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What if the euro had never been launched? A counterfactual analysis of the macroeconomic impact of euro membership

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Abstract

The aim of this paper is to gauge quantitatively the macroeconomic impact of EMU membership. Building on the Global VAR framework designed by Pesaran et al. (2004), we want to shed light on the following important questions: What if the euro had never been launched? How would national outputs and inflation rates have evolved? We show that monetary unification promoted lower interest rates and higher output in most euro area (EA) countries, relatively to a situation where national monetary policies would have followed a German-type one. If national monetary policies had adopted British monetary preferences after September 1992 however, this would have led to higher interest rates, depreciations of national exchange rates and higher output in most EA countries, especially over the 1992-1998 period. This is particularly true for the three biggest countries of the EA (France, Germany and Italy). Besides, the single currency regime probably did not have a massive impact on price developments.

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1 Introduction

From the very beginning of the nineties, the European Monetary Union (EMU) has been a hotly debated idea. Many academics from different fields of international macroeconomics used to predict serious troubles for the central bank which would have to set a common monetary policy for such heterogenous countries. Using the Optimal Currency Area theories (Mundell, 1961; Mc Kinnon, 1963), Eichengreen (1991) argued that the euro area (EA) had neither the labor flexibility and mobility, nor the fiscal integration which are necessary to replace exchange rate adjustments. Moreover, authors like Cukierman and Lippi (2001) stressed that, confronted to the long term trade-off between inflation and employment in case of cyclical shocks, the very inflation-averse European Central Bank (ECB) would be unable to lead any stabilization policy. In other words, the strengthened credibility of the new central banker and the gains related to the reduction of transaction costs would not weigh enough when countries would be confronted to the inability of dampening asymmetric shocks using the exchange rate.

Now that monetary integration is effective, this article aims at providing a quantitative assessment of the adequacy (or the inadequacy) of the single monetary policy to each member country using a counterfactual approach. While the latter has recently received a growing interest for monetary policy analysis (see e.g. Carlstrom and Fuerst, 2006, or Cavoli and Rajan, 2006), there are only a few studies using it in the context of a global macroeconomic setting in order to compare alternative monetary policy regimes. The two closest experiments to our own research can be found in Pesaran et al. (2007) and Dees et al. (2007). Both studies use a global macroeconometric framework (Global Vectorial AutoRegressive, hereafter GVAR), developed by Pesaran et al. (2004), to investigate the interdependencies between countries, especially those belonging to the euro area. Pesaran et al. (2007) is of particular interest to us because it addresses a similar question regarding the United Kingdom - What if the UK had joined the euro in 1999? Also close to our research is the paper by Dees et al. (2007), since it extends the original GVAR model by augmenting the number of countries and variables, providing a more fully description of the interactions in the world economy and of the transmission mechanisms of shocks at a global level.[1]

Following the work of Dees et al. (2007) and Pesaran et al. (2007), our contribution is twofold. First, to our knowledge, a quantitative approach to gauge the macroeconomic impact of EMU membership has never been attempted. Second, we rely on the GVAR framework and modify it to test two different scenarios related to the absence of the euro after January 1999.

This paper sheds light on the following important questions: What if the euro had never been launched? How would national outputs and inflation rates have evolved? Based on

[1]Another noticeable contribution of Dees et al. (2007) is that they develop a theoretical framework where the GVAR is interpreted as a global unobserved common factor model.

the comparisons between the "true" GVAR and counterfactual GVARs, our main findings show that monetary unification promoted lower interest rates and higher output in most EA countries, relatively to a situation where national monetary policies would have followed a German-type one. If national monetary policies had adopted British monetary preferences after September 1992 however, this would have led to higher interest rates, a depreciation of national exchange rates and higher output in most EA countries, especially over the 1992-1998 period. This is particularly true for the three biggest countries of the EA (France, Germany and Italy).

The paper is structured as follows. Section 2 presents the macroeconometric framework. Section 3 addresses methodological concerns and details the different counterfactual scenarios. In Section 4, results of the different scenarios are presented and commented. Section 5 provides concluding remarks.

2 The Global VAR framework

We consider a sample of N countries, $i = 1, ..., N$. In our empirical analysis, $N = 30$,[2] data are monthly and cover the period from April 1980 to May 2006. The aim of the GVAR framework is to construct a model in which all the variables are endogenous. To this end, we can proceed in three steps (see Pesaran et al., 2004, and Pesaran et al., 2007).

In a first step, we estimate N individual VAR processes:

$$X_{it} = \Phi_{i0} + \Phi_{i1}X_{it-1} + ... + \Phi_{ip}X_{it-p} + \Psi_{i0}X^*_{it} + \Psi_{i1}X^*_{it-1} + ... + \Psi_{ip}X^*_{it-p} + \varepsilon_{it} \qquad (1)$$

with $i = 1, ..., N$ is the country and $t = 1, ..., T$ is time. The VAR process contains two types of variables: country-specific (vector X_{it}) and foreign (vector X^*_{it}) variables. Both vectors contain seven variables: real industrial production, consumer price index, short-term nominal interest rate, real money stock, real equity prices, nominal exchange rate against the US dollar, and oil prices. All variables, but the interest rate, are expressed in logarithms. For all countries, but the US, oil prices are included as an exogenous variable. By contrast, exchange rates are treated as endogenous for all countries, except for the US. Turning to the foreign variables, we have:

$$X^*_{it} = \sum_{j=1}^{N} w_{ij}X_{jt} \qquad (2)$$

[2]The list of considered countries and the description of the data are given in the appendix. As in many previous studies (Pesaran et al., 2004 and Dees et al., 2007), notably absent are the newly constituted economies of the Eastern Europe. These countries have been excluded due to obvious data availability on the considered period. Whereas our time span starts in 1980, time series are most of the time not available for Central and European Countries before the first half of the nineties.

where w_{ij} denotes the share of country j in the trade of country i, $i \neq j$. Note that $w_{ii} = 0$ and that the sum of the weights is equal to 1, that is $\sum_j w_{ij} = 1$. The weights rely on the geographic distribution of imports and exports of goods and services in 2004 and are taken from the CEPII-BACI database. We thus consider constant weights, an assumption which deserves some comments, especially in the case of our counterfactual analysis. Since the commonly expected benefit of adopting a single currency is increased trade, various studies have investigated the question of how the euro was boosting trade since the pioneering study by Rose (2000).[3] The current consensus is that the positive impact of the euro on trade is lower than that was initially expected with an estimated effect on trade growth that is below 5% (see Fontagné et al., 2009). More precisely, Baldwin et al. (2008) report that after the introduction of the euro, aggregate trade flows between euro-area countries increased by only 2%. On the whole, while the trade-creating effect of the euro within area countries is positive, it is sufficiently limited in size to justify the use of constant weights. An additional argument can be found in Pesaran et al. (2004) who argue that time-varying weights could introduce an undesirable degree of randomness into the analysis and mask the cyclical movements of the regional output being measured. Finally, it should be noted that Dees et al. (2007) addressed this issue by using time-varying weights and find that the results were quite similar to those based on constant weights.

Turning to the other characteristics of the individual VAR processes, note that the US model presents specificities reflecting the impact of the US economy on some worldwide variables like oil prices. In other words, some restrictions are imposed concerning the US variables: only foreign industrial production and CPI are considered as exogenous in the US model.

In a second step, the country-specific and foreign variables are stacked to study the dynamics for all the variables and all the considered countries simultaneously. By denoting $Z_{it} = \begin{pmatrix} X_{it} & X_{it}^* \end{pmatrix}'$ and defining X_t as the vector which put together all the endogenous variables of the system, that is $X_t = \begin{pmatrix} X_{1t} & X_{2t} & ... & X_{Nt} \end{pmatrix}'$, we can write:

$$Z_{it} = W_i X_t \tag{3}$$

where W_i denotes the trade matrix for country i.

In the third step, we derive the expression of the GVAR in which all the variables are endogenous:

$$X_t = G_0 + G_1 X_{t-1} + ... + G_p X_{t-p} + u_t \tag{4}$$

[3] See Baldwin et al. (2008), Fontagné et al. (2009), Ottaviano et al. (2009), and the references therein.

with G_0 and G_j, $j = 1, ..., p$, are matrix of coefficients that notably depend on the trade matrix and u_t is the error term matrix.

3 Counterfactual scenarios: Methodological options

Our purpose is to simulate two scenarios of non-participation to the euro. Formally, this will be done by (i) estimating the GVAR on a subperiod preceding the European Exchange Rate Mechanism (ERM) crisis and (ii) imposing restrictions to the interest and exchange rate equations of the GVAR. Afterwards, the difference between the forecast produced by the unrestricted GVAR and this restricted forecast will be analyzed. Following Pesaran et al. (2007), we do not compare the outcomes produced by the alternative scenario to the actual data. If we consider the latter as restricted forecasts, it may be difficult to perform clear comparisons, since it will not be possible to distinguish between the effects of forecasts errors and the effects of the restrictions imposed. Here, we avoid the problem by studying the difference between the unrestricted and restricted forecasts.[4]

Turning to the scenarios themselves, they aim at providing answers to two questions: can we outline differences between the single currency world and various counterfactual ones where countries keep their own currencies? And more generally, would European countries have benefitted from less conservative monetary policies in the nineties, as argued by many academics (see in particular De Grauwe, 1995)? Of course, we cannot know exactly what would have happened if the project of a single currency had been cancelled. But we can definitely imagine a few credible paths. We consider therefore two different counterfactuals, which are polar cases with the same basis. They both postulate that the European Exchange Rate Mechanism does not survive the September 1992 crisis, and that all euro area members come back to floating exchange rates. Therefore, we reestimate the GVAR over the 1980:04-1992:09 period and proceed as follows. In the first scenario, all EA members decide to adopt German monetary preferences. This is modelled by imposing German coefficients for interest and exchange rates behaviors, that is, by constraining coefficients

[4]Of course, the use of a pure autoregressive specification can be challenged by the Lucas critique. Structural Dynamic Stochastic General Equilibrium (DSGE) models incorporate rational expectations allowing them to be theoretically robust the critique. Without questioning its theoretical logic, a number of studies showed however that the Lucas critique had empirical limited implications (see in particular Estrella and Fuhrer, 1999, or Levieuge and Penot, 2008). Others emphasized that forward-looking models often suffer from serious drawbacks regarding macroeconomic shocks identification, since they fail to consider the inertial behaviors of agents and then sluggishness of data (see Fuhrer, 1997; Estrella and Fuhrer, 2002). In our context, a VAR approach may seem more appropriate since it imposes only minimal structural requirements, allowing to "let the data speak". Besides, Pesaran *et al.* (2007) emphasize that DSGE have VARs with restrictions on the coefficients as reduced forms. But the building of such a "global DSGE", with a GVAR as reduced form, is clearly beyond the scope of our paper. This also raises crucial identification issues. Indeed, simulation exercises usually draw on hypotheses regarding the equations of the structural model, supporting in turn the restrictions on the reduced-form equation.

of all EA members interest and exchange-rate equations to be equal to the German ones. This scenario has two major interests. First, Germany was the only country to have an autonomous monetary policy since it was the EMS leading country. Second, over all the considered period, it seems that the German monetary policymaker followed a forward-looking variant of the Taylor (1993) rule (1.3 on inflation gap, 0.25 on output gap, see Clarida, Gali and Gertler, 1998).

In the second scenario, EA countries decide to adopt British monetary preferences, the UK being a genuine floater. We proceed the same way we did for the German case, by constraining coefficients of all EA members interest and exchange-rate equations to be equal to the British ones. This scenario may appear as a textbook experiment. However, it constitutes a relevant benchmark since many observers and academics considered that UK monetary policy was much more suitable regarding both output growth and stabilization than the European / German-lead ones (see, among others, Coquet and Le Bihan, 1997).

4 Results

Figures A1 and A2 in Appendix present the results of the empirical study for each EA member. Figures A1 report, over each relevant subperiod, the mean (interest rates) and the variation (output, prices and exchange rates) coming from the real data and the ones produced by the original GVAR. By solving the original GVAR, we have an overview of its ability for reproducing the real data. The comparison of the data for each country emphasizes that the GVAR reproduces fairly well the original data. Figures A2 report, for each simulation exercise, the gap between the forecasts produced by the unrestricted GVAR and the ones deduced from the counterfactual GVAR.[5] A negative (resp. positive) gap means that the considered variable is lower (resp. higher) in the genuine GVAR. For the exchange rates, a negative sign implies that the exchange rate depreciates relatively to the unrestricted (genuine) GVAR. Conversely, a positive sign means that the exchange rate appreciates relatively to the path predicted by the genuine GVAR. Finally, we distinguish subperiods before and after 1999 (corresponding to the launch of scriptural euro), in order to check the possibility of new trends or dynamics induced by the single currency regime.

4.1 Scenario 1: German scenario

The results of this first counterfactual are remarkably consistent. Regarding interest rates, the gaps are almost systematically negative, indicating that interest rates would have tended to be higher under German monetary preferences. Interestingly, this is especially true for the 1999-2005 subperiod, where gaps are significant for all countries but France and Greece. The levels of these gaps (ranking from -2.51 to -11.37%) are also quite substantial: under this counterfactual regime, many EA members would have seen their interest rates

[5]Detailed tables of the results, including t-statistics to judge the significance of the gaps, may be downloaded at: http://economix.u-paris10.fr/fr/membres/?id=302.

stuck to their mid-1990s values. Logically, our simulations show that national exchange rates vs. the dollar would have appreciated significantly more under the German scenario, before and after 1999. It is also worth noting that this over-appreciation (relatively to the genuine GVAR, under the single currency regime) tends to accelerate after 1999.

Turning to output, the different profiles are once again very homogenous. Consistently with previous results, output tends to be higher under the single currency regime (that is, lower under Scenario 1) for many countries, but not for all over both subperiods. Interesting exceptions are Belgium (but with weak significance), France, Germany and Portugal. For these four countries, output is significantly lower in the genuine GVAR than under the German scenario before 1999. One might see here the consequences of restrictive policy-mix set up to fulfill the convergence criteria of the Maastricht Treaty. Conversely, output is significantly higher after 1999 under the single currency regime for Belgium, Finland, Germany, Ireland, Luxembourg, Netherlands, Portugal and Spain, with gaps ranking from 5.67% to 41.59%. For all other countries but Greece (the only one to exhibit a significant negative gap), gaps are not significant. Once again, a plausible explanation of these higher outputs may be the much more expansionary monetary conditions in the unrestricted GVAR (i.e. under the single currency regime).

Concerning price evolutions, the separation around 1999 enlightens interesting differences. Before 1999, countries clearly divide into two groups, one with higher prices in the genuine GVAR (Belgium, Greece, Italy, Luxembourg, Netherlands) and one with lower prices (Finland, France). The situation with higher prices is the most intuitive since monetary policy is relatively more expansionary in the unrestricted GVAR than in the counterfactual. For the remaining countries (Austria, Germany, Ireland, Portugal and Spain), the difference is not significant. After 1999, the distribution is quite different: half of the EA members display lower prices (Belgium, Finland, France, Greece, Italy, Luxembourg) while Austrian, German, Irish and Dutch gaps are insignificant. What is remarkable, however, is that the magnitude of these gaps is very small, even when they are significant: they rank from -0.38% to -3.06%, over a seven years period. With the exception of Portugal and Spain which exhibit significantly higher prices under the single currency regime, this means that price dynamics are not fundamentally different between Scenario 1 and monetary unification as embodied by the unrestricted GVAR. This should not be a surprise, since Scenario 1 is based on German monetary preferences, the latter being quite close to the ones of the European Central Bank in terms of price stability.

To sum it up, the German counterfactual features mainly higher interest rates and appreciating exchange rates, relatively to the GVAR with single currency. Output tends to be consistently higher under the single currency regime for most countries, while prices do not display very high differences between the two regimes.

4.2 Scenario 2: British scenario

Once again, the results of this second counterfactual are quite consistent. Regarding interest rates, gaps tend to be negative before 1999 for a huge number of countries, indicating that interest rates would be once again lower under the single currency regime than under a "British style" monetary policy. Before 1999, interest rates are higher with British monetary preferences for Austria, Belgium, France, Germany, Greece, Luxembourg, Netherlands, and Portugal. Gaps are insignificant for Finland, Ireland, Italy and Spain, while no country displays higher interest rates in the unrestricted GVAR. After 1999, the picture changes, since gaps are insignificantly different from zero for the three biggest EA countries (France, Germany and Italy) and the three countries of the former Deutsche Mark zone (Austria, Belgium, and Netherlands). Gaps are positive for four small countries (Finland, Ireland and Luxembourg), and negative for Greece and Portugal. Overall, these results strongly support the idea that national monetary policies with British preferences would have been more restrictive until 1999, possibly reflecting an increase of risk premia on currencies often prone to exchange rate crisis and sharp devaluations. After 1999, however, a British style monetary policy would not have been different from ECB's one, at least for the six countries forming the historical and economic core of EA and accounting for more than 90% of its GDP.

Exchange rates display evolutions consistent with interest rates behavior. Indeed, gaps are significantly negative in almost all cases, whatever the considered subperiod, indicating that national exchange rates would have depreciated quite strongly against the dollar under Scenario 2, instead of the appreciation observed in the "real GVAR". Only Greece displays a stronger appreciation in the British counterfactual relatively to the unrestricted GVAR, over the 1992-1998 subperiod. For all other countries, the behavior of the exchange rate can easily be explained by the lack of credibility of national monetary policies in a context of monetary uncertainty, characterized by quite substantial risk premia on interest rates (cf. supra). In other terms, the monetary instability of the beginning of the nineties would have lasted under Scenario 2, bringing strong depreciation dynamics. On the theoretical ground, this would fairly well fit the uncovered interest rate parity theory, which associates higher interest rates with expectations of depreciation for the exchange rate.

Turning to output, the distinction between the two subperiods reveals interesting differences. Before 1999, output is lower under the single currency regime than in the British counterfactual for Belgium, France, Germany, Italy, Ireland, Luxembourg, Netherlands, Portugal, and Spain. Only Finland displays a higher output in the unrestricted GVAR, while the remaining two (Austria, Greece) do not exhibit any significant difference. In other words, a huge majority of countries would have substantially benefited, in terms of output, from depreciated exchange rates, at least before 1999. This is especially true for the three biggest EA members, with gaps reaching -7.84% (France), -11.52% (Germany), and -7.11% (Italy). After 1999, the picture changes significantly. Indeed, three groups of countries emerge, not very different in size. The first group, made of Austria, France, Ire-

land and Luxembourg, displays a lower output under the single currency regime, with gaps ranking from -5.20% to -35.80%. In these countries, a weaker currency may still explain this higher output in the British counterfactual. Conversely, the unrestricted GVAR predicts a higher output relatively to the British counterfactual for Belgium (15.27%), Finland (3.15%) and Greece (1.93%). For the two latter, it is worth noting that these gaps are quite small for a seven years period. For Belgium, this may mean that the country benefited more from monetary integration than what an autonomous monetary policy could have brought. Eventually, Germany, Italy, Netherlands, Portugal and Spain do not display any significant difference between the two monetary regimes.

Concerning price evolutions, one can again observe differences between subperiods. Before 1999, prices are higher in the "true" GVAR for all countries but Spain, where no significant difference emerge. After 1999, prices are higher under the single currency regime in Austria, Finland, France, Italy, Portugal and Spain; they are lower in Belgium and Germany, while Greece, Ireland, Luxembourg and Netherlands do not display any significant gap. Like in the German counterfactual however, it is striking to see that the magnitude of these gaps is very small, even when they are significant: except Greece (over the 1992-1998 period), the difference rarely exceeds 3.2% over seven years. This relative stability of price dynamics across the different monetary regimes is another interesting outcome of our simulations.

To sum it up, the British counterfactual features mainly higher interest rates and depreciating exchange rates, relatively to the GVAR with single currency. Output tends to be consistently lower under the single currency regime (higher under British monetary preferences) for many countries, especially over the 1992-1998 period, mimicking therefore the evolutions of British key macro variables during the nineties. Finally, prices do not display very high differences between the two regimes.

5 Conclusion

The purpose of this paper consisted in providing quantitative estimations of the macroeconomic impact of monetary integration for the euro area countries. To do so, we used a GVAR model in order to test two scenarios related to the absence of single currency. These scenarios examined polar cases, where national EA monetary policies would have adopted German preferences on the one hand, and British preferences on the other hand.

Our analyze emphasizes several major outcomes. It seems that monetary unification promoted lower interest rates and higher output in most EA countries, relatively to a situation where national monetary policies would have followed a German-type one. If national monetary policies had adopted British monetary preferences after September 1992 however, this would have led to higher interest rates, huge depreciations of national exchange rates against the dollar and higher output in most EA countries, especially over the 1992-1998 period. This is particularly true for the three biggest countries of the EA (France, Germany and Italy). Interestingly, our simulations emphasize that the single currency regime

probably did not have a massive impact on price developments, comparatively to credible alternative monetary policy regimes.

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Appendix

We consider a sample of 30 countries. They are listed in the following table.

Argentina	Germany (Ger)	Norway
Australia	Greece (Gre)	New Zealand
Austria (Aut)	India	Portugal (Prt)
Belgium (Bel)	Ireland (Irl)	South Africa
Brazil	Italy (Ita)	Spain (Spa)
Canada	Japan	Sweden
China	Korea	Switzerland
Denmark	Luxembourg (Lux)	Turkey
Finland (Fin)	Mexico	United Kingdom
France (Fra)	Netherlands (Net)	United States

Data are taken from various sources:

- Bilateral exchange rates against the USD are taken from IFS (International Financial Statistics, IMF), with the exception of the Greek series which is extract from Datastream. Note that exchange rate series are expressed in nominal terms and are considered in logarithms.

- Consumer price indexes (CPI) are generally taken from IFS, except for Australia and New Zealand (Datastream). China is also an exception since CPI data are issued from WDI (World Development Indicators, World Bank). All CPI series are based in 2000.01 such that 2000.01 = 100. They are expressed in logarithms.

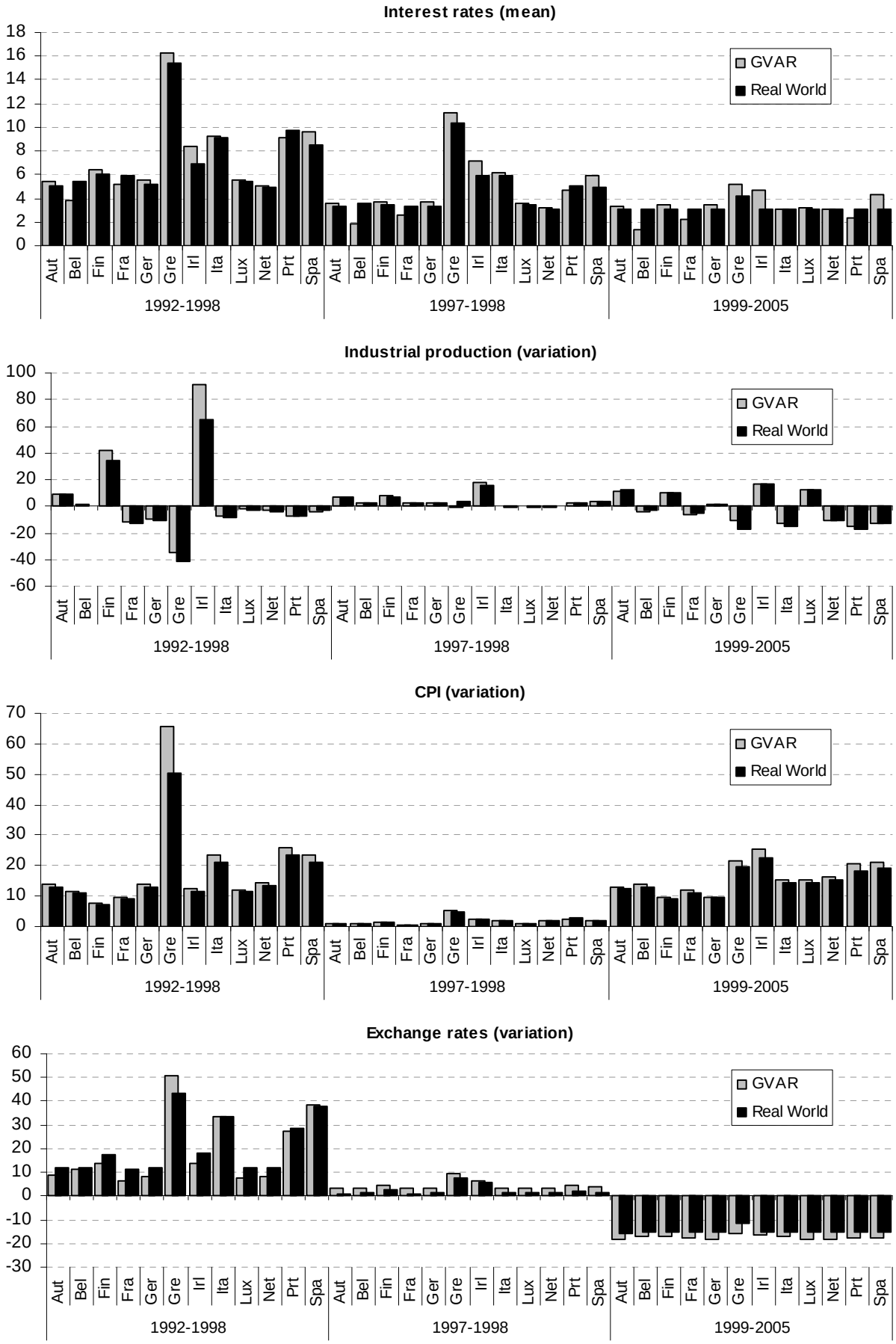
- Industrial production series generally come from IFS. Note that, for 7 countries — Argentina, Australia, Brazil, China, Greece, New Zealand and Switzerland — the series are taken from Datastream. Industrial production series are expressed in real terms, i.e. they have been deflated by the corresponding CPIs. All industrial production series are based in 2000.01 (i.e. 2000.01 = 100) and are transformed into logarithms.

- Concerning money, we generally consider the M1 aggregate, with the exception of Brazil, Germany and Sweden for which we use the M3 aggregate. Money series are taken from Datastream for China, France, Ireland, Italy, Luxembourg, Mexico, the Netherlands and Greece. For some series, two sources are used: Austria (Datastream and Osterreichische National Bank), Belgium (Datastream and Eurostat), Denmark (Datastream and IFS), Germany (IFS and Deutsche National Bank), Norway (Datastream and IFS), Portugal (Eurostat and Banco de Portugal), and Spain (Datastream and Eurostat). For the other countries, series are extracted from IFS. Money series are expressed in logarithmic real terms (deflated by corresponding CPIs) and converted in USD.

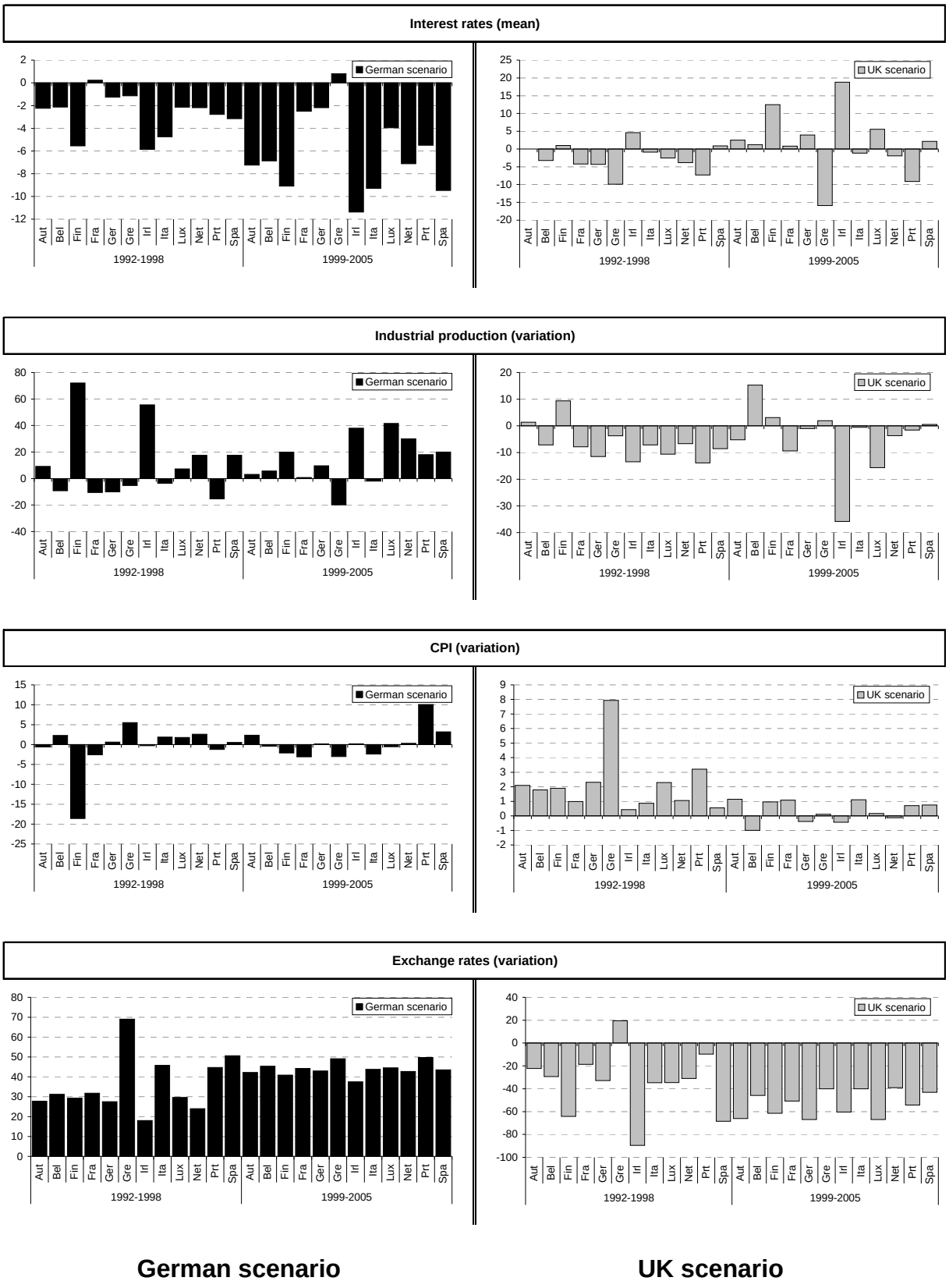
- Interest rate series are generally taken from IFS. For three countries, Denmark, Luxembourg and Portugal, data are issued from Eurostat. For India and New Zealand, the data are given by the Reserve Bank, and by the Central Bank for Norway. The considered series are short term nominal interest rates (call money rate, one month or three month rates, depending upon the considered country and data availability).

- Concerning share prices, series are mainly taken from IFS. We use data from Datastream for Denmark, France, Sweden. For Austria, Luxembourg, Norway and Portugal, data are taken from IFS and Eurostat. Finally, for UK, we use Eurostat database. All series are expressed in real terms (i.e. deflated by corresponding CPIs) and in logarithmic terms. They are based in 2000.01 such that 2000.01 = 100.

Finally, due to data availability or to the presence of outliers, some series are not considered in our sample. This is the case for interest rate series for Argentina, Brazil, Mexico and Turkey; money series for Finland, Greece, Ireland and Luxembourg; share price series for Argentina, China, Greece, Portugal, Switzerland and Turkey.



Figures A1. Comparison between real data and unrestricted (original) GVAR.



Figures A2. Differences between the forecasts produced by the unrestricted (original) GVAR and the counterfactual GVAR (left: German scenario, right: UK scenario).