The US monetary dominance in Europe: A structural VAR approach

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Abstract

In this study we compare the monetary policies of the American Federal Reserve System (FED) and the European Central Bank (ECB). We identify the effect of US monetary shocks on the decisions taken by the ECB. Using SVAR (structural vector autoregressive) methodology which showed excellent capacities to analyse macroeconomic fluctuations, estimates indicate that European monetary policies are strictly related to the FED's decisions. Results show that the ECB changes its interest rate according to the decisions made by the FED. The other economic indicators of Economic and Monetary Union (EMU) are also affected by US monetary shocks. Thus, we bring to light the role of the American monetary policies in the transmission of subprime crisis in Europe.

Keywords: Monetary policy, Interest rates, SVAR, SVECM.

JEL: E5, E31, C3

1. Introduction

Many researches have focused on the issue of the international transmission of US monetary shock to foreign interest rates. Kim (2001) states that the G-6 countries do not react strongly to the American monetary shocks. He asserts that the foreign monetary authorities do not follow the US monetary policy rigorously and that through the world capital market, the US monetary expansion reduces the world real interest rates and stimulates global demand. Todd (2004) find that the US monetary shocks do not necessarily spread to other monetary policies. In fact, he stipulates that the situation of the US worldwide has been overturned while facing the start of Europe and the affirmation of the Japanese power. Faust and al. (2003) contested the results of Kim (2001) concerning the international transmission of the US monetary shocks to foreign interest rates via the global capital market. These authors even assume that the G6 countries modify their monetary policies according to the decisions made by the FED. Ehrmann and Fratzscher (2006) suggest that the shocks of US monetary policy are global as they affect most, if not all markets simultaneously.

According to Aglietta (2009), the US played a leading role in the international monetary system, but the subprime crisis led us to ask about the future of the dollar, the resources allocation in the world, the inflation and the monetary policies.

So, the question about the effects of US monetary policy shocks on other countries and especially in Europe is found strongly mixed.

It is shown that SVAR method has excellent capacities to analyze macroeconomic fluctuations. It leads to go through shocks from canonical VAR to shocks which can be interpreted economically. The main objective of SVAR is to identify the structural components of error terms by assuming enough restriction in order to assess the impulse responses of endogenous variables to structural shocks. Blanchard and Quah (1989) have pioneered the SVAR approach. They studied the long-run identifying restrictions to study demand and supply shocks in economy. Then, Gali (1992) proposed a combination of short-term and long-term restrictions. However, another form of SVAR model can be adapted. It is the structural vector error correction model (SVECM) which is used in the case of presence of cointegration relationships between studied variables. The theory of these models is developped in Pfaff (2008), Lükepohl (2006), Hendry(1995), Johansen (1995), Hamilton (1994), Banerjee and al. (1993).

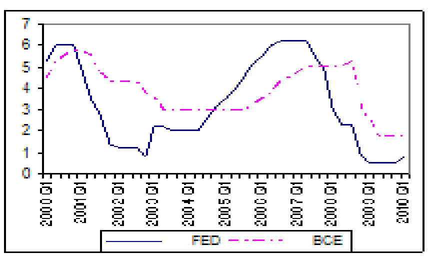
The objective of this study is to use SVECM analysis for testing the hypothesis of the American monetary dominance in Europe and to bring to the fore the role of FED in the transmission of the american subprime crisis in Europe. The remaining of the paper is structured as follows: In the next section, a comparing monetary policy of US and EMU is presented. Section 3 is devoted to SVAR and SVECM representations. Section 4 provides an empirical application. Section 5 offers some tentative conclusions.

2. Monetary policy in the US and EMU

The primary objective of the ECB is to maintain price stability. This objective was defined to keep the inflation rate close to 2% over the medium term. Price stability in Europe is the most important contribution of the monetary policy in order to achieve a favourable economic environment and a high level of employment. The ECB's monetary policy strategy includes an analytical framework based on two pillars: one pillar of economic analysis (this is to take into account the real activity and financial conditions in the economy) and another pillar of monetary analysis with the regular evolution on of monetary aggregates mainly that of M3. The ECB also operates by steering short-term interest rates to influence economic developments. Whereas FED sets its monetary policy so as to promote the goals of maximum employment, stable prices and moderate long-term interest rates. In order to manage its monetary policy, FED controls inflation and influence output and employment indirectly, mainly by adjusting a short-term interest rate called the "federal funds rate”. Currently, the main point of the ECB and the FED monetary policies is achieved by the manipulation of the interest rate. It’s the qualitative approach of the monetary policy which is privileged. That’s to say the effect on the interest rate evolution and the amount of liquidity.

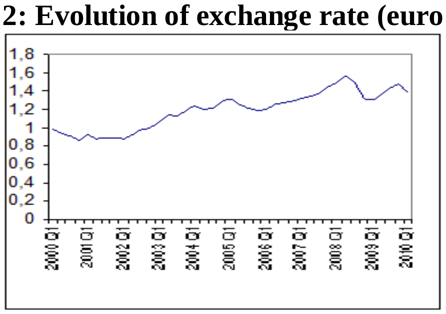
The graph1 below shows the evolution of interest rates applied by the FED and ECB and graph 2 presents the variations of exchange rate (euro-US dollar) since 2000.

Graph 1: Evolution of interest rate



Source: Authors.

Graph 2: Evolution of exchange rate (euro dollar)



Source: Authors

The short term interest rates are lowered sharply at the beginning of the year 2001 to reach 0.75% at the end of 2002. For several years, mortgages loans at risk, called “subprime” were offered to borrowers with low rates and without adequate guaranties. The excessive rise in 2005 led to the reversal of the real estate market. A big number of households couldn't meet their debts. The cumulative sales of their properties and the decrease in the US growth brought about a decline in the price of the American real estate which gave notice of the subprime crisis.
The above graph also shows that the ECB interest rates movements follow the same variations as those of the American rates with a decalage of few months. However, we notice that FED is more reactive than the ECB because it has greater latitude to implement its monetary policy.

The variations of interest rates decided by central banks are more likely to induce exchange fluctuations which are represented in graph 2, for the same period. This graph shows a stabilization of exchange rate (euro-dollar) from 2000 to 2002, then the euro started to go up from 2003 to 2004 to depreciates in 2005. The depreciation of the American dollar since 2002 is caused by the US current account deficit on the market. In 2005, the euro depreciation faced with the US dollar may be explained by the difference of interest rate between the two areas. The euro depreciation has put pressure on import prices. Therefore, the ECB has intervened to increase the value of its currency. In 2006, the euro appreciation has caused loss competitiveness of European companies. The dollar fell sharply within a few months following the accumulation of deficits in the US economy despite the increase of interest rates. In the summer of 2007, the reversal of the real estate market and the U.S. subprime crisis led to a financial crisis that weakened banks and spread to the real economy through credit crunch, construction sector's slowdown and the reduction of the value of US household assets. Several reasons of crisis have been given: the expansive monetary policy of FED, the speculation on basic products and commodities, the increase in the prices of goods imported from China, etc...

The global economy integration and the reduction of US imports from Europe have brought about the slowdown of the European growth and the transmission of the US crisis in Europe. Bankruptcies multiplied everywhere, the GDP collapsed, and unemployment and public deficits exceeded ceilings. The global inflation has reached its highest level in many countries for several years. The economists affirm that the states and central banks did not make the same mistake as that of 1929 by increasing interest rates and decreasing liquidity. The recapitalizations of banks, the guarantees for certain assets, the decline of interest rates and new financial regulations were adopted.

3. SVAR and SVECM models

The SVAR representation is equivalent to VAR in a reduced form whose value appears in the stage of estimation. A process VAR (p) is defined as:

$$X_t = A_1 X_{t-1} + ... + A_p X_{t-p} + \varepsilon_t \qquad (1)$$

Where $X_t = (X_{1t},..., X_{Kt})$ is a vector of K endogenous variables, A_i are $(K \times K)$ coefficient matrix for $i = 1 \ldots p$ and ε_t is a white noise error vector with $E(\varepsilon_t) = 0$ and variance-covariance matrix $E(\varepsilon_t, \varepsilon_{t'}) = \sum_\varepsilon$.
The canonical innovation $\varepsilon_{it}; 1 \le i \le K$ are the smallest unpredictable parts of different series at time (t), given the information contained in past values of X_t vector $\{ X_{1t-1};...; X_{Kt-1} \}$.
The residuals of the reduced form can be retrieved from the structural VAR form.

The structural VAR model can be presented as:

$$AX_t = A_1^* X_{t-1} + \ldots + A_p^* X_{t-p} + Bw_t \quad (2)$$

The structural errors w_t are white noise and A_i^* for $i = 1 \ldots p$ are structural coefficients matrices that are different from the coefficients of reduced form.
If we multiply equation (2) by the inverse of A matrix, we obtain:

$$X_t = A^{-1} A_1^* X_{t-1} + \ldots + A^{-1} A_p^* X_{t-p} + A^{-1} Bw_t \quad (3)$$

$X_t = (X_{1t},..., X_{Kt})'$, at each time t, resulting from the dynamic combination of n past structural shocks. These shocks are those we wish to interpret economically.
According to (1) and (3), the vector of innovations in VAR model is a linear combination of structural innovations: $\varepsilon_t = A^{-1} Bw_t$. The residuals of the reduced form can be retrieved from the

SVAR representation. The structural innovations are assumed to be orthogonal. That's to say, the variance-covariance matrix Σ_w is an identity matrix: $\Sigma_w = E(w_t, w_{t'}) = I$ which allows us to impose identification restrictions on A and B matrices. SVAR model can be used to identify shocks by relying on impulse response functions and / or the variance decomposition of forecast error through imposing identification restrictions on the matrices A and/or B. The estimation of SVAR is acquired as soon as the matrices A and B have been estimated.

To impose such restrictions, three types of models can be distinguished:

- A model: the matrix B has the form of identity matrix and minimum number of restrictions to be imposed is: $K(K-1)/2$.
- B model: the matrix A has the form of identity matrix and .minimum number of restrictions to be imposed is: $K(K-1)/2$.
- AB model: In this case the minimum number of restrictions to be imposed for identification is: $K^2 + K(K-1)/2$.

However if cointegration between the variables does exist it can be better to use the structural vector error correction model (SVECM) form.

The error correction model (VECM) is defined as:

$$\Delta X_t = \alpha\beta' X_{t-1} + \Gamma_1 \Delta X_{t-1} + \ldots + \Gamma_{p-1}\Delta X_{t-p+1} + \varepsilon_t$$

Where $\Gamma_i = -(A_{i+1} - \ldots - A_p),\quad i = 1,\ldots, p-1$ and $\alpha\beta' = -(I - A_1 - \ldots - A_p)$

X_t a vector of endogenous variables K. $\Gamma_1 \ldots \Gamma_{p-1}$ are $K \times K$ in the model and represent coefficient matrices, they measure the transitory effects of model VECM. The dimensions of α and β are $K \times r$ where r is the cointegration rank, it is the number of long-term relationships between variables. The coefficients of the long-term relationship are contained in β matrix.

We can deduce the SVECM model:

$$\Delta X_t = \alpha\beta' X_{t-1} + \Gamma_1 \Delta X_{t-1} + \ldots + \Gamma_{p-1} X_{t-p+1} + Bw_t$$

Where $\varepsilon_t = Bw_t$, ε_t is the reduced form residue and w_t represents the structural innovations, $w_t \sim N(0, I_K)$. The transitory effects of the structural errors are contained in the matrix B to be estimated.

According Johansen's (1995) version of the Granger's representation theorem, the VECM has the following moving average representation:

$$X_t = \Xi \sum_{i=1}^{t} \varepsilon_i + \sum_{j=0}^{\infty} \Xi^*_j \varepsilon_i + X^*_0 \qquad (6)$$

Where X^*_0 contains all initial values of the vector time series. The long-term effects of the shocks are represented by the term $\Xi \sum_{i=1}^{t} \varepsilon_i$ which captures the common stochastic trends.

The matrix Ξ has the form:

$$\Xi = \beta(\alpha' (I_K - \sum_{i=1}^{p-1} \Gamma_i)\beta)^{-1} \alpha'$$

It has rank $(K-r)$. Thus, there are $(K-r)$ independent common trends. Substituting Bw for ε_t in the common trends term in (6) gives $\Xi \sum_{i=1}^{t} \varepsilon_i$.

Clearly, the long-run effects of the structural innovations are given by ΞB because the effects of w_t impulse vanish in $\sum_{j=0}^{\infty} \Xi_j^* B w_i$ in the long run.

The long-term effects of structural shocks are given by the matrix $A = \Xi B$. The ΞB matrix is of $(K-r)$ rank, it can be composed of r columns whose elements are all zero. The structural innovations are assumed to be orthogonal, that's to say, the variance-covariance matrix is an identity matrix $w_t \sim N(0, I_K)$. This allows us to impose identifying restrictions on A and B. To identify permanent and transitory shocks, we must impose $r \times (r-1)/2$ short-term restrictions with (r) the number of cointegration relationships and $(K-r) \times (K-r-1)/2$ the long-term restrictions[1].

4. Application

4.1 The choice of variables

We have chosen to study the effects of the US monetary policy in Europe. In fact, we opt for a multivariate approach and we choose quarterly data over the period 2000 Q1 to 2010 Q1. All data are seasonally adjusted. The main source is the database of the International Monetary Fund (IMF). The series of harmonized consumer prices index are from statistics of the Organization for Economic Cooperation and Development (OECD). A logarithmic transformation was carried out for gross domestic product and consumer prices index series.

In a first stage, we build a model that includes 5 variables: the US real short-term interest rate (ru) representing the US monetary policy and 4 European data that are the nominal GDP in volume (ye), the prices index (pe), the real short-term interest rates (re) and the European exchange rate against US dollar (e). Graph 1 in the appendix shows the series of model (1). This model depends on a structural shocks vector: $w = [w^{ru}, w^{ye}, w^{pe}, w^{re}, w^{e}]$, where w^{ru} is a US monetary shock, w^{ye} a supply shock, w^{pe} a demand shock, w^{re} a monetary shock and w^{e} an exchange shock. We regard the US interest rate variable, representing an external shock, as the most exogenous. Then, we introduce the variables representing the non-monetary shocks and then those related to monetary shocks.

In a second stage, we construct a second model (model 2) including 4 variables: the gap between interest rates set by the FED and the ECB (rue), the exchange rate of euro against US dollar (e), the gap between the US and European prices index (pue) and the gap between the US and European GDP (yue). The series of the model 2 are shown in the appendix (graph 2). The vector of structural shocks is the following: $w = [w^{yue}, w^{pue}, w^{rue}, w^{e}]$ where w^{yue} a shock of gap between GDP, w^{pue} a shock of gap between prices index, w^{rue} a shock of gap between interest rates and w^{e} a shock of European exchange rate.
In our models, we introduce changes regime which can be located along the fourth quarter of 2000 which is the date of the explosion of the Internet bubble, the first quarter of 2008, the date of which the subprime crisis became widespread in the US, and the second quarter of 2008, the date of crisis transmission to Europe. Technically, we introduce dummy variables in the models.

4.2 Stationarity and Cointegration

To study the stationarity of variables, we use the augmented Dickey Fuller (ADF) test. It is based on the null hypothesis of non stationarity. The application of the ADF test requires initially to choose the number of delay *p* to introduce in order to whiten the regression residuals. For that we use the order *p* which minimizes the information criteria (Akaike, Schwartz, Hannan).

As shown in table 1 in the appendix, all of the variables have unit roots. To determine the order of integration series, we apply the ADF test for the series of the first order differences. We can observe that the series becomes stationary, all the variables are integrated of order one (I(1)).

[1] For more details, see Lütkepohl (2006).

Multivariate analysis of cointegration rank using the Johansen (1995) methodology shows three cointegrating relationships between variables in model (1) (Table 2 in appendix) and two cointegrating relationships between variables in model (2) (Table 3 in appendix). Therefore, they are the error correction models that are suitable.

4.3 The models

$$\Delta X_t = \alpha\beta' X_{t-1} + \Gamma_1 \Delta X_{t-1} + \ldots + \Gamma_{p-1}\Delta X_{t-p+1} + \sum_{j=1}^{3}\mu_j + Bw_t$$

We choose the lag order $p = 1$ for the two models. X_t is a vector of 5 variables in Model (1) and 4 endogenous variables in model (2), $\Gamma_1 ... \Gamma_{p-1}$ are 5×5 in model 1 and 4×4 respectively in model 2 and they represent coefficient matrices, the μ_j are the constants of different regimes. $\varepsilon_t = Bw_t$, where ε_t and w_t are vectors of dimension 5 in model 1 and 4 in Model 2. ε_t is the residue of the reduced form and w_t represents structural innovations. The effect of short-term shocks w_t are given by B matrix to be estimated. The long-term effects of the shocks w_t are given by $A = \Xi B$ matrix (defined in section 3).

<u>Identifying restrictions</u>

- ✓ <u>Model (1):</u> $X = [ru, ye, pe, re, e]$

Table 2 in the Appendix shows three cointegrating relationships between variables (r=3), where the number of restrictions of short-term equals 3: "$r\times(r-1)/2 = 3$" and the number of long-term restriction is 1: "$(n-r)\times(n-r-1)/2 = 1$".

$$A = \begin{bmatrix} a_{11} & 0 & 0 & 0 & a_{51} \\ a_{12} & 0 & 0 & 0 & a_{52} \\ a_{13} & 0 & 0 & 0 & 0 \\ a_{14} & 0 & 0 & 0 & a_{54} \\ a_{15} & 0 & 0 & 0 & a_{55} \end{bmatrix}; \quad B = \begin{bmatrix} b_{11} & b_{21} & b_{31} & b_{41} & b_{51} \\ b_{12} & b_{22} & b_{32} & b_{42} & b_{52} \\ b_{13} & b_{23} & b_{33} & b_{43} & b_{53} \\ b_{14} & 0 & b_{25} & b_{44} & b_{54} \\ b_{15} & 0 & b_{25} & 0 & b_{55} \end{bmatrix}$$

In A and B matrices, the first column reflects the impact of U.S. monetary shock. The columns (2, 3, 4 and 5) show the impact of European shocks in the following order: aggregate supply shock, aggregate demand shock, monetary shock and exchange rate shock.

The short-term restrictions that we have imposed in B matrix are based on economic theories such as:

- There is an inverse relationship between prices and production (the aggregate demand curve -AD) according to the quantity theory.
- As stated in Keynesian theory, an increase in the price level (an aggregate demand shock) reduces aggregate demand and lowers the product in the short term.
- According to the hypothesis of Fisher, the shock of aggregate demand has an effect of rising interest rates. A restrictive monetary policy of higher interest rates leads to a short-term decrease in consumption, prices and production.

The other restrictions that we have assumed on B matrix are the effect absence of production shock on interest and on the exchange rate (2nd column) and the effect absence of a monetary shock on the exchange rate (4th column).

The long term restrictions that we have imposed in A matrix, can be explained by the absence of long-term effects of production shock, aggregate demand shock and monetary shock on other variables (2nd, 3rd and 4th columns). According to the classical theory, money is neutral in the long run. Changes in the money supply do not affect real variables.

Similarly we imposed the effect absence of exchange rate shock on the European inflation rate over the long term in the long term (5th column).

✓ Model (2): $X = [\,yue, pue, rue, e\,]$

Table 3 in the appendix shows the presence of two cointegration relationships $(r = 2)$. Hence there is one short-term restriction "$r \times (r-1)/2 = 1$", and one long-term restriction "$(n-r)\times(n-r-1)/2 = 1$".

$$A = \begin{bmatrix} 0 & a_{11} & 0 & 0 \\ 0 & a_{12} & a_{22} & 0 \\ 0 & a_{13} & a_{23} & 0 \\ 0 & a_{14} & a_{24} & 0 \end{bmatrix} \qquad B = \begin{bmatrix} b_{11} & b_{21} & b_{31} & b_{41} \\ b_{12} & b_{22} & b_{32} & b_{42} \\ 0 & b_{23} & b_{33} & b_{43} \\ b_{14} & b_{24} & b_{34} & b_{44} \end{bmatrix}$$

The columns of A and B matrices reflect respectively the shocks impact of gap of the GDP, gap of prices index, gap of interest rates and the European exchange rate.

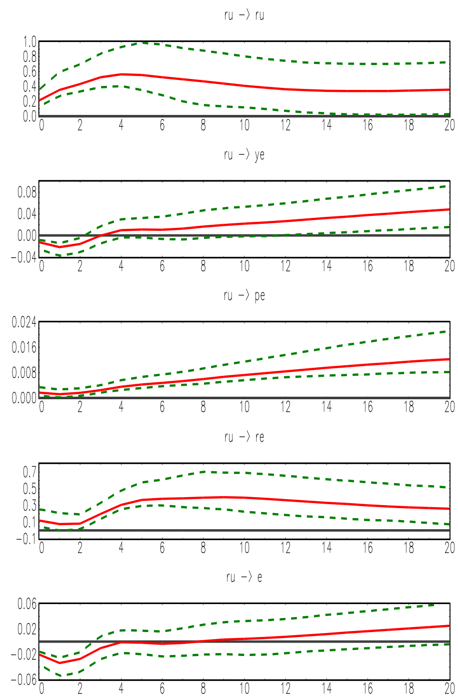
In A matrix, we assumed the long-term an absence impact shocks of gap of productions on the other variables (first column), of gap of interest rates on gap of GDP (third column) and of exchange rate on other variables (fourth column).

For B matrix, we assume the absence of a short-term output shock effect on gap of interest rate.

4.4 Results and interpretations

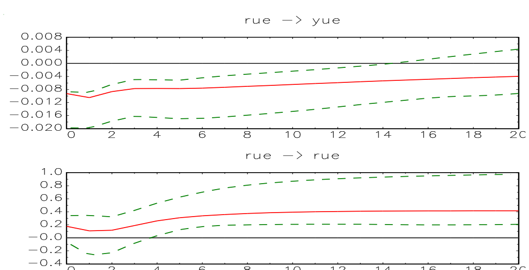
4.4.1 Impulse response functions to US monetary shocks

Graph 3: the effects of the US monetary shocks



Source: Authors.

Graph 4:The shocks effects of gap between interest rates



Source: Authors.

Graphs 3 and 4 correspond to results of impulse responses analysis of model 1 and model 2 respectively. The horizontal axis of graphs shows the number of periods and the vertical axis measures the response of variable. The solid lines for each graph denote impulse responses and the dotted lines are computed by percentile method proposed by Hall (1992). Our simulation covers 20 periods. Graph 3 shows the responses of US interest rates and the European variables (production, inflation, interest rate and exchange rate euro/dollar) to US monetary shock. Graph 4 corresponds to the shock effect of gap between US and Europe interest rates on the gap of outputs and interest rates.

Our results in graph 3 show the responses of series after U.S. monetary contraction following an unexpected rise of interest rate. The effect of a US monetary shock on the European interest rate representative of European monetary policy is persistent. Even after 20 periods, the variable does not find its equilibrium. Graph 4 allows us to confirm these results. In fact, a shock on the gap between interest rates (USA-Europe) leads to response close to zero of this variable in the short and the long term. This implies that European monetary authorities seek to minimize the gaps between the ECB and FED interest rates and to align with the US interest rates. These results can be explained by the influence of the US monetary policy in Europe. Our results in graph 3 also show that the US interest rate shock implies the deterioration of economic activity in Europe. The increase in FED rates affects that in the ECB rates and then lowers the European output. Figure 4 confirms these results because a shock of the gap between interest rates has a negative and significant effect on the gap of GDP in short and medium term. The effect of US monetary shock on European inflation is persistent. The variable does not find its equilibrium even after 20 periods. In fact, it is through its impact on European interest rates, the U.S. monetary shock has an effect on European output and inflation. The US monetary restriction via the increase in interest rate also implies the depreciation of the European exchange Rate (graph1). The interest rate increase of FED attracts the follow of capital towards the USA and appreciates the value of the US currency. Therefore, the ECB raises European interest rates to be able to fight against capital flight to US.

4.4.2 Forecast Error Variance Decomposition:

The variance decompositions for four different forecast horizons (1, 2, 10 and 20 quarters) are reported in Tables 1 and 2. Each column reports, the proportion of the forecast error that is explained by structural shocks to each of variables, listed on the left-hand side of the tables.

Tableau1: *(model 1)*

Contribution des différents chocs (%)						
variable	horizon	w^{ru}	w^{ye}	w^{pe}	w^{re}	w^{e}
ru	1	32	49	15	00	04
	5	76	16	03	01	05
	10	77	07	01	01	14
	20	70	04	01	01	25
ye	1	20	00	58	00	21
	5	25	00	19	03	54
	10	21	01	08	02	69
	20	43	01	03	00	52
pe	1	21	04	09	12	54
	5	52	08	10	05	25
	10	84	03	04	01	07
	20	96	01	01	00	02
re	1	18	00	42	39	01
	5	53	04	25	16	02
	10	84	03	07	05	02
	20	87	01	03	02	06
e	1	36	00	55	00	09
	5	45	01	17	02	35
	10	25	01	10	01	63
	20	21	01	05	01	72

Source : Les auteurs

Tableau2: *(model 2)*

Contribution des différents chocs (%)					
variable	*horizon*	w^{yue}	w^{pue}	w^{rue}	w^{e}
yue	1	03	01	84	12
	5	07	18	71	04
	10	04	58	35	03
	20	01	89	10	01
pue	1	03	94	03	00
	5	02	73	24	01
	10	02	59	38	01
	20	01	40	57	01
rue	1	00	03	21	77
	5	00	26	17	57
	10	00	56	25	19
	20	00	66	28	07
e	1	08	00	82	10
	5	02	04	91	03
	10	01	12	85	02
	20	01	33	66	01

Source: Les auteurs.

Our results show that a U.S. monetary shock is mainly due to its own innovations in the short and long term (70%), but it is not influenced by the European interest rates.

However, the European monetary shock is mainly caused by respective short and long term US interest rates innovations of (53% and 87%). Similarly, the variability of the gap between interest rates in US and Europe account to at least 20 percent of its own innovations at horizons up to 20 quarters (table 2). This shows that the US monetary shocks contribute to the dynamics of the European monetary policy in both the short and long run. US interest rates are also responsible of variability in aggregate supply and aggregate demand in Europe in the short and long term respectively of 43 and 96 percent after 20 quarters. Additionally, the innovations of the gap between interest rates justify for a greater part the shocks of gap between productivity and the shocks of the gap between prices index (table 2). Table 1 also shows that a variance share of production and inflation in Europe is explained by only negligible contributions of European interest rates shock.

The aggregate supply shock in Europe is due to innovations of European exchange rate over 60% up to 10 quarters and remaining over 50% at further increasing horizon. However, exchange rate is influenced by respective short and long term US interest rates changes of (45% and 21%). From our results in table 2, an exchange rate shock is largely caused by innovations of the gap between interest rates to greater than 80% in the short run and 66% in the long run. The gap between interest rates is due to US interest rates changes which act directly on the European exchange rate. Lower US interest rate causes the appreciation of the euro against the dollar and affects negatively European companies and could result in lower production.

5. Conclusions

From the two models estimated, the results show that the monetary decisions of FED have an impact on the European monetary policy. The European monetary authorities seek to align with the US interest rates: the rise of FED interest rates affects the increase of ECB interest rates to fight against capital flight to the US and the decrease of FED interest rates leads to the decrease of ECB interest rates, reduce prices of European products and improve competiveness on the external markets.

Consequently, the US monetary policy has an effect on the facilities of getting credits, on the productivity, prices and market exchange in Europe.

Our results also show that a US monetary shock has more impact than a European monetary shock on the European variables. The US monetary policy has an effect on the European economy through its influence on the European monetary policy and through the US imports from the European countries and the investment flows.

Our results bring us to confirm the hypothesis of the US monetary dominance in Europe and allow us to highlight the role of this dominance in the transmission of the subprime crisis in Europe. The increase of interest rates and the lack of liquidity may aggravate the crisis because they have harmful effects on the production and prices (graph 1). Therefore, central banks have lowered their rates and they have offered the necessary liquidity to second-tier banks in order to stimulate the production and reduce the prices. The important decrease of US interest rates leads to the decrease of the gap between FED and ECB interest rates (Table 2) which results in the appreciation of the euro compared to the US dollar, which explains the current situation.

References

Aglietta, M. (2009). Dollar: fin de règne ? Revue d'Economie Financière, 94, 5-2.

Banerjee, A., Dolado, J, Galbraith J, & Hendry D. (1993). Co-Integration, Error-Correction, and the Econometric Analysis of Non-Stationary Data. Oxford University Press, New York.

Blanchard, O., & Quah D. (1989). The Dynamic Effect of Aggregate Demand and Supply Disturbances.

American Economic Review, 79 (4), 655-673. [Online] Available: http://www.jstor.org/stable/1827924?seq=5

Dickey, D. A., & Fuller, W. A. (1981). Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root. Econometrica, 49, 1057-1072.

Ehrmann M.,& Fratzscher M. (2006). Global financial transmission of monetary policy shocks. EBC working paper, 616, 4-50. [Online] Available: http://www.ecb.int/pub/pdf/scpwps/ecbwp616.pdf

Faust, J., Rogers H., Swanson, E., & Jonathan, H. W. (2003). Identifying the effects of monetary policy shocks on exchange rates using high frequency data. NBER Working Paper *9660.*

Gali, J. (1992). How Well Does the IS-LM Model Fit Postwar US Data? Quarterly Journal of Economics, 107 (2): 709–738.

Hamilton, JD. (1994). Time Series Analysis. Princeton University Press, Princeton.

Hendry, D. (1995). Dynamic econometrics, Oxford, Oxford University Press.

Johansen, S. (1995). Likelihood Based Inference in Cointegrated Vector Autoregressive Models. Oxford University Press, Oxford.

Kim, S. H. (2001). International transmission of U.S. monetary policy shocks: evidence fromVAR'S. Journal of monetary Economics, 48, 339-372.

Lütkepohl, H. (2006). New Introduction to Multiple Time Series Analysis. Springer-Verlag, New York.

Pfaff, B. (2008). VAR, SVAR and SVEC Models: Implementation Within R Package vars. Journal of Statistical Software, 27(4), 1-32.

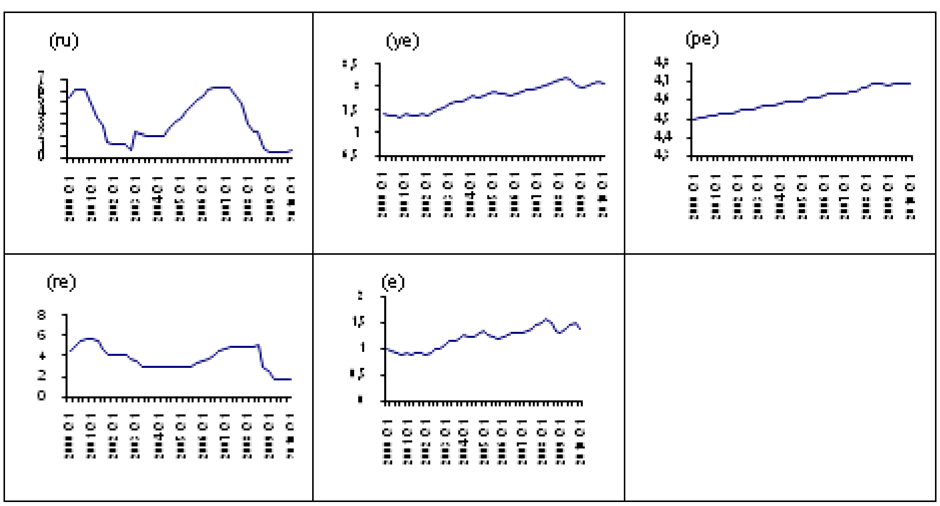
Sims, C.A. (1980). Macroeconomics and Reality. Econometrica, 48(1), 1-48.

Saikkonen, P., & Lutkepohl H., (2000). Testing for the cointegrating rank of a VAR process with structural shifts. Journal of Business and Economic Statistics, 18(4), 451–464.

Todd, E. (2004). Après l'empire: Essai sur la décomposition du système américain. (Ed. Poche 2004). Folio-Gallimard.

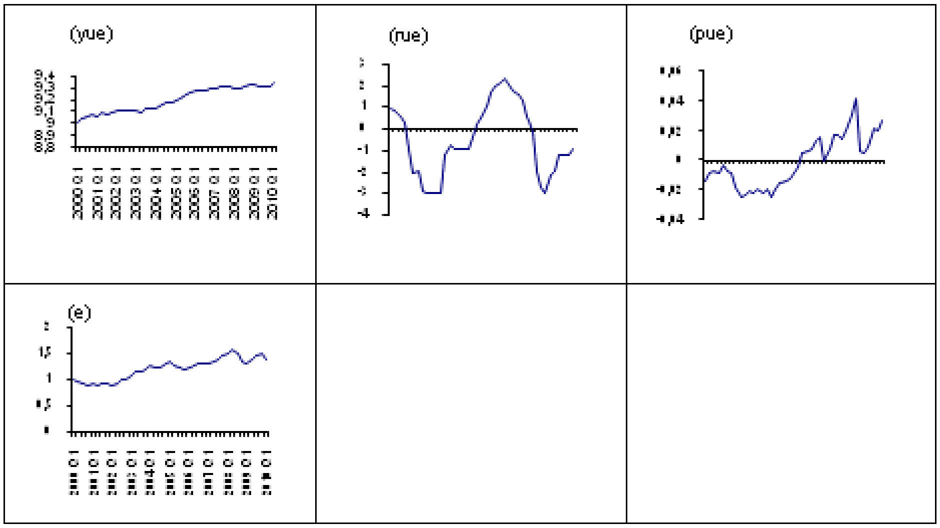
Appendix

Figure 1: Variables of model 1



Source : Les auteurs.

Figure 2 : Variables of model 2



Source : Les auteurs.

***Table1:* Dickey Fuller Test**

Variables	Tendance	Constante	Retard (k)	Test statistique ADF	Valeurs critiques		
					1%	5%	10%
ru	-	-	1	-1.6156	-2.56	-1.94	-1.62
Δru^{*}	-	-	0	-3.7504	-2.56	-1.94	-1.62
ye	-	-	5	9360	-2.56	-1.94	-1.62
Δye^{**}	-	-	4	-1.7685	-2.56	-1.94	-1.62
pe	-	-	7	4.8361	-2.56	-1.94	-1.62
Δpe^{*}	-	constante	6	-5.1676	-3.43	-2.86	-2.57
e	tendance	constante	1	-2.6518	-3.96	-3.41	-3.13
Δe^{*}	-	-	1	-4.6374	-2.56	-1.94	-1.62
re	-	constante	2	-2.4225	-3.43	-2.86	-2.57
Δre^{*}	-	-	0	-4.7553	-2.56	-1.94	-1.62
rue	-	-	1	-1.9341	-2.56	-1.94	-1.62
Δrue^{*}	-	-	0	-3.6051	-2.56	-1.94	-1.62
pue	-	-	6	-2.6085	-3.96	-3.41	-3.13
Δpue^{*}	tendance	-	5	-2.4837	-2.56	-1.94	-1.62
yue	-	-	2	2.7810	-2.56	-1.94	-1.62
Δyue^{*}	-	constante	1	-4.0635	-3.43	-2.86	-2.57

(*,**) The hypothesis that a variable contains a unit root is rejected at 5% and 10% significance levels, respectively

Table 2: Johansen Test (1995)
(Model 1)

Rang (r)	LR	pval	90%	95%	99%
0	127.59	0.0000	72.74	76.81	84.84
1	73.98	0.0002	50.50	53.94	60.81
2	43.51	0.0043	32.25	35.07	40.78
3*	16.56	**0.1518**	17.98	20.16	24.69

* There is 3 relations of cointégration (P>0,05 for r=3)

Table 3: Johansen Test (1995)
(Model 2)

Rang (r)	LR	pval	90%	95%	99%
0	121.85	0.000	50.50	53.94	60.81
1	47.73	0.0010	32.25	35.07	40.78
2*	17.35	0.1209	17.98	20.16	24.69

*There is 2 relations of cointégration (P>0,05 for r=2)