ABSTRACT

This paper concentrates on the asymmetric shocks in European monetary union stemming from the effect of exchange rate fluctuations on trade. In an open macro model, I have used Taylor (2001) monetary policy rule accompanied with a weighted mean mechanism to extract optimal weights for optimal monetary policy in a monetary union. Then, I have derived the nominal and real effective exchange rates, which are much more changeable than actual ones so that will absorb the potential source of variation in the current account balance of payments.

JEL classification: E52; F32; F33

Keywords: monetary policy; economic and monetary union; weighted mean mechanism; asymmetry; current account balance of payments

1. Introduction

An important anxiety for countries forming a monetary union, such as Monetary Union (EMU) in Europe, is the happening of asymmetric shocks (De Grauwe 2000; Kenen 2002). The happening of such shocks is an important cost of monetary unions because members cannot have confidence in exchange rate changes to respond to such shocks (Mundell 1961).

This paper concentrates on the asymmetric shocks in European monetary union stemming from the effect of exchange rate changes on the European current account balance of payments.

The literature of Optimal Currency Area (Mundell 1961) asserts that a precondition for a successful currency region is a considerable convergence. On my opinion, the discrepancy between regional and national economies within the European countries is significant (OECD 2007) because, the rates of inflation based on GDP deflator across this countries in 1998 differed from -0.4% in the case of Luxembourg to 6.5% in the case of Ireland. The rates of unemployment differed from around 2.7% in the case of Luxembourg to 15% in the case of Spain. Current account balance of payments differed from -7.1% of GDP in the case of Portugal to 9.2% of GDP in the case of Luxembourg. Economic growth differed from 1.4% to 8.5% in the case of Italy and Ireland respectively.
In 2005, economic growth in the euro zone varied from 0.9% in Germany to 5.5% in Ireland. Budget deficit also differed from small surpluses in some countries to substantial deficits in others. Greece continued to run deficit -4.2% of GDP to -5.1% from 1998 to 2005 respectively, while Finland continued to run surplus 1.7% of GDP to 2.5% of GDP from 1998 to 2005. Current account balance of payments varied from -9.2% of GDP in the case of Portugal to 11.8% of GDP in the case of Luxembourg in 2005. Inflation rates were different from 0.6% in the case of Finland and Germany to 4.7% in the case of Luxembourg while, the rates of unemployment differed from 4.4% to 9.9% in the case of Ireland and France respectively in 2005. Therefore, you can see large discrepancies in economic presentation between countries forming the euro area. In addition, there are no signs on any withdrawing of these differences. Therefore, countries probably would confront to different shocks and affected in a different way by shocks. The latest understandings have revealed that strictly divergent countries in the euro area persist. Therefore, the euro area is not an OCA, and the euro has not caused the convergence for the euro area to become one.

The aim of this paper is to investigate the asymmetric shocks on the European current account balance of payments that stem from the euro/dollar changes and to survey the technique that the ECB can use to confront to the asymmetric shocks to use an appropriate monetary policy which consider the relations between fiscal and monetary policy and the benefits of all countries independently and all together. If exchange rate fluctuations have different effects across sectors, and if countries have different specialization, such asymmetric shocks will occur.

In this paper, I will identify another tool that countries or better to say the ECB can use to react to asymmetric shocks. I will derive optimum weights by considering the interaction between national fiscal and monetary policies in one hand and the same monetary policy exerted independently by the ECB on the other hand, in which the ECB considers the exchange rates when setting its instrument. By driving optimal weights, none of each countries can influences on the ECB decision and the ECB Board employs the optimal weights to make decision about the optimal monetary policy. The arrangement of the paper is as follows: the model structure is in section 2. Section 3 discusses the “weighted mean mechanism”. In section 4, I calibrate the model to survey the quantitative importance of it and section 5 concludes.

2. The model

In the following, all variables except interest rates are in logarithms. The demand for money has a positive relation with the aggregate price index, a positive relation with real domestic income, and negative relation with the domestic nominal interest rate. That is:

\[ Md_t = P_t + \eta_i Y_t - \sigma_i r_t + \mu_i \]  

(1)

Where \( Md_t \) is the demand for money in current period \( t \) by country \( i \), \( P_t \) is the presently visible aggregate price index in country \( i \), \( Y_t \) is the real domestic income in period \( t \) in
country i, \( r_t \) is the nominal interest rate in the present period \( t \) in country i and \( \mu_t \) is a transitory money demand shock residual with zero mean and normal distribution.

The aggregate demand has a positive relation with the real exchange rate, negative relation with the domestic real interest rate, and has a positive relation with the budget deficit. That is:

\[
Yd_t = \beta_t (S_t + P^e_t - P^e_t) - \theta (r_t + P_t - P^e_t) + b_t X_t + \nu_t
\]  

(2)

Where the nominal exchange rate \( (S_t) \) is defined as the currency of country i per unit of foreign currency in the present period, and \( P^e_t \) is the aggregate price index of the foreign country in the present period, \( P^e_t \) is the expected price level based on the information that is accessible in the present time, \( X_t \) is the country’s current budget deficit. The fiscal authority in country i chooses a policy variable \( X_t \), which is present government budget deficit; a larger \( X_t \) means a more expansionary fiscal policy and \( \nu_t \) is a transitory aggregate demand shock term with zero mean and normal distribution.

The supply of home output is dependent on the price at which producers want to sell their output relative to the price expectations. \( P_t^e \) refers to the aggregate price of country i and \( P^e_t \) is the price that is expected by private sector in country i, so the term \( (P_t^e - P^e_t) \) is the usual supply effect of surprise price and \( \varepsilon_t \) is a transitory aggregate supply shock term with zero mean and normal distribution. This creates a well-known Lucas function for the economy’s total output:

\[
Ys_t = a_t(P_t^e - P^e_t) + \varepsilon_t
\]  

(3)

The financial capital is completely movable and that home and foreign bonds are perfect substitutes; as a result, the uncovered interest parity condition holds incessantly. That is:

\[
r_t = r_t^e + S_t^e - S_t
\]  

(4)

Where \( r_t^e \) is the foreign interest rate in the current period, and \( S_t^e \) is the expected nominal exchange rate based on the information that is accessible at time \( t \). The expression \( (S_t^e - S_t) \) gives the expected rate of depreciation of the currency.

For closing the model, we require the simultaneous fulfillment of the following two equations: money demand in the present time \( (Md_t) \) equal the present money supply \( (Ms_t) \) and that present aggregate supply equal present aggregate demand. That is:

\[
Ms_t = Md_t
\]  

(5)

\[
Yd_t = Ys_t
\]  

(6)
By assumption floating exchange rates, the money supply is determined exogenously and
the home interest rate and exchange rate are determined endogenously but joined together via
the uncovered interest rate parity condition.

I use aggregate demand and supply in equation (6) to extract the equilibrium condition in
the real sector of the economy.

\[ P_i = \frac{1}{a_i + \beta_i + \theta_i} \left[ \beta_i (S_i^* + P_i^*) + (a_i + \theta_i)P_i^* - \theta_i r_i + b_i X_i + \nu_i - \varepsilon_i \right] \] (7)

Based on equation (7), I can write the change in the aggregate price relative to the change
in the nominal exchange rate:

\[ \frac{\partial P_i}{\partial S_i} = \frac{\beta_i}{a_i + \beta_i + \theta_i} \] (8)

An increase in the nominal exchange rate causes an increase in the aggregate demand, hence the aggregate price goes up to increase the aggregate supply and preserve equilibrium
in the real sector of the economy. The elasticity of price relative to the exchange rate changes
is positive and smaller than one. Therefore, nominal depreciation creates real depreciation.

I use equations (1) and (4) to extract equilibrium condition in the money sector of the
economy.

\[ S_i = S_i^* + r_i^* - \frac{1}{\sigma_i} \left[ P_i - Md_i + \eta_i Y_i + \mu_i \right] \] (9)

Based on equilibrium in the money sector, I can write the change in the aggregate price
relative to the alteration in the nominal exchange rate:

\[ \frac{\partial P_i}{\partial S_i} = -\sigma_i \] (10)

For a given stock of money, an increase in the nominal exchange rate causes the expectation of the currency appreciation, and because of diminishing interest rate demand for money increases so, the aggregate price should fall to maintain equilibrium in the money
market.

In the above model i is the country (i = 1, 2…N-n). The leading council of the ECB
consists of N members which n members represent the ECB Board and don’t have any
nationalistic perspective, N-n members are appointed by national banks and consider their
country specific situation. The parameters denote the transmission of shocks in the model; \( a_i \)
denotes the transmission parameter of price shocks in the aggregate supply, \( \beta_i \), \( \theta_i \) and \( b_i \)
denote the transmission parameters of real exchange rate, real interest rate and budget deficit
in the aggregate demand respectively. \( \eta_i \), \( \sigma_i \) denote the transmission parameters of real
income and nominal interest rate in the demand for money.
As my aim is to focus on the implications of asymmetries in transmission, I presuppose that these coefficients differ between countries while the aggregate supply shock \( \varepsilon \), aggregate demand shock \( \nu \) and money demand shock \( \mu \) are symmetric. Therefore, in the following I set \( \varepsilon_i = \varepsilon \), \( \nu_i = \nu \) and \( \mu_i = \mu \) for all \( i \).

The major characteristic of the model is that voters are nationalistic and each voter is worried about economic circumstances in his country.

First, I have presupposed that the monetary powers manage the rate of inflation and thus minimize their losses using the nominal interest rate as their tool.

Second, The European Central Bank (ECB) has the sole responsibility for performing monetary policies in euro land. In the following, equation (11), the central bank is assumed to have an explicit target for the goal variables such as the price target and real income target.

\[
L_{ni} = \frac{1}{2} \left[ P^2 + \lambda_i (Y_i - Y^*_i)^2 \right] \\
\lambda_i > 0
\]  

(11)

Where \( \lambda_i \) is denoting the relative weight country \( i \) places on the real income gap which \( Y^* \) is the normal real output. To keep model as simple as possible, suppose that N-n members are divided in two distinctive groups \( j \) and \( h \) with preferences described by \( \lambda_j \) and \( \lambda_h \).

Monetary authority in Country \( j \) minimizes its loss function, equation (11) subject to equations (7) and (9). The first-order condition with respect to \( r_j \) gives:

\[
P_{ji} = \frac{\lambda_i (Y_i - Y^*_i)}{\eta_j}
\]  

(12)

Bearing in mind that monetary policy focuses on reaching price stability and fiscal policy holds the major duty for output stabilization under the presence of shocks. In order to reach these targets the fiscal authority uses the budget deficit as an instrument. The implicit rule for the instrument derived from the first order condition of the explicit loss minimization, equation (13).

\[
L_{j_i} = \frac{1}{2} \left[ X^2_i + \lambda_i (Y_i - Y^*_i)^2 \right] \\
\lambda_i > 0
\]  

(13)

Fiscal authority in country \( j \) minimizes its specific loss function, equation (13) subject to equations (7) and (9). The first-order condition with respect to \( X_{ji} \) is:

\[
X_{ji} = \frac{b_j \lambda_i (Y_i - Y^*_i)}{\eta_j (a_j + \beta_j)}
\]  

(14)

It is worth considering if an economy stagnates before achieving a “close to balance or in surplus” situation for the public deficit the SGP causes a stabilization problem. However, the
SGP impose tax increase and diminishing expenditure in a situation where an expansionary fiscal policy would be more suitable. Hence, the fiscal policy acts pro-cyclically.

In the first order condition, derived from minimization of fiscal authority loss function, the fiscal policy responds pro-cyclically to home activity.

The optimal monetary policy rules consider the exchange rate when setting its instrument; in open economies (see Ball 1998; Svensson 2000; Taylor 2001; Kollmann 2002; cobham 2006). In fact, there is no agreement how a central bank should respond to changes in the real exchange rate. Taylor (2001) recommends a ‘rule of thumb’ that a real appreciation should stimulate the central bank to unwind monetary policy; that is, to lesser, the nominal interest rate. Since the real exchange rate is related to present aggregate demand and consequently to producer prices so, considering the present level of the real exchange rate tends to be stabilizing. Certainly, it is likely to use nominal depreciation of the domestic currency as in Taylor (2001). However, I track this idea but center of attention on the case where the central bank increases the nominal interest rate whenever it expects a real depreciation of the domestic currency. Supplementary allowing for reaction to the price level and the case where each of N-n members considers their national fiscal expansion (\(X_\mu\)), the monetary policy rule locally approximated by:

\[
r_\mu = q_\mu^e - q_\mu + p_\mu + X_\mu
\]

(15)

Where \((q_\mu^e - q_\mu)\) is the expected real depreciation of the domestic currency.

Equation (14) shows the fiscal reaction function based on the viewpoint of fiscal authority in country j. Now, monetary authority in country j uses this reaction function and its first-order condition, equation (12), to determine the monetary policy. So, the monetary authority considers the specific situation of its country by interaction with the fiscal authority. By using equations (12), (14) and (15), the optimal monetary policy extracted.

\[
r_\mu = q_\mu^e - q_\mu + \left(\frac{a_j + \beta_j}{a_j + \beta_j} \right) \frac{\lambda_j}{\eta_j} (Y_\mu - \bar{Y}_\mu)
\]

(16)

Equation (16) shows the viewpoint of monetary authority in country j. Monetary authority uses its first-order condition and the viewpoint of fiscal authority in country j to determine the optimal monetary policy for country j. This phrase shows the optimal committee preferences from the point of view of country j. The same phrase is written for the point of view of country h.

3. Monetary policy in the European Monetary Union

With the purpose of recognizing the significance of a vote throw by country j carries a different weight than the vote throw by country h, a “weighted mean mechanism” employed.

\[
r = \sum_{i=1}^{N-n} W_i r_\mu
\]

(17)
Where \( r \) is the committee’s choice on monetary policy, \( w_i \) is the voting weight of country \( i \), and \( r_i \) is the monetary policy option connected with country \( i \)’s delegate. Since each country is connected with a different and exceptional optimal monetary policy choice, \( r \) is replaced by \( \text{OPT}_i \), thus identifying the optimal policy choice from the point of view of country \( j \). However, in this paper, there are only two countries \( j \) and \( h \).

\[
\text{OPT}_j = w_j r_j + w_h r_h
\]

(18)

Country \( j \) can use equation (18) as policy instrument. Then, the optimal policy choice from the perspective of country \( j \) is as follows: here, I assume that the desired monetary policy of one country holds as euro-wide monetary policy.

\[
q_j^* - q_j = \left( \frac{a_j + \beta_j + b_j}{a_j + \beta_j} \right) \frac{\lambda_j}{\eta_j} (Y_j - Y_j^*) = w_j \left[ q_j^* - q_j + \left( \frac{a_j + \beta_j + b_j}{a_j + \beta_j} \right) \frac{\lambda_j}{\eta_j} (Y_j - Y_j^*) \right] + w_h r_h
\]

By assuming that \( w_j + w_h = 1 \), I can extract the equation (19).

\[
r_{ht} = q_{ht} - q_{ht} = \left( \frac{a_j + \beta_j + b_j}{a_j + \beta_j} \right) \frac{\lambda_j}{\eta_j} (Y_{ht} - Y_{ht}^*)
\]

(19)

The optimal policy choice from the perspective of country \( h \) is written:

\[
r_{ht} = q_{ht} - q_{ht} = \left( \frac{a_h + \beta_h + b_h}{a_h + \beta_h} \right) \frac{\lambda_h}{\eta_h} (Y_{ht} - Y_{ht}^*)
\]

(20)

For the sake of simplicity, the right hand of equations (19) and (20) are defined \( \Omega_j \) and \( \Omega_h \).

Now, if the members of the ECB Board want to consider the viewpoint of each country should use the optimal policy choice of each country. Then, the ECB Board must give such a weight to the viewpoint of each country that the following equation holds:

\[
\frac{r_{ht}}{r_j} = \frac{\Omega_j}{\Omega_h}
\]

(21)

The ECB Board employs equations (17) and (21) to make decision about the optimum monetary policy so that the viewpoint of each country accepted:

\[
r = w_j r_j + w_h r_h
\]
\[ r = w_j \frac{r_h \Omega_h}{\Omega_j} + w_h \frac{r_j \Omega_j}{\Omega_h} \]  

(22)

However, the ECB Board can make decision without considering the viewpoint of each country but at the same time, countries j and h use their optimal monetary policy based on equation (16) to interfere their preferences in the council’s decision on monetary policy.

I assume that the members of the ECB Board take a euro-wide perspective, while the N-n national governors take a nationalistic perspective.

\[ r = w_j \Omega_j + w_h \Omega_h \]  

(23)

From the equations (22) and (23), the relation of optimal weights for countries can be extracted, so that the viewpoint of each country and the ECB Board in making decision about the optimal monetary policy have been employed.

\[ w_j \frac{r_h \Omega_h}{\Omega_j} + w_h \frac{r_j \Omega_j}{\Omega_h} = w_j \Omega_j + w_h \Omega_h \]

By using optimal monetary policy for each country, and some simple mathematical derivations, the relation of optimal weights can be written:

\[ w_j \frac{\Omega_h^2}{\Omega_j} + w_h \frac{\Omega_j^2}{\Omega_h} = w_j \Omega_j + w_h \Omega_h \]

\[ w_j \left[ \frac{\Omega_h^2 - \Omega_j^2}{\Omega_j} \right] = w_h \left[ \frac{\Omega_h^2 - \Omega_j^2}{\Omega_h} \right] \]

\[ \frac{w_j}{w_h} = \frac{\Omega_j}{\Omega_h} \]  

(24)

By employing \( w_j + w_h = 1 \) and equation (24), optimal weight for each country is acquired.

\[ w_j = \frac{\Omega_j}{\Omega_j + \Omega_h} \]  

(25)

\[ w_h = \frac{\Omega_h}{\Omega_j + \Omega_h} \]  

(26)

Each country states the optimal monetary policy based on the country specific situation.

The ECB Board employs the optimal weights to make decision about the optimal monetary policy. So, none of each countries can influence on the ECB Board decision.
4. A quantitative illustration

In this section, I calibrate the model to investigate whether my results could be of quantitative importance. First, I calibrate the weights based on the equations (25) and (26) then, the euro area long term interest rates will be computed, (equation 17). Second, the real effective exchange rates, based on equation (16) and computed interest rates in the first step, calibrated for euro area. I calibrate the parameters of the model by drawing on existing literature on policy rule.

In calibrating the elasticity of output with respect to the aggregate price, $a$, and the elasticity of aggregate demand with respect to government budget deficit, $b$, I adapt the values which have been used by Andersen (2005) for euro zone. Where I compute indices of real effective exchange rates for euro zone, I use these values, which are 0.5 and 0.3 respectively in equation (16). However as one of the goals of this article is to show the effect of asymmetries in the European countries, and because Germany and France are the two leading member economies, for calibrating the model, I use these two countries data. In this respect, I changed the value of $a$ from 0.5 to be 0.8 for Germany and 0.2 for France that is compatible to the Germany and France preferences against inflation and unemployment. I have used 0.3 for Germany and France. For calibrating the effect of real output on the real demand for money, I used the value which is extracted by Hallett and Piscitelli (2002) based on the MULTIMOD computations, this value is 0.21 for $\eta$. This value is suitable for France, Germany, Italy and England. However, I have used this value for euro zone and the separate countries like Germany and France. The last parameter that I need to calibrate is $\beta$, which estimates the effect of real exchange rate on the aggregate demand, the value of this parameter, based on the computations of Svensson (2000) is 0.039 for France and Germany which I have used the same value for euro zone too.

The value of $\lambda$ is reported in two cases. In the first case, I set $\lambda=10$ for France that because of his high sensitivity against unemployment and $\lambda=1$ for Germany. The difference between $\lambda$, in two countries is compatible to the model that all countries in MU are divided in two completely distinctive categories. Different $\lambda$ and $a$ in two countries highlight the asymmetries at a disaggregate level. In calibrating the output gap, I set the 35-year geometric mean of the real GDP growth for France, Germany and euro area as the natural real rate and then the difference between the mean and the annual real GDP growth rate computed as output gap.

First, with considering the relations between fiscal and monetary policies and the optimal monetary policy in equation (16) and data from Germany and France, the expected real depreciation for these two countries has been computed, then I have computed euro area long term interest rates based on the equations (25), (26) and (17) and then they have been compared with the actual euro area long term interest rates, extracted from OECD stat 2007 for years from 1994 to 2005 (available data). It is seen from Fig. 1; the computed interest rates are lower than the actual rates. However, these differences are so small especially after introduction euro in 2002 that can be neglected. Thus, the model can be considered as relatively good one.
Considering appropriate weight for each country is the result of calibration. Therefore, the euro system should comprise the problems of asymmetry and aggregation by considering the results of calibration in setting monetary policy. However, when asymmetries in the transmission of common shocks are present, the ECB can progress the quality of monetary policy by using nationwide information to make appropriate weight for the point of view of each country about the monetary policy.

![Fig.1. Actual and Computed Euro Area Long Term Interest Rates](image)

Second, by considering the computed interest rates, I calibrate the expected real depreciation and then the real effective exchange rates, based on equation (16), for euro zone and compare them with actual real effective exchange rates in Germany, France and euro zone. It is worth considering that because of the importance of real effective exchange rates on the current account balance of payments, I have computed and compared them with the actual ones.
As it is seen from the above figures, the fluctuations of the current account balance of payments are completely opposing for Germany, France, but the trends of actual nominal exchange rates (national currency/dollar) and actual real effective exchange rates are relatively stable and are not well-matched with the current account fluctuations of these two countries and euro area. By comparing computed real effective exchange rates and computed nominal exchange rates with the actual ones, it is seen; computed rates are highly fluctuating so that they will absorb the exogenous shocks and hold the endogenous variables roughly
stable, thus the economy and the current account balance of payments would be stable against asymmetric shocks.

5. Conclusion

An important subject for monetary policy in open economies is how the interest rate response should be to the exchange rate in a monetary regime of flexible exchange rate with price target and a monetary policy regulation. In this paper, I explain the monetary policy rule that respond frankly to the exchange rate, as well as to price and fiscal policy instrument.

By using optimal weights and monetary policy rule; optimal interest rates for EMU have been extracted and then for evaluating the efficiency of the computed interest rates, the optimal exchange rates have been calculated. It is seen; computed rates are highly fluctuating so that they will absorb the exogenous shocks and maintain the endogenous variables roughly stable.

Therefore, the computed weights would be the optimal ones which can be used by the ECB to offset the divergent state of current accounts in the euro area.

References