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"The Macroeconomic Effects of Global Financial Shocks"

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Abstract

In this essay I report the results of a VAR model I run with the purpose of find how European and American economies respond to a positive shock in the Global Financial Cycle. The model includes an estimation of the Global Financial Factor, defined in a paper of Miranda-Agrippino and Rey, along with other relevant macroeconomics variables. I involve the Inflation Rate, Unemployment Rate and Central Bank's Interest Rate for both regions and the USDEUR exchange rate observations. Findings supports a significant expansionary pressure as a response for both EU and US and a higher reaction of the European Central Bank. Furthermore, I try to trace out an economic mechanism that can bring to these results and, doing this, I emphasize the role of financial intermediaries in the transmission channel through which the shock hits the real economy.

Nelle pagine che seguono ho riportato i risultati ottenuti dal modello VAR che ho costruito per studiare come l'economia Europea e quella Americana possano rispondere ad uno shock positivo del Ciclo Finanziario Globale. Il modello include una stima del Fattore Finanziario Globale come definito da Miranda-Agrippino e Rey e altre variabili macroeconomiche rilevanti. In particolare, ho incluso nel modello il tasso d'Inflazione, di Disoccupazione e il Tasso d'Interesse per entrambe le regioni, oltre al tasso di cambio Dollaro-Euro. I risultati trovati supportano l'esistenza di una risposta espansiva nell'economia sia per quanto riguarda l'Europa, sia per l'America. Inoltre, si ha evidenza di una reazione maggiore da parte della Banca Centrale Europea. Dopo la descrizione dei risultati derivanti dal modello ho provato a delineare i tratti di un processo che possa portare ai risultati osservati. Nel fare ciò, ho enfatizzato il ruolo degli intermediari finanziari nel canale di trasmissione dello shock all'economia reale.

Più nello specifico, i risultati del modello che ho utilizzato consistono in grafici di Impulso Risposta in cui ho assunto uno shock positivo del Fattore Finanziario Globale di una deviazione standard. Per ogni variabile, quindi, viene tracciata nel relativo grafico la risposta in un arco temporale di 24 mesi. Questi mostrano un aumento nel Tasso d'Inflazione, dei Tassi d'Interesse e una riduzione del Tasso di disoccupazione per entrambe le regioni. Inoltre, il tasso di cambio mostra come ci sia un deprezzamento del Dollaro in risposta allo shock analizzato. I risultati ottenuti possono essere causati da un incremento nell'offerta di finanziamenti ad aziende e privati da parte del settore bancario. Questo dovrebbe far si che aumenti la domanda di fattori produttivi da parte delle aziende e la domanda dei cittadini di beni durevoli, provocando un aumento dell'occupazione e una spinta inflazionistica. Il confronto tra Europa e Stati Uniti riporta una maggiore sensibilità della prima a questa tipologia di shock e una sua maggiore risposta in termini di Tassi d'Interesse.

Summary

1. Introduction

The globalization path that occurs all over the world in the last decades, not only interests trading and business, but also the financial landscape. At the same time, the technology development makes more accessible holding financial securities and expands the access to market. So, this global integration is an interesting phenomenon to observe by different points of view. In my case, I decided to analyse the relationship between global financial movements and the real economy. To do this, my starting point is the paper of Miranda Agrippino and Rey (2020) in which they defined a global factor to describe global price movements and the cycle in world finance. Furthermore, they analyse the US dominance that affects global financial conditions, its monetary policy it was proved to be a significant determinant of them.

My purpose is to contribute to this theme studying the effects that in turn this factor has on the main macroeconomic aggregates. I will go into the discussion of how global financial condition influences economy and, in addition to this, I will spot some difference in the American and European reaction to it. Doing this, I find evidence of some asymmetry in their response and of a US dominance. These findings are the result of an empiric study based on the monthly observation of the variables I consider crucial. In particular, I run a VAR model to study their dynamic response after a shock. This is an initial examination of the argument that use a simple analytical tool and can be subject for a more advanced discussion. So, this is a first step toward the comprehension of the relationship between the Global Finance and countries' real economy.

The essay is structured as follow. In the second paragraph (2) I will talk about the financial integration and the Global Financial Cycle to introduce the environment I study; in the third section I will describe the shock analysed (3.1) and the variables used in my study (3.2). Then, in the same section, I will set up the VAR (3.3) and present the results I obtained from it (3.4). Finally, in the fourth one I will propose my interpretation of the results with a description of what can lead to them (4) and, after it, I made a brief conclusion (5).

2. Global Financial Cycle

The financial and economic integration is a phenomenon that has interested the entire world and in particularly it took place among western countries. This integration is continuing to growth in the few last decades and by the financial side there was a real explosion of financial securities' capitalization. According to the IMF[1] between 1990 and 2005 the estimated sum of equity market capitalization, outstanding total bond issues (sovereign plus corporate), and bank assets in the world economy rose from 81 percent of GDP to 137 percent. In addition, the derivatives over-the-counter market grew up even more creating new and more sophisticated instrument to transfer risk and cash flows.

In the literature there are discussions about the role in the economic growth of the financial integration (see M. Osada - M. Saito, 2010; H.J. Edison et al., 2002) but it is a fact that the pace of financial liberalization and integration does not stop, on the contrary, policy makers and

[1] *The Growing Integration of the Financial Sector and the Broader Economy: Challenges for Policy Makers, Speech by Rodrigo de Rato. (IMF speech of November 23, 2006)*

academic economists agree to consider it a long run trend. Furthermore, a relationship with the business cycle is proved at regional level as it is written above, data shows that there is a long run Domestic Financial Cycle that cause and/or intensify the cyclical path of real economy. Due to the linkage between countries' economic and financial activities, it seems reasonable to assume that there can be a global co-movement in the drivers of regional financial condition. In other words, in such a scenario it is realistic to believe that economic agents all over the world tend to behave in a similar way, responding to an environment that is significantly explained at an international level.

In a study on developing country of 1996, Calvo et al. observed that there was a global factor that affect capital inflows and outflows, such as real interest rate and advanced economy growth, and they discovered an important cyclical component in their movements. Since that moment other economists have investigated more in detailed this observation. In particular, I focused on the studies of Miranda-Agrippino and Rey who estimated a factor which explain a significant amount of the common variation in the risky asset prices around the world. They specify a Dynamic Factor Model in order to summarize fluctuations in the global financial markets, that is, they designed a multivariate time series model in which the endogenous variables are linear functions of exogenous factors. This general structure is flexible and it was differently specificized in order to allow for global, regional and sector specific factors. The panel they used in the model includes a large and heterogeneous group of assets traded in the major global markets, a collection of corporate bond indices and commodities price series. Data they used supported the existence of a single common global factor that explain 20% of the common variation.

Miranda-Agrippino and Rey interpreted this global factor as a function of the aggregate volatility and the degree of aggregate risk aversion in the market. More in detail, it is constructed in such a way that make Volatility and Risk Aversion fall when it rises. It is observed that the Global Factor has a procyclical walk while the variance and the risk aversion have counter-cyclical movement as it is showed in these pictures below taken by the original paper.

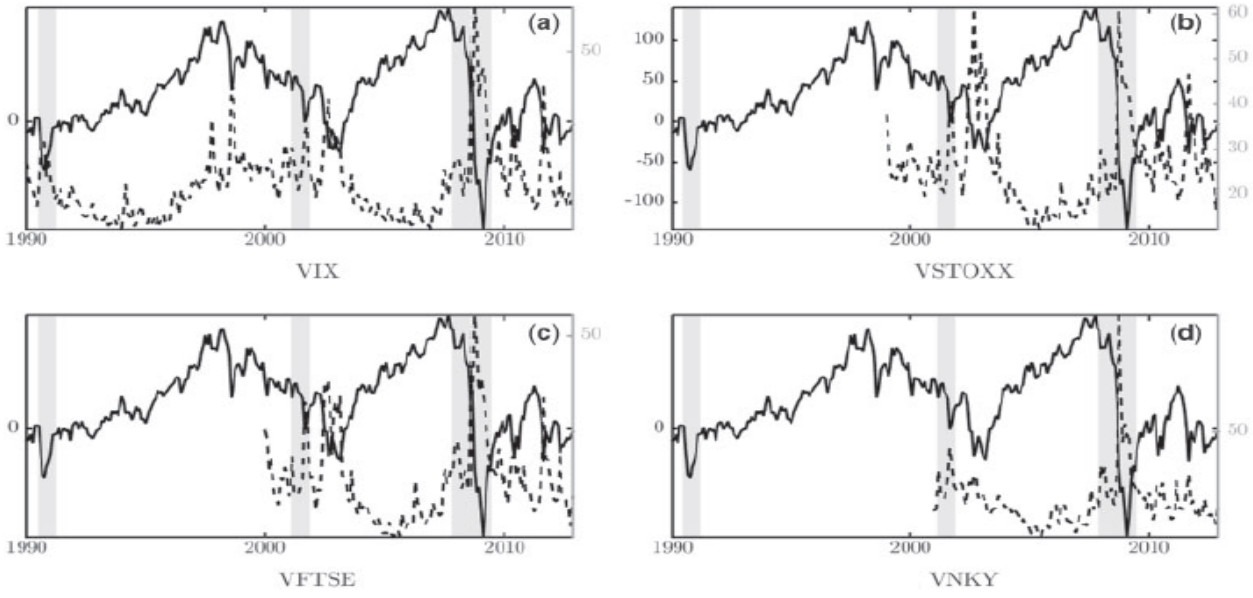


Figure 1
These graphs plot the Global Factor (solid line) coupled with major volatility indices (dotted lines): VIX (US), VSTOXX (EU), VNKY (JP), and VFTSE (UK). Grey areas correspond to NBER recessions times.
Source: S. Miranda-Agrippino & H. Rey U.S. Monetary Policy and the Global Financial Cycle

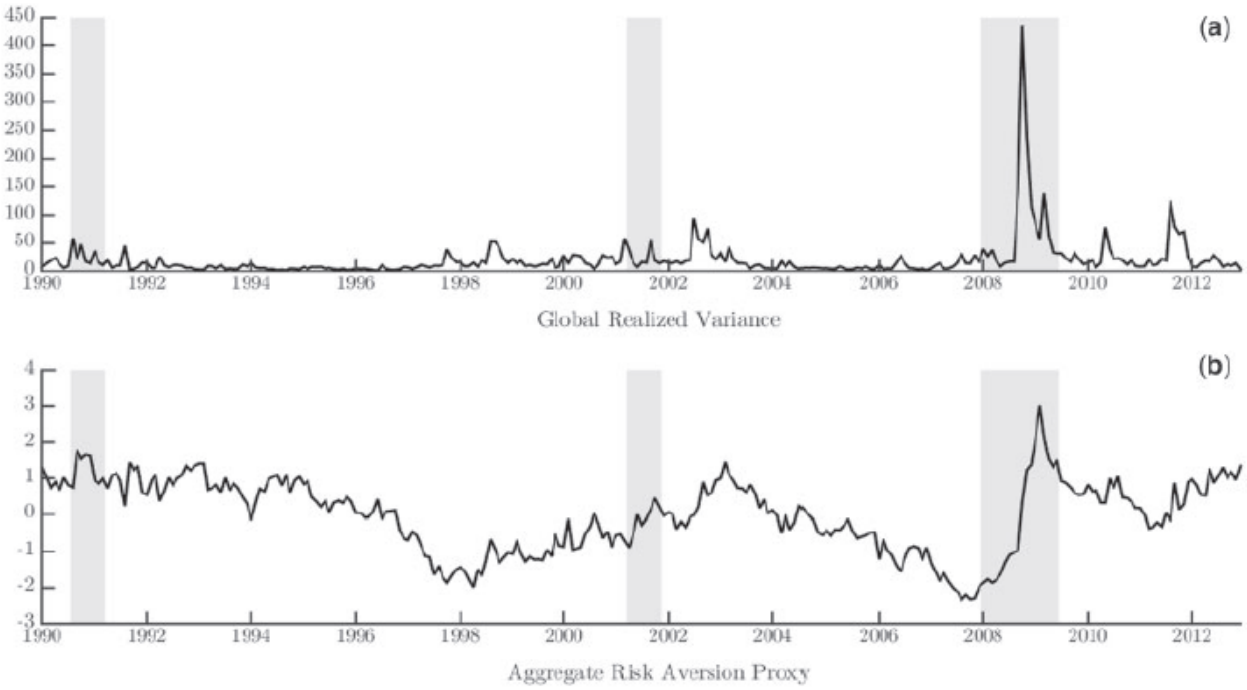


Figure 2
Panels report the Global Realized Variance based on MSCI Index (a) and a proxy of Risk Aversion based on global factor centred residuals (b) taken from Miranda-Agrippino and Rey's paper. Grey areas correspond to NBER recessions times.
Source: S. Miranda-Agrippino & H. Rey U.S. Monetary Policy and the Global Financial Cycle

They seem to confirm the existence of a negative correlation between Volatility, Risk Aversion and the Common Global Factor, supporting the idea that there is a world co-movement in asset price caused by the behaviour of economic agents lead by their risk aversion and the volatility they observe in the market. The result is an aggregate cyclical path.

Also, Helen Rey in her paper on the monetary trilemma showed that periods of low volatility, i.e. in which VIX is low, are associated with gross capital flow rises, credit growth and with an increase of leverage, especially in the main financial centres. (Rey, 2015)

A critique to the quantitative importance of the Global Financial Cycle comes by Cerutti et al. who find data to support the idea that empirically the financial cycle has a small impact on capital flows. Their empirics based on conventional models stated that there is only little evidence about a systematically explanation of capital flow variation due to the Global Financial Cycle (Cerutti et al., 2017). These results can partially come by the type of analysis conducted and, in the future, it is possible to find more evidence supporting or not the influence of Financial Cycle.

In this essay I assume that there is a common pattern in capital flows and asset prices, at least to a certain extent, and I focus on the study of the macroeconomic effects in the United States and in the European Union deriving from financial shocks. This hypothesis is ground on the works of Miranda-Agrippino and Rey and it is reinforced by the following table taken by an European Central Bank publication[2]. It shows the unweighted averages of bilateral correlations

[2] *Maurizio Michael Habib and Fabrizio Venditti: The global financial cycle: implications for the global economy and the euro area (ECB Economic Bulletin, Issue 6/2018)*

between capital flows and asset prices in a sample of 50 countries over the period 1990-2017. The capital flows average coefficients are presented in four subcategories with the purpose of distinguish their different typologies. The correlations showed in the table are all positive and this is an evidence of the common pattern across countries.

	Capital flows				Asset prices
	Foreign direct investment	Portfolio equity	Portfolio debt	Other investment	Stock returns
Whole sample	9.5	6.1	5.9	10.2	40.3
Advanced economies	8.0	5.7	10.4	17.7	54.5
Emerging economies	11.1	6.5	7.0	10.1	35.5

Table 1
Average of bilateral correlation of capital flows and asset prices.
Sources: IMF Balance of Payments Statistics, Global Financial Data and ECB calculations. ECB Economic Bulletin, Issue 6/2018
M. M. Habib and F. Venditti.

Supported by these empirics I rely on the assumption that a Global Financial Cycle exists and that is significantly moved by the Factor described. Furthermore, in the following pages I will refer to them with the abbreviations GFC and GF respectively.

3. The model

3.1 What is a Financial Shock?

I think is a crucial step of the analysis to make a good and concrete characterization of the shock taken in account in the model I built. It is a first movement in order to describe my findings and what I suppose to be the underlying economic mechanism. Due to this belief, this section has got the intention of setting the environment for the following reasoning.

In the existing literature there are a lot of definitions that focuses on different aspects. In ECB publication[3] a financial shock is reported as a net worth transfer. More in detail, a wealth shift from the non-financial sector to the financial sector is associated with a positive shock and similar is the interpretation of Meh and Moran (2010). They interpret the shock as an exogenous change in financial intermediaries' net worth. Since bank capital is strictly correlated with debt production capacity, the shock may have wider consequences for financing conditions and, through the investment channel, for the real economy. Also, Hirakata et al. (2009) stated that a shock to the intermediaries' net worth has a great aggregate impact, even larger than a non-financial net worth shock, because of their role. Nolan and Thoenissen (2009) and Hall (2010) see at the shock as a change in the financial markets' frictions. According to Hall, a friction is

[3] *Fabio Fornari and Livio Stracca: What does a financial shock do? First international evidence (ECB Working Paper Series, NO 1522 / march 2013)*

a cost borne by one side that is not a benefit for the other side. In credit market this can lead to a high cost of funds for borrowers without an increase in the payoff that the credit supplier receives. So, they pay attention to the efficiency of contractual conditions between borrowers and lenders, a financial shock can make more (less) difficult and costly to obtain the access to credit. Furthermore Gilchrist et al. (2009) described a financial shock as change in external finance premium, that is, the difference of cost that an economic agent faces borrowing the wealth she needs instead of use her own one.

These shocks described can occur either at regional or at global level. In setting my framework, I suppose the existence of a global common behaviour that affect the dimensions mentioned above. For this reason, I consider an Innovation in the GF which can be caused, for instance, by a policy or technological change. This shock can be interpreted as a shift in the risk aversion and in the market volatility, coherently with the GF definition, and it is likely also to involve a change in the net worth allocation, in the market frictions and in the financing premium. So, the reason why I wrote about different financial shock definitions is to introduce the way through which this shock can reverberate on the economic activity.

As it is showed by the recent history, financial sector stability is a necessary condition for macroeconomic stability, and its disturbance can imply the consequences described. Moreover, the financial sector is also highly leveraged and for this reason can be hit more by these types of shocks with consequences on the credit production capacity and in the costs associated with it. These in turn impact on firms' financing and (if the shock hits deeper) investment policies. Considering that, intermediaries' sector is reasonably the main channel through which the Global Financial Shock, as it is defined above, impacts on the real economy.

3.2 The variables used

In their paper Miranda-Agrippino and Rey (2020) stated the central role of the United States monetary policy to determine the GFC, starting from that point I focus my efforts studying how the GFC can influence the US and the European Union macroeconomy indicators. I take in account the two poles of the western world for their importance in the international economy and because they are likely the most sophisticated area among the big economies. So, I want to spot how these two big players react to a GFC shock.

For the sake of simplicity, in the rest of the text from this point later I will refer to the European Union as a country, even if properly it is not.

In order to do this analysis, I consider the U.S. Dollar exchange rate against Euro and the Inflation Rate, the Unemployment Rate and the Shadow Interest Rate of both countries. Using these variables, I made a sample of 244 monthly observations which range from January 1999 to April 2019. For the Inflation Rate I used the Consumer Price Index available on the Federal Reserve Bank of St. Louis Database (Fred) that is a measure of the average monthly change in the price of goods and services, less food and energy (also tobacco and alcohol in the EU index), experienced by urban citizens. Also, the Unemployment Rate and the Exchange Rate data that I used were taken from the same database.

For the Interest Rate variables, I rely on an updated dataset of estimated monthly Shadow Rate made by J. C. Wu and F. D. Xia for their paper of 2016. In that article they proposed this new measure to summarize the monetary policy because, since the Great Recession of 2008, central

banks reached interest rate lower bound and they began to adopt different tools such as large-scale asset purchases commonly called Quantitative Easing in order to stimulate the economy. Wu and Xia rates are allowed to go below the zero level with the scope of taking into account the non-conventional policies implemented by central banks and, for this reason, they summarize better the overall action of monetary policy in the current environment. Furthermore, I take into account the USDEUR variable even as a control for the central banks' behaviour.

Note that the variables are reported in the software output in an abbreviated form, using underscore mark instead of the space. Furthermore, I called F_NORM the GF, because I used the normalized value of it.

3.3 VAR defining and set up

VAR stands for Vector AutoRegression and it is an econometric linear model in which there is *n*-variables and *n*-equation used to capture the relationship between included variables over time. In the reduced form of a VAR model, each variable is explained by its own lagged value plus the lagged values of the other remaining *n-1* variables and each equation includes its own error term. Variables' parameters in the model are quantify using the standard methods of the OLS (*Ordinary Least Square*) that set coefficients with the aim of minimize the sum of the squares of the differences between values of the observed dependent variables, observed in the given dataset, and those predicted by the linear function constructed on other variables. This framework helps to analyse multiple time series in a relatively simple way and its vector name derives from the fact that this model is often and simply write using vectors and matrices.

One of the main problems of a VAR is to establish an appropriate lag structure. This problem arises because of the trade-off between *accuracy* and *precision*. Including more lagged values means to introduce the information that comes from a deeper past in the equation, and this provides a better forecast of the estimated value. On the other side of the balance this means that there are more parameters to estimate which rely on the same information set, if we assume that the sample does not change together with the lag values implemented. This leads to a lower precision in the parameters' estimation. To solve this trade-off, it is commonly used to employ an Information Criteria. In the following table I report some IC estimated with EViews, the econometric software I used to make my analysis. They are constructed such as the best lag structure is the one that minimize that particular IC.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1938.945	NA	0.002022	16.49953	16.61695	16.54686
1	1366.596	6358.964	2.37e-15	-10.97116	-9.914393*	-10.54517*
2	1459.227	171.9168	1.87e-15	-11.21379	-9.217684	-10.40914
3	1528.317	123.5414	1.80e-15*	-11.25692*	-8.321471	-10.07362
4	1567.892	68.08319	2.23e-15	-11.04993	-7.175139	-9.487971
5	1614.160	76.45916	2.62e-15	-10.89966	-6.085520	-8.959038
6	1681.397	106.5539	2.61e-15	-10.92709	-5.173610	-8.607815
7	1744.043	95.03006*	2.71e-15	-10.91561	-4.222787	-8.217678
8	1790.992	68.03763	3.26e-15	-10.77112	-3.138951	-7.694528

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 2
Information Criteria output by EViews.

I arbitrarily choose to use a model with four times lags for each variable. The choice was made starting from the fact that on average the best model for the ICs is the one with three lags but, moving to forward lags structure, Information Criteria's losses are very small. So, I computed the model with three and with four lags and, after seeing that the precision is affected in a very limited way, I selected the latter one to have more precision.

Another problem with this type of model is the correlation across equations' error terms. If the variables included in it are correlated as they typically are in practice, also the error terms are contemporaneously correlated or, using algebra's vocabulary, they are *not orthogonal*. This means that error terms variance-covariance is a square matrix whose transpose is not equal to its inverse. This challenge can be solved by using a recursive VAR as it was proposed by J. H. Stock and M. W. Watson (2001). It consists in ordering in a specific way the variables, from the more endogenous to the less one, and including some contemporaneous values in the equations. In this way the first order variable and equation consider all the lagged values, the second one takes into account the lagged values *and* the current value of the first variable, the third one also considers the current value of the second one and so forth. In this manner estimation produces residuals that are uncorrelated across equations.

In order to study the effect of a Global Financial Shock on the variables above mentioned, I set up a VAR model[4] and then I plotted an Impulse Response graph to see how they react. To do this I have to make possible to vary an error term, holding other ones constant. So, I used the Cholesky Decomposition available on EViews to order variables and make error term orthogonal. To do this, I put the variables in the following order: Inflation Rate US, Unemployment Rate US, Interest Rate US[1], Inflation Rate EU, Unemployment Rate EU, Interest Rate EU[1], Exchange Rate US Dollar-Euro, GF. I defined an Innovation of one Standard Deviation in the Global Factor, holding everything else constant, as the Impulse occurring at time zero and then the software computed other variables responses forecasted by the model for the following 24 months. For the responses standard errors (SE), I used Monte Carlo method, available on EViews, that derived them *by simulating impulses by drawing innovations from the standard normal distribution*[2]. More in detail, the algorithm is run using the sample included in the VAR and it provides many results based on a normal distribution that are averaged to make the estimation needed. In my case I chose to make the software run 1000 times the simulation to estimate SEs. Then I used those SEs to build the confidence interval of the Responses to the shock, I used a statistically significant set to 30% because of the sample that includes only 240 observations for each variable.

3.4 Results

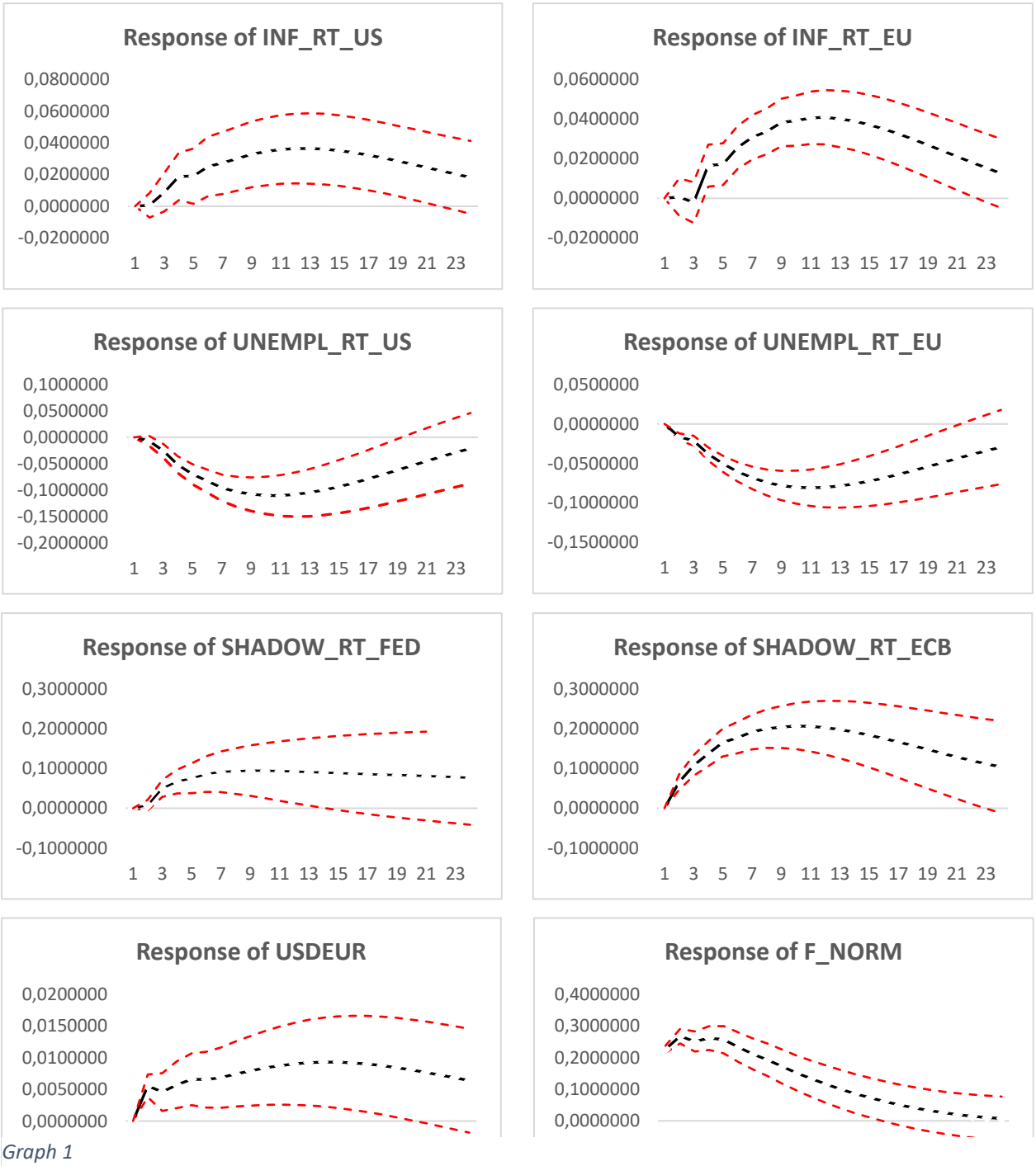
In the following page there are the Impulse Response Function plots I estimated with the VAR model. It is noticeable that there is a similar response among US and EU, a financial shock seems to have similar effects on these tow economies. Small differences regard Inflation and Unemployment Rate, the first one rises a little bit more in EU, instead the second variable is more sensible in the US. Despite of this the differences are insomuch little that they are few significant, to the point that in the Inflation case the Confidence Interval is larger in the US response and the upper band is higher than the EU's upper band. More interesting is the

[4] *In the appendix to this essay, you can find the complete VAR output table obtained with EViews.*

response of the Shadow Interest Rate, in this case evidence supports in a significant way that in Europe there is a more sizeable reaction with the respect to the Global Financial Shock.

These results can be summarized in four main points:

- Inflation and Unemployment Rate have a similar behaviour in both regions, apart from slight differences in the response degree. For both countries Inflation significantly rises, and Unemployment significantly falls.
- Shadow Interest Rate significantly grows for both and ECB reacts more to GF shock.
- Exchange Rate significantly rises, i.e. US Dollar depreciates with respect to the Euro.
- At the end of the horizon consider (24 months) the shock on GF is reabsorbed.



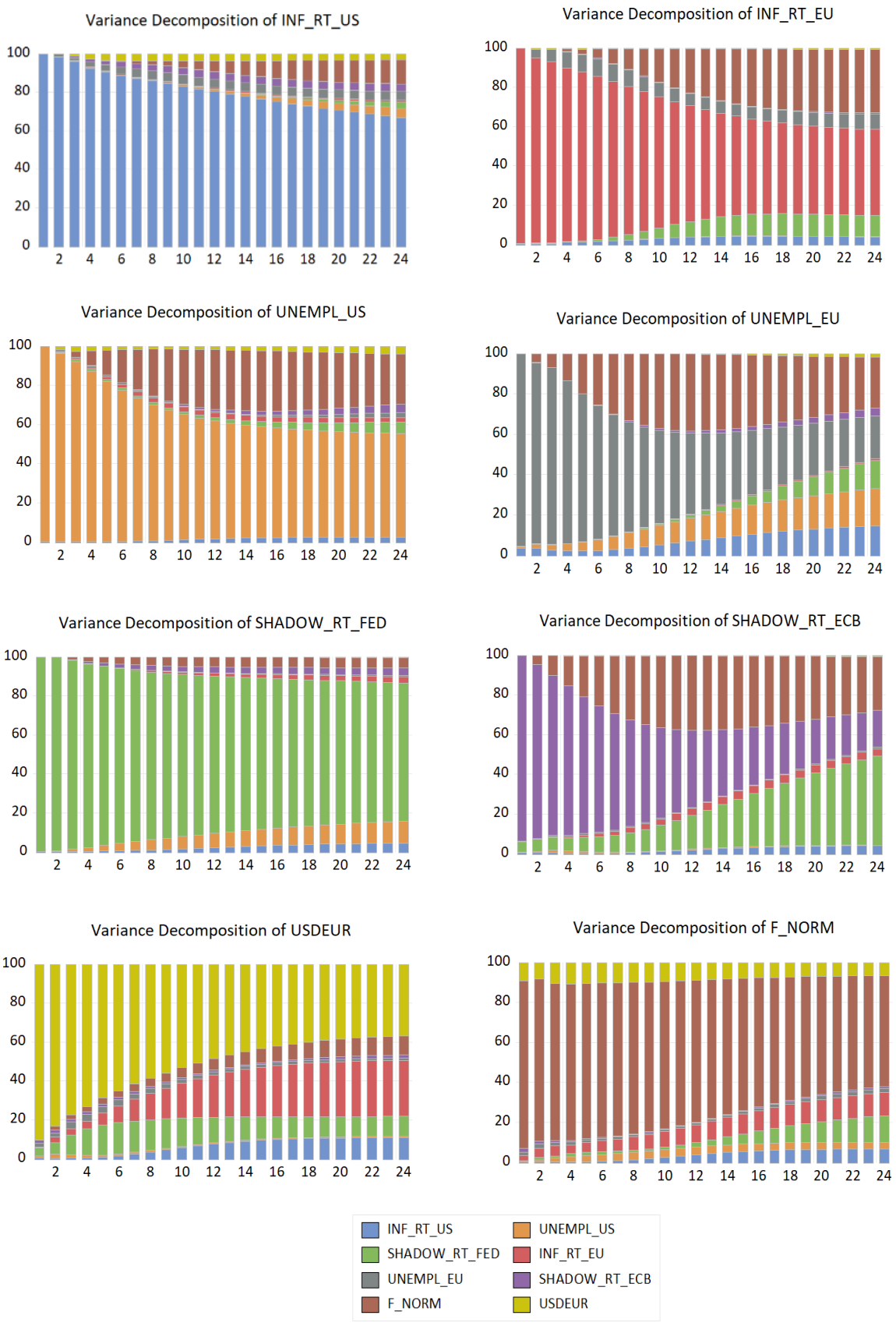
Graph 1

Dynamic Response Function after a shock of one Standard Deviation in the GF (F_NORM) based on a sample of 240 monthly observations (May 1999 – April 2019) on a 24-month horizon.

While impulse functions describe the effects resulting by a shock to one variable on to the other variables included in the model, variance decomposition splits the error terms variance of each variable into the component ascribable to exogenous shocks to the other VAR's variables. So, to deepen my analysis of European and American link with the GFC, I also computed the Variance Decomposition of the variables to trace out the relative importance of each random innovation in affecting the variables in the VAR or, in other words, the amount of information each variable provides into explain other variables in the model. Even these statistics are computed in the same horizon of 24 months, and I used the same variables order in the settings of Cholesky Decomposition. I also try to compute the Variance Decomposition putting the EU's variables first in the order in order to control if there are some relevant differences to report. The only one regards the US Inflation Rate. It becomes more sensitive to the EU Unemployment Rate that accounts for about a 12% of the total variance since the fourth months.

The results showed in the following page can be summarized as follows:

- GF explain a larger part of European Inflation Rate variance (22% after a year) respect to the US one (only 5% after a year).
- GF account for a large portion of the variance of both US and EU Unemployment Rate, respectively 30% and 38% after a year.
- EU Shadow Interest Rate variance is largely explained by the GF (38% after a year) and by the American one set by the FED (17% after a year).
- On the contrary, the US Shadow Interest Rate is very little explained by the GF (about 5% after a year).
- The Exchange Rate USDEUR is largely explained by the US Shadow Interest Rate (14% after a year) and by the European Inflation Rate (22% after a year).
- Graphs show that US variables have a considerable impact on the EU variables, but the opposite is not true.



Graph 2
Variance Decomposition graphs on a 24-month horizon.

4. Results interpretation and Mechanism

As it is observable by the results displayed above, a GF positive shock impact on the real economy in an expansionary way. This means that a positive shock on the Stock, Company Bond and Commodity prices derived by a fall in Volatility and Risk Aversion provides a stimulus to the US and EU economies, recognizable by the increase in the Inflation Rate and in a decline in the Unemployment Rate. This dynamic make sense and it is a result that I reasonably expected to find, but the question is what is it going on? Now I will try to explain the underlaying economic mechanism, or better, I will make a hypothesis on what can happen in the economic system as a consequence of this types of shock.

By an overall point view, a GF shock impact on the real economy through the financial system, changing the environment in which it is located the relationship between them. It has an effect on one of the main functions of the financial sector is the role of matching funds supply by agents in financial surplus with funds demand by agents in financial deficit. In our world this intermediation position is crucial for an efficient capital allocation. Indeed, direct lending of resources is unfeasible in the most cases because of frictions in the market. The Principal-Agent problem is very likely to be the imperfection that account for the largest part and its effects are partially limited by the intermediation. This is due to the fact that intermediaries can manage better the problem. This fact derives from two facts. They can rely on a higher bargaining power resulting in a greater ability of enforce payment, furthermore they are able to diversify risk thanks to their big portfolios. Even if they are able to manage, at least partially, market frictions, costs associated with them do not vanish at all and a stable environment can help in alleviate the misfunctioning related with these imperfections. So in this context, such a shock can mitigate uncertainty and, further, can help intermediaries in reducing the costs associated with frictions. As a result, there is an improvement in market efficiency and stability, and the resulting smoother functioning of lending infrastructure lays the substrate to expand business activity.

In my opinion, to understand how shock transmission works and to have something like the overall picture, it is needed to analyse what can be called the Bank Lending Channel, the Firms Balance Sheet Channel and how firms behave, the Households Behaviour and the Central Banks response. This approach is partially inspired by the 1995 paper of Bernanke and Gertler in which they described the credit channel of monetary policy transmission. For this reason, I organized in this way the following paragraphs.

4.1 Bank lending channel

A Global Financial Shock may affect the real economy by shifting the supply of credit intermediated by banks. It can be the results of two different mechanism, one related to the behaviour toward risk and another one linked to banks lending capacity. To make thigs more clear I introduce a brief explanation of the stylized bank functioning.

Commercial banks' work can be reduced to the production of standard deposit contract (Certificate of Deposit) that provide funds to the institution, and the activity of give these funds

to company and private citizens who need them. Deposits on the liabilities side are characterized by the fact that are supposed to be risk free contract and payable at sight. For this reason, they are a bank commitment which hold a run risk while, on the assets side, intermediaries face a medium to long term risk. The credit granted is intrinsically risky and it is commonly structured with multi-year contracts. Market making is another critical function which consist of providing both a bid and an offer for a security (or a basket of securities) in a sizeable amount. This is a way to make a market more liquid, stable and, in a sense, safe, because it means to make feasible to sell or to buy a security at a standard price. In order to carry out this function, large institutions hold reserves of securities for which they make the market. Also, such reserves are held for investment purposes (typically by Investment Banks) or as a store of value (this second case involve securities that are considered to have very small risk). Hence, even if the investment banks are the subjects who commonly make the market, they both have on the assets side some financial assets and securities and both are often within a group which contain also commercial bank. Made these considerations, I assumed banks as a unique body ignoring this complexity of the real world to simplify the discussion and I will refer to them in this way thereinafter.

A GF shock hit banks' assets side through an increase of reserves' value and debt price (if it is quoted) having an expansionary effect on the balance sheet in both cases. This can be considered a subtle form of capitalization for banks who face an increase in their equity and a consequently increase in their capital ratio. This gives to banks creditworthiness that results in better condition for bank funding to stay liquid, as it is also shown by the proved procyclical financial sector leverage ratio. Consequently, institutions have funds to lend to real economy through the credit channel and to make markets liquid, feeding back the expansionary path to securities prices. For investors more liquid market are more appealing and this can further rise prices. As a result, the initial rise of securities value makes them more attractive and then less costly to the intermediaries to make the market for them. This is the consequence of both a liquidity and leverage positive feedback that enhance the expansionary process and in such a positive shock they have the possibility to better perform their role and even to increase their activities. For example, buying more securities or granting more credit to economic agents. Whether there is also a reduction in the credit rationing due to frictions can be the subject of additional research on the theme.

Further the less risk aversion combined with what described above form conditions for a positive shift in the supply of credit to the economy, even taking too much risk and relying too much on leverage and liquidity. There is large agree upon the negative correlation between high financial sector leverage and financial stability. Anyway, ignoring this part of the story, it seems reasonable to state in my opinion that a GF positive shock create a world in which credit is available in a higher quantity and perhaps with better conditions.

4.2 Firms and Households behaviour

In an imperfect environment, companies' financial structure contributes to determine their business and investment plan. Financial conditions are important for firms' solvency and for the business growth. In a sense, they have to provide the stability needed for conduct a business properly and to make available the resources needed to develop it.

One of the problems that companies can face is a liquidity shortage related to their operational cycle, that is, the time gap between the moment in which they face money outflows and the moment in which they collect their revenues. For this purpose, a part of the companies' liabilities is made by short term loans which are renewed again and again in accordance with their needs. Another issue is related to what can be called the *finance premium,* the wedge between the cost they have to deal with in order to obtain the credit service and the opportunity cost they face if the funds are collected inside the firm. Its impact is on the income statement and in the new project planning. Indeed, too averse financial conditions in terms of interest to be paid or in term of collateral to be posted to back the loan can make an investment less attractive and even compromise its realization. This wedge reflects the costs associated with market frictions: expected costs of monitoring, collection and costs due to the fact that lenders typically do not know how borrowers behave. In addition this premium should depend on borrowers' financial conditions and wealthier they are, lower will be the costs to be incurred.

Among firms, a positive GF shock implies better financial condition. Less volatility and a rise in the securities prices mean that firms financial collaterals are more valued and, most important, they have to pay less interest. Let us analyse this statement. A GF positive shock denotes a rise in the corporate bonds' prices, among other things, and given the negative correlation between interest and price this implies an interests fall. Therefore, a company that holds a floating interest rate debt, as much as another one that has to renew its short-term position, will experience a benefit in term of cost to be paid. Put it in another way, companies can face less expenditure related to their debt or have the chance to refund it easily and this put them in a better condition to carry out their activities and make investments. I find reasonable to assume that a decrease in the Coverage Ratio, interest payment as a share of the sum of operating and non-operating profits, results in an increase in productive factors demand, including workers. Indeed, if companies have a less pressure on the financial expenditure related to their financing, they would be able to allocate resources in order to growth and this should result in employ more production capacity. In a sense I found that the concept behind the financial accelerator (B. S. Bernanke, M. Gertler, S. Gilchrist, 1999) can support the idea that the financial shock here described impacts in this way on the firms' activities. Furthermore, if an adverse shock is considered, there should be a credit retrenchment and a worsening of firms' financial condition that cause a contraction in production and a slowdown in economic activity. In both cases there can be a feedback that amplify and propagate the magnitude of the initial shock.

This mechanism can explain symmetrical unemployment results observed for EU and US, in which the financial sector is well developed and should be the channel through which the positive shock impacts on real economy. A more uncertain conjectures can establish a link between the US Dollar depreciation and the little difference in the unemployment degree of response. Stating that such a depreciation can hit the trade balance causing a rise of US exports. More likely, the difference is caused by the different structure of these labour markets and, in particularly, in the flexibility that characterized US market. To better understand the role of the labour market's structure in determining these results, it is the case to go deepen in the literature about this theme and a good starting point can be the Solow's paper on labour-market flexibility published in 1998 (R. M. Solow, 1998). For the purpose of this essay, I stopped observing the unemployment response difference and stating that it is probably due to this structural market dissimilarity, at least partially.

The repercussion of the shock can be perceived also by households affecting their consumptions. Shift in the credit market conditions should be relevant not only for firms' choice, but even for citizens decision upon their borrowing and spending. In particular the impact can be important for the expenditure for house, automobiles and other durable goods. So, a larger credit availability on the market can be also viewed in term of an increase in the volume of mortgage and consumer credit granted. This can reduce liquidity constraints faced by households, stimulating their consumption and, at aggregate level, increase the current demand of durables. Furthermore, this can be also the results of a higher financial wealth held by citizens after the increase in market prices. This could be an interest point of investigation and certainly need more empirics in supports, anyway it cannot be ruled out that some capital gains, resulting from the shock, can be cashed out and used to finance some consumption expenditure. In this regards it could also the case to examine whether durables consumption is the only one that could experiment an increase or not. Indeed, people can bias in their spending behaviour and shit their demand for goods even in response to a market price shock because they feel to be richer. It can be the case in a world where technology and financial integration make easier and widespread financial securities holding.

However, households have a significant and increasing exposure to financial markets as it is shown in the graph below. In turn, this can be an evidence of consumption sensitivity to GF that mean an upward shift of aggregate demand in case of a positive shock. This may create an inflationary pressure in the economy that explain the results of the VAR I run.

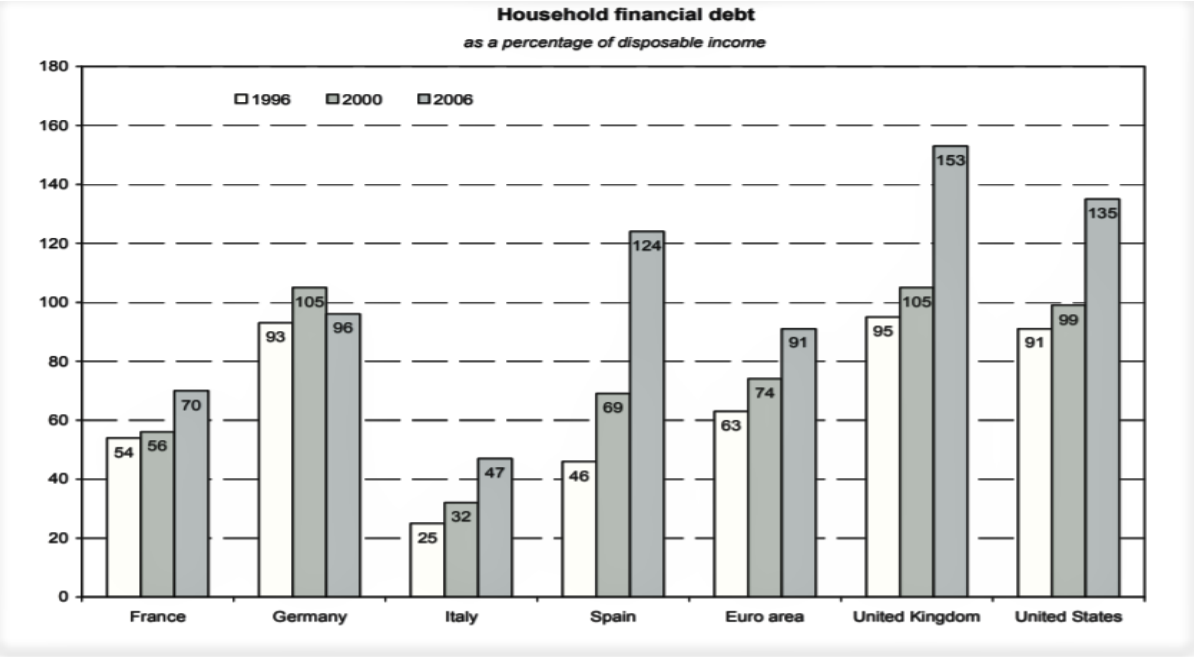


Figure 3
Households financial debt estimation as a percentage of disposable income.
Source: Bank of Italy report for the IMF and NBR Seminar on Financial Stability Issues

4.3 Central Banks response

After the description of how economy reacts to the GF shock, it is the case to look at the possible behaviour of Central Banks. As it is shown by the VAR results, interest rates grow up significantly reaching the highest deviation from the initial state after around ten months. This is a predictable result. Since the shock hit the real economy in an expansionary way, Central Banks rise the short-term interest rate in order to manage the business cycle, preventing an economy overheating. So, in my simple model shadow rates follows movements in other variables' value without a considerable lag. In the real world it can be the case that central reaction takes a while to come in action, resulting in a lag of rates response. However, this require a more sophisticated model so in this essay I focus on the fact that there is a reaction, as it is foreseeable, and on the observation that there is a considerable difference in the responses. US' variation is about 9,5 basis points while the EU's one approximately reaches 20,6 basis points. This can be the result of a higher European aversion to Inflation which leads the ECB to rise its interest rate in a more sizeable way. More technically, this can be explained, if we assume that both follow a Taylor Rule and that EU has a higher inflation parameter. However, looking at shadow rates' variance decomposition, you can see that ECB seems to react mainly to the GF and to the FED's rate. This is interesting for two reasons. The first one is that the GF itself directly affect European monetary policy. It could be that shock triggers also a reaction for the expected increase in economy inflation or that the bank wants to prevent a rise of a bubble in financial market associated with price increase. Further, the fact that ECB reacts to what FED does can be an evidence of American monetary dominance. How this dominance can influence monetary responses and their difference it is hard to say. In any case, evidence of this dominance can be found also in other variables reaction, almost everyone is affected by an American variable and the opposite is not true. Further, as I reported, GF impact considerably more on European variables. Knowing and anticipating these facts, ECB may want to set a stronger response, compared to the American one, in order to adequately smooth business cycle.

The use of the USDEUR exchange rate in the VAR control for the Central Banks behaviour, as I wrote above when I has introduced it. In particular, it shows whether policy is set taking in account its change. Observing the results, it seems to be the exchange rate to react to European and American variables without an effect on the policy rate. So, dollar depreciation can be recognized as a result of the difference in interest rate response. Likely, higher European rate attracts a capital flow from US to EU that cause a shift in the rate of exchange.

5. Conclusion

In this essay I spotted the relevance of global financial movements as a driver in the macroeconomic aggregates of EU and US. A positive shock in the degree of volatility and risk aversion causes an expansionary pressure on the economy, especially due to a shift in intermediaries credit capacity. Despite this, overall welfare benefits of the Global Financial Cycle have to be deeper analysed with a more detailed study. Indeed, credit expansions are associated with financial bubble and a more leveraged economy is proved to be more sensible to adverse shock. For this reason, the correlation with GF can involve a danger for financial stability, if it is not managed properly, and it calls for macroprudential tools to make financial sector not totally free.

A strong regulation, in terms of capitalization, leveraging and amount of risk allowed to be taken, is needed in a financial integrated world. This seems to be clear to institutions and especially after the Great Recession of 2008 government bodies have taken more care about these aspects.

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Appendix

Vector Autoregression Estimates
Date: 05/05/21 Time: 17:30
Sample (adjusted): 1999M05 2019M04
Included observations: 240 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	INF_RT_US	UNEMPL_US	SHADOW_RT_FED	INF_RT_EU	UNEMPL_EU	SHADOW_RT_ECB	F_NORM	USDEUR
INF_RT_US(-1)	1.020.684	-0.141460	-0.135552	-0.107992	-0.000277	0.053163	-0.112306	-0.000430
	(0.06909)	(0.08401)	(0.11880)	(0.08139)	(0.03783)	(0.16477)	(0.14728)	(0.01556)
	[14.7722]	[-1.68390]	[-1.14103]	[-1.32677]	[-0.00732]	[0.32264]	[-0.76254]	[-0.02762]
INF_RT_US(-2)	0.042704	0.209072	0.187806	0.148745	-0.054412	-0.004004	0.139028	-0.015894
	(0.09877)	(0.12008)	(0.16982)	(0.11635)	(0.05407)	(0.23554)	(0.21053)	(0.02224)
	[0.43237]	[1.74104]	[1.10594]	[1.27844]	[-1.00627]	[-0.01700]	[0.66038]	[-0.71455]
INF_RT_US(-3)	-0.110409	-0.087971	-0.088688	0.134656	0.070259	-0.057988	-0.003290	0.010030
	(0.09790)	(0.11903)	(0.16833)	(0.11533)	(0.05360)	(0.23347)	(0.20868)	(0.02205)
	[-1.12777]	[-0.73906]	[-0.52689]	[1.16758]	[1.31083]	[-0.24837]	[-0.01576]	[0.45493]
INF_RT_US(-4)	-0.054132	0.072935	-0.022800	-0.155516	0.012842	-0.080107	-0.123001	-0.014671
	(0.06829)	(0.08303)	(0.11741)	(0.08045)	(0.03739)	(0.16285)	(0.14556)	(0.01538)
	[-0.79269]	[0.87843]	[-0.19419]	[-1.93318]	[0.34350]	[-0.49190]	[-0.84501]	[-0.95395]
UNEMPL_US(-1)	0.048851	0.824081	-0.154937	0.011927	0.025578	0.160390	-0.013371	0.022689
	(0.05761)	(0.07004)	(0.09905)	(0.06786)	(0.03154)	(0.13738)	(0.12279)	(0.01297)
	[0.84801]	[11.7659]	[-1.56429]	[0.17576]	[0.81102]	[1.16751]	[-0.10889]	[1.74884]
UNEMPL_US(-2)	-0.069787	0.130769	-0.012113	-0.048139	-0.019986	0.078637	-0.183392	-0.027909
	(0.07440)	(0.09046)	(0.12793)	(0.08765)	(0.04073)	(0.17743)	(0.15859)	(0.01676)
	[-0.93796]	[1.44556]	[-0.09469]	[-0.54923]	[-0.49065]	[0.44319]	[-1.15636]	[-1.66558]
UNEMPL_US(-3)	0.071074	0.001030	0.164561	0.047742	-0.004181	-0.334804	0.123429	-0.006061

	(0.07275)	(0.08845)	(0.12508)	(0.08570)	(0.03983)	(0.17349)	(0.15507)	(0.01638)
	[0.97695]	[0.01165]	[1.31560]	[0.55708]	[-0.10497]	[-1.92979]	[0.79595]	[-0.36992]
UNEMPL_US(-4)	-0.060202	0.021742	-0.022268	0.001192	0.009129	0.160961	0.083773	0.013044
	(0.05585)	(0.06790)	(0.09603)	(0.06579)	(0.03058)	(0.13319)	(0.11905)	(0.01258)
	[-1.07793]	[0.32019]	[-0.23190]	[0.01812]	[0.29858]	[1.20853]	[0.70371]	[1.03703]
SHADOW_RT_FED(-:	0.029507	-0.027990	1.234.927	-0.024215	0.002135	0.045384	-0.159284	-0.013858
	(0.04227)	(0.05140)	(0.07268)	(0.04980)	(0.02314)	(0.10081)	(0.09011)	(0.00952)
	[0.69802]	[-0.54460]	[16.9910]	[-0.48626]	[0.09226]	[0.45020]	[-1.76775]	[-1.45564]
SHADOW_RT_FED(-:	-0.019465	0.012112	0.038311	-0.012016	-0.020544	0.046627	0.354503	-0.000106
	(0.06515)	(0.07921)	(0.11202)	(0.07675)	(0.03567)	(0.15537)	(0.13887)	(0.01467)
	[-0.29877]	[0.15290]	[0.34200]	[-0.15656]	[-0.57597]	[0.30010]	[2.55272]	[-0.00722]
SHADOW_RT_FED(-:	0.039837	0.078267	-0.289531	0.082071	0.016859	-0.120230	-0.304407	0.007401
	(0.06477)	(0.07875)	(0.11136)	(0.07630)	(0.03546)	(0.15445)	(0.13805)	(0.01459)
	[0.61507]	[0.99392]	[-2.60000]	[1.07568]	[0.47546]	[-0.77842]	[-2.20498]	[0.50737]
SHADOW_RT_FED(-4	-0.045973	-0.073230	0.013190	-0.085035	-0.000465	0.078421	0.163709	0.011631
	(0.04348)	(0.05286)	(0.07475)	(0.05122)	(0.02380)	(0.10368)	(0.09267)	(0.00979)
	[-1.05744]	[-1.38538]	[0.17645]	[-1.66033]	[-0.01952]	[0.75638]	[1.76656]	[1.18785]
INF_RT_EU(-1)	-0.031362	0.098171	-0.051293	0.392436	0.018473	-0.037606	0.196016	0.031899
	(0.05937)	(0.07218)	(0.10207)	(0.06993)	(0.03250)	(0.14157)	(0.12654)	(0.01337)
	[-0.52828]	[1.36011]	[-0.50252]	[5.61153]	[0.56838]	[-0.26563]	[1.54903]	[2.38591]
INF_RT_EU(-2)	0.107841	-0.227194	0.050358	0.261417	0.019176	-0.041298	-0.145813	-0.026263
	(0.06464)	(0.07860)	(0.11115)	(0.07615)	(0.03539)	(0.15416)	(0.13779)	(0.01456)
	[1.66824]	[-2.89065]	[0.45309]	[3.43285]	[0.54182]	[-0.26789]	[-1.05822]	[-1.80399]
INF_RT_EU(-3)	-0.073313	0.055684	0.130443	0.133947	0.020172	0.016886	-0.109610	0.012332
	(0.06473)	(0.07871)	(0.11130)	(0.07626)	(0.03544)	(0.15437)	(0.13798)	(0.01458)

	[-1.13254]	[0.70750]	[1.17200]	[1.75652]	[0.56917]	[0.10939]	[-0.79438]	[0.84590]
INF_RT_EU(-4)	-0.070942	-0.060525	-0.081800	-0.101809	0.000558	0.189215	0.176999	0.033709
	(0.05842)	(0.07103)	(0.10044)	(0.06882)	(0.03198)	(0.13932)	(0.12452)	(0.01316)
	[-1.21437]	[-0.85213]	[-0.81440]	[-1.47938]	[0.01745]	[1.35818]	[1.42142]	[2.56210]
UNEMPL_EU(-1)	0.299255	0.237701	-0.135547	0.529026	0.904004	0.145370	-0.226815	0.004403
	(0.13050)	(0.15867)	(0.22438)	(0.15373)	(0.07145)	(0.31121)	(0.27817)	(0.02939)
	[2.29311]	[1.49810]	[-0.60410]	[3.44120]	[12.6528]	[0.46711]	[-0.81538]	[0.14982]
UNEMPL_EU(-2)	-0.228058	-0.208240	0.440062	-0.247028	0.215418	-0.263475	0.429882	-0.082078
	(0.17443)	(0.21208)	(0.29992)	(0.20549)	(0.09550)	(0.41598)	(0.37182)	(0.03928)
	[-1.30741]	[-0.98188]	[1.46729]	[-1.20215]	[2.25570]	[-0.63338]	[1.15617]	[-2.08931]
UNEMPL_EU(-3)	0.081994	0.134264	-0.280263	-0.091863	-0.105828	-0.132177	-0.055370	0.097061
	(0.17838)	(0.21688)	(0.30670)	(0.21014)	(0.09766)	(0.42540)	(0.38023)	(0.04017)
	[0.45965]	[0.61906]	[-0.91379]	[-0.43716]	[-1.08363]	[-0.31071]	[-0.14562]	[2.41600]
UNEMPL_EU(-4)	-0.147978	-0.216491	-0.016536	-0.269074	-0.017358	0.284757	-0.095230	-0.013935
	(0.13419)	(0.16315)	(0.23072)	(0.15808)	(0.07347)	(0.32001)	(0.28603)	(0.03022)
	[-1.10275]	[-1.32693]	[-0.07167]	[-1.70215]	[-0.23627]	[0.88984]	[-0.33294]	[-0.46109]
SHADOW_RT_ECB(-:	-0.021136	-0.005122	-0.011477	-0.003712	0.020518	0.770300	-0.035858	-0.002926
	(0.02977)	(0.03620)	(0.05119)	(0.03508)	(0.01630)	(0.07101)	(0.06347)	(0.00671)
	[-0.70988]	[-0.14148]	[-0.22418]	[-0.10583]	[1.25866]	[10.8484]	[-0.56499]	[-0.43629]
SHADOW_RT_ECB(-:	-0.044787	-0.026379	-0.097861	0.010445	-0.030089	0.198224	-0.093365	0.005496
	(0.03767)	(0.04580)	(0.06476)	(0.04437)	(0.02062)	(0.08983)	(0.08029)	(0.00848)
	[-1.18899]	[-0.57598]	[-1.51103]	[0.23539]	[-1.45904]	[2.20669]	[-1.16283]	[0.64783]
SHADOW_RT_ECB(-:	0.027406	0.011845	0.025209	-0.064343	0.006989	-0.000565	0.116856	-0.003858
	(0.03811)	(0.04634)	(0.06553)	(0.04490)	(0.02087)	(0.09089)	(0.08124)	(0.00858)
	[0.71908]	[0.25562]	[0.38470]	[-1.43313]	[0.33496]	[-0.00621]	[1.43843]	[-0.44952]

SHADOW_RT_ECB(-	0.031585	0.045987	0.078070	0.050064	0.012971	-0.005930	0.003788	-0.002408
	(0.02999)	(0.03647)	(0.05157)	(0.03533)	(0.01642)	(0.07152)	(0.06393)	(0.00675)
	[1.05309]	[1.26110]	[1.51394]	[1.41697]	[0.78995]	[-0.08291]	[0.05925]	[-0.35650]
F_NORM(-1)	-0.006440	-0.069380	0.038041	-0.015393	-0.082544	0.345147	1.191.749	0.025902
	(0.03467)	(0.04215)	(0.05961)	(0.04084)	(0.01898)	(0.08268)	(0.07390)	(0.00781)
	[-0.18576]	[-1.64597]	[0.63818]	[-0.37690]	[-4.34890]	[4.17466]	[16.1269]	[3.31744]
F_NORM(-2)	0.048826	-0.038020	0.133216	0.053876	0.053282	-0.076126	-0.338243	-0.034552
	(0.05136)	(0.06245)	(0.08831)	(0.06050)	(0.02812)	(0.12248)	(0.10948)	(0.01157)
	[0.95065]	[-0.60885]	[1.50854]	[0.89046]	[1.89487]	[-0.62152]	[-3.08959]	[-2.98709]
F_NORM(-3)	0.011055	0.003748	-0.145451	0.103135	-0.042767	-0.110260	0.291208	0.022903
	(0.05103)	(0.06204)	(0.08773)	(0.06011)	(0.02794)	(0.12169)	(0.10876)	(0.01149)
	[0.21666]	[0.06042]	[-1.65789]	[1.71578]	[-1.53092]	[-0.90611]	[2.67741]	[1.99297]
F_NORM(-4)	0.010780	0.027481	-0.005079	-0.006143	0.022110	0.004460	-0.212469	-0.011188
	(0.03640)	(0.04426)	(0.06259)	(0.04288)	(0.01993)	(0.08682)	(0.07760)	(0.00820)
	[0.29613]	[0.62087]	[-0.08115]	[-0.14325]	[1.10935]	[0.05137]	[-2.73810]	[-1.36467]
USDEUR(-1)	0.278449	1.245.715	-0.467523	0.551282	0.316285	-1.564.070	-0.284652	1.118.760
	(0.33444)	(0.40663)	(0.57503)	(0.39398)	(0.18310)	(0.79757)	(0.71288)	(0.07532)
	[0.83257]	[3.06352]	[-0.81304]	[1.39926]	[1.72738]	[-1.96105]	[-0.39930]	[14.8533]
USDEUR(-2)	0.174344	-0.887204	0.703203	-1.220.106	-0.272948	0.929282	1.598.431	-0.333657
	(0.50372)	(0.61244)	(0.86607)	(0.59339)	(0.27577)	-120.125	-107.370	(0.11344)
	[0.34611]	[-1.44864]	[0.81195]	[-2.05617]	[-0.98975]	[0.77360]	[1.48871]	[-2.94118]
USDEUR(-3)	-0.351405	0.143314	-0.686219	0.387023	0.158483	0.829641	-1.891.181	0.114549
	(0.49611)	(0.60319)	(0.85300)	(0.58443)	(0.27161)	-118.311	-105.749	(0.11173)
	[-0.70831]	[0.23759]	[-0.80448]	[0.66222]	[0.58349]	[0.70123]	[-1.78836]	[1.02522]

USDEUR(-4)	-0.317203	-0.132063	0.431131	-0.393573	0.018270	-0.928339	0.635254	0.054281
	(0.32348)	(0.39330)	(0.55618)	(0.38107)	(0.17710)	(0.77143)	(0.68952)	(0.07285)
	[-0.98058]	[-0.33578]	[0.77516]	[-1.03281]	[0.10316]	[-1.20340]	[0.92130]	[0.74509]
C	0.528846	0.275399	0.144754	1.848.387	-0.413490	0.033194	-0.629828	-0.034739
	(0.23469)	(0.28534)	(0.40352)	(0.27647)	(0.12849)	(0.55968)	(0.50025)	(0.05285)
	[2.25339]	[0.96515]	[0.35873]	[6.68570]	[-3.21813]	[0.05931]	[-1.25902]	[-0.65725]
R-squared	0.946712	0.995146	0.995010	0.885869	0.998159	0.994181	0.950740	0.981153
Adj. R-squared	0.938474	0.994395	0.994238	0.868225	0.997874	0.993281	0.943125	0.978240
Sum sq. resids	2.510.635	3.711.360	7.421.914	3.484.082	0.752521	1.427.818	1.140.706	0.127340
S.E. equation	0.110130	0.133900	0.189353	0.129736	0.060294	0.262634	0.234748	0.024803
F-statistic	1.149.225	1.326.163	1.289.824	5.020.930	3.507.030	1.105.152	1.248.488	3.367.646
Log likelihood	2.066.671	1.597.636	7.659.898	1.673.469	3.512.505	-1.916.509	2.502.350	5.644.384
Akaike AIC	-1.447.226	-1.056.363	-0.363325	-1.119.557	-2.652.088	0.290971	0.066471	-4.428.653
Schwarz SC	-0.968638	-0.577775	0.115263	-0.640969	-2.173.500	0.769559	0.545059	-3.950.065
Mean dependent	1.997.844	5.900.000	1.352.804	1.230.875	9.471.250	0.500590	0.403608	1.207.032
S.D. dependent	0.443993	1.788.597	2.494.597	0.357390	1.307.736	3.204.097	0.984327	0.168139

Determinant resid covariance (dof ac	7.49E-16
Determinant resid covariance	2.29E-16
Log likelihood	1.597.027
Akaike information criterion	-1.110.856
Schwarz criterion	-7.279.859
Number of coefficients	264