

Real and Nominal Divergences in a Monetary Union – an Approach Beyond the Theory of Optimum Currency Areas

Realne i nominalne dywergencje w unii monetarnej – ujęcie spoza teorii optymalnych obszarów walutowych

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Abstract

This paper is intended to theoretically present divergent business cycles as effects of a monetary union, even in the absence of asymmetric, exogenous shocks.

The main inference from the model developed in this paper says that microeconomic optimization may lead to sub-optimal macro states and sustainable macroeconomic equilibrium is possible only for a country specific equilibrium interest rate. The model offers an explanation of macroeconomic fluctuations in a monetary union and, in particular, the nominal and real divergences we have been observing in the EMU. More generally, it may be considered as a theoretical argument for the costs of a fixed rate or a common currency, quite separate from the existing theory of the optimum currency area.

Keywords: monetary union, business cycle

JEL: F33, E32, E52, F41, F31

Streszczenie

Celem artykułu jest teoretyczne przedstawienie rozbieżnych cykli koniunkturalnych jako skutku utworzenia unii monetarnej, niezależnie od ewentualnych egzogenicznych wstrząsów asymetrycznych. Do realizacji tego celu wykorzystano oryginalny model, który wskazuje, że mikroekonomiczna optymalizacja może prowadzić do suboptymalnych stanów makroekonomicznych, a trwała równowaga makroekonomiczna jest możliwa tylko przy odpowiednim poziomie stopy procentowej. Ten poziom może być zróżnicowany pomiędzy krajami tworzącymi unię monetarną, co nieuchronnie prowadzi do odmiennych stóp inflacji i – w konsekwencji – realnych fluktuacji. Model dostarcza teoretycznej interpretacji zjawisk obserwowanych w strefie euro, może być także zastosowany do analizy zagadnienia kosztów przyjęcia kursu sztywnego. Przedstawiony sposób analizy i argumenty są odrębne od teorii optymalnych obszarów walutowych.

Słowa kluczowe: unia monetarna, cykl koniunkturalny

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1. Introduction

As a form of introduction I would like to pay some attention to economic phenomena and literature to which the analysis presented in this paper is relevant.

Firstly, the results obtained in this paper constitute a good framework to interpret nominal and real divergences in the EMU. The existence of these divergences is well recognized (for example European Commission 2001; 2005) but it is not sufficiently explained. It is interesting that even enthusiasts of the EMU warn the new member countries of the overheating resulting from euro adoption (Kroger 2002). It is also characteristic that some papers which envisage (risks of) credit and demand booms refuse to analyze them in the context of monetary policy and instead they argue for “compensating fiscal restraint and meticulous bank supervision” (Schadler et al. 2004). However, European Commission long ago admitted that it is monetary policy convergence that led to overheating, including increasing inflation rates, in some countries of the union (European Commission 2001).

In my opinion the comprehension of the divergences is impaired by the fact that the constituting theory of the EMU is the theory of optimum currency areas but the divergences seem to have little in common with the asymmetric, sectoral shocks the theory concentrates on. Some other characteristics of the economies of the union must be the key to understand the problem. For the time being there is no consistent theory which could explain what these characteristics are and how they matter. However, there are a few papers which recognize and offer some explanation of the problem (Blanchard 2006; Koronowski 2005; MacDonald, Wójcik 2006; Wyplosz 2006a; 2006b). I hope that this paper gives another useful insight in this respect.

The framework presented here may find a broader application. In particular it helps rationalize the phenomenon of exchange rate based stabilization cycles.¹ A remarkable exemplification of the cycles is the Mexico crisis in 1994. This example also suits very well the reasoning in this paper since the patterns of private consumption spending were a driving force behind the crisis. When it comes to a currency crisis the situation differs in one respect from a monetary union: under a fixed rate recession may trigger an adjustment process of (forced) devaluation which is not an option in a monetary union. A formal presentation of this difference (modeling a currency crisis) within the framework of rational expectations would require introducing stochastic shocks which might increase the cost of recession and make it optimal to devalue in line with, for example, Obstfeld (1994).

Moreover, the model presents an alternative framework to Balassa-Samuelson explanation of inflationary pressures within a monetary union.

¹ For more about the cycles see Kiguel, Liviatan (1992); Calvo, Vegh (1992); Santaella, Vela (1996); Khamis (1996); Koronowski (1997).

2. Basic assumptions of the model

The economy consists of a continuum of identical² economic agents (households) – consumers/producers. Each of them provides a respective part of the domestic product and receives the same respective part of income spent on domestic goods. The structure of the domestic product and prices of particular domestic goods are not considered. By the analysis of a typical agent we can infer about the whole economy by simple aggregation. In fact a “multiplied” agent constitutes the economy. For this reason the analysis may be applied in per capita terms.

The agents choose between a basket of domestic goods (aggregated domestic product) and a basket of foreign goods (aggregated foreign product).

Prices are sticky in the sense that they never fall but they are perfectly flexible upward. This assumption may reflect wage determination when employees do not accept nominal wage reductions and thus – at given technologies and techniques and under perfect competition – don't leave room for any price cut. However, demand driven wage and price increase does not face any obstacles.

The real domestic income/product is determined by the nominal expenditures as long as they do not exceed the potential production at current prices – in this case prices are stable at an “inherited” (previous period) level. If the nominal spending on the domestic product exceeds the potential level of production at current prices, the real product is equal to the potential level – the equality between the nominal spending and the nominal product is regained due to an increase in the price level.

As regards potential production, I assume it remains constant at a certain “inherited” level throughout the periods of analysis. The model does not include capital accumulation/depreciation or any other problems of growth. In particular, the model does not take into account labour productivity growth. Such growth is a factor which could compensate for loss of competitiveness envisaged in the model and substitute – to a degree - for flexible wages/prices. Generally, the model does not describe the production side of the economy – domestic product is determined in accordance with the simple assumptions specified above. In fact these assumptions are not very restrictive. Their purpose is only to establish some benchmark for maximum real production and maximum non-inflationary nominal spending in a simple situation when the trade-off along the Phillips curve is beyond consideration. It also helps to define recession as production below this benchmark. This

² It is not necessary but convenient to assume that all agents are identical in size. It would be enough to assume they have constant shares in the baskets of production and consumption. There is no reason, either, to complicate the model by the introduction of any stochastic shocks.

benchmark could be made flexible by some addition to the model.

The aggregated expenditures of all agents determined by utility maximization are identified in the model with the aggregated domestic demand and not just the consumption spending. Investment expenditures are not distinguished.

Another assumption restricts the analysis to only two moments (rather than periods) when transactions are performed – “now” and “the future”. There is only one domestic and one foreign interest rate in the time span (period) between the two moments (transaction sessions). I admit the existence of earlier moments (periods) – the last one gives some “inherited” values of the potential product and the price level. The assumption of two moments is not very restrictive. The model could be re-written for more periods, this would however make it less tractable. In a multi-period version the determination of future central bank’s interest rates would also create problems; one should have a separate model of the monetary policy strategy (loss function of the central bank). However, the solution to the problem is trivial as long as the analysis is restricted to the case of a monetary union or a fixed rate where the analyzed country “imports” (due to UIP) the foreign interest rate. More periods would also give benefits – the model could describe more precisely the time path of analyzed developments, in particular it could describe inflation as a process of price rise.

The model does not include fiscal policy. Formally it could be easy to include some public spending or saving. However, its impact on the aggregate demand would be a more complicated issue; it could be straightforward or it could be eradicated due to the Ricardian equivalence. Any other assumptions than the one taken would complicate the model and would be arbitrary anyway. It is also worth a remark – as a practical argument – that fiscal policy can hardly play an anti-cyclical role in the EMU. This is due to the fact that – on the one hand – fiscal policy is restricted by the Stability and Growth Pact and – on the other hand – it is rather far from a balance over a cycle (Buti et al. 2002; De Grauwe 2003; von Hagen 2003).

Finally, I assume that the foreign country is big and its incomes and inflation are not affected by developments in the home country and remain stable. This assumption reflects well the asymmetry between an individual, non-dominant member of a monetary union and the rest of it.

3. The model

Every economic agent has a utility function

$$u = \log(c_{1D}^a c_{1F}^b) + \beta \log(c_{2D}^a c_{2F}^b) \quad (1)$$

where c_{tF} is real expenditures of an agent at the moment t for the domestic product and c_{tD} is real expenditures for (purchases of) the foreign product, β is a time preference coefficient.

Every agent faces a budget constraint

$$\bar{Y} = P_t c_{1D} + P^* E_t c_{1F} + \frac{P_2 c_{2D}}{1+r} + \frac{P^* E_2 c_{2F}}{1+r} \quad (2)$$

where \bar{Y} stands for a pre-determined nominal income in the analyzed time span, P_t is the price of a unit of the composite domestic product at the moment t , P^* is the price of a unit of the foreign composite product, E_t stands for the exchange rate at time t (nominal price of the foreign currency in the domestic currency³), r and r^* are the home and foreign interest rates respectively. Goods are priced domestically, there is no pass-through effect.

Each agent may freely lend or borrow in the domestic and foreign currencies. However, it does not influence the rate of discount r in equation 2 when uncovered interest rate parity obeys:

$$(1+r) = (1+r^*) \left(1 + \frac{E_2 - E_1}{E_1}\right) \quad (3)$$

This condition could be expressed in the form with a risk premium, for simplicity it is not applied here.

Assumed current account balance in the time span covering two periods is represented by equation

$$P^* E_t c_{1F} + \frac{P^* E_2 c_{2F}}{1+r} = P_t c_{1F}^* + \frac{P_2 c_{2F}^*}{1+r} \quad (4)$$

where c_{tF}^* stands for foreign imports of domestic goods in the period t (per capita domestically).

According to the assumption of a big foreign country its imports depend only on some permanent features of the foreign country, the domestic price and the exchange rate (given $P^* = 1$).

$$c_{tF}^* = Z \left(\frac{E_t}{P_t}\right)^\theta \quad (5)$$

where Z represents fundamental factors determining the foreign demand for domestic goods and θ is price elasticity of real foreign imports. For easy tractability I assume $\theta = 1$.

Maximizing the utility function (equation 1) under the predetermined budget constraint (equation 2) gives – with equation 4 – the following four conditions where

$$Im^* = P_t c_{1F}^* + \frac{P_2 c_{2F}^*}{1+r} : \quad (6)$$

$$c_{1F} = \frac{Im^*}{E_1(1+\beta)}$$

³ This nominal exchange rate divided by the level of the price of the complex domestic product (given fixed foreign prices) is also terms of trade.

$$c_{2F} = \frac{Im^*(1+r^*)\beta}{E_1(1+\beta)} \quad (7)$$

$$c_{1D} = \frac{aIm^*}{bP_1(1+\beta)} \quad (8)$$

$$c_{2D} = \frac{a\beta(1+r)Im^*}{bP_2(1+\beta)} \quad (9)$$

The problem of utility maximization has been solved for any predetermined income but due to equations 4 and 5 the solution gives exact values of all four categories of domestic spending. These values – with respect to equation 2 – determine the value of predetermined income. Moreover, equation 2 and equation 4 give equation

$$\bar{Y} = P_1c_{1D} + P_1c_{1F}^* + \frac{P_2c_{2D}}{1+r} + \frac{P_2c_{2F}^*}{1+r} \quad (10)$$

which represents on its right side different categories of incomes received by a typical domestic agent. Apparently, incomes from domestic sales depend on (they are equal to) an agent's own spending. In fact this should be interpreted as a respective part of all other domestic agents' spending which goes to each typical agent.⁴ No agent can create/boost his own incomes. This is why his individual income is predetermined, it depends on expenditures incurred by others and every agent faces a genuine budget constraint he must consider when maximizing utility. Moreover, each agent understands that all other agents maximize in the same way. These are rational expectations of every agent with regard to the spending decisions of other identical agents – “I know everybody is going to do what I find optimal”. As a consequence both aggregated spending and incomes are restricted. If anyone were irrationally spendthrift he or she would not receive incomes covering his or her expenditures.

4. The cases of macro-equilibrium and disequilibrium within the model

To tackle the case of equilibrium let's recall the assumptions of a stable potential level of production and the assumption of price level determination. The condition of macroeconomic equilibrium at both moments can thus be expressed with the following equations:

⁴ As a consequence of the assumptions there is eventually no need for domestic credit. This feature of the model could be eliminated, for example, by introducing two “generations” of domestic agents. This would complicate the model and would not give any new insights to the problems it is intended to shed light on. It is important that the interest rate matters even in the present structure of the model with eventually no domestic credit. Each agent making individual decisions on his time pattern of spending of the predetermined income takes into consideration the level of the interest rate. In principle, he is free to lend or borrow domestically. Moreover the domestic interest rate determines through UIP the cost of foreign lending/borrowing. The quotas of agents' spending depend on the interest rate.

$$c_{1D} + c_{1F}^* = \Psi \quad (11)$$

$$c_{2D} + c_{2F}^* = \Psi \quad (12)$$

$$P_1 = 1, \quad (13)$$

$$P_2 = 1, \quad (14)$$

where the “inherited” price level is standardized at 1, and Ψ stands for the potential product (per capita when not aggregated).

Equation 3, double equation 5 (for $t = 1, 2$), equations 6–9 and 11–14 constitute a set of eleven equations with eleven variables (six categories of spending, exchange rates and price levels for each period, the interest rate); in principle this should be solvable.⁵

What does macro-equilibrium depend on and what is the mechanism which could guarantee its conditions are met? Equilibrium could be preserved only when all the endogenous variables assume proper equilibrium values.

Firstly, macro-equilibrium may be preserved only at a certain level of the interest rate which is a part of the solution of the equations. However, the interest rate is a monetary policy instrument set by the central bank – in this sense this is an exogenous variable.⁶ Of course the central bank makes it endogenous by its efforts to keep macroeconomic equilibrium but it is a matter of question how effective it is.⁷ If it sets its interest rate at a level which is not consistent with macro-equilibrium, micro-optimization will drift the economy towards disequilibrium.

Secondly, macro-equilibrium demands the exchange rate be exactly at the level determined by the solution of the equations (including eq. 11–14). This is not subject to any restrictions if the exchange rate is freely floating.

The problem looks different in the case of a monetary union when the interest rate is exogenously determined. It prohibits the realization of the conditions of equilibria (equations 11–14) – two of them could not be met. However, in accordance with the assumptions,

⁵ If the respective equations reasonably represent the reality, there must be a solution which represents the real state.

⁶ The interest rate of the central bank is one for a very short-term and it does not exclusively set longer-term market rates. This gives some flexibility to the system, which is not expressed in the model. A multi-period version of the model could do better with this respect. However, when a small country in a monetary union is considered, this problem is of little importance – interest rates, also for longer periods, are determined by the exogenous rates of the central bank of the union. In fact, in the EMU there is very little difference among national longer term interest rates despite major fundamental distinctions among the member countries.

⁷ This is a more complex issue; when the central bank's target is macro-equilibrium in the sense applied in the model it means it does not concentrate its efforts on general price-level stability or inflation, it does not set the interest rate to eliminate the effects of exchange rate fluctuations on general price level. This is rather inconsistent with real-life monetary strategies under floating exchange rates (direct inflation targeting in particular).

we know that $P_2 \geq P_1$ and $c_{1D} + c_{1F}^* \leq \Psi$. This is not enough to show analytically what directions disequilibria would take – it depends on particular values of the interest rate and the exchange rate and – of course – on the values of the parameters. This is understandable and stays in accordance with empirical observations of the EMU. In the next part of the paper some numerical examples are analyzed. They provide insights into how the model behaves and what results it can produce, in particular in the case of a monetary union.

Computations can also be performed for a case when only the interest rate does not match its equilibrium level and the exchange rate is freely floating. One of the equilibrium conditions (equations 11–14) can not be met then. Numerical examples clearly show which condition must be breached.⁸

Before we turn to numerical examples it is worth considering some aspects of exogenous variables in this case. In a monetary union the interest rate is set at an exogenous level – both in its mathematical and geographical sense – with little respect to a local equilibrium. Also the exchange rate remains fixed at a certain level. Even though in principle this level may be freely chosen there is no level of it which would be consistent with sustainable macroeconomic equilibrium if the interest rate is not at its equilibrium value.⁹

One can ask why the foreign and domestic equilibrium interest rates cannot be equal. In principle they could but why should they? In a multi-country monetary union where nations are geographically based entities¹⁰ and which differ in many respects such as wealth, incomes, social structures, growth perspectives,

tax systems, culture and so on they probably differ also with respect to their time preferences and they need different equilibrium interest rates. This needs more empirical and theoretical investigation but even a superficial look at data makes the preposition sound reasonable.

5. Some numerical examples

Let's set the values of the parameters as follows: $a = 0.5$, $b = 0.5$, $Z = 0.2$, $\beta = 0.8$, $\Psi = 1$, $P^* = 1$, $r^* = 0.05$. "Inherited" price of the domestic good is equal 1 (and respectively eq. 13 and 14 obey in equilibrium). Solving the equations for equilibrium values of the domestic interest rate and the exchange rate gives:

$$r \approx 0.15, E_1 \approx 2.40, E_2 \approx 2.62, c_{1F} \approx 0.22, c_{2F} \approx 0.18,$$

$$c_{1D} \approx 0.52, c_{2D} \approx 0.48, c_{1F}^* \approx 0.48, c_{2F}^* \approx 0.52$$

In the case of a monetary union the domestic interest rate is equal to the foreign rate; $r = r^* = 0.05$. Let the parity exchange rate be close to the average of E_1 and E_2 from the previous example; $E_1 = E_2 = 2.5$. The remaining values are the same as before. In this case there is a solution characterized by inflation at the first moment with respect to the "inherited" price level $P_0 = 1$ ($P_1 \approx P_2 \approx 1.04$) and recession at the second moment (real production at the second moment $Y_2 \approx 0.92$ as compared to $\Psi = 1$ and $Y_1 = \Psi$). This example shows a country ("Italy") which as a result of its participation in a monetary union experiences inflation and loss of competitiveness which lead to consecutive recession.

However, if we set the exchange rate at a sufficiently high value of the domestic currency (for example $E_1 = E_2 = 2$) the result would be recession (production below the "inherited" potential level) at both moments. Such a country ("Germany") has clearly set its exchange rate as overvalued. Of course, its situation improves when the assumption of a stable foreign price level does not hold.¹¹

Moreover, as it has been already noted, there is no fixed exchange rate (parity) which could bring about equilibrium at both moments in a union country but by chance when the equilibrium interest rate of a country happens to match the interest rate of the union. This possibility is not improbable – there may be some countries of a union which meet this condition.

6. Conclusions

The model presented in this paper shows that macroeconomic equilibrium depends on proper

⁸ For example, if the interest rate is below its equilibrium level it exerts inflationary pressure at the first moment. This sets the real exchange rate for the first moment and – due to UIP – for the second moment. If there is deficient demand at the second moment neither the exchange rate nor sticky prices allow for a shift towards equilibrium. The nominal exchange rate cannot be fixed first with respect to equilibrium at the second moment since it would bring about inflation at the first moment – the real exchange rate at the second moment would be too strong anyway. It is only unexpected devaluation (the breach of UIP) that could help with respect to the maintenance of equilibrium at the second moment. Also expectations of such a juncture could bring about positive risk premia and a rise in market interest rates. This should shift the economy closer to equilibrium. If these alternative mechanisms were not considered the situation when the domestic interest rate is fixed equal to the foreign rate should be identical with the case of a monetary union.

⁹ The exchange rate parity is set administratively after an economic consideration of its proper, sustainable equilibrium level. Equilibrium is widely defined as simultaneous internal and external equilibria and respectively the Swan diagram is applied to illustrate the idea of the equilibrium exchange rate. This is the dominant intellectual device beyond determination of the level of a fixed rate. However it should be clear now that there is no sustainable equilibrium at a fixed rate or – to say the same differently – there is no equilibrium fixed rate but for the case when domestic equilibrium interest rate exactly matches the interest rate of the union. In this context it is worth noticing that the Swan diagram is a static device with unclear understanding of external equilibrium which does not explicitly recognize inter-temporal optimization.

¹⁰ Also in the theory of optimum currency areas the old argument of factor mobility must be applied with extreme caution; even if European employees were mobile it is difficult to imagine a country readily accepting a major outflow of its citizens and an economic shrinkage in the aftermath of a heavy asymmetric shock. European practice shows that it is equally improbable these migrants would be readily accepted.

¹¹ This would not, however, constitute a process of relative price level adjustments leading to equilibria in all countries involved. "Germany" ceased to be in recession at the expense of "Italy" and any stance of monetary policy would not guaranty equilibrium in both countries simultaneously.

macroeconomic policy and that optimization by economic agents cannot substitute for such policy – in fact such optimization based on rational expectations can drive the economy away from equilibrium. Moreover, inter-temporal trade does not help when a budget constraint (limits to debt) is imposed.

The maintenance of macroeconomic equilibrium depends thus on both policy variables – the interest rate – and the flexibility of the exchange rate. Their equilibrium values depend on idiosyncratic features of particular economies such as inter-temporal preferences,

which reflect further specific features of each economy and each society.

A participation in a monetary union imposes restrictions on the values of the variables crucial for sustainable equilibrium – in this sense a monetary union may be a source of both inflation and recession in member countries. These effects are due to some in-depth, lasting features of particular economies and not of any asymmetric shocks which are in the center of the theory of optimum currency areas.

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