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Forecasting in the euro area: The role of the US long rate

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Forecasting the euro area: The role of the U.S. long rate¹

This letter analyses the relationship between economic variables in the euro area and the United States and determines the importance of various indicators in forecasting the euro area macroeconomy. Results using a novel empirical technique show that innovations in the U.S. long-term interest rate (long rate) explain substantial variation in euro area GDP and inflation. This finding is consistent over a historical sample and supports the emphasis placed on U.S. economic conditions when constructing projections of the euro area macroeconomic outlook. The important contribution of the U.S. long rate most likely indicates its value as a proxy for the state of the global economy.

Introduction

The U.S. continues to significantly shape the world economic outlook, owing to its role in setting global macroeconomic policy and driving financial conditions. Additionally, the high quality of U.S. data releases can imply that emerging impulses to the global economy are most clearly identified in the U.S. This letter applies a novel empirical technique to examine the relationship between economic developments in the United States and the euro area, in order to improve forecasting of activity in the latter. The model estimated is a semi-parametric VAR with time-varying parameters developed in Petrova (Forthcoming, *Journal of Econometrics*). This technique enables an increase in the number of macro variables included, which improves the approximation of cross-economy relationships. Given that monetary policy normalisation in the euro area will be data-driven, it is crucial from a policy perspective to understand the extent of influence from both international and domestic factors.

The U.S. share of global output has steadily decreased since the 1950s following the growth of China and other emerging economies, as shown by Schmitz et al. (2012) who report a decline in the weight placed on the U.S. as a trading partner to the euro area. Notwithstanding this, U.S. data have been used to proxy for the global economy, due to the relatively high quality and the dominance of the U.S. dollar as the world's anchor currency, which has increased in recent decades despite the decreasing U.S. output share, according to Itzetzki, Reinhart, and Rogoff (2017).² The U.S. can influence the euro area through many channels including trade, financial markets, labour markets, industry structure, and participation in global value chains. There are also however, many international factors outside the two economies, such as observed global oil shocks or unobserved global political shocks, which can also affect both economies simultaneously. While a structural interpretation of such confounding factors is not possible with a model using only euro area and U.S. variables, the extent to which they feed into macroeconomic indicators considered, renders such indicators useful for forecasting.

Literature investigating the links between the U.S. and the euro area suggests an increased interdependence between their money markets. Using high-frequency financial data, Ehrmann, Fratzcher, and Rigobon (2011) find substantial cross-market spillovers from the U.S. and report that on average financial market movements in the U.S. can explain 30% of such movements in the euro area during 1989-2004. Ehrmann and Fratzscher (2005) also find increased financial

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² Often in economic modelling, the U.S. is a proxy for the rest of the world. Examples specific to euro area include Lubik and Schorfheide et al. (2005), Neri and Nobi (2007), Rabanal and Tuesta (2011) and more recently De Walque et al. (2017).

interdependence and show that U.S. macroeconomic news is a leading indicator for euro area activity. Dées et al. (2007) use a global VAR (GVAR) model to show that U.S. financial shocks are quickly transmitted to the euro area and have significant effects on inflation and economic growth. The authors apply a recursive identification scheme and consider a number of variable orderings. Eickermeier and Ng (2015) also apply a GVAR and report that U.S. credit supply shocks explain about 10% of one-year-ahead forecast error variation in euro area output. Galesi and Lombardi (2009) follow a GVAR approach and report strong linkages between inflation in the U.S. and euro area.

There is also a vast literature assessing the global impacts of changes in U.S. monetary policy. Georgiadis (2015) apply a GVAR to find evidence of substantial spillovers of U.S. monetary policy and report positive correlations between these spillovers and the revisions of economic growth forecasts. Neri and Nobili (2006) consider a two-country VAR and find short and long-term effects on euro area economic growth in response to U.S. monetary policy changes. Chen et al. (2015) observes spillover effects of U.S. unconventional monetary policy on the euro area real economy but find more sizeable impacts for emerging economies. Nyholm (2016) investigates spillovers between the interest rate term structures of the U.S. and euro area and find increased influence from the U.S., while Eijffinger (2008) reports interdependence between U.S. and euro area long-term bond yields. Chin et al. (2018) examine the co-movement in long-term interest rates of small open economies and the U.S. through a theoretical open-economy model and suggest that central banks accommodate U.S. inflation trends.

Economic policy uncertainty in the U.S. has also been found to affect the global economy, with the euro area often being reported as one of the economies most affected. Colombo (2013) applies a two-economy smooth-transition VAR (STVAR) and finds that spillovers from U.S. economic policy uncertainty affect the euro area real economy. Belke and Osowski (2019) use a GVAR approach and find difficulties in differentiating between spillovers and a pure global shock as unexpected movements in U.S. uncertainty contemporaneously affect euro area uncertainty, and vice versa.

The GVAR model is frequently used when examining relationships between economies as it allows for the inclusion of a large number of economies and global variables to proxy the world economy. However, the GVAR approach has limitations due to the scale of the model, with the key restriction being that trade linkages, relationships, and spillovers between economies are assumed to remain constant over the sample. The empirical approach outlined in the following section overcomes this limitation by allowing for time varying relationships.

Empirical approach

This empirical exercise follows Liu, Matthes, and Petrova (2018) by estimating a Vector Auto Regression using Bayesian methods with economy-specific blocks and time-varying parameters (TVP-BVAR). Model coefficients can vary continuously over the sample, allowing for changes within and across economies. A key feature of this model is that it allows for a number of channels of time-variation and can capture changes in the trends, persistence and correlations of the included macroeconomic variables. The model has a domestic block with euro-area specific macroeconomic indicators and a corresponding foreign block approximated by the economy of the United States. There are five variables in each block, which include real GDP growth (YED), price inflation (HICP), short-term interest rates (STN) and long-term interest rates (LTN), and the nominal effective exchange rate (EEN) over the period 1973Q1-2018Q4.³ A long sample is

³ Euro area data are from the New Area Wide Model database, which approximates the euro area pre-1999 (<https://eabcn.org/page/area-wide-model>) and U.S. data are from FRED database.

considered to reduce parameter uncertainty during estimation and to highlight changes in dynamics.

Overall, the model consists of ten variables and two lags:

$$y_t = B_{0t} + \sum_{p=1}^2 B_{pt}y_{t-p} + \varepsilon_t, \quad \varepsilon_t = \Gamma_t^{-1/2}\eta_t, \quad \eta_t \sim NID(0, I_M). \quad (1)$$

$$y_t = \{y_t^{EA}, y_t^{US}\}$$

$$y_t^{EA} = \{EA \text{ GDP Growth}, EA \text{ HICP Inflation}, EA \text{ 3 month euribor}, EA \text{ 10 year Government bond yield}, EA \text{ NEER}\}$$

$$y_t^{US} = \{US \text{ GDP Growth}, US \text{ CPI Inflation}, US \text{ 3 month Treasury Bill rate}, US \text{ 10 year Government bond yield}, US \text{ NEER}\}$$

To estimate the model, we apply the semi-parametric methodology developed in Petrova (Forthcoming, Journal of Econometrics), which is preferred to a more standard parametric approach as it allows for more than five variables.

Results

Model implied pair-wise correlations

To observe changes in co-movement of the two economies, Figure 1 displays the model-implied correlations of the variables of each block with the other. The black solid and dashed lines indicate the model-implied correlations and credible intervals of estimates respectively, and the solid blue line is the 15-year moving correlation in each subplot, highlighting the longer-term nature of co-movement that the model captures. For all euro area variables, there is a considerable amount of time-variation before and after the monetary union. The correlations of GDP growth across the two economies (top left panel) decreases after the global financial crisis and is currently close to sample lows, indicating differences in business cycles owing to region specific shocks, such as the sovereign debt crisis in the euro area. However, inflation across the two economies appears to remain highly positively correlated after the crisis, which may be a result of similar monetary policy inflation targets. Both short- and long-term interest rates have become less correlated recently and may indicate differences in current monetary policies. The model-implied correlation of nominal effective exchange rates recently became negative. The lower correlation between exchange rates could reflect weaker synchronisation in business cycles and monetary policy as compared to previous periods.

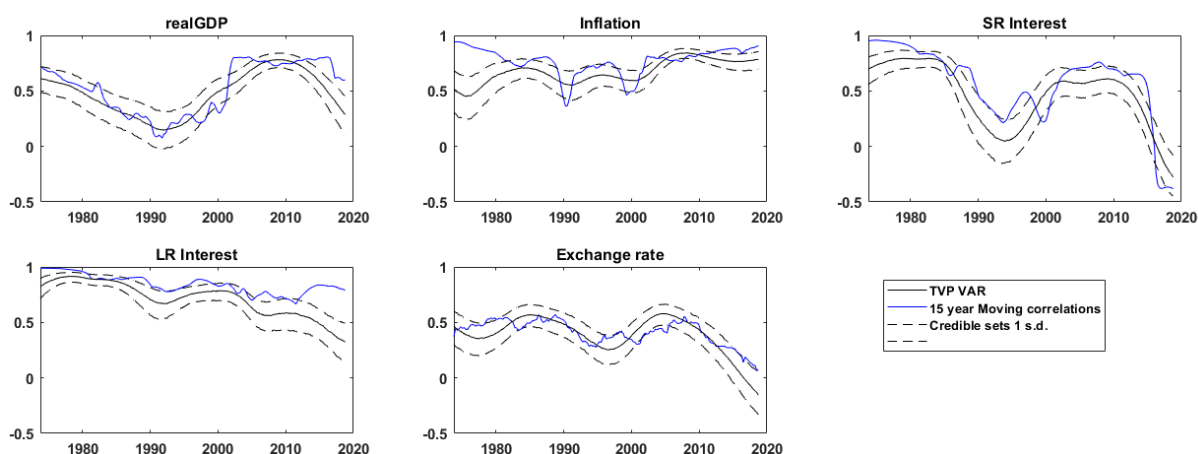


Figure 1: The black solid and dashed lines in each subplot indicate the model-implied correlations and credible intervals of estimates respectively. The blue solid line represents the 15-year moving correlation in each subplot.

Role of US variables in euro area macroeconomic outlook

To examine the linkages across the two economies, we look at Generalised Forecasts Error Variance Decompositions (GFEVDs) following Galesi and Lombardi (2009). The GFEVDs developed in Koop, Pesaran, and Potter (1996) and Pesaran and Shin (1998) contain information about the proportion of movements in real GDP growth and inflation that are due to innovations in euro area versus U.S. variables. The approach does not impose identifying assumptions on shocks but the GFEVDs identify the relative importance of each variable for each region in explaining the propagation of GDP inflation. As such they provide insights on the transmission channels through which region-specific shocks spillover. More recently GEFVDs are used to construct a connectedness index in Diebold and Yilmaz (2014) and applied in Demirer et al. (2018) and Liu, Matthes, and Petrova (2018).

Contributions to euro area GDP

Figure 2 shows the contributions of each variable in explaining the one-year-ahead forecast error variance of euro area GDP over the sample.⁴ At each point in the sample, the portion of the stacked bar roughly corresponds to the fraction of one-year-ahead uncertainty in euro area GDP that is explained by innovations of a particular variable.⁵ An interesting finding is that U.S. variables explain large amounts of variation in euro area GDP, throughout the entire sample. In total U.S. variables explained 70% of the movement in 2018Q4, indicating a substantial influence of the recent slowdown on euro area growth. The main contribution comes from the U.S. long-term rate. The U.S. nominal effective exchange rate can also have significant effects, in particular when there are large movements in the value of the dollar. Of the domestic contributions in the euro area, the long-term interest rate and nominal effective exchange rate (green and grey portions of stacked bars) were the largest.

⁴The quantities obtained cannot be considered proportions due to the contemporaneous correlations among innovations, therefore, the contributions are rescaled such that the associated percentages add up to 100 following Galesi and Lombardi (2009).

⁵ Similar contributions are reported for both shorter and longer term horizons of forecast error variance (one quarter, two year and five-year-ahead) and are available on request.

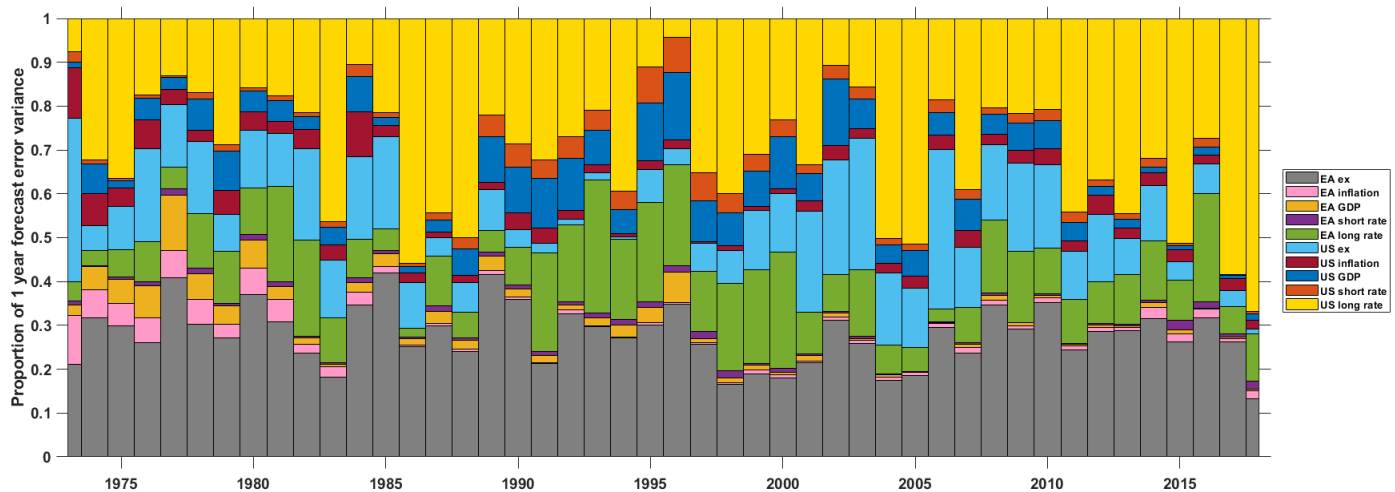


Figure 2: The contributions of each variable in explaining the one-year forecast error variance of euro area GDP.

Contributions to euro area inflation

Figure 3 shows the contributions of each variable in explaining the one-year-ahead forecast error variance of euro area HICP inflation. Similar to the findings for GDP, a large amount of variation in euro area inflation is explained by innovations in U.S. variables. Innovations in the U.S. long-term interest rate play a dominant role in explaining a large amount of inflation variation in most periods after the financial crisis of 2008, in line with literature that highlights the global influence of U.S. monetary policy (Chin et al. (2018) and Borio et al. (2018)). Inflation innovations in the U.S. (represented by the dark red in the stacked bar) are the second largest foreign contributor to euro area inflation. With respect to the recent euro area slowdown, U.S. variables explain over 55% of the variation in euro area inflation in 2018. The contribution of U.S. GDP growth is small (represented by the blue in the stacked bar) and often under 5%, however this finding is consistent with the magnitudes reported in Galesi and Lombardi (2009).

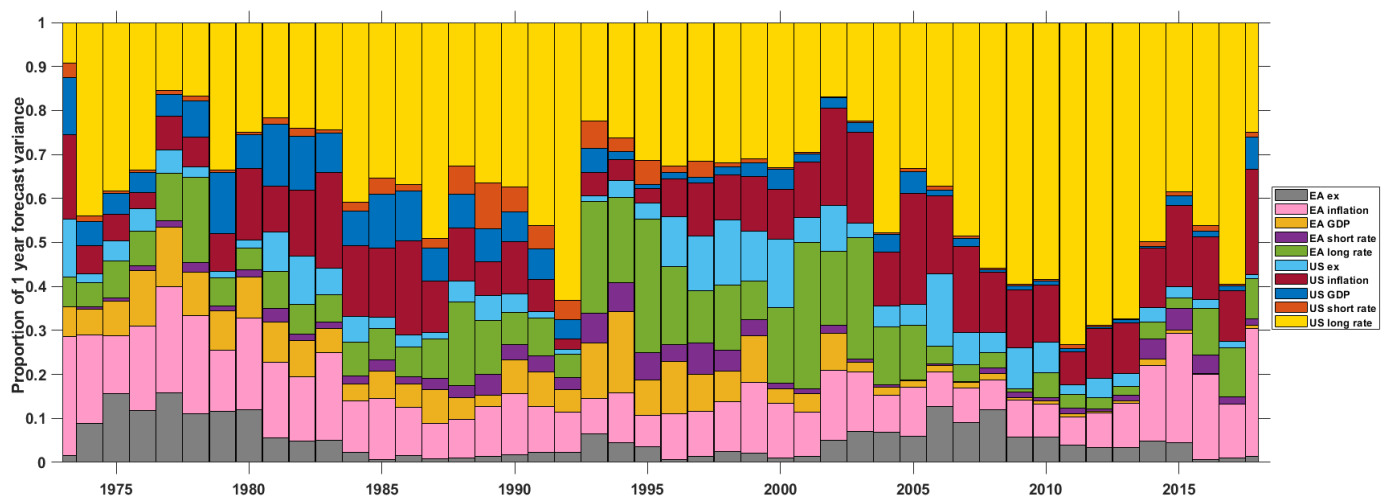


Figure 3: The contributions of each variable in explaining the 1 year forecast error variance of euro area HICP Inflation.

Potential mechanisms of U.S. long rate contributions

The substantial contribution of U.S. variables shown in the GFVEDs indicates that innovations in the U.S. economy have strong links to movements in euro area economic growth and inflation. This result supports the findings of Ehrmann and Fratzscher (2005) and Georgiadis (2015) that U.S. macroeconomic news is a leading indicator for the economic outlook of the euro area.

The contribution of the U.S. long rate could operate through many mechanisms. The magnitudes found in this letter are larger than those found in studies that specifically examine the effect of trade and financial linkages on the euro area macroeconomic environment, such as De Walque et al. (2017). The substantial contribution of the U.S. long-rate may operate through its ability to proxy for the state of the global economy.⁶ For example, it might be an indicator of global risk appetite, global investor and consumer sentiment and global productivity. These mechanisms have implications for the evolution of euro area variables, which are not captured with a more narrow focus only on trade and financial linkages. Recent dynamics of the U.S. long-rate such as its stickiness and a decoupling with respect to short-term rates may be a source of its increased contribution. Hanson et al. (2018) highlight the perhaps puzzling combination of high-frequency excess sensitivity of the long-rate and a low-frequency decoupling of short- and long- term rates in the U.S. since the 2000s.

Overall, the effect of global factors can complicate the interpretation of spillovers, as it is very difficult to disentangle the specific effect of a shock. However, the extent to which such confounding factors are captured by the U.S. long rate means that it is valuable in terms of forecasting euro area inflation and GDP growth.

Conclusion

This letter uses a model capable of capturing time-variation to examine the influence of global factors on economic developments in the euro area. Results show cross-economy correlations display differences in the movement of euro area and U.S. business and monetary policy cycles. Innovations in the U.S. long-term interest rate appear to contribute to a large amount of variation in euro area economic growth and inflation. This contribution is likely to operate through its ability to proxy the state of the global economy.

⁶ Oil price has also been included as a global variable and it does not significantly change the results. The figures for robustness checks are available on request.

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