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RESEARCH ARTICLE

Fair Value and Market Conditions: Contribution to Systemic Risk and Contagion

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Abstract

We study the banks equity evolution constraint to the market conditions and financial derivatives. Thus, we try to detect the systemic risk sources cross accounting tools; market conditions and financial market derivatives. We apply the quantile regression panel data and calculate the conditional variance to investigate the risk transmission by contagion between different accounts. This allows us to interpret the internal dynamics between the different accounts of bank's balance sheet. Thus, we identified the source of instability and accounts risks infected by contagion transmission. We conclude that transmission of systemic risk between accounts within a single institution and intra-institution by the contagion effect is justified during the process trained to market conditions.

Keywords: *Contagion, Derivatives, Fair value accounting, Market Conditions, Systemic Risk.*

Jel classification: G15, G18, G01, G02

Introduction

The debate on the accounting role, for both valuation models, at the systemic risk creation and crisis amplifying process, remains open. Adherents, who defend direct and immediate lack accounting system effect, show that market conditions are such crucial to trigger episodes risk and, without this, the accounting effect remains ambiguous. The adverse to this point of view provides that accounting techniques, especially fair value tool, played a definitive role in last subprime crisis. We want here, introducing market conditions and financial derivatives in the analysis, perceive the market-to-marked repercussions and its implications for the financial system stability, detection risk and spread by contagion. So many studies have investigated the systemic risk sources, detection and transmission to other sectors creating a systemic financial crisis.

Literature Review

The majority systemic risk models integrated statistical market price based data to obtain macro-prudential measures. In this context this research direction extrapolates from the micro-prudential risk measures of Basel II to macro measures. Conditional Variance (CoVar) by Adrian and Brunnermeier [1], Distress Insurance Premium (DIP) by Huang and al. [2], Probability that at least one bank becomes distressed (POD) by Segoviano and Goodhar [3], Acharya and al. [4], Chan-Lau [5], Shapley-Value by Tarashev and. al. [6] and Macro-prudential capital by Gauthier and al [7].

A financial crisis is systemic if it results from a group banking failure induced by an individual bankruptcy, which is transformed by the contagion to other banks and creating a panic in the banking system. In a partial equilibrium, the banking regulation standard theory approach is based on a representative banking sector account like a single institution. This design suffers from serious problems when understanding, and analyzing systemic risk sources. This policy ignores the externality of bank investment choices on the others profits, hence, their investment decisions. Given this constraint, banks choose to adopt a Nash behavior by developing a secular game face externalities and regulatory mechanisms. Systemic risk can also arise since interbank contracts. Risk types diversification and analysis models proliferation indicate a potential change in techniques and used tools. These changes have led to new terminology and methodology of analysis. On the one hand, the risk assessment focuses more and more on macro-prudential analysis, which requires treatment with collective dimension despite an idiosyncratic design. The new approach interested risk analysis as a collective welfare, endogenous to the financial system, seeking the entire economic sphere stability. The main objective in this context depends on the correlation between institutions and their common risk exposures in order to avoid the costs in GDP terms. Thus, the prudential supervision dimension moved in a vertical view of the pyramid top to the base. In this context, several models were developed. Acharya and All [4] proposed a "systemic expected shortfall" SES model, showing empirically, the ability to anticipate emerging risks during subprime crisis. The analysis focused on the stress tests by regulators. Lower valuations of large companies' financial stocks, which were considered to be effective during the crisis and their credit default (swap) expansion, remain the main crisis occurrence causes.

Brunnemeier and Adrian [1] suggest a systemic risk measure based on statistical model CoVaR, resulted from "conditional variance" measure. Arbitrarily, the value at risk (Var) is used to measure an individual risk. The technique conditional variance is obtained by adding the prefix Co, resulting terms: *co*nditional *co*ntagion, or *co*-movement, Var model. Indeed, conditional variance define the institution contribution to the systemic risk as the difference between institution conditional VaR in distress and median state. This tool is applied to financial institutions to listing, and quantifying the risk degree by the introduction of leverage, size and maturity mismatches to augur each institution contribution at risk. The propagation losses through financial institutions, distress, by contagion, the economic sphere through emergence systemic risk. Indeed, in altered financial system, the financing capacity and function of intermediation become critical and threatens the credit supply to the real economy. Such phenomena as a source of increased risk, that turn, indirectly, or by direct contractual links to counterparty risk and a liquidity loss. This results in a co-movement in institutions asset-liability accounts (movements up and down). Adrian and Brunnemeier [1], argue that institution conditional variance is defined in relation to the system as the entire financial sector VaR conditional to the institution distress. The difference between the conditional VaR, institution in distress, and the same conditioning in the institution normal state, ΔCoVaR, measures the individual and marginal institution contribution (but not in causality way) on the system's risk. This leaves the adopted regulation, which calculates the risk institutions in isolation (idiosyncratic) despite the collective entire financial system analysis that preserve the collective welfare. Estimates revealed that ΔCoVaR and VaR are not always reciprocal relationship. Another advantage of the co-risk measure technique is that it allows investigating the abuse of an institution in relation to each other (entire financial system). Brunnemeier and al [8] identify systemic risk as the institution individual capacity to the systems, which are interconnected and widely repeated, so to have the ability to cause negative effects creating a recursive bankruptcy phenomenon (herd behavior). The risks are based typically back shots as imbalance and bubbles, which materialized only during a crisis.

This methodology resulted in the capture violation; an institution can lead to another. Thus, the institution distress may well cause increased risk to another. However, the feedback effect is not verified $(CoVaRj/i \neq CoVaRi/j)$. The simple quantile regression captures the risk arising from adverse movements in asset prices and liquidity risk. These tests are based in transactions market value changes per week that publicly held on asset markets. This permits to address the observations scarcity problem (small size) for risk management measures (Note 1). This omission is overcome by adopting a *forward_CoVaR* (Note 2). The study focuses on the commercial banks, dealers, brokers, public institutions and insurance companies.

The *ΔCoVaR* technique is a summary of systemic risk measure that entire measures designed individually for financial institutions. Also, this technique allows expanding the risk extent to allow a macroprudential perspective. The *forward-ΔCoVaR* (Note 3) allows us to anticipate the institutions contribution to systemic risk, such forward-looking measure, can be potentially used in the macroprudential policies implementation.

Achraya [9], with double vision approach, positive and normative, studies the essential prudential regulation properties of the banking sector, which focuses on a micro-level analysis. This is through a general multiple periods' equilibrium model. Thus, positive vision addresses systemic risk and other normative on prudential regulation structure. A model that examines the default probability of bank deposits, the financial externalities effect following the bank failure on the banking sector, regulatory incentives and the preventive actions interaction. In this model, agents, in the presence of externalities, are assumed heterogeneous. The application extends too many economic phenomena; agents adopt behaviors and similar strategies. Unlike the existing literature, which discusses the bank liabilities structure, systemic risk is defined as the common failure risk expressed by the extras yields correlation in bank asset balances. Under certain conditions, banks prefer an inefficient and high correlation of their assets returns creating a herd behavior giving rise to the systemic risk emergence.

The normative dimension focuses on the optimal control design to mitigate the systemic risk inefficiencies. In this context, the regulation nature dominates individual control policies and collective supervision and may increase the situation severity. The optimal regulation or cooperative based on better management of closed banks and not to sales group following an individual bankruptcy. Indeed, capital requirements should be more correlated with the risk (individual and systemic), Acharya [9]. In this approach, the banks responsibility is crucial to cushion or mitigate risks that may trigger markets. Banks that manage simple debt contracts, grant risky and non-risky assets in Defined Industries, choose the portfolios correlations. In this regard, banks prefer lend to similar industries (banking specialization). Indeed, as soon as abnormalities occur for one firms, the contagion effect spreading these concerns to other firms in the same sector. The central bank acts as a regulator whose purpose is to maximize the welfare of the owners [10] banks and the depositors' net social costs and financial distress. Thus, roles and services coordination can it lessened these anomalies?

Segoviano and Goodhart [3] study the banking stability as bank's portfolio and infer the system's multivariate density (BSMD) from which the proposed measures are estimated which take account of distress dependence among the banks. Thus, a set of tools to analyze stability from complementary perspectives by allowing the measurement of common distress of the banks in a system, distress between specific banks, and a specific bank distress associated with bank's system. These tools capture linear and non-linear distress dependencies among the banks in the system, and its changes along economic cycle.

Allen and Carletti [11] develop an empirical model (microeconomic model of utility maximization) resulted from Allen and Gale [12], to study the systemic risk and contagion effects. This analysis is based on an incomplete market items such as that of long-term loans and companies insurance liabilities, which were held by financial institutions, and in the absence central bank intervention. The main dilemma was to allow institutions that hold long-term capital (LTCM), to fail in the marketplace. This policy is defended in the United States that led to the LTCM liquidation, creating a market for "rescue" these assets producing an effect sales spiral. This contagion behavior which feeds on the market, built a criticism, which included the historical cost tool adoption, would be less exasperating anomaly liquidation. So the question is there a link between the assets and liabilities accounts fair value measurement and the risk high level that occurred during the crisis? And we can predict from the residues analysis between assets and liabilities to predict areas that are risk sources and there was contagion transmission to other accounts?

Accounting Model, Systemic Risk and Contagion

"However, it is important to note that fair value accounting rules by themselves may not increase contagion among banks. It is only when fair values are used as inputs in regulatory ratios, internal control mechanisms or incentive contracts for management that a more fair value-oriented reporting regime can interact with market conditions to increase bank contagion", Urooj Khan, [13].

The contagion existence in the national or international financial system is arranged according to three procedures (Note 5). Correlation coefficients tests between markets are the simple and robust methodology. The GARCH model is the most repeated estimation technique when the contagion transmission effect. This procedure is based on the covariance analysis between country and the financial system various components to draw inside infection. The risk spread in bond markets after the Mexican crisis, stating that the capital controls process affects the shocks transmission. These tests, carried out by an augmented GARCH model, show that there are significant externalities from Mexico to Argentina. These results indicate that volatility has been transmitted from one country to another, but says nothing about if the "velocity" has changed during the crisis. A third tests category focuses on accounting value changes in the long term as an alternative to the short-term, which can vary between markets after a shock.
In this context, three main components constitute the main infection source. First, there must be a risk source in the system. In this context, the banking and insurance accounts, which hold long-

term assets, can be liquidated in the market crisis and subsist contagion major source. The credit risk transfer model may induce insurance companies that hold long-term assets as well as for banks, in instability wave. The long-term assets liquidity evaluation reacts reciprocally with the fair value accounting rules producing a contagion effect [14].

Plantin, Sapra, and Shin [15] show, however, that historical cost regime may lead to some inefficiency. The mark-to-market can lead to excessive price volatility and making suboptimal decisions due to reaction effect. This analysis suggests that the problems due to accounting mark-to-market are particularly severe when commitments are long term, illiquid, and major. Banks and insurance companies' assets are characterized by these traits. This provides a signal to banks and insurance companies to unravel against the abundant technical: fair value. Another reason for banks and insurance companies is that accounting regime can induce contagion while the historic cost accounting does not.

Other studies analyze the fair value accounting implications and fined variety perspectives. O'Hara [16] provides that update this accounting technique impact when the maturity of debt and discovers, the accounting system increases the long-term borrowing interest rates. This anomaly induced borrowings court term transmutation. This reduces liquidity creation by banks and borrowers exposed to excessive wind. The accounting market price reduces information asymmetry, thus increasing liquidity and intensifies risk problems. Finally, Freixas and Tsomocos [17] put the focus on banks role as institutions that smooth inter-temporal shocks. Allen and Carletti [11] analyze how financial innovation can create contagion across financial sectors and lowers welfare relative to autarky state. A detailed reading and analysis of the role of the two techniques is advanced by Biondi [18]: "these arguments point out the dangers of disclosing fair value estimates from subjective models rather than marking to market; they also raise concerns about introducing "excess volatility" into earnings and the feedback effects on business practices and institutional rules that could damage a business and even heighten systemic risk, as well as the overall misunderstanding of the economics of the business firm itself".

However, Allen and Carletti [11] focused their research on the liquidity shocks that unbalanced the banking sector structure, as the main contagion mechanism source. This study, converge on the various accounting model impacts by showing that this technique guides to contagion. The financial assets holding period and market exposure are critical factors and contagion due to cycle crisis amplification role. The banks expertise, which use customer deposits to grant risky loans to a firms group in the long term (constant yield) and short-term, can invest their portfolio management using asset returns in the short term to meet the depositors potential demand and draw earning potential long-term loans.

The fair value tool use in non-payment case and no liquid market for long-term assets, this makes deposits liquidated at current market prices, and that is certainly much lower than the value in which are grant, (assumed constant returns). Therefore, the contagion and systemic risk effects are created by fair value tool if market illiquidity and lack the central bank role. Bankruptcy causes a reduction in the capital overall supply (deposits) in the economy, causing the banking recession and as a result investment narrowing (negative externality). In contrast, a positive externality resulting from a scaling or depositors migration occurs. A preference for a high correlation arises as a common limited liabilities consequence and bank shareholders' equity and the externalities funds nature. Thus, should the central bank intervention to mitigate systemic and individual risk shifting bank owner's incentives with designing banks closing policy and capital requirements. The second contribution is based on the illustration bank policies design, taking in account the collective investment policies. The third contribution concerns the regulatory capital adequacy design. The BIS current requirements to address individual risk and does not penalize the assets holding in highly correlated returns. In this sense, in some structure, each bank can reduce optimally the individual failure risk. In short, the systemic risk arising from strong correlation remains unchanged. Another dilemma is a collective approach to capital budgeting and the role of intra-bank exchange creating long-term correlations: one not held by the BIS behavior reforms.

Agents' complementary behavior examination and agency problems may be a fruitful direction to explain the agent's collective behavior and their responses to operator failure externality which acts negatively on other operator's profitability. Given their limited liability, traders have an incentive to undertake their trading strategies to survive together without profit rates subsidized by the others failure. Political risk management and budgeting capital firms, based on the correlations between offices, should be designed in conjunction with the incentive various offices systems to mitigate such naive behavior.

Acharya [9] modeled the systemic risk in the correlation choice between the various banks assets. As a result, the risk regulation of each bank cannot fully capture the risks that could spread through a contract nexus. This spread is particularly worrying in the banking sector, given the opacity of banks' assets and investments. Borio [19], by the famous phrase from Milton Friedman "today we are all adapted to a macroprudential approach" reminder that regulators and system of banking supervision are paraphrasing the term never be used in practice. The macroprudential approach origins back to twenty-four years of the last century and were aimed at preserving macroeconomic stability, in parallel with the micro prudential regulation that focuses on develop financial institutions idiosyncratic risk that may mask an important dimension unfolded to financial stability effects. The term macroprudential, resumed again in speeches in 2000 (IMF), has quickly gained the trail of financial regulators after the impact due to recent crises and crashes, and reserving a considerable boost [20]. However, the term remains ambiguous in the financial vocabulary and is treated as an attempt to limit systemic risk. In this context, two main problems are addressed: the definition and characterization of the term macroprudential and second, the main lines analysis and policies to strengthen the guidance devices macroprudential regulation and forecasts highlighted to realize the term size.

The term macroprudential by analogy to its antonym "micro-prudential" accepted by regulatory and monitoring devices (black and white coexist in the most natural shades of gray). Three basic features characterize the macroprudential approach: the objective, purpose and risk. When, the first objective is to reduce the episode risk affecting the entire system thereby enhancing their economic cost. The second purpose is to guide the system in its entirety, in which the economy is treated by analogy to a portfolio as each representing a financial institution. And the macroprudential approach focuses on losses across the portfolio, the risk diversification and concentration degree. Exposure correlated outweighs individual behavior. The last, the risk is considered as endogenous to the system as a whole and therefore the whole economy dynamics. "The differences in terms of targeting and risk perceptions have important implications on how the two approaches analyze the financial crisis origins" Borio [19]. The system apparent strength is not always synonymous with entire economy health. Institutions, dispersing their balance sheets risk could be made available to the common risk especially if their portfolios are uniform. Any negative shock affects more widely a large number of institutions.

Macroprudential level, the risk endogenous nature appear that the best measures applied to financial institutions lead to negative reactions [21]. The financial crisis costs may not affect individual health, "ignoring exposures that are common to financial institutions and endogenous risk, a micro approach may not provide effective support to the stability of the entire system, Borio [19]. On a micro point view, for a system to be healthy in its entirety, it is necessary and sufficient that all institutions are too.

The macro approach analysis rises between two dimensions: a transverse dimension reflects the financial system snapshot [22], a temporal dimension that follows the system evolution as film events and manner knowledge in which the risk is magnified for purpose. Otherwise, the economic system pro-cyclicality [8, 19, 23, 24] like Booms, the ripple effect from the risks reduction and their perception, the trivialization of financing constraints ... are all famous examples.
As a result, accountability, transparency and conformity, objectives and achievement, correction of objectives imperfect alignment, instruments and experience within the institutional framework, are the main factors keeping order. Strengthening the various authorities comparative advantage remain essential ingredients for success: "*The previous focus on micro-prudential regulation needs to be supplemented by macro-prudential regulation. While we cannot hope to Prevent crises completely Call, we can perhaps make them fewer and milder by adopting and implementing better regulation* "Shin and al, 2009 Geneva.

Model

We note $\sum_i A_i(t)$ the assets amount and $\sum_i L_i(t)$ the liabilities amount. Let $R(t)$ the impasse in liquidity equal to the difference between assets and liabilities (also the assets and liabilities residue in the same position in the same period).

$$R(t) = \sum_i A_i(t) - \sum_i L_i(t) \quad (1)$$

Denote M^a and N^l, respectively, the state variables as interest rates lenders and borrowers, the treasury bills rates, liquidity. The financial assets and liabilities in the balance sheet are subject to a long-term vision. Banks hold in their accounts flows paid at fixed or variable rates. Thus a long-term vision is required when the effect analysis in market conditions changes on the financial institutions stability. We denote by T the margin compensation at later date. Residuals between assets and liabilities accounts allow analyzing these questions. A relationship which states:

$$R(t,T) = \sum_i A_i(t,T) * M^a(t,T) - \sum_i L_i(t,T) * N^l(t,T) \quad (2)$$

If we denote $\widetilde{F_.(s)}$ the new flow anticipated in each balance sheet (assets and liabilities) at a given moment as $t < s \leq T$, the amount of this flow is still present in the accounts balance sheets time T has the characteristics of being featured in the balance $S(t,T) = 1$ and has a maturity date later (derecognition) $S(T,\infty) = 0$. This allows us to write the following equation which defines the liquidity agreement:

$$F(t,T) = F(t) * S(t,T) \quad (3)$$

Thus the dynamics of the system and from equations (2) and (3) allows us the evolution of the difference between asset and liability account, which is written in the form:

$$\Delta R(s,T) = \sum_i A_i(t,T) + \int_t^T \widetilde{F_a(s)} * S(s,T) - \sum_i L_i(t,T) + \int_t^T \widetilde{F_l(s)} * S(s,T) \quad (4)$$

Definition of CoVar

We denote by $\mathrm{CoVar}_q^{j|i}$ the Var of items j (or the financial system) conditional on some event $C(X^i)$ of items i. that is, $\mathrm{CoVar}_q^{j|i}$ is simplicity defined by the q-quantile of the conditional probability distribution:

$$\Pr\left(X^j \leq \mathrm{CoVar}_q^{j|C(X^i)} \middle| C(X^i)\right) = q \quad (5)$$

We denote items i's contribution to j by:

$$\Delta \mathrm{CoVar}_q^{j|i} = \mathrm{CoVar}_q^{j|X^i = Var_q^i} - \mathrm{CoVar}_q^{j|X^i = Median^i} \quad (6)$$

Quantile Regression

This technique is advanced by Koenker and Bassett [25]. The quantile regression model is how a simple minimization problem, giving quantiles common samples can be generalized in a regression model. Considering a random sample of independent observations $y_1, \ldots . y_t$ following the following distribution: $\Pr(y_t < \theta | x_t) = F_t(\theta | x_t), \quad t = 1 \ldots \ldots \ldots t$

Whose x_t present a regressor vector design(k,l).

Note, $x'_t\beta_\tau$ le $\tau - quantile$, thus, we write:

$$y_t = x'_t\beta_\tau + \mu_\alpha \quad (7)$$

With $Quant\tau(y_t|x_t) = x'_t\beta_\tau$ is $\tau - quantile$de y_t conditionnal to x_t.

Model Dynamics and State Variables Effects

The effect changes analysis in market conditions on the stability of financial institutions requires the temporal dimension integration. We are estimating the dynamics model conditioned by asset's state variables variation M_{t-1} and $N_{t-1}$for the liabilities. Noting the time course change of $CoVar_t$and $Var_t$with index t and applying quantile regression on series packed with state variables, this allows us to write:

$$\sum_i A_i(t) = \alpha^i_{a,t} + \gamma^i_{a,t} M_{t-1} + \varepsilon^i_{a,t} \quad (8)$$

And

$$\sum_i L_i(t) = \alpha^i_{l,t} + \gamma^i_{a,t} N_{t-1} + \varepsilon^i_{l,t} \quad (9)$$

Applying the Var the two equalities we have this:

$$\mathrm{Var}(\sum_i A_i(t)) = \hat{\alpha}^i_{a,t} + \bar{\gamma}^i_{a,t} Var^i_q \quad (10)$$

And $\mathrm{Var}(\sum_i L_i(t)) = \hat{\alpha}^i_{l,t} + \bar{\gamma}^i_{a,t} Var^i_q \quad (11)$

With the $CoVar$ calculating technique we can deduce the following relation:

$$CoVar_q^{system} = Var_q^{system} | Var_q^i \quad (12)$$

Thus, we estimate the change in assets and liabilities based on state variables. From equation (8) is derived for the current account:

$$\sum A_i(t) = \alpha^i_{a,t} + \gamma^i M_{t-1} + \varepsilon^i_{a,t} \quad (14)$$

The change in assets and liabilities based on the state variables allows us to write:

$$\sum L_i(t) = \alpha^i_{l,t} + \gamma^i N_{t-1} + \varepsilon^i_{l,t} \quad (15)$$

In the absence of market conditions, the variance test results are abused. Thereafter, we represent the different accounts variances with conditions market to determine the effect of the presence of thus conditions on the results.

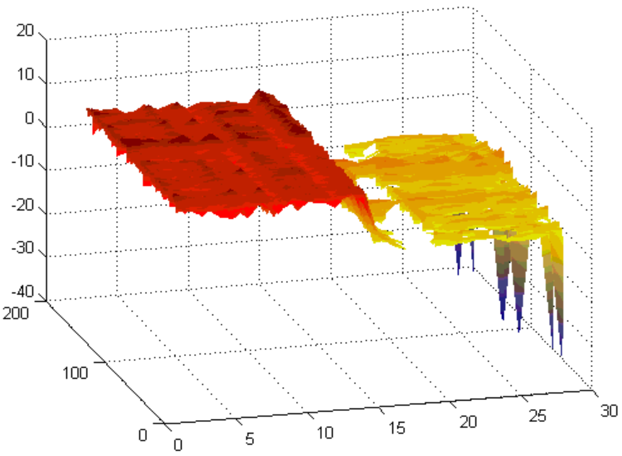

Fig. 1: The financial assets variation under market conditions along subprime crisis, 2007-2009.

So, we try first step to validate the theoretical advanced to justify later by empirical analysis. We see, from the graphical representation elements bank accounts: variances evolution, that the estimate of the change in book value is significant in market conditions.

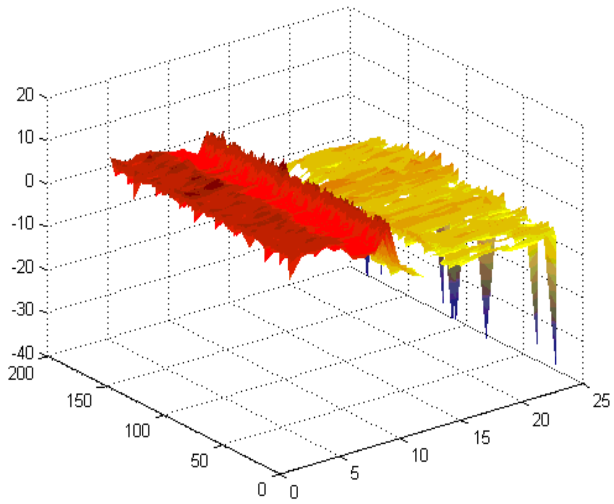

Table 2: The financial assets variation with market conditions along subprime crisis, 2007-2009.

This justifies the views which argue that the valuation at fair value in absence of market conditions play a limited amplifier role. The estimation of equations (14) and (15) allows to deduce the parameters: $\widehat{\alpha}_a, \hat{\gamma}_a$ et $\hat{\varepsilon}_a$

Table1. Model Garch (1, 1), the number of observations is 120. The variables describe the liability account of all U.S. commercial banks between 2007_2009. The tests are applied to a threshold of 1% and 5%.

	CoVar, Level 1%	Std. Dev	CoVar, Level 5%	Std. Dev
Bank credit	-,0376	,4693	-,0478	,5973
Securities in bank credit	-,0306	,4211	-,04	,4997
Treasury and agency securities	-,0310	,3871	-,0432	,5394
Other securities,	Nan	Nan	-,0408	,5114
Loans and leases in bank credit	-,0077	,0956	-,044	,5496
Commercial and industrial loans	-,0225	,2821	-,0415	,5177
Real estate loans	-,0307	,3834	-,0378	,4725
Consumer loans	Nan	,1857	-,0263	,3287
Other loans and leases	-,0329	,4105	-,0517	,6455
Interbank loans	-,025	,3118	-,0447	,5578
Fed funds and reverse RPs with banks	-,027	Nan	Nan	Nan
Loans to commercial banks	-,0153	,1905	-,037	,4616
Cash assets	-,02772	,3395	-,0438	,5465
Other assets	-,0198	,2482	-,0407	,5082
Mean	-0,0256	0,3104	-0,0414	0,5181
R^2	68%		76%	

Then, $\widehat{\alpha}_l$, $\hat{\gamma}_l$ et $\hat{\varepsilon}_l$

Table 2: Garch (1, 1) model, this test was conducted on 120 observations, eight variables describing the asset accounts. The assets represent those of all commercial banks in the USA between 2007_2009.

	CoVar, Level 1%	Std. Dev	CoVar, Level 5%	Std. Dev
Total assets,	-0,0218	0,2723	-0,0451	0,5633
Deposits,	-0,0267	0,3334	-0,0413	0,5158
Large time deposits,	-0,0289	0,3612	-,0451	0,5629
Borrowings,	-0,0335	0,4182	-0,0437	0,5454
Net due to related foreign offices,	-0,0344	0,4299	-0,0414	0,5167
Other liabilities	-0,0205	0,2564	-0,03	0,3742
Securitized consumer loans,	-0,0142	0,1720	-0,0301	0,3763
Securitized credit cards and other revolving plans,	-0,0034	0,0425	-0,0153	0,1913
Other securitized consumer loans,	-0,0349	0,5403	-0,0501	0,6256
Mean	-0,0255	0,3317	0,0380	0,4746
R^2	73%		78%	

$$R^i(t,T) = \left(\alpha^i_{a,t} + \gamma^i M_{t-1} + \varepsilon^i_{a,t}\right) - \left(\alpha^i_{l,t} + \gamma^i N_{t-1} + \varepsilon^i_{l,t}\right) \quad (16)$$

$$R_t^{sys} = \alpha^{sys|i} + \beta^{sys|i}\left(\sum A_i(t) - \sum L_i(t)\right) + \gamma^{sys|i}(M_{t-1}; N_{t-1}) + \varepsilon_t^{sys|i}(M_{t-1}; N_{t-1}) \quad (17)$$

Table 3: Garch model (1.1), number of observations 156; variables: all commercial banks assets and liabilities in USA between 2007_2009.

	CoVar, Level 1%	Std. Dev	CoVar, Level 5%	Std. Dev
Bank credit	,1346	0,2423	0,0533	0,9315
Securities in bank credit	-,0435	0,2302	0,065	0,8664
Treasury and agency securities	,9310	0,2217	0,0602	0,8929
Other securities,	,8334	0,22	0,0638	0,8742
Loans and leases in bank credit	,0967	0,1489	0,059	0,8997
Commercial and industrial loans	,0826	0,1955	0,0627	0,8784
Real estate loans	-,0307	0,2208	0,0683	0,8483
Consumer loans	,0198	0,1714	0,0855	0,7524
Other loans and leases	,0623	0,2276	0,0474	0,9636
Interbank loans	,0220	0,2025	0,0579	0,9052
Fed funds and reverse RPs with banks	,0763	0,2422	0,0603	0,8918
Loans to commercial banks	,0335	0,1726	0,0695	0,8410
Cash assets	,04270	0,2098	0,0593	0,8976
Other assets	,0438	0,1870	0,0639	0,8721
Bank credit	-,0194	0,2657	0,0512	0,9432
Total assets,	0,0317	0,1930	0,0594	0,8975
Deposits,	,0672	0,2083	0,0630	0,8772
Large time deposits,	,0495	0,2153	0,0573	0,9086
Borrowings,	,0832	0,22955	0,0594	0,8969
Net due to related foreign offices,	,0743	0,2324	0,0629	0,8778
Other liabilities	,105	0,1891	0,08	0,7828
Securitized consumer loans,	,3981	0,1356	0,0813	0,7756
Securitized credit cards and other revolving plans,	,0532	0,1356	0,1020	0,6608
Other securitized consumer loans,	,1392	0,2607	0,0498	0,9504
Mean	0,1385	0,2065	0,0636	0,8686
R^2	43%		49%	

This allows us to deduce the residue as follows:

$$R_t^{sys} = \alpha^{sys|i} + \beta^{sys|i} * \hat{\alpha}^* + \beta^{sys|i} * \hat{\gamma}_{a,t} * M_{t-1} - \beta^{sys|i}\hat{\gamma}_{l,t} * N_{t-1} + \frac{1}{\tau}\frac{H}{F(t) * S(t,T)} + \beta^{sys|i}\hat{\varepsilon}^* + \varepsilon_t^{sys|i} \quad (18)$$

With H is a financial shock that may feature in the current account liabilities and is written as follows:

$H = \tau\left(M(t,T); N(t,T)\right) * F(t) * S(t,T)$

and $\Upsilon^{system|i} = 1/\tau$,

The application of the regression gives us and if we assume that: $\hat{\alpha}_a - \hat{\alpha}_l = \hat{\alpha}^*$; $\hat{\gamma}_a - \hat{\gamma}_l = \hat{\gamma}^*$; $\hat{\varepsilon}_a - \hat{\varepsilon}_l = \hat{\varepsilon}^*$ and from equations (7) and (12) we deduce:

$$Var_t^i(q) = \hat{\alpha}_q^i + \hat{\gamma}_q^i(M_{t-1}; N_{t-1}) \quad (19)$$

$$CoVar_t^i(q) = \hat{\alpha}^{sys|i} + \beta^{sys|i} Var_t^i(q) + \hat{\gamma}^{sys|i}(M_{t-1}; N_{t-1}) \quad (20)$$

Empirical Results

In numerical implementation, we conducted tests on panel data describing the all U.S. banks assets and liabilities. The data are weekly, spread from 1 January 2007 until 31 December 2009, that is to say during the subprime crisis. The data are publicly available on the website of CBOE and the Federal Reserve Bank H.9 and H.15. Our sample contains 16 liabilities accounts categories, 8 assets type and 12 account market conditions (interest rates, inflation rates, treasury bills in one month, one year and ten years, the 1 month, one year and ten years inflation rate, , Baa, Aaa market volatility: VIX, credit and debit interest rates) is in total 5634 observations. The regression is made for 1% to 5% quantiles. We started with a regression model in its entirety and in the second stage we detailed analysis for each assets and liabilities separately packaged to market variables. In the first step we tested a GARCH (1, 1) model applied to 120 observations for each type. We calculated the COVAR first. The results are in the three tables in the appendix. The first table represents liabilities accounts. We note that the liability account, which describe credit and leasing, have a negative ΔCoVar. The application of tests at 1% and 5% and deducting the ΔCoVar, we note that the credit card securitization and other capital are the elements that have a negative ΔCoVar. This justifies the mortgage crisis roots that have shaken the credit markets in USA during the period 2007_2009 (Table 2). These tests are performed to study the contagion transmission between different accounts at banks. We note that the 1% level that accounts for securitized credit cards and other working capital, other securities, consumer loans, federal funds and RPs reserves with banks and consumer loans securitized are the contagion sources target (Table 3).

Risk Systemic and Contagion

We take equation (18) in which we considered the existence of financial shock in the assets and liabilities accounts. Thus, according to the insertion of equation (3) with equation (18) allows us to interpret the following two equations that describe the anticipated financial shock evolution in the flow presence:

$$A_i(t) = \beta\left(R_t + L_i(t)\right) + \delta\left(M(t,T);N(t,T)\right) * F(t) * S(t,T) + \varepsilon_t$$

$$\Delta\left(R_t + L_i(t)\right) = \tau\left(M(t,T);N(t,T)\right) * F(t) * S(t,T) + \mu_t \qquad (21)$$

Or

$$L_i(t) = \beta\left(R_t - A_i(t)\right) + \delta\left(M(t,T);N(t,T)\right) * F(t) * S(t,T) + \varepsilon_t$$

$$\Delta\left(R_t - A_i(t)\right) = \tau\left(M(t,T);N(t,T)\right) * F(t) * S(t,T) + \mu_t \qquad (22)$$

$A_i(t)$ and $L_i(t)$ represents, respectively, the financials assets and liabilities. $\tau\left(M(t,T);N(t,T)\right) * F(t) * S(t,T)$ is a sudden shock that exacerbate bank accounts elements. ε_t and μ_t a idiosyncratic and independent shocks. However, an imbalance that reaches one account, liabilities or assets, is transmitted through the other equity accounts clutter dependent from accounting institutions. At this analysis level we include Allen and Gale advanced (2000): *"On the other hand, if the interbank market is incomplete, each region is connected with a small number of other regions. The initial impact of the financial crisis may be felt very strongly in those neighboring regions, with the result that they too succumb to a crisis. As each region is affected by the crisis, it prompts premature liquidation of the long asset, with a consequent loss of value, so that previously unaffected regions find that they too are affected because their claims on the region in crisis have fallen in value".* Thus, β is the factor that describes the shock transmission to the other part. The analysis is endogenous and occurs within the same institution. So a liquidity shock that appears in the liabilities accounts, written after a default:

$$\tau\left(M(t,T);N(t,T)\right) * F(t) * S(t,T) = \begin{cases} \tau L_i(t) & L_i(t) < 0 \\ 0 & L_i(t) > 0 \end{cases} \qquad (23)$$

Or the shock is in the current account due to the debtor account insolvency:

$$\tau\left(M(t,T);N(t,T)\right) * F(t) * S(t,T) = \begin{cases} \tau A_i(t) & A_i(t) < 0 \\ 0 & A_i(t) > 0 \end{cases} \qquad (24)$$

The balance sheet accounts shocks empirical analysis is done by the data introduction describing each asset and liability account evolution (adding 36 observations). We test the variance-covariance matrix in order to predict contagion existence between sets. The sample contains 156 observations which we have applied the log to the differential absolute value. The results allow us to conclude that the matrix is a symmetric matrix, in this sense, the matrix lower part (below the diagonal) is a mirror image of the upper half. Along the diagonal, we have the assets and liabilities covariance cited outside diagonal.

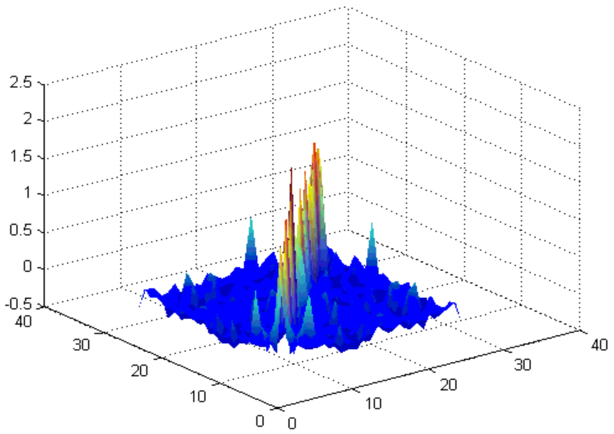

Fig.3: Variance-covariance matrix of asset accounts and liabilities accounts of all commercial banks in USA between the periods 2007_2009.

The accounts statements changes introduction in the analysis allowed us to have, to some accounts, their variation ΔCoVar becomes negative, which was not the case before (table 3). This justifies that these accounts are subject to contagion transmitted by other accounts. We also recorded the presence of correlation between several series. In conclusion, we performed similar tests on the same variables conditioned to market data. Second step, tests are applied without market conditions. This is in order to validate our results obtained previously. The sample is spread over three years between 2010 and 2012. The results showed that the inclusion of market conditions allows having significant results, a case that is not upon completing tests on banks accounts without introducing conditional variables. Results are reported in Table 4, in which the results of the estimation with variables without market conditions are in parentheses.

Conclusion

Accounting residues' empirical analysis with Covar methodology applying the quantile regression, we were able to detect the systemic risk onset to certain balance sheet accounts. In the second step, we detected the contagion existence that has served to spread risk to other balance sheet accounts. This phenomenon creates a contagion spiral along accounts and creating a systemic risk phenomenon. Tests applied to the packaged accounts changing values with market data conditions remain fertile for detecting instability sources in the first step, and following its spread throughout the entire banking system. In this regard, the banks portfolio management seems useful and supervisory tool to discover the accounts "contaminated" and arbitrate to better risk management, maintain a holy area and limit crises episodes. Thus, systemic risk analysis is connected to understand structure and dynamics of complex financial market conditions. Efficient methods for large scale simulation the market conditions' dynamics optimization provide better insight than simplistic equilibrium models based on homogeneous network structures

Table 4: Garch model (1.1), number of observations 158; variables: all commercial banks assets and liabilities in USA between 2010_2012

	Covar,Level 1%	Std. Dev	Covar,Level 5%	Std. Dev
Bank credit	-,0376	,4693	-,0478	,5973
	(0,8624)	(0,0852)	(0,4176)	(0,2344)
Securities in bank credit	-,0337	,4211	-,04	0,4997
	(0,9063)	(0,0395)	(0,3947)	(-0,1931)
Treasury and agency securities	-,0310	,3871	-,0432	0,5394
	(0,869)	(0,1879)	(0,4689)	(-0,2064)
Other securities,	-,0304	0,3802	-,0408	,5114
	(1,0696)	(0,02243)	(0,3862)	(0,2110)
Loans and leases in bank credit	-,0077	,0956	-,044	,5496
	0,8923	(0,0756)	(0,4128)	(0,251)
Commercial and industrial loans	-,0225	,2821	-,0415	,5177
	(0,6775)	(0,0943)	(0,4221)	(0,2071)
Real estate loans	-,0307	,3834	-,0378	0,4725
	(-0,0693)	(0,254)	(0,502)	(-0,2123)
Consumer loans	-0,0148	,1857	-,0263	,3287
	(0,8852)	0,0785)	(0,4142)	(0,1910)
Other loans and leases	-,0329	,4105	-,0517	,6455
	(-0,6671)	0,0992)	(0,4246)	(0,2073)
Interbank loans	-,025	,3118	-,0447	,5578
	(0,9752)	(0,0142)	(0,3821)	(0,2438)
Fed funds and reverse RPs with banks	-,0376	0,4691	-,0431	,5378
	(0,5624)	(0,0795)	(0,4147)	(0,377)
Loans to commercial banks	-,0153	,1905	-,037	,4616
	(0,7847)	(0,2254)	(0,4877)	(0,1909)
Cash assets	-,02772	,3395	-0,0438	,5465
	(1,072)	(0,758)	(-0,754)	(0,2088)
Other assets	-,0198	,2482	-,0407	,5082
	(0,9802)	(0,0137)	(0,3818)	(0,1973)
Bank credit	-,0451	,5631	-,0492	,6148
	(-0,0549)	(0,9934)	(0,8717)	(0,4358)
Total assets,	-0,0218	0,2723	-0,0437	0,5463
	(0,9782)	(0,07830)	(0,4141)	(0,2070)
Deposits,	-0,0267	0,3334	-0,0413	0,5158
	(0,9033)	(0,03412)	(0,3920)	(0,1960)
Large time deposits,	-0,0289	0,3612	-,0451	0,5629
	(0,8711)	(0,0329)	(0,3914)	(-0,1957)
Borrowings,	-0,0335	0,4182	-0,0437	0,5454
	(0,6665)	(0,0548)	(0,4024)	(0,2012)
Net due to related foreign offices,	-0,0344	0,4299	-0,0414	0,5167
	(0,8656)	(0,0226)	(0,3863)	(0,1931)
Other liabilities	-0,0205	0,2564	-0,03	0,3742
	(0,9795)	(0,0127)	(0,3813)	(0,1906)
Securitized consumer loans,	,0033	,0425	-0,0291	0,3635
	(0,9033)	(0,0117)	(0,3808)	(0,1904)
Securitized credit cards and other revolving plans,	-0,0034	0,0425	-0,0153	0,1912
	(0,8651)	(0,0341)	(0,3920)	(0,1960)
Other securitized consumer loans,	-0,0349	0,5403	-0,0501	0,6256
	(0,5767)	(0,0672)	(0,4086)	(0,2043)

Mean	-0,0233 (0,85)	0,3263 (0,13477)	-0,0409 (0,4273)	0,5030 (0,2136)
R^2	65% (81%)		72% (85%)	

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14. Note 6 the resulting loss of depositors of a bank failure is not internalized by the owners, this is an externality.
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21. Note 7 this dimension is explained by the fact that financial institutions are directly exposed to the same or similar asset classes or links existing between them. The guiding principle, calibration of prudential tools must be taken into top-down.
22. Note 8 movements decrease during periods of financial stress is rational and almost inevitable from the point of view of the various participants. However, if they become widespread, the consequences can be harmful to everyone causing liquidations in disaster and tighter credit conditions. This possibility is excluded by definition in the micro approach, where the risk is considered exogenous.
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Remarks

Note 1 the risks vary from one situation to another according to the information available on the market and it is difficult to have a crisis that spreads widely in time.

Note 2 allow capturing the accumulation of systemic risk before and can detect which firm (based on its characteristics) will contribute more to risk. It increases systemically, capital depreciation important financial institutions and protecting the financial system against the excesses and externalities risk against party.

Note 3 ΔCoVaR is built by projecting the characteristics of these institutions in others.

Note 5 this scenario is not valid in case of the use of historical cost which there would be no effect, Plantin and Al (2004) accounting tool.