CHAPTER 2

MACROFINANCIAL STABILITY AMID HIGH GLOBAL ECONOMIC UNCERTAINTY

Chapter 2 at a Glance

- Uncertainty regarding global economic outcomes and policies has been higher since the COVID-19 pandemic amid inflation shocks and rising geopolitical tensions.
- High macroeconomic uncertainty can profoundly affect macrofinancial stability by exacerbating downside market tail risks, delaying consumption and investment decisions, and reducing credit supply.
- As financial indicators may not fully capture macroeconomic uncertainty, particularly in economies with less-developed financial systems, there is merit in considering measures of macroeconomic uncertainty in systemic risk assessment frameworks such as the growth-at-risk framework.
- An increase in macroeconomic uncertainty equivalent to its rise during the global financial crisis reduces the downside outcome (the 10th percentile) of one-year-ahead real GDP growth by, on average, 1.2 percentage points in advanced and emerging market economies.
- Macroeconomic uncertainty also tends to amplify the effect of prevailing macrofinancial vulnerabilities, such as excessive leverage in the private and public sectors, on downside risks to future output growth.
- A significant easing of financial conditions amid high macroeconomic uncertainty can exacerbate downside risks to future output growth, particularly during periods of low financial market volatility (that is, during "macro-market disconnects"). An adequate macroprudential policy response can, however, mitigate this effect.
- The effects of macroeconomic uncertainty can spill over across borders through trade and financial interlinkages, increasing the risk of contagion in the face of adverse shocks.

Policy Recommendations

- Reduce domestic macroeconomic uncertainty by strengthening the credibility and transparency of frameworks for monetary, fiscal, and financial sector policies and through effective communication strategies.
- Implement adequate fiscal and macroprudential policies to contain macrofinancial vulnerabilities and build resilience against adverse shocks, particularly when macroeconomic uncertainty is high.
- Build adequate international reserve buffers and allow exchange rate flexibility to help cushion the adverse spillover effects of an increase in foreign macroeconomic uncertainty.
- Devote resources to quantifying, managing, and mitigating the risks from rising geopolitical uncertainty on macrofinancial stability.

Introduction

A high level of uncertainty has characterized the global macroeconomic landscape since the COVID-19 pandemic. Uncertainty about economic outcomes and policies spiked during the COVID-19 pandemic and has remained high since then, compared with levels in earlier years, amid inflation shocks, escalating geopolitical tensions, rapidly emerging new technologies, and increasing climate-related risks.[1] Different measures of macroeconomic uncertainty make this evident (Figure 2.1).[2]

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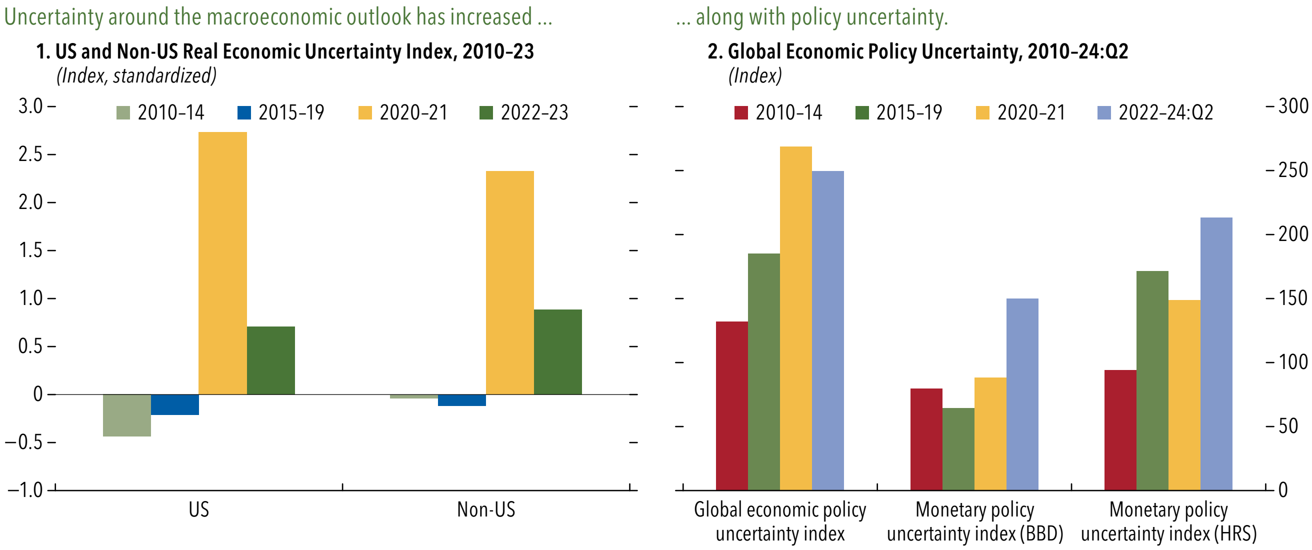
[1]In economics, uncertainty refers to situations in which future outcomes are difficult to predict (Knight 1921).

[2]Measures of macroeconomic uncertainty tend to be volatile but on average have stayed elevated since the pandemic. Some measures, such as global economy policy uncertainty of Baker, Bloom, and Davis (2016), declined in the first quarter of 2024 but rose again in the second quarter amid electoral uncertainty in some major economies (Online Annex Figure 2.1.1).

Figure 2.1. Economic and Policy Uncertainty



Sources: Baker, Bloom, and Davis 2016; Husted, Rogers, and Sun 2020; IMF, Global Data Source and International Financial Statistics databases; Organisation for Economic Cooperation and Development, Main Economic Indicators database; and IMF staff calculations.

Note: Panel 1 shows values on a real economic uncertainty index for the United States and other economies based on the approach in Ludvigson, Ma, and Ng (2021). The index is standardized over its historical mean (January 1990 through September 2023) and averaged across different periods. Non-US real economic uncertainty index is a GDP-weighted average across non-US economies. In panel 2, "Global economic policy uncertainty index" is a GDP-weighted index from Baker, Bloom, and Davis (2016) averaged over the indicated time period. For additional details on the data sources, see Online Annex 2.1. The monetary policy uncertainty indices pertain to the United States and are compiled by Baker, Bloom, and Davis (BBD, 2016) and Husted, Rogers, and Sun (HRS, 2020), respectively.

Increased macroeconomic uncertainty can profoundly affect macrofinancial stability. High macroeconomic uncertainty can potentially affect macrofinancial stability—or systemic risk—through three key channels.[3] First, it can exacerbate downside market tail risks in the event of an adverse shock (the market channel). Second, it can delay private sector consumption and investment decisions, slowing economic activity and raising credit risks for financial institutions that can in turn trigger an adverse macrofinancial feedback loop (the real channel). And third, it can reduce the supply of domestic credit by financial institutions by exacerbating challenges in determining the creditworthiness of new borrowers (the credit channel). These three channels can interact and mutually reinforce each other, amplifying the effect of macroeconomic uncertainty on macrofinancial stability.[4]

Macroeconomic uncertainty can interact with potential vulnerabilities in the real and financial sectors to magnify the effects of adverse shocks. For example, in the presence of high levels of public debt relative to GDP, investors may react more strongly to an expansionary fiscal shock when uncertainty regarding the economic outlook is high instead of low, leading to a sharp increase in sovereign bond yields (see the October 2024 *Fiscal Monitor*). Periods of high macroeconomic uncertainty may also make the corporate debt market more vulnerable to adverse shocks, particularly when leverage in the corporate sector is high or credit spreads are perceived by investors to be overly compressed. Equity markets are also likely to experience larger price corrections in the face of adverse shocks when uncertainty about the macroeconomic outlook is high and valuations are stretched relative to fundamentals.[5] These considerations may be particularly pertinent at the current juncture as, along with macroeconomic uncertainty, macrofinancial vulnerabilities remain elevated (Online Annex Figure 2.1.1).

The effect of macroeconomic uncertainty can spill over across borders. Global financial and real

[3]Macrofinancial stability is defined in terms of systemic risk, that is, the risk of disruption to the financial system that can have serious negative consequences for the real economy, and is measured by downside tail risks to future real GDP growth.

[4]While studies using well-known measures of macroeconomic uncertainty generally find it to be negatively associated with asset returns and volatility (Asgharian, Christiansen, and Hou 2015; Bali, Brown, and Tang 2017), the effect could also be positive. For example, high-tech revolutions promising future productivity gains can be a source of positive or "good" uncertainty, while geopolitical conflicts can be considered as a source of negative or "bad" uncertainty (Bloom 2014; Segal, Shaliastovich, and Yaron 2015; Dew-Becker and Giglio 2023).

[5]The set of shocks can include shocks to uncertainty itself that drive aggregate fluctuations (Bloom 2009; Bloom and others 2018).

interconnectedness implies that increased macroeconomic uncertainty can have cross-border implications through the aforementioned channels. For example, an increase in macroeconomic uncertainty that imposes losses on investors in a particular region may force them to sell assets in other countries, leading to large asset price declines and triggering international financial contagion.[6] Similarly, by reducing domestic consumption and investment, macroeconomic uncertainty can weaken the demand for imports, raising downside risks to economic activity in trading partner countries.

Financial variables may not fully span macroeconomic uncertainty. Existing approaches to assess macrofinancial stability typically consider selected financial indicators, including those related to financial market uncertainty (for example, the Chicago Board Options Exchange Volatility Index [VIX]), as relevant variables in frameworks to assess systemic risk (Adrian, Boyarchenko, and Giannone 2019; Adrian and others 2019). However, financial indicators may not fully reflect macroeconomic uncertainty, making it useful to consider it in frameworks to assess systemic risk and predict tail risks to markets and economic activity.[7] This may be particularly relevant for countries with less developed financial markets or during episodes of "macro-market disconnect"—that is, when macroeconomic uncertainty is high and financial market volatility (realized and implied) is low.[8]

Against this background, this chapter examines risks to macrofinancial stability posed by macroeconomic uncertainty. The chapter first lays out a simple conceptual framework for discussing the main channels through which macroeconomic uncertainty can undermine macrofinancial stability, measured by downside risks to real GDP. It then uses panel data from a sample of 43 advanced and emerging market economies since 1990 (or the earliest year for which data are available) to empirically address three key questions.[9] First, does macroeconomic uncertainty help predict downside risks to output? Second, how does macroeconomic uncertainty interact with macrofinancial vulnerabilities to affect downside risks to output? Third, does the effect of macroeconomic uncertainty spill over across borders to affect downside risks to economic activity in a country's major financial and trading partners? The chapter then discusses policy options to mitigate the risks posed by high macroeconomic uncertainty.

To assess the downside risk to future economic activity from macroeconomic uncertainty, the chapter extends the growth-at-risk (GaR) framework. Since the global financial crisis, significant progress has been made in systemic risk analytics. The GaR framework (Adrian, Boyarchenko, and Giannone 2019) has become an operational cornerstone in this regard, providing a quantitative tool to assess the effect of financial conditions on downside tail risks to real GDP growth.[10] The chapter builds on this framework in two dimensions. First, it augments the GaR model with measures of macroeconomic uncertainty to examine if these are associated with downside tail risks to real GDP growth. In this context, the chapter considers three types of commonly used macroeconomic uncertainty measures—those based on (1) the accuracy and dispersion of forecasts for key macroeconomic variables, (2) domestic policies, and (3) geopolitical tensions. Second, the chapter implements the augmented GaR framework using machine learning tools, in addition to the standard panel quantile regressions, to exploit their advantages in prediction and improve the forecasting of downside tail risks to future GDP growth.[11]

[6]Bond and stock market volatility tend to be positively correlated across major economies, and this correlation seems to have increased since the pandemic (Online Annex 2.1), suggesting that stress in asset markets can spread quickly across the financial system.

[7]See, for example, Valkanov and Zhang (2018) and Dew-Becker and Giglio (2023). Online Annex 2.2 shows that financial variables explain about 80 percent of the variation in commonly used measures of macroeconomic uncertainty for advanced economies like the United States, and 40 to 50 percent of the variation in those for major emerging markets such as Brazil. This is because available financial instruments may not fully hedge important risks facing households and firms—for example, those related to housing markets (Shiller 2003, 2013; Benford, Ostry, and Shiller 2018).

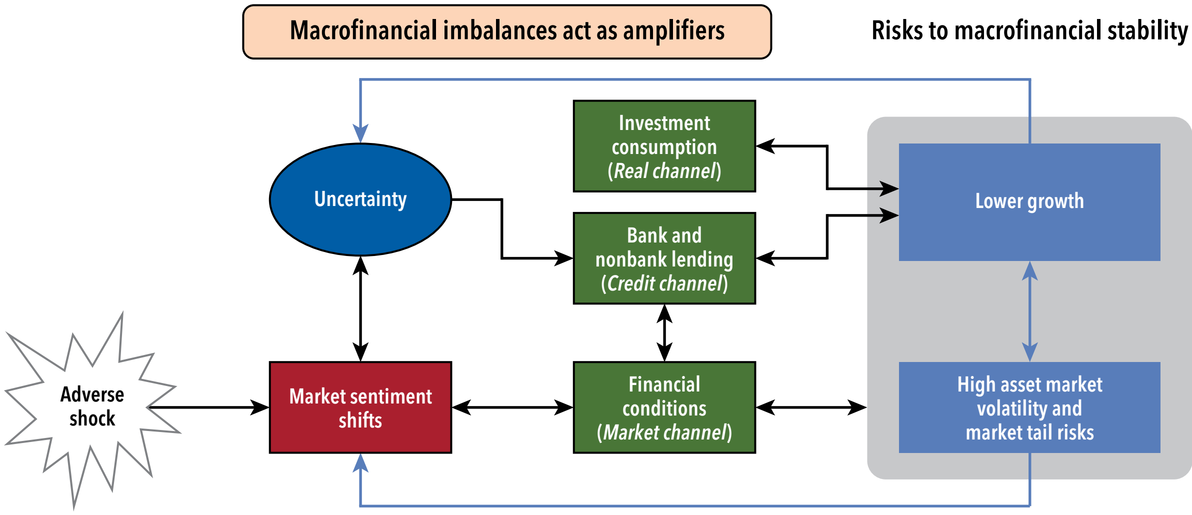
[8]Several factors can drive macro-market disconnects, including investor perception that future policy reactions will protect against downside market risks. Bialkowski, Dang, and Wei (2022) show that low-quality political signals, higher divergence in opinions among investors, and strong equity market performance drive disconnects between the VIX and US economic policy uncertainty. Todorov and Vilkov (2024) note the role played by hedging of covered calls in keeping the VIX at a low level in recent years.

[9]The cross-country sample coverage varies across exercises depending on data availability. See Online Annex 2.1 for information on countries included in the sample and the data sources.

[10]Downside risks to future GDP growth are typically captured by the 5th or 10th percentile of the distribution, while financial conditions are proxied by a composite indicator of risky asset prices (such as equity and corporate bond returns, real house price growth, etc.) and measures of financial uncertainty (such as the VIX).

[11]Machine learning models have gained popularity for forecasting economic and financial variables as they can accommodate many predictors and complex, nonlinear relations between variables (Gu, Kelly, and Xiu 2020; Coulombe and others 2022; Lenza, Moutachaker, and Paredes 2023).

Figure 2.2. Macroeconomic Uncertainty and Macrofinancial Stability: Channels of Transmission



Source: IMF staff elaboration.

Macroeconomic Uncertainty and Financial Stability: A Conceptual Framework

Macroeconomic uncertainty can affect macrofinancial stability through three key channels. First, it can affect macrofinancial stability through a *market channel*, whereby macroeconomic uncertainty can amplify the impact of adverse shocks on investor sentiment, raising downside market tail risk—that is, the risk of large negative realized future asset returns (Figure 2.2) (Baker and Wurgler 2006; Birru and Young 2022). The realization of market tail risks could be transmitted to the broader economy through balance sheet and financial acceleration effects, raising downside risks to output (Adrian and others 2019). Second, macroeconomic uncertainty can affect macrofinancial stability through a *real channel*, whereby in response to higher macroeconomic uncertainty, firms and consumers may adopt a wait-and-see attitude and delay investment and consumption. This would slow economic activity, raising credit risks for financial institutions that could trigger an adverse macrofinancial feedback loop.[12] Third, macroeconomic uncertainty can affect macrofinancial stability through a *credit channel*. This channel may arise because of reduced credit supplied by financial intermediaries as they face greater challenges in determining the creditworthiness of new borrowers when the macroeconomic outlook is more uncertain.[13] These three channels can potentially interact and mutually reinforce each other, amplifying the effect of macroeconomic uncertainty on macrofinancial stability.[14]

Recent technological innovations and social media could aggravate uncertainty as well as its effect on market tail risks. Over the past few years, investors and depositors have been more attentive to surprises in data and news disseminated through social media, affecting their relationship with financial institutions and intensifying stress episodes (see Online Annex Figure 2.1.3). At the same time, fintech has made

[12]This channel originates from the "real options" literature, where the option value of deferring decisions rises with uncertainty (Bernanke 1983). Gilchrist, Sim, and Zakrajšek (2014), however, find that uncertainty mainly affects investment by causing financial distortions rather than through wait-and-see attitudes.

[13]See, for example, Valencia (2017); Buch, Buchholz, and Tonzer (2015); Wu and Suardi (2021); and Berger and others (2022).

[14]The literature has considered the effect of uncertainty both as a shock and as a type of vulnerability that can amplify the effects of other shocks. For example, Arellano, Bai, and Kehoe (2010); Christiano, Motto, and Rostagno (2014); and Gilchrist, Sim, and Zakrajšek (2014) analyze how increasing risk premiums can transmit uncertainty shocks to economic outcomes, while He and Krishnamurthy (2013) examine how high borrowing costs from higher uncertainty can undermine firms' profitability and solvency, making them more vulnerable to financial shocks. Alfaro, Bloom, and Lin (2022) show that uncertainty shocks and financial shocks to firms can amplify each other.

conducting transactions faster and easier, exacerbating funding and market liquidity risks (see the April 2022 *Global Financial Stability Report*). In addition, artificial intelligence (AI) is penetrating deeply into the financial sector, with institutional investors' use of AI-based algorithmic trading strategies further raising market volatility risks because of a potential increase in herding behavior among investors using similar AI models (see Chapter 3). Although these innovations have benefits, they also create systemic complexities that can accelerate the transmission of shocks and amplify the effect of macroeconomic uncertainty on financial stability.

The Global Landscape of Macroeconomic Uncertainty

Macroeconomic uncertainty can stem from different sources. These include (1) innovations affecting the real sector of the economy such as output, product prices, factor costs, and firms' profitability; (2) monetary, fiscal, trade, and regulatory policies; and (3) geopolitical tensions, for example, conflicts or policy-driven decisions to impose barriers on cross-border trade and capital flows.[15] To quantify macroeconomic uncertainty from these sources, the chapter considers different measures. For example, real sector uncertainty is proxied by two indicators: the real economic uncertainty index (REU) of Jurado, Ludvigson, and Ng (2015) and Ludvigson, Ma, and Ng (2021), which reflects the accuracy of forecasts for a large set of key macroeconomic variables, and by the dispersion in real GDP forecasts based on Consensus Economics' survey of professional forecasters. Uncertainty pertaining to domestic macroeconomic and regulatory policies is captured by the text-based economic policy uncertainty index of Baker, Bloom, and Davis (2016), as well as by the world uncertainty index of Ahir, Bloom, and Furceri (2022). Finally, geopolitical uncertainty is measured by the text-based geopolitical risk index of Caldara and Iacoviello (2022).[16]

The different measures of macroeconomic uncertainty tend to be positively but not strongly correlated. The degree to which the macroeconomic uncertainty measures correlate with each other varies considerably but is generally modest (Figure 2.3, panel 1). This suggests that the different measures capture some idiosyncratic phenomena in addition to common shocks, making it important to individually assess their association with tail risks to economic activity.[17] The REU is of particular interest because it exhibits the strongest correlation with other measures of macroeconomic uncertainty, possibly because real sector outcomes may capture uncertainty from different sources including policies and geopolitics.

Measures of macroeconomic and financial uncertainty may contain complementary information but do not always fluctuate in tandem. The correlations of macroeconomic uncertainty measures with commonly used measures of financial uncertainty—such as that based on Ludvigson, Ma, and Ng (2021), which captures the precision of forecasts for different financial market variables, or the VIX—are generally positive but also modest (Figure 2.3, panel 1). Looking at the evolution of different measures of macroeconomic and financial uncertainty for the United States, for example, makes evident that in some major crises, such as the global financial crisis or the COVID-19 pandemic, all measures spiked in tandem (Figure 2.3, panel 2). However, for many economic and political events, only some of the measures have shown a significant response while other measures have remained muted. The US dot-com bubble of the late 1990s is one such case that is only captured by measures of financial uncertainty (VIX), while the intensification of trade tensions between China and the United States that started around 2018 is largely captured by an increase in the economic policy uncertainty index.

[15]Several other factors could also influence macroeconomic uncertainty such as climate change, climate policy, and technological innovation. These are not explicitly analyzed in the chapter because of limited data availability. However, some of the measures of macroeconomic uncertainty used in the chapter may at least partly capture the effects of these sources as well. There may also be some overlap between the different sources of macroeconomic uncertainty—for example, that stemming from geopolitical tensions could affect both real outcomes and policies.

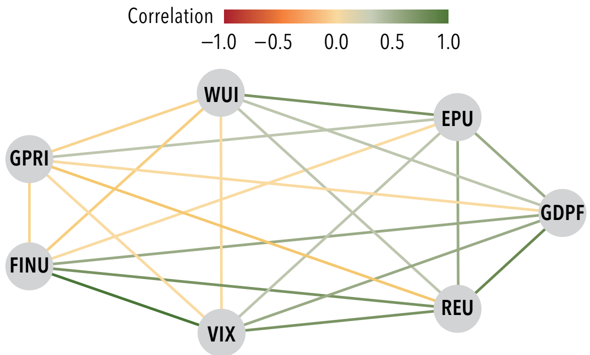
[16]See Online Annex 2.2 for further details on the various measures of uncertainty.

[17]Correlation among measures of uncertainty has increased over time (Online Annex Figure 2.1.4). Kozeniauskas, Orlik, and Veldkamp (2018) show that measures of economic uncertainty are statistically distinct and can covary positively or negatively depending on the type of shock. Nevertheless, these measures tend to have some common fluctuations beyond the business cycle effect, which is driven by changes to macroeconomic volatility.

Figure 2.3. Measures of Macroeconomic and Financial Uncertainty

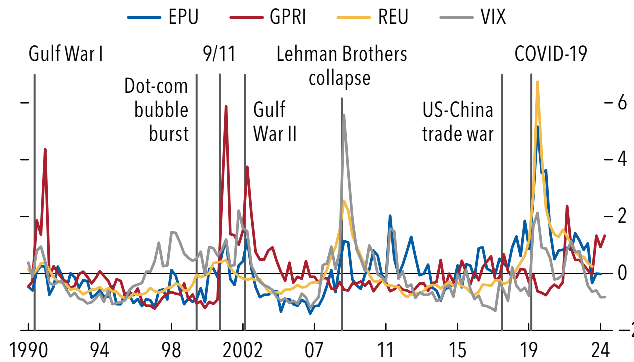
Measures of uncertainty are not perfectly correlated ...

1. Correlations between Selected Measures of Macroeconomic and Financial Uncertainty, 1990–2023
(Correlation coefficient)



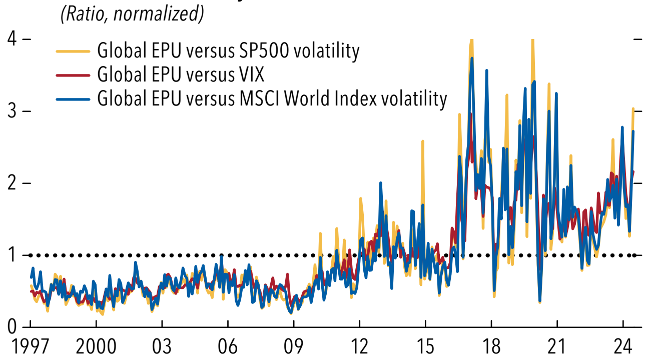
... and may increase idiosyncratically around certain events.

2. Selected Measures of Macroeconomic and Financial Uncertainty for the United States, 1990–2024
(Standardized values)



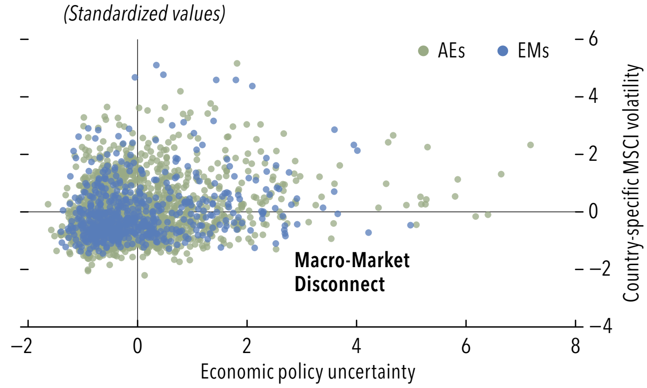
A disconnect between the level of macroeconomic and financial uncertainty can arise ...

3. Global Economic Policy Uncertainty Relative to Realized and Implied Stock Market Volatility, 1997–2024
(Ratio, normalized)



... and is often observed in both advanced and emerging market economies.

4. Realized Stock Market Volatility and Economic Policy Uncertainty across Economies, 1990–2024
(Standardized values)



Sources: See Online Annex 2.1; and IMF staff calculations.

Note: Panel 1 shows the correlation between several macroeconomic and financial uncertainty measures from 1990 to 2023. Panel 2 depicts standardized measures of uncertainty for the United States. Panel 3 shows the monthly ratios of the global economic policy uncertainty index to the realized S&P 500 volatility, to the VIX, and to the MSCI World Index volatility, with the ratios normalized to have a mean of one over 1997:M1–2024:M2. Panel 4 shows a scatterplot of standardized country-specific economic policy uncertainty against MSCI country-specific realized stock market volatility. Realized stock market volatility is computed as the within-quarter volatility of daily returns. The fourth quadrant of the panel (with above average macroeconomic uncertainty and below average stock market volatility) indicates observations of a macro-market disconnect across countries. AEs = advanced economies; EMs = emerging markets; EPU = economic policy uncertainty index; FINU = financial uncertainty measure; GDPF = real GDP forecast dispersion; GPRI = geopolitical risk index; REU = real economic uncertainty index; SP500 = S&P 500; VIX = Chicago Board Options Exchange Volatility Index; WUI = world uncertainty index.

Measures of macroeconomic and financial uncertainty can remain disconnected for a period of time. Commonly used measures of financial uncertainty are limited in scope and generally restricted to certain time horizons. For example, measures of option-implied market volatility, such as the VIX, capture risk related to stock market returns—that is, the performance of publicly traded firms as perceived by investors—at short time horizons. In contrast, the information embedded in measures of macroeconomic uncertainty such as policy uncertainty can be relevant for assessing the outlook of an economy over much longer horizons, for example, when it pertains to geopolitical shocks or to electoral cycles.[18] This may at least partly explain why at times financial market volatility (realized and

[18]Policy uncertainty can increase because of electoral uncertainty when candidates' policy proposals diverge significantly, or there is less clarity on the proposals. Goodell, McGee, and McGroarty (2020) show that changes in the incumbent party's probability of reelection drive key changes to policy uncertainty.

implied) may be low while macroeconomic uncertainty is high—that is, there is a "macro-market disconnect"—which may remain persistent (Figure 2.3, panels 3 and 4).[19]

Macroeconomic Uncertainty and Downside Risk to Output

To assess the association of macroeconomic uncertainty with downside risks to future output, the chapter estimates an augmented GaR model.[20] The analysis looks at the full distribution of future GDP growth at different horizons, with a focus on the left tail (the 10th percentile) as a measure of downside tail risk.

The results show that an increase in macroeconomic uncertainty is associated with a significant rise in downside risk to future GDP growth. A one-standard-deviation increase in measures of macroeconomic uncertainty reduces one-quarter-ahead real GDP growth (annualized) by 0.5 to 2.0 percentage points (Figure 2.4, panel 1).[21] Measures of macroeconomic uncertainty based on real outcomes such as the REU and dispersion of GDP forecasts have quantitatively the largest effect, but the association of all measures with downside risks to future output is statistically significant. Moreover, the impact of macroeconomic uncertainty persists up to about seven quarters after the shock (Figure 2.4, panel 2). In cumulative terms, an increase in the REU equivalent to that observed on average across countries during the global financial crisis translates into a decline in one-year-ahead GaR of about 1.2 percentage points.[22]

Increased uncertainty has an asymmetric association with the distribution of future GDP growth, affecting downside ("bad") tail risks more strongly than upside ("good") tail risks. Macroeconomic uncertainty has a negligible effect on the median of the distribution of future real GDP growth but a large and statistically significant effect on the lower and upper quantiles (Figure 2.4, panel 3).[23] Overall, however, an increase in uncertainty exerts a stronger effect on downside tail risks to future GDP growth (at the 5th or 10th percentiles) than on upside tail risks (at the 90th or 95th percentiles). Additional analysis presented in Online Annex 2.2 suggests that some technological revolutions (for example, the 1990s dot-com bubble in the United States and the mobile phone revolution in Finland), postcrisis reforms (for example, those in Korea after the Asian financial crisis), and major political shifts (for example, the reunification of East and West Germany in the late 1980s) could be considered as examples of "good" uncertainty that raised upside tail risks to future growth. By contrast, increased macroeconomic uncertainty at the onset of the global financial crisis or the COVID-19 pandemic are examples of "bad" uncertainty.[24]

Machine learning models can improve predictions of downside risk to GDP growth, particularly when measures of macroeconomic uncertainty are added as predictors. Applying machine learning models—such as panel quantile random forest and panel quantile neural network—to the GaR framework (ML-GaR)

[19]For example, while the 2016 US presidential election was associated with significant uncertainty about its effect on the country's long-term policies, volatility in stock markets remained low. Similarly, Brexit caused considerable uncertainty about UK trade, growth, and immigration policies, yet it had less of an impact on short-term stock market volatility. Aït-Sahalia and others (2024) show that macroeconomic uncertainty and stock return volatility could be disconnected. In particular, the relationship between macroeconomic uncertainty and volatility could vary over time depending on the precision of political signals, even though (a priori) they are expected to be positively correlated (Pástor and Veronesi 2013).

[20]The analysis extends the baseline GaR model of Adrian, Boyarchenko, and Giannone (2019) to include measures of macroeconomic and financial uncertainty, while controlling for current GDP growth, financial conditions, and country fixed effects. Estimations are carried out using panel quantile regressions for different time horizons. While the focus of the analysis is on predicting downside risks to future output, and not on identifying the causal effects of uncertainty on future output, potential endogeneity concerns are addressed in robustness exercises. See Online Annex 2.3 for more details on the estimation methodology, results, and robustness analysis.

[21]These estimates are quantitatively significant, considering that the annual output decline in the bottom 10th percentile of the historical GDP growth distribution for the full sample, across advanced and emerging market economies, is 1.2 percent.

[22]Note that an increase in the financial uncertainty measure also raises downside risks to real GDP growth beyond the effect of the financial conditions index included in the model. These estimates are based on panel data, capturing the cross-country average effects. The effects of macroeconomic and financial uncertainty variables for individual countries may be larger or smaller.

[23]The macroeconomic uncertainty measures are significantly associated with the mean of one-quarter-ahead GDP growth when the financial conditions indicator is not included in the model, but they are not significant otherwise.

[24]Episodes of "bad" and "good" uncertainty are distinguished by following the approach of Segal, Shaliastovich, and Yaron (2015) (see Online Annex 2.2 for details). Intuitively, uncertainty marked by positive shocks like technological advancements or unexpected market opportunities can potentially be "good" because businesses and investors, perceiving future gains, may increase investment and expand operations, driving economic growth and higher asset prices. By contrast, "bad" uncertainty, related to negative shocks to macroeconomic variables, would lower prices and reduce investment.

Figure 2.4. Uncertainty and Downside Risks to Output: Results from Panel Quantile GaR Model

Measures of macroeconomic uncertainty have a strong impact on downside risks to output ...

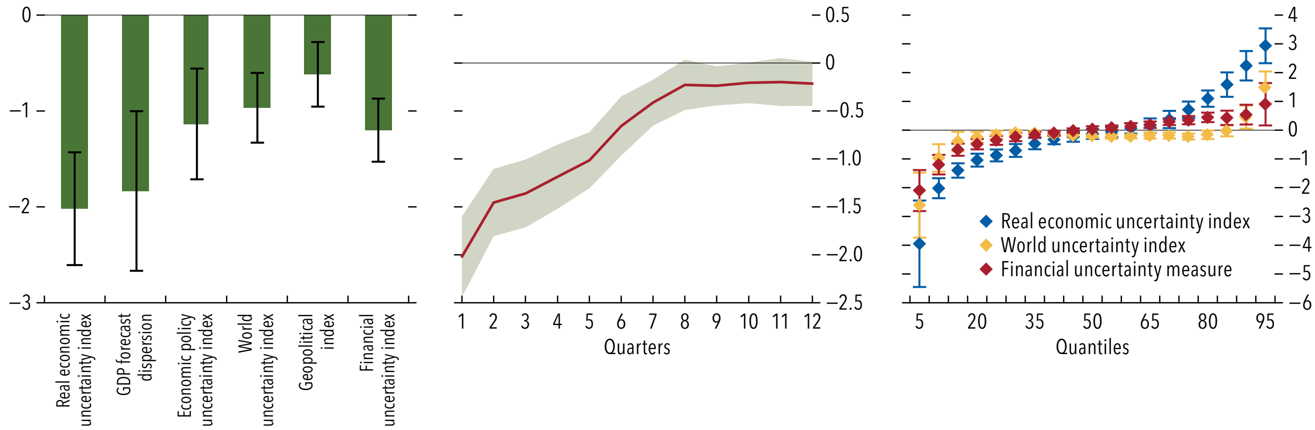
1. Effect of Measures of Uncertainty on Growth-at-Risk, One Quarter Ahead
(Percentage points, annualized)

... and effects are persistent up to about seven quarters ahead.

2. Effect of Real Economic Uncertainty on Growth-at-Risk at Different Horizons
(Percentage points, annualized)

A rise in uncertainty has asymmetric effects on the distribution of future GDP growth.

3. Effect of Uncertainty on Growth-at-Risk, One Quarter Ahead
(Percentage points, annualized)



Sources: Ahir, Bloom, and Furceri 2022; Baker, Bloom, and Davis 2016; EUROPACE AG/Haver Analytics; IMF, Global Data Source and International Financial Statistics databases; LSEG Datastream; Organisation for Economic Co-operation and Development, Main Economic Indicators database; and IMF staff calculations.

Note: Panel 1 illustrates the impact of a one-standard-deviation increase in various measures of uncertainty individually on the 10th percentile of the one-quarter-ahead real GDP growth distribution, with current real GDP growth, financial conditions, and country fixed effects controlled for. Panel 2 shows the impact of a one-standard-deviation increase in the real economic uncertainty index used in the chapter, based on Ludvigson, Ma, and Ng (2021), on the 10th percentile of the average future real GDP growth distribution at different time horizons. The solid line shows estimated coefficients; shaded areas around estimated coefficients correspond to 90 percent confidence intervals. Panel 3 depicts the effect of various measures of uncertainty on the full distribution of one-quarter-ahead real GDP growth. All estimations are carried out using panel quantile regressions across the economies considered in the sample. Error bars indicate 90 percent confidence intervals. For more details on variables, estimations, and data sources, see Online Annexes 2.1, 2.2, and 2.3. GaR = growth-at-risk.

improves out-of-sample prediction accuracy compared to the standard benchmark GaR model based on linear quantile regressions. Specifically, out-of-sample prediction accuracy for advanced and emerging market economies improves by up to 7 percent at different horizons (Figure 2.5, panels 1 and 2, green bars).[25] Adding measures of macroeconomic uncertainty (such as the REU) as predictors further improves the out-of-sample forecast performance of ML-GaR models by 5 to 13 percent relative to the standard GaR models that exclude uncertainty (Figure 2.5, panels 1 and 2, red bars).[26]

ML-GaR models also show that macroeconomic uncertainty contributes at least as much as the financial conditions index to predicting downside risk to real GDP growth. For both one- and four-quarter-ahead forecasts of downside risks to output growth in advanced and emerging market economies, the REU on average contributes more to predictions than the financial conditions index typically included in GaR models (Figure 2.5, panels 3 and 4).[27]

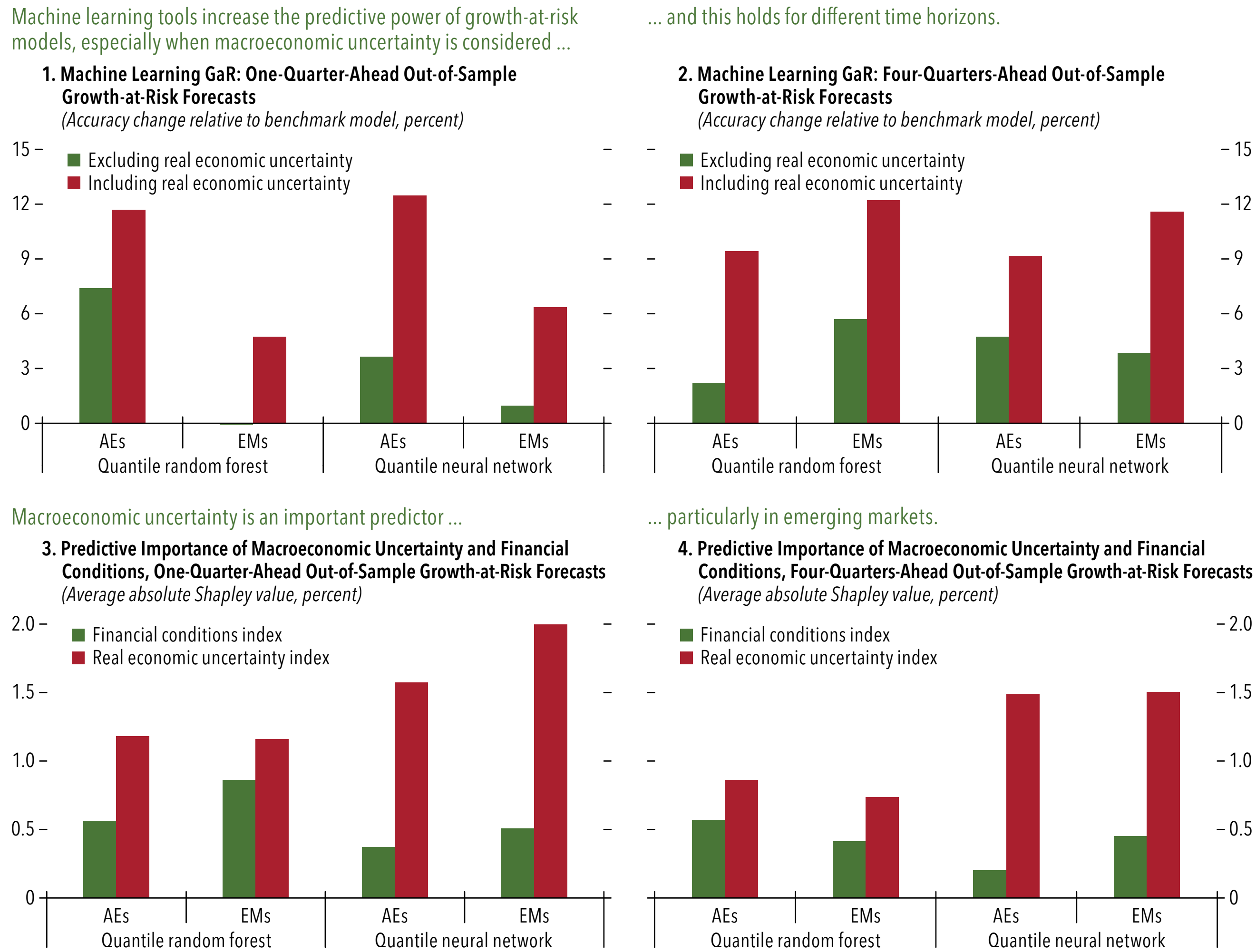
Market and credit channels play an important role in transmitting the effect of macroeconomic uncertainty on future output growth. An increase in macroeconomic uncertainty is associated with a greater likelihood of large negative realizations of stock market returns, as well as of spikes in sovereign bond spreads (Box 2.1). Furthermore, macroeconomic uncertainty influences tail risks to future bank lending, particularly in countries where banking exposure to sovereign debt is high.

[25]The benchmark quantile regression GaR model and the machine learning models are estimated on the same panel of economies and predict the 10th percentile of the one- or four-quarter-ahead GDP growth distribution. See Online Annex 2.3 for further details.

[26]These results are qualitatively robust to the use of alternative measures of macroeconomic uncertainty and training samples that exclude major crises such as the global financial crisis and the COVID-19 pandemic (see Online Annex 2.3 for details).

[27]Contributions for each variable to the forecast are calculated as average absolute Shapley values in panel quantile random forest and quantile neural network models. These contributions may vary across countries and over time. For example, the financial conditions index may play a more important role than the REU during periods of financial stress in advanced economies. On average, the contribution of the REU is higher when the quantile neural network models, which provide more flexibility to capture complex nonlinearities between uncertainty and other predictors, are used.

Figure 2.5. Improvement in Predictive Accuracy from Applying Machine Learning GaR Models



Sources: EUROPACE AG/Haver Analytics; IMF, Global Data Source and International Financial Statistics databases; Organisation for Economic Cooperation and Development, Main Economic Indicators database; LSEG Datastream; and IMF staff calculations.

Note: Panels 1 and 2 compare the predictive accuracy of alternative ML-GaR models (quantile random forest and quantile neural network) against a benchmark GaR model estimated using panel quantile regressions for one- and four-quarter-ahead output growth (at the 10th percentile), respectively, for a sample of advanced and emerging market economies. The benchmark GaR model includes current real GDP growth, the financial conditions index used in the chapter, and country fixed effects as predictors. The comparator ML models include the same variables for results presented in green bars and additionally include the real economic uncertainty index for results presented in red bars. The predictive accuracy improvement is defined as one minus the percentage change in realized quantile loss for the 10th percentile when moving from benchmark GaR to ML-GaR predictions for out-of-sample forecasts. Panels 3 and 4 display the average absolute Shapley values for the real economic uncertainty index and the financial conditions index to assess the importance of each variable for one- and four-quarter-ahead predictions of GaR (10th percentile of output growth). For additional details, see Online Annex 2.3. AEs = advanced economies; EMs = emerging markets; GaR = growth-at-risk; ML = machine learning.

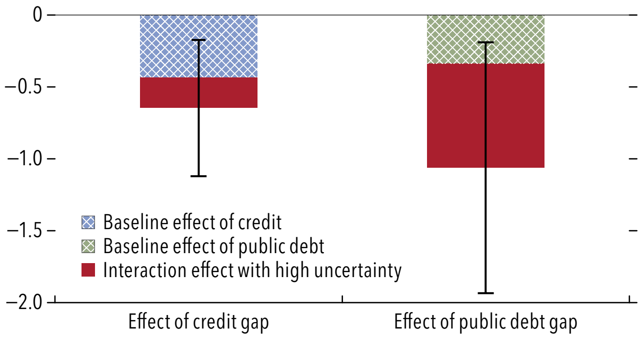
Macroeconomic Uncertainty Amplifies the Impact of Macrofinancial Vulnerabilities

Macroeconomic uncertainty interacts with debt vulnerabilities to exacerbate downside tail risks to GDP growth. High real economic uncertainty combined with excessive domestic credit (measured as the deviation of the credit to the private-sector-to-GDP ratio from its long-term trend) reduces one-quarter-ahead downside tail risk to GDP growth (that is, the 10th percentile of the distribution of future GDP growth) by 0.6 percentage points (Figure 2.6, panel 1). Similarly, high public debt levels (captured by the deviation of the public-debt-to-GDP ratio from its long-term trend) significantly increase downside risks to GDP growth, particularly when real economic

Figure 2.6. Macroeconomic Uncertainty and Macrofinancial Vulnerabilities

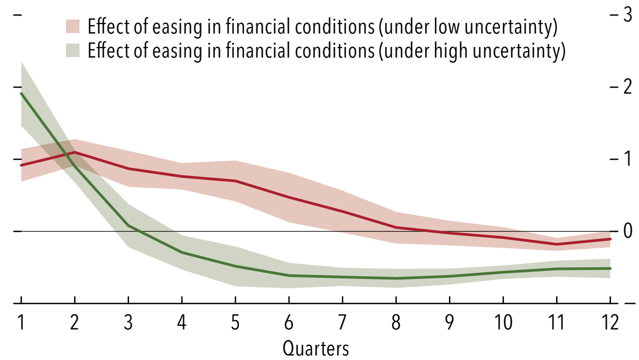
High macroeconomic uncertainty amplifies the effects of macrofinancial vulnerabilities on downside risks to future GDP growth ...

1. Effect on GaR of Interaction between Real Economic Uncertainty and Public and Private Sector Leverage
(Percentage points, one quarter ahead)



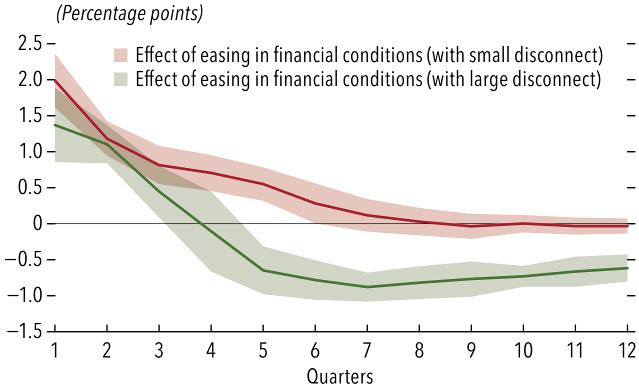
... as well as the intertemporal trade-off posed by easy financial conditions on growth-at-risk ...

2. Effect of Easing in Financial Conditions on GaR amid High and Low Real Economic Uncertainty
(Percentage points)



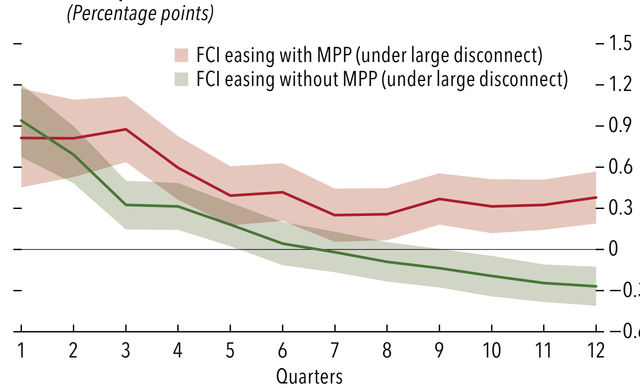
... particularly when uncertainty in the macroeconomy becomes substantially disconnected from that in financial markets.

3. Effect of Easing in Financial Conditions on GaR amid High and Low Macro-Market Disconnect
(Percentage points)



Macroprudential policies can help mitigate the intertemporal trade-off and maintain financial stability.

4. Effect of Easing in Financial Conditions on GaR with and without Macroprudential Policies
(Percentage points)



Sources: EUROPACE AG/Haver Analytics; IMF, Global Data Source, Integrated Macroprudential Policy, and International Financial Statistics databases; LSEG Datastream; Organisation for Economic Co-operation and Development, Main Economic Indicators database; and IMF staff calculations.

Note: Panel 1 shows the impact of private credit-to-GDP gap and public debt-to-GDP gap on GaR (10th percentile of the distribution of one-quarter-ahead output, annualized) amid high real economic uncertainty. The analysis extends the baseline GaR model of Adrian, Boyarchenko, and Giannone (2019) by adding variables relating to the gaps in private credit and public debt, a dummy variable indicating periods of high uncertainty, and their respective interaction terms. Periods of high (low) uncertainty are defined as those with values above (below) the median. The credit-to-GDP gap and total public debt-to-GDP gap are measured by the deviations of the variables from a one-sided Hodrick-Prescott filter. Estimations are conducted using panel quantile regressions for the countries in the sample, depending on data availability. Error bars (solid color) indicate 90 percent confidence intervals for the sum of the coefficients on vulnerabilities and their interaction with the uncertainty dummy variable. Panels 2 and 3 present the impact of a one-standard-deviation easing in financial conditions on the term structure of GaR amid high (low) real economic uncertainty and amid high (low) macro-market disconnect, respectively. High (low) macro-market disconnect is defined as the ratio of real economic uncertainty to realized market volatility that is above (below) the mean. Panel 4 illustrates the impact of a one-standard-deviation easing in financial conditions during a period of macroprudential tightening, using a methodology similar to that in Chapter 2 of the April 2021 *Global Financial Stability Report*. The macroprudential tightening regime refers to quarters in the preceding year with net macroprudential tightening. See Online Annexes 2.1 and 2.4 for further details on estimations. Solid lines show estimated coefficients; shaded areas around estimated coefficients correspond to 90 percent confidence intervals. FCI = financial condition index; GaR = growth-at-risk; MPP = macroprudential policies.

uncertainty is high instead of low—possibly through the effects of increased public debt on borrowing costs, and thereby on investment and consumption.[28]

More generally, high macroeconomic uncertainty can exacerbate macrofinancial stability risks associated with loose financial conditions. In the standard GaR framework, changes in financial conditions lead to intertemporal trade-offs. In the short term, an easing of financial conditions that is typically associated with rising asset valuations and a compression of credit spreads and stock market volatility reduces downside tail risks to GDP growth. Easy financial conditions, however, also encourage a buildup of debt vulnerabilities which exacerbate downside tail risks to GDP growth in the medium term. This intertemporal trade-off has relevance for monetary and macroprudential policy making because tighter policies can help weaken it (Adrian and Liang 2018). An increase in macroeconomic uncertainty can, however, amplify the trade-off, particularly when it is not synced with financial market volatility—that is, when there is a macro-market disconnect. This is because such a disconnect increases the possibility of sudden jumps in financial market volatility and market crashes in the face of adverse shocks as investors realign their expectations, with broader implications for financial stability.[29]

The analysis suggests that macroeconomic uncertainty significantly influences the intertemporal trade-off. Estimates of the GaR model augmented with the REU show that under high macroeconomic uncertainty, looser financial conditions exacerbate downside tail risks to GDP growth in the medium term (Figure 2.6, panel 2). The impact of looser financial conditions is even more pronounced when there is a large macro-market disconnect, confirming that compressed market volatility may reverse quickly in the face of a shock when real economic uncertainty is high (Figure 2.6, panel 3).

Macroprudential policies can help mitigate the intertemporal trade-off. Further analysis suggests that a net tightening of macroprudential policies can help offset the rise in medium-term downside risks that accompany easy financial conditions, especially when there is a macro-market disconnect.[30] Specifically, when the macro-market disconnect is large, a loosening of financial conditions coupled with a net tightening of macroprudential policies is associated with a reduction in downside risks to GDP growth of 0.3 to 0.6 percentage points in the medium to long terms, compared with a scenario in which no macroprudential measures are put in place (Figure 2.6, panel 4). These findings suggest that policymakers may need to be more proactive in deploying policies aimed at preserving financial stability in periods when macroeconomic uncertainty is high relative to market volatility. More generally, credible policy frameworks may also help reduce macroeconomic uncertainty and its impact on downside risks to output (Box 2.2).

The Downside Risks of Macroeconomic Uncertainty and Cross-Border Spillovers

The downside risks from macroeconomic uncertainty can spill over across borders through trade and financial linkages. An increase in macroeconomic uncertainty in a country's major trading and financial partners can raise domestic downside risks through the real channel (as the demand for the country's exports dwindles) as well as through the market and credit channels (by limiting foreign capital flows).[31] To investigate these possible cross-border spillover

[28]For example, uncertainty about future economic policies can prompt investors to demand higher risk premiums, thereby increasing government borrowing costs and making debt servicing more expensive. Machine learning models further expose the nonlinear relationship between public and private debt and downside risks to GDP growth, conditional on the level of real economic uncertainty (Online Annex Figure 2.4.1).

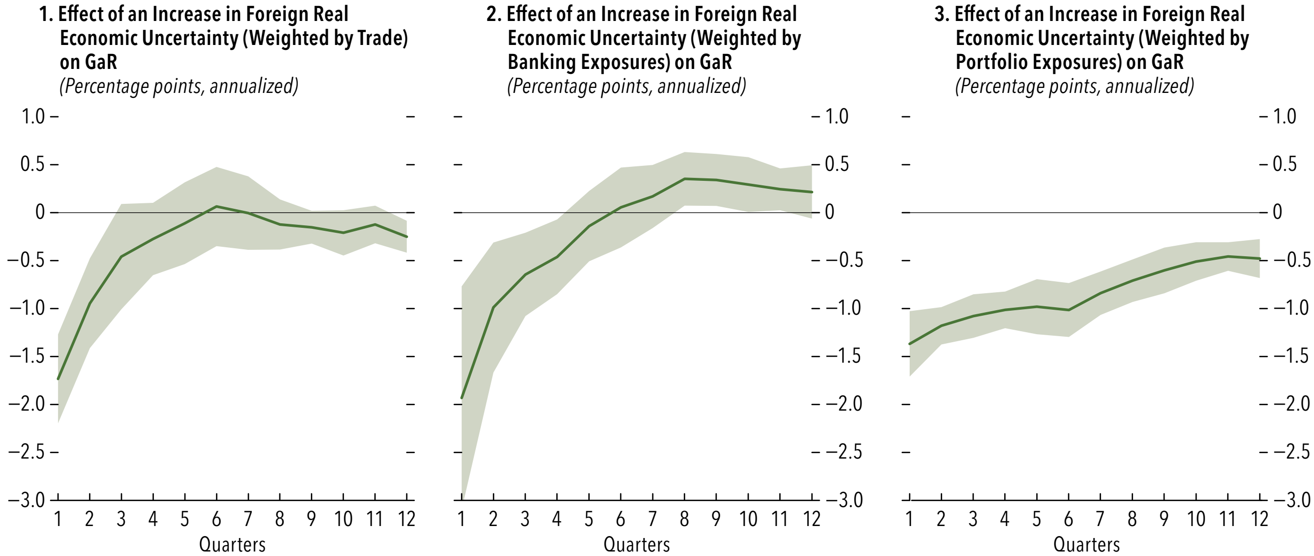
[29]Periods of compressed risk premiums may be associated with overexuberant sentiment and are often followed by a reversal in valuations (Greenwood and Hanson 2013). Extending the GaR model with a variable for a large macro-market disconnect—defined as the ratio of real economic uncertainty to realized stock market volatility that is above its mean level—confirms that such a disconnect is associated with an increase in downside tail risks to future output growth (see Online Annex 2.4).

[30]This result complements the findings in Chapter 2 of the April 2021 *Global Financial Stability Report*, which show that macroprudential policy can temper buildups in private sector leverage, reducing downside risks to growth in the medium term. The analysis here considers the presence of all types of macroprudential measures, focusing on the frequency of tightening episodes rather than on their intensity (for details, see Online Annex 2.5).

[31]A large body of literature examines the cross-border spillover effects of global financial uncertainty (proxied by the VIX) on asset prices, capital flows, domestic credit growth, and output, documenting strong effects (for example, Rey 2013; Obstfeld, Ostry, and Qureshi 2019; Bhattarai, Chatterjee, and Park 2020). Biljanovska, Grigoli, and Hengge (2021) show that an increase in economic policy uncertainty in China, Europe, and the United States reduces economic activity in the rest of the world, and Londono, Ma, and Wilson (2024) find that foreign uncertainty negatively affects domestic economic outcomes. These studies, however, mostly focus on the mean spillover effects of uncertainty and not on tail risks to output.

Figure 2.7. Cross-Border Spillover Effects of Foreign Uncertainty

An increase in real economic uncertainty in a country's major trade and financial partners can raise downside risks to domestic output.



Sources: EUROPACE AG/Haver Analytics; IMF, Global Data Source and International Financial Statistics databases; LSEG Datastream; Organisation for Economic Co-operation and Development, Main Economic Indicators database; and IMF staff calculations.

Note: The figure shows the effect of a one-standard-deviation increase in various measures of foreign uncertainty on the 10th percentile of future quarterly domestic real GDP growth (annualized) over time. In panel 1, the measure of foreign uncertainty is calculated as a weighted average of the chapter's real economic uncertainty index in a country's trading partners, with weights computed as the sum of the ratios of bilateral exports and imports to domestic GDP. In panel 2 (3), the measure of foreign uncertainty is calculated as a weighted average of the chapter's real economic uncertainty index in a country's financial partners, with weights computed as the sum of the ratios of bilateral banking (portfolio) assets and liabilities to domestic GDP. The model controls for current GDP growth, the domestic financial conditions index, measures of domestic real economic and financial uncertainty (based on Ludvigson, Ma, and Ng 2021), global real GDP growth, the global financial conditions index, a dummy variable for the global financial crisis and country fixed effects. Estimations are conducted using a panel quantile regression framework for the full sample of advanced and emerging market economies. For more details on computations and data sources, see Online Annex 2.6. Graph lines represent estimated coefficients; shaded areas around estimated coefficients correspond to 90 percent confidence intervals. GaR = growth-at-risk.

effects, the chapter constructs measures of "foreign uncertainty" as a weighted average of measures of macroeconomic uncertainty in each country's major trading and financial partners—with weights based on the intensity of trade (export and import) or banking and portfolio investment exposures between the domestic and partner economy. The foreign uncertainty measures are included in the GaR model, along with measures of domestic uncertainty and other relevant control variables, and the model is estimated for the full sample of advanced and emerging market economies.[32]

The findings show that foreign macroeconomic uncertainty can exacerbate downside tail risks to domestic GDP growth through both trade and financial linkages. The 10th percentile of the one-quarter-ahead distribution of GDP growth declines by 1.7 percentage points following a one-standard-deviation increase in the trade-weighted foreign macroeconomic uncertainty measures (based on the REU) (Figure 2.7, panel 1). The effect is, however, less persistent than that resulting from a similar increase in domestic macroeconomic uncertainty (Figure 2.3, panel 2) and peters out in about three quarters. Similar results are obtained for an increase in the REU in partner countries with which a country has strong banking relationships (Figure 2.7, panel 2) or cross-border portfolio investment exposures (Figure 2.7, panel 3).[33] In the latter case, the effect is notably more persistent, suggesting that nonbank financial intermediaries can potentially play an important role in transmitting

[32]See Online Annex 2.6 for methodological details and detailed results of the cross-border spillover analysis.

[33]These results are robust to other measures of macroeconomic uncertainty. For uncertainty related to foreign economic policy, the impact on domestic downside risks to output is found to be more persistent, lasting up to six quarters.

macroeconomic uncertainty across borders through the market channel.[34]

International reserve buffers and exchange rate flexibility can help mitigate the adverse implications of foreign uncertainty. While macroeconomic uncertainty can be a potential source of international financial contagion, additional analysis shows that downside risks arising from a rise in foreign macroeconomic uncertainty could be mitigated by building adequate international reserve buffers, or through greater exchange rate flexibility (Online Annex 2.6).

Conclusion and Policy Recommendations

Macroeconomic uncertainty remains elevated globally since the COVID-19 pandemic. This chapter shows that high uncertainty about economic fundamentals and policies increases downside risks to future real GDP growth, stock and bond market returns, and bank lending. Macrofinancial vulnerabilities, such as high ratios of public and private sector debt to GDP, can interact with high macroeconomic uncertainty to amplify the effects of adverse shocks on future output growth. Moreover, high macroeconomic uncertainty worsens the intertemporal trade-off posed by an easing of financial conditions for downside risk to medium-term output growth, particularly when accompanied by low financial market volatility (a macro-market disconnect). The impact of macroeconomic uncertainty tends to spill over across borders through trade and financial linkages, raising the risk of international contagion in the face of large adverse shocks. The chapter also presents evidence that macroprudential policies, larger buffers of international reserves, and enhanced exchange rate flexibility can help mitigate the domestic and cross-border effects of macroeconomic uncertainty.

The findings also show that machine learning models can improve the forecasting capacity of systemic risk assessment frameworks such as the GaR framework. Regulatory and policy institutions can enhance their systemic risk monitoring frameworks by explicitly considering the role of macroeconomic uncertainty as a key determinant of systemic risk while also exploiting the advantages of AI tools such as machine learning models for predicting downside tail risks to output and financial markets. Other AI tools (such as natural language models) can be used to extract useful and high-frequency information from a range of text-based sources (including firms' earning call reports, social media, and local and global news) to enhance real-time monitoring of systemic risk.[35]

Policy actions should focus on reducing macroeconomic uncertainty as well as on mitigating its adverse effects by strengthening resilience and containing macrofinancial vulnerabilities.

Reducing Policy Uncertainty

Credible monetary and fiscal policy frameworks and improved communication can reduce macroeconomic uncertainty and its adverse effects on the economy. Enhancing the credibility of policy frameworks through, for example, the adoption of fiscal and monetary policy rules supported by strong institutions can reduce policy uncertainty (Box 2.2). Credible policy frameworks can also offer policymakers more room to cope with large adverse shocks, thereby mitigating the effects of increases in macroeconomic uncertainty on downside risks to output growth. In addition, improved transparency and well-designed policy communication frameworks can steer market expectations and make policy decisions more predictable and less uncertain.[36]

A stable financial regulatory framework is important to help mitigate policy uncertainty. In the financial sector, constant innovations open new loopholes and sources of complexity, which can threaten financial stability and require a regulatory response without delay. To prevent these reforms from generating unnecessary policy uncertainty among market participants and financial institutions, they should be announced and implemented with clear communication strategies, robust calibration, phase-in periods as necessary, and clear and practical use of supervisory discretion and enforcement.

[34]Studies note that nonbank financial intermediaries are more sensitive to changes in drivers of global liquidity flows than banks (Buch and Goldberg 2024) and that nonbanks' large-scale selling during uncertain times can amplify global market disruptions (Ma, Xiao, and Zeng 2022).

[35]Although machine learning methods are well suited for improving systemic risk surveillance, their application entails conceptual and practical challenges. First, data requirements and technological know-how for applying machine learning tools are significant, which may pose challenges for many emerging market and developing economies with data, skill, and technological constraints. Second, weak signal-to-noise ratios of financial variables can lead large and sophisticated models to perform poorly out of sample. Finally, machine learning methods often suffer from poor transparency and interpretability. Online Annexes 2.3 and 2.4 discuss how these shortcomings have been addressed in the chapter using cross-validation methods for model selection and overfit mitigation, as well as by numerical simulations and analysis of variable importance.

[36]For example, Blinder and others (2008) show that increased transparency and improved policy communication among central banks in major economies has increased the predictability of central banks' interest rate decisions, reducing their impact on market volatility.

Mitigating the Financial Stability Risks Associated with Macroeconomic Uncertainty

Policymakers should deploy adequate macroprudential and fiscal policies to contain financial stability risks arising from elevated macrofinancial vulnerabilities amid high macroeconomic uncertainty. As high uncertainty can exacerbate the adverse effects of macrofinancial vulnerabilities such as excessive private sector leverage on the real economy, policymakers should remain vigilant and proactively deploy macroprudential policies to limit these vulnerabilities. This is particularly relevant when financial conditions are loose and seemingly disconnected from the elevated uncertainty prevailing in the broader economy.[37] In such cases, the response could include not only tighter macroprudential policies but also a tighter monetary policy stance by the central bank if that is aligned with its goal of maintaining price stability (Adrian 2020).[38]

In addition, fiscal policies should prioritize debt sustainability to contain the adverse effects of elevated public debt levels on borrowing costs that risk undermining macrofinancial stability (see the October 2024 *Fiscal Monitor*).

Prudential regulators and supervisors should ensure that bank and nonbank financial institutions assess their vulnerabilities to cross-border spillovers of spikes in foreign macroeconomic uncertainty. At the country level, given the cross-border spillovers of macroeconomic uncertainty, adequate reserve buffers and greater exchange rate flexibility can help countries cushion the potential adverse impacts of foreign uncertainty shocks.

Amid rising geopolitical uncertainty, governments should build adequate safety nets to mitigate macrofinancial stability risks. As uncertainty related to geopolitical developments can exacerbate tail risks to domestic markets, credit, and output, governments should make utmost efforts to reduce geopolitical tensions through diplomacy and multilateral cooperation. To the extent that such cooperation remains elusive, policymakers should devote resources to identifying, quantifying, managing, and mitigating financial stability risks associated with increases in geopolitical tensions and uncertainty (see Chapter 3 of the April 2023 *Global Financial Stability Report*). In this context, policymakers should ensure an adequate level of international reserves as well as of capital and liquidity buffers at financial institutions to mitigate the adverse consequences of increasing geopolitical risks.

[37]The specific type of macroprudential policy to be deployed would depend on prevailing circumstances and vulnerabilities. Policies to build resilience against turns in the financial and credit cycle, such as countercyclical capital buffers, could be relevant. Borrower-based measures could also be activated, for example, if lax financial conditions amid high uncertainty (a macro-market disconnect) encourage excessive borrowing for investment in real estate.

[38]Higher uncertainty tends to shorten the horizons at which the intertemporal trade-off becomes unfavorable for financial stability (that is, the horizons at which downside risks to future growth rise in response to an easing of current financial conditions), as Figure 2.6 illustrates. Because monetary and macroprudential policies can have very different implementation and transmission lags, the level of macroeconomic uncertainty and its disconnect from financial market volatility can inform policymakers' decisions regarding policy instruments and the magnitude of the response.

Box 2.1. Market and Credit Channels Are Important in Transmitting the Effect of Macroeconomic Uncertainty on Output

Dynamics originating in the financial sector amid high macroeconomic uncertainty can play a crucial role in generating risks to macrofinancial stability through the market and credit channels (Figure 2.2). This box examines whether different measures of macroeconomic uncertainty can help explain downside tail risks to future asset (stock and sovereign bond) returns as well as to bank lending by using a panel quantile regression framework.[1]

Market Channel

The results indicate that macroeconomic uncertainty raises the likelihood of future spikes in sovereign bond yields. A one-standard-deviation increase in the real economic uncertainty index (REU) is, on average, associated with an increase of 150 basis points in upside tail risks to sovereign bond spreads (defined as the 90th percentile of the distribution of sovereign bond spreads) in emerging market economies at a six-month horizon (Figure 2.1.1, panel 1). By contrast, for the average advanced economy, a shock of a similar magnitude to the REU increases upside tail risks by about 25 basis points.[2]

In addition, the impact of macroeconomic uncertainty on sovereign bond spreads is more pronounced when fiscal vulnerabilities such as public debt service and banks' exposure to public debt are high rather than low in emerging market economies (Figure 2.1.1, panel 2).[3] In turn, a widening of sovereign bond spreads is more likely to have an adverse impact on public debt dynamics and macrofinancial stability (through the sovereign–financial sector nexus) when public debt or debt service as a share of GDP is already high (see Chapter 2 of the April 2022 *Global Financial Stability Report*). Thus, amid elevated public debt vulnerabilities and macroeconomic uncertainty, a sharp widening of spreads becomes more likely as well as more damaging to the economy (Figure 2.6, panel 1).

Analysis for stock market returns suggests that increased macroeconomic uncertainty can also exacerbate the risk of stock market crashes. A one-standard-deviation increase in the REU can raise downside tail risks to stock market returns (the 10th percentile of the distribution of stock market returns) by about 30 percentage points, one year after the shock in advanced and emerging market economies (Figure 2.1.1, panel 3).

Credit Channel

To examine the relevance of the bank lending channel, the analysis estimates the effect of macroeconomic uncertainty on tail risks to bank lending, defined as the 10th percentile of future bank lending distribution. Macroeconomic uncertainty is measured using the various indicators discussed earlier as well as a new text-based measure developed from transcripts of individual banks' earnings calls.[4] The bank-level measure is intended to capture more directly the level of uncertainty banks perceive, which can influence their lending decisions.

The results indicate a strong relationship between macroeconomic uncertainty and tail risks to future bank lending. For example, a one-standard-deviation increase in the REU is associated with a decline of about 1 percentage point (annualized) in the 10th percentile of the distribution of one-quarter-ahead real credit growth (Figure 2.1.2, panel 1).[5] This effect persists through about seven quarters, although it becomes smaller over time. These findings are qualitatively robust across the

[1]See Online Annex 2.5 for methodological details and regression results for the analysis presented in this box.

[2]These findings complement the analysis in Chapter 1 of the October 2024 *Fiscal Monitor*, which shows that higher global policy uncertainty and geopolitical risk raise sovereign yield volatility across countries.

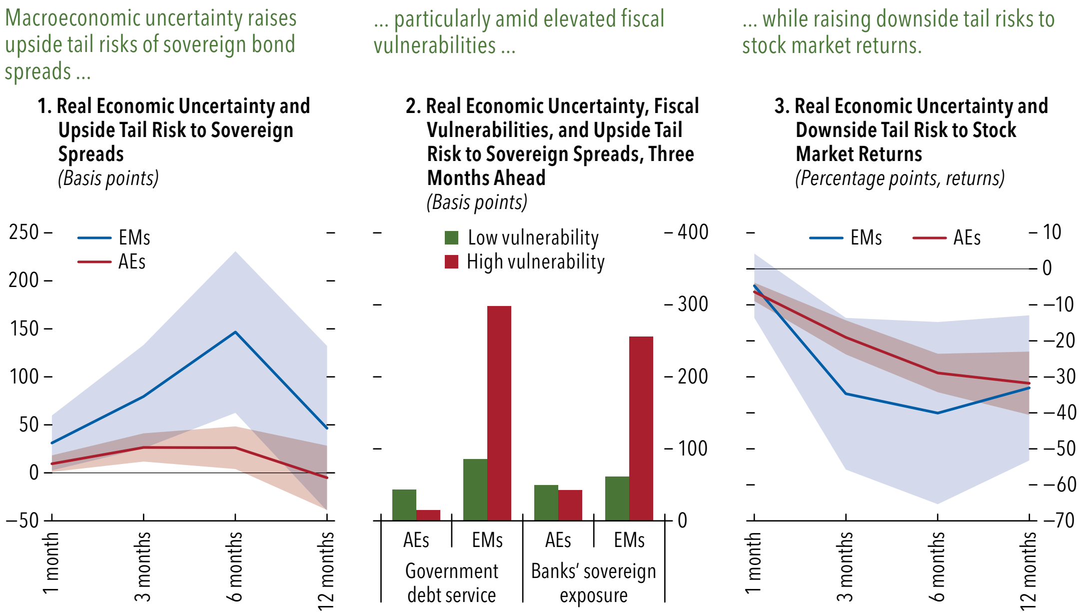
[3]For advanced economies, fiscal vulnerabilities do not appear to play a statistically significant role in amplifying the effect of macroeconomic uncertainty on sovereign bond spreads (Box Figure 2.1.1, panel 2). This could be because spikes in macroeconomic uncertainty may trigger flight to quality effects, whereby investors reallocate investments from equity or corporate bonds with low credit ratings to sovereign bonds. In addition, in response to increased macroeconomic uncertainty, central banks in advanced economies are more likely to intervene in sovereign bond markets (purchasing bonds to lower yields) when fiscal vulnerabilities and yields are already elevated—reinforcing the role of such bonds as a "safe haven" for investors.

[4]Following the approach of Soto (2021), the bank-level uncertainty measure is constructed by calculating the percentage of sentences including words related to uncertainty in the earnings call transcripts of specific banks, using definitions from the February 2024 update of the Loughran-McDonald Master Dictionary (https://sraf.nd.edu/loughranmcdonald-master-dictionary/). These percentages are then averaged across banks in a specific country to arrive at a country-level indicator. As Online Annex 2.5 shows, the bank-level text-based measure generally exhibits a low degree of correlation with the other measures of uncertainty.

[5]The estimates are based on panel quantile regressions for a sample of 18 advanced and 13 emerging market economies using data from 2001 to 2023. The model controls for lagged credit growth dynamics, output growth, financial conditions, and financial vulnerabilities. The last of these are measured by the position in the credit cycle and banking sector fundamentals such as capital adequacy, asset quality, profitability, and exposure to sovereign risk. The model also includes country and time fixed effects. See Online Annex 2.5 for more details on the methodology and estimation results.

Box 2.1 *(continued)*

Figure 2.1.1. Macroeconomic Uncertainty and Tail Risks in Financial Markets



Sources: EUROPACE AG/Haver Analytics; Federal Reserve Bank of St. Louis, Federal Reserve Economic Data; ICE Bank of America; IMF, Global Data Source and International Financial Statistics databases; LSEG Datastream; Organisation for Economic Co-operation and Development, Main Economic Indicators database; and IMF staff calculations.

Note: Panel 1 shows the effects of a one-standard-deviation increase in the real economic uncertainty index at time t on upside tail risks to sovereign bond spreads (that is, the 90th percentile of the distribution of changes to sovereign bond spreads between time t and time $t + h$) at different horizons (h = 1, 3, 6, and 12 months), estimated using panel quantile regressions with country fixed effects. The sample consists of monthly data for 20 advanced and 9 emerging market economies from 1990:M1 to 2023:M12. The underlying regressions include relevant controls for the sovereign bond market at the country and global levels, following Gilchrist and others (2022), as well as the lagged dependent variable. Spreads for each country are calculated relative to a benchmark economy (Germany for Euro area countries and the United States for all others) using only debt denominated in the same currency as that of the benchmark economy. Panel 2 illustrates the effect of a one-standard-deviation increase in the real economic uncertainty index on upside tail risks to sovereign bond spreads at a three-month horizon conditional on high and low levels of government debt service (as a percentage of GDP) and domestic banks' exposure to sovereign risk (measured by domestic banks' holdings of sovereign bonds as a share of their total assets). Low and high levels of government debt service and banks' sovereign exposure are defined as the 25th percentile (green bars) and the 75th percentile (red bars) of the respective distributions. Note that the difference between green and red bars (that is, low and high fiscal vulnerabilities) is not statistically significant for advanced economies in the analysis. Panel 3 presents the effect of a one-standard-deviation increase in the real economic uncertainty index in month t on the 10th percentile of the distribution of the overall stock market return at different horizons (t + 1, 3, 6, and 12 months), estimated using panel quantile regressions with country fixed effects. The sample consists of monthly data for 21 advanced economies and 19 emerging markets from 1990:M1 to 2023:M12. The panel quantile regressions include as explanatory variables country fixed effects, lagged returns, and relevant controls at the country level, following Schmeling (2009) and Goyal and Welch (2008). Solid lines show estimated effects; shaded areas represent 95 percent confidence intervals. See Online Annex 2.5 for further details. AEs = advanced economies; EMs = emerging markets.

various measures of uncertainty, including the bank-level text-based measure (Figure 2.1.2, panel 2), and also hold for the subsamples of advanced and emerging market economies.[6]

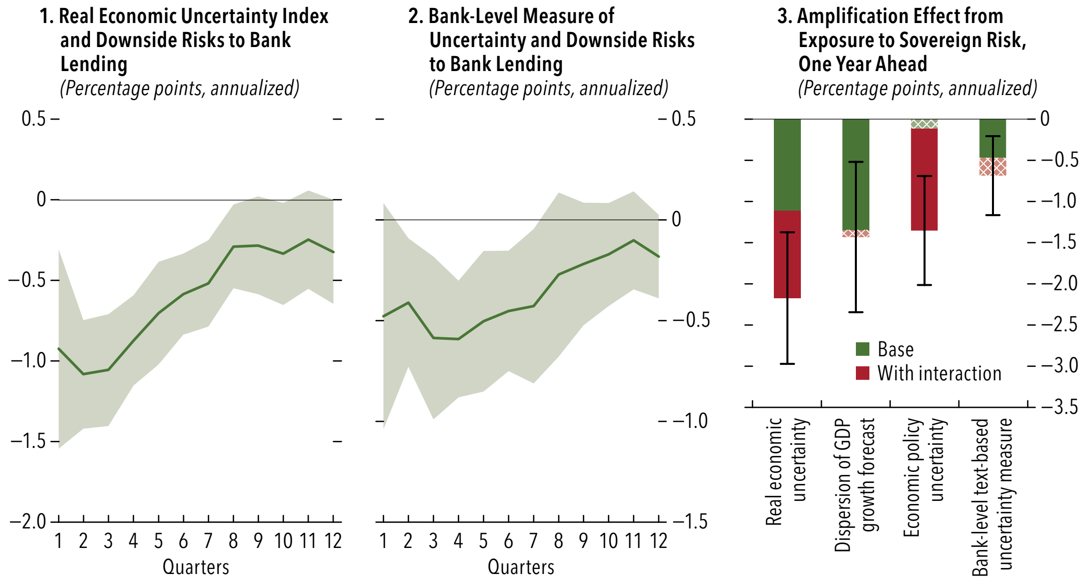
[6]Although the bank-level text-based measure of uncertainty has a somewhat smaller impact on future tail risks to bank lending than the REU, it remains statistically significant when all other measures of uncertainty are included in the regression. This suggests that the measure captures aspects of uncertainty that may not be captured by other broad-based indicators.

Existing financial vulnerabilities can amplify the effects of higher uncertainty on downside risks to bank lending. Extending the model to include interaction terms of the macroeconomic uncertainty measure with financial vulnerabilities such as banks' exposure to sovereign debt shows that countries with a higher bank exposure to sovereign risk exhibit a greater likelihood of a sharp decline in future bank loan growth when macroeconomic uncertainty rises (Figure 2.1.2, panel 3). For instance, a one-standard-deviation

Box 2.1 *(continued)*

Figure 2.1.2. Macroeconomic Uncertainty and Tail Risks to Bank Loan Growth

Higher macroeconomic uncertainty is associated with larger downside risks to future credit growth ... … and its impact increases when financial vulnerabilities are high.



Sources: Bank for International Settlements; Fitch Analytics; IMF, Global Data Source and International Financial Statistics databases; Organisation for Economic Co-operation and Development, Main Economic Indicators database; and IMF staff calculations.

Note: Panels 1 and 2 show the effects of a one-standard-deviation increase in the real economic uncertainty index and the bank-level text-based uncertainty measure, respectively, on the 10th percentile of the distribution of future aggregate real credit growth at different time horizons. For each horizon, the growth rate indicates the average quarterly rate (annualized). Results are obtained from a panel quantile regression using country-level data for both advanced and emerging market economies. Graph lines show estimated effects; shaded areas represent 90 percent confidence interval. Panel 3 shows the effect of a one-standard-deviation increase in four types of measures of uncertainty on the 10th percentile of the distribution of one-year-ahead real credit growth interacted with banks' exposure to sovereign debt (defined as the share of banks' holdings of sovereign debt in an economy as a share of banks' total assets). The "Base" effect (green bars) shows the coefficient for the measure of uncertainty, and "With interaction" (red bar) shows the effect of uncertainty when banks' exposure to sovereign debt is one standard deviation above the mean. The measures of uncertainty and sovereign exposure variable are standardized. Estimated coefficients (solid bars) are statistically significant at the 10 percent level. The error bars represent the 90 percent confidence intervals for the sum of the coefficients, including both the base effect and the interaction effect. See Online Annex 2.5 for further details.

increase in the REU is associated with an increase in the one-year-ahead downside risk to lending (10th percentile of the real credit growth distribution) of about 1 percentage point when domestic banks' exposure to sovereign risk is high (one standard deviation above the mean) compared to at the mean level.

Box 2.2. Macroeconomic Uncertainty and Policy Credibility

Many factors, including policy uncertainty, can drive macroeconomic uncertainty (Bloom 2009). Several studies document that monetary and fiscal policy uncertainty can have contractionary effects (Fernández-Villaverde and others 2015; Husted, Rogers, and Sun 2020; Beckmann and Czudaj 2021; Mumtaz and Ruch 2023). This box examines whether rules-based frameworks, or strengthening of policy frameworks more generally, can reduce policy uncertainty.

Monetary Policy

Early proponents of monetary policy rules (Henry Simons, Lloyd Mints, Milton Friedman) argued that reducing policy uncertainty and its adverse effects on the real economy (inefficiencies) was the main benefit of such rules. In their view, inflation expectations were stabilized through reduced policy uncertainty (Dellas and Tavlas 2022).[1] Empirical evidence shows that enhanced monetary policy credibility can help stabilize an economy by more firmly anchoring inflation expectations to target levels (Park 2023; Beckmann and Czudaj 2024) and that policy rules can play an important role in reducing uncertainty (Cochrane, Taylor, and Wieland 2020, and references therein).[2]

More generally, the degree of soundness of monetary policy frameworks (regardless of whether they are strictly rules based) may reduce monetary policy uncertainty and its effect on downside risk to GDP growth. Figure 2.2.1, panel 1, shows that countries where inflation expectations deviate more from the policy (inflation) targets experience higher levels of economic policy uncertainty. This result suggests that a weaker policy framework or impaired policy credibility can amplify economic policy uncertainty. In addition, in the context of the growth-at-risk framework, Figure 2.2.1, panel 2, shows that increased macroeconomic uncertainty (real or policy related) has a larger effect on downside risk to one-quarter-ahead GDP growth when policy targets were missed by wider margins over the preceding three years (that is, when monetary policy frameworks were weaker). These results support the view that enhanced credibility and reliance on stronger monetary policy frameworks can mitigate the adverse implications of increased uncertainty for macrofinancial stability.

Fiscal Policy

Similar arguments in favor of fiscal rules and their impact on macroeconomic uncertainty apply to fiscal policy. Several studies have analyzed the effects of fiscal policy rules on policy variables (such as budget balances or debt levels), market variables (interest rates and sovereign risk premiums), and output cyclicality, concluding that fiscal rules can reduce fiscal policy uncertainty, fiscal procyclicality, and market volatility and enhance fiscal sustainability (Reuter 2015). Fatas and Mihov (2006), Badinger and Reuter (2017), and Arroyo Marioli, Fatas, and Vasishtha (2024) document that more stringent fiscal rules can reduce overall macroeconomic volatility (and hence real economic uncertainty).[3,4]

[1]The modern (that is, since the late 1970s) literature on rules versus discretion proves theoretically that discretion can generate inefficiencies even if it does not increase policy uncertainty. Although this literature places less emphasis on uncertainty, it does not provide evidence regarding, or argue against, the connection between policy rules and uncertainty; it establishes that weaker theoretical conditions are needed to favor rules over discretion (Dellas and Tavlas 2022).

[2]Policy uncertainty can also increase when the effectiveness of policies comes into question (Carney 2016). Available evidence indicates that high uncertainty can weaken monetary policy transmission (Castelnuovo and Pellegrino 2018; Lakdawala and Moreland 2024). A more uncertain response of the economy to policy stimulus, in turn, exacerbates policy uncertainty, increasing uncertainty surrounding the extent to which policy instruments will need to be adjusted to achieve policy goals.

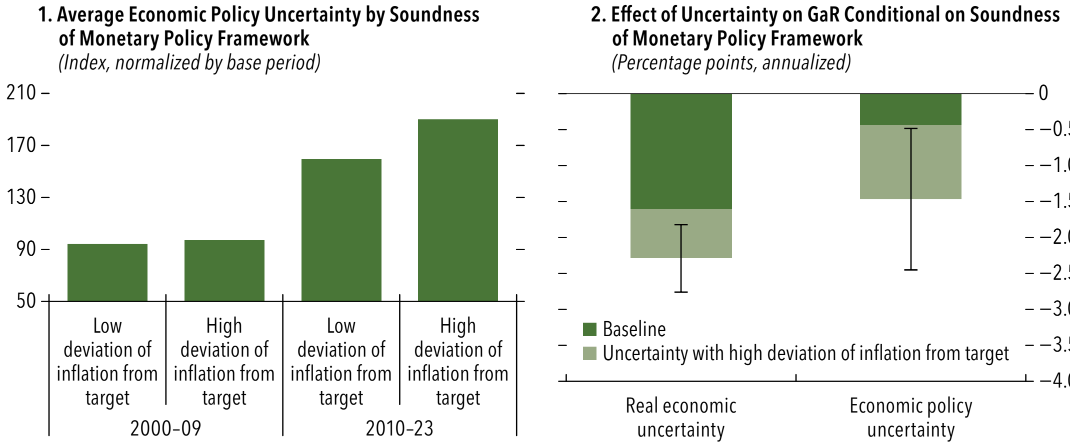
[3]Discretionary fiscal policy is prone to deficit bias due to political incentives to delay austerity, leading to excessive deficits and debt (Alesina and Drazen 1991). Fiscal rules can help offset this bias by acting as a commitment device to limiting the government's incentives to exert discretion (Alesina and Tabellini 1990).

[4]There is also evidence that increased uncertainty can impair the effectiveness of fiscal policy (Jerow and Wolff 2022; Liu 2023), suggesting that policy responses themselves could become more uncertain, potentially magnifying macroeconomic uncertainty.

Box 2.2 *(continued)*

Figure 2.2.1. Soundness of Monetary Policy Framework and Effect of Uncertainty on Future GDP

Credible policy frameworks tend to help reduce economic policy uncertainty and its impact on downside risks to output.



Sources: Online Annex 2.1; and IMF staff calculations.

Note: In panel 1, high deviation is based on the sample median of the deviation of inflation expectations from the policy inflation target (absolute value summed over preceding three years). The "high deviation" regime acts as a proxy for the effectiveness of monetary policy framework across countries, indicating less effective frameworks. Panel 2 shows the effect of a one-standard-deviation increase in measures of real and economic policy uncertainty on the 10th percentile of the distribution of one-quarter-ahead real GDP growth without (baseline, dark green bar) and with (interaction term, light green bar) sound monetary policy frameworks. Whiskers (solid bars) indicate 90 percent confidence intervals (significance). GaR = growth-at-risk.

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