

# The global impact of risk-off shocks

By Ricardo Caballero<sup>1</sup> and Gunes Kamber<sup>2</sup>

## Abstract

Global risk-off shocks can be highly destabilising for financial markets and, absent an adequate policy response, may trigger severe recessions. In Caballero and Kamber (2019), we document that the unconventional policies adopted by the main central banks were effective in containing asset price declines following risk-off episodes. These policies impacted long rates and inspired confidence in a policy-put framework that reduced the persistence of risk-off shocks. We also show that domestic macroeconomic and financial conditions play a key role in benefiting from the spillovers of these policies during risk-off episodes.

JEL classification: E40, E44, E52, E58, F30, F41, F44, G01

Keywords: risk-off, conventional and unconventional monetary policy, policy-puts, spillovers, macroeconomic fundamentals, developed and emerging markets, Asia-Pacific region

<sup>1</sup> MIT and NBER. email: [caball@mit.edu](mailto:caball@mit.edu)

<sup>2</sup> Bank for International Settlements. email: [Gunes.Kamber@bis.org](mailto:Gunes.Kamber@bis.org)

We thank Chris Ackerman, Efrem Castelnuovo, Stijn Claessens, Piti Disyatat, Ippei Fujiwara, Peter Hoerdahl and Benjamin Wong for their comments. Jose-Maria Vidal Pastor and Giulio Cornelli provided excellent research assistance. The views expressed in this paper are those of the authors and do not necessarily represent the views of the Bank for International Settlements.

## 1. Introduction

Big sell-offs in financial markets (risk-off shocks) can trigger severe recessions if fiscal and monetary policymakers fail to respond appropriately. During the Great Financial Crisis (GFC) and its aftermath, central banks in advanced economies (AEs) resorted to unconventional monetary tools such as asset purchases. These measures successfully propped up the economy, but they have been criticised for encouraging investors to buy riskier assets (reach-for-yield behaviour). As such, these unconventional policies have been seen as a sort of free “put option” or insurance for investors.

In this paper, we summarise our work in Caballero and Kamber (2019), which looks at how financial markets around the world have reacted to risk-off shocks and how the authorities have responded to these upheavals. First, we focus on how risk-off shocks have affected the financial markets of AEs, comparing their effects before and after the GFC. We then study the knock-on effects (spillovers) from these shocks to emerging market economies (EMEs). We explore how these effects were influenced by the monetary policy of AEs, as well as the economic conditions of EMEs. We pay particular attention to how the response of EMEs to these shocks has changed after the GFC.

In Caballero and Kamber (2019), we find that the unconventional monetary policies of the main AEs were highly effective, at a time when already low interest rates would have hindered central banks from attempting to boost the economy through further policy rate cuts. Without these policies, financial markets would have been more vulnerable to global sell-offs. Most of the policy discussion has focused on the problems arising from the strong capital flows into EMEs that these policies encouraged. But we document a positive side to these policies. They increased the resilience of the rest of the world against global risk-off shocks. For EMEs in particular, credit spreads were smaller and long-term interest rates rose less following such shocks.

The remainder of the paper is organised as follows: Section 2 presents an overview of the theoretical framework underlying our empirical analysis. Section 3 summarises the impact of risk-off shocks for AEs and EMEs. Section 4 contains final remarks.

## 2. Theoretical framework

In this section, we present the risk-centric view of macroeconomic fluctuations. The modelling details of the risk centric view are presented in Caballero and Simsek (2018). This research is part of an agenda that argues that looking at risk market dislocations helps us think about the mechanism behind several of the main economic imbalances, crises, and structural fragilities observed in recent decades in the global economy (see Caballero (2018)). This perspective sheds light on the types of policies, especially unconventional ones, that may help the world economy navigate this tumultuous environment.

This risk-centric perspective starts by observing that economic activity generates both output and risks. Economic agents must absorb both to ensure smooth growth. During normal expansions and contractions, macroeconomists and mainstream macroeconomic models mainly focus on goods markets, studying whether the

demand for output is well aligned with potential output, while risk markets considerations are relegated to a secondary role, mostly relevant to the field of finance. In sharp contrast, this hierarchy flips during severe risk-off events. Risk markets become central and their disruptions quickly permeate the real side of the economy. Insufficient demand for the risks generated by economic activity contaminates – often in a chaotic (even Knightian uncertainty) fashion – equilibrium in goods markets.

These risk-off events take place in a global economy with heterogeneous and highly interconnected financial markets. These markets operate in different currencies and are exposed to large swings in capital flows. These flows provide many useful services to the global economy but can be fickle, perhaps because foreign crises cause faster transitions from speculation mode to Knightian uncertainty mode than local crises. This difference is partly due to the fact that the policy infrastructure to support risk markets during international crises is much less developed than the infrastructure to combat local crises. Furthermore, the international dimension creates multiple substitutes for distressed markets, which facilitates a speedy exodus, particularly from peripheral markets.

There are important structural factors behind the build-ups to these risk events, which stem from frictions in the production of financial assets (ie in the mapping from risk generation to asset production). These frictions are more acute in EMEs, but fast growth in EMEs relative to developed markets (DMs), combined with increased prudence in EMEs, has turned the global economy into a sort of “advanced EME” with recurring risk events. A central ingredient in the instability of this global integration process is the large asymmetry in safe asset production across the world, with the United States supplying most safe assets.

Conventional monetary policy, the quintessential tool for plain vanilla cycles, plays an important role in risk-based contractions, mostly by improving the (ex ante) Sharpe ratio of risky assets. However, this channel can become insufficient, because interest rate adjustments may be constrained by an effective lower bound, or by the need to defend a rapidly weakening exchange rate. In this context, unconventional monetary policies may play a significant role. These unconventional policies are mostly risk markets interventions. These interventions can work via two channels. In the first channel, a government/central bank with a credible balance sheet absorbs part of the risk the private sector does not want when interest rates are at their effective lower bound. For example, quantitative easing policies that swap credit products for US Treasury bonds effectively amount to reducing the supply of risk in the economy. By purchasing risky assets from the private sector, the government has decreased the private sector’s exposure to risk. In the second channel, the central bank can increase the expected capital gain in case of a recovery. One can think of forward guidance as increasing the expected value of future asset prices by keeping rates below the natural rate for an extended period during the recovery.

### 3. The impact of risk-off shocks in advanced and emerging market economies

With the risk-centric perspective in mind, in Caballero and Kamber (2019) we present empirical evidence on the impact of risk-off shocks on financial markets in AEs and

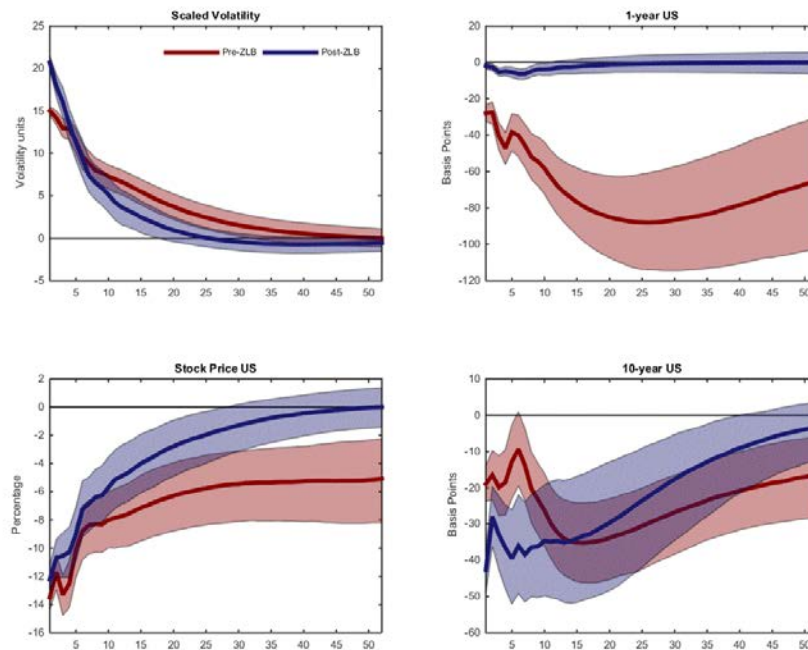
EMEs. We highlight the role played by unconventional policy frameworks in dealing with the effects of risk-off shocks.

For AEs, our empirical analysis is based on structural vector autoregressions (SVARs). The risk-off shocks are identified in line with the empirical literature on the macroeconomic effects of uncertainty shocks. That is, global risk-off shocks are identified as unexpected movements in the VIX Index. Although the VIX refers to the implied volatility of stock prices in the United States, using the VIX does not mean that we are only interested in shocks originating in the US economy. Given the high correlation of implied volatility indexes across major economies, this approach can account for shocks happening anywhere in the world if they are large enough to affect the VIX.

The baseline VAR for the US economy is estimated on weekly data and includes data on the VIX, short-term and long-term interest rates and equity prices. Graph 1 presents the dynamic effects of a risk-off shock in the United States. We present the effects of the risk-off shocks for two subsamples. The first one, the pre-zero-lower bound (ZLB), shows the effects of the risk-off shocks estimated for the subsample starting in 1999 and ending just before the collapse of Lehman Brothers. During this period, conventional monetary policy tools were available to the Federal Reserve. In order to contrast the results when conventional monetary policy tools were constrained, the second subsample covers April 2009 to December 2015. This is a period when policy rates in the United States were at their zero lower bound and the Federal Reserve engaged in a number of unconventional monetary policies.

The effects of risk-off shocks in the US

Graph 1



<sup>1</sup> The figure shows impulse responses to a risk-off shock obtained from weekly VARs estimated for two subsamples. The variables included in the VAR are the VIX Index, one- and 10-year US Treasury yield and the log of the S & P 500 index. The first subsample, labelled pre-ZLB, covers January 1999 to September 2008. The second subsample, labelled post-ZLB, covers April 2009 to December 2015. Red (blue) solid lines and shaded areas correspond to point estimates and one standard deviation confidence intervals. The volatility shock is calibrated to generate a 15 vols increase in VIX in the first subsample. The impulse responses in the post-ZLB sample are scaled so that the 12-week cumulative increase in the response of VIX is the same in both subsamples. The units of the vertical axes are vols for the VIX, basis points for interest rates and percentage points for stock prices.

In order to give our results a quantitative dimension, we calibrate the initial response of the VIX to be equal to the average of the three largest weekly increases in our sample. These three events are associated with major risk-off episodes over the last decade. The first episode is immediately following the collapse of Lehman Brothers. The second one is in August 2011, amidst concerns of the European sovereign debt crisis spreading to Spain and Italy. And the final event is during the sell-off following China's Black Monday in August 2015. The average increase in VIX in these three events corresponds to about a 15-volatility point spike.

Focusing on the first period, following an unexpected risk-off shock the VIX increases persistently and returns to its baseline after about nine months. The shock triggers a sharp drop in equity prices of around 14%. In response, the Federal Reserve eases monetary policy and the one-year Treasury yield falls immediately after the risk-off shock. The peak decline in the one-year Treasury yield is around 100 basis points and happens after four to five months. Although the effect of the risk-off shock slowly dissipates, the one-year yield is still lower than normal after a year. The easier monetary policy also affects long term interest rates. The evolution of the 10-year Treasury yield after a risk-off shock is similar to the evolution of short-term interest rates, but the impact is smaller. At its lowest point, the 10-year Treasury yield is around 40 basis points lower than before the shock.

The effects of risk-off shocks in the aftermath of the GFC are labelled post-ZLB in Graph 1. A first observation is that the effect of a risk-off shock on the VIX dies out much faster in this period. While the VIX stays significantly above the pre-shock level for more than nine months in the conventional policy period, in the ZLB subsample the effect on the VIX dies out after about four months. The response of the one-year Treasury yield is small and mostly insignificant. This is not surprising since the federal funds rate was constrained by the ZLB during this sample.

The interesting observation is that the 10-year Treasury yield responds more quickly to risk-off shocks compared to the pre-ZLB sample. Immediately after the shock, the 10-year yield declines by about 40 basis points and stays significantly below the pre-shock level for more than half a year. While its decline is less persistent than in the pre-ZLB sample, its quick recovery is consistent with the risk-off shock itself being less persistent. This policy response limits the sell-off in financial markets. If the monetary policy reaction is completely muted in all dimensions, one would expect an equivalently large increase in volatility to trigger a bigger fall in asset prices. We find, however, that stock prices fall by a similar amount in both periods.

This finding supports the view that, despite the ZLB binding on short term interest rates, the Federal Reserve was still able to generate significant movements in longer term interest rates via its unconventional monetary policy tools. It also appears that the policy-put framework was credible enough to trigger an immediate and reinforcing response from the private sector. Moreover, signalling a reliable policy-put framework seems to have reduced the persistence of risk-off shocks.

Risk-off shocks have significant negative effects on EMEs. In Caballero and Kamber (2019), we document that following a risk-off shock, equity markets in EMEs decline sharply. At the same time, as capital leaves the country, their long-term interest rates tend to increase and their currencies depreciate.

We show, that the effects of risk-off shocks on EMEs seem to have changed after the GFC and are linked to the stance of monetary policy in AEs. We first compare the effects of risk-off shocks on EMEs between the conventional and unconventional monetary policy periods. We find that a similarly sized risk-off shock triggers a larger

fall in stock prices during the conventional policy period. Therefore, and somewhat paradoxically, unconventional monetary policies in major economies appear to benefit EME equity markets more than conventional policies during risk-off episodes. We conjecture that this is related to the change in the response of EMEs' long rates to a risk-off shock. For instance, prior to the GFC, we find that the long-term interest rates in EMEs rise in response to a risk-off shock, despite falling long-term interest rates in major economies. In the unconventional policy period, however, after an initial jump EMEs' long rates fall persistently.

To further explore the impact of monetary policy in major economies, we interact the effect of risk-off shocks with measures of US monetary policy. We find that the interaction term has a significant effect on the response of EME variables. That is, when short rates are low or monetary policy is loose in core economies, a risk-off shock triggers a smaller decline in EME equity markets and a smaller increase in their long-term interest rates, and their exchange rates depreciate less. Conversely, the effects of risk-off shocks on EMEs are larger when monetary policy in AEs is tight.

Macroeconomic characteristics and risk-off shocks

Table 1

	<b>Stock Prices</b>	<b>10-year yields</b>	<b>Exchange rates</b>
CA/GDP	-0.66	-27.66***	-3.63***
ST debt/reserves	-0.04	2.07	0.33***
Reserves/GDP	-0.08	-3.23***	-0.33***
Sovereign saving	0.00	-0.35***	-0.01***
Total debt/GDP	0.00	0.00	0.00
Safe asset index	0.36	-6.78**	-0.52***
Fin openness	0.00	-0.09***	-0.01***
GDP per capita	0.02	-0.63**	0.00

<sup>1</sup> The table reports the estimated coefficients risk-off shock when interacted with measures of economic fundamentals. See Caballero and Kamber (2019) for details. The first column indicates which measure of economic fundamentals was used as an interaction term. Columns 2–4 report the estimated coefficient on EMEs' stock prices, 10-year sovereign yields and exchange rates. Asterisks indicate statistical significance at the 5% (\*\*) or 1% (\*\*\*) level.

Source: Authors' calculations.

We next investigate whether the effects of risk-off shocks are homogeneous across EMEs and whether EMEs' economic fundamentals shape how their financial markets respond to global risk-off shocks. We consider a wide range of indicators that could contribute to cross-country differences in response to global risk-off shocks. Table 1 reports the coefficient on the interaction term between the risk-off shock and selected indicators of economic fundamentals. Larger estimates indicate that a country's response is tightly linked to its fundamentals

We find a rather limited role for economic fundamentals in differentiating the responses of equity markets across EMEs. None of our estimated interaction terms are significantly different from zero for equity market response. We find, however, that most of the interaction terms are significant and have the expected sign for the responses of long-term interest rates and exchange rates. For instance, countries with low current account deficits (or surpluses), countries with low short-term debt to foreign reserves, and countries with high foreign reserves to GDP ratios appear to experience less upward pressure on their bond yields and their exchange rates depreciate less.

The same seems to be true for countries with higher levels of GDP per capita and countries that are more integrated with international financial markets, as both interaction terms are statistically significant. Regarding indicators related to public debt, our results suggest that, while a country's sovereign debt rating appears to attenuate the effects of risk-off shocks, the level of total public debt doesn't have a statistically significant effect. Finally, the interaction term with the index of ability to create safe assets also has a negative coefficient. This suggests that, in countries that can produce local currency-denominated sovereign debt at low spreads, the long end of their yield curves are less sensitive to global risk-off shocks.

## 4. Final remarks

We have shown that the policy-put framework implemented by core economies following the GFC was highly effective in substituting for the exhausted conventional monetary policy instruments. Absent these policies, financial markets would have been substantially more vulnerable to the periodic risk-off episodes experienced by the world economy.

These policies had substantial spillovers to the rest of the world. While most of the policy discussion has focused on the problems caused by the reach-for-yield capital flows towards EMEs, we document that there is a positive side of these policy-put frameworks since they increase the resilience of the rest of the world with respect to global risk-off shocks. For EMEs in particular, this increased resilience took the form of more stable long rates and smaller credit spreads in the face of risk-off shocks. Core policy-put frameworks seem to have prevented the traditional unhinging of the long end of EMEs' yield curves during risk-off episodes.

By the same token, this policy-framework spillover observation raises the issue that as (and if) the core policy-put framework is gradually removed, individual economies may need to boost their self-hedging mechanisms. Self-hedging often means an increased demand for safe assets, which may reignite the downward pressure on long interest rates and global imbalances, unless regional supplies of safe assets expand as well, an issue on which the Asia-Pacific region has much to contribute. This expansion in the supply of safe assets can take place at the individual country or regional level, perhaps by creating tranches from pooled regional debts. Similarly, the region could consider creating a regional policy-put framework.

## References

Caballero, R and G Kamber (2019): "On the global Impact of risk-off shocks and policy-put frameworks," *BIS Working Papers*, no 772, March.

Caballero, R and A Simsek (2018): "A risk-centric model of demand recessions and macroprudential policy," *BIS Working Papers*, no 733, July.

Caballero, R (2018): "Risk-centric macroeconomics and safe asset shortages in the global economy: an illustration of mechanisms and policies," Massachusetts Institute of Technology (MIT), mimeo, September.