The Transmission of the Subprime Crisis

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The Transmission of the Subprime Crisis: from Financial Markets to the Real Sphere

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Abstract: This paper aims to study the contagion effects of the subprime financial crisis on the real economy of the USA. The contagion of this crisis is measured by increased linkages between markets after a shock has taken place (the stock market shocks, the interbank spread). The VAR model is utilized to examine the relationship between the U.S. markets on two sub-periods: a calm period and a crisis period. Our results show that the subprime financial crisis has seriously affected the economic growth of USA. Our results show that the impact of financial shocks on the real sphere, during the subprime crisis, is negative. We emphasize that the uncertainty about the proliferation of financial shocks is a recessive factor by its effects on consumption and investment.

Keyword: Subprime Crisis, Contagion, Stock Market, Interbank Market, Real Sphere.

1. Introduction

This decade witnessed a serious financial and economic crisis affecting the USA. It began with the subprime financial crisis in the summer 2007 and continued with the failure of major financial institutions (Bear Sterns, Fannie Mae and Freddie Mac, Lehman Brothers, AIG, Washington Mutual, CitiGroup), then the stock market crash of 2008 and the spread of the financial crisis in their real economy. This in risk assessment has led to over-indebtedness of households and risky subprime such as increased financial and real estate prices. Indeed, the derivatives are now on the market for subprime loans, which explains their failures on the front line serving as a trigger of crisis. This financial crisis has spread

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to the real economy. First, the financial crisis has led to a crisis of confidence affecting all economic agents in which banks refuse to lend to each other. Then, lenders facing an increased risk of default have tightened credit conditions. The crisis of confidence and the contraction in credit conditions have negatively affected investment either for households or businesses.

In this study we will discuss the effects of contagion across markets namely stock markets, interbank markets and real activity USA. In this study, we have adopted the definition proposed by Forbes and Rigobon (2002): according to them, financial contagion is 'a significant increase in cross-market linkages after a shock to one country (or group of countries)'.

With reference to this definition, we propose to test whether there is an increase of links between different markets during the crisis. We apply the VAR models to estimate the relationship between the markets studied in two sub-periods and estimate a parsimonious model in which the links and causalities are clearly identified.

Our results show that financial shocks have significant effects on the activity in the United States. During this crisis, it appears that the financial turmoil is repetitive, they contribute to the business cycle very largely and they seem to grow during the crisis.

The rest of this paper is organized as follows: Section 2 presents the test of contagion and the empirical results. Section 3 is a conclusion.

2. Testing for Contagion

The notion of contagion is related to periods of crisis when the phenomena of shock transmission are clear. To study this phenomenon, it is important to divide the total period (July 2003 - September 2010) into two periods: pre-crisis period (July 2003 - October 2006) and the crisis period (November 2006 - September 2010). Thus, the model should allow us to account for all price changes that play a role in the transmission and amplification of financial crises.

3.1. VAR's Variables

In tests of contagion between the various markets of the USA, we focus on some key variables:

To approximate the uncertainty of the global economy, which affects the spending

decisions of economic agents, a variable of stock returns[1] has been introduced for all countries. The stock price is a proxy of financial wealth of the agents and is added to capture the financial effects. We use the return series of the American index (S&P500). The series of monthly returns are calculated by taking the natural logarithm of price ratios multiplied by 100.

The variable interbank spread is a proxy of liquidity problem (quantitative) faced by banks in times of crisis. This is an indicator of bank stress, it measures the difference between the 3-month interbank rates and treasury bills rates. It is an indicator of the difficulties of refinancing banks in times of crisis.

For the macroeconomic variables we have chosen the most important macroeconomic indicators such as variations in the consumer prices index the CPI and the index of industrial production IPI.

Table 1: Descriptive Statistics

USA	Precrisis period : (2003 :07-				Crisis period (2006 :11-2010 :11)			
	ΔIPI	$RSP500$	$\Delta Spread$	ΔCPI	ΔIPI	$RSP500$	$\Delta Spread$	ΔCPI
Mean	0.173	0.866	0.008	0.231	-0.090	-0.401	-0.003	0.181
Std. dev.	2.016	2.149	0.073	0.423	5.787	5.787	0.534	1.62
Skewness	0.002	-0.103	-0.777	-0.329	-0.270	-0.808	0.550	-1.710
Kurtosis	-0.201	-0.440	1.699	0.271	0.690	0.845	5.161	5.364
JB	0.067	0.394	8.849	0.848	1.507	6.524	54.55	79.28
ADF	-9.35 (S)	-3.547 (S)	-6.712 (S)	-5.10 (S)	-4.207 (S)	-4.592 (S)	-5.98 (S)	-3.295 (S)

Note: The significance is at the 5% level. (S) indicates that the process is stationary. The value between (.) is the P value.

Table.1. presents descriptive statistics for each return series for the two sub-periods. Stationary is examined by applying the Dickey-Fuller (ADF). The results of this test allow us to reject the null hypothesis of existence of a unit root against the alternative hypothesis for all variables. All series are stationary and thus integrated of order zero (I (0)), it is recommended to apply in this case a VAR model.

All series of returns are leptokurtic and have a very strong asymmetry mainly to the left. The test statistic of Jarque-Bera allows us to reject the null hypothesis of normality in all cases. We can see also that the yields are high during the period before the crisis. High

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[1] The fall in stock prices makes it more difficult business financing and deteriorating balance sheets and balance sheets of financial institutions whose assets are valued at their market value, which penalizes the various projects investment.

yields are associated with a high level of risk (represented often by the standard deviations). This proves that the crisis appears to be an atypical period for the USA with a deterioration of returns that are in most cases strongly negative. We find that this decline in yields is associated with a high risk.

3.2. VAR Results

The application of the VAR model allows us to directly examine whether links between markets in times of crisis, differ from those in periods of calm.

The VAR model can be written as:

$$\Delta Y_t = \alpha + \sum_{i=1}^{k} \beta_k \Delta y_{t-k} + \delta_k \Delta X_{t-k} + \varepsilon_t$$

Separately for each of the four different dependent variables ΔY_t described in the previous section, we use the changes in the IPI, the CPI and the interbank spreads, as well as the returns on the S&P500 index.

Note that we estimate the VAR seven different times, each time using a different dependent variable. In addition, we estimate the VAR separately for each of the two subperiod: the precrisis period and the crisis period. The lag structure is suggested by the Akaike Information Criterion (AIC).

Table 2 summarizes the results of estimating the VAR model for the two sub-periods. These results allow us to determine whether there is a significant difference in the relations between the markets studied in times of crisis. Table 2 also reports the p-values for the F-test that the δ_k coefficients are jointly zero. This F-test can also be viewed as a test of the hypothesis that ΔX_{t-k} Granger-cause subsequent changes or returns in the other markets examined.

Our results show that the two variables used to capture the impact of financial shocks namely stock returns and interbank spread, reflected significantly in the United States. Indeed, the interbank spread has a capacity to predict stock returns. The negative sign of coefficient δ_k in times of crisis indicates that a negative shock to the interbank market due to a problem of liquidity increases uncertainty and leads to lower stock returns. This result thus shows the important role of banks in the transmission and amplification of shocks. So there is a contagion between the U.S. capital markets. The contagion is coming from the interbank market and affecting the U.S. stock market. This result is explained by the effects of the recent crisis which caused a severe liquidity crisis in the

interbank market. This liquidity crisis has manifested itself by a sharp increase in three-month interbank rates; we are talking about a financial shock (interest rate shocks) whose significant effect is confirmed by this study. The transmission channels that have been present here are: the rate channel and the interests of the financial effect.

Table 2: VAR Estimation Results

Models	Pre-crisis Period			Crisis Period		
	δ_k	DW	P	δ_k	DW	P
$RSP500_t = \alpha + \sum_{i=1}^{k} \beta_k RSP500_{t-k} + \delta_k \Delta Spread_{t-k}$	7.30 (0.16)	2.29	0.18	-3.34 (0.03)	1.83	0.19
$\Delta Spread_t = \alpha + \sum_{i=1}^{k} \beta_k \Delta Spread_{t-k} + \delta_k RSP500_{t-k}$	0.0008 (0.88)	2.55	0.23	-0.003(0.83)	1.90	0.25
$\Delta IPI_t = \alpha + \sum_{i=1}^{k} \beta_k \Delta IPI_{t-k} + \delta_k RSP500_{t-k}$	-0.009 (0.93)	2.49	0.56	0.071 (0.09)	2.05	0.30
$\Delta IPI_t = \alpha + \sum_{i=1}^{k} \beta_k \Delta IPI_{t-k} + \delta_k \Delta Spread_{t-k}$	-5.56 (0.11)	2.42	0.41	-0.307(0.49)	1.90	0.89
$\Delta IPI_t = \alpha + \sum_{i=1}^{k} \beta_k \Delta IPI_{t-k} + \delta_k \Delta CPI_{t-k}$	-0.358 (0.55)	2.47	0.72	0.53 (0.21)	1.95	0.16
$\Delta CPI_t = \alpha + \sum_{i=1}^{k} \beta_k \Delta CPI_{t-k} + \delta_k \Delta Spread_{t-k}$	0.485 (0.61)	1.53	0.27	-0.445(0.00)	2.37	0.68
$\Delta CPI_t = \alpha + \sum_{i=1}^{k} \beta_k \Delta CPI_{t-k} + \delta_k RSP500_{t-k}$	-0.017(0.58)	1.57	0.16	0.039(0.00)	1.90	0.63

Note: The value between (.) is the p- value.

The same applies to variables of activity; our results show that industrial production in the United States responds with the expected sign various financial shocks. The coefficient δ_k is positive and significant, indicating that a negative shock on the stock market leads to a lower level of investment. The turmoil in stock markets considered here as negative shocks have arisen by the spread of uncertainty and hence the increase in volatility, these shocks have reduced industrial production and had therefore adversely affected the activity. Investors and households are forced to take their investment decisions and consumer in this very risky climate. In this climate of uncertainty, households increased their precautionary savings. Investors have delayed or postponed

their investment decisions, consequently reducing the demand and production. We' are talking about a contagion through the channel of shock and uncertainty and that of the wealth effect.

Our results also show that the difficulties in the interbank market and stock market have caused a deterioration in consumption to the extent that δ_k is significant negative sign for the largest market while it is significantly positive for the stock market. For the latter the collapse of the U.S. stock market in the United States led to the deterioration of household wealth, which explains the decrease in consumption. This deterioration in consumption in the United States is mainly due to the phenomenon of financialization consumption characterizing U.S. households. They have the opportunity to increase their indebtedness if the conditions are favorable and their homes have value, but in case of flipping real estate, this funding source disappears and expenditures of these households fall.

4. Conclusion

The subprime crisis, the collapse of interbank liquidity and the stock market crash are factors that have played a fundamental role in the recent financial crisis and economic recession. Motivated by the definition of contagion frequently adopted in the literature and proposed by Forbes and Rigobon (2002), we adopted a VAR model to test the relationship between these markets. We tested a model at the macro level to examine the links in the U.S. markets.

Our results provide strong evidence of increased cross-market linkages. In times of crisis, the financial indicators are able to predict changes in leading indicators of economic growth in USA. The fall in stock prices and the deterioration of liquidity have led the American economy a major recession, whose effects are particularly profound. The propagation of disturbances occurred between interbank markets, stock markets and real economy through different channels during the period of the crisis, which were absent during the period before the crisis. It is clear from our results that USA have suffered the negative effects of financial shocks due to the subprime financial crisis.

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