa, Savor, and Wilson (2020), Miranda-Agrippino and Nenova (2022), and Ca'Zorzi et al. (2023). Brusa, Savor, and Wilson (2020) find that the Fed has a uniquely strong impact on global equities compared to the BoE, the ECB, and the Bank of Japan. Ca'Zorzi et al. (2023) show that conventional policy shocks by the Fed have a greater impact on the Euro Area and the rest of the world than do shocks of the ECB. Lastly, Miranda-Agrippino and Nenova (2022) compare international spillovers of unconventional policy shocks by the Fed and ECB. While the transmission is qualitatively similar, it is substantially stronger for the Fed.

7 Discussion

We next interpret our findings in the broader context of the literature. In particular, we center our discussion around two key mechanisms emphasized by prior work on the global financial cycle: US monetary policy and risk-taking behavior. To conserve space, we defer details and the underlying analyses to Supplementary Appendix S7.

7.1 The Role of US Monetary Policy

To investigate the role of systematic monetary policy responses, we study the stock-bond co-movement around US macro news releases. Textbook asset pricing theory implies that stock price changes can be decomposed into a growth expectations, an equity premium, and a risk-free rate component. Further, bond yield changes decompose into a risk-free rate and term premium component. By controlling the risk-free rate, monetary policy affects both stock prices and bond yields in opposite directions. All else equal, increases in the risk-free rate lower stock prices while raising bond yields. Hence, the co-movement of stock prices and bond yields following US news releases is informative about the importance of monetary policy. Specifically, if the expected monetary policy reaction by the Fed in response to US macro news was the dominant channel, US stock prices and bond yields should co-move negatively around macroeconomic announcements.[28]

To test this prediction, we estimate a version of specification (5), where we now use US Treasury yields of different maturities as well as the S&P 500 on the left-hand-side. Consistent with the evidence from prior work (e.g., Gürkaynak, Kısacıkoğlu, and Wright, 2020), we find that US yields significantly increase across all maturities following positive surprises in either real activity or prices (see Online Appendix Table C4). For real activity news, the co-movement of US stock prices and bond yields is therefore positive, ruling out a dominant monetary policy channel (see Online Appendix Table C5). Put differently, US stock prices increase after positive real activity surprises *despite* higher risk-free rates. This suggests that the equity premium must decline, expected future dividends must rise, or both. For price news, on the other hand, the co-movement is negative, suggesting that the monetary policy channel is potentially dominant. Since we showed in Section 5, however, that real activity news accounts for the large majority of the explanatory power of overall US macro news, we conclude that expected US monetary policy reactions to news releases is generally not the dominant channel driving our results.[29]

This finding provides an alternative perspective on the role of the Fed's interest rate policy for the global transmission of shocks. A large body of work has documented large spillovers of US monetary policy shocks to the rest of the world (e.g., Kalemli-Özcan, 2019). This research has led to the widespread view that active US monetary policy has destabilizing effects on global markets. For example, Bernanke (2017) recalls that Fed tightening often draws criticism from foreign policymakers. Our results in this section suggest, however, that more active US monetary policy reactions to real activity news could *reduce* the transmission of US shocks. Since the total effect of positive real activity news on global stock markets is positive and the contribution of the Fed's policy reaction negative, a more active policy response should reduce spillovers. In this sense, strong systematic US monetary policy reactions can also have

[28] The negative co-movement of stock prices and bond yields following FOMC announcements has been documented in a wide range of empirical papers (e.g., Rigobon and Sack, 2004). In addition to a higher risk-free rate, Bernanke and Kuttner (2005)—among others—have documented that monetary tightening also leads to an increase in the equity premium and diminished growth expectations. Since both a higher risk premium and lower growth expectations lower stock prices, these forces do not alter the co-movement pattern of stock prices and bond yields.

[29] We argue in Appendix S7.2 that the potential presence of Fed information effects does not alter this conclusion.

stabilizing effects on global markets.

7.2 The Role of Risk-Taking

To examine the role of risk-taking, we also study the co-movement between foreign stock prices and foreign bond yields after surprises in US real activity. Since this co-movement is again positive (see Online Appendix Table C6), foreign monetary policy reactions to US news cannot explain the observed co-movement either. Hence, this evidence, likewise, points to a dominant role for equity risk premia and/or growth expectations. Further, as noted in Section 4.2, implied stock market volatility measures of foreign countries systematically fall following positive US real activity surprises (see also Online Appendix Table C1). To the extent that these implied volatility measures proxy for risk-taking behavior, this evidence also suggests that the risk-taking channel is active. Lastly, we document in Supplementary Appendix S7.3 that multiple proxies of the US equity premium consistently fall after positive surprises about US real activity. Hence, our evidence supports the view that changes in risk-taking behavior following US macro surprises are important for explaining the observed effects. Theories of the global financial cycle in which agents' willingness to take on risk changes after macroeconomic shocks are thus consistent with our findings (e.g., Coimbra and Rey, 2024).[30]

8 Conclusion

Prior work has convincingly established that capital flows, risky asset prices, credit growth, and leverage co-move globally. Since much of the evidence in the literature is based on correlations, however, the interpretation of this co-movement is often not clear. Bernanke (2017), for instance, questions that the US economy is an important source of the disturbances driving the global financial cycle.

In this paper, we contribute to our understanding of the global financial cycle by establishing a causal link between the US economy and a large set of global risky asset prices. US macroeconomic news has strong and synchronous effects on foreign stock markets, the VIX and other implied volatility measures, as well as commodity prices. It also explains a sizable fraction of their variation. Since the co-movement of these risky asset prices is a defining feature of the global financial cycle, we interpret our findings as evidence that shocks driving the US business cycle also drive the global financial cycle.

We also document a striking asymmetry between the effects of US macro news and foreign macro news. While US macro news has large effects on foreign stock markets, foreign macro news has essentially no effect on the US stock market. This finding highlights the US' central position in the global financial system, and suggests a limited role for global common shocks. Consequently, and providing a partial answer to Bernanke's (2017) conjecture men-

[30] In Supplementary Appendix S8, we investigate the role of the US dollar exchange rate in the transmission of US macro news. Our findings suggest that the exchange rate response is not central for understanding the direct effect of US macro news on stock prices. Of course, this does not conflict with the view that the US dollar is central for understanding the global financial system and that the dollar may also be important for understanding the asymmetry documented in Section 6.

tioned above, our evidence *does* indicate that US-specific shocks drive international financial conditions.

Our results are consistent with and complementary to those in Miranda-Agrippino and Rey (2020). This suggests that the common elements across findings may help guide future modeling efforts. In our assessment, the most salient of these are the following. First, both papers identify drivers of the global financial cycle and the origin of the shock is the US. Hence, features of the US economy—whether size or other—are likely central to understanding the driving forces of the global financial cycle. Second, in both cases the effects of the respective shocks on risk-taking is the key driving force of international risky asset prices. The evidence therefore points to a class of models that can generate time variation in measured global risk-premia.

Lastly, a central question arises from our and prior work on the global financial cycle: Is the size of the US sufficient or are other features necessary to explain the US' role for the global financial cycle? Since economic size and, for example, the special role of the US dollar are likely interdependent and not easily separable from other characteristics, this question is empirically difficult to answer. Our evidence only provides a loose indication: ECB policy shocks tend to have smaller effects on international equity prices than monetary policy shocks of the Federal Reserve, even though the size of the Euro Area is comparable to the US according to some measures. This may suggest that other features specific to the US determine its importance for the global financial cycle. It is clear, however, that more research is needed to answer this question satisfactorily.

Data Availability Statement

The data and code underlying this research is available on Zenodo at `https://doi.org/10.5281/zenodo.14846107`.

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