The quantified analysis of causes of market risk fluctuations in the group of construction, real estate and construction material companies in Vietnam during and after the global crisis 2007-2011

HOANG THANH HANH
Thuong Mai University Ha noi, VIETNAM

LE THI VIET NGA
Thuong Mai University Ha noi, VIETNAM

DINH TRAN NGOC HUY
Banking University of Ho Chi Minh city, VIETNAM
and Graduate School of International Management, International University of Japan, Niigata, JAPAN

LUONG MINH LAN
Van Lang University, Ho Chi Minh city, VIETNAM

PHAM MINH DAT
Thuong Mai University Ha noi, VIETNAM

Abstract: - This research analyzes the fluctuations on market risk for the listed firms in the Vietnam real estate, construction and construction material industries as it becomes necessary, esp. after the financial crisis 2007-2011. It also provides us with a model to identify key causes of these above risk fluctuations. Firstly, by using quantitative and analytical methods to estimate asset and equity beta of the total 205 listed companies in Vietnam’s real estate, construction and construction material industry with a proper traditional model, we found that in the viewpoint of asset beta used as market risk measurement, the construction industry has the lowest risk, next is the construction material industry and real estate one has the highest risk. Secondly, we recognized that in the real estate, construction and construction material industry, the main factors affecting market risk are GDP growth, lending rate, and inflation. Thirdly, by using a proper quantitative analysis method, the study realized that in the viewpoint of asset beta, construction industry has the lowest market risk because of GDP growth decreasing, inflation increasing and average income increasing. On the contrary, real estate industry has the highest market risk because GDP growth decreases and lending rate increases. Finally, this paper provides some outcomes that could provide companies and government with more evidence in establishing their policies in governance and in monitoring these industries.

Key-Words: - construction industry, real estate, exchange rate, lending rate, market risk, policy

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1 Introduction
Vietnam economy experienced high interest rates in 2008, which decreased in 2009 and went up again in 2011 while GDP growth rate reduced in 2009 but recovered in 2010. During the period 2009-2011, the number of real estate transactions in Vietnam declined with huge inventory and real estate price bubble in 2007-2008 has been one of three price bubbles since 1991. In the real estate industry, some companies have investment over their capacity which leads to in-progress projects. In the construction and construction material industry, during difficult economic time, some cement and steel companies reported losses due to lots of inventories, declining purchasing power. And in all three industries, there is pressure of repaying debt and interests and of high production costs.

This paper is organized as follows. The research issues and literature review will be covered in the next sections (2 and 3), for a short summary. Then, methodology and conceptual theories are introduced in sections 4 and 5. Section 6 describes the data in
empirical analysis. Section 7 presents empirical results and findings. Next, section 8 covers the analytical results. Lastly, sections 10 and 11 will present discussion and conclude with some policy suggestions. This paper also supports readers with references, exhibits and relevant web sources. Another point of this paper’s usefulness is that it indicates the higher exchange rate and lending rate, the higher market risk. Hence, it contributes to a suitable macro policies for banks and foreign exchange.

2 Problem Formulation

2.1. Research issues

This study focuses on several issues in the construction company group as followed:
Issue 1: Summarizing market risk fluctuations in the three industries: construction, real estate and construction material
Issue 2: Analyzing the impact of financial leverage (FL) changes on the market risk of three above industries
Issue 3: Identifying causes of the above analysis and giving out some suggestions or solutions.

2.2. Literature review

Probably, the most successful models to account for the time-dependent volatility in financial time series are GARCH processes [7]. Findings found that firms which maintain good governance structures have leverage ratios that are higher (forty-seven percent) than those of firms with poor governance mechanisms per unit of profit [13]. Research stated today, the assumption of efficient capital markets is very controversial, especially in these times of crisis, and is challenged by research showing that the pricing was distorted by detection of long memory [4].

Study also indicated in the three factor model that “value” and “size” are significant components which can affect stock returns. They also mentioned that a stock’s return not only depends on a market beta, but also on market capitalization beta. The market beta is used in the three factor model, developed by Fama and French, which is the successor to the CAPM model by Sharpe, Treynor and Lintner [3]. Research mentions that equity volatility increases proportionally with the level of financial leverage, the variation of which is dictated by managerial decisions on a company’s capital structure based on economic conditions. And for a company with a fixed amount of debt, its financial leverage increases when the market price of its stock declines [1]. Then, as research result pointed, the task of estimating cost of equity in emerging markets is more difficult because of problems such as collecting data in short periods [10]. And study revealed that in different industries in Sri Lanka, the degree of financial leverage has a significant positive correlation with financial risk [6]. Finally, financial leverage can be considered as one among many factors that affect business risk of wholesale and retail firms.

2.5 Methodology

In order to estimate systemic risk results and leverage impact, in this study, we use the live data during the crisis period 2007-2011 from the stock exchange market in Vietnam (HOSE and HNX and UPCOM).

In this research, analytical research methods, philosophical methods and specially, leverage scenario analysis methods are used. Analytical data is obtained from the situation of listed wholesale and retail firms in VN stock exchange and the current tax rate is 25%.

In addition to, quantitative analysis method is used to analyze economic data and identify causes of the empirical findings. Data is from the stock exchange as followed:

Table 0 – The number of Vietnam listed firms in the three above industries

| Market | Listed Real Estate companies (1) | Listed Construction companies (2) | Listed Construction Material companies (3) | Note (4) |
|--------|---------------------------------|----------------------------------|-------------------------------------------|----------|
| Viet Nam | 23                              | 77                               | 45                                        | estimating by traditional method |
|         | 22                              | 27                               | 12                                        | estimating by comparative method |
| Total   | 44                              | 104                              | 57                                        | Total firms in groups: 205 |

(Note: The above data is at the December 12th, 2012, from Viet Nam stock exchange)

Finally, we use the results to suggest a policy for these enterprises, relevant organizations and government.

3 Problem Solution

The study analyzes data of a total of 205 listed firms in the above three industries on VN stock exchange (HOSE and HNX mainly).

In this part, the current level of financial leverage is kept as in the 2011 financial statements which is used to calculate market risk (beta). Then, quantitative
analysis with the support of Eview is used to identify causes of the findings.

Market risk (beta) under the impact of the financial leverage, includes: 1) equity beta; and 2) asset beta.

Table 1 – Market risk level in three industries: real estate, construction and construction material

| Equity beta | No. of firms | Financial leverage (average) | Ratio |
|-------------|--------------|-------------------------------|-------|
| < 0         | 0            | 0.0%                          | 0.0%  |
| 0 < beta < 1| 96           | 62.0%                         | 46.1% |
| Beta > 1    | 110          | 63.6%                         | 53.8% |
| Total       | 205          | 63.2%                         | 100.0%|

| Asset beta | No. of firms | Financial leverage (average) | Ratio |
|------------|--------------|-------------------------------|-------|
| < 0        | 0            | 0.0%                          | 0.0%  |
| 0 < beta < 1| 196         | 33.5%                         | 95.8% |
| Beta > 1   | 9            | 184.4%                        | 4.4%  |
| Total      | 205          | 63.2%                         | 100.0%|

Furthermore, the construction industry experienced the largest gap between equity and asset beta (0.799), next is the construction material industry (0.554) and the last is the real estate one (0.487). Hence, FL has the most effective impact on the construction industry, next is the construction material industry and the last is the real estate one. It is the construction industry that has the biggest fluctuation between equity and asset beta var, next is the construction material industry and the last is the real estate one.

Table 2 – Market risk level statistic results in real estate, construction and construction material company group 2007-2011

| Statistic results | Equity beta | Asset beta (assume debt beta = 0) | Difference |
|-------------------|-------------|----------------------------------|------------|
| MAX                | 1.777       | 1.598                            | 0.190      |
| MIN                | 0.070       | 0.019                            | 0.052      |
| MEAN               | 0.937       | 0.441                            | 0.497      |
| VAR                | 0.2466      | 0.1111                           | 0.135      |

Note: Sample size : 44 (real estate industry)

| Statistic results | Equity beta | Asset beta (assume debt beta = 0) | Difference |
|-------------------|-------------|----------------------------------|------------|
| MAX                | 2.884       | 1.458                            | 1.427      |
| MIN                | 0.115       | 0.006                            | 0.107      |
| MEAN               | 1.106       | 0.307                            | 0.799      |
| VAR                | 0.2527      | 0.0640                           | 0.189      |

Note: Sample size : 104 firms (construction)

| Statistic results | Equity beta | Asset beta (assume debt beta = 0) | Difference |
|-------------------|-------------|----------------------------------|------------|
| MAX                | 3.693       | 1.807                            | 1.885      |
| MIN                | 0.129       | 0.044                            | 0.085      |
| MEAN               | 1.011       | 0.456                            | 0.554      |
| VAR                | 0.2639      | 0.1101                           | 0.174      |

Note: Sample size : 57 firms (material)

The above table 1 and 2 give us some results: the construction industry has the lowest beta volatility with the gap of 1.45 (between asset beta max and min) while the real estate industry has the second lowest beta volatility (the gap is 1.57), and the construction material has the largest beta volatility (the gap is 1.77).

Chart 1 – Equity and asset beta of construction company group 2007-2011

The above chart 1 generates some results: Equity beta in the construction industry is the highest, and the lowest is in the real estate industry. Asset beta in the construction material industry is the highest, the lowest is in the construction industry.

Then, equity beta volatility in the construction material industry is the highest, the lowest is in the real estate one. Asset beta volatility in the real estate industry is the highest, the lowest is in the construction industry.

Therefore, in the viewpoint of asset beta used as market risk measurement, the construction industry has the lowest risk, next is the construction material industry and real estate one has the highest risk.

The analysis of causes:

The key reasons of the above findings will be presented in the following section under a quantitative analysis.
The above table 3 and 4 show that mean of asset beta is 0.253 and the median is 0.278 (low).

With SER01 = asset beta, SER02=Lending rate, SER03=VNIndex, SER04=inflation, SER05=exchange rate, SER06=GDP growth rate, SER07= average income per capita, the regression result with Eview gives us:

\[
\text{SER01} = 0.46 + 2.65 \times \text{Lending rate} - 0.0003 \times \text{VNIndex} - 2.04 \times \text{inflation} + 1.89 \times \text{exchange rate} - 7.72 \times \text{GDP growth} - 0.01 \times \text{average income per capita} \quad (\text{equation 1})
\]

Hence, market risk level or asset beta has the positive relationship with lending rate (strongly, 2.65) and exchange rate. The higher the lending rate, the higher market risk.

On the contrary, market risk level or asset beta has the negative relationship with GDP growth (strongly, -7.72), next is inflation (-2.04), average income (-0.01), and VN index (-0.0003). The higher GDP growth and inflation, the bigger market risk. The higher average income and VN index, the bigger market risk.

The main factors are GDP growth (-), lending rate (+) and inflation (-).

The above table 5 and 6 show that mean of asset beta is 0.257 and the median is 0.261 (lower than that of real estate industry).

With SER01 = asset beta, SER02=Lending rate, SER03=VNIndex, SER04=inflation, SER05=exchange rate, SER06=GDP growth rate, SER07= average income per capita, the regression result with Eview gives us:

\[
\text{SER01} = -0.4 + 0.24 \times \text{Lending rate} - 0.0003 \times \text{VNIndex} - 0.89 \times \text{inflation} + 7.95 \times \text{exchange rate} - 1.89 \times \text{GDP growth} - 0.01 \times \text{average income per capita} \quad (\text{equation 2})
\]

Hence, market risk level or asset beta has the positive relationship with GDP growth rate (1.8, differ from
real estate), lending rate (0.24) and exchange rate. The higher GDP growth and lending rate, the higher market risk. On the contrary, market risk level or asset beta has the negative relationship with inflation (-0.89), next is average income per capita (-0.05), and VN index (-0.0003). The lower inflation and VNIndex and average income, the bigger market risk. The higher average income and VN index, the bigger market risk. The main factors are GDP growth (+, differ from real estate and construction material), inflation (-) and lending rate (+).

Table 7 – Construction material industry, (asset beta), Equation estimation with Eview 2007-2011

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|----------|-------------|------------|-------------|-------|
| C        | -0.022183   | 0.751024   | -0.033750   | 0.9761 |
| SER02    | 0.669226    | 1.869695   | 0.44147     | 0.6731 |
| SER03    | 0.000223    | 0.000510   | -0.046874   | 0.7278 |
| SER04    | -0.763588   | 0.956372   | -0.797093   | 0.4374 |
| SER05    | 3.61605     | 4.062406   | 0.897433    | 0.3721 |
| SER06    | -3.318397   | 3.239190   | -1.039827   | 0.0007 |
| SER07    | -0.020574   | 0.021917   | -1.160005   | 0.4566 |

R-squared 0.238003 Mean dependent vari 0.185000
Adjusted R-squared -0.181920 S.D. dependent vari 0.241220
S.E. of regression 0.021478 Akaike info criterion 5.025475
Sum squared resid 0.000356 Schwat criterion 4.893503
Log likelihood 27.09290 P-statistic 0.019560
Durbin-Watson stat 2.468646 Prob(P-statistics) 0.885872

Table 8 – Construction material industry, 2007-2011, Descriptive statistics

| Variable | Mean | Median | Minimum | Maximum | Sample Size |
|----------|------|--------|---------|---------|-------------|
| SER01    | 0.465000 | 0.465000 | 0.136000 | 0.990000 | 100          |
| SER02    | 0.000000 | 446.5000 | 0.123000 | 187.9070 | 0.000000 100 |
| SER03    | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 100 |
| SER04    | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 100 |
| SER05    | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 100 |
| SER06    | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 100 |
| SER07    | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 100 |

Hence, market risk level or asset beta has the positive relationship with lending rate (0.7) and exchange rate. The higher exchange rate and lending rate, the higher market risk. On the contrary, market risk level or asset beta has the negative relationship with GDP growth (-1.32), inflation (-0.77), next is average income per capita (-0.03), and VN index (-0.0002). The lower inflation, GDP growth, and VNIndex and average income, the bigger market risk. The higher average income and VN index, the bigger market risk. The main factors are GDP growth (-, differ from real estate and construction), inflation (-) and lending rate (+).

Table 9 – Real estate (equity beta), Equation estimation with Eview 2007-2011

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|----------|-------------|------------|-------------|-------|
| C        | 1.855169    | 0.364466   | 1.091763   | 0.0006 |
| SER02    | 6.391298    | 1.195156   | 3.710164   | 0.0002 |
| SER03    | -1.004430   | 1.002808   | -0.991762  | 0.0000 |
| SER04    | -4.281641   | 1.261004   | -3.391762  | 0.0006 |
| SER05    | -2.541298   | 0.623065   | -4.020627  | 0.0000 |
| SER06    | -0.256714   | 3.470294   | -4.703765  | 0.0000 |
| SER07    | 0.016349    | 0.026879   | 0.583643   | 0.5666 |

R-squared 0.994325 Mean dependent vari 0.751765
Adjusted R-squared 0.990030 S.D. dependent vari 0.151161
S.E. of regression 0.000300 Akaike info criterion 4.402426
Sum squared resid 0.000319 Schwat criterion 4.414771
Log likelihood 24.579313 P-statistic 0.141123
Durbin-Watson stat 2.468646 Prob(P-statistics) 0.885872

The above table 7 and 8 show that mean of asset beta is 0.161 and the median is 0.164 (lower than those of real estate and construction industry). The regression result with Eview gives us:

\[ \text{SER01} = -0.03 + 0.7\text{lending rate} -0.0002\text{VNIndex} - 0.77\text{inflation} + 3.91\text{exchangerate} - 1.32\text{GDPgrowth} -0.03\text{average income} \] (equation 3)

The above table 9 and 10 show that mean of equity beta is 0.792 and the median is 0.855 (lower than 1).
The regression result with Eview gives us:

\[
\text{SER01} = 1.87 + 6.38 \text{lending rate} - 0.0004 \text{VNIndex} - 4.23 \text{inflation} - 2.54 \text{E*exchangerate} - 20.57 \text{GDPgrowth} + 0.02 \text{average income} \quad (\text{equation 4})
\]

Hence, market risk level or equity beta has the positive relationship with lending rate (strongly, 6.38) and average income (0.02). The higher average income and lending rate, the higher market risk.

On the contrary, market risk level or asset beta has the negative relationship with GDP growth (strongly, -20.57), inflation (-4.23), next is VN index (-0.0004) and exchange rate (2.54E). The lower inflation, GDP growth, and VNIndex and exchange rate, the bigger market risk.

The main factors are GDP growth (-), inflation (-) and lending rate (+).

### Table 11 – Construction (equity beta), Equation estimation with Eview 2007-2011

| Variable | Coefficient | Std Error | t-Statistic | Prob. |
|----------|-------------|-----------|-------------|-------|
| C        | -2.063898   | 4.449801  | -0.461908   | 0.6465 |
| SER02    | 1.367072    | 0.015151  | 9.07396     | 0.9065 |
| SER03    | 0.000147    | 0.000217  | 0.066065    | 0.9496 |
| SER04    | -4.785794   | 0.710082  | -6.78963    | 0.5985 |
| SER05    | 0.000429    | 0.000227  | 1.757393    | 0.3609 |
| SER06    | 9.180803    | 1.979214  | 4.630721    | 0.7229 |
| SER07    | 0.018902    | 0.130327  | -0.018524   | 0.9943 |

R-squared: 0.930317 Mean dependent var: 1.352000
Adjusted R-squared: 0.921309 S.D. dependent var: 0.154703
S.E. of regression: 0.138961 Akaike info criterion: -1.467395
Sum squared resid: 0.001001 Schwarz criterion: -1.397364
Log likelihood: 2.126959 F-statistic: 1.325620
Durbin-Watson stat: 2.489848 Prob(F-statistic): 0.989159

The above table 11 and 12 show that mean of equity beta is 1.352 and the median is 1.375 (higher than 1 and than that of real estate).

The regression result with Eview gives us:

\[
\text{SER01} = -2.26 + 1.39 \text{lending rate} - 0.002 \text{VNIndex} - 4.79 \text{inflation} + 0.0004 \text{exchangerate} + 9.19 \text{GDPgrowth} - 0.26 \text{average income} \quad (\text{equation 5})
\]

Hence, market risk level or equity beta has the positive relationship with GDP growth (strongly, 9.19), lending rate (1.39) and exchange rate (0.0004). The higher GDP growth, exchange rate and lending rate, the higher market risk. On the contrary, market risk level or asset beta has the negative relationship with inflation (-4.79), next is average income (-0.26) and VNIndex (-0.002). The lower inflation, average income, and VNIndex and exchange rate, the bigger market risk.

The main factors are GDP growth (+, differ from real estate), inflation (-) and lending rate (+).
The above table 13 and 14 show that mean of equity beta is 0.828 and the median is 0.843 (lower than 1 and than those of construction and real estate).

The regression result with Eview gives us:

\[
SER01 = -0.2 + 3.29lendingrate -0.001VNIndex - 3.78inflation + 0.0002exchangerate - 6.31GDPgrowth -0.13averageincome
\]  
(equation 6)

Hence, market risk level or equity beta has the positive relationship with lending rate (3.29) and exchange rate (0.0002). The higher exchange rate and lending rate, the higher market risk.

The main factors are GDP growth (+, differ from construction), inflation (-) and lending rate (+).

**Analysis of causes:**

Comparing three (3) industries (+: positive, -: negative), market risk measured by equity beta depends mainly on GDP growth, with the highest level in real estate industry (-20.57), next is construction (+9.19) and the last is construction material (-6.31). Next, market risk measured by equity beta depends on inflation, with the highest level in construction industry (-4.79), next is real estate (-4.23) and the last is construction material (-3.78). The next factor is lending rate, with the highest level in real estate industry (+6.38), next is construction material (+3.29) and the last is construction (+1.39).

And market risk measured by equity beta depends little on average income, with the highest level in construction industry (-0.26), next is construction material (-0.13) and the last is real estate (+0.02).

Looking at exhibit 1,2,3,4,5, showing that:

First, GDP growth rate trend decreasing over years 2007-2011 (exhibit 1) makes:

- Real estate industry: equity beta increases, asset beta decreases
- Construction industry: equity beta decreases, asset beta increases
- Construction material industry: equity beta increases, asset beta increases

Second, lending interest rate trend increasing over years 2007-2011 (exhibit 2) makes:

- Real estate industry: equity beta increases, asset beta increases
- Construction industry: equity beta increases, asset beta increases
- Construction material industry: equity beta increases, asset beta increases
Third, inflation trend slightly increasing over years 2007-11 (exhibit 3) makes:

- Real estate industry: equity beta decreases, asset beta decreases
- Construction industry: equity beta decreases, asset beta decreases
- Construction material industry: equity beta decreases, asset beta decreases

Average income per capita trend increasing over years 2007-11 (exhibit 4) makes:

- Real estate industry: equity beta increases, asset beta decreases
- Construction industry: equity beta decreases, asset beta decreases
- Construction material industry: equity beta decreases, asset beta decreases

From the above analysis, it is noted that equity beta in the construction industry is the highest because of increasing lending rate trend. Equity beta in the real estate industry is the lowest due to increasing inflation trend. And in the viewpoint of asset beta, construction industry has the lowest market risk because GDP growth decreases, inflation increases and average income increases. On the contrary, real estate industry has the highest market risk because GDP growth decreases and lending rate increases.

4. Discussion
Real estate industry has the highest market risk measured by asset beta. Other special reasons are: the number of real estate transactions decreasing, limited real estate loans with high rates. Other reasons include: a tightening monetary policy performed in 2008, global economic crisis impact and companies’ high stock pricing. The impact of high market risk in the real estate industry is that investors might expect a higher ROI, as we can see in the below SML chart showing the relationship between beta and expected return:

Chart 2 – Security market line (SML)

Next, a high beta in real estate industry can lead to a high cost of equity and high cost of capital. Hence, NPV of these firms’ projects or firms’ value will decrease.

5 Conclusion and Policy suggestion
Real estate industry: considering target inflation policy with proper controlled growth rate in order to reduce market risk, other policies including supporting GDP growth and reducing lending interest rates. Construction industry: suggesting reasonable salary and wage increasing policy stage-by-stage and creating more jobs in order to reduce market risk. Construction material industry: encouraging GDP growth policy, lending rate reducing plans and target inflation policy with proper controlled growth rate in order to reduce market risk. Last but not least, the government has to consider the impact on the mobility of capital in the markets when it changes its macroeconomic policies whilst continuing to increase the effectiveness of building the legal system and regulation supporting the plan of developing the real estate, construction material and construction market.

Impacts of this paper in financial engineering: real estate market need to receive more financial products to recover after economic recession, esp. during this stage. Applications of this paper in banking industry: because lending rate has positive correlation with market risk, banks are in favor of decreasing lending rates will help to reduce market risk.

Declaration of Conflicting Interests
The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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**Exhibit**

**Exhibit 1- VNI Index in VN 2007-2011 (declining)**

![VNI Index in VN 2007-2011](image1)

**Exhibit 2- USD Exchange rate in VN 2007-2011 (increasing)**

![USD Exchange rate in VN 2007-2011](image2)