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Cooling Down Economy with Fiscal Policy in a Monetary Union

INTRODUCTION

Economic interaction is very often perceived as a process of a sequential giving up autonomy in economic policy of national authorities and delegating it to supranational level. Under this approach, the monetary union is the final stage of economic integration, when member states move monetary policy decisions to a common institution (a common central bank). Despite many potential benefits flowing from using a common currency, it was already pointed out by the classical OCA theory that there is a relationship between macroeconomic losses and several criteria that characterize member economies. These were connected with the probability and severity of asymmetric shocks and any responses by economic policies.

When the stage of full monetary integration is achieved, the only autonomous policy at the national level is the fiscal policy. This means that it becomes relatively more important for achieving national economic policy goals, for example when cooling down is required to converge business cycles in a monetary union. Despite a very good elaboration of the role and consequences of monetary policy actions in the DSGE-class models, there is neither similar consensus nor analytical framework in case of the fiscal policy. The European Central Bank and other central banks outside Europe use large macromodels that allow for forecasting consequences of their decisions [Wouters & Smets 2004, Staub & Tchakarov 2007]. They are, however, not able to capture consequences of the independent fiscal policies. These models are based on extensive microfoundations covering a representative agent with the infinite planning horizon. They assume, however, that the fiscal policy does not influence demand or internal equilibrium. These two assumptions can be found invalid on the empirical ground [Kumhof & Laxton 2007a]. Therefore there is a need for developing modelling frameworks in which dynamic effects of fiscal policy would be properly captured and used for forecasting consequences of

a policy mix. This is true not only in the case of a monetary union, but for any country case in which independent economic policies are implemented. However, the problem of the role of the fiscal policy in converging business cycle phases among currency union member states is of superior importance in monetary union economics.

The aim of this paper is to present a modified version of the GIMF (Global Integrated Monetary and Fiscal model) created by the International Monetary Fund. The modification takes form of adjustments reflecting some additional assumptions and mechanisms present under full monetary integration (lack of monetary policy instruments in cooling down domestic economy). The empirical studies that were utilizing the original GIMF model recognized so far the following features [Leight 2008]:

- how stronger response of the fiscal policy in consecutive business cycle phases can decrease the scope of necessary monetary policy response,
- to what extent stronger fiscal policy response in consecutive business cycle phases induces substitution effect: inflation to output,
- in what way efficiency of fiscal policy in increasing macroeconomic stability depends on interaction with monetary policy and lags in its implementation.

This paper presents the methodology, discusses theoretical background and formulates suggestions in regard to implementing the modified version of the GIMF model and further research directions.

MODIFICATION OF THE GIMF FRAMEWORK FOR A CURRENCY UNION SETTING

The GIMF model belongs to a modern class of open economy models. This is a model of general equilibrium, which allows for analyzing both monetary and fiscal policies (policy mix). In particular, the assumptions result in not conforming to the Ricardian equivalency. The Ricardian equivalency is not present due to the characteristics of the representative agents. The overlapping generations have a finite time horizon. As a consequence, the fiscal expansion affects permanently their wealth and they do not expect the necessity of bearing costs in a form of higher taxes in the future. In addition, productivity of labor that decreases with age means that workers discount future increases in income taxes. The older they are the probability of being affected by increased taxes is lower. Consumers do not have access to financial markets, which prevents consumption smoothing. It results in a direct and a very strong impact of any

changes in income taxes on demand. This condition / assumption must be perceived as the most severe drawback of the presented model. Further theoretical research and developing models of this class require departing from this assumption since it is inconsistent with the reality.

In this model there are two taxes: the income tax and the tax on investment. They are causing distortions because both consumption and investment depend on relative prices. This assumption results in the fact that they are directly affected by any changes in the tax rates.

The original version of the GIMF model assumes that public spending is productive. In particular, this refers to spending on infrastructure and increasing productivity of production factors in the private sector this way. Real rigidity refers to customary preferences in the area of consumption. This real rigidity induces inertia of investment and generates costs of any changes in imports. Nominal rigidities are embodied by sticky Phillips curves in each sector [Kumhof & Laxton 2007a].

The government is able to set the ratio of the budget BALance to the GDP and to raise additional tax revenue. The fiscal policy rule is defined as follows:

$$BAL_t/GDP_t = \alpha + \beta (T_t - T_t^*/GDP_t) \quad (1),$$

where BAL_t/GDP_t is the ratio of the budget BALance to the GDP,

β – is a parameter describing deficit response (fiscal policy response) to changes in the public revenue from the income taxes.

When $\beta=0$, then BAL_t/GDP_t is maintained always at the level „ α “. T_t is the actual tax revenue while T^* is the tax revenue in equilibrium. Procyclicality of this rule is present both at $\beta = 0$ and $\beta < 0$. With the increase of β above zero, more and more additional income tax revenue is saved. When $\beta = 1$, the response of the fiscal policy can be recognized as a structural deficit, since 1% increase of the tax revenue (as the % of the GDP) leads to 1% increase in the BALance. Conducting fiscal policy is simply based on adjusting public spending (G) or the tax revenue (T_t). For $\beta > 1$ the fiscal policy becomes counter-cyclical and tax smoothing is present. Deficits (negative BALances) appear in recessions and accumulated public debt is repaid during booms.

The monetary policy, according to present solutions, when based on inflation targeting, is conducted in a form of adjustments of nominal interest rates. Modelling of this element is very often based solely on expectations and assumption of some inertia [Lopez 2003]. Adjusting the formula for monetary policy to institutional framework at the European Central Bank (ECB) yields the following equation:

$$i_t = i_{t-1}^{\mu_i} \times (r_t^* \times \bar{\Pi}_{t+4})^{1-\mu_i} \times \left(E_t \frac{\bar{\Pi}_{t+4}}{\Pi_{t+4}^*} \right)^{(1-\mu_i)\mu_\pi} \quad (2),$$

where it is the nominal interest rate set by the central bank,

Π^* – is the inflation target defined as a joint inflation for the forecast period of 4 quarters ($\Pi_{t+4} = \Pi_{t+1} \cdot \Pi_{t+2} \cdot \Pi_{t+3} \cdot \Pi_{t+4}$),

E – reflects expectations formulated on the basis of information available at time „t”.

The coefficient $\mu_i \in [0 ; 1)$ reflects nominal interest rate inertia.

If $\mu_i=0$, equation (2) implies that when the inflation forecast exceeds the target by 1 percentage point, the nominal interest rate increases by $1 + \mu_\pi$.

The equilibrium real interest rate (r_t^*) is endogenous, and is determined by the global market for loanable funds, as well as a country-specific risk premium.

The real interest rate at equilibrium is a dependent variable, set at the global loan market and includes specific risk premium for a monetary union. In case of the Eurozone this risk premium is relatively small, but its theoretical relationship with the fiscal policy in the model requires this element to be introduced. This premium is a difference between the monetary union interest rate and the rest of the world interest rate subject to expected changes of the exchange rate.

$$i_t = i_t^{RW} \times E_t \varepsilon_{t+1} (1 + \varphi_t) \quad (3)$$

where i_t^{RW} – is the nominal interest rate in the rest of the world,

ε_{t+1} – is the future rate of change of the nominal exchange rate, and

φ_t is the monetary union-specific risk premium.

In an open economy setting the interest rate must comply with the uncovered interest rate parity. The central bank ex ante sets its interest rate at a certain level, but the market forces (via uncovered interest rate parity) induce appropriate capital flows and any difference between the ex ante interest rate set by the central bank and the global interest rate (plus risk-specific premium) and ex post interest rate disappears. The aim is to introduce the impact of fiscal policy in the model by assuming that the risk premium depends on fiscal policy. Therefore (ex post) the central bank will adjust the interest rate or allow for appreciation/depreciation of the common currency – as a result of fiscal policy actions.

This element must be therefore associated with the fiscal policy to allow modelling of agents' response to the difference in rates of return on domestic

(i.e. union) and foreign assets. For the framework consistent with nominal convergence criteria in the EMU the following formula is required:

$$\varphi_t = \delta_1 + \frac{\delta_2}{\left(0.6 - \frac{PD_t}{GDP_t}\right)^{\delta_3}} \quad (4).$$

The first element in brackets (0.6 => 60%) reflects the maximum level of public debt that is allowed in monetary union member states. The bigger the difference between the limit and the actual level of public debt, the higher the flexibility of the fiscal policy [Młodkowski 2007]. In addition, it results in decreasing the specific risk premium and drives the union-wide interest rate closer to the global one. Parameters δ_1 , δ_2 , δ_3 reflect the specific features of the monetary union economy. δ_1 is the premium for a specific risk independent from budgetary issues. δ_2 is always positive and reflects reaction observed in empirical data between risk premium and the level of the public debt [Arora & Cerisola 2001] – positive impact of debt on risk premium in the nominal interest rate. δ_3 is also positive and it sets the scope of convexity of the function φ_t .

For the households (in the monetary union and in the rest of the world) 15-year planning horizon is assumed and decreasing productivity at 5% yearly [Kumhof & Laxton 2007b]. Coefficients describing fiscal policy and impact of public investment on the GDP must be estimated on the basis of separate models or be taken from reviews of studies utilizing meta-analysis as in Ligthart & Suarez [2005].

The model presented here allows for testing different levels of the „ β ” parameter that reflects the nature of the fiscal policy reaction in each of the business cycle phases. Available tools of influencing business activity cover income tax, consumption tax (VAT) and tax on investing in financial instruments.

In the steady state the fiscal balance is supposed to be maintaining the ratio PD_t/GDP_t at the stable level. This means proportionate fluctuations of debt and output according to the rate of change of the nominal GDP:

$$\left(\frac{DEF}{GDP}\right) = \frac{\Delta GDP}{1 + \Delta GDP} \times \left(\frac{PD}{GDP}\right) \quad (5).$$

In a hypothetical case for the EMU, if the PD_t/GDP ratio in equilibrium is for the EMU countries at 40% (on average) and the average nominal GDP growth rate is around 4,23% (table 2), then the deficit in the Eurozone must not exceed 1,62% of the GDP (on average). Adjusting the parameter that is

responsible for nominal interest rate inertia (μ_i) one can refer to paper by Clarida, Gali, Gertler [1998], who estimated this parameter also for the German economy at 0,8 (monthly data) and 0,51 (quarterly data).

On the basis of results obtained by Rowland and Torres [2004] one can assume that in the EMU growth of PD_t/GDP_t by one percentage point would lead to change in specific risk premium by 5–7 basis points.

On the foundations of the model for the Eurozone it becomes possible to study fiscal policy effects when cooling down economic activity is conducted as a response to a positive asymmetric shock. At the beginning it is necessary to point out specific conditions prevailing in the EMU for fiscal policies. Because of high levels of public debt in the biggest Eurozone economies the flexibility of fiscal policy is low. This element is, however, of minor importance when studying a response to a positive economic shock.

Cooling down process is defined as decreasing the deficit (DEF_t) and debt (PD_t) that leads to increasing potential scope of fiscal policy response in the future to negative asymmetric shocks. Comparing the assumptions and parameters describing growth rates of the nominal GDP and the limits for debt and deficit with the current situation of the EMU member states one can conclude that from the very beginning of the Eurozone fiscal policy was expansionary. This resulted in the unstable PD/GDP ratio and executing influence on premium on specific risk for all EMU issuers. This observation is supported by information on interest rates in table 1.

Table 1. Interest rates (after removing inflation premium) and the average fiscal balance in the EMU

	1999	2000	2001	2002	2003	2004	2005	2006	2007
EMU interest rates	3.43	3.75	4.08	3.83	2.10	3.15	2.14	3.88	
EMU fiscal position	-1.7	-0.4	-1.7	-2.1	-2.4	-2.5	-2.2	-1.4	-1.1

Source: International Financial Statistics, International Monetary Fund, June 2008 (for interest rate) and the European Central Bank database (for fiscal position).

As an important impediment in stabilizing PD/GDP ratio in the Eurozone one can recognize low nominal GDP growth rates (table 2).

Table 2. Euro 12 – Growth rate of the gross domestic product at market prices 1999–2007

1999	2000	2001	2002	2003	2004	2005	2006	2007
4.58%	5.21%	4.35%	3.50%	2.94%	4.04%	3.70%	4.79%	4.92%

Source: European Central Bank database.

The only available solution is a cut in public spending to reach the deficit below 1.62% GDP (this is observed in 2006&2007). Only after arriving at such stance, the debt/GDP ratio will become stable and will start to drop (as indicated in figure 1 for 2006&2007).

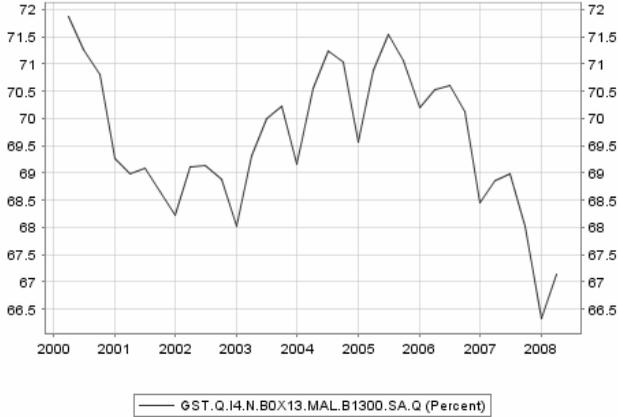


Figure 1. The average debt-to-GDP ratio for the 15 EuroArea members 2000–2008 (quarterly)

Source: European Central Bank database.

However, it is already the process of achieving this level of deficit can be perceived as restrictive fiscal policy. The proposed model may help in answering questions about any potential consequences.

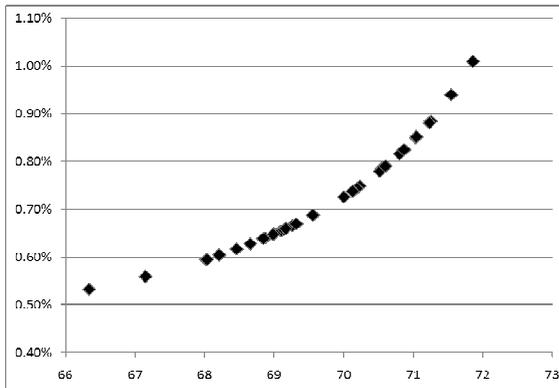


Figure 2. Estimated relationship of ϕ_t (risk premium) and PD/GDP for EURO AREA from 2000 to 2008

Source: Author.

As expected, cuts in public spending lead in the GIMF model to an expedite decrease in demand. In the long run theoretically there is a relationship of GDP returning to the initial level. This is because of savings on interest payments and possibility of decreasing taxes, when PD/GDP drops.

The mentioned decrease in demand in a monetary union member state has its impact on prices, which were growing faster in a country hit by a positive demand shock. The common monetary policy will not respond to this anti-inflation impulse generated by a restrictive fiscal policy. There is actually no way it could be done due to the impossible trinity. Instead, one should expect increase in the effectiveness of the common monetary policy resulting from converging business cycle phases in member economies. Decreasing domestic absorption leads to improvement in trade balance and the current account. If one assumes that the internal equilibrium was associated with zero net exports, then an additional effect of the restrictive fiscal policy would be accumulation of foreign exchange reserves and increase of domestic savings. This is a result of a commonly accepted relationship based on an equivalency derived from national accounts – twin deficits. In addition, one can notice the fact that this is a feature that distinguishes the GIMF-class models from the standard open economy models based on Ricardian assumptions.

CONCLUSION

The proposed model is a simple modification of a standard GIMF created by the IMF. A very important feature is the lack of monetary policy response to fiscal contraction. It results in omitting some mechanisms included in the standard GIMF version [Leight 2008]. However, even without the support in the form of decreasing nominal interest rates (Figure 2), there are some positive effects of decreasing public spending. In the medium and the long run these benefits cover increase in savings, drop in interest payments and potential for decreasing taxes on income and capital. Decreasing taxes (and the specific risk premium for union-issuers) results in increasing labour supply, investment, the GDP and consumption. The future directions for studies and developing GIMF models for a monetary union should focus on calibrating parameters and implementing all nominal convergence criteria.

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Summary

The paper offers a modification to a simple theoretical framework of the DSGE class model for an open economy with extended microfoundations. It can be used for an analysis of an economy of a monetary union when a member state is hit by an asymmetric shock. The focus is on the response of national fiscal policy and its efficiency under nominal convergence criteria that apply for central government deficit and public debt. Due to non-Ricardian assumptions regarding representative agents it becomes possible to capture reaction of consumption and investment to alterations in the level of taxation. The proposed modification of the standard GIMF framework is quite simple and takes a form of introducing a limit for public debt (defined as % of GDP) and removing direct interaction with monetary policy that would otherwise (without full monetary integration) decrease social cost of fiscal contraction.

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Streszczenie

W opracowaniu proponuje się modyfikację prostych teoretycznych ram modeli klasy DSGE dla gospodarki otwartej o rozszerzonych podstawach mikroekonomicznych. Mogą one znaleźć zastosowanie w analizach gospodarki Unii Walutowej w sytuacji, kiedy państwo członkowskie znalazło się w sytuacji asymetrycznego szoku. Uwaga ogniskuje się na możliwych działaniach w ramach narodowej polityki fiskalnej i ich efektywności w sytuacji ograniczeń w postaci nominalnych kryteriów konwergencyjnych odnoszących się do deficytu budżetu państwa i długu publicznego. W oparciu o pozaricardiańskie założenia dotyczące reprezentatywnych agentów możliwe staje się uchwycenie reakcji konsumpcji i inwestycji na zmiany w poziomie opodatkowania. Proponowana modyfikacja ram standardów GIMF jest nieskomplikowana i przyjmuje kształt wprowadzenia ograniczeń dla zadłużenia publicznego (określonego jako procent PKB) oraz usunięcia bezpośrednich związków z polityką monetarną, która w przeciwnym wypadku (bez pełnej integracji monetarnej) zmniejszyłaby społeczne koszty ograniczeń fiskalnych.