The Impact of the New Financial Products on the Volatility of the Economic Growth

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Abstract: *The derivative financial products, the result of the financial innovation process undertaken during the last decades, have a priori an important role in the continuous financing of the economy and in the diversification of the risks. Consequently, these financial instruments have to enable, beyond their speculative character, a reduction of the volatility of the economic and financial activity. Looking at derivatives from the perspective of physiology rather than pathology, we have analyzed the impact the use of these products has upon the economic volatility in four European countries whose financial markets are members of the Euronext stock-exchange market and we discovered a positive relationship between the amount of the transactioned contracts and the reduction of the volatility of the macroeconomic activity. We have previously calculated the reduction of the volatility of the economic activity in the analyzed countries in the period 1988-2006, based on two different methods: the evolution of the standard deviation and the evolution of the contribution of the components to the volatility of an aggregate. The contributions of this article are, on one hand, the use of a more detailed analysis method for the reduction of the volatility, and, on the other hand, the testing of the relationship between the volatility of the real GDP, investments and commercial exchanges and the use of the derivative products. The results have to be interpreted with caution due to the assumptions taken into consideration because of the lack of complex statistic data.*

Keywords: financial innovations, derivative products, volatiliy of the economic activity.

1 Introduction

The economic literature analyzing the reduction of the volatility of the economic cycle is splited in two main categories. A first part analyzes the factors that contribute to the reduction of the economic activity and is mainly centered on the economy of the United States, and the second part focuses on the relationship between the economic and financial integration and its impact upon the volatility. Our study which is in line with the first series of analysis is based on the study of the recent situation in the countries whose financial markets are members of Euronext (except for Portugal) and compares two recent periods: 1988-1999 and 2000-2006. After performing the analysis, we observed that the volatility of the investments and that of the commercial exchanges is much more important than the volatility of the consumption and consequently we have to insist upon the analysis of the factors which contribute to the reduction of the volatility of the first two elements mentioned above. The relationship between the use of the derivative products and the reduction of the macroeconomic volatility has not been analyzed from an empirical point of view. Unlike the other studies which analyze the reduction of the volatility by calculating the standard deviation, we tried to carry out a sensitivity analysis to see which of the real GDP components contributes the most to its volatility. The structure of the article is as follows: the first part presents theoretical aspects related to factors that contribute to the reduction of the macroeconomic volatility as well as the trends observed in the analyzed countries, and the second part presents the results of the econometric tests and, finally, the findings.

2 Explaining the Decline in the Volatility of Growth

In theory, the factors that contribute to the reduction of the macroeconomic volatility present a diverse nature. One of the factors is represented by the reduction of the shocks on the demand and on the supply (Gordon, 2005). Blanchard and Simon (2001) consider as main factors for the reduction of the volatility of the economic activity a reduction of the volatility of the governmental expenses, of the investments and also a reduction of the inflation.

Another factor is represented by the technological progresses, particularly in the area of the informational technology. An easier access to the information enabled the investors to establish medium and long term strategies, contributing thus to the reduction of the fluctuations (Stiroh, 2006). The techniques used for stocks' management stand for one of the most common elements that contribute to the reduction of the

volatility of the economic activity. The stocks management reduces the volatility of the production (Taylor, 2000).

The financial reforms and the fiscal policy represent other elements proposed by Arias and al. (2006). The monetary policy is also considered a foreground element which contributed to the reduction of the macroeconomic volatility (Gordon, 2005). There are also opinions opposed to this point of view: Boivin and Giannoni (2006) assert that the reduction of the volatility of the real GDP in the United States was accompanied by the alteration of the mechanisms used for the propagation of the monetary policy.

The modification of the economy's structural composition contributes to the reduction of the volatility of the economic activity. The services sector, which developed progressively, is less volatile than the industrial or agricultural sector. This factor was promoted by Stiroh (2006).

Kose and al. (2003) underline the impact of the international financial integration on the economic volatility. Their study was carried out on an extended group of industrialized countries and the results demonstrate that a weak commercial integration exposes more of the studied countries to the shocks on the external demand. De Souza (2004) considers that free commercial exchanges between the countries in Central and Eastern Europe led to the reduction of the volatility of the economic activity.

Arias and al. (2006) show that the volatility of the economic cycle in the United States diminished starting with 1983 due to the reduction of the shocks on the productivity. Stiroh (2006) shares the same opinion, adding to the reduction factors the increase of the labour market's flexibility and the reduction of the volatility of the capital. In fact, in respect of the last mentioned factor, it is about the access to the capital, access facilitated by the financial innovation process.

The factor financial innovation represents in its turn a potential source for the reduction of the shocks on the economic activity, contributing to the reduction of its volatility. Akhaveim and al. (2001) have analyzed the impact of the use the banks do of the scooring for the credits upon the productivity and upon the reduction of the volatility of the investments. Moreover, Jerman and Quadrini (2006) consider the innovation and the development of the financial markets as elements contributing to the reduction of the volatility of the production activity. These authors observed that the volatility of the financial activity increased with the reduction of the volatility of the economic activity.

Equally, Stock and Watson (2003) considered the reduction of the volatility as a result of the "good luck", as they believe that neither of these elements can justify the reduction of the volatility of the production.

In respect of the empirical studies, the results of the analysis are different and rather ambiguous. While Rincon (2007) does not find a positive and significant relationship between the globalization and the reduction of the volatility, Prasard and al. (2004) discover a significant relation but in the context of a "better quality of the governance" of the authorities. On one hand, De Souza (2004) finds a positive relation between the degree of economical integration and the reduction of the volatility, and on the other hand Buch (2005) discovers that the volatility of the GDP is more important in the open economies[1].

Rose and Spiegel (2007) consider that the proximity to major international financial centers (New York, Londra and Tokyo) contributes to the reduction of the volatility of the production and consumption. In the opinion of Bekaert and al. (2006), the fact that the financial markets and the capital account are now open for foreign investors, represents an important factor for the reduction of the volatility. Using a theoretical model to demonstrate the reduction of the volatility, after simulations, the authors observe that the countries with a free capital account have in average a volatility of the consumption smaller with 2% as compared to the closed economies. The authors used the following control variables: the life expectancy, the demographic growth or the ratio between the governmental consumption and the GDP, considering that the volatility is smaller for countries applying sophisticated macroeconomic policies.

In order to demonstrate the relationship between the structural changes and the reduction of the macroeconomic volatility, Kent and al. (2005) use the OLS method, for a regression with fixed effects on a panel of data. The measurement of the volatility is performed on five-year rolling window, for 20 OCDE countries, between the years 1970-2003. A reduction of the volatility appeared in 14 out of the 20 analyzed countries. The explicative variables taken into consideration were the financial liberalization, the volatility of the inflation and that of the fiscal policy.

Only Dynan and al. (2006) emphasize the process of financial innovation as the main factor for the reduction of the volatility of the economic activity in the United States. These authors test empirically the relation between the credit products and the reduction of the volatility of the economic cycle. The financial innovations led, according to their opinion, to the increase of the capacity of the households and enterprises

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[1] Obviously, the results are influenced by the chosen samples and by the used analysis methods, but the results do not prove the existence of a general phenomenon.

to borrow funds, reducing thus the volatility of the consumption and of the investments. The financial innovations have been sustained in this direction by the improvement of the methods used for risks' management, by the governmental policies or by the attitude towards the credit process. In their study this authors approached the term of financial innovation in a broad sense (Wachter, 2006). They analyzed the impact of the innovation on the reduction of the consumption's volatility, or, as we have already stated, the investments are those proving the highest volatility.

As mentioned above, most of the studies focus on the economy of the United States and the evolution of the economic volatility during the last two decades is compared with the evolution of the volatility between 1960s –1970s. As a method for the calculation of the reduction of the volatility, the standard deviation is used for a rolling window of five years. In our study, we use the same method in the first step, but we diminish this window at two years (eight quarters) and we consider that the standard deviation of an interval corresponds to the quarter situated in the middle of this interval. The reduction of the interval used for the calculation of the standard deviation was possible because we use quarterly data, seasonally adjusted, (Eurostat database), which do not present cyclical fluctuations on short term, and also because we keep the same rolling window method[2]. Moreover, this method enables us to observe if the use of the derivative products in a certain quarter will result in the reduction of the volatility of the investments and of the commercial exchanges in the following quarters. The evolution of the volatility, calculated based on the standard deviation for the United Kingdom, Netherlands, France and Belgium, is shown in Figure 1.
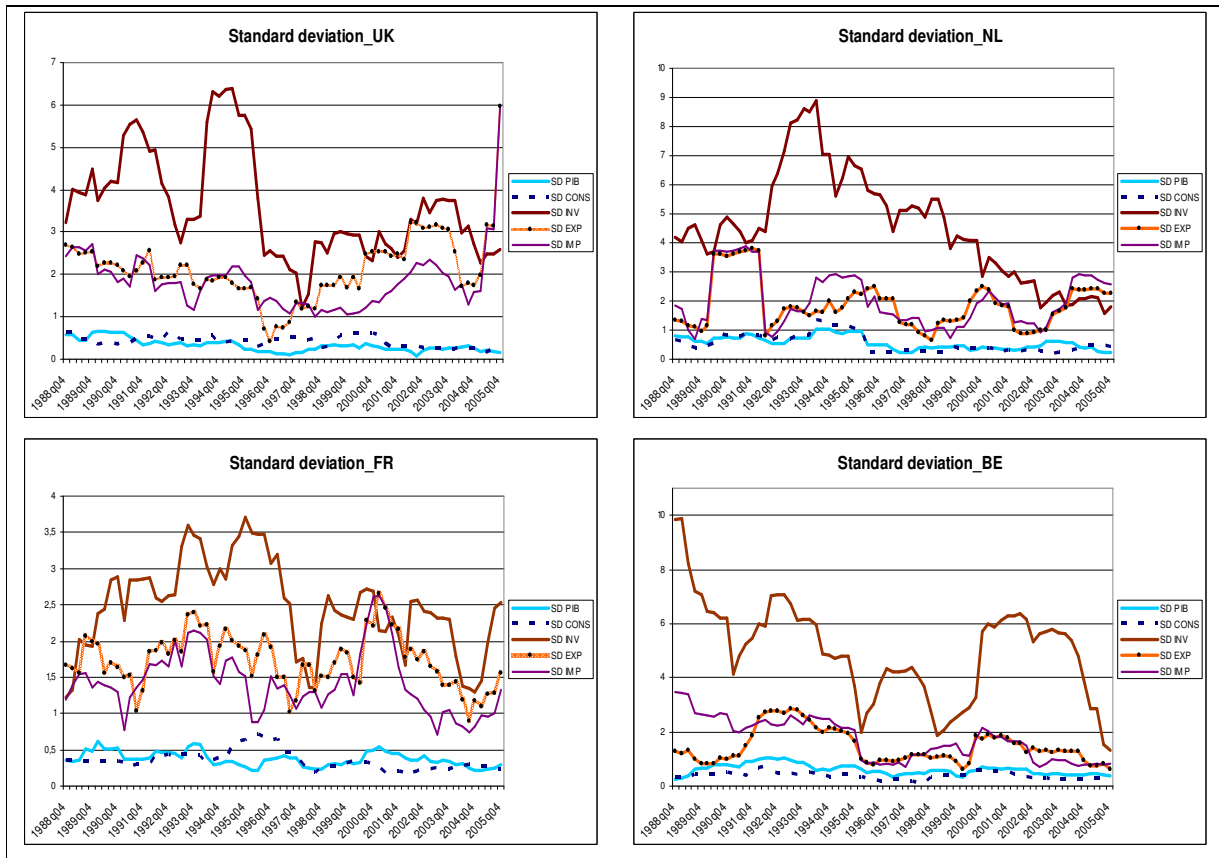

Figure 1: The Evolution of the volatility of the real GDP and of its components (standard deviation)

In the figure above, it can be observed that in all the countries, the investments, the exports and the imports show the highest volatility, but this volatility tends to decrease.

In the analyzed countries, the volatility of the GDP corresponding to the two periods is shown in Table 1. The phenomenon of macroeconomical volatility reduction is also observed in the other countries in Western Europe. These countries could not be included in the analysis due to the fact that the data about the use of the derivative products are missing.

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[2] For example, the standard deviation for the "window" (t : t+7) corresponds to the "t+3" quarter and the deviation corresponding to the quarter t+4 will be calculated based on the interval (t+1: t+8).

Table 1: Standard Deviation of the real GDP and of its components for the periods 1988-1999 and 2000-2006

Standard Deviation	GDP		CONS		INV		EXPNET	
Period	1988-1999	2000-2006	1988-1999	2000-2006	1988-1999	2000-2006	1988-1999	2000-2006
United Kingdom	1,66	0,72	1,14	0,78	1,51	0,70	1,28	0,63
Netherlands	1,55	1,35	1,04	0,78	1,82	1,07	1,21	0,77
France	1,50	1,06	0,69	0,37	1,32	0,90	0,61	0,49
Belgium	1,67	1,29	0,88	0,78	1,46	1,36	1,19	0,97

Firstly, if we compare the two periods, we observe that the volatility tends to diminish, and secondly, the trade of derivative products[3] on the Euronext exchange[4] presents a pronounced increasing trend – Figure 2:
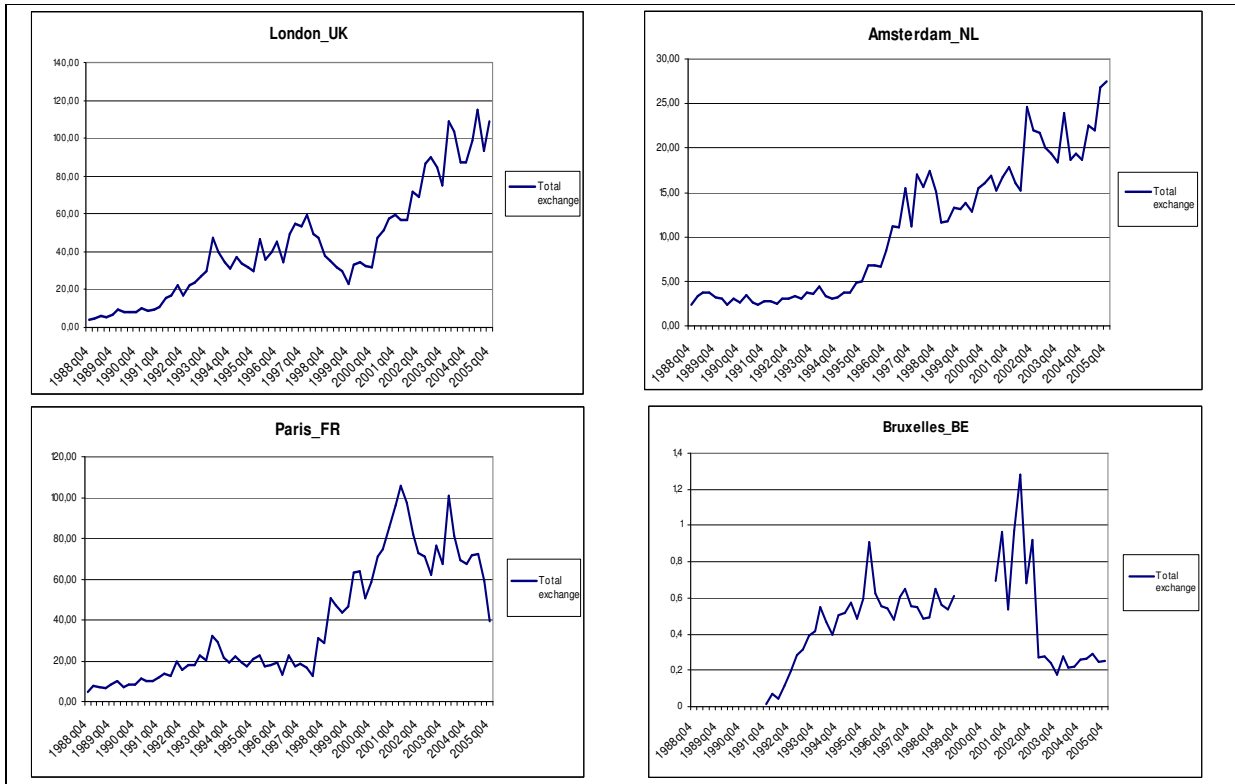

Figure 2: The Evolution of the no. of contracts[5] with derivative products traded on the Euronext stock-exchange

In the next section we present the results of the econometric tests made on the panel data for these countries. Before proceeding to this analysis, we shall present a method that enables us to perform a finer analysis of the reduction of the volatility, namely to calculate the contributions to the volatility. We want to

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[3] The derivatives fall under two main groups: forward contracts which include future, swap and forward and options contracts. For exemple, a swap is an agreement between two parties in relation with the exchange of a cash-flow at a certain moment, at a price that will be established by the market at that specific moment. In this case, the exchange is compulsory. On the contrary, an option represents the right to sell or to buy an underlying asset at a price that will be established by the market at a future date. The holder of an option can always choose not to exert his right.

[4] After the fusion of the markets, a series of contracts is traded only in London and Amsterdam, a fact which determined an increase of the number of contracts on these markets and their diminution, starting with 2002, on the Paris and Brussels exchange markets. However, the general increasing trend that can be observed is much more important. Euronext includes also the Lisbon stock-exchange, but we did not include Portugal in the analysis due to the special situation in this country (lack of data for the interval 1988-1994 and an excessive volatility caused by the budgetary conditions).

[5] Taking into consideration the fact that the value of the contracts is relatively constant, the number of contracts is an appropriate indicator to measure the amount of the transactions.

see if the contribution to the volatility also tends to reduce in case of the investments and of the commercial exchanges. Thus, we analyze the method of Chanut and Laroque (1979) – Box 1.

Box 1: The calculation method for the contribution of the components of an aggregate to its volatility

We study on T quarters, t = 1,.....,T, the evolution of an aggregate A(t) and of its "*m*" components Ci(t), where *i* varies from 1 to *m* :

$$A(t) = \sum_{i=1}^{m} Ci(t) \qquad (1)$$

The growth rate of the aggregate is:

$$x(t) = \frac{\left[A(t) - A(t-1)\right]}{A(t-1)} \qquad (2)$$

and the contributions xi(t) of each component to this growth rate are defined by:

$$xi(t) = \frac{\left[Ci(t) - Ci(t-1)\right]}{A(t-1)} \qquad (3), \text{ which implies}$$

$$x(t) = \sum_{i=1}^{m} xi(t), \text{ for t=2,....,T} \quad (4)$$

The model is the following (under the assumption of independence, we suppose that $[x_1(t), ..., x_m(t), x(t)]$ represents the performance of a random stationary process of second order on date *t*. We note Ex_i, σ_{xi} and $corr(x_i,x_j)$ represents the expected value of x_i, the standard deviation of x_i and the correlation factor between x_i and x_j. The result is :

$$x = \sum_{i=1}^{m} x_i \qquad (5), \text{ which implies:}$$

$$E(x) = \sum_{i=1}^{m} Ex_i \qquad (6) \text{ and}$$

$$\sigma x = \sum corr(x, x_i) * \sigma x_i \qquad (7)$$

In (6) and (7), we replace the moments of the random variations for the associated empiric moments:

$$\bar{x}_i = \sum_{t=2}^{T} x_i(t)/T, \text{ for } Ex_i;$$

$$\bar{\sigma}_i = \sqrt{\sum_{t=2}^{T} [x_i(t) - \bar{x}_i]^2 /T}, \text{ for } \sigma_{xi} \text{ şi}$$

$$\sum_{t=2}^{T} [x_i(t) - \bar{x}_i][x(t) - \bar{x}]/T \bar{\sigma}\bar{\sigma}_i, \text{ for corr } (x_i, x).$$

The growth contribution of the components will be:

$$GC_i = \frac{E(x_i)}{E(x)} \qquad (8)$$

and the contribution of the components to the aggregate's volatility results from:

$$VC_i = \frac{corr(x_i, x) * \sigma x_i}{\sigma x} \qquad (9)$$

This method enables the correction of the volatility of the extremely volatile components, depending on their share in the structure of the aggregate. The application of this method for the chosen group of countries leads to the results presented in Figure 3:
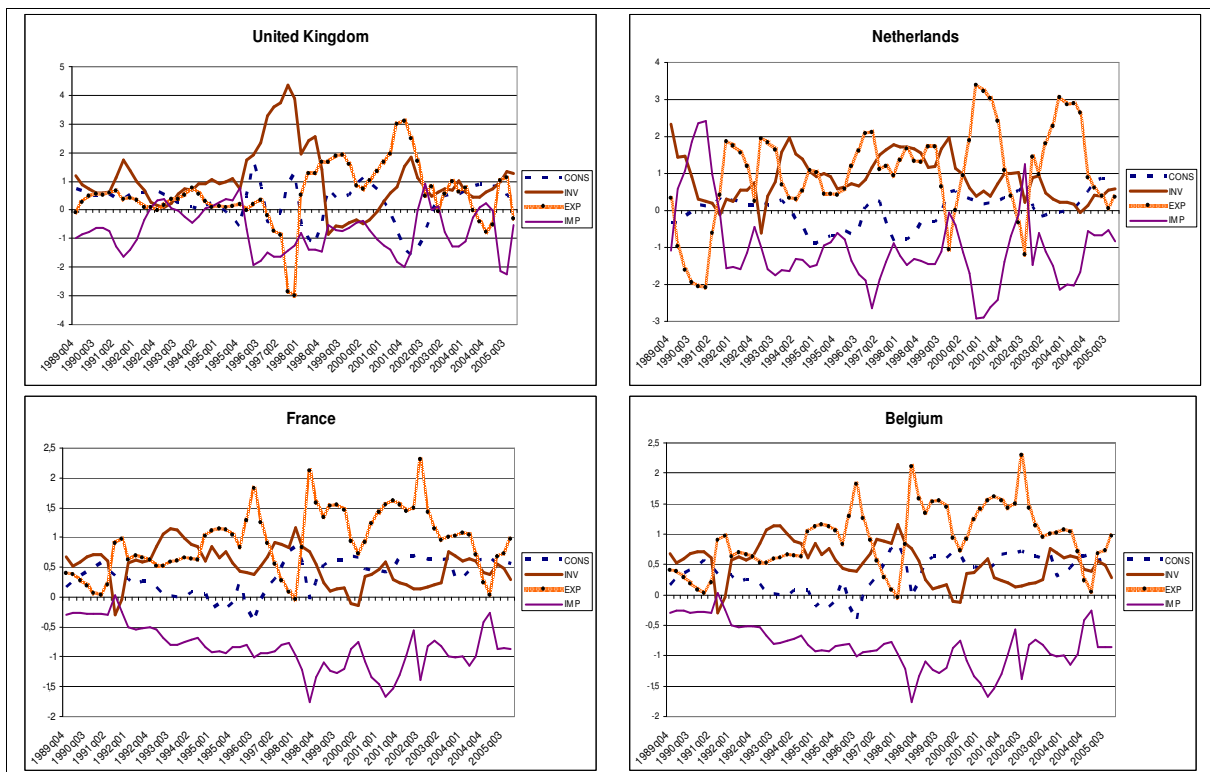
Figure 3: The evolution of the contribution of the real GDP components to its volatility

Analyzing the diagrams, we can say that, in relation with the real GDP, the contribution of the components to its volatility does not tend to decline in none of the analyzed countries. Using this method, the sum of the contributions to the volatility is always equal to 1, no matter the period. As we will see, the results of the econometric tests presented in the next section do not find a significant relationship between the use of the derivative products and the reduction of the contributions to the volatility. It can be observed that the investments and the commercial exchanges have the most important contribution to the volatility.

3. The Results of the Econometric Tests

Using a panel of data for the four countries taken into consideration, we performed two categories of regressions. The first category tests the relationship between the evolution of the standard deviation of the GDP, of the investments and of the commercial exchanges (the exports for exemple) and the amount of the traded derivative products, reflected by the number of contracts. The relationship between the volatility and the amount of the traded contracts is negative and significant, but no difference can be observed between the two periods (the coefficient of the introduced dummy variable is not signifiant), situation probably due to the considerable volatility of the economic activity after the crash of the stock-exchange occured at the end of the year 2000. The control variables introduced are: domestic credit/GDP, the size of the real GDP and the stock-exchange capitalization/GDP. The second category of regressions tests the relationship between the contribution of the investments (gross fixed capital formation) and of the commercial exchanges (exports) to the volatility of the economic activity and to the amount of traded derivative products.

The results have to be interpreted carefully because the number of cross-sections is limited and we start from the assumption that the residents of a country effectuate most of the transactions on the national stock-exchange market (smaller direct costs related to transactions, a better knowledge of the market and of the regulations, etc.). Moreover, we only dispose of data corresponding to standardized markets.

The tested regressions are of the following type:

$\text{Volatility}_i = c + \alpha X + \beta \, dum{*}X + \delta Z + \varepsilon_t$, and

$\text{Contribution to the volatility}_j = c + \alpha X + \beta \, dum{*}X + \delta Z + \varepsilon_t$, where:

- the dependent variables *i* are represented by the standard deviation of the GDP [1], of the investments [2] and of the exports [3], and the dependent variables *j* are given by the contribution the investments [4] and the exports [5] have to the volatility; the explicative variable X, whose coefficient α is of special interest for us, represents the amount of the traded derivative products (deriv); the *dummy* variable acquires the value 1

in the period 2000-2006 and 0 for the other period; Z represents the vector of the control variables and ε_t represents the errors term.

As econometric methods, we have used the method of the ordinary least squares (OLS) as well as the method of the weighted least squares (WLS) but the findings are almost similar. The results of the two types of regressions (OLS method) are presented in Table 2 and 3.

Table 2: The derivative products and the macroeconomic volatility (panel regression)

OLS	1988-2006		
Volatility	[1] PIB_SD	[2] INV_SD	[3] EXP_SD
c	0.969719***	3.896143***	1.494637***
deriv	-0.002543**	-0.015670**	-0.007332
dum_deriv	0.003192***	0.020008***	0.010975***
gdp_vol	-0.013458***	-0.080591***	0.006842
domcredit_gdp	-0.046469***	-0.355713***	0.048170
mkcap_gdp	-0.061496**	1.516011***	-0.015012
number of observations	225	225	225
R-squared	0.578322	0.474589	0.090971

*Note: *, ** and ***, mean statistic relationship significant at 10%, 5% respectively 1% (t-statistic).*

As it can be seen, the contribution of the use of the derivative products to the reduction of the volatility of the GDP and of the investments is significant. Equally, the control variables prove the fact that the relationship is robust: the big countries, with a more developed financial system, show a more reduced volatility. We can not state the same thing about the volatility of the exports. Moreover, it seems that the relation reached is weaker in the second period, as opposed to the initial assumptions (the sign of the *dummy* variable is positive and significant).

Table 3: The derivative products and the contribution to the volatility (panel regression)

OLS	1988-2006	
Contribution to the volatility	[4] INV_VC	[5] EXP_VC
c	0.656761***	-0.001618
deriv	-0.007203	0.019758***
dum_deriv	0.007383**	-0.011654***
gdp_vol	-0.735020***	-0.444265***
domcredit_gdp	-0.047442	0.026205
mkcap_gdp	0.008230	0.055895
number of observations	220	220
R-squared	0.569895	0.282295

*Note: *, ** and ***, mean statistic relationship significant at 10%, 5% respectively 1% (t-statistic).*

The insignificant results of the second category of regressions reflect the evolution of the contributions to the volatility, earlier explained by means of the descriptive statistics. Consequently, we can say that, even if the volatility of the investments and of the commercial exchanges tends to decline, their contribution to the volatility of the real GDP remains important.

4. Conclusion

After the performed analysis, we observed the fact that the volatility of the investments and of the commercial exchanges is much more important than the volatility of the consumption and consequently the accent has to fall on the analysis of the elements that influence these macroeconomic variables. We consider that the use of the derivative products can contribute to a better allocation of resources and to a better management of the risk, a fact which has a positive impact on the reduction of the volatility of the investments and of the commercial transactions.

In the present study we have analyzed two different methods to emphasize the reduction of the volatility. The second method for the evaluation of the contribution of the components to the aggregates' volatility represents a sensitivity analysis, being completely different as compared to the method for the calculation of the volatility based on the standard deviation.

The econometric results show a significant relation between the reduction of the volatility of the economic activity and the amount of the derivative products traded on the market. This relation is less significant in the second analyzed period and consequently the results have to be interpreted with reserves. The fact that the group of countries is reduced and that we start from the assumption that the resident investors perform most of the transactions on the national stock-exchange markets constitutes another limit for our study. Moreover, the statistics enable the analysis of the transactions with financial products traded on standardized markets (stock-exchange markets), or the most considerable amount of derivative products is traded *over-the-counter* (OTC). The access to a data base that could enable the visualization of off-balance sheet banking data[6] gives the opportunity to develop this analysis and to obtain more accurate results, a considerable part of the constraints being eliminated. The continuation of the study based on such data also enables the extension of the analysis over other countries.

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