

Nowzohour, Laura; Stracca, Livio

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More than a feeling: Confidence, uncertainty and macroeconomic fluctuations

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Laura Nowzohour, Livio Stracca

More than a feeling:
confidence, uncertainty and
macroeconomic fluctuations

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Abstract

Economists, observers and policy-makers often emphasize the role of sentiment as a potential driver of the business cycle. In this paper we provide three contributions to this debate. First, we critically survey the existing literature on sentiment (considering both confidence and uncertainty) and economic activity. Second, we review existing empirical measures of sentiment, in particular consumer confidence, stock market volatility (SMV) and Economic Policy Uncertainty (EPU), on monthly data for 27 countries, 1985-2016. Third, we identify some new stylized facts based on international evidence. While different measures are surprisingly lowly correlated on average in each country, they are typically highly positively correlated across countries, suggesting the existence of a global factor. Consumer confidence has the closest co-movement with economic and financial variables, and most of the correlations are contemporaneous or forward-looking, consistent with the view that economic sentiment is indeed a driver of activity.

Keywords: animal spirits, confidence, uncertainty, business cycles, dynamic correlations

JEL: E32, E71, F44, G15, G41

Non-technical Summary

According to the Merriam-Webster English Dictionary, "*sentiment*" can be defined as "*an attitude, thought, or judgment prompted by feeling*" or as "*an idea colored by emotion*". In economic matters, sentiment may be used to describe economic agents' views of future economic developments that may influence the economy because they influence agents' decisions today; a view that may reflect rational arguments and facts but also a mood of optimism or pessimism. In this paper, we focus on the role of sentiment in the business cycle, providing three contributions:

First, we provide a critical survey of the existing literature, taking stock of recent developments in empirical and theoretical research on the sources and transmission channels of confidence shocks and uncertainty. We also make some theoretical conjectures of how confidence and uncertainty may affect the business cycle in a different way.

Second, we review six existing measures of sentiment based on a monthly panel database covering 27 advanced countries from January 1985 to October 2016 including a composite survey-based index of consumer and business confidence, a newspaper-based index of Economic Policy Uncertainty from Baker et al. (2015), realized stock market volatility, realized stock market skewness as well as realized absolute negative stock returns. Taking the first principal component of consumer confidence, stock market volatility and Economic Policy Uncertainty, we find that their common variation explains around 50% of their total variation at country level across our sample. Furthermore, there is a strong negative correlation between the first principal component and consumer confidence as well as a strong positive correlation with Economic Policy Uncertainty and stock market volatility at country level. This shows that there is an important common component in uncertainty and confidence measures. Moreover, the loadings on the common component show that confidence and uncertainty are negatively correlated. We also reconcile large movements in the sentiment measures (cross-country averages over time) with major (geo-)political and economic events.

Third, we provide a set of stylized facts. A central question we address is how our different sentiment measures are correlated among each other and also how they are (cross) correlated with economic activity. First, different measures are surprisingly lowly correlated on average in each country, as well as with an index of geopolitical risk by Caldara and Iacoviello (2016). Second, measures are typically highly positively correlated across countries, suggesting the existence of a global factor. Third, consumer confidence has the closest co-movement with economic and financial variables, and most of the correlations are contemporaneous or forward-looking, consistent with the view that economic sentiment could indeed be a driver of activity.

1 Introduction

According to the Merriam-Webster English Dictionary, "*sentiment*" can be defined as "*an attitude, thought, or judgment prompted by feeling*" or as "*an idea colored by emotion*". In economic matters, sentiment may be used to describe economic agents' views of future economic developments that may influence the economy because they influence agents' decisions today; a view that may reflect rational arguments and facts but also a mood of optimism or pessimism. In this paper, we focus on the role of sentiment in the business cycle, providing three contributions: first, we provide a critical survey of the existing literature; second, we review some existing measures of sentiment; and third, we provide a set of stylized facts.

How exactly are agents' choices affected by market sentiment? This question remains subject to debate with views ranging from the underlying shock originating from news about future technological improvements to fluctuations being caused by purely psychological waves of optimism and pessimism. Nevertheless, the global financial crisis has shown how adverse the real effects of a severe and largely unanticipated bust in market sentiment can be. Since then, realized volatility has dropped significantly (with the exception of another peak during the European sovereign debt crisis), while perceived uncertainties remained at elevated levels. Figure 1 shows four different global market sentiment measures, namely the VIX and measures of Economic Policy Uncertainty, geopolitical risks and consumer confidence, from January 2006 until November 2016. The VIX, representing a widely used uncertainty measure, is at historically low levels. Similarly, global consumer confidence is in moderately positive territory. On the contrary, both geopolitical risk as well as Economic Policy Uncertainty are at elevated levels, the latter particularly so. This stylized representation of global market sentiment suggests that uncertainties today stem from different sources than before the global financial crisis, i.e. financial-market-based risks seem to be less important than risks posed by shifts in economic policy and geopolitical tensions. Evidence (e.g. Rossi et al. (2016)) furthermore suggests that the nature of uncertainties we face today has changed vis-à-vis those posed pre-crisis, with agents' inability to grasp the probability distribution generating the data of future economic developments

being more important than uncertainty about the odds of certain outcomes. That is, ambiguity rather than risk has become an important driver of agents' actions. A similar conclusion can be drawn from Kozłowski et al. (2015), where the materialization of an event ex ante perceived as extremely unlikely (such as the global financial crisis) leads to a strong re-assessment of macro risks and, in particular, the probability of tail events. These structural changes in both the source of risks as well as the nature of agents' risk perception call into question traditional measures of market sentiment and beg the question of what is a good measure of market sentiment today.

Against this backdrop, we address three related questions in this paper. *First, we provide a thorough literature survey* taking stock of recent developments in empirical and theoretical research on the sources and transmission channels of confidence shocks and uncertainty. *Second, we show and compare six different market sentiment proxies*; based on a monthly panel database including 27 advanced countries from January 1985 to October 2016, we have a composite survey-based index of consumer and business confidence, a newspaper-based index of Economic Policy Uncertainty from Baker et al. (2015), realized stock market volatility, realized stock market skewness as well as realized absolute negative stock returns. This gives us a range of indicators reflecting both uncertainty and confidence measures¹. Taking the first principal component of consumer confidence, stock market volatility and Economic Policy Uncertainty, we find that their common variation explains around 50% of their total variation at country level across our sample. Furthermore, there is a strong negative correlation between the first principal component and consumer confidence as well as a strong positive correlation with Economic Policy Uncertainty and stock market volatility at country level. This shows that there is an important common component in uncertainty and confidence measures. Moreover, the loadings on the common component show that confidence

¹The empirical literature on uncertainty measures discusses various other measures, which we do not include in this paper. For example, we leave out forecasters' disagreement as this variable is not available for many countries and at monthly frequency like the indicators we look at. We also leave out conditional variances of macroeconomic indicators as they are measures of realized macroeconomic risk and as such not exactly relevant for our purpose, which is to measure the impact of perceived or expected risks.

and uncertainty are negatively correlated. *Third, we establish some stylized facts.* A central question we address is how our different sentiment measures are correlated among each other and also how they are (cross) correlated with economic activity. First, different measures are surprisingly lowly correlated on average in each country, as well as with an index of geopolitical risk by Caldara and Iacoviello (2016). Second, measures are typically highly positively correlated across countries, suggesting the existence of a global factor. Third, consumer confidence has the closest co-movement with economic and financial variables, and most of the correlations are contemporaneous or forward-looking, consistent with the view that economic sentiment is indeed a driver of activity. We also look at episodes of strong sentiments and find qualitatively similar results.

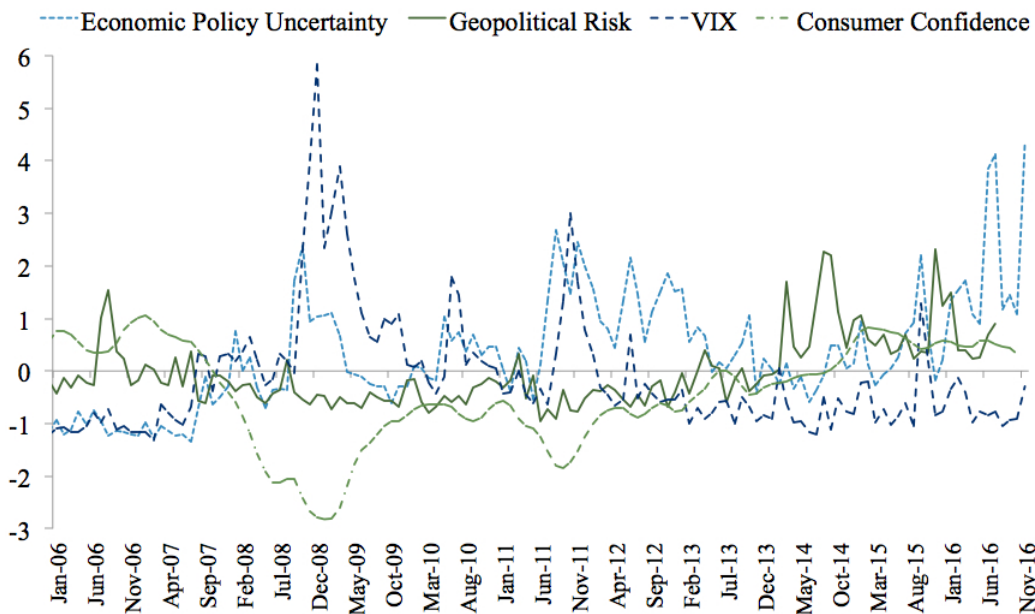


Figure 1: Measures of Global Market Sentiment;

Sources: Baker et al. (2015), Caldara and Iacoviello (2016), Datastream/CBOE and authors' computation. **Note:** Series are standardized to a mean of zero and a unit standard deviation.

The paper is structured as follows: Section 2 gives an overview of possible transmission channels of sentiment to the economy, elaborates on the decomposition of sentiment in confidence and uncertainty and introduces the relevant literature on both confidence and uncertainty, Section 3 describes our database, Section 4 establishes some stylized facts, and Section 5 concludes.

2 Literature

A selection of recent contributions to the literature on confidence and uncertainty are presented in table in Table 1 and 2, respectively.

2.1 Sentiment and the economy: the possible transmission channels

Intuitively, economists and observers find it plausible that (economic) sentiment and economic developments are related, and, in fact, some measures of sentiment are tightly correlated with the business cycle (more on this below). However, the existence of a relation does not necessarily shed light on the underlying transmission mechanisms and shocks. Broadly speaking, there are three competing views or conceptual frameworks in the recent literature on the role of sentiment in the business cycle:

Irrational animal spirits advocates (dating back to Keynes (1936), but more recently Akerlof and Shiller (2010) and De Grauwe and Ji (2016)) see the cause of macroeconomic fluctuations in purely psychological waves of optimism and pessimism, implying that any expansion driven by animal spirits must eventually lead to a bust as fundamentals remain unaffected.

Self-fulfilling animal spirits advocates (e.g. Acharya et al. (2017a), Benhabib et al. (2016), Bacchetta and Van Wincoop (2013)) also see the root of macroeconomic fluctuations in purely psychological, sunspot-driven waves, but believe that precisely the actions following these waves lead to changes in fundamentals making the initial boom or bust in confidence rational as expectations eventually materialize. The result is an economy constantly fluctuating between booms and busts. Shiller (2017) gives a somewhat different spin to essentially the same view, emphasizing the role of narratives as drivers of economic fluctuations and underpinning changes in sentiment over time.

News advocates (e.g. Beaudry and Portier (2014), Beaudry and Portier (2006), Barsky and Sims (2012), Blanchard et al. (2013)) on the other hand, believe that

agents have access to a non-measurable source of imperfect information about future developments of the economy; a signal, which make them act as to cater to the economy's future demand today. In this framework, the economy is subject to recurrent booms (if the signal was correct) and occasional busts (if the signal was false).

2.2 Decomposing sentiment: confidence vs. uncertainty

What are the "thought patterns that animate peoples' ideas and feelings?" (Akerlof and Shiller (2010), page 1, ll. 2-3). Underlying the discussion of the nature of sentiment is its decomposition in at least two of its components, confidence and uncertainty. While confidence can be thought of as a subjective feeling of certainty or strong belief in *positive* future economic developments, which, as discussed earlier, may be the result of animal spirits and/or news about future economic developments, uncertainty could be either the range of possible outcomes of future economic developments (type I), and/or the lack of knowledge of the probability distribution from which future economic developments are drawn (type II). The interaction and respective importance of the three concepts for overall sentiment is far from trivial as they may be observationally equivalent. Theoretically, however, we can make some conjectures.

Let us consider the interplay of type I uncertainty and confidence: when the range of possible outcomes is large, agents feel uncertain about their expected outcome, i.e. the mean of the distribution of potential outcomes, and are therefore less confident in their actions reflecting their expectations of future economic developments. For example, if I expect the economy and my income to grow over the next 12 months with certainty, I would be confident to consume more today in anticipation of my increased budget tomorrow. However, if my belief is subject to large uncertainty, i.e. if the range of possible outcomes of future economic developments was large, my risk aversion would keep me from increasing my consumption by as much as I would have increased it in the absence of high uncertainty. Therefore, *ceteris paribus*², higher uncertainty in the sense of risk may lead to a dampening

²Assuming an increase in uncertainty in the sense of a mean-preserving spread.

of the transmission of confidence to the real economy, while the strength of this effect depends on the agents' degree of risk aversion.

Let us now consider the interplay of type II uncertainty and confidence: when agents are ambiguous about the probability distribution of possible economic outcomes, their confidence is hardly quantifiable. Since there is no distribution from which agents draw their expectations, they have to rely on their subjective sentiment and perception of the future economic situation. Agents are therefore more likely to be overly risk-averse because they lack the ability to assess risks, making them prone to erratic choices and herding behavior. In the absence of a clear strategy guiding their economic choices, agents are more likely to follow the crowd in the belief that the market has more information about the economy than the individual does. As a result, the economy may experience extreme volatility in times of panic and extreme stability in the surrounding times of little economic action, both driven by agents' risk aversion.³

In reality, a change in uncertainty rarely comes alone. That is, both type I and type II uncertainty are likely to have repercussions on agents' confidence rather than acting as a mean-preserving spread. Without knowledge of a preference structure, it is often impossible to assess which confidence-uncertainty-bundle stochastically dominates another. In general however, it is plausible to expect confidence and uncertainty of both types to have a negative relationship.

2.3 Literature on confidence

Despite the difficulty in identifying the mechanisms behind sentiment shocks, the recent literature generally emphasizes their role in business cycle fluctuations (e.g. Schmitt-Grohé and Uribe (2012), Angeletos and La'O (2013)). One major empirical challenge remains the unique identification of sentiments and their transmission mechanism in the data; that is, the distinction between (self-fulfilling) animal spirits and news (e.g. Blanchard et al. (2013), Beaudry et al. (2011)). One would need

³Type II uncertainty may be thought of as either a source of uncertainty of its own or as an amplifier of type I uncertainty, a point also made in Rossi et al. (2016).

to control for news in real-time in order to be sure to capture pure animal spirits. While there have been attempts to trace back the effect of sentiment shocks on macroeconomic variables to its roots, for example using structural VARs (e.g. Dées and Guntner (2014), Levchenko and Pandalai-Nayar (2015)), ex-post measures of economic developments (e.g. Dées and Zimic (2016)) or survey-based nowcast errors (e.g. Enders et al. (2013)), the results are heterogeneous and remain sensitive to the model setup and assumptions made. We do not take a stand on any of these approaches here, but rather give an overview of recent contributions to the literature on economic sentiment.

Table 1: Selected Literature - Confidence

Paper	Main transmission mechanism	Sample	Variables	Key findings
Acharya et al. (2017a)	Sentiments as endogenous, self-fulfilling changes in beliefs: agents in the economy have dispersed information and receive noisy endogenous signals confounding information about current aggregate actions with payoff-relevant fundamentals about the aggregate action in the economy.	-	-	Sentiments can generate persistent aggregate fluctuations which are observationally distinct from i.i.d. shocks if one of the two conditions is satisfied: (i) agents do not observe aggregate fundamentals in the current or preceding period and/or (ii) agents do not observe lagged aggregate outcomes (or observe lagged actions with a delay).
Angeletos et al. (2014), closely related to Angeletos and La'O (2013) and Benhabib et al. (2015)	Coordination failure of agents' beliefs of each other's actions that manifests itself in waves of optimism and pessimism about the short-term economic outlook.	US	GDP, consumption, hours, investment, the relative price of investment, inflation, the federal funds rate, and government spending.	A drop in confidence has similar incentive effects on a firm's hiring and investment decision as a joint tax on labor and capital. Therefore, a recession can be attributed to a non-monetary form of scant demand.
Benhabib et al. (2016)	Financial information frictions generate sentiment-driven fluctuations in asset prices. The price of capital acts as a signal to the real side of the economy, thereby making the initial boom/bust self-fulfilling.	-	-	Sentiment-driven fluctuations both explain global recessions and the cross-country co-movement puzzles. Furthermore, they can generate persistent fluctuations in output and employment.
De Grauwe and Ji (2016)	Endogenous propagation of animal spirits, i.e. waves of optimism and pessimism that get correlated internationally.	Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Australia, Canada, Czech Republic, Denmark, Hungary, Japan, Korea, Norway, Poland, Sweden, Switzerland, UK and US.	Business cycle component of GDP growth and bilateral trade links as $\frac{\sum Trade}{\sum GDP}$.	Propagation of animal spirits (and business cycle synchronization) occurs with relatively low levels of trade integration with diminishing marginal synchronization to trade integration. Membership in a monetary union raises synchronization. Furthermore, the size of the transmission of a demand shock from one country to another strongly depends on the initial conditions (business cycle situation of the countries involved). That is, transmission is stronger when either extreme optimism or pessimism prevails, but weaker during moderate times.

Paper	Main transmission mechanism	Sample	Variables	Key findings
Bacchetta and Van Wincoop (2013)	Self-fulfilling shifts in risk via sunspots.	US, Germany, Canada, France, Japan, Switzerland, Belgium, Netherlands, India, Mexico, South Korea, South Africa.	Implied volatility indices	An event that suddenly draws attention of investors all over the world to a weak fundamental somewhere leads to a widespread self-fulfilling increase in risk perceptions.
Kozlowski et al. (2015)	Belief revision mechanism: Agents estimate PDF of aggregate shocks based on past experience. Once a new shock is observed, they re-estimate the distribution from which it was drawn.	US	Capital, Employment, Output, Investment, Consumption.	Even transitory shocks have persistent effects because they feed into the agents' information set once they have been observed. The more "unlikely" an event had been anticipated to be, the larger and more persistent is the effect on the macro-economy. The mechanism explains the 12% downward shift in post-global financial crisis US trend output.
Barsky and Sims (2012)	Animal spirits vs. News	US	Consumer confidence, real consumption of goods and services, real GDP, inflation, real exchange rate.	Confidence innovations are composed of news, animal spirits as well as pure noise. However, the relationship between confidence and subsequent activity reflects mainly the news component. Confidence innovations may therefore well be characterized as noisy measures of changes in expected productivity growth over a relatively long horizon.
Beaudry et al. (2011)	Self-fulfilling animal spirits or news (cannot empirically identify)	US	TFP, stock prices, consumption, investment, output, hours worked, real interest rate, inflation rate, relative price of investment, real wage and consumer confidence.	Findings suggest that confidence shocks, identified as a combination of increases in stock prices, consumer expenditures and survey measures of consumer confidence, may be the main driving force of business cycles. Such shocks seem to be demand-driven but non-inflationary. As regards the question of rationality, the authors find that all identified confidence shocks are followed by an eventual rise in TFP. This result is consistent with both, the news and the self-fulfilling animal spirits view. The authors suggest that there may be a causal force from optimism to subsequent TFP growth.

Paper	Main transmission mechanism	Sample	Variables	Key findings
Dées and Guntner (2014)	Following Beaudry et al. (2011) but no focus on whether confidence shocks are rational but rather how they affect macro developments	US, Euro Area, Germany, France, Italy and UK. Third-party countries: Australia, Brazil, Canada, Denmark, Japan, Norway, South Africa, South Korea and Switzerland.	Consumer confidence, real private household consumption, short-term interest rates, unemployment rate, real GDP.	Findings from the closed-economy VAR are consistent with Beaudry et al. (2011). Evidence from a FAVAR model suggests that a noticeable share of the confidence shocks identified in the closed-economy VAR must be attributed to common global components. They also find supportive evidence for the notion of a confidence channel in the international transmission of shocks.
Dées and Zimic (2016)	Temporary animal spirits/false news (noise shock) vs. News	US	Estimated forecast errors of GDP, GDP, private consumption, investment, stock prices, interest rates, inflation and consumer sentiment.	Noise shocks explain almost half of the short-term business cycle variation, while technology shocks merely predict up to 20 % of output variations at business cycle frequencies. Technology shocks turn negative a few years before recessions, while noise shocks are positive at the end of a cycle peak and remain negative for some time during recovery phases, with the latter mostly led by technology shocks.
Enders et al. (2013)	Irrational animal spirits vs. Technology shocks	US	Survey-based now-cast errors of output growth, Output growth, Labor productivity, Hours worked.	Both optimism and technology shocks have a large and long lasting effect on output, while their effect on the nowcast error differs substantially - technology shocks induce a positive nowcast error, while optimism shocks induce a negative nowcast error. Hence, the correlation of nowcast errors and economic activity conditional on optimism shocks changes sign relative to the unconditional correlation. According to the forecast error variance decomposition, the contribution of optimism shocks amounts to almost 30 percent of output fluctuations in the short run.
Levchenko and Pandalai-Nayar (2015)	Animal spirits vs. Surprise technology shock and News shock	US & Canada	GDP forecast, TFP (utilization-adjusted, unobserved), Real GDP, Consumption, Hours.	Sentiment shocks explain the bulk of high-frequency business cycle co-movement between the US and Canada, while news are more important for medium-term to long-term synchronization. Surprise TFP shocks are found to be nearly irrelevant.

2.4 Literature on uncertainty

The empirical literature on uncertainty has brought forward a substantial variety of ways to measure uncertainty; for example, based on realized or implied stock market volatility, forecast densities, forecast disagreement, economic data surprises, and conditional variances of macroeconomic variables. Since uncertainty is a very broad concept, measures often rely on a number of different macroeconomic indicators and the choice of the best measure depends on the type of uncertainty that is intended to be captured. Measures may also lose or gain relevance over time because uncertainty is a phenomenon subject to time-varying and subjective perception of agents. There have been recent attempts to identify different types of uncertainty and their relevance for macroeconomic fluctuations over time.

In the literature on macroeconomic uncertainty, Rossi et al. (2016) differentiate between aggregate uncertainty and disagreement, where the former can be further decomposed into ambiguity (uncertainty about the probability distribution generating the data) and realized risk. The authors propose a measure of uncertainty based on survey density forecasts, which allow for this decomposition. Their evidence suggests that the business cycle dynamics and macroeconomic impacts of the different uncertainty components vary substantially, both across components and over time. That is, disagreement is only a small fraction of the overall uncertainty while realized risk and ambiguity have been important components of uncertainty over the last thirty years, but the former strongly decreased after the global financial crisis, while the latter remained high.

Focusing on firm-level uncertainty, Bachmann et al. (2013) construct proxies of time-varying uncertainty based on business survey data and analyze their behavior over the business cycle. Using micro data on disagreement and forecast errors the authors find that the two are highly correlated. According to results of their structural VAR, surprise movements in either measure lead to significant but short-lived reductions of production and employment in Germany, while the effect is more persistent in the US. Suggested channels by which uncertainty may affect the business cycle include *wait-and-see*-behavior of firms (e.g. Bloom (2009)),

Bloom et al. (2012)), financial frictions (e.g. Gilchrist et al. (2014), Christiano et al. (2014)) or the notion that uncertainty is rather a *by-product* than a cause of recessions (e.g. Bachmann et al. (2011)). A critical assessment of the role of firm-level risk shocks in the business cycle has recently been added to the literature by Bachmann and Bayer (2014). The authors find that the cross-sectional dispersion of investment rates is procyclical. This novel business cycle fact can be replicated in their calibrated heterogeneous-firm business cycle model with nonconvex capital adjustment costs and countercyclical dispersion of firm-level productivity shocks. Importantly, small shocks to firm risk suffice to generate the procyclical investment dispersion while not producing business cycles thus limiting any model in which risk shocks have important aggregate implications.

The recent empirical literature on financial uncertainty is closely linked to the topic of financial stability. For example, Allen et al. (2012) propose a measure of aggregate risk taking in the banking sector that can be used as an indicator of systemic risk and is shown to predict macroeconomic downturns approximately six months before they materialize. Acharya et al. (2012) and Acharya et al. (2017b) propose measures of an institution's contribution to systemic risk as its systemic expected shortfall (its propensity to be undercapitalized when the system as a whole is undercapitalized). The more recent paper shows that the measure empirically succeeds in predicting the outcome of stress tests performed by regulators for the financial crisis of 2007-2009, the associated decline in equity valuations of large financial firms and the widening of their credit default swap spreads. Similarly Brownlees and Engle (2016) propose the expected capital shortage of a firm conditional on a substantial market decline as a measure of systemic risk, whereas Adrian and Brunnermeier (2016) propose the difference between the value at risk of financial institutions conditional on other institutions being in distress and the financial system's value at risk as an institution's marginal contribution to systemic risk. A comparison and critical assessment of the most popular systemic risk measures is given by Benoit et al. (2013).

Table 2: Selected Literature - Uncertainty

Paper	Hypothesized channel	Sample	Variables	Key findings
Baker et al. (2015)	Economic Policy Uncertainty	Canada, China, France, Germany, India, Italy, Japan, Korea, Russia, Spain, UK and the US.	Firm-level regressions: Option-implied stock price volatility (dependent variable), Federal government purchases/GDP, Exposure to government purchases (government purchases of goods and services/revenue), Economic Policy Uncertainty Index, Investment rates, Employment growth, Firm sales. VARs: Economic Policy Uncertainty index, Log of the S&P 500 index, Federal funds rate, Log employment/unemployment rate, log industrial production.	Firm-level regressions: For the average firm, implied volatility is best explained by the VIX. However, the Economic Policy Uncertainty index provides additional explanatory power for the implied volatility of firms in sectors with high government exposure. The results also suggest that for the latter firms elevated policy uncertainty has depressed investment and employment growth substantially in recent years. VARs: Results suggest that policy uncertainty shocks foreshadow deteriorations in macroeconomic outcomes. However, when adding the Michigan Consumer Sentiment index, results imply that it contains overlapping information with the Economic Policy Uncertainty index, which has predictive power for future output and employment growth.
Bloom (2009)	Uncertainty based on implied stock market volatility (VXO Index)	US/Firm-level data	VXO, firm profits growth, firm sales, firm stock returns, industry TFP growth, US GDP forecasts, industrial production in manufacturing, avg. hours in manufacturing, avg. CPI, avg. hourly earnings for production workers (manufacturing), Fed Funds rate, stock market volatility index, S&P500 stock market index	The author identifies 17 dates, which are associated with stock market volatility in excess of 1.65 standard deviations above its HP-detrended ($\lambda = 129600$) mean. These identified volatility shocks are strongly correlated with other measures of uncertainty, e.g. the cross-sectional spread of firm- and industry-level earnings and productivity growth. VAR evidence suggests that volatility shocks generate a short-run drop in industrial production of 1%, lasting about six months, and a longer-run overshoot.
Chang et al. (2013)	Option-implied moments of the stock return distribution: Volatility, Skewness and Kurtosis.	Cross-section of stocks based on S&P 500 Index Options.	Estimated option-implied moments (skewness, volatility and kurtosis) of stock return distribution, stock returns of risky assets, risk-free assets and market portfolio.	Stocks with high exposure to innovations in implied market skewness exhibit low returns on average. The market skewness risk premium cannot be explained by other common risk factors such as the market excess return, size, book-to-market, momentum, and market volatility factors, or firm characteristics.

Paper	Hypothesized channel	Sample	Variables	Key findings
Jurado et al. (2015)	Uncertainty based on the common variation of the unforecastable component of the future value of a large number of macro series	Global selection (\Rightarrow uncertainty that may be observed in many economic indicators at the same time, across firms, sectors, markets, and geographic regions)	Macro-level: 132 monthly macroeconomic indicators (used in Ludvigson and Ng (2009)) on real output, income, employment, hours, real retail, manufacturing, trade sales, consumer spending, housing starts, inventories, inventory sales ratios, orders, unfilled orders, compensation, labor costs, capacity utilization measures, price indexes, bond and stock market indexes, and foreign exchange measures. 147 monthly financial time series (used in Ludvigson and Ng (2007)) on valuation ratios such as the dividend-price ratio and earnings-price ratio, growth rates of aggregate dividends and prices, default and term spreads, yields on corporate bonds of different ratings grades, yields on Treasuries and yield spreads, and a broad cross-section of industry, size, book-market, and momentum portfolio equity returns. Firm-level: 155 quarterly firm observations on profit growth normalized by sales	The authors' estimates imply fewer important uncertainty episodes than do other commonly used proxies (e.g. based on stock market volatility from Bloom (2009)), namely the months surrounding the 1973–1974 and 1981–1982 recessions and the Great Recession of 2007–2009, with the 2007–2009 recession being the most striking episode of heightened uncertainty since 1960. Consequently, there seems to be substantial variability in the stock market and in other uncertainty proxies that does not reflect movements in genuine uncertainty across the broader economy. The authors' suggest the reason for this to be that other proxies over-weight certain series in the measurement of macro uncertainty, and that they falsely attribute forecastable fluctuations to a movement in uncertainty.
Rossi et al. (2016)	Uncertainty based on forecast densities: Distinction between disagreement vs. aggregate uncertainty about the probability distribution, Knightian uncertainty vs. risk and ex-ante vs. ex-post uncertainty.	US	Real GNP/GDP growth density forecasts, real GDP (growth), employment, Fed funds rate, stock prices.	Evidence from a VAR suggests that the authors' overall uncertainty index has recessionary effects, while the roles of its components differ. Simply looking at disagreement may thus underestimate or lag the actual degree of uncertainty. Realized risk and Knightian uncertainty (uncertainty about the probability distribution generating the data) were important components of uncertainty in the last three decades, but the former decreased post-global financial crisis while the latter remained high. An exercise comparing their uncertainty indicator to an index of Economic Policy Uncertainty by Baker et al. (2015) suggests that the latter is a reflection of ex ante risk, rather than ex post.
Scotti (2016)	Economic data surprises and macroeconomic uncertainty	US, Euro Area, UK, Canada, Japan	Real GDP, non-farm payroll, forecasts of the latter, industrial production, employees on non-agricultural payrolls/unemployment rate, retail sales, survey measure of the manufacturing sector or the overall economy, personal income (US only).	The author suggests to measure agents' optimism or pessimism about the economy by combining macroeconomic news surprises and to measure agents' uncertainty about the current state of the economy through her uncertainty index measuring perceived uncertainty about the state of the economy.

3 Data

Sentiment is one of many elements shaping agents' decisions and as such both difficult to measure and to identify. Hence, we start the description of our data with two caveats. First, given our data, we are unable to clearly identify a change in confidence from a change in uncertainty. Second, a central issue when using confidence and uncertainty proxies is the risk that they may reflect actual news about the future, in which case we would not be measuring animal spirits but rather an anticipated change in fundamentals. For now, we expect to capture some combination of the two with our sentiment measures. With that purification in mind, in the following we review the most used and plausible measures of economic sentiment that are available for our sample and on a monthly basis, providing a detailed description as well as a set of stylized facts on them.

3.1 Description

3.1.1 Sample

We use panel data starting in January 1985 (where possible) until October 2016 for a set of 27 advanced economies⁴ at monthly frequency. The panel is unbalanced as some variables are missing for a few countries and the lengths of series vary by country. This is the case because time series going back to 1985 are not always available. However, overall we have a large number of observations. For a detailed overview on country coverage and exact definitions, see Table 4 in the Appendix.

3.1.2 Variables

Consumer confidence. Our database contains a harmonized consumer confidence indicator based on weighted averages (double weights on extremes) of the seasonally adjusted balances in percentage points of the answers (a lot better, a little better, the same, a little worse, a lot worse) to questions on consumers' expectations over the next 12 months regarding the general economic situation as well as

⁴Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Japan, Korea, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, UK, US.

household-specific factors.⁵ The series is then smoothed, normalized and amplitude adjusted around 100 according to the OECD CCI Harmonization Guidelines. We also include individual forward-looking consumer confidence series on their expectations regarding the general economic situation, the financial situation of the household, unemployment, savings, consumer prices⁶ and major purchases⁷ as seasonally adjusted percentage balances.

Business Confidence. We also have a harmonized business confidence index based on the arithmetic average of the seasonally adjusted balances (in percentage points) of the answers (increase/above normal, constant/normal or decrease/below normal) to questions on production expectations, order books and stocks of finished products (the last with inverted sign)⁸. The series is then smoothed, normalized and amplitude adjusted around 100 according to the OECD CCI Harmonization Guidelines.

Economic Policy Uncertainty. Furthermore, our database contains a newspaper-based indicator of Economic Policy Uncertainty from Baker et al. (2015). This index reflects the relative frequency of articles in leading local newspapers⁹ that contain at least a triplet of terms regarding the economy, uncertainty, and policy.¹⁰ The policy terms for the US have been selected based on results from a

⁵The general economic situation: "How do you expect the general economic situation in this country to develop over the next 12 months?"; the financial situation of the household: "How do you expect the financial position of your household to change over the next 12 months?"; unemployment: "How do you expect the number of people unemployed in this country to change over the next 12 months?" (inverted sign); and savings of the household: "Over the next 12 months, how likely is it that you save any money?"

⁶"By comparison with the past 12 months, how do you expect that consumer prices will develop in the next 12 months?"

⁷"Compared to the past 12 months, do you expect to spend more or less money on major purchases (furniture, electrical/electronic devices, etc.) over the next 12 months?"

⁸Production expectation: "How do you expect your production to develop over the next 3 months?"; order books: "Do you consider your current overall order books to be...?"; stocks: "Do you consider your current stock of finished products to be...?"

⁹**US:** LA Times, USA Today, Chicago Tribune, Miami Herald, Dallas Morning News, Houston Chronicle, San Francisco Chronicle, NY Times.

¹⁰**Economy:** economic OR economy; **Uncertainty:** uncertain OR uncertainty; and **Policy (US):** congress AND/OR deficit AND/OR Federal Reserve AND/OR legislation AND/OR regulation AND/OR White House.

large-scale audit study, in which more than 12000 articles from 1900 to 2012 containing "economic" or "economy" and "uncertainty" or "uncertain" were read and coded according to whether the article reflected Economic Policy Uncertainty or not. If it did, the policy term was recorded. Based on these records, a set of 15 frequently appearing policy terms in economic-policy-uncertainty-related newspaper articles were identified. For each permutation of four or more terms of this set, the coding process was repeated with computers. The comparison of computer and human assignments of whether an article reflected Economic Policy Uncertainty or not yielded a set of false positives and false negatives for each permutation. The policy term set minimizing their sum was then chosen as the baseline policy term set. A language and/or culturally adjusted term set that captured the same concepts (or same journalistic standards) has been used for countries other than the US. The number of underlying newspapers varies across countries between two and eight.

Stock market-based variables. Based on daily stock price indices (normalized to 100 on January 4, 2006), our database contains a number of financial uncertainty measures. First, we compute realized historical stock market volatility as the annualized standard deviation of daily stock price returns within each month. Second, we compute the realized skewness of daily stock returns within each month. And, finally, we compute a measure of absolute negative stock returns by adding up all negative stock returns within each month.

Geopolitical Risk. We also include three indicators of geopolitical risk from Caldara and Iacoviello (2016). The authors define geopolitical risk as "*the risk of events such as wars, political tensions, and terrorist acts that affect the normal and peaceful course of international relations*" and, similarly to Baker et al., construct an index by counting the number of articles mentioning phrases related to geopolitical tensions in eleven international/Anglo-Saxon newspapers¹¹. However, in contrast to Baker et al., the index is a measure of *global* geopolitical risk and

¹¹**US:** The Boston Globe, Chicago Tribune, Los Angeles Times, The New York Times, The Wall Street Journal, The Washington Post; **UK:** The Daily Telegraph, Financial Times, The Guardian, The Times, **Canada:** The Globe and Mail.

hence not available on a country level. The term sets used to classify articles are ordered along the lines of eight categories, whose definitions have been shaped by a small-scale audit study (authors are in the process to formalize auditing procedures following Baker et al.). The baseline geopolitical risk index is based on all eight term sets.¹² We also include a measure of geopolitical risk *threats* based on search categories one to five and a measure of geopolitical risk *acts* based on search categories six to eight.

Macroeconomic and financial variables. In addition, our database covers a variety of macroeconomic and financial variables including seasonally adjusted measures of industrial production, retail sales, consumer prices, the unemployment rate, and real house prices. Furthermore, we have short-term (three-month) interbank lending rates, long-term (ten-year) treasury bond yields, private bank credit (claims on the private sector), realized bank stock volatility, stock market returns, as well as the net trade balance, the real effective exchange rate, capital flows as portfolio investment assets, portfolio investment liabilities and net flows. To account for global factors, we finally include the VIX as well as the price of current-month free-on-board Brent Crude Oil in USD per barrel.

3.1.3 Data transformations

All sentiment indicators as well as bank stock volatility have been standardized to a mean of zero and a unit standard deviation for the sake of better comparability. For the sentiment indicators, zero represents the long term average, or normal situation, as they are not attached to a specific base year. In particular, the standardized consumer confidence indicator above zero indicates a boost in the agents' sentiment towards the economy suggesting a healthier economy (i.e., positive changes to the general economic situation, decrease of the unemployment

¹²**Geopolitical risks:** geopolitical AND risks OR concerns OR tensions OR uncertainty; **Bilateral regional tensions:** military OR war OR geopolitical OR coup OR guerrilla OR warfare AND tensions AND Latin America OR Central America OR South America OR Europe OR Africa OR Middle East OR Far East OR Asia AND United States; **War or military risks:** war risks OR war fears OR military threats; **Nuclear threats:** nuclear war OR nuclear catastrophe OR atomic war AND fear OR threat OR terror OR risk; **Terrorist threats:** terrorist threats; **Terrorist acts:** terrorist acts; **Beginning of wars:** beginning of the war OR escalation of the war; and **Life cost of war:** war AND heavy casualties OR battle AND heavy casualties.

rate) combined with an improvement in the financial conditions of the household in the next 12 months (i.e., less likelihood to save, propensity to spend money on major purchases), whereas a value below 0 may signal a more pessimistic attitude towards the economy, expressing a tendency of saving more, which may translate into a contraction in confidence. Because the series of consumer confidence is much smoother than the series for stock market volatility, absolute negative returns, skewness and Economic Policy Uncertainty, all of the latter have been filtered using a six-month backward-looking moving average. Henceforth, whenever we refer to our data, we mean the transformed data as described in this section.

3.1.4 Selection of sentiment measures

We use consumer confidence as our measure of household-based confidence. Due to low country coverage, we leave out the other forward-looking consumer confidence series in the analysis. We furthermore dispense with absolute negative stock returns because, as we will see later, they do not add any informational value over stock market volatility, which we use as a measure of financial-market-based uncertainty. Business confidence as a measure of firm-based confidence is also excluded from the main analysis because it is, on average, highly correlated with consumer confidence.¹³ This leaves us with consumer confidence, stock market volatility, stock return skewness and Economic Policy Uncertainty. Figure 2 shows the four series for the US. Taking their principal components on a country level uncovers the underlying common trend, shown for the US in Figure 3. Figure 4 shows the corresponding factor loadings of the first and second principal component. While the first principal component is highly positively correlated with Economic Policy Uncertainty and stock market volatility and highly negatively correlated with consumer confidence, stock return skewness does not contribute much to the common variation in sentiment proxies, a result we found to be robust across countries. We therefore drop stock return skewness in our subsequent analysis and recompute the first principal component on a country level based on consumer confidence, stock market volatility, and Economic Policy Uncertainty, all of which, including their first principal component will henceforth be considered our *main sentiment*

¹³However, we plan to include business confidence in a more structural VAR analysis in preparation for the next version of this paper.

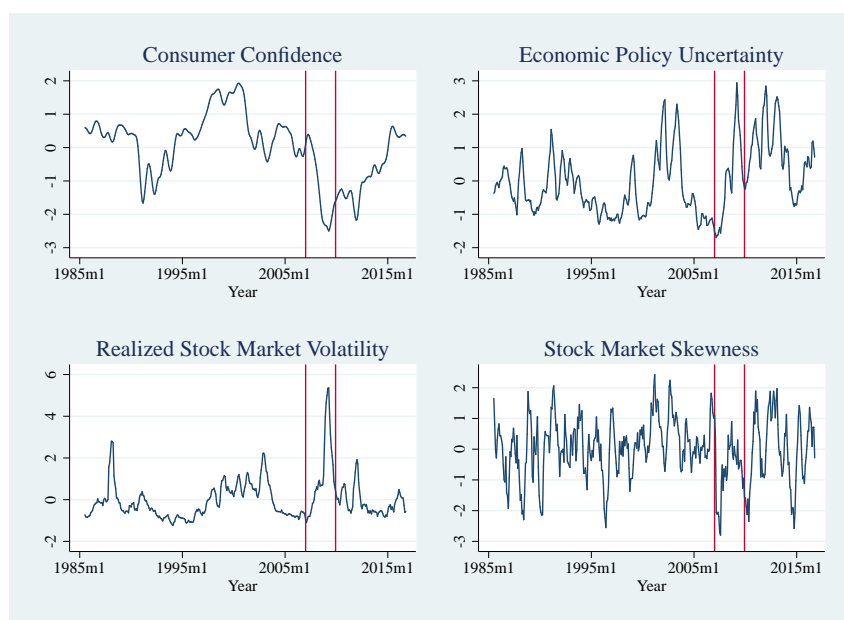


Figure 2: Sentiment proxies in the US (six-month moving averages; vertical red lines refer to January 2007 and December 2009, respectively)

indicators.

3.2 Summary Statistics

3.2.1 Standard summary statistics

We report the number of observations, the unconditional mean, standard deviation, minimum and maximum of our data (all across countries and time) in Table 3. Our sentiment indicators have a mean of zero and a standard deviation of one since they have been standardized and filtered, as explained above. The first principal component varies more than its factors. Long-term rates are, on average, higher and less volatile than short-term rates.

3.2.2 Time variation in main sentiment indicators

For our main sentiment indicators, we summarize the variation over time in the data based on averages across countries¹⁴, from 2000 onwards in Figure 5. In

¹⁴There is no variation over countries based on averages across time because the sentiment indicators have been standardized to have a mean of zero on a country level.

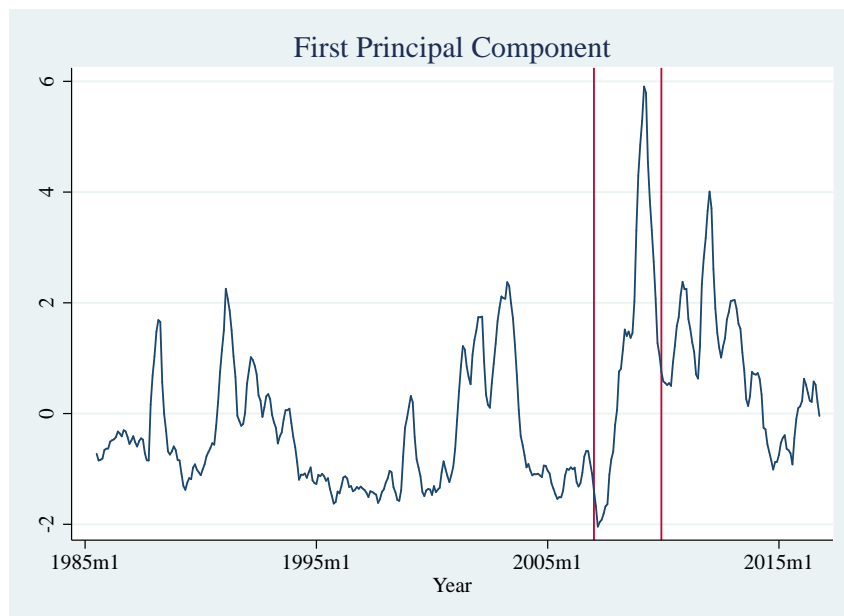


Figure 3: First principal component of consumer confidence, Economic Policy Uncertainty and stock market volatility in the US (six-month moving averages; vertical red lines refer to January 2007 and December 2009, respectively)

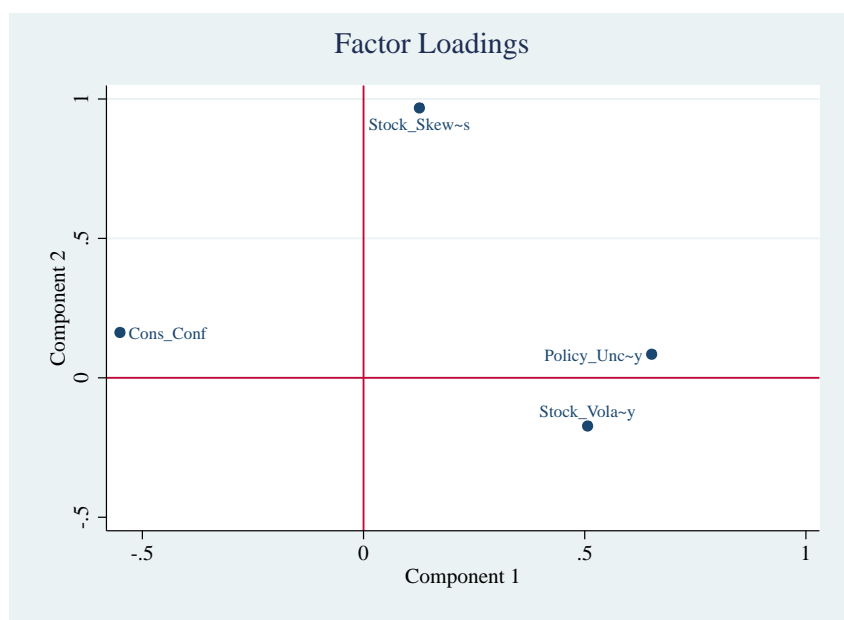


Figure 4: Factor loadings of first and second principal component of consumer confidence, Economic Policy Uncertainty, stock market volatility and stock return skewness in the US (six-month moving averages)

particular, the Figure shows yearly averages of consumer confidence (top left), stock market volatility (top right), Economic Policy Uncertainty (bottom left), and their first principal component (bottom right).

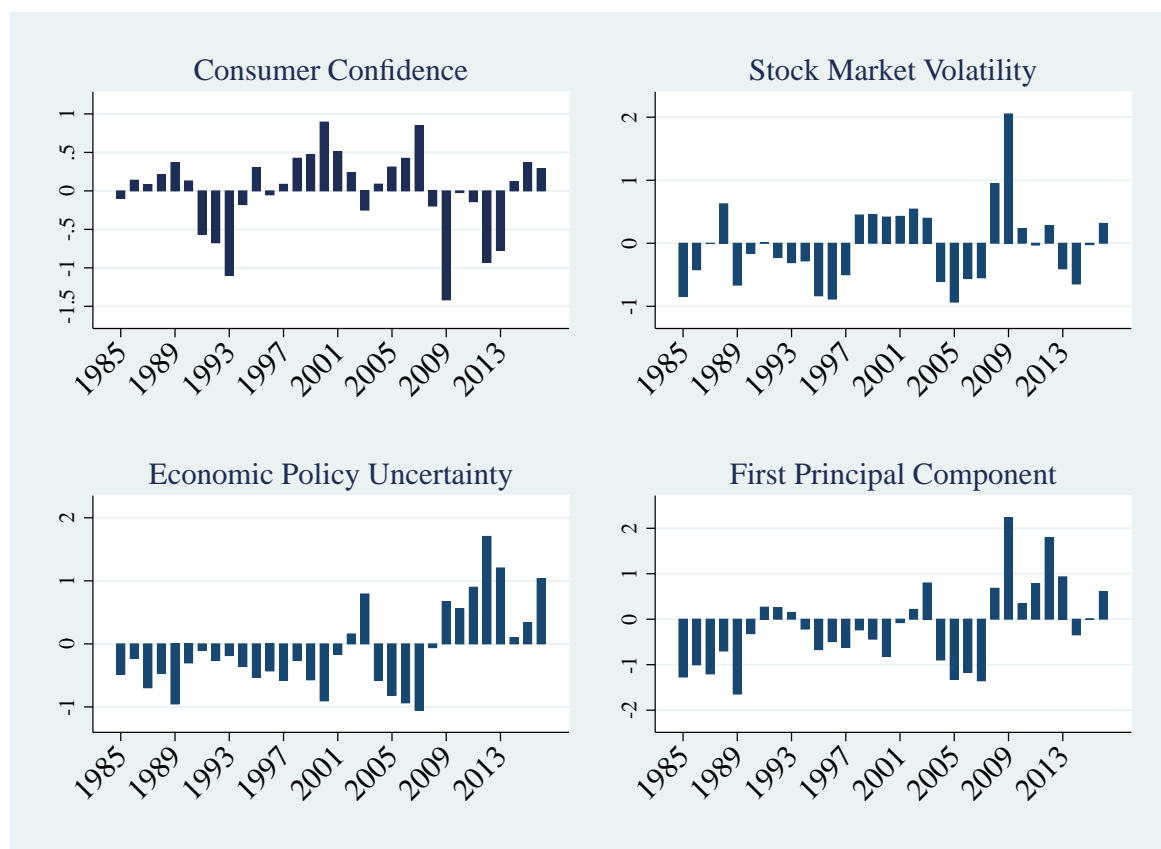


Figure 5: Yearly cross-country averages of sentiment proxies, 2000 - 2016

The Global Recession of the early 1990's is strongly reflected in consumer confidence between 1991 and 1994, likely a repercussion of the Savings and Loan Crisis in North America in the aftermath of the Black Monday of 1987. In contrast, the stock market remained calm in the 1980's and 1990's with only 1988 being a year with above-average volatility. Even though the Black Monday had been larger than the stock market crash of 1929, it was absorbed more effectively by the global economy. Hence, while consumers in the US and large parts of the western world suffered from the Savings and Loan Crisis, stock markets recovered more quickly. Economic Policy Uncertainty remained below its long-term average throughout the 1980's and 1990's.

The DotCom-Bubble is also reflected in consumer confidence, with both the boom phase (1997-2000) and the bust phase (2000-2003) visible in the data. It is noteworthy that, despite the clear bell-shaped movements, consumer confidence remained in above-average territory in all years except for 2003. At the same time, stock market volatility was at persistently elevated levels between 1998 and 2003, with no clear hump when the bubble burst in 2000. Thus, judging from this data, the DotCom-Bubble seems much less important than the Global Recession of the early 1990's and, to some extent, more contained in the stock market rather than in consumers' everyday-life. Economic Policy Uncertainty remained below its long-term average until 2001.

9/11 and the Second Gulf War were two global events, which, despite their direct link to the United States, may have influenced consumer confidence, stock market volatility, and certainly Economic Policy Uncertainty globally. With 9/11 representing a shock to the western perception of safety, the subsequent US-American invasion in 2003 can be seen as "the tip of the iceberg" (western world fears of threats posed by muslim extremism). Accordingly, Economic Policy Uncertainty started increasing in 2001 and peaked in 2003. As mentioned, consumer confidence also dropped into negative territory in 2003 and stock market volatility was in positive territory throughout 2001 to 2003.

The Global Financial Crisis. Similarly to the DotCom-Bubble, the boom and bust in consumer confidence likely related to the Global Financial Crisis can be seen clearly in the data. An important difference between the two events is, however, that the fall after the peak has been both much more rapid and much more persistent in 2008 than in 2000. Consumer confidence started rising in 2004 and kept doing so until 2007, where it reached its peak at almost 1 standard deviation above its long-term average (as it did in 2000). Consumer confidence then dropped dramatically from 2007 to 2008 by one standard deviation arriving below zero and once more from 2008 to 2009 by even more than one standard deviation reaching its lowest level since 1985. In contrast to the DotCom-Bubble, the Global Financial Crisis is also clearly visible in the stock market. In 2008 and 2009, volatility

reached unprecedented levels of one and two standard deviations above its long-term average, respectively. Economic Policy Uncertainty reacted with a slight lag, persistently staying in positive territory since 2009.

The European Sovereign Debt Crisis is reflected in consumer confidence, which, not fully recovered from the Global Financial Crisis and therefore still in negative territory, dropped again between 2010 and 2013 to one standard deviation below its long-term average. During these years, the stock market remained relatively calm, with volatility moving closely around zero. The European sovereign debt crisis, being a crisis of sovereign debt repayments, inevitably also lead to high Economic Policy Uncertainty across advanced economies (the Euro Area is a large part of our sample). Thus, Economic Policy Uncertainty remained at elevated levels since 2009 and peaked in 2012 at more than 1.5 standard deviations above its long-term average.

Recent years and Brexit. By 2014, the direct negative impact on market sentiment of the Global Financial Crisis and the subsequent European sovereign debt crisis seems to have worn out: consumer confidence, stock market volatility and Economic Policy Uncertainty were all at moderate levels close to zero. Since then, consumer confidence has improved slightly, stock market volatility has risen slightly and Economic Policy Uncertainty has peaked again in 2016 due to Brexit, which did not seem to have long-lasting repercussions on the other two measures on aggregate.

4 Stylized Facts

Since, to our knowledge, no paper before ours has conducted an analysis with a comparable time-country-coverage before, most of the findings in this section have not been documented so far. However, we sometimes compare our results to papers that only have results for fewer or individual countries.

4.1 Relatively low correlation between different sentiment indicators at country level

Figure 6 shows pairwise correlation coefficients of our sentiment proxies (except for business confidence) as the average of their correlations on a country level, where green corresponds to a correlation coefficient below 0.5, orange to a correlation coefficient between 0.5 and 0.7 and red to a correlation coefficient above 0.7 (in terms of absolute values). Overall, our sentiment proxies are fairly lowly correlated among each other.

Consumer Confidence. The consumer confidence index (CCI) is highly correlated with three of the series it is composed of, that is, expectations on the general economic situation (0.86), unemployment (0.89) and the financial situation (0.77), while it is only moderately correlated with its fourth component series, expectations on savings (0.60). It is noteworthy that those component series that are highly correlated with CCI, are also highly correlated among each other, i.e. consumers' expectations on the general economic situation co-move strongly with their expectations on unemployment and their own financial situation. Furthermore, inflation expectations are extremely lowly correlated with consumers' expectations on the general economic situation. Both observations suggest that consumers' perception of economic developments are rather driven by "personal circumstances" than by other factors such as inflation pertaining to the general economic situation, a point also made in ECB (2013). Interestingly, consumers' expectations on their savings and major purchases to be made are only moderately positively correlated with their expectations on their own financial situation (0.51 and 0.62, respectively). CCI is also positively correlated (0.61) with business confidence.

Stock Market volatility. The stock market variables are only lowly correlated with the consumer expectations variables, however, with the expected negative sign for stock market volatility (SMV) and absolute negative stock returns. Most strikingly, SMV and absolute negative stock returns are almost perfectly co-linear indicating that SMV essentially represents realized downside risk. SMV is only lowly negatively correlated with overall consumer and business confidence (-0.26

and -0.25, respectively).¹⁵

Economic Policy Uncertainty. The indicator of Economic Policy Uncertainty (EPU) is, on average, negatively correlated with consumer confidence. However, our estimate of -0.37 is in absolute terms considerably lower than the correlation Baker et al. (2015) find between EPU and the Michigan Consumer Sentiment index of -0.74 indicating that the link between EPU and CCI is higher in the US than in other advanced economies in our sample. EPU is also negatively correlated with business confidence (-0.27) and slightly less positively correlated with stock market volatility (0.33) than what Baker et al. (2015) find between EPU and the VIX (0.58), which could be interpreted in the same way. This relatively low correlation supports the notion of Economic Policy Uncertainty and stock market volatility representing different types of uncertainty, a point also stressed in Baker et al. (2015)), and may reconcile with Rossi et al. (2016), who find that Economic Policy Uncertainty rather reflects ex-ante uncertainty, while stock market volatility represents ex-post uncertainty.

¹⁵On a sidenote, Jansen and Nahuis (2003) find a positive correlation between consumer confidence and stock market returns for ten European countries (except Germany) between 1981 and 2001 with stock returns Granger causing consumer confidence but not vice versa.

	Consumer Confidence	Consumer Expectations on Economy	Consumer Expectations on Unemployment	Consumer Expectations on Financial Situation	Consumer Expectations on Savings	Consumer Expectations on Major Purchases	Consumer Expectations on Prices	Realized Stock Market Volatility	Absolute Negative Stock Returns	Skewness of Stock Returns	Economic Policy Uncertainty
Consumer Confidence	1,00	0,85	-0,84	0,80	0,24	0,34	0,09	-0,26	-0,20	-0,08	-0,19
Consumer Expectations on Economy	0,85	1,00	-0,78	0,64	0,16	0,07	-0,09	-0,26	-0,23	-0,11	-0,30
Consumer Expectations on Unemployment	-0,84	-0,78	1,00	-0,58	-0,05	-0,18	-0,18	0,21	0,14	0,06	0,25
Consumer Expectations on Financial Situation	0,80	0,64	-0,58	1,00	0,32	0,37	0,05	-0,23	-0,18	-0,10	-0,24
Consumer Expectations on Savings	0,24	0,16	-0,05	0,32	1,00	0,17	0,39	-0,17	-0,14	0,01	0,04
Consumer Expectations on Major Purchases	0,34	0,07	-0,18	0,37	0,17	1,00	0,16	-0,21	-0,18	-0,02	-0,04
Consumer Expectations on Prices	0,09	-0,09	-0,18	0,05	0,39	0,16	1,00	-0,08	-0,01	0,07	0,09
Realized Stock Market Volatility	-0,26	-0,26	0,21	-0,23	-0,17	-0,21	-0,08	1,00	0,97	0,38	0,20
Absolute Negative Stock Returns	-0,20	-0,23	-0,11	-0,10	-0,14	-0,18	-0,01	0,97	1,00	0,39	0,18
Skewness of Stock Returns	-0,08	-0,11	0,06	-0,10	0,01	-0,02	0,07	0,38	1,00	0,24	0,24
Economic Policy Uncertainty	-0,19	-0,30	0,25	-0,24	0,04	-0,04	0,09	0,20	0,18	0,24	1,00

Figure 6: Average country-level correlation across sentiment proxies (six-month moving averages); green: corr < 0.5, orange: corr \in [0.5,0.7], red: corr > 0.7 (all in terms of absolute values); monthly data, 1985-2016, 27 advanced countries.

4.2 Relatively high cross-country correlation of sentiment measures, especially for SMV and EPU

How global are the measures of economic sentiment? The average pairwise cross-country correlations of our market sentiment proxies are shown in Figure 7 (except for business confidence)¹⁶. While CCI has an average cross-country correlation of only 0.33, EPU and SMV show somewhat higher correlations of 0.65 and 0.63, respectively.¹⁷ The cross-country correlation of the first principal component of all three indicators (0.7) suggests that the latent common variation in market sentiment proxies exhibits stronger cross-country co-movement than the underlying market sentiment proxies themselves. This shows that economic sentiment not only has an important common factor on a country level but that this common factor seems to be driven by global shocks across advanced economies. We also report cross-country correlations of the other forward-looking consumer confidence series on prices, unemployment, major purchases, the financial situation, savings and the general economic situation. They are, on average, similarly lowly correlated across countries (coefficients below 0.5) as the composite consumer confidence index. In particular, movements in savings expectations seem to be detached from one country to another with a correlation coefficient of about 0.1. Business confidence is slightly higher correlated across countries (0.43) than consumer confidence.

¹⁶The Appendix provides a more granular view on the data. In particular, Figure 10 shows how correlated CCI is across countries in our sample, where light red refers to negative values, green corresponds to a correlation coefficient below 0.5, yellow to a correlation coefficient between 0.5 and 0.7 and dark red to a correlation coefficient above 0.7. The widespread green area indicates a low correlation on average. All negative correlations remain above -0.5 and there is no clear pattern regarding the few pairwise correlations above 0.7. The broad picture changes when looking at Figure 11, the heatmap of EPU, not only because we have data for much fewer countries but because widespread dark red and yellow areas are apparent, whereas green areas are the exception and there are no negative correlations. Hence, there seems to be strong co-movement in Economic Policy Uncertainty across our sample with the exception of Japan. A similar impression emerges when looking at Figure 12, the heatmap of SMV. With the exception of Greece, Korea and Slovenia, there is strong positive co-movement in realized stock market volatility across countries. Figure 13 shows that the first principal component (taken at a country level) of CCI, EPU and SMV is highly positively correlated across countries, for which it is available, with the exception of Korea.

¹⁷Strong cross-country correlation of stock market volatility is a well-documented finding in the literature (e.g. Kupiec and Studies (1991), Forbes and Rigobon (2002), Prasad et al. (2005)).

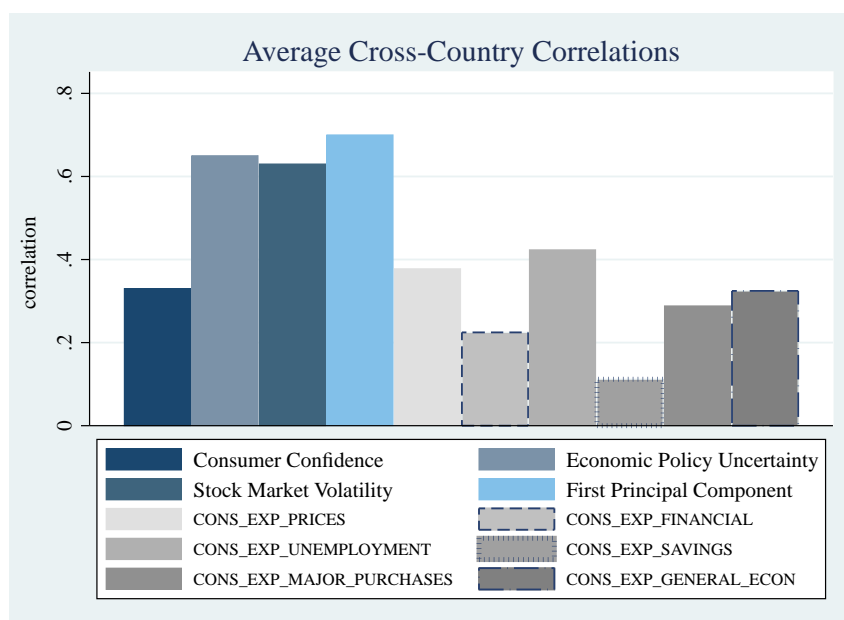


Figure 7: Average cross-country correlation of sentiment proxies; monthly data, 1985-2016, 27 countries.

4.3 Dynamic correlations of market sentiment indicators and macroeconomic and financial variables

4.3.1 Headline correlations

In Figure 8 we report the (cross) correlations between seven measures of economic activity (annual CPI inflation, annual industrial production growth, the unemployment rate, annual private credit growth, annual real house price growth, annual real appreciation with respect to major trading partners, and the short-term interest rate) and four main sentiment indicators, standardized series of the consumer confidence index (CCI), stock market volatility (SMV), Economic Policy Uncertainty (EPU) and the standardized first principal component (common factor) among these at country level. More precisely, the numbers shown are not exactly (cross) correlations but the coefficients of a panel regression for each economic activity variable on leads and lags of the sentiment indicator, controlling for time and country fixed effects. Each lead and lag is included individually in a separate regression; we consider up to 12 monthly leads and lags. Due to some large outliers, we exclude inflation observations if the absolute value exceeds 50% per year.

In the Figure, coefficients shown to the left of zero refer to the forward-looking correlation for each sentiment variable, i.e. the result of a regression of the economic activity variable on lags of the sentiment indicator. For example, regressing inflation in month t on CCI in $t-6$ will tell us whether CCI has leading indicator properties for inflation 6 months ahead. As noted, observe that we are not making causality statements here. Clearly, causality can run both from sentiment to economic activity and the other way around. Moreover, we are not claiming the absence of a third factor driving both sentiment and economic activity. Still, it is useful to see what the evidence suggests in terms of correlation, before moving to a more structural analysis.

Quantitatively, the coefficients should be interpreted as follows. Suppose that we find the coefficient for unemployment on CCI to be -0.1 ; this implies that a rise in CCI by one standard deviation above its trend is associated with a fall in unemployment by 0.1% . Note that for most variables, we use delta logs and not percentages. Therefore, for example, for inflation and CCI, a coefficient of 0.1 would be associated with an inflation rise by 10% . Turning to the results, we find that, predictably, correlations switch signs between CCI and the other variables.

Consumer confidence is positively associated with future inflation, past and contemporaneous industrial production growth, overall real house price growth (though most strongly contemporaneously), and contemporaneous and future real appreciation. It is negatively associated with contemporaneous and future unemployment and past short-term interest rates. From the point of view of sentiment, most coefficients peak either contemporaneously or leading economic developments, while they tend to be lower when lagging economic developments. This evidence may suggest that consumer confidence is, on balance, rather a leading than a lagging indicator of the business cycle, which in turn suggests that it might play an active (or at least a forecast-performance-enhancing) role in it.¹⁸ The correlations we observe are economically significant. For instance, a rise in CCI by

¹⁸This notion has already been stressed by a string of literature including Garner (1991), Carroll et al. (1994), Santero and Westerlund (1996), Golinelli and Parigi (2004), and Vuchelen (2004).

one standard deviation above its long-term average is preceded by a 3% drop in the short-term rate eight to twelve months before the increase and an increase in industrial production growth by about 1.5% six months before the increase. It is also associated with a rise in inflation of about 0.4% one year after the increase, an instantaneous one-percent drop in the unemployment rate, a rise of 2.5% in credit growth 12 months after the increase, a contemporaneous 4% increase in real house price growth, and a real appreciation of 1% about three months after the increase.

SMV and EPU. The coefficients for the other two sentiment variables are generally surrounded by more uncertainty. SMV is largely the mirror image of CCI, but the correlations with macro variables are generally less tight and EPU has the lowest and least consistent correlations with macroeconomic and financial variables. There are, however, some interesting characteristics. For instance, both EPU and SMV are associated with real depreciation, but surprisingly with higher, not lower, industrial production growth.¹⁹ Only SMV, but not EPU, is associated with lower credit and real house price growth, and higher past short-term rates. A rise in SMV by one standard deviation above its long-term average is associated with a drop in short-term rates by about 0.1% twelve months after the increase, while a rise in EPU by one standard deviation above its long-term trend is associated with a drop of 0.4% twelve months after the increase. The reaction of unemployment to such an increase is hardly significant in the case of EPU at any point, whereas it rises by about 1.3% 12 months after the increase in the case of SMV. An interpretation for this could be the notion that policy uncertainty may affect firms both positively or negatively, while stock market volatility may be rather a symptom of an economic re-adjustment process, during which the natural rate of unemployment is higher, or simply a symptom of a recession. Inflation is not meaningfully affected by EPU, while future inflation is negatively associated with SMV.²⁰

¹⁹In contrast to this, Baker et al. (2015) find that EPU precedes drops in output, investment and employment in a Panel VAR setting for 12 major economies. Additionally, Karnizova and Li (2014) find EPU to be a performance-enhancing predictor of future US recessions at the longer forecast horizons of six to nine quarters ahead.

²⁰Our findings are at odds with Engle et al. (2013) who find that inflation and industrial production growth contain useful information for future stock market volatility.

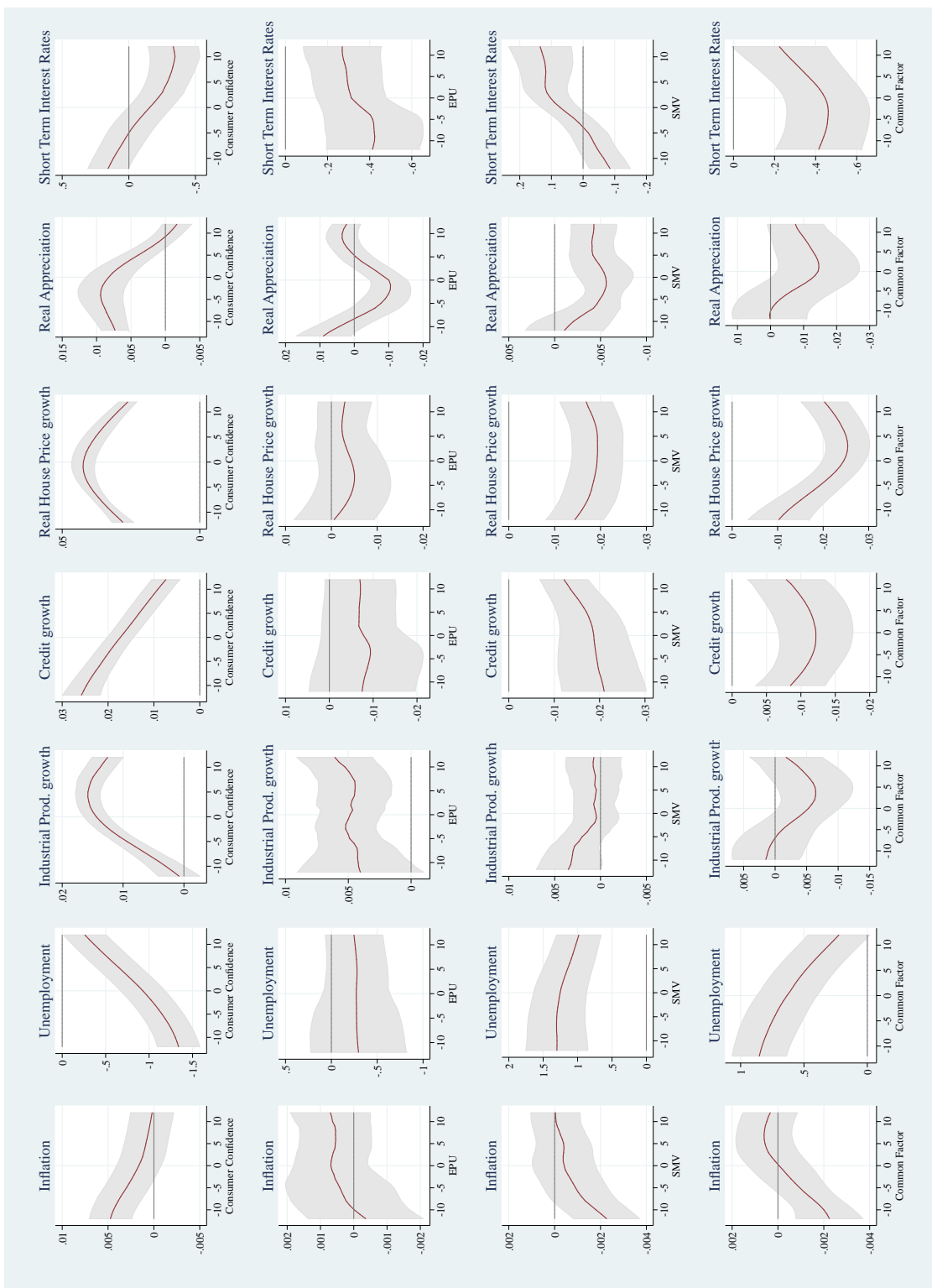


Figure 8: **Cross correlations of sentiment proxies and macroeconomic as well as financial variables.** In each chart, we report the coefficient of a panel regression of the variable indicated at the top (e.g., inflation in the top left chart) on monthly leads and lags (both up to 12) of the variable indicated at the bottom (e.g., consumer confidence in the top left chart). We run the panel regression on monthly data for up to 27 countries, in the sample period 1985M1-2016M10 (where possible), and also include time and country fixed effects. The error bands are within one standard error.

Common factor. Looking at the common factor (last row of Figure 8), which can be interpreted as an overall measure of (weak) economic sentiment or uncertainty, we find that its correlations are largely the mirror image of those of CCI. For instance, it is negatively correlated with (mostly future) inflation and the short-term rate, with (mostly contemporaneously) industrial production, credit, real house price and real exchange rate growth, and positively with (mostly future) unemployment. Again, the peak correlations are either contemporaneous or future-oriented, suggesting that also this common factor does appear to be a leading indicator of the cycle.

4.3.2 Booms and Busts

Conceivably, the relationship between economic sentiment and macroeconomic variables could be non-linear (ECB (2013)). The relationship could be more blurred for normal fluctuations of the sentiment indicators, but be more visible or only visible for extreme values of sentiment, e.g. in booms or busts. This is what Figure 9 purports to show. It reports the impulse responses already shown in Figure 8 (black) with impulse responses derived from a regression on a categorical variable taking a value of 1 if the (six-month moving average)²¹ of the sentiment indicator is at least 2 standard deviations above the mean, and -1 if it is more than 2 standard deviations below the mean, i.e. a variable capturing booms and busts in the sentiment variables (red). So it is a comparison between “normal” and “extreme” developments of sentiment.

It is quite clear from Figure 9 that not much is gained by looking at extreme episodes only. Correlations are often larger in absolute value for the red lines but the difference is not always statistically significant. In most cases the sign is the same, but not always.

²¹We take a moving average to smooth out very short term fluctuations in the sentiment indicator that are likely not a manifestation of an underlying trend.

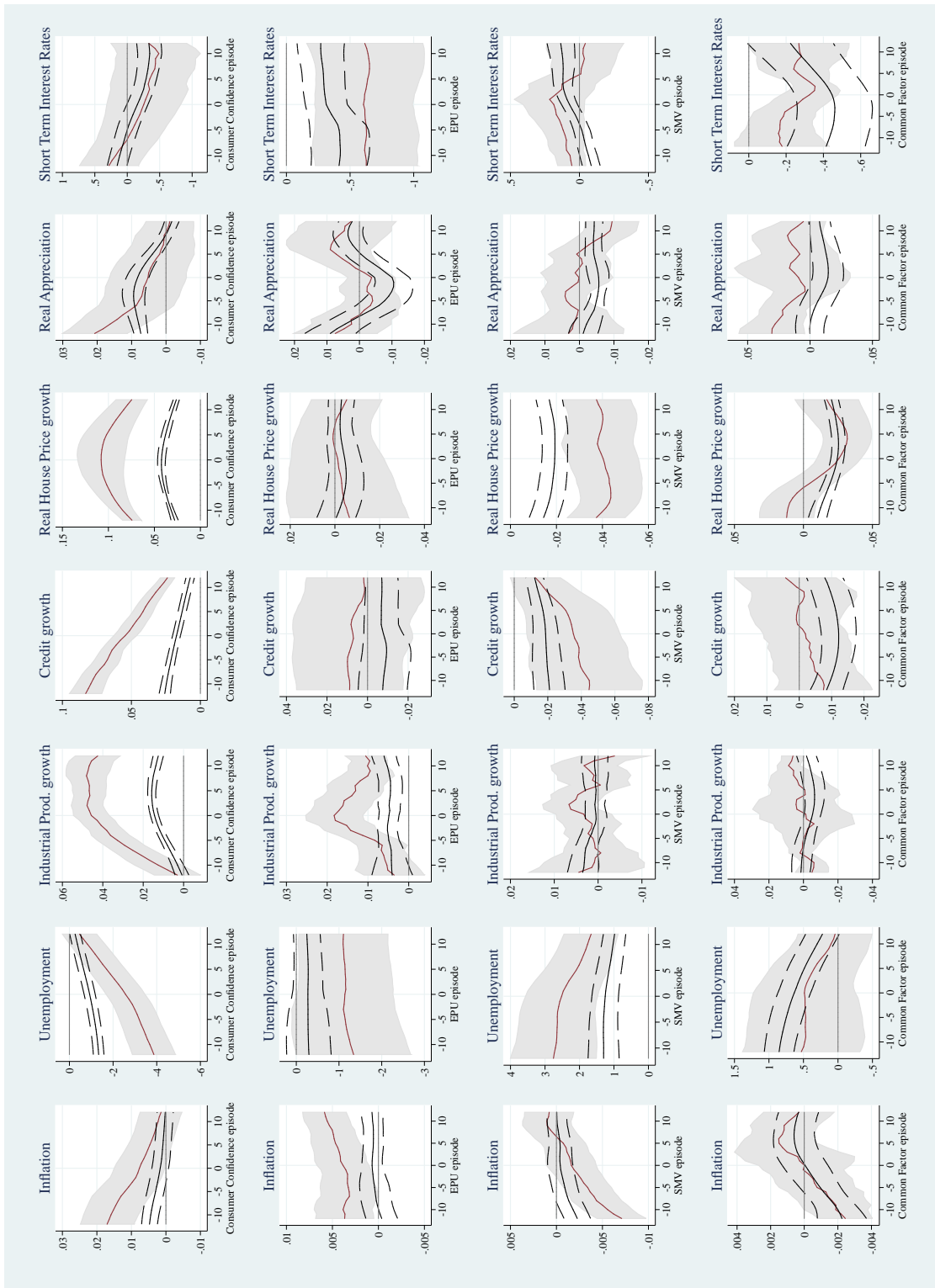


Figure 9: Cross correlations of booms and busts in economic sentiment and macroeconomic as well as financial variables. In each chart, we report the coefficient of a panel regression of the variable indicated at the top (e.g., inflation in the top left chart) on monthly leads and lags (both up to 12) of the variable indicated at the bottom (e.g., consumer confidence in the top left chart). We run the panel regression on monthly data for up to 27 countries, in the sample period 1985M1-2016M10 (where possible), and also include time and country fixed effects. The error bands are within one standard error.

Consumer confidence is more positively related to inflation, industrial production growth, credit growth and real house price growth and more negatively related to unemployment, while there is no meaningful change in the relationship with short-term rates and the real effective exchange rate. Quantitatively, the differences are somewhat substantial for future inflation (+1 percentage point (pp)), future unemployment (-2 pp), past industrial production growth (+2 pp), future credit growth (5 pp), and overall real house price growth (5 pp).

SMV and EPU also show some interesting dynamics in response to extreme sentiment episodes. For instance, inflation reacts negatively to EPU, while it reacts positively to SMV, a difference which was not clear when looking at levels. Similarly, the opposite reaction of unemployment to EPU (negative) and SMV (positive) is more pronounced. Surprisingly, industrial production growth is even more positively associated with EPU than when looking only at levels. Similarly, real house price growth shows a stronger negative relationship with SMV than when looking only at levels.

The common factor exhibits very similar relationships with macro variables when looking at episodes rather than levels.

5 Conclusions

The objective of this paper is to review the role of economic sentiment as a potential driver of the business cycle. Our contribution has been threefold. First, we thoroughly reviewed three potential transmission mechanisms of sentiments to the real economy: irrational animal spirits, self-fulfilling animal spirits, and news. We also made some theoretical conjectures of how two components of sentiment, confidence and uncertainty, may affect the business cycle in a different way and provided an extensive literature survey covering relevant empirical and theoretical research on both subjects. Second, we built an international database of economic sentiment, a panel of 27 advanced countries from January 1985 to October 2016 at monthly frequency, covering a wide range of commonly used sentiment measures including survey-based consumer and business confidence, news-based Economic

Policy Uncertainty, stock market volatility, as well as a first principal component of a subset on a country level. We also reconciled large movements in the sentiment measures (cross-country averages over time) with major (geo-)political and economic events. Third, we provided a set of stylized facts, of which the main ones are that (i) while different measures are surprisingly lowly correlated on average in each country, they are typically highly positively correlated across countries, suggesting the existence of a global factor; (ii) consumer confidence has the closest co-movement with economic and financial variables, and (iii) most of the peak correlations between sentiment and macroeconomic variables are contemporaneous or forward-looking, consistent with (though not necessarily explained by) the view that economic sentiment is indeed potentially a driver of activity.

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Appendix: data

Table 3: Summary Statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
<i>Sentiment</i>					
Consumer confidence	8525	0	1	-3.03	2.67
Business confidence	9123	0	1	-4.17	3.33
Exp.* on general economic situation	5973	0	1	-3.1	2.99
Exp.* on major purchases	5966	0	1	-3.65	2.69
Exp.* on savings	5023	0	1	-4.08	2.69
Exp.* on unemployment	6068	0	1	-2.47	2.98
Exp.* on financial situation	5091	0	1	-3.6	2.49
Exp.* on prices	6475	0	1	-4.14	2.98
Stock market volatility	7706	0	1	-2	5.61
Stock return skewness	7706	0	1	-3.55	3.79
Absolute negative stock returns	7712	0	1	-1.72	5.9
Economic Policy Uncertainty	3056	0	1	-1.82	4.92
First principal component	2827	0	1.31	-2.72	6.03
<i>Macro-financial</i>					
Long-term rates	8553	5.51	3.25	-0.54	29.51
Short-term rates	8581	4.48	4.06	-0.85	67.23
Stock market returns	5489	0	0.01	-0.08	0.12
Bank stock volatility	7529	0	1	-1.69	6.03
LN(Credit)	9330	13.39	2.58	6.56	21.55
Real house prices	8486	0.85	0.28	0.26	1.98
CPI	9289	81.4	21.12	0	113.6
Industrial production	8784	90.6	21.76	14.7	189.3
Retail sales	8485	0.18	2.06	-21.6	19.4
Unemployment	8513	7.81	4.14	1.3	27.9
<i>Trade</i>					
REER	9838	98.32	13.4	46.9	150.33
Net Trade	9740	-0.84	9.31	-76.03	28.41
LN(Portfolio assets)	6616	7.97	2.27	-3.4	12.36
LN(Portfolio liabilities)	6543	8.29	2.21	-3.4	12.88
Portfolio net flows	8122	0	0.01	-0.18	0.12

Variable	Observations	Mean	Std. Dev.	Min	Max
<i>Global controls</i>					
VIX	8667	19.73	7.65	10.31	68.51
Oil Price	10314	43.33	33.42	9.5	141.37
Geopolitical risk	10233	84.08	47.44	33.83	393.1
Geopolitical risk Threats	10233	86.12	48.91	27.03	380.09
Geopolitical risk Acts	10233	77.35	63.68	19.23	492.5

*Consumer expectations over the next 12 months.

Table 4: List of variables - Definitions, Coverage and Sources

Name	Description	Source	Coverage	Range*	Frequ.
Consumer confidence	Harmonized consumer confidence index, based on consumers expectations over the next 12 months on the general economic situation, the household's financial situation and savings, and unemployment (inverted sign)	OECD MEI	Full sample without NOR	1985-2016	M
Economic Policy Uncertainty	Newspaper-based Economic Policy Uncertainty index	Baker et al.	AUS, CAN, DEU, ESP, FRA, GBR, ITA, JPN, KOR, NLD, USA.	1985-2016	M
Stock market volatility	Realized stock market volatility, based on realized variance of daily stock returns within the month	Bloomberg/MSCI and own calculations	Full sample without SVK	1985-2016	M

Name	Description	Source	Coverage	Range*	Frequ.
First Principal Component	First principal component of consumer confidence, Economic Policy Uncertainty and stock market volatility	Own computations	AUS, CAN, DEU, ESP, FRA, GBR, ITA, JPN, KOR, NLD, USA.	1985-2016	M
Exp.** on general economic situation	Consumer expectations on general economic situation over the upcoming 12 months	European Commission BCS	Full sample except CAN, CHE, CZE, GRC, JPN, KOR, NOR, NZL.	1985-2016	M
Exp.** on financial situation	Consumer expectations on financial situation over the upcoming 12 months	European Commission BCS	Full sample except AUS, CAN, CHE, CZE, DNK, GRC, JPN, KOR, NOR, NZL, USA.	1985-2016	M
Exp.** on unemployment	Consumer expectations on unemployment over the upcoming 12 months	European Commission BCS	Full sample except AUS, CAN, CHE, JPN, KOR, NOR, NZL, USA.	1985-2016	M
Exp.** on prices	Consumer expectations on price developments over the upcoming 12 months	European Commission BCS	Full sample except CAN, CHE, IRL, JPN, KOR, NOR, NZL.	1985-2016	M
Exp.** on major purchases	Consumer expectations on major purchases to be made over upcoming 12 months	European Commission BCS	Full sample except AUS, CAN, CHE, IRL, JPN, KOR, NOR, NZL, USA.	1985-2016	M

Name	Description	Source	Coverage	Range*	Frequ.
Exp.** on savings	Consumer expectations on savings over upcoming 12 months	European Commission BCS	Full sample except AUS, CAN, CHE, IRL, JPN, KOR, NOR, NZL, PRT, SVN, USA.	1985-2016	M
Business confidence	Harmonized business confidence index, based on companies' expectations over the next 12 months on production expectations, order books and stocks of finished products (inverted sign)	OECD MEI	Full sample	1985-2016	M
Stock return skewness	Realized stock market skewness, based on realized skewness of daily stock returns within the month	Bloomberg/MSCI, Datastream and own calculations	Full sample without SVK	1985-2016	M
Absolute negative stock returns	Realized absolute negative stock market returns	Bloomberg/MSCI, Datastream and own calculations	Full sample without SVK	1985-2016	M
Geopolitical risk (Threats/Acts)	Index of geopolitical risk	Available online	global	1985-2016	M
Industrial production	Industrial production, seasonally adjusted, 2010 = 100	OECD MEI/Haver Analytics	Full sample except AUS, CHE, NZL.	1985-2016	M
Retail sales	Retail Sales Volume (SA, Prev. Period % Change)	OECD MEI/Haver Analytics	Full sample except AUS, NZL.	1985-2016	M
CPI	Consumer Price Index (SA, 2010=100)	OECD MEI/Haver Analytics	Full sample except AUS, NZL.	1985-2016	M

Name	Description	Source	Coverage	Range*	Frequ.
Unemployment rate	Unemployment Rate (SA, %)	OECD MEI/Haver Analytics	Full sample except CHE, NZL.	1985-2016	M
Short-term rates	3-month interbank lending rates (%)	Reuters/Datastream	Full sample except ESP	1985-2016	M
Long-term rates	Long-Term Treasury Bond Yields (EOP, % per annum)	Reuters/Datastream	Full sample except EST	1985-2016	M
Credit	Bank Credit, claims on priv. sector (EOP, mln LCU)	IMF IFS (new presentation) starting in 2003 and extrapolated backwards using lin. interpolated quarterly BIS/national source data.	Full sample	1985-2016	M (partly lin. interpolated from Q)
Stock market returns	Stock Market Returns (EoP)	Bloomberg/MSCI and own calculations	Full sample without SVK	1985-2016	M
Bank stock returns	Realized Bank Stock Volatility	Reuters/Datastream	Full sample except EST, FIN, LUX, NZL, SVK, SVN.	1985-2016	M
Real house prices	Real House Price Index, CPI deflated (SA, 1995/2010=100)	OECD MEI/BIS/own computations	Full sample	1985-2016	M (lin. interpolated from Q)
Net trade	Net trade balance (bln USD)	OECD MEI	Full sample	1985-2016	M

Name	Description	Source	Coverage	Range	Frequ.	
REER	Real effective exchange rate (2010=100)	OECD MEI	Full sample	1985-2016	M	
Portfolio assets	Portfolio Investment Assets (mln USD)	IMF (BoP)	IFS	Full sample	1985-2016	M
Portfolio liabilities	Portfolio Investment Liabilities (mln USD)	IMF (BoP)	IFS	Full sample	1985-2016	M
Portfolio net flows	Net flows (mln USD)	IMF (BoP), own computations	IFS	Full sample	1985-2016	M
VIX	CBOE Implied Volatility Index of the S&P 500 Index Options	Datastream/CBOE	global	1990-2016	M	
Oil price	Brent Crude Oil Current Month Free on Board Price (USD/barrel)	Datastream/ICIS Pricing	global	1985-2016	M	

*Longest available.

**Consumer expectations over the next 12 months.

Appendix: figures

	AUS	AUT	BEL	CAN	CHE	CZE	DEU	DNK	ESP	EST	FIN	FRA	GBR	GRC	IRL	ITA	JPN	KOR	LUX	NLD	NZL	PRT	SVK	SVN	SWE	USA
AUS	1,0	-0,1	0,1	0,4	0,4	0,0	-0,1	0,6	0,2	0,3	0,7	0,3	0,4	0,0	0,2	0,0	-0,1	0,3	0,4	0,1	0,7	-0,4	0,0	0,2	0,2	0,3
AUT	-0,1	1,0	0,6	0,2	0,4	0,1	0,4	-0,2	0,2	0,6	-0,1	0,5	-0,2	0,4	0,1	0,2	0,4	0,2	0,6	0,4	-0,2	0,2	0,1	0,4	0,6	0,1
BEL	0,1	0,6	1,0	0,2	0,5	0,0	0,6	0,2	0,7	0,6	0,4	0,9	0,4	0,2	0,5	0,6	0,1	0,1	0,9	0,7	-0,1	0,4	0,0	0,6	0,6	0,4
CAN	0,4	0,2	0,2	1,0	0,7	0,1	0,3	-0,1	0,4	0,6	0,6	0,4	0,5	0,4	0,1	0,3	0,3	0,1	0,7	0,3	0,2	0,2	0,2	0,5	0,4	0,5
CHE	0,4	0,4	0,5	0,7	1,0	0,0	0,6	0,3	0,5	0,7	0,7	0,7	0,4	0,2	0,3	0,3	0,1	0,2	0,6	0,5	0,3	0,0	0,2	0,4	0,7	0,5
CZE	0,0	0,1	0,0	0,1	0,0	1,0	0,1	0,5	0,1	0,5	0,0	0,1	0,3	-0,1	0,0	0,3	0,3	-0,1	0,5	0,0	0,3	0,2	0,8	0,6	0,1	-0,2
DEU	-0,1	0,4	0,6	0,3	0,6	0,1	1,0	0,1	0,4	0,6	0,3	0,6	0,1	-0,1	0,2	0,3	0,2	0,3	0,4	0,4	-0,2	0,2	0,3	0,2	0,7	0,1
DNK	0,6	-0,2	0,2	-0,1	0,3	0,5	0,1	1,0	0,2	0,8	0,7	0,3	0,4	-0,3	0,4	0,0	-0,3	0,3	0,4	0,2	0,6	-0,4	0,6	0,4	0,5	0,1
ESP	0,2	0,2	0,7	0,4	0,5	0,1	0,4	0,2	1,0	0,5	0,4	0,7	0,7	0,4	0,8	0,8	0,3	0,2	0,7	0,8	0,1	0,6	0,1	0,6	0,2	0,8
EST	0,3	0,6	0,6	0,6	0,7	0,5	0,6	0,8	0,5	1,0	0,6	0,6	0,5	0,1	0,5	0,3	0,7	0,2	0,5	0,6	0,3	0,2	0,6	0,4	0,6	0,5
FIN	0,7	-0,1	0,4	0,6	0,7	0,0	0,3	0,7	0,4	0,6	1,0	0,5	0,6	0,0	0,4	0,3	-0,2	0,3	0,7	0,5	0,5	-0,2	0,2	0,5	0,5	0,4
FRA	0,3	0,5	0,9	0,4	0,7	0,1	0,6	0,3	0,7	0,6	0,5	1,0	0,4	0,3	0,5	0,5	0,2	0,1	0,8	0,7	0,1	0,3	0,2	0,6	0,6	0,5
GBR	0,4	-0,2	0,4	0,5	0,4	0,3	0,1	0,4	0,7	0,5	0,6	0,4	1,0	0,2	0,6	0,6	0,1	0,2	0,5	0,5	0,4	0,4	0,3	0,6	0,2	0,6
GRC	0,0	0,4	0,2	0,4	0,2	0,1	-0,1	-0,3	0,4	0,1	0,0	0,3	0,2	1,0	0,2	0,5	0,4	-0,1	0,4	0,5	0,1	0,6	-0,1	0,6	-0,1	0,6
IRL	0,2	0,1	0,5	0,1	0,3	0,0	0,2	0,4	0,8	0,5	0,4	0,5	0,6	0,2	1,0	0,6	0,2	0,1	0,4	0,7	0,2	0,4	0,2	0,5	0,1	0,8
ITA	0,0	0,2	0,6	0,3	0,3	0,3	0,0	0,8	0,3	0,3	0,3	0,5	0,6	0,5	0,6	1,0	0,2	0,1	0,5	0,7	0,1	0,7	0,0	0,6	0,0	0,6
JPN	-0,1	0,4	0,1	0,3	0,1	0,3	0,2	-0,3	0,3	0,7	-0,2	0,2	0,1	0,4	0,2	0,2	1,0	0,1	0,3	0,2	-0,1	0,5	0,4	0,3	0,3	0,3
KOR	0,3	0,2	0,1	0,1	0,2	-0,1	0,3	0,3	0,2	0,2	0,3	0,1	0,2	-0,1	0,1	0,1	0,1	1,0	0,1	0,2	0,2	0,1	-0,1	-0,2	0,6	0,0
LUX	0,4	0,6	0,9	0,7	0,6	0,5	0,4	0,4	0,7	0,5	0,7	0,8	0,5	0,4	0,4	0,5	0,3	0,1	1,0	0,7	0,3	0,4	0,5	0,7	0,4	0,5
NLD	0,1	0,4	0,7	0,3	0,5	0,0	0,4	0,2	0,8	0,6	0,5	0,7	0,5	0,5	0,7	0,7	0,2	0,2	0,7	1,0	0,0	0,6	0,3	0,6	0,3	0,7
NZL	0,7	-0,2	-0,1	0,2	0,3	0,3	-0,2	0,6	0,1	0,3	0,5	0,1	0,4	0,1	0,2	0,1	-0,1	0,2	0,3	0,0	1,0	-0,3	0,0	0,2	0,0	0,3
PRT	-0,4	0,2	0,4	0,2	0,0	0,2	0,2	-0,4	0,6	0,2	-0,2	0,3	0,4	0,6	0,4	0,7	0,5	0,1	0,4	0,6	-0,3	1,0	0,3	0,6	0,1	0,5
SVK	0,0	0,1	0,0	0,2	0,2	0,8	0,3	0,6	0,1	0,6	0,2	0,2	0,3	-0,1	0,2	0,0	0,4	-0,1	0,5	0,3	0,0	0,3	1,0	0,4	0,2	-0,1
SVN	0,2	0,4	0,6	0,5	0,4	0,6	0,2	0,4	0,6	0,4	0,5	0,6	0,6	0,6	0,5	0,6	0,3	-0,2	0,7	0,6	0,2	0,6	0,4	1,0	0,1	0,5
SWE	0,2	0,6	0,6	0,4	0,7	0,1	0,7	0,5	0,2	0,6	0,5	0,6	0,2	-0,1	0,1	0,0	0,3	0,6	0,4	0,3	0,0	0,1	0,2	0,1	1,0	0,0
USA	0,3	0,1	0,4	0,5	0,5	-0,2	0,1	0,1	0,8	0,5	0,4	0,5	0,6	0,6	0,8	0,6	0,3	0,0	0,5	0,7	0,3	0,5	-0,1	0,5	0,0	1,0

Figure 10: Heatmap of cross-country correlations of Consumer Confidence

	AUS	CAN	DEU	ESP	FRA	GBR	ITA	JPN	KOR	NLD	USA
AUS	1,0	0,8	0,8	0,6	0,6	0,6	0,7	0,7	0,7	0,8	0,9
CAN	0,8	1,0	0,8	0,5	0,8	0,8	0,7	0,5	0,6	0,8	0,7
DEU	0,8	0,8	1,0	0,6	0,8	0,8	0,6	0,4	0,7	0,6	0,8
ESP	0,6	0,5	0,6	1,0	0,5	0,5	0,6	0,6	0,6	0,5	0,7
FRA	0,6	0,8	0,8	0,5	1,0	0,9	0,6	0,3	0,6	0,6	0,6
GBR	0,6	0,8	0,8	0,5	0,9	1,0	0,5	0,5	0,6	0,5	0,6
ITA	0,7	0,7	0,6	0,6	0,6	0,5	1,0	0,4	0,5	0,8	0,7
JPN	0,7	0,5	0,4	0,6	0,3	0,5	0,4	1,0	0,5	0,7	0,6
KOR	0,7	0,6	0,7	0,6	0,6	0,6	0,5	0,5	1,0	0,7	0,7
NLD	0,8	0,8	0,6	0,5	0,6	0,5	0,8	0,7	0,7	1,0	0,8
USA	0,9	0,7	0,8	0,7	0,6	0,6	0,7	0,6	0,7	0,8	1,0

Figure 11: Heatmap of cross-country correlations of Economic Policy Uncertainty

	AUS	AUT	BEL	CAN	CHE	CZE	DEU	DNK	ESP	EST	FIN	FRA	GBR	GRC	IRL	ITA	JPN	KOR	LUX	NLD	NOR	NZL	PRT	SVN	SWE	USA
AUS	1,0	0,9	0,8	0,7	0,7	0,7	0,6	0,7	0,7	0,7	0,3	0,7	0,8	0,4	0,9	0,7	0,7	0,3	0,6	0,6	0,8	0,7	0,7	0,4	0,6	0,8
AUT	0,9	1,0	0,7	0,7	0,6	0,6	0,6	0,8	0,7	0,8	0,2	0,7	0,7	0,6	0,9	0,8	0,7	0,2	0,5	0,6	0,9	0,5	0,7	0,4	0,6	0,7
BEL	0,8	0,7	1,0	0,7	0,9	0,7	0,9	0,9	0,8	0,6	0,5	0,9	0,9	0,3	0,8	0,8	0,7	0,4	0,6	0,9	0,8	0,5	0,8	0,5	0,8	0,9
CAN	0,7	0,7	0,7	1,0	0,7	0,9	0,7	0,8	0,7	0,7	0,7	0,8	0,8	0,2	0,8	0,6	0,6	0,6	0,7	0,6	0,7	0,5	0,6	0,6	0,8	0,9
CHE	0,7	0,6	0,9	0,7	1,0	0,7	0,9	0,8	0,8	0,5	0,6	0,9	0,9	0,2	0,7	0,7	0,5	0,5	1,0	0,7	0,6	0,7	0,5	0,7	0,8	0,9
CZE	0,7	0,6	0,7	0,9	0,7	1,0	0,7	0,8	0,6	0,6	0,6	0,7	0,8	0,1	0,7	0,5	0,7	0,6	0,6	0,7	0,8	0,7	0,5	0,7	0,8	0,8
DEU	0,6	0,6	0,9	0,7	0,9	0,7	1,0	0,8	0,8	0,5	0,7	1,0	0,9	0,2	0,6	0,8	0,6	0,6	0,5	1,0	0,7	0,6	0,7	0,4	0,9	0,9
DNK	0,7	0,8	0,9	0,8	0,8	0,8	0,8	1,0	0,9	0,7	0,5	0,9	0,9	0,4	0,9	0,8	0,7	0,5	0,7	0,8	0,8	0,4	0,8	0,4	0,8	0,8
ESP	0,7	0,7	0,8	0,7	0,8	0,6	0,8	0,9	1,0	0,6	0,5	0,9	0,9	0,5	0,8	0,9	0,7	0,4	0,5	0,8	0,7	0,6	0,8	0,3	0,8	0,8
EST	0,7	0,8	0,6	0,7	0,5	0,6	0,5	0,7	0,6	1,0	0,5	0,6	0,7	0,3	0,8	0,5	0,5	0,5	0,7	0,6	0,7	0,7	0,5	0,3	0,7	0,7
FIN	0,3	0,2	0,5	0,7	0,6	0,6	0,7	0,5	0,5	0,5	1,0	0,6	0,6	0,0	0,3	0,4	0,4	0,7	0,6	0,6	0,3	0,6	0,3	0,6	0,9	0,7
FRA	0,7	0,7	0,9	0,8	0,9	0,7	1,0	0,9	0,9	0,6	0,6	1,0	1,0	0,3	0,8	0,8	0,7	0,5	0,6	0,9	0,8	0,6	0,7	0,4	0,9	0,9
GBR	0,8	0,7	0,9	0,8	0,9	0,8	0,9	0,9	0,9	0,7	0,6	1,0	1,0	0,3	0,8	0,8	0,7	0,5	0,6	0,9	0,8	0,5	0,7	0,5	0,9	0,9
GRC	0,4	0,6	0,3	0,2	0,2	0,1	0,2	0,4	0,5	0,3	0,0	0,3	0,3	1,0	0,5	0,7	0,3	-0,1	0,3	0,2	0,3	0,3	0,8	-0,2	0,2	0,3
IRL	0,9	0,9	0,8	0,8	0,7	0,7	0,6	0,9	0,8	0,8	0,3	0,8	0,8	0,5	1,0	0,7	0,8	0,2	0,6	0,7	0,9	0,5	0,7	0,5	0,7	0,8
ITA	0,7	0,8	0,8	0,6	0,7	0,5	0,8	0,8	0,9	0,5	0,4	0,8	0,8	0,7	0,7	1,0	0,6	0,3	0,5	0,8	0,7	0,6	0,9	0,2	0,6	0,7
JPN	0,7	0,7	0,7	0,6	0,7	0,7	0,6	0,7	0,7	0,5	0,4	0,7	0,7	0,3	0,8	0,6	1,0	0,4	0,5	0,7	0,7	0,5	0,6	0,5	0,6	0,7
KOR	0,3	0,2	0,4	0,6	0,5	0,6	0,6	0,5	0,4	0,5	0,7	0,5	0,5	-0,1	0,2	0,3	0,4	1,0	0,3	0,5	0,4	0,6	0,3	0,7	0,7	0,5
LUX	0,6	0,5	0,6	0,7	0,5	0,6	0,5	0,7	0,5	0,7	0,6	0,6	0,6	0,3	0,6	0,5	0,5	0,3	1,0	0,5	0,5	0,4	0,5	0,2	0,7	0,6
NLD	0,6	0,6	0,9	0,6	1,0	0,7	1,0	0,8	0,8	0,6	0,6	0,9	0,9	0,2	0,7	0,8	0,7	0,5	0,5	1,0	0,7	0,6	0,7	0,5	0,8	0,9
NOR	0,8	0,9	0,8	0,7	0,7	0,8	0,7	0,8	0,7	0,7	0,3	0,8	0,8	0,3	0,9	0,7	0,7	0,4	0,5	0,7	1,0	0,6	0,6	0,5	0,7	0,8
NZL	0,7	0,5	0,5	0,5	0,6	0,7	0,6	0,4	0,6	0,7	0,6	0,6	0,5	0,3	0,5	0,6	0,5	0,6	0,4	0,6	0,6	1,0	0,5	0,5	0,5	0,6
PRT	0,7	0,7	0,8	0,6	0,7	0,5	0,7	0,8	0,8	0,5	0,3	0,7	0,7	0,8	0,7	0,9	0,6	0,3	0,5	0,7	0,6	0,5	1,0	0,2	0,6	0,7
SVN	0,4	0,4	0,5	0,6	0,5	0,7	0,4	0,4	0,3	0,3	0,6	0,4	0,5	-0,2	0,5	0,2	0,5	0,7	0,2	0,5	0,5	0,5	0,2	1,0	0,6	0,6
SWE	0,6	0,6	0,8	0,8	0,8	0,8	0,9	0,8	0,8	0,7	0,9	0,9	0,9	0,2	0,7	0,6	0,6	0,7	0,7	0,8	0,7	0,5	0,6	0,6	1,0	0,8
USA	0,8	0,7	0,9	0,9	0,9	0,8	0,9	0,8	0,8	0,7	0,7	0,9	0,9	0,3	0,8	0,7	0,7	0,5	0,6	0,9	0,8	0,6	0,7	0,6	0,8	1,0

Figure 12: Heatmap of cross-country correlations of Stock Market Volatility

	AUS	CAN	DEU	ESP	FRA	GBR	ITA	JPN	KOR	NLD	USA
AUS	1,0	0,8	0,8	0,7	0,7	0,8	0,7	0,8	0,5	0,6	0,8
CAN	0,8	1,0	0,6	0,7	0,8	0,8	0,8	0,6	0,4	0,8	0,6
DEU	0,8	0,6	1,0	0,8	0,6	0,8	0,7	0,7	0,4	0,6	0,8
ESP	0,7	0,7	0,8	1,0	0,8	0,9	0,8	0,8	0,5	0,8	0,9
FRA	0,7	0,8	0,6	0,8	1,0	0,8	0,9	0,5	0,3	0,9	0,7
GBR	0,8	0,8	0,8	0,9	0,8	1,0	0,8	0,7	0,5	0,8	0,9
ITA	0,7	0,8	0,7	0,8	0,9	0,8	1,0	0,6	0,3	0,9	0,7
JPN	0,8	0,6	0,7	0,8	0,5	0,7	0,6	1,0	0,5	0,7	0,7
KOR	0,5	0,4	0,4	0,5	0,3	0,5	0,3	0,5	1,0	0,5	0,5
NLD	0,6	0,8	0,6	0,8	0,9	0,8	0,9	0,7	0,5	1,0	0,8
USA	0,8	0,6	0,8	0,9	0,7	0,9	0,7	0,7	0,5	0,8	1,0

Figure 13: Heatmap of cross-country correlations of First Principal Components

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Laura Nowzohour

Graduate Institute of International and Development Studies, Geneva, Switzerland; email: laura.nowzohour@graduateinstitute.ch

Livio Stracca

European Central Bank, Frankfurt am Main, Germany; email: livio.stracca@ecb.europa.eu

© European Central Bank, 2017

Postal address 60640 Frankfurt am Main, Germany
Telephone +49 69 1344 0
Website www.ecb.europa.eu

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