Journal of Sustainable Development in Africa (Volume 10, No.2, 2008)

ISSN: 1520-5509

Clarion University of Pennsylvania, Clarion, Pennsylvania

ESTIMATION OF THE IMPACT OF CHANGES IN FINANCIAL VARIABLES ON THE BALANCE SHEET AND STOCK MARKET VALUE OF CREDIT LIFE INSTITUTIONS IN FRANCE, ENGLAND, AND SWITZERLAND

Elie Ngongang
Fayetteville State University

Abstract

The activity of a financial institution is strongly linked to the performance of financial markets. The performance of financial assets directly influences the results of financial institutions. For that reason, it is only national for changes in the financial market to have a significant impact on the evolution of the share prices of financial institutions.

The purpose of this paper is to estimate the impact of the evolution of the stock market, interest rates and real estate on the rate of return of credit life financial institutions. In order to avoid the influence of market organization and regulatory agencies, the analysis of sensitivity to change in share markets and interest rates is carried out in some European countries. It is assumed that the exposure to interest rates risks of financial enterprises is assessed differently depending on the country, and the manner in which the influence of control mechanisms are taking into account. Beyond the description of the sensitivity model used by credit life financial institutions, a dynamic analysis model is developed.

Finally, the sensitivity of the net worth of a credit life financial institution to the evolution of financial variables is determined from stock market prices.

Introduction

The follow-up of financial risks requires the modeling of the behavior of financial assets values. This modeling has been the subject of an abundant literature. Moreover, the principal asset models have recently been presented by several authors such as Black and Scholes, or Morton, 1973, 1976; Stone, 1974; Lintner, 1965, 1969; He Myer and Webb, 1996, 2000; Flannery and James, 1984; Scholes and Williams, 1997; Dimson, 1999 etc. But to model a portfolio of values it is also necessary to determine correlations between financial assets. The estimation of these correlations is carried out using times-series regressions in case there does not yet exist liquid hybrid derivatives which allows deducting them implicitly from the prices of existing market prices. All the computation problems involved reside in the choice of time-series data to determine these correlations. It is then necessary to model the link between financial asset performance and the evolution of commitments.

The stock market value of a share reflects the future returns of a credit life institutions and the activity's risk (Rerolle, 1996). The activity of a financial concern is strongly linked to financial market performance. The performance of financial assets on the other hand, has a direct impact on the results of financial institutions. For that reason, it is only national for developments financial markets to have a significant impact on the evolution of the stock market prices of financial institutions.

Borbalan (1996) has analyzed the impact of interest rates on the share prices of credit institutions in Europe. He has shown that there exists a sensitivity specific to the evolution of interest rates which is not integrated in market risk. Hoyt and Trieschman (1991) have highlighted the differences in the sensitivity to the markets for the shares of credit life institutions, damages or mixed. Theses studies exclude real estate. However, Mei and Lee (1994) have shown the existence of a real estate factor. Borde, Chambliss and Madura (1994) have moreover tested the impact of several risk factors, of which real estate, on the beta of US credit life financial institutions. He, Mayer and Webb (1996) have shown that introducing the real estate factor improves the estimation models of the evolution of US banks' share prices.

In actual fact, market analysis and risk assessment are operations performed by the financial market as an external actor. How are the risks linked to a stock and to the interest rates of companies assessed by the market? Is this assessment identical on other country market? Whatever the method of recording and covering financial risks chosen by financial institutions, investors assess the sensitivity of these companies and of the whole sector to financial markets.

The present study is a corollary of internal risk analysis carried out using dynamic methods. This sensitivity to interest rates and to stock values estimated for all different (internal and external) expressions of the net worth (wealth) of a company. The present research is in keeping with this perspective.

The main objective of this paper is to estimate the impact of the evolution of the stock market, interest rates and real estate on the rate of returns of credit life financial institutions. In order to avoid the impact of market organization and regulatory agencies, the analysis of sensitivity to stock market variations and interest rates is carried in most European countries. We follow Oertman, Rendu and Zimmerman (1996) in assuming that exposure to the interest rate risk of financial institutions is assessed differently according to the country, and like Mayers (1994), Franks and Mayers (1994), we take into account the influence of control mechanisms.

The contribution of this paper is twofold: to present concurrently the methods of measuring sensitivity to financial markets used internally by credit life financial institutions, and the assessment of risks by financial markets for the financial concerns listed in the stock market. Beyond the description of static sensitivity models used by credit life financial institutions, a dynamic model is developed. This model globally simulates the credit life institution's balance sheet. This approach is not used by insurers whose analysis is based on the segmentation of risks. Here, the balance sheet is modeled globally in order to get the value of equity capital resulting from the evolution of capital markets. The approach of risk assessment by the market for listed institutions is extended to all of the most important markets.

The remaining part of the paper is organized as follows: section *2* presents the literature review; section *3* shows the different methodologies used; section *4* applies these methods to the insurance market; in section *5*, these methods are applied to the main regional insurance markets certain countries in Europe (France, Great Bretagne and Swiss), and section *6*, concludes the study.

Review of the literature

Credit life financial institutions nowadays use derivatives to cover their financial products. Thus, the market for shares has witnessed a strong increase in recent years, portfolios yield high capital gains, interest rates have decreased and the proportion of insurance gathered has become significant. These conditions lead insurers to buy protection on the markets in order to maintain the levels of their capital gains and capitalization reserves. Thus, the OAT TEC 10[1] i.e. the dated government bond became the privileged cover in 1997 and 1998. Credit life financial institutions possess more than 70% of outstanding (e.g. 40% of OAT 2007 and 90 % OAT 2010)[2]. This is a liquid product sensitive to rate increases, and easy to record in accordance with article R332.20 regulating assets in the form of bonds[3].

The balance sheet in book value does not allow assessing neither the risks generated by the evolution of financial markets, nor the options contained in the commitment of the credit life financial institution. The different business failures caused by derivatives and poor asset management have made regulatory agencies aware of market risks. Moreover, according to Capital Market Risk Advisors, losses due to financial derivatives were estimated at 19 billon USD for the period between 1988 and 1998. A study by Prat (1998) found that Showa Shell Sekiyu lost more than 1600 million USD on foreign currency derivatives. Financial markets have experienced other important failures or losses (Amenc and LeSourd, 2003). US savings and Loans have lost more than 145 billion dollars because they had a large unfavorable discrepancy between the duration of their commitments and the financial assets they were holding. Credit Lyonnais has also lost more than 37 billion USD, notably because of poor management and strong exposure of real estate whose prices had significant fallen.

Since 1994 likewise, the Group of 30 (G30) has published a report on the risk linked to the utilization of derivatives. In 1994, the General accounting Office has also published another report on the utilization of derivatives. The Security Exchange commission in 1996 has introduced a regulation requiring all listed financial concerns to calculate the robustness of their balance sheets. This information permits the market to evaluate the financial soundness of the concern.

European credit institutions listed in the US must work out computations imposed by the *Security Exchange Commission*. In some European countries like France, these institutions must, in accordance with legislation enacted on July 20, 1998, publish a report on their solvency at the end of each fiscal year. This report comprises an analysis of the conditions under which it is able to weet its medium and long-term commitments.

On the internal level, the risk induced by the evolution of financial markets is also monitored by the calculation of the balance sheet intrinsic wealth. The intrinsic value is obtained by comparing the stock market values of assets with the discounted financial flows of liabilities expected.

To determine the amount of equity capital at any time with a dynamic model, it is necessary to model the assets and liabilities of credit life financial institutions.

The literature provides two models which simulate all the assets of a credit life financial institution.

Wilkie (1987) has developed a stochastic model encompassing the set of all assets of a credit institution. This model is based on inflation. The variables of this model are stock dividends, the interest rate stocks. All the variables are obtained by composing their lagged values and inflation, the latter being an autoregressive variables of order 1 with white noises. Wilkie (1992) sets the limits of his first model. He only takes into account one maturity rate (the long- term government bond rate), only one stratum of actions, and does not integrate the international impact and real estate. He extends his model to France, Great Britain, and introduces correlations between the economic series of different countries.

Brys and Varenne (1993) propose a modeling by option of a capitalization contract with a single premium and with a guaranteed rate. The asset is modeled by a global stochastic process correlated with a rate without risk. Equity capital is modeled as a spread between two options to buy (the net asset of commitments or debts and deduction of profit sharing when it exists)

To determine equity capital, all the assets must be modeled. But as concerns real estate, exploratory data are of different types. There exists, real estate assessment series, quotation series of enterprises engaged in real estate activities 9 called real estate shares), and price series on real estate transactions. Eichholtz and Hartzell (1996) analyze the three series on the US market. Lizieri and Sottchell (1997) focus their study only real estate shares. Hartzell, Hekman and Miles (1986), and Hoag (1980) are interested in real estate assessment series. The choice of the series is important. Zisler and Ross (1991) show that the standard deviation of real estate prices is probably three times higher than that of real estate assessment series. This study doses not integrate assessment series. For the European market, Hoesli and Thion (1996) studied the real estate market using real estate shares. Roquemaurel and Scaillet (1997), and Spiezer (2000) extended this study with the prices of real estate transactions and re-estimated the performance of assets by introducing inflation.

The dynamic modeling of the wealth of credit life financial institutions were developed by Hoesli and Thion (1996) and Roquemaurel and Scaillet (1997). Given the specificity of the insurance activity, the treatment of accounting operations, and the performance of financial assets, the dynamic model estimates the financial position of the financial institutions shareholders. This assessment of the wealth and risk linked to their investment is carried out with internal data. There exists another assessment of the financial institution's activity and of its equity capital: the stock market value. It is an external evaluation. This stock market value is also sensitive to the conditions of financial markets. But is this assessment identical in all countries, activities etc?

In the light of the preceding, hypotheses are tested by using an independent regression and multiple and successive regressions on a sample of 26 European credit financial institutions in year 2000 (out of which 6 are French, 12 British and 8 Swiss).

In a first aspect, the different methodologies used are presented. The first test is a sensitivity calculation (without, and thus with a lagged variable) of the beta coefficients for each share on different financial markets (stocks, rates and real estate). This test is completed by a simultaneous regression for each share with all the market variables retained. The limits of this last test are due to the dependences existing between financial markets. A regression test with the residuals of a first regression is presented.

In a second aspect, these methodologies are applied to the market for insurance. Does there exist specific interest rate and real estate factors on the credit life financial institution market?

In a third aspect, the study is extended to the main regional insurance markets. The choice of countries is motive by their importance. The British market represents an encashment (receipts) of about 222.3 billon USD in year 2000, according to the European Insurance Committee[4]. Switzerland is retained owing to its number of credit life financial institutions (ranked 6th in Europe). Tests have been carried out for Great Britain and Switzerland in order to estimate sensitivity to interest rate and shares. They highlight a different sensitivity of the share's profitability to financial markets according to sector of activity and the nature of the enterprise listed.

Methodology of the Tests

The sensitivity of credit life financial institutions prices to the evolution of different financial markets can be worked out in various ways. A first eventual analysis is an independent regression of rates of returns of each of the market shares, rates and real estate on the stock market profitability of each of the financial institutions. The beta coefficients of the stock market shares, interest rates and real estate are thus obtained. The quality of regressions depend the shares' level of liquidity. Since the market is not always liquid, it is opportune to utilize lagged variables in the regressions of Scholes and Williams (1997) or Dimson (1997).

A second analysis consists of carrying out simultaneous regressions according to Stone's model (1994). With a two- factor model, the rate of returns of each enterprise is regressed at the same time on that of rates and shares. Then with a three-factor model, the rate of returns of each enterprise is regressed simultaneously on that of rates, shares, and real estate.

However, this analysis is based by the correlations existing between different domestic financial markets. Flannery and James (1984), have proposed successive regression in order to resolve the problem of dependence.

Calculation of the Betas

The beta measures the sensitivity of a share to that of the stock market. The rates of returns $R_{i,t}$, of a share i at time t is given by the following formula.

$$R_{i,t} = \left[\frac{P_{i,t} + D_{i,t} - P_{i,t-1}}{P_{i,t-1}} \right] \qquad (1)$$

Where $R_{i,t}$ is the price of share i at time t, $D_{i,t}$ the dividend distributed by company i at time t. The rate of returns of the index adjusted for re-investment of dividends is given by

$$R_{it} = \left[\frac{PI_{tt} - PI_{t-1}}{PI_{tt-1}} \right] \qquad (2)$$

Where R_{it} is the rate of returns of the index at time t, PI_{tt}, the value of the index at time t. The periodicity of the study is the month (i.e. the periodicity of the MSCI index). For a swap rate on an annual basis of T %, the rate of returns is given by: $Y_t = T_t - T_{t-1}$.

To determine the sensitivity of the each of the shares' profitably to stock markets and interest rates, we apply the market model:

$$R_{i,t} = \alpha R_{it} + \beta + \varepsilon_t \quad (3)$$

$$R_{it} = \lambda Y_t + \beta^{'} + w_t \quad (4)$$

$$R_{it} = kI_t + \beta^{''} + w_t \quad (5)$$

Where $R_{i,t}$ is the rate of returns of share i at time t, R_{it} the rate of returns of the index at time t; Y_t, the returns of the swap 10 years [5]after time t, I_t, the rate of return the real estate index at time t.

Equations *(3)*, *(4)* and *(5)* separately measure the sensitivity of the shares' returns to those of the markets.

The betas determined on shares subject to little exchange are biased. To eliminate the bias, Scholes and Williams (1977) propose to run a regression with the simultaneous rate of returns, a lay, and a lead of order 1 $(R_{t,}\ R_{t-1,}\ R_{t+1})$.

The beta is therefore the sum of the three betas adjusted from the visiting correction between lagged variables. Dimson (1979) proposes the aggregated method, i.e. regressions with n lags $(R_{t-1,}\ R_{T-2,......}R_{t-n})$ and n leads $(R_{t+1}\ R_{T+2,......}R_{t+n})$. The show of the beta is the sum of 2n+1 beta. He insists that this method is more efficient than the Scholes and Williams' estimator.

In our study, the aggregated beta is not adjusted for correlation. It remains to determine the number of lags and leads. Regressions are determined in monthly steps. The shares concerned are liquid (significant financial institutions in a sector of reference). The number of lags is reduced to one (higher order regressions yield negative coefficients). Consideration of lead variables means that the rate of returns of the share incorporates that of the following month's market. This hypothesis may generate more bias than correction since it seems stronger. The time lag considered is an order one lag. Therefore, equations *(3)*, *(4),* and *(5)* become:

$$R_{i,t} = \alpha RI_t + \alpha^{''} RI_{t-1} + \beta + \varepsilon_t \quad (6)$$

$$R_{i,t} = \lambda Y_t + \lambda^{'} Y_{t-1} + \beta^{'} + w_t \quad (7)$$

$$R_{i,t} = kI_t + k^{'} I_{t-1} + \beta^{''} + w_t \quad (8)$$

Where $R_{i,t}$ is the rate of returns of share i at time t ; R_{it}, R_{it-1}, the rate of returns of the index at time t and $t-1$; Y_t, Y_{t-1}. The rate of a 10 years swap a time and $t-1$; and I_t, I_{t-1}, the rate of returns of real estate at time t and $t-1$. The beta is the sum of the coefficients of simultaneous and lagged variables.

The beta of the stock therefore is $\alpha + \alpha^{'}$, the rate beta $\lambda + \lambda^{'}$, and the real estate beta $k + k^{'}$.

The Stone Model

Financial insurance institution often holds asset portfolios in which bonds are dominant. They are therefore likely to support a risk linked to a specific interest rate. The Stone model (1974) integrates this additional risk concept, which is due to interest rates for financial institutions. To measure this risk, stone proposes the regression of market returns and rates on the yield of shares of the form:

$$R_{it} = \varphi Y_t + \xi RI_t + k + \mu_t \quad (9)$$

Where $R_{i,t}$ is the rate of returns of share i at time t ; RI_t the rate of returns of the index at time; and Y_t, the rate of returns of the 10-year swap at time t .

Moreover, there may exist a specific real estate risk given the weight of financial insurance institutions in the European market. The model is a three-factor model. He, Myer and Webb (1996) have presented this model. It is written as follows:

$$R_{it} = \varphi Y_t + \xi RI_t + \theta I_t + k + \mu_t \quad (10)$$

Where, $R_{i,t}$ is the rate of returns of share i at time t; RI_t, the rate of returns of the index at time t; Y_t, the rate of returns of the 10 years Swap at time t; and I_t, the rate of returns of the real estate index at time t. However, the stock markets, interest rates and real estate are correlated; which introduces a bias in the regression. To avoid this bias, Flannery and James (1984) propose a two-step regression.

The Flannery and James Model

Flannery and James (1984) propose to regress the rates return of interest rates on the rate of return of shares. Then, the residues of this regression and the rate of return of interest rates are regressed on the rate of return of shares. Their reasoning is expressed by the following equations:

$$\mathrm{Re}s_t = R_{it} - Y_t$$

$$\xi = \mathrm{cov}(R_{it}, Y_t) / Var(R_{it})$$

$$\mathrm{cov}(\mathrm{Re}s_t, RI_t) = 0$$

And the corresponding regression equation is defined as follows:

$$R_{i,t} = \alpha''Y_t + \beta'' \mathrm{Re}s_t + k + \mu_t \quad (11)$$

Where $\beta^{''}$ measures the sensitivity of the yield of share i to the yield of the stock market with the interest rate variable fixed; $\alpha^{''}$ measures the sensitivity of the yield share i to the sensitivity of the market of rates.

This model can be extended to real estate. Chance and Lane (1980) have thus proposed its orthogonalization in the following manner:

$$Y_t = \xi Y_t + wRI_t + k + \mu_t \qquad (12)$$

All the coefficients are determined by ordinary least squares (OLS).

Empirical Study on the French Market

After presenting the French market data, the various tests mentioned above will be applied and analyzed.

The Market Data

The stock market index retained is the MSCI (*Morgan Stanley Capital International*), which is the overall market index in monthly data. This index is computed for the main markets.

The rate index must reflect the financial institution's activity. To that end, it is advisable to choose a long-tern rate derivative with a liquid maturity: a 10 year maturity swap.

The real estate index is the one available over the long-term; it is the housing price index presented previously. The study period extends from January 1993 to April 2000, given in monthly data. Regressions with monthly data yield lower correlation and the R^2 is more significant (see, He, Myer and Webb, 2000).

Results of Independent regressions

The regressions are those of the yields of the share prices of French credit life financial institutions on each of the yields of financial market indexes. The results are presented in Table 1 below.

Table 1: Sensitivity of the Share Prices of French credit Life Financial Institutions to French Indexes of Stocks Rates and Real Estate (without lags)

	Stock beta	R^2	F	Rate beta	R^2	F	Real estate beta	R^2	F
AXA **t**	0.639 2.653*	7.97%	6.1*	-0.946 -3.077*	10.79%	8.64*	-0.030 -0.079	0.01. %	0.006
SCOR **t**	0.712 3.292*	12.66%	9.98*	-0.610 -.103**	5.70%	4.36*	-0427 -1.300	2.32%	1.695
CARDIT **t**	0.706 3.114*	10.88%	8.98*	-0.642 -.132**	4.98%	4.53*	0.316 0.906	1.13%	0.826
GAN **t**	1.10 4.89*	24.56%	23.79*	-1237 -4.366*	20.14%	18.30*	0.044 0.119	0.02%	0.014
SAFR **t**	0.350 2.017**	5.29%	4.06*	-0.402 -1.698	4.11%	3.07**	0.075 0.287	0.11%	0.083
AGF **t**	0.801 4.804*	23.87%	22.97*	-1.118 -5.378	27.79%	27.94*	-0.075 -0.280	0.11%	0.076
Average	**0.718**			**-0.825**			**-0.016**		

* Significant at the 99% level **significant at the 95 % level

Note: AXA = AXA Insurance Life; SCOR = Reinsurance Life company; GAN = Navigation Group Insurances Life;
SAFR = Reinsurance French Life; AGF = General Life French Insurance

The values obtained for the betas coefficients of shares are heterogeneous. The beta- value of the variable GAN is the highest (1.10). The other shares have betas values lower than 1.0, the SAFR beta value being the lowest with a 0.35 value. This institution has an activity that is a little different to those of other institutions in the sample. All the values for the betas coefficients of shares are significant at the 99 % significance level. The F-Statistic is significant at the 95% level for all credit life financial institutions. The relation has an economic and statistical meaning. The average value of the beta coefficient of share on the market is 0.718, and it is lower than that obtained by Borde, Chambliss and Madura (1995) on the US market, which was estimated to be 0.92. This lower magnitude can be justified by its lack of liquidity.

The value of the beta coefficient for interest rate is negative for all of the institutions in the sample considered. This could be linked to the evaluation of credit life institutions as long-term bonds (Paraut, 1995). However, all the beta coefficients for interest rate are significant except for the SAFR. Generally, the beta's rate ranges between – 0.40 to – 1.237 with an average value of – 0.825.

The beta-value for the real estate is negative for AXA, AGF, SCOR, and positive for CARDIF, GAN and SAFR. But none of them is significant. The R^2 of these regressions are low and ranges from 0.02 % to 2.32 %.

Given the results of simple regressions, it is necessary and opportune to introduce a lag in the market variable (see Table 2 below). Information contained in the share at time t is derived from market information at time t and t-1.

Two observations can be made following the regressions. The R^2 and F-Statistic obtained are high for all regressions. In the first regression, the R^2 of the highest share betas range between 5.30% and 24.6 %. Moreover, some Fisher-Sneider statistics are significant at the 95% level (AXA, SAFR AGF). These significant results correspond to regressions with higher R^2. Furthermore, the level of significance of variables is also higher. Thus, all the financial institutions have a significant rate beta, save for SAFR.

The beta value of the overall share is higher for the preceding regression. The average beta value of this (French) market is 1.01. This value is close to that obtained (1.09) by Huit and Trieschman (1991) for mixed-activity financial institutions in the US market.

Table 2: Sensitivity of Share Prices at time t of credit Life Institutions to French Stock, Rate and Real Estate Price Indexes at Time t and t-1.

Table 2a (Stocks)

	Index (t-1)	Index (t)	Overall beta	R^2	F
AXA **t**	0.124 0.502	0.643 2.631*	0.765	9.23%	3.60*
SCOR **t**	0.237 0.237	0.700 3.281*	0.930	13.75%	6.11*
CARDIT **t**	0.210 0.931	0.701 3.093	0.915	12.99%	5.32*
GAN **t**	0.371 1.689	1.01 4.998*	1.469	29.11%	14.16*
SAFR **t**	0.508 3.024	0.345 2.046**	0.856	16%	6.87*
AGF **t**	0.373 2.320**	0.800 4.962*	1.176	31.01%	15.44*
Average	**0.3038**	**0.6998**	**1.0185**	//	//

*significant at the 99% level ** significant at the 95% level

Table 2b- Rates

	Rate (t-1)	Rate (t)	Overall beta	R^2	F
AXA **t**	-0.175 -0.558	-0.943 -3.046*	-1.120	12.00%	4.89*
SCOR **t**	-0.651 -2.290**	-0.572 -2.061**	-1.211	12.31%	4.98*
CARDIT **t**	-0.302 -0.996	-0.629 -2.091**	-0.929	7.26%	2.80**
GAN **t**	-0.384 -1.669	-0.386 -1.707	-0771	7.76%	2.99**
SAFR **t**	-0.370 -1.779	-1.101 -5.373*	-1.475	32.01%	16.52**
AGF **t**	-0.472 -1.590	-1.271 -4.365*	-1.748	24.60%	11.13**
Average	**-0.3923**	**-0.817**	**-1.209**	//	//

*significant at the 99% level ** significant at the 95% level

The beta value of the overall interest rate is negative. The average beta value for market is -1.209. The values obtained for the real estate beta are not homogenous. Coefficients range between -0.028 to 1.307. However, two financial institutions

GAN and SAFR have coefficients with significant values for the lagged real estate variable.

Table 2c: Real Estate

	real Estate (t-1)	real Estate (t)	Overall beta	R^2	F
AXA **t**	0.010 0.027	-0.027 -0.061	-0.016	0.01%	0.00
SCOR **t**	0.276 0.276	-3.01 -0.338	-0.028	3.09%	1.13
CARDIT **t**	0.685 1.809	0.623 1.626	1.307	5.53%	2.05
GAN **t**	0.817 2.018**	0.405 1.004	1.226	5.48%	2.06
SAFR **t**	0.562 1.970	0.324 1.137	0.891	5.30%	1.99
AGF **t**	0.401 1.320	0.101 0.335	0.503	2.49%	0.89
Average	**0.4585**	**0.2808**	**0.6618**	///	///

*significant at the 99% level ** significant at the 95% level

To be more explicit, we evaluate overall sensitivity simultaneously on the three markets, using the Stone model.

Results according to Stone's Model

The preceding regressions do not reflect the overall sensitivity vis-à-vis the three markets. The Stone test allows comparison of simultaneous regressions results on the three markets. This test comprises the two-factor test (see Table 3) and the three- factor test (see Table 4). The results of these tests are given in Table 3 and Table 4 below.

We note that for the two-factor test, the betas obtained are higher than those obtained by Borbalan (1996). The R^2 values range from 6.6 to 36.1 %.

Table 3: The two- factor Stone Model

	Rate	Index	constant	R^2	F
AXA **t**	-0.734 -2.109**	0.370 1.347	0.006 0.479	14.40 %	6.02*
SCOR **t**	-0.162 -0.532	0.636 2.589**	0.000 0.037	13.27 %	5.55*
CARDIT **t**	-0.288 -0.859	0.603 2.312**	0.010 0.879	13.10 %	5.29*
GAN **t**	-0.789 -2.513**	0.807 3.274*	-0.021 -2.280**	32.10 %	16.78*
SAFR **t**	-0.253 -0.974	0.263 1.299	0.06 0.773	6.68 %	2.54**
AGF **t**	-0.797 -3.549*	0.501 2.845*	-0.010 -1.475	36.15 %	20.39*
Average	**-0.5038**	**0.530**	**-0.0015**	//	//

*significant at the 99% level ** significant at the 95% level

Table 4: The Three -Factor Stone Model

	Real Estate	Rate	Index	Constant	R^2	F
AXA **t**	-0.010 -0.029	-0.732 -2.058**	0.369 1.327	0.006 0.472	14.35 %	3.973*
SCOR **t**	-0.475 -1.539	-0.081 -0.262	0.696 2.822*	-0.001 -0.117	16.18 %	4.552*
CARDIT **t**	0.259 0.783	-0.332 -0.983	0.572 2.160**	0.010 0.950	13.69 %	3.760*
GAN **t**	0.026 0.087	-0.792 -2.476**	0.802 3.198*	-0.024 -2.244**	32.01 %	11.012*
SAFR **t**	0.061 0.230	-0.262 -0.993	0.256 1.239	0.006 0.787	6.77 %	1.713
AGF **t**	-0.051 -0.231	-0.790 -3.435*	0.508 2.830*	-0.010 -1.482	36.12 %	13.45*
Average	**-0.0316**	**-0.4981**	**0.5338**	**-0.0021**	//	//

*significant at the 99% level ** significant at the 95% level

Results from the three factor test (Table 4) show that, all the coefficients of stock index are significant. GAN, AXA, and AGF have a significant bate rate. Or the other hand, the real estate index has no significant coefficient.

The coefficients of the rate and real estate variables are negative. He, Myer and Webb (1996) have carried out the three factor Stone test on US financial institutions market, and they obtained R^2 values higher than 78 %. Rates coefficients are negative and significant. The coefficients of the real estate factor are positive and often significant on the French market. Borbalan (1996) obtained heterogeneous results for the coefficients of the interest rates and stock variables on the European market. The R^2 range is from 6.77 % to 36.12 %. And the coefficients of the interest rate variable are often positive but insignificant. What would happen if we regress the indexes of financial markets first?

Results According to the Flannery and James Model

The correlations which exist between the markets exert an influence on the computed results in previous section. It biases the results. Flannery and James (1984) solved this problem by first regressing financial market indexes. Thus, it is necessary to regress the (yield) profitability of real estate on that of interest rates and shares. The results obtained are given in Table 5. These results have little statistical significance.

The results integrating a factor of order 2 seem to be more significant. Borbalan (1996) obtained on the French market significant values with the 10 year rate and the CAC40.

Table 5: Results of the Rates Shares Profitability Regression on that of Real Estate

	Share Index	Rate Index	constant	R^2	F
Real estate depending on rates and shares	0.13	0.18	-0.004	3.7 %	//
t- Statistics	1.338	1.493	0.87	//	1.37

This regression brings a few modifications to our preceding conclusions (see Table 6). For GAN, AXA and AGF, the beta value for share becomes significant; however, the beta rate for AXA is no longer significant, while SAFR gets a significant beta rate.

Table 6: The Flannery and James Model with three Factors

	Residues	Rate	Index	Constant	R^2	F
AXA	-0.011	-0.098	0.650	0.013	9.13 %	2.370
t	-0.028	-0.096	2.617**	0.186		
SCOR	-0.471	-0.697	0.675	0.050	16.60 %	4.695*
t	-1.535	-0.799	3.176*	0.779		
CARDIT	0.257	0.460	0.734	-0.025	13.09 %	3.569*
t	0.776	0.492	3.180*	-0.332		
GAN	0.028	-0.496	1.097	0.015	26.00 %	8.340*
t	0.089	-0.539	4.832*	0.225		
SAFR	0.066	-1.866	0.293	0.146	13.97 %	3.841*
t	0.268	-2.639**	1.698	2.743*		
AGF	-0.050	-0.287	0.802	0.011	25.22 %	7.987*
t	-0.209	-0.417	4.757*	0.233		
Average	**-0.0301**	**-0.498**	**0.7085**	//	//	//

*significant at the 99% level ** significant at the 95% level

Empirical Study Extended to the Other Markets (British and Swiss)

The results obtained on the preceding French market are perhaps linked to various regulations internal to the country. A similar study can be realized on other markets, i.e. the Swiss and British markets. The same tests are carried out, but they do not take real estate into account since data on this variable is unavailable.

The Financial Data

The list of financial institutions quoted in each of these two countries and their quotations have been obtained from the DataStream database. The quotations must be revised by incorporating operations on capital (divisions of shares, conversion of convertible bonds, etc.) and dividends disbursed to shareholders. These financial data are available in the Bloombery database (see list of financial institutions by country, FFSA, 2000).

Both markets have a different regulation for that of finance. For instance, a financial institution in Great Britain or Switzerland has several types of shares quoted on its own domestic market. In accordance with the right to vote linked to the share, there exist three main categories of shares. The Bearers are bearer stock shares. The so-called registered securities (REG) require the endorsement of the board of directors for any purchase of sale. Both of these securities (or shares) are less liquid. Castly, the so called preferred stocks (PREF) do not have voting rights attached to them but are given priority when dividends are distributed. More specifically, Swiss stocks are of the registered and bearers types, but preferred stocks are equity bonds.

Market indexes most reflect the market in the best way possible, and take into account the re-investments of the dividends disbursed by the firms operating the market. Each country's indices must be comparable to one another. This is why the index retained for each market is that of Morgan Stanley Capital International (MSCI), with re-investments of dividends. The interest rate index retained is also the 10 year swap. The study period goes from February 1992 to May 2000, in monthly data.

Results of Independent Regressions

The results obtained are presented in Tables 7 and 8 below.

Table 7: Results of Independent Regressions on the British Market

	Ratet-1	Rate t	Global Beta	R^2	F	Rt-1	Rt	Bêta global	R^2	F
Prudential **t**	0.070 0.360	-0.966 -4.815*	-0893	43.70 %	11.624 *	-0.281 -1.893	1.137 7.639 *	0.857	47.89 %	30.259 *
L.D.N & Manc **t**	-0.183 -0.970	-0.560 -3.002*	-0.760	13.95 %	5.254*	0.291 1.895	0.880 5.709 *	1.172	36.20 %	18.708 *

Legal General **t**	0.040 0.195	-0.870 -4.094*	-0.829	20.47%	8.384*	0.206 1.193	1.150 6.600*	1.358	41.02%	22.982*
Britannic **t**	-0.230 -0.964	-0.541 -2.222**	-0.773	8.77%	3.120	0.182 0.820	0.715 3.205*	0.898	14.59%	5.626*
Willis Corroon **t**	0.557 1.998	-0.998 -3.522*	-0.440	19.15%	7.689*	0.187 0.693	0.978 3.590*	1.166	17.17%	6.829*
Sedgwick **t**	0.627 2.330	-0.751 -2.746**	-0.122	15.65%	6.021*	0.310 0.210	0.864 3.359*	1.175	16.72%	6.610*
Royal & Sun **t**	0.204 0.878	-0.949 -3.999*	-0.743	20.09%	8.155*	-0.028 -0.137	1.229 6.080*	1.194	35.93%	18.495*
London **t**	0.012 0.039	-0.433 -1.139	-0.419	5.13%	0.647	-0.062 -0.224	0.435 1.430	0.373	7.97%	1.082
Inde.GP **t**	0.008 0.017	0.075 0.148	0.083	0.010%	0.012	0.417 1.121	0.462 1.155	0.880	8.66%	1.186
Guardian **t**	-0.177 -0.611	-1.063 -3.561*	-1.241	30.77%	6.660*	0.139 0.574	1.227 5.052*	1.366	28.43%	13.10*
General Accident **t**	-0.011 -0.057	-0.870 -3.937*	-0.882	19.35%	7.811*	-0.192 -1.123	1.274 7.412*	1.082	45.65%	27.710*
Commercial Union **t**	0.029 0.170	-0817 -4.543*	-0.787	24.14%	10.327*	-0.253 -1.822	1.103 7.939*	0.850	49.67%	32.495*
Average	**0.0789**	**-0.7285**	**-0.6505**			**0.0628**	**0.9545**	**1.0310**		

*significant at the 99% level ** significant at the 95% level

Table 8: Results of Independent Regressions on the Swiss Market

	Rate t-1	Rate t	Beta global	R^2	F	Rt-1	Rt	Beta global	R^2	F
Zürich Inr. **t**	-0.298 -2.506**	-0.492 -4.187*	-0.791	27.76%	11.80*	0.214 1.730	0.963 7.846	1.179	50.98 %	32.98*
Winter Thur **t**	-0.290 -1.913	-0.411 -2.750**	-0.701	19.30%	5.40*	-0.010 -0.066	0.957 5.732*	0.947	34.90%	15.975*
Vaudoise **t**	-0.239 -1.425	-0.223 -1.359	-0.463	5.99%	1.907	0.008 0.049	0.772 4.065*	0.781	21.10%	8.279*
Swiss Re **t**	-0.251 -0.759	-0.673 -2.227**	-0.924	35.01%	3.45**	0.327 0.659	1.012 2.170*	1.340	25.98%	2.550
Rentenanstal p. **t**	-0.434 -2.257**	-0.245 -1.296	-0.682	9.87%	3.332**	0.115 0.482	0.560 2.320*	0.675	8.50%	2.888

Hel Vetia **t**	-0.041 -0.432	-0.158 -1.670	-0.200	4.67%	1.476	-0.099 -0.813	0.213 1.786	0.117	5.62%	1.844
Berner R. **t**	-0.113 -0.826	-0.172 -1.276	-0.286	3.59%	1.135	-0.272 -1.654	0.497 3.041*	0.225	15.49%	5.711*
Baloise R. **t**	-0.246 -1.442	-0.228 -1.353	-0.4774	5.92%	1.913	0.371 1.947	0.756 3.998*	1.129	25.00%	10.40*
Average	**-0.239**	**-0.3252**	**-0.5651**			**0.0817**	**0.7166**	**0.7991**		

*significant at the 99% level ** significant at the 95% level

The beta share value with Zero lag is significant at the 99% level for all financial institutions, except for the Swiss institutions, Swiss RE and Rentenanstalt, where the beta value is significant at the 95% level, and Helvetia (Swiss) Independent Insurance, London Insurance (British institutions) where the beta is not significant.

The values of the beta share are heterogeneous between the financial institutions of the same country. Thus, the standard deviation is 0.40 in Switzerland and 0.28 in Great Britain. For the same relation, R^2 varies from 5 to 50% for Switzerland and from 7 to 49% for Great Britain. However, we notice that the lowest R_s^2 in each of the countries are linked to regressions whose share beta values are not significant (e.g., the cases of Helvetia with R^2=5.62% for Switzerland, London Insurance with R^2 = 7.97%, Independent Insurance with R^2 = 8.66% for Great Britain.

The share of financial insurance institutions is close to that of the market (beta =1) in Great Britain (1.031). The value of beta share of financial insurance institutions is 0.799 in Switzerland. However, market organization is different in these two countries. We observe that countries with strong regulations have a beta less than 1. The French market lies between the Swiss Market and the British market (Switzerland (0.799) ‹ France (1.016) ‹ Great Britain (1.031).

The regression results of the profitability of financial institutions prices on those of rates are less significant. The R_s^2 and Fs of the regressions are lower than those of regressions of the profitability of share market.

In the UK, on Independent Insurance and London Insurance have insignificant rates for betas. The average beta is – 0.6505. In Switzerland, Swiss RE, Winthertur, Zurich and Retenanstalt have positive beta rates.

Results According to the Stone Model

The Stone test results are presented in Tables 9 and 10 below.

Table 9: application of the Stone Model on the British Market

	Rate Beta	Stock Beta	R^2	F
Prudential **t**	-0.306 -1.610	0.942 5.662*	48.00 %	28.780*
L.D.N & Manc **t**	-0.007 -0.047	0.891 4.529*	33.10 %	16.18*
Legal General **t**	-0.251 -1.139	1.015 4.687*	41.01 %	22.964*
Britannic **t**	-0.123 -0.430	0.654 2.349**	14.10 %	5.38*
Willis Corroon **t**	-0.422 -1.225	0.743 2.210**	18.42 %	7.444*
Sedgwick **t**	-0.191 -0.580	0.770 2.388**	15.28 %	5.980*
Royal & Sun **t**	-0.245 -0.965	1.078 4.345*	37.22 %	19.15*
London **t**	-0.228 -0.540	0.347 1.010	8.86 %	1.220
Independent GP **t**	0.485 0.869	0.622 1.339	6.96 %	0.929
Guardian **t**	-0.554 -1.822	0.913 3.098*	31.50 %	15.179*
General Accident **t**	-0.143 -0.649	1.180 5.496*	44.97 %	26.962*
Commercial Union **t**	-0.219 -1.210	0.965 5.510*	48.27 %	30.752*
Average	**-0.1836**	**0.7810**	//	//

*significant at the 99% level ** significant at the 95% level

Table 10: application of Stone Model on the Swiss Market

	Rate Beta	Stock beta	R^2	F
Zürich Ihr. **t**	-0.271 -2.747*	0.861 6.856*	54.86 %	37.66*
WinterThur **t**	-0.185 -1.356	0.878 5.041*	36.58 %	17.79*
Vaudoise	-0.019	0.765	21.07 %	8.29*

t	-0.118	3.799*		
Swiss Re **t**	-0.471 -1.469	0.796 1.708	34.55 %	3.70*
Rentenanstal p. **t**	-0.089 -0.450	0.527 2.067**	8.48 %	2.867**
Hel Vetia **t**	-0.103 -1.027	0.166 1.309	6.20 %	2.048
Berner R. **t**	-0.067 -0.502	0.452 2.567**	12.22 %	4.32*
Baloise R. **t**	-0.022 -0.136	0.770 3.744*	20.56 %	7.996*
Average	**-0.1538**	**0.6518**	//	//

*significant at the 99% level ** significant at the 95% level

The Stone test validates the preceding results. This means that Independent Insurance, London Insurance (British financial institutions), Swiss Re and Helvetia (Swiss institutions) have insignificant betas. The rank of beta share values between the two markets is maintained. Great Britain has a beta of 0.7810 whereas Switzerland has a beta value of 0.6518.

The betas of shares are less volatile on a given market. Thus the standard deviation amounts to 0.22 in Switzerland (whereas previously it was 0.40). However, only the British market is volatile with a standard deviation of 0.33 (against 0.28 previously). The only significant rate is that of Zurich Insurance.

Results According to the Flannery James Model

Flannery and James' first regression is one of the profitability of rates on that shares (see Table 11 below). All the coefficients are significant.

Table 11: Results of the First Regression of the Flannery and James Test

	Rate Beta	t- test	R^2	F
Great Britain	-0.578	-6.118*	34.78 %	38.10*
Switzerland	-0.270	- 2.846*	9.95 %	9.01*

*significant at the 99% level ** significant at the 95% level

The Flannery and James test also validates the results of preceding tests. Commercial Union, General Accident and London Insurance in Great Britain (see Table 12 below) have a specific rate risk which must be added to the market risk. However, no Swiss financial institution presents any specific rate risk (see Table 13).

Table 12: Second Regression Results of the Flannery and James Test for Great Britain

	Residues Beta	Rate Beta	R^2	F
Prudential **t**	0.976 4.346*	-0.156 -0.839	22.98 %	9.82*
L.D.N & Manc **t**	0.912 4.308*	-0.037 -0.222	28.00 %	9.33*
Legal General **t**	1.047 4.199*	-0.164 -0.787	21.78 %	9.170*
Britannic **t**	0.681 2.375**	0.229 0.960	8.91 %	3.225*
Willis Corroon **t**	0.775 2.166**	-0.183 -0.613	7.15 %	2.549*
Sedgwick **t**	0.794 2.364**	-0.122 -0.437	8.11 %	2.910*
Royal & Sun **t**	1.107 4.060*	-0.437 -1.888	23.40 %	10.10*
London **t**	0.163 0.499	0.876 2.567**	23.79 %	3.905*
Independent GP **t**	0.548 1.157	0.328 0.666	8.28 %	1.123
Guardian **t**	0.950 2.894*	-0.524 -1.911	15.60 %	6.080*
General Accident **t**	1.205 5.163*	-0.576 -2.939*	35.13 %	17.87*
Commercial Union **t**	0.990 4.859*	-0.353 -2.057**	29.89 %	14.06*
Average	**0.8457**	**-0.0932**		

*significant at the 99% level ** significant at the 95% level

Table 13: Second Regressions Results of the Flannery and James Test for Switzerland

	Residues Beta	Rate Beta	R^2	F
Zürich Ihr.	0.861	-0.003	54.86 %	37.666*

t	6.847*	-0.463		
Winter Thur **t**	0.878 5.042*	-0.008 -1.354	36.47 %	17.796*
Vaudoise **t**	0.765 3.799*	-0.002 -0.375	21.10 %	8.230*
Swiss Re **t**	0.794 1.708	0.006 0.438	34..59 %	3.687*
Rentenanstal p. **t**	0.526 2.067**	-0.227 -1.202	8.47 %	2.870*
Hel Vetia **t**	0.168 1.308	-0.146 -1.641	6.18 %	2.033
Berner R. **t**	0.451 2.565**	-0.186 -1.423	12...20 %	4.343*
Baloise R. **t**	0.431 3.724**	-0.222 -1.449	20...51 %	7.994*
Average	**0.6092**	**-0.07075**	//	//

*significant at the 99% level ** significant at the 95% level

Thematic Analyses of Betas

The beta values in each country are heterogeneous. The shares studied have different characteristics (nature of shares), and reflect a variety of activities (financial institutions of credit life, mixed, etc.). From the annual report of financial institutions, it is possible to define the main activity of the listed institution. Information on the shares is presented by FFSA 2000. The betas compared are those of shares and overall rates (i.e. the sum of the beta of variable of order 0 and order 1)

The type of activity has an impact on the beta (see Table 14 below). In fact, each activity implies different risks and different portfolios of assets. The more diversified the financial institution, the more its behavior is identical that of the market, and consequently, its beta tends to be closer to 1. Moreover, credit life financial institutions have a beta share higher than that of diversified financial institutions (1.08 versus + 0.799 for the beta share, and – 0.907 versus – 0. 746 for the rate beta). The direction of this relation is the reverse of the one observed in the studies of Borde, Chambliss and Madura (1994), and Hoyt and Trieshmann (1991) on the US market.

Table 14: Impact of Activity on the Share Beta

Activity	Rate Beta	Beta
Broker	-0.310	1.063
Diversified	-0.746	0.799
Reinsurance	-0.976	1.047
Life	-0.907	1.108
Total	-0.734	0.968

These authors obtained a beta value of 0.92 for diversified financial institution versus 0.84 for credit life financial institutions.

However, brokers have a share beta closer to 1 (i.e. 1.063). They seem to be less exposed to risk of interest rates with a beta of - 0.310.

Table 15: Impact of Share Type on Share Beta

Share type	Rate Beta	Share Beta
Bearer	-0.799	1.003
Equity bond	-0.683	0.674
Registered	-0.630	0.815
Preferred	-0.849	1.050
Total	-0.734	0.968

Reinsurance activities have a beta share of 1.047 and a beta rate of – 0.976. The shares of the reinsurance institution have behavior to that of the market than diversified financial institutions.

The nature of the share may have an impact on the beta insofar as it is synonymous to a different liquidity (Table 15). Preferred and bearer shares have beta shares closer to 1 (i.e. 1.003 and 1.050 respectively) and a rate beta close to – 0.8 (-0.779 and 0. 849 respectively). Registered shares and equity bonds have lower betas (0.815 and 0.274) for their betas share, and (- 0.630 and – 0.683) for their betas' rates. The trading conditions of these shares make them less sensitive to market evolution.

In the final analysis, the share beta of French financial institutions is positive and significant. Moreover, there also exists a significant interest rate for risk. But no significant relationship occurs between the profitability of shares and that of the real estate (housing) market.

The beta of French financial insurance institutions is close to 1.0 (i.e. 1.0185). The beta of British financial institutions is 1.031, while the beta of Swiss financial institutions is less important. These differences mark the different nature of controls between countries.

The evolutions of the net worth of credit life and reinsurance financial institutions are closer to those of the share market than diversified financial institutions. The brokerage activity displays little sensitivity to evolution in interest rates.

The evolutions of preferred and bearer share are closer to those of stock markets and interest rate than to those of registered shares and equity participation bond.

Conclusion

The purpose of this paper was to analyze the impact of financial variables on the balance sheet and the market value of credit life financial institutions, putting the idea which underlies then forward in the even (same time) time the applications capable to permit the operational redeployment.

The analyses carried out during this research have allowed us to draw some results and to propose a modeling of the evaluation and monitoring of financial risks sustained by credit life financial institutions. The analysis also shows the existence of risk assessment models which depend on the evolution of financial markets. The illustrative models are calculations required by the SEC'S report for all financial institutions quoted in Wall Street and an actuarial approach. These are static models. However, future risk is captured better by a dynamic rather than a static risk model.

The dynamic models revolve around assumptions about the evolution of asset values and correlations. On the basis of these elements, a calculation of the amount of equity capital is performed. When a financial institution is listed, Equity capital appreciates in accordance the stock market value of its shares.

The sensitivity of the value of these shares to the evolution of financial markets constitutes an indicator that may be used by investors to assess financial risks. The betas of French and British financial insurance institutions are close to 1.0, while the beta of Swiss institutions is low at 0.79. The regulatory effect by country, but also the type of activity and the nature of the share, have an impact on the beta of shaves. The more liquid a share, the closer its beta is to that of the market. Moreover, a share held by a financial insurance institution whose activity is diversified has a lower beta than financial life insurance and reinsurance institutions.

Finally, the balance sheet of investments and commitments of credit life financial institutions is linked to a portfolio of financial products (instruments) whose value depends on the evolution of economic and financial variables. Simultaneously, the sensitivity of the net worth of a financial institution to the evolution of financial variables values is determined by stock market prices.

Notes

1. OAT TEC 10 is a purchase option of structured obligation, with fixed rate of maturity 10 years whose coupon is fixed during the first years, between 2 and 4 years, then variable depending of the rate of the obligation.

2. Prat (1998) in ‘’ Impact des variables économiques et financiers sur les bilans des compagnies d’assurances en France’’, illustrates its text with additional statistical data.

3. Article R.332-20 (Replaced by D.94-481, June 8, 1994 article 2) evaluations of assets-with the exception of values listed as provided for in Article R.332.19, the assets mentioned in article R.332.2 and other financial and real estate investments are entered in the balance sheet and the basis of the purchase prices or the cost prices.

4. The European Union totaled about 4975 billion CFAF of encashments in 1998. France ranks first as a collector of insurance premiums amounting to 11703 billion CFAF during the same year.

5. Swap 10 years carried on interest rates or on change rates in maturity 10 years. It is about an engagement between 2 parts which proceeds to exchanges of liquidity flux to maturity 10 years.

References

Amenc N et LeSourd V., (2003), *Théorie du portefeuille et analyse de sa a performance*, Economica.

Black F. et Scholes M., (1973), «The Pricing of Options and Corporate Liabilities », *Journal of Political Economy*, mai- juin, pp637-654

Borbalan L., (1996), *Etude empirique de l'influence des taux d'intérêt sur les cours de la bourse des principaux établissements de crédit français*, Thèse d'Etat, Université Aix-Marseille III, Marseille.

Bodie Z et Morton R., (2000), *Finance*, Prentice Hall.

Borde S, Chambliss K et Madura J., (1994), « Explaining Variation in Risk Across Insurance Companies », *Journal of Financial Services Research,* 8, PP 117-191.

Briys E. et Viala P., (1995), *Elément de théorie financière,* Nathan, Paris.

Briys E. et Varenne (de) F., (1993) *Life Insurance in a contingent Claim Framework: Pricing and regulatory implications,* October, EGRE.

Brie B. (de), (1998), «Performances des OPCVM: mode d'emploi», *Revue Banque*, n° 591

Change D et Lane W., (1980), « A Re-examination of Interest Rate Sensitivity in the Common Stock of Financial Institution», *Journal of Financial Research*, n0 3, PP 49-55.

Dimson E., (1979), « Risk Measurement When Shares are Subject to Infrequent Trading », *Journal of Financial Economics*, 7, PP 197-226.

Eichholtz P. et Hartzell D., (1996), « Property Shares, Appraisals and the Stock Market: An International Perspective », *Journal of Real Estate Finance and Economics*, 12, pp163-178.

Flannery MJ et Mayer CM (1984), « The *Institute of Actuaries*, Vol, 119.effect of interest rate Changes on the common stock returns of financial institutions», *Journal of Finance*, 39, PP 1141-1153.

Franks J.R. et Mayer C., (1997), « Ownership, Control and the Performance of German Corporations », Seminar de l'AFFI, juin.

Hartzell D, Hekman J et Miles M., (1986), «Diversification Categories in Investment Real Estate », *AREUEA Journal*, 14, PP 230-254.

He L, Myer F et Webb J., (1996), «The Sensitivity of Bank Stock Returns to Real Estate», *Journal of Real Estate Finance and Economics*, 12, PP 203-220.

He, Myer et Webb, (2000), '*'The Transmission of Shocks Across Reel Estate Investment Trust*'', Applied Financial Economics, Vol 14, n°17 nov15, PP 1211-1217.
He, Myer et Webb, (2000), '*'The Transmission of Shocks Across Reel Estate Investment Trust*'', Applied Financial Economics, Vol 14, n°17 nov15, PP 1211-1217.
Ho, T. S. Y., (1992), «Key Rates Durations: Measures of Interest Rate Risks», *Journal of fixed Income*

Hoag J., (1980), «Towards Indices of Real Estate Value and Return », *Journal of Finance*, 35, PP 569-580.

Hoesli M. et Thion B., (1996), «Investissement immobilier: rentabilité, risque et diversification de portefeuille », *Banque et Marchés*, n° 22, mai juin, pp5-11.

Ho T. et Lee S., (1996), «Term Structure Movements and Pricing Interest Rate Contingent Claims », *Journal of Finance*, vol.41, n°5, pp1011-1029.

Hoyt R et Trieschmann J., (1991), «Risk/ Return Relationships for Life- Health, Property- Liability, and diversified Insurers», *The Journal of Risk and Insurance*, 58, 2, PP 322-330.

Lintner J., (1965), « he Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets », *Review of Economics and Statistics*, P. 13-37.

Lintner J., (1965), «The Aggregation of Investor's Diverse Judgments and Preferences in Purely Competitive Security Markets », *Journal of Financial and Quantitative Analysis*, vol. 4, no 4, P. 347-400.

Lizieri C. et Satchell S., (1997), «Interactions between Property and Equity Markets: an Investigation of Linkages in the United Kingdom », *Journal of Real Estate Finance and Economics*, 15, pp 11-26.

Mayer C., (1994), *Stock Markets, Financial Institutions and Corporate Performance*, Capital Market and Corporate Governance.

Mei J et Lee A., (1994), «Is There a Real Estate Factor Premium? », *Journal of Real Estate Finance and Economics*, 9, PP 113-126.

Merton R., (1973), « Theory of Rational Option Pricing », *Bell Journal of Economics and Management Science*, 4, PP 141-1-183.

Merton R., (1976), « Option Pricing When Underlying Stock Returns are discontinuous», *Journal of Financial Economics*, January-March, PP 125-144.

Oertmann P, Rendu C et Zimmermann H., (1996), *Interest Rate Risk of Financial Corporations' Equity Returns: an European Perspective*, séminaire de l'AFFI, juin.

Prat I., (1998), «Impact des variables économiques et financières sur le bilan des compagnies des assurances en France», Thèse de Doctorat, Paris I, Paris Parant P., (1995), « Les actions de sociétés d'assurances sont- elles des valeurs de taux», *Option finance*, n° 357, PP 26-29.

Rerolle J.F., (1996), « Evaluation d'entreprise: Principes et méthodes », *Revue Fiduciaire et comptable*, n^0 223, pp37-72.

Roquemaurel (de) et Scaillet O., (1997), «Comparaison de la rentabilité historique de l'immobilier, des actions, des obligations et du monétaire », *Banque et marchés*, n°28, mai- juin, pp 16-20.

Ross S et Zisler R., (1991), «Risk and Return in Real Estate», *Journal of Real Estate Finance and Economics*, 4, PP 175-190.

Scholes M et Williams J., (1977), «Estimating Beats from non-Synchronous Data», *Journal of Financial Economics*, 5, PP 309-327.

Stone B. K. (1974), «Systematic Interest Rate Risk in a two-index Model of Returns», *Journal of Financial and Quantitative Analysis*, November, PP 709-725.

Wilkie, A D., (1987), « Stochastic Investment Model: Theory and Applications », *ijmn*, 6 1987, 65-83.

Wilkie, A D., (1992), « Report on the Wilkie Stochastic Investment Model», *Journal of the Institute of Actuaries*, Vol, 112.

Wilkie, A D., (1995), « More on a Stochastic Investment Model for Actuarial Use », *Journal of the Institute of Actuaries*, Vol, 119.

Wilkie, A D., Waters, H R. and Yang, S Y., (2003), « Reserving, pricing and Hedging for Policies with Guaranteed Annuity Options», *British Actuarial Journal*, 9(2), 263-426.