Chapter

The Primary Origin of the Financial Crisis

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Abstract

This paper examines the relationship between the stock return volatility, outside directors, independent directors, and variable control using simultaneous-equation panel data models for a panel of 89 France-listed companies on the SBF 120 over the period of 2006–2012. Our results showed that the outside directors (FD) and audit size increase the stock return volatility. Furthermore, the results indicate that the independent directors and ROA have a negative effect on the stock return volatility; this result indicates that these variables contribute to decrease and stabilize the stock return volatility. This study employs a variety of econometric models, including feedback, to test the robustness of our empirical results. Also, we examine the relationship between the corporate governance and the stock returns volatility, exchange rate, and treasury bill using GARCH-BEKK model for a panel of 99 French firms over the period of 2006–2013.

Keywords: stock return volatility, corporate governance, risk management, simultaneous-equation models, GARCH

1. Introduction

During the peak of the global financial crisis of 2008, the major failures that have been involved in the banking crisis were particularly remuneration, as executive incentives, risk management, shareholder activism, and the problems of qualification of the board. Indeed, an excess of credit combined with poor governance in the banking industry can generate carrier failures of a systematic risk. At this point, the term governance has drawn the attention of lawyers and economics experts, political scientists, sociologists, and management scientists [1]. Also, poor banking governance was a major cause of global crisis [2].

Bernanke [3] showed that the financial crisis of 2007/2008 has been started for many reasons (insufficient information, fraud, and incompetence).

Kirkpatrick [4] suggests that the systematic crisis, due to the failure of the international financial market, was also a crisis of corporate governance and regulations. Before and during the financial crisis, corporate governance issues have been attracted attention, since it led to the collapse of many financial institutions in the OECD report. Kirkpatrick [4] showed that the "financial crisis can be to an important extent attributed to failures and weakness of corporate governance arrangements. When they were put to the test, corporate governance routines did not serve the purpose to safeguard against excessive risk-taking in some financial service companies."

Furthermore, the subprime crisis started in the second half of 2006 with the crash of mortgage loans (mortgages) at risk in the United States (the subprime), which borrowers, often of a modest condition, were no longer able to repay. Revealed in February 2007 by the announcement of significant provisions passed by the HSBC bank, it turned into an open crisis when the periodic auctions did not find buyers in July 2007. Given the current accounting rules, it is impossible to give a value to these securities, which had to be provisioned at a value close to zero.

Besides, policy makers have realized the extent and nature of this crisis belatedly, during the collapse of the prices of the various assets. The recent "subprime" crisis revealed some shortcomings in corporate governance and risk management. It also revealed failures of risk management throughout the business world. Since corporate governance is designed to reduce the information asymmetry and control of opportunism management, which is considered as a factor, this contributed to the recent crisis [5, 6]. The latter is crucial for both the developed and developing countries. The organization of power in the company is considered an important factor in the stability of capital markets and investment dynamics.

In fact, risk management is widespread as a mode of governance and management control, although financial crisis has clearly shown its shortcomings. Based on the existing literature on risk management, we will argue that the global financial crisis provides ample opportunity to understand the rhetorical tactics informing about the discourse of risk management. Our research is based on a scientific debate about the relationship between risk management and corporate governance. Several studies showed that corporate governance failure and risk management are the primary causes of the 2008–2009 crisis. Inadequate risk management and inappropriate remuneration practices in the financial sector are placed squarely in the center of the financial crisis. Risk management presents the most important factor in the context of a set of practices and corporate governance structures. While most studies indicate that the weakness o corporate governance and inadequate risk management leads to the financial crisis, in particular, where there is insufficient risk oversight by the board of directors. For example, Working Group on Financial Regulation (2008)[1] mention in March just before the Bear Stearns collapse, "risk management feebleness at some large US and European financial institutions" as one of "the primary underlying causes of the turmoil in the financial markets." That report complains about "regulatory policies, including capital and disclosure requirements that failed to mitigate risk management weaknesses." They showed that the weak risk management in some major US and European financial institutions was the main causes of the global financial crisis. Other investigations indicate that the defeat in corporate governance is a major factor in the financial crisis.

In this chapter, we focus on the French market and bring new light in various regards.

First, France is based on concentration ownership, marked by family stockholders, even big, public companies [7]. In this area, Faccio and Lang [8] indicate that less than 14% of French companies are multi-participation, against to 37% in Europe in general; furthermore, 64.82% of French companies are controlled by a single family, compared to 44.29% in Europe. Also, Johnson et al. [9], France is different to other European countries, in the financial systems, since it comprises two systems, which are the following ones: "the central family" and the "based on the bank," although the first prevails.

[1] See The President's Working Group on Financial Markets, "Policy Statement on Financial Markets," March 2008, https://ecgi.global/sites/default/files/working_papers/documents/SSRN-id1448118.pdf

Second, the legal context is also unique: France is based on civil law, with little protection for minority shareholders, a weak market for corporate control and very few hostile takeovers [10].

2. Literature review

2.1 Does corporate governance "cause" the financial crisis

Walker's review [11] showed that the moral failure and inadequacy of corporate governance mechanisms in the global financial system contribute to the financial crises.

In this vein, Minton [12], Lemmon and Lins [13], and Baek et al. [14] found that a certain degree of corporate governance is effective regarding the stock price reduction in the event of a financial crisis. However, risk is another important factor on which investors base their investment. Therefore, Huson et al. and Choi et al. [15, 16] stated that higher ratio of independent directors is expected to have a positive effect on corporate performance. Huang et al. [17] believe that the independent board can help reduce the stock market volatility. They divide the sample into two groups regarding whether the firm appoints independent directors and investigate the effect of independent directors on stock price volatility.

Burcu et al. [18] showed that the interaction of ownership structures and stock prices differ from period to period. They indicated the positive relation between inside ownership structure and stock price in the periods January 2008 and March 2009; a negative relationship is observed during the periods between October 2008 and January 2009. The strong negative relation is monitored between largest ownership, concentrated ownership, and stock prices.

Steven [19] uses a variety of econometric models, including feedback, to test the robustness of (dynamic panel estimations) and to examine the relationship between the board's characteristics and foreign ownership. They showed that the outside directors have important role in the stabilized stock price volatility.

2.2 Risk management and the financial crisis

Karolyi et al. [20] indicated that the yen/dollar foreign exchange rates, the treasury bill returns, and the industry impacts have no measurable effect on the US and Japanese return correlations. Moreover, Antoniou et al. [21, 22] found that futures' trading has a significant impact on co-movements across the markets. Borokhovich et al. [23] found that there is a positive nexus between the monitoring of outside directors and the firm's use of the interest rate derivatives.

2.3 Risk management, corporate governance

Board sizes are responsible for the identification, assessment, and management of all types of risk, including operational risk, market risk, and liquidity risk (FRC2010b). The debate regarding this relationship, which has long been ignored as an important element in the process of development of the stock markets, minimizes the risk of investor. In this context, Minton et al. [12] found that the board size negatively affects the market risk. Similarly, in a recent study, Kryvko et al. [24] have examined the European banks and also found a negative relationship between the board size and the risk of the company.

Regarding the relationship between the independence of the board and the risk of liquidity, the first who examined the debate were Anderson et al. [25], who used the cost of the debt of the company as a proxy. They found that the more independent board is, the more the debt cost decreases. Pathan [26] found that the independent board is negatively associated with the market risk.

3. Results

3.1 Corporate governance stock returns volatility

3.1.1 Methodology and data

In this paper, we examine the three-way linkages between corporate governance and stock return volatility. Our study focuses on French companies composing the SBF 120 index for the data collection; we were required to use a data source, i.e., the database "http://investir.lesechos.fr." The sample period runs from 2006 to 2012.

The following regression equation is formulated to test empirically the

$$\begin{aligned} VOL_i = \alpha + \beta_1 CEO_i + \beta_2\, FD_i + \beta_3\, INDD_i + \beta_4\, CPA_i \\ + \beta_5\ \ LEV_i + \beta_6\, SIZE_i + \beta_7 PER_i + \beta_8 TURN_i + \varepsilon_i \end{aligned} \tag{1}$$

The *Vol*, as the dependent variable in the model, is measured by the standard deviation of annual stock returns. Concerning the independent variable is as follows:

The *CEO* is the chairman also serving as CEO. The *INDD* is independent directors and measured by the ratio of independent directors. The *FD* is outside directors. The *CPA* is audit size.

In addition, the variable of corporate governance is as follows: *PER* is ROA. The *TURN* is firm size (total liabilities). The *SIZE* is firm size, and the *LEV* is firm's debt ratio. Our work is a panel data study, Eq. (1) can be written in the form of panel data as follows:

$$VOL_{it} = \alpha + \alpha_i + \sum_j \beta_j E_{jit} + \sum_n \delta_n Y_n + \varepsilon_{it} \tag{2}$$

Since our study is a panel data study, Eq. (3) can be written in a panel data form as follows:

$$VOL_{it} = \alpha + \alpha_i + \sum_{j-1} \beta_j E_{jit} + \sum_n \delta_n Y_n + \varepsilon_{it} \tag{3}$$

$$VOL_{it} = \alpha + VOL_{it} + \beta_{vd} INDD_{it} + \beta_{vf} FD + \beta_{vv} V_{i,t-1} + \sum_n \delta_n Y_n + \varepsilon_{it} \tag{4}$$

$$INDD_{it} = \alpha + \alpha_i INT_{it} + \beta_{vd} VOL_{it} + \beta_{vf} FD + \beta_{vv} INDD_{i,t-1} + \sum_n \delta_n Y_n + \varepsilon_{it} \tag{5}$$

$$FD_{it} = \alpha + \alpha_i FD_{it} + \beta_{vd} VOL_{it} + \beta_{vf} INDD + \beta_{vv} FD_{i,t-1} + \sum_n \delta_n Y_n + \varepsilon_{it} \tag{6}$$

We then use the production function in Eq. (4) to derive the empirical models to simultaneously examine the interactions between stock return volatility; INDD is independent directors, and FD is outside directors. These simultaneous-equation models are also constructed on the basis of the theoretical and empirical insights from the existing literature. While estimating the causal links between CEO is

chairman also serving as CEO, CPA is audit size, PER is ROA, LEV is debt ratio, and SIZE is firm size are included as instrumental variables (e.g., [17, 27]).

In Eq. (5), INDD: present the independent directors CEO is chairman also serving as CEO, FD is outside.

Directors, and VOL is stock return volatility, are the main factors of resistance of the company during the variations of the stock markets.

In this research, we use a dynamic panel data model of lagged levels of the dependent variables and for this reason; we utilize the Blundell and Bond [28] two-step system GMM methodology. This methodology is explained on the basis that traditional OLS estimator is biased in the presence of the lagged-dependent variable as regressor, and it also reports for the prospective endogeneity of certain dependent variables.

3.1.2 Empirical result and discussion

Table 1 presents the descriptive statistics for the regression variables. In this table, we can see "Mean", "standard deviation", "Min", and "Max". The stock return volatility showed the maximum standard deviation 1.67%, and there is also a much smaller standard deviation of 0.003%, with a mean of 39.86% and a maximum of 1.16%. For an independent variable, the chairman also serving as CEO showed the maximum standard deviation of 48.16%, and there is also a much smaller standard deviation of 0%, with a mean of 63.56% and a maximum of 1%.

The independent directors showed the maximum standard deviation of 13.32%, and there is also a much smaller standard deviation of 0%, with a mean of 1.04% and a maximum of 33.3%. The outside directors illustrate the standard deviation of 18.58%, and there is also a much smaller standard deviation of 5.55%, with a mean of 29.16% and a maximum of 1.60%.

Concerning the control variable, the audit size showed the maximum standard deviation of 13.52%, with a mean of 32.96% and a maximum of 1.2%. The debt ratio presents the maximum standard deviation of 81.03%, with a mean of 53.09% and a maximum of 65.553%. For the firm's size showed a standard deviation of 79.27%, with a mean of 6.48% and a maximum of 8.90%. We can see "Mean", "standard deviation", "Min", and "Max". Finally, the ROA presents the maximum standard deviation of 57.01%, and there is also a much smaller standard deviation of −6.95%, with a mean of 7.27% and a maximum of 9.28%.

Next, **Table 2** provides the correlation matrix for the dependent variable, stock return volatility, and all the independent variables. It also presents the correlation coefficients among the variables in our analysis. At first glance, it can be seen that

Variables	Obs	Mean	Std. dev.	Min	Max
Stock return volatility	623	0.3986773	0.1878925	0.0037603	1.167427
Chairman also serving as CEO	623	0.635634	0.4816386	0	1
Outsider directors (FD)	367	0.291568	0.1858492	0.055555	1.609438
Independent directors	623	1.04751	13.32312	0	0.333
Audit size	623	0.3296789	0.1352636	0	1.2
Relative ROA	623	0.072706	0.5701465	−6.95	9.285
Debit ratio	623	53.09744	81.03811	−110.45	65.553
Firm size	623	6.483938	0.7927428	0	8.904955

Table 1.
Summary statistics of corporate governance.

Variables	Volatility	CEO	FD	IND	Audit size	ROA	Debt ratio	Firm size
Stock return volatility	1.000							
Chairman also serving as CEO	0.1286* 0.0013	1.000						
Outside directors (FD)	0.0445 0.3950	0.0846 0.1055	1.000					
Independent directors	−0.0132 0.7419	0.0287 0.4753	0.1974* 0.0001	1.000				
Audit size	0.0953* 0.0174	0.0207 0.6057	0.3308* 0.0000	−0.0456 0.2560	1.000			
Relative ROA	−0.0119 0.7674	0.0119 0.7676	0.0912 0.0811	−0.0034 0.9323	0.0073 0.8549	1.000		
Debt ratio	0.1199* 0.0027	0.0866* 0.0307	−0.0846 0.1055	−0.0341 0.3949	−0.0051 0.8999	0.0012 0.9760	1.000	
Firm size	−0.0019 0.9632	−0.0584 0.1452	−0.0451 0.3893	−0.0084 0.8341	−0.3175* 0.0000	0.0201 0.6174	0.0534 0.1827	1.000

*The * indicate significance at the percent levels.*

Table 2.
The correlation matrix of corporate governance.

Volatility stock return				
Variables	**Ols-Fe**	**Ols-Ar**	**Ab**	**Abbb**
Volatility stock return	0.0213691	0.0261624	−0.000477	−0.012617
Chairman also serving as CEO	0.0164611	0.1483642	0.2842368**	0.16203
Outside directors (FD)	0.1834594*	0.1840265**	0.2219233**	0.2840837**
Independent directors	0.0446437	0.0539175	−0.080685	0.1292659
Audit size	−0.042662	−0.075450	0.0526602	−0.209908***
Relative ROA	0.0002644*	0.0002502**	0.0001734	0.0003577**
Debt ratio	0.0043407	0.0064761	−0.008987	0.0338603
Firm size	0.0046849	0.018764	0.0280472	0.0128239
Constant	0.1674346	0.013684	−0.351875***	−0.1473147
Volatility		0.4377655*	0.2849317*	

*The *, **, and *** significant at 1, 5, 10, percent levels, respectively.*

Table 3.
Robustness tests—no feedback and governance variables not endogenous.

the stock price fluctuation is negatively correlated with the independent directors, relative ROA, and firm size which suggests that these variables help stabilize the stock return volatility. The stock price volatility is a positive correlation between the debt ratio, CEO, outside director, and audit size. In fact, all these have contributed to the increase of the stock price volatility.

In **Table 3**, we based on four methods (Ols-Fe, Ols-Ar, Ab, Abbb). Concerning the first method (OLS-fe), we can see only that the chairman also serving as CEO and relative ROA have a positive and significant (at 1%) impact on the stock market volatility, while the second method (OLS-ar), this result indicates that the CEO and ROA have a positive and significant (at 5%) impact on the stock market volatility. Concerning the Arellano-Bond regression (AB) method, we note that the CEO and

outside directors have a positive and significant (at 1%) impact on the stock market volatility. This result suggests that these variables contribute to the increase in the stock return volatility.

The empirical results about Arellano-Bover/Blundell-Bond (ABBB) method showed that the outside directors and ROA have a positive and significant impact on the stock return volatility. Also, in this method we can see that the audit size have a negative and significant impact on the stock return volatility. This result suggests that the audit size contribute to decrease and reduce stock return volatility. Moreover, the different reports about robust regressions (OLS-fe, OLS-ar, ABBB, and AB) pointed out that the debt ratio (LEV) has a positive and significant impact on the stock market volatility. This suggests that the stock return volatility is elastic on the leverage ratio, and a 10% increase in the leverage ratio increases the stock return volatility within a range of 0.026%. This result indicates that the debt ratio increases the stock return volatility.

Table 4 presents the random effect regression effects. The first model (1) included only the control variable; the result indicates that the ROA has a positive and significant impact on the stock return volatility, while the firm size has a negative and significant impact on the stock return volatility. For model (2) that contains the dependent variable, we can see that the outside directors have a negative and significant impact on the stock return volatility; the outside directors can help to reduce the stock return volatility. According to Vo [29], the foreign director can stabilize the stock return volatility.

In model (3), when combining control variable with outside directors and independent directors, we found that the ROA has a positive and significant impact on the stock return volatility, while the firm size has a negative and significant impact on the stock return volatility. Finally, model (4) included all variables; the result indicates that the outside directors and ROA have a positive and significant impact on the stock return volatility.

In **Table 5**, we can see that the CEO, audit size, debt ratio, and total liabilities have statically significant and positive impacts on the stock return volatility; this result indicates that these variables contribute to increase the stock return volatility. Moreover, the fact that foreign ownership, firm's size, and ROA have a negative

Variables	**Stock return volatility**			
	Model 1	**Model 2**	**Model 3**	**Model 4**
Stock return volatility		0.0152933		0.0213691
Chairman also serving as CEO		0.0171294		0.0164611
Outside directors (FD)		0.1786031*	−0.0000928	0.1834594*
Independent directors		−0.0340352	−0.0337171	0−4.42e-10
Audit size	−0.0063078		−0.0063206	−0.0426624
Relative ROA	0.0002156***		0002145***	0.0002644***
Debt ratio	−0.0012812		−0.0012117	0.0043407
Firm size	−0.052031**		−0.051979**	0.0046849
Constant	0.7526633*		0.7519738*	0.1674346
Fixed/random effect	4.80	1.88	4.75	42.55*
Breusch-Pagan LM test (p-value)	789.20*	793.62*	789.37*	

*The *, **, and *** significant at 1, 5, 10, percent levels, respectively.*

Table 4.
Random effect regressions (the impact of corporate governance on the stock returns volatility).

Variables				
Volatility stock return	**Coef.**	**Std. Err.**	**t**	**P > |t|**
Chairman also serving as CEO	0.0314574***	0.0169676	1.85	0.065
Outsider directors (FD)	−0.0590011**	0.0526383	−1.12	0.026
Independent directors	0.0666269	0.0410113	1.62	0.105
Audit size	0.164201**	0.082536	1.99	0.047
Relative ROA	−0.352634*	0.1010953	−3.49	0.001
Debt Ratio	0.0004149*	0.0000889	4.67	0.000
Firm size	−0.0386955**	0.0123863	−3.12	0.002
Constant	0.0506746**	0.0179811	2.82	0.005

*The *, **, and *** significant at 1, 5, 10, percent levels, respectively.*

Table 5.
Linear regression.

Variables	(1)	(2)	(3)
	Volatility stock return	**FDi (outside directors)**	**IND (independent directors)**
Stock return volatility		0.997335	−0.088921*
Chairman also serving as CEO	−0.0024182	0.0150367	−0.0204414
Outsider directors (FD)	0.2347926**		0.3823154*
Independent directors	−0.9719472*	0.2.198526*	
Audit size	0.3733843**		
Relative ROA	−0.4283953**		
Debt ratio	0.0002094	−0.0002125	−0.0001434
Firm size		−0.0631012	0.0670512*
AR (1)	−3.28*	−2.34**	−3.04**
Test de Hansen	32.88**	10.28	13.09
Wu-Hausman F test	12.17108 F (1365)		
0.00054	22.59621 F (1365)		
0.00000	12.85766 F (1365)		
0.00038			
Durbin-Wu-Hausman	11.87514*	21.45378*	12.52223*

*The *, **, and *** significant at 1, 5, 10, percent levels, respectively.*

Table 6.
Three-stage least squares for simultaneous equations.

effect on the stock return volatility; these results indicate that these variables contribute to decrease and stabilize the stock return volatility.

Table 6 contains three-stage least squares for simultaneous equations. In this table, the result suggests that the outside directors (FD) and audit size have a

positive and significant impact on the stock return volatility; this result indicates that these variables contribute to increase and stabilize the stock return volatility. In this area, this result compared to the study of Steven et al. [19], they indicate that the outside directors contribute to stabilize the stock return volatility. Also, we found the independent directors and ROA have a negative effect on the stock return volatility; this result indicates that these variables contribute to decrease and stabilize the stock return volatility.

Moreover, the results indicate that the stock return volatility has a negative and significant (1%) impact on the independent directors. This stipulates that the independent directors contributed to the minimization of the volatility of the stock returns, that is to say, they are considered a real factor of corporate governance. In this context, the independent directors are considered a sign of good governance. This result is consistent with the findings of Huang et al. [17].

Table 6 reports the results of Arellano and Bover [30] and Blundell and Bond [28] "system GMM" estimation of [Eq. (2)], using different measures of the firm. In the GMM system, first-differenced variables are used as instruments for the equations in levels, and the estimates are robust to unobserved heterogeneity, simultaneity, and dynamic endogeneity (if any). The diagnostic tests in **Table 5** show that the model [Eq. (2)] presenting the effect of the stock return fluctuation on the independent director is well-fitted with statistically insignificant test statistics of the first-order autocorrelation in first differences (AR1) and Hansen J-statistics of overidentifying restrictions. Accordingly, in **Table 5**, we could see statistically insignificant AR (1) for all the firm's measures. Likewise, the Hansen's J-statistics of overidentifying restriction test, the null instrument validity, and the statistically insignificant Hansen J-statistics for all the firm's measures indicate that the instruments are valid in the respective estimation. Finally, the number of instruments (i.e., 24) used in the model is less than the panel (i.e., 212) which makes the Hansen J-statistics more reliable. By contrast, Eq. (1) presents the impact of the independent directors on the stock price fluctuation and shows that it is well fitted with the statistically significant test statistics of the first-order autocorrelation in the first differences of AR (1) and with the Hansen J-statistics of overidentifying restrictions.

3.2 Risk management and the financial crisis

3.2.1 Data description and variable

In this paper, we examine the linkages between stock returns and risk management. Our study focuses on French companies composing the SBF 120 index for the data collection; we were required to use a data source, i.e., the database "http://investir.lesechos.fr." The sample period runs from 2006 to 2013.

3.2.1.1 Stock returns volatility

Annual returns are computed as geometric and arithmetic growth rates, respectively. In particular, we used the formula $\frac{P_{t-P_{t-1}}}{P_{t-1}}$ for the annual data.

3.2.1.2 Exchange rate

The study is an extension of the approach suggested by Karolyi et al. [20], Longin and Solnik [31] to examine the future contracts (such as foreign exchange rates, treasury bond, and index of stock prices).

3.2.1.3 Treasury bills

This measure has been used in the previous studies, including those of Koulakiotis et al. [32]. We want to help enrich the earlier work by studying French companies.

3.2.1.4 Market index

This variable was also considered by Zhian et al. [33] and Koulakiotis et al. [32].

3.2.2 Model

$$FD_{it} = \alpha + \alpha_i FD_{it} + \beta_{vd} VOL_{it} + \beta_{vf} INDD + \beta_{vv} FD_{i,t-1} + \sum_n \delta_n Y_n + \varepsilon_{it} \qquad (7)$$

In **Table 7,** we can see all that the maximum standard deviation of the stock returns in the financial crisis in our sample is 73%, and there is also a much smaller standard deviation of 37%. These results show that the great impact of the financial crisis on all firm's stock price volatility.

Table 8 shows the correlations of all the variables. In this table, it can be seen that the stock return volatility is negatively correlated with the exchange rates, which suggests that the exchange rate variables help stabilize the stock return volatility. The stock return volatility is also positively correlated with the treasury bills.

In **Table 9,** the results confirm that an exchange rate is negatively and significantly correlated with the stock return volatility. Moreover, the treasury bills

Variable	Obs	Mean	Std. Dev.	Min	Max
Stock returns volatility	986	0.6748399	0.8306421	0	7.307498
Exchange rates	986	2.006649	0.0063299	1.997008	2.019531
Treasury bills	986	2.734162	0.5490697	2.09	3.72

Table 7.
Summary statistics of management risk.

Variables	Stock returns volatility	Exchange rates	treasury Bills
Stock returns volatility	1.0000		
Exchange rates	−0.0613	1.0000	
Treasury bills	0.0032	0.6833	1.0000

Table 8.
The correlation matrix of management risk.

Stock returns volatility	Coef.	Std. Err.	P > |t|
Exchange rates	−15.62909	5.710487	0.006
Treasury bills	0.1279229	0.0658331	0.052
Cons	31.68719	11.33675	0.005

Table 9.
Summary statistics of risk management and the financial crisis.

have a positive effect on the stock return volatility, which is clearly evidenced in all the regressions.

3.3 Risk management and corporate governance

3.3.1 Data description and variable

3.3.1.1 Dependent variables

In this paper, we examine the three-way linkages between stock returns, corporate governance, and risk management. Our study focuses on French companies composing the SBF 120 Index For the data collection; we were required to use a data source, i.e., the database "http://investir.lesechos.fr." The sample period runs from 2006 to 2013. Annual returns are computed as geometric and arithmetic growth rates, respectively. In particular, we used the formula $\frac{P_{t-P_{t-1}}}{P_{t-1}}$ for the annual data.

3.3.1.2 Independent variables

- Board of directors

The board of directors is an important internal mechanism in business that contributes to the control of management. In this sense, several authors consider that a large board strengthens its ability to control and improve its information sources. In this context, several studies found that companies with a large board of directors are realizing better performance (Daily and Dalton) [34]. Hence, we set the following assumption:

H1: The impact of the board is positive on the stock market volatility

- Institutional investors

Institutional investors have an active role in corporate governance. In this sense, Pound [35] pointed out that institutional shareholders are better equipped regarding knowledge and monitoring of professional skills than individual shareholder. In this way, the agency problems can be reduced. Current research also supports the monitoring mechanism on the part of institutional investors [36, 37]. Moreover, institutional control also plays an important role in the company's performance. Cornett et al. [38] reported that institutional investors have a positive influence on the performance of a company. Sias and Starks [39] found that higher institutional shareholdings would have a positive impact on stock prices. On the other hand, Dennis et al. [40] showed that abnormal stock returns during periods of high market volatility linked to the percentage of institutional ownership could be used to predict abnormal stock returns during the liquidity crisis. Beber et al. [41] found that institutional ownership affects liquidity. To do this, we put forward the following hypothesis:

H2: The impact of institutional investors is negative on the stock market volatility

- Exchange rate

The study is an extension of the approach suggested by Karolyi [20], Longin, and Solnik [31] to examine the future contracts (such as foreign exchange rates,

treasury bond, and index of stock prices). To this end, we propose the following hypothesis:

H3: The exchange rate impact is positive on the stock market volatility

- Market index:

A hint of what is designed to measure price changes of a set of markets, such as the stock market or the bond market. This variable was also considered by Zhian et al. [32] and Koulakiotis et al. [33].

H4: The impact of the market index on the stock market volatility is positive

3.3.2 Model

3.3.2.1 GARCH model

Eqs. (8) and (9) show the return and volatility equations, respectively, which have been used in the investigation of the impact of corporate governance variables on the volatility persistence and error terms. Accordingly, the corporate governance variables are embedded in the model below to detect the effect on volatility and error:

$$\begin{aligned} r_t &= \beta_0 + \beta_1 s_1 + \beta_2 s_2 + \varepsilon_t \\ \varepsilon_t/\pi_{t-1} &\sim T(0, h_t) \end{aligned} \tag{8}$$

s_1 denotes the variable of corporate governance of the average board size. The second corporate governance variable s_2 controls the share of employee representatives. The sample period is from 2006 to 2013. A symmetric response to shocks is made from Bollerslev's univariate GARCH model:

$$h_t = \alpha_0 + \alpha_1 h_1 + \alpha_2 \varepsilon_{t-1}^2 \tag{9}$$

3.3.3 Empirical results and discussions

Table 10 reports the summary statistics and the diagnostic tests of AR (1) residuals. We can observe that the results uncover non-normality since the Jarque-Bera test rejects the null hypothesis of Gaussianity at 1% level. The series also displays a negative skewness and leptokurtic behavior, symptomatic of a heavier tailed distribution than the standard.

The descriptive statistics of the different variables for the panel are given in **Table 1**.

From **Table 1**, we find that the coefficients of skewness are positive in some cases and negative in others; it is to that the distribution of the variables is shifted left asymmetric for some variables (board of administration) and right for other

	Mean	Variance	Skewness	Kurtosis	Jarque-Bera
SBF120	0.169785	0.851913	6.300151	61.426594	56358.580960
Institutional investors	0.377604	0.085123	0.484719	−0.907466	25.274010
Exchange rate	2.007108	0.000049	0.454862	−0.623050	17.426292
Board size	1.090817	0.020644	−0.772521	1.339174	59.921052

Table 10.
Summary statistics of corporate governance and risk management.

variables. It may be noted that the lowest coefficients of negative skewness are recorded for boards of directors, while the highest skewness is recorded in the case of returns SBF120.

The coefficients of kurtosis variables are significantly more than three (SBF 120). This shows that for these series, which have a flatter distribution than the normal distribution, all other distributions are leptokurtic. According to the test Jarque-Bera (JB), the null hypothesis (H_0) of normality is not rejected, and the different variables studied are not normally distributed.

Table 11 shows the correlations of all the variables. We observe any high correlations among the independent variables that might affect our regression results. This table shows the correlations between all the variables. We observe high correlations among the independent variables that might affect our regression results.

Table 12 shows the results of the panel unit root tests for the levels of the variables. It can be seen from **Table 12** that all the variables in first difference are statistically significant under the LLC and HLM tests, indicating that all variables are integrated of order one, I(1). Furthermore, the results shown in the table indicate that all the series that display values LLC and HLM are below the critical values. Therefore, we accept hypothesis H1. The variables of this study are stationary and integrated of order zero because there is no differentiation for the first stationary.

In **Table 13**, we can observe that the results uncover non-normality since both the Ljung-Box (Q(10)) and the Breusch-Godfrey LM statistics point to the absence of autocorrelation in the residual series, which reveals that the chosen AR (1) specification seems sufficient to eliminate any serial correlation present in the data. Our results showed the stationarity constraint of the model is verified ($\alpha + \beta < 1$) for all the equations, which supports a weak presence of effect ARCH and GARCH

Variables	SBF 120	Exchange rate	Board size	INST INV
SBF120	1.000000	−0.0392 0.4686	−0.0569 0.2930	0.0809 0.1345
Exchange rate		1.000000	−0.0569 0.2930	0.0108 0.8420
Board size			1.000000	0.0539 0.3188
Institutional investors				1.00000

Table 11.
The correlation matrix of corporate governance and risk management.

Variables	First level	
	LLC	HLM
SBF120	−9.8018 (0.0000)	1.3191 0.0936
Exchange rate	−17.4655 (0.0000)	6.0866 (0.0000)
Institutional investors	−25.5105 (0.0000)	2.9574 (0.0016)
Board size	−1.1e + 02 (0.0000)	7.0130 (0.0000)

Table 12.
Unit root test based on levels of variables for all four panels.

Variables	c	AR_1	α_0	α_1	β_1	AIC(6)	BIC(6)	Ljung-Box	Pop
SBF120	0.1156 0.0970	0.7141 0.000	473.83 0.003	0.1208 0.000	0.7621 0.000	3836.10	3859.13	304	0
Exchange rate	0.5464 0.0000	−0.9764 0.00000	0.2086 0.0000	−0.4196 0.000	0.8922 0.000	1250.59	1273.61	5.69	0
Board size	0.02216 0.000	0.80378 0.0000	0.0586 0.0000	56.68195 0.0000	0.75636 0.0000	3003.86	3026.89	7089	0
Institutional investors	0.08737 0.76299	0.79627 0.000	6052.5 0.1325	0.32979 0.07420	0.56896 0.04523	4288.42	4311.44	156,124	0

Table 13.
Univariate GARCH effects with and without the impact of corporate governance variables.

in all the cases (exchange rate and institutional investor), except for (board size, SBF120), i.e., $(\alpha + \beta) \geq 1$ has a high persistence of volatility shocks. So, in this we can see that the institutional investors reduce their stock price volatility.

4. Conclusion

This study investigated the relationship between the internal mechanisms of corporate governance and the stock return volatility on panel data models of 89 firms over the period of 2006–2012.

Concerning the relation between the internal mechanisms of corporate governance and stock return volatility, our results based on the three-stage least squares for simultaneous equations, in this area we can see that the outside directors (FD) and audit size have a positive and significant impact on the stock return volatility, and our results showed that the outside directors (FD) and audit size increase the stock return volatility. Also, we found that the independent directors and ROA have a negative effect on the stock return volatility; this result indicates that these variables contribute to decrease and stabilize the stock return volatility.

For the linkages between stock returns volatility and risk management (exchange rate, treasury bills), our study focuses on French companies composing the SBF 120 during 2006–2013. Our results confirm that an exchange rate is negatively and significantly correlated with the stock return volatility. This result indicates that these variables contribute to decrease and stabilize the stock return volatility. Moreover, the treasury bills have a positive effect on the stock return volatility.

Our results showed that the stationarity constraint of the model is verified $(\alpha + \beta < 1)$ for all the equations, which supports a weak presence of effect ARCH and GARCH in all the cases except for stock index, board of directors, and inv. inst., i.e., $(\alpha + \beta) \geq 1$ has a high persistence of volatility shocks.

The principal connotation, which occurs from our study, can be posted as follows. The results of this paper are particularly important for research on institutional investor in the French markets and the firm's stock price fluctuation. This paper provides evidence that confirms the benefits of institutional investors in the French markets. Moreover, the finding in this paper suggests that intuitional investors in France are beneficial for the economy not only because for their contribution to the invested firms but also due to the stabilizing effect benefits in macroeconomic perspectives. This paper also has clear policy implications for the government. Firstly, it provides an empirical investigation to clarify the role of the institutional investor's participation. It clearly suggests that the existence of more

institutional investors in firms reduce their stock price volatility, and hence, they become less stock market's volatility. Secondly, a clear understanding of the stock market volatility and effects of institutional investors is important for policy makers in making relevant policies on foreign capital restrictions, especially policies in response to shocks during the financial crisis.

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