Contents

A Note from the Editor's Board

The YMC Management Review has been published for four volumes so far. The Annual International Conference on Finance, Accounting, I nvestment, and Risk Management (the iFAIR Conference) has been held for three consecutive years. Due to the 311 earthquake that occurred in Japan in early 2011, the iFAIR 2011 conference has now changed its venue to Kaohsiung, Taiwan.

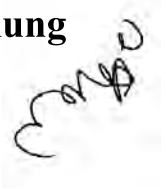
The YMC Management Review publishes two numbers each year. The first number publishes the cooperation of holding the iFAIR conference. The second number, discussed mainly in Mandarin, publishes topics about practical management. The editor's board welcomes all articles that are ready for submission, regarding the practical management discussions or management cases. Furthermore, we hope the YMC Management Review could be included as a member of the Social Science Citation Index (SSCI) in the near future.

This number of the YMC Management Review contains four papers. *Determinants of Foreign Direct Investment Inflows in Vietnam* discusses some determinants about direct foreign investment in Vietnam. *Capital Struc ture of Firms in the Steel Industry of Taiwan* discusses the corporate capital structure in the steel industry of Taiwan. *An Empirical Analysis of Voluntary and Mandatory Disclosure of Financial Forecasts and Accuracy* discusses the effect of the voluntary and mandatory disclosure of financial forecast in Taiwan. Finally, *A Study of Grey VAR on Dynamic Structure between Economic Indicators and Stock Market Indices an Example of Hong Kong*, discusses the dynamic structure between economic indicators and stock market indices in Hong Kong.

Once again, we invite you to submit your paper to the YMC Management Review any time, and we hope to meet you in the iFAIR conference every year in the future.

Editor-in-Chief

CHANG, Alex Kung-Hsiung



Determinants of Foreign Direct Investment Inflows in Vietnam

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ABSTRACT

Foreign capital investment is indispensable part of the social and economic investment for many developing countries. For developing countries-Vietnam, foreign direct investment has become one of the most important sources of capital for development investment, industrialization and modernization.The purpose of this study is to examine the six significant factors to the foreign direct investment inflows in Vietnam over period 1997- 2009. For example, consumer price index in Vietnam, unemployment rate in Vietnam, registered capital, implementation capital and licensing of investment project.

Our results show that the full model find three important factors, unemployment rate (x_2), GDP(x_3) and implementation capital (x_5), affecting foreign direct investment inflows in Vietnam, but we find independent unemployment rate (x_2) and implementation capital (x_5) have obvious problems of collinearity in the regression model by the serial procedure of diagnosis. Thus, we use stepwise method and variance inflation factor (VIF) to solve this problem, and finally we find Implementation capital (x_5) and CPI (x_1) are significant predictors of FDI inflows, and no problem of multicollinearity.

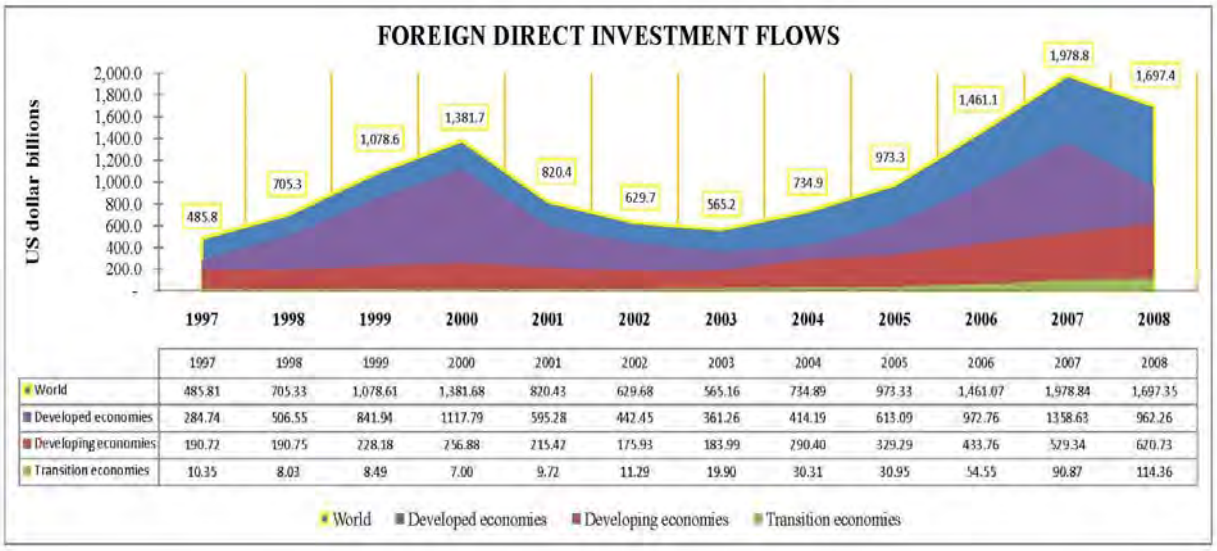
Keywords: Foreign Direct Investment (FDI) Inflows, Collinearity, Variance Inflation Factor (VIF), Vietnam

1. Introduction

Foreign capital investment is an indispensable part of the total investment of social and economic of each country, and the conditions of necessary to exploit and develop human resources in the country. Along with the process of globalization, the role of foreign direct investment is increasingly important. For developing countries, with Vietnam in particular, significantly more foreign direct investment than it showed in an important role in the provision of capital, technology and production scale, creating the new production capacity, improving competitiveness of Vietnam in integration process.

Vietnam has been successful in poverty reduction strategies and has been able to ensure rapid growth with relative equity. Among the factors that led to this success, foreign direct investment (FDI) inflows has played a crucial role, providing Vietnam's economy with its relatively scarce factor, capital, and representing an extremely important instrument for integration in the world economy.

Figure 1 shows the capital of foreign direct investment having a huge increase in 2007, this demonstrates a clear competitive investment environment of Vietnam that has been raised. Vietnam is becoming attractive investment in Asia in the eyes of the international investment community.



	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
World	485.81	705.33	1,078.61	1,381.68	820.43	629.68	565.16	734.89	973.33	1,461.07	1,978.84	1,697.35
Developed economies	284.74	506.55	841.94	1117.79	595.28	442.45	361.26	414.19	613.09	972.76	1358.63	962.26
Developing economies	190.72	190.75	228.18	256.88	215.47	175.93	183.99	290.40	329.29	433.76	529.34	620.73
Transition economies	10.35	8.03	8.49	7.00	9.72	11.29	19.90	30.31	30.95	54.55	90.87	114.36

Figure 1 Foreign Direct Investment Flows in Vietnam : 1997-2008

Source: http://stats.unctad.org/

2. Literature Review

The literature review is done by comparing past studies in terms of its sample, data collection, methodology, variables used and results obtained. So, this chapter is sorted out the past reference about this definition and classification.

2.1 Foreign Direct Investment (FDI) in Vietnam

Foreign Direct Investment in Vietnam since 1988 have been regarded as a very impressive phenomenon of the economic transition from a centrally planned economy to a market oriented economy (Kokko et. al. 2003). Whereas annual foreign direct investment inflows into Vietnam have increased dramatically from USD 2.59 Billion in 1997 to nearly USD 4.50 billion in 2009, with an annual growth rate of 56.8 percent (GSO, 2010). In the Figure 2, we can see registered capital and implementation capital are stable from 1997 to 2005, and rise quickly from 2006 to 2008, then fall from the top point in 2008.

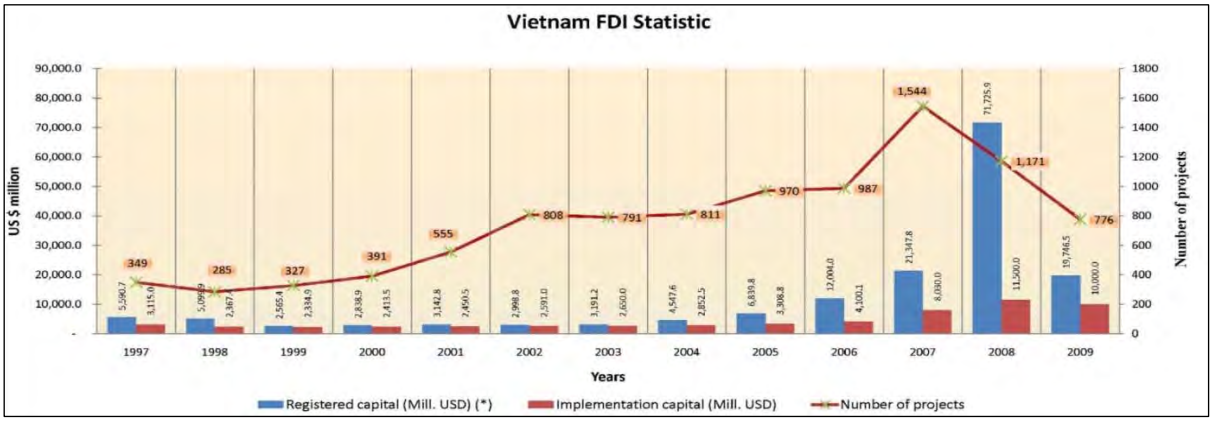


Figure 2. Vietnam Foreign Direct Investment Statistics

Source: Vietnam Ministry of Planning & Investment http://www.mpi.gov.vn/

2.2 Foreign Direct Investment (FDI) and Economic Growth

Many economists proposed and amended the neoclassical growth model by including the growth-driving factors of human capital as well as physical capital to explain the presence of FDI in developing countries (Romer, 1986, 1987; Lucas, 1988, 1990 and Mankiw,1992). In addition, Blomstrom and Kokko (1998) argued that multinational corporations (MNCs) bring modern technologies into host countries in order to allow them to compete successfully with other MNCs and local enterprises, FDI contributes significantly to human capital such as managerial skills and research and development (R&D).

Many empirical studies have found that economic growth is an important determinant of FDI and pointed out that higher economic growth results in greater FDI inflows as it is a measure of the attractiveness of the host countries (Moore,1993; Lucas, 1993; Chakrabarti, 2001; Cernat and Vranceanu, 2002 and Asiedu, 2002). Whether foreign direct investment inflows are beneficial or not to economic growth, and what governments should do to attract foreign direct investment inflows effectively, are still a matter of considerable debate (Masina 2002; Kokko et. al. 2003).

2.3. Significant Factors for FDI Inflows and Economic Crisis.

Kravis and Lipsey (1982) found a positive relationship between the market size in host nations and the location decision of US multinationals. Chakrabarti (2001) found a strong positive relationship between the market size of a host country and foreign direct investment. Following the existing literature, this study uses GDP per capita as a measure of Vietnamese market size. But Grossman and Helpman (1991) and Barro and Martin (2004) have argued that a more open trade regime leads to a greater ability to absorb technological progress and export goods that stimulates economic growth.

As cheap labor is a major determinant of foreign direct investment in developing countries, Moore (1993) and Lucas (1993) proposed that foreign direct investment inflows tend to dry up as the cost of labor increases. The empirical studies by Biswas (2002) and Brainard (1997) demonstrated a negative relationship between the cost of labor and foreign direct investment inflows.

In Vietnam, Do (2005) examines the impact of foreign direct investment on Vietnamese economy and concluded that foreign direct investment had not only short run but also long run effect on GDP of Vietnam. And this study also examines the impact of trade openness on GDP. The result of this study found that trade is stronger than that of foreign direct investment. And Jenkins (2006) found the impact of foreign direct investment on employment in Vietnam. He concluded that Vietnam received considerable inflow of foreign capital in the 1990s as part of its increased integration with the global economy. The study shows that the indirect employment effects have been minimal and possibly even negative because of the limited linkages which foreign investors create and the possibility of "crowding out of domestic investment".

Kwack (2000) tests a hypothesis that the causes of the Asian financial crisis are weaknesses in the balance sheet of financial institutions, high international interest rates, high short-term external debts, excessive loans, and continuing large current account deficits. It also tests a hypothesis regarding the determination of nonperforming bank loans. Empirical tests are carried out with panel data on seven countries in Asia—Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, and Thailand—for the 1995 through 1997 period. And then Lin and Lai (2005) proposed that the unemployment rate, economic growth rate, inflation rate and the interest rate spread are significantly related to the NPL ratio in Taiwan.

In short, all the researchers above, we can find that foreign direct investment had not only short run but also long run effect on GDP and economic growth is an important determinant of FDI inflows and pointed out that higher economic growth results in greater FDI inflows as it is a measure of the attractiveness of the host countries. This study attempts to explore the significant factors affecting foreign direct investment inflows in vietnam, using the multiple linear regression model.

3. Research Methodology

This chapter carries on the synopsis to the research framework of study, and then elaborates this article in the analytic hypothesis. Finally the third part is to introduce statistical method of this research.

3.1 Research Framework

For the research of framework of this article, we try to examine the significant factors to the foreign direct investment flows in Vietnam.

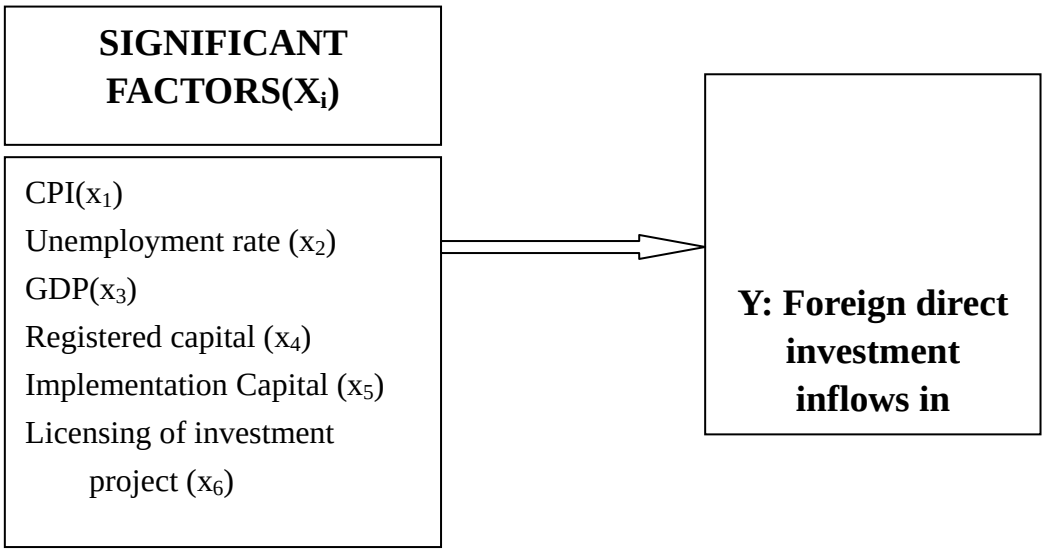


Figure 3. Research Framework

The definition of Research framework is as below (Bade and Parkin, 2009):

1. Consumer Price Index- CPI in Vietnam (x_1): A measure of the average of the price paid by urban consumers for a fixed market basket of consumption goods and services in Vietnam.

2. Unemployment rate in Vietnam (x_2): The percentage of the people in the labor force who are unemployed in Vietnam.

3. Gross Domestic Product (GDP) (x_3): The monetary value of all the finished goods and services produced within a country's borders in a specific time period, though GDP is usually calculated on an annual basis. It includes all of private and public consumption, government outlays, investments and exports less imports that occur within a defined territory.

4. Registered capital (x_4) : the capital were registered in Vietnam

5. Implementation Capital (x_5): the capital were implemented in Vietnam

6. Licensing of investment project (x_6): the investment project were licensed in Vietnam

7. Foreign direct investment flows in Vietnam (Y_i)

3.2 Hypothesis

Following the literature review and research framework, the hypothesis is proposed:

H_1: CPI Consumer Price Index in Vietnam has a significant effect on the foreign direct investment flows in Vietnam

H_2: Unemployment rate in Vietnam has a significant effect on the foreign direct investment flows in Vietnam

H_3: Gross Domestic Product in Vietnam has a significant effect on the foreign direct investment flows in Vietnam

H_4: Registered Capital in Vietnam has a significant effect on the foreign direct investment flows in Vietnam

H_5: Implementation Capital in Vietnam has a significant effect on the foreign direct investment flows in Vietnam

H_6: Licensing of investment project in Vietnam has a significant effect on the foreign direct investment flows in Vietnam

3.3 Research Methods

We assumed that the model include multiple linear regression and shown below：

$$Y_{FDI\ \ flows\ in\ Vietnam} = \alpha + \beta_1 X_{CPI} + \beta_2 x_{unemployment\ rate} + \beta_3 x_{GDP} + \beta_4 x_{registered\ capital} + \beta_5 x_{implementation\ capital} + \beta_6 x_{licensing\ of\ investment\ project}$$

$$Y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6$$

3.3.1 Correlation

The Pearson's product-moment correlation is used to when we want to explore the strength of the relationship between two continuous variables (Pallant, 2007). The correlation coefficient not only indicates the strength of any linear association between Y and X variable, but also whether the relationship is positive or negative (Pardeo, 2006). In particular, a positive correlation indicates that as one variable increases, so does the other. A negative correlation indicates that as one variable increases, the other decreases.

If we have a series of n measurements of X and Y written as x_i and y_i where $i = 1, 2, ..., n$, then the Pearson correlation coefficient r between X and Y is written where x and y are the sample means of X and Y, and s_x and s_y are the sample standard deviations of X and Y.

$$r = \frac{s_{xy}}{s_x s_y} = \frac{\frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{n-1}}{\sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})}{n-1}}\sqrt{\frac{\sum_{i=1}^{n}(y_i - \bar{y})}{n-1}}} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})}\sqrt{\sum_{i=1}^{n}(y_i - \bar{y})}}$$

3.3.2 Analysis of Variance **(ANOVA)**

Total variation (SST) = between-group variation (SSB) + within-group variation (SSW)

Analysis-of-variance table using definitional formulas

Table 1 Analysis-of-Variance

Source	Sum of Squares	Degrees of Freedom	Mean Square (Variance)	F
-Between groups	$SSB = \sum_{j=1}^{c} n_j \left(\overline{X_j} - \overline{\overline{X}}\right)^2$	c – 1	$MSB = \frac{SSB}{c-1}$	$F = \frac{MSB}{MSW}$
-Within groups	$SSW = \sum_{j=1}^{c} \sum_{i=1}^{n_j} \left(X_{ij} - \overline{X_j}\right)^2$	n – c	$MSW = \frac{SSW}{n-c}$	
Total	$SST = \sum_{j=1}^{c} \sum_{i=1}^{n_j} \left(X_{ij} - \overline{\overline{X}}\right)^2$	n – 1		

3.3.3 Multiple linear regression

(1) Model Assumption

There are four assumptions of linear regression model describe the probability distributions of the random errors in the model (Pardeo, 2006):

Assumption one :The probability distribution of random errors at each X has a mean of zero.

Assumption two :The probability distribution of random errors at each value of X has constant variance.

Assumption three :The probability distribution of random errors at each value of X is normal.

Assumption four :The value of random errors for one observation is independent of the value of random errors for any other observation.

(2) Multiple Linear Regression

Multiple linear regression analysis is used when several quantitative factors (x1, x2,...,xn) affect a criterion variable (Yockey, 2008). Establishes a relationship for a criterion variable and two or more predictor variables, we assumed the multiple linear regression model.

$$Y = \alpha + \beta 1x1 + \beta 2x2 + \beta 3x3 + \beta 4x4 + \beta 5x5 + \beta 6x6$$

Where

Y = the predicted score on the dependent variable. In our example, Y corresponds to the predicted meaning in life scores

α = the Y-intercept; the value of Y when all Xs = 0

β_i = the regression coefficient for the ith predictor. In this example, I take on the values of 1, 2, or 3 for the first (connect), second (optimism) and third (success) predictors, respectively

(3) Testing the Relevance of the Model

The examination of null hypothesis correlation coefficient βi are all 0, indicated by H0 . The expression is as follows:

H_0： $\beta_1 = \beta_2 = \ldots = \beta_i = 0$

H_1：At least one of β_i is different from 0

(4) Collinearity Diagnostics

With multiple linear regression models, if independent variables x1 and x2 are highly correlated in the regression model, this phenomenon can lead to unstable models and inflated standard errors. Method for identifying multicollinearity is to calculate variance inflation factors (VIF) or Tolerance for the regression model. A useful rule of thumb is that there is a potential multicollinearity problem if the VIF for a quantitative predictor is greater than 10 (Pardeo, 2006).

4. Analytical Results

This chapter presents the empirical results, interpretation of the analyses, discussing the hypotheses tested and elaborating on the findings obtained from the regressions.

4.1 Correlation

We use the Pearson Correlation coefficient to quantify the level of the tight linear relationship between two variables. Absolute value of r indicates how close the relationship is linear. Table 2 shows the relationship between the dependent variable foreign direct investment flows in Vietnam with each independent variable.

Table 2. Correlations

variables		FDI (Y)	CPI(x_1)	Unemployment rate (x_2)	GDP(x_3)	Registered capital (x_4)	Implementation Capital (x_5)	Licensing of investment project (x_6)
FDI (Y)	Pearson Correlation	1	.826(**)	-.741(**)	.267	.889(**)	.936(**)	.693(**)
	Sig.(2-tailed)	.	.000	.004	.378	.000	.000	.009
	N	13	13	13	13	13	13	13

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

4.2 Multiple Linear Regression Analysis

4.2.1 Full Model

(1) Model Summary

At first, we use the method “Enter” to review the survey and selection all six variables. From Table 3, we obtained the model summary, with high explainable ability of model (R square=0.966, Adjusted R square=0.93)

Table 3. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.983(a)	.966	.931	585.84721	1.452

a Predictors: (Constant), X6, X4, X3, X2, X1, X5

b. Dependent Variable: Y

(2) Testing the Condition of Autocorrelation

The value of random errors for one observation is independent of the value of random errors for any other observation. To assess the independence assumption, we can look at the Durbin-Waston. If the values of Durbin-Waston is closed to 2, we can say that it is no autocorrelation or serial correlation. In our research, the values of Durbin-Waston is 1.452 (Table 3), it seems fitting the assumption.

(3) ANOVA

In Table 4, the value of F statistic is 28.161, with Sig.=0.000. So, a combination of existing variables in the model can explain the change of Y.

Table 4. ANOVA(b)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	57992767.571	6	9665461.262	28.161	.000(a)
Residual	2059301.748	6	343216.958		
Total	60052069.319	12			

a Predictors: (Constant), X6, X4, X3, X2, X1, X5

b Dependent Variable: Y

(4) Coefficients

As for multiple linear regression, the outcome variable is predicted by a combination of all the variables multiplied together their respective coefficient plus a residual term. The table 5 provides each of the predictors for significance or not. In this multiple linear regression, only unemployment rate (x_2), GDP(x_3) and implementation capital (x_5) are significant predictors of FDI.

Table 5. Coefficients(a)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
variables	B	Std. Error	Beta		
(Constant)	-17527.478	6354.808		-2.758	.033
CPI(x_1)	10.506	62.141	.030	.169	.871
Unemployment rate (x_2)	1907.091	720.277	.688	2.648	.038
GDP(x_3)	596.959	278.221	.305	2.146	.076
Implementation Capital (x_5)	.001	.027	.013	.057	.957
Implementation Capital (x_5)	.865	.207	1.236	4.186	.006
Licensing of investment project (x_6)	1.758	1.009	.291	1.742	.132

a Dependent Variable: dependent (Y)

(5) Collinearity Diagnostics

Assessing the multicollinearity, we can check the variance inflation factors (VIF), tolerance, dimension, eigenvalue and condition index. From Table 6, though unemployment rate (x_2) and implementation capital (x_5) are significant predictors of FDI, the variance inflation factors (VIF) is high than ten (tolerance is small 0.1).

Then we test dimension, eigenvalue and condition index to diagnose collinearity of our research (Table 7). There are too many dimension, large first value of eigenvalue and high condition index in dimension 7. From Table 6 and Table 7, therefore we can sure that there are obvious problems of multicollinearity for unemployment rate (x_2) and implementation capital (x_5).

Table 6. Coefficients(a)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
variables	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-17527.478	6354.808		-2.758	.033		
X1	10.506	62.141	.030	.169	.871	.186	5.387
X2	1907.091	720.277	.688	2.648	.038	.085	11.818
X3	596.959	278.221	.305	2.146	.076	.282	3.544
X4	.001	.027	.013	.057	.957	.114	8.788
X5	.865	.207	1.236	4.186	.006	.066	15.259
X6	1.758	1.009	.291	1.742	.132	.205	4.879

a Dependent Variable: dependent (Y)

Table 7. Collinearity Diagnostics(a)

Model			Variance Proportions						
Dimension	Eigenvalue	Condition Index	(Constant)	X1	X2	X3	X4	X5	X6
1	5,867	1,000	,00	,00	,00	,00	,00	,00	,00
2	,871	2,596	,00	,01	,00	,00	,04	,00	,00
3	,120	6,991	,00	,06	,00	,00	,11	,00	,16
4	,097	7,785	,00	,36	,00	,00	,00	,10	,03
5	,035	12,918	,00	,54	,00	,01	,72	,16	,13
6	,010	24,738	,00	,00	,03	,44	,01	,03	,54
7	,000	115,457	1,00	,03	,97	,55	,13	,70	,14

a Dependent Variable: Y

(6) Testing the Normality Assumption

The probability distribution of random errors at each value of X is normal. The normality assumption can used histogram, normal P-P plot and residuals statistics to check. For the Residuals Statistics and histogram, the mean of standard residual is between 3 standard deviations, we can assess the residuals seem to be approximately normally distributed over the entire residual plot. From figure 5, we can see Mean = 0 and Standard deviation Std.Dev = 0.71. We can say the balance of distribution is approximately standard. Therefore we can conclude that the normality assumption is not violated. Figure 6 displays normal P-P plot of residual which again look sufficiently normal in the upper row of plot. The results show that the observation points are not dispersed far from the expected straight line, so we can conclude that the normality assumption is not violated.

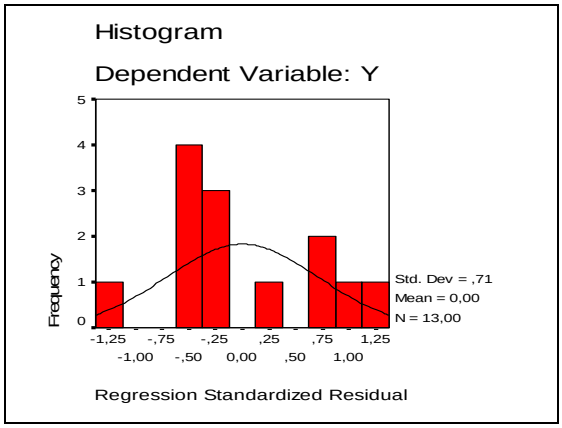


Figure 5 Histogram

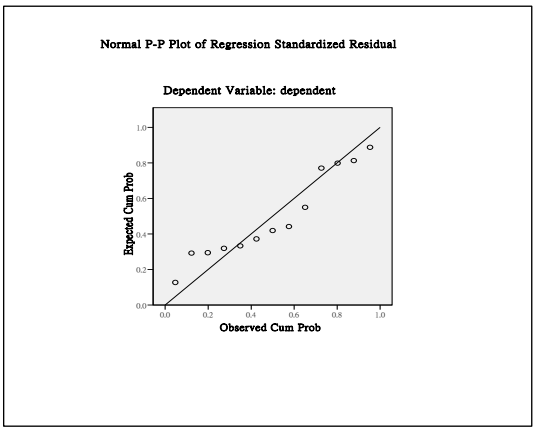


Figure 6 Nomal P-P plot of Regression Standardized Residual

4.2.2 Reduced Model

In Table 6 Coefficients, only unemployment rate (x_2), GDP(x_3) and implementation capital (x_5) influence significantly foreign direct investment inflows in Vietnam. But two independent variables (unemployment rate (x_2) and implementation capital (x_5)) appear obvious problems of multicollinearity. Thus regression equation is estimated on the Stepwise method shows the implementation capital variables affect for foreign direct investment flows in Vietnam is the best.

(1) Model Summary

In reduced model, we use method Stepwise to choose variable for solving the problems of multicollinearity for unemployment rate (x_2) and implementation capital (x_5). From modle 2 of Table 8, we obtained the model summary, with high explainable ability of model (R square=0.911, Adjusted R square=0.893)

Table 8. Model Summary[c]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.936[a]	.875	.864	825.29970	
2	.954[b]	.911	.893	730.83450	1.719

a. Predictors: (Constant), X_5

b. Predictors: (Constant), X_1, X_5

c. Dependent Variable: FDI

(2) Coefficients

The Model 2 of Table 9 provides two predictors for significance of FDI. In this multiple linear regression, only Implementation capital (x_5) and CPI (x_1) are significant predictors of FDI, and no situation of multicollinearity.

If the implementation capital (x_5) more and more, the capital flows of foreign direct investment in Vietnam will more. CPI (x_1) has also been linked more with foreign direct investment flows in Vietnam. A new equation is written in the form of

$$Y_{\text{FDI flows in Vietnam}} = -123.231 + 0.50524x_{\text{implementation capital}} + 101.24x_{\text{CPI}}$$

Table 9. Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	-110.626	402.215		-.275	.788		
	X_5	.654	.074	.936	8.784	.000	1.000	1.000
2	(Constant)	-123.231	356.232		-.346	.737		
	X_5	.505	.100	.721	5.064	.000	.438	2.281
	X_1	101.240	50.447	.286	2.007	.073	.438	2.281

a. Dependent Variable: Y

5 Conclusions

The main purpose of this research is to examine whether the factors affect foreign direct investment in Vietnam over period 1997- 2009 by using 6 independent variable (CPI, unemployment rate, GDP, registered capital, implementation capital and licensing of investment project) by applying the different of statistical analysis.

At first, we use the method “Enter” to review the survey and selection all six variables. We find three important factors, unemployment rate (x_2), GDP(x_3) and implementation capital (x_5), affecting foreign direct investment inflows in Vietnam, but we find independent unemployment rate (x_2) and implementation capital (x_5) have obvious problems of collinearity in the regression model. Therefore, we use stepwise method and variance inflation factor (VIF) to fix the problem, and finally we find Implementation capital (x_5) and CPI (x_1) are significant predictors of FDI inflows, and no situation of multicollinearity. An equation is created in the form of

YFDI flows in Vietnam = -123.231 + 0.50524ximplementation capital + 101.24xCPI

Finally, we show and explain this multiple regression analysis as Table 16

Table 10 Regression Variable Table

Variables	Test Result
Implementation capital (x_5)	The more of implementation capital , the more the FDI inflows in Vietnam.
CPI (x_1)	The more of consumer price index, the more the FDI inflows in Vietnam.

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Capital Structure of Firms in the Steel Industry of Taiwan

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ABSTRACT

Recent studies have found that firms may deviate from their target capital structure over time but adjust toward the target in the long term. However, little attention has been so far given to address the issue in the steel industry. This paper takes the financial constraint of over-leverage and under-leverage into account to investigate the adjustment of capital structure of firms in the steel industry of Taiwan. Controlling for the possible impact of financial crisis, this study was conducted at years of economic trough and peak during the period of 1981-1996. Empirical results show that, first, firms with the financial constraint of over-leverage finance less debt than do firms with the financial constraint of under-leverage relative to the target capital structure. Second, the adjustment of debt ratios is statistically significant and positively related to economic growth but negatively related to macroeconomic conditions. Finally, firms adjusted very slowly toward their target debt ratios.

Keywords: Capital Structure, Partial Adjustment Model, Steel Industry.

1. Introduction

Aggregate economic activities fluctuate along with the shifts in economic conditions that arise from ups and downs of the business cycle. Corporate performance may also vary with economic conditions over the business cycle. In particular, corporate profit increases during economic expansion but decreases during economic contraction for firms in cyclical industries that include capital goods and consumer durables (Reilly and Brown, 2000). Some recent studies such as Korajczyk and Levy (2003), Hackbarth, Miao and Morellec (2006), and Yeh and Roca (2007) suggested that capital structure is influenced by macroeconomic conditions. In addition, recent studies (Byoun, 2008; Flannery and Rangan, 2006; Hovakimian et al., 2001) have found that firms may deviate from their target capital structure over time but they would adjust toward the target in the long run. Steel industry, a capital-intensive and technology-intensive industry, plays an important role in

nation's defense and the economy and, in addition, its performance varies cyclically with macroeconomic conditions over time. However, little attention has been given to the adjustment of capital structure of firms in the steel industry. This study is conducted to fill the gap and provides evidence on the adjustment of capital structure of firms in the steel industry.

2. Literature Review

After Modigliani and Miler (1958), most of prior studies addresses the determination of capital structure at the firm and industry level. These prior studies have so far documented some common determinants of capital structure at the firm and industry level. Some recent studies have found that economic growth and macroeconomic conditions affect the determination of capital structure of firms (Feidakis and Rovolis, 2007; Hackbarth et al., 2006; Korajczyk and Levy, 2003; Levy and Hennessy, 2007; Yeh and Roca, 2007). Korajczyk and Levy (2003) tested whether the tradeoff theory and the pecking order theory can explain the effect of macroeconomic conditions on capital structure. In their study, they found that capital structure is counter-cyclical for financially unconstrained firms. Further, Hackbarth et al. (2006) analyzed credit risk and capital structure in their contingency-claims model and found that default thresholds are countercyclical. They contended that corporate leverage should be counter-cyclical to the shifts in economic conditions. Levy and Hennessy (2007) developed a general equilibrium model explaining corporate financing over the business cycle. They argued that, to avoid agency conflicts, firms substitute debt for equity during periods of economic contraction to maintain managerial equity shares. During periods of economic expansion, managerial risk-sharing improves and firms substitute equity for debt. In their simulations, they found counter-cyclical variation in leverage for financially less-constrained firms. Based on the findings of these prior studies, capital structure is negatively related to macroeconomic conditions. However, Yeh and Roca (2007) found positive effect of economic growth and macroeconomic conditions on the debt ratios of firms in the plastics and textile industries of Taiwan during the period of 1981-1996. Moreover, little attention has been thus far given to examine the adjustment of capital structure in the steel industry. This study is conducted to provide insight into the adjustment of capital structure of firms in the steel industry over the business cycle.

3. Method and Data

3.1 Model for the Adjustment of Capital Structure

Several studies (Byoun, 2008; Flannery and Rangan, 2006; Hovakimian et al., 2001; Marsh, 1982; Taggart, 1977) suggest that firms adjust toward the target capital structure over time. The econometric model,

i.e. the partial adjustment model, posits that actual level may deviate away from the target level in the short run but would adjust toward the target in the long run. The partial adjustment model fits with the adjustment behavior of capital structure of firms. Following prior studies such as Flannery and Rangan (2006) and Byoun (2008), this paper utilizes the partial adjustment model to examine the adjustment of capital structure of firms in the steel industry over the business cycle. Given a positive adjustment rate in the partial adjustment model, the adjustment of capital structure can be expressed as a proportion (i.e. adjustment rate) of the difference between the target capital structure and the capital structure of previous period. If the adjustment rate is equal to 1, then the adjustment made by firms is equal to the difference between the target capital structure and the capital structure of previous period. If the adjustment rate is not equal to 1, then firms make an incomplete adjustment and deviate from their target capital structure. The partial adjustment model of capital structure is written as follows:

$$Y_t - Y_{t-1} = \gamma(Y_t^* - Y_{t-1}) + \varepsilon_t \quad (1)$$

where, Y_t: the capital structure at year *t*, Y_{t-1}: the capital structure at year *t*-1, γ: the rate of adjustment toward the target capital structure, Y_t^*: the target capital structure at year *t* and ε_t: error term. Assume that firms in the steel industry have the same rate of adjustment toward the target capital structure. Given a positive adjustment rate (γ) in the standard partial adjustment model, i.e. Equation 1, the change in capital structure depends on the difference between the target capital structure and the previous capital structure. When the target capital structure of firms is higher than their previous capital structure and the difference is positive, firms face the financial constraint of under-leverage relative to the target. Given a positive rate of adjustment toward the target in the model, the greater the adjustment rate, the greater is the increase in capital structure. On the other hand, when the target capital structure of firms is lower than their previous capital structure and the difference is negative, firms face the financing constraint of over-leverage relative to the target. The greater the adjustment rate, the greater is the decrease in capital structure. In addition, according to the theory of capital structure, firms with the financial constraint of over-leverage would finance less debt than do firms with the financial constraint of under-leverage relative to the target capital structure due to higher risk and costs of bankruptcy. Thus this study modifies the standard partial adjustment model and includes the financial constraint (FC) of over-lever1ge and under-leverage relative to the target capital structure in the model for the adjustment of capital structure of firms.

Further, the target capital structure is unobservable in the application of the partial adjustment model. It is assumed that, as suggested by recent studies (Chu et al., 1992; Feidakis and Rovolis, 2007; Flannery and Rangan, 2006; Hovakimian et al., 2001; Korajczyk and Levy, 2003), the target capital structure of firms in the steel industry is a linear function of their determinants, namely economic growth, macroeconomic conditions and firm characteristics. Therefore, in addition to the inclusion of financial constraint of over-leverage and under-leverage in the partial adjustment model, this study estimates target capital structure through these

determinants for examining the adjustment of capital structure of firms in the steel industry. The modified partial adjustment model for the adjustment of capital structure of firms is written as follows:

$$Y_t - Y_{t-1} = \beta_{FC}\mathrm{FC} + \gamma(\beta_{EG}\mathrm{EG} + \beta_{EC}\mathrm{EC} + \beta_X \mathrm{X} - Y_{t-1}) + \varepsilon_t \quad (2)$$

where, Y_t^*: the target capital structure at year *t*, β: regression coefficients, FC: financial constraint of over-leverage and under-leverage relative to the target capital structure, EG: economic growth, EC: macroeconomic conditions, X: firm-specific variables, Y_{t-1}: the capital structure at year *t*-1 and ε_t: error term.

As discussed earlier in this section, firms with the financial constraint of over-leverage would finance less debt than do firms with the financial constraint of under-leverage due to higher risk and costs of bankruptcy. Based on Equation 2, the adjustment of capital structure would be negatively related to the financial constraint of over-leverage and under-leverage. Further, the adjustment of capital structure would be positively related to economic growth, as suggested by Feidakis and Rovolis (2007). The adjustment of capital structure would be negatively related to macroeconomic conditions, as suggested by prior studies (Hackbarth et al., 2006; Korajczyk and Levy, 2003; Levy and Hennessy, 2007).

3.2 Variables and Their Measures

The dependent and independent variables used in this study are calculated at book value of annual financial data. As suggested by previous studies, the total debt ratio is used as the proxy for capital structure. Thus, annual change in total debt ratios (dDR) is used as the proxy for the adjustment of capital structure. Given a positive rate of adjustment toward the target debt ratios, firms would make a negative (positive) adjustment when they face the financial constraint of over-leverage and under-leverage relative to their target. Thus, the binary dummy variable DFC with the value of 1 and 0 for negative and positive adjustment of debt ratios, respectively, is used as the proxy for the financial constraint of over-leverage and under-leverage. Further, annual growth rate of the real gross domestic product (gGDP) is used as the proxy for economic growth, as suggested by Feidakis and Rovolis (2007). In addition, the binary dummy variable DEC with the value of 0 and 1 for years at economic trough and peak, respectively, is used to represent the shifts in macroeconomic conditions, as suggested by recent prior studies (Hackbarth et al., 2006; Korajczyk and Levy, 2003; Levy and Hennessy, 2007).

Furthermore, the natural logarithm of net sales (*ln*S) is used as the proxy for firm size (Booth et al., 2001; Chu et al., 1992; Huang and Song, 2006; Rajan and Zingales, 1995; Titman and Wessels, 1988; Wiwattanakantang, 1999). Annual growth rate of total assets (gTA) is used to measure growth opportunities (Titman and Wessels, 1988). The ratio of operating income to total assets (OITA) is used as a proxy for profitability (Titman and Wessels, 1988). The ratio of total depreciation to total assets (DEPTA) is used to represent non-debt tax shields (Chu et al., 1992; Kim and Sorensen, 1986; Titman and Wessels, 1988; Wald,

1999; Wiwattanakantang, 1999). The ratio of inventory plus net fixed assets to total assets (INVFATA) is used as the proxy for asset tangibility (Chu et al., 1992; Downs, 1993; Titman and Wessels, 1988; Wald, 1999).

3.3 Sample and Data

Controlling for the potential effect of financial crisis, the sample includes firms in the steel industry that are listed on the Taiwan Stock Exchange and, in addition, that have complete financial data during the period of 1981-1996 over three business cycles of Taiwan. In addition, this study selected the years of economic peaks and troughs during the period from 1981 to 1996 to represent the shifts in economic conditions. According to official reference dates published by the Council for Economic Planning and Development of Taiwan, the years of 1983, 1988 and 1994 closest to the economic peaks and the years of 1985, 1990 and 1996 closest to the economic troughs, respectively, are selected to represent the shifts in economic conditions. Annual financial data used in the study are collected from the database of the Taiwan Economic Journal.

3.4 Empirical Model

Incorporating the proxies for the variables in the study into Equation 2, the empirical model for the adjustment of capital structure of firms in the steel industry can be written as follows:

$$\begin{aligned} dDR_t = {} & b_{FC}DFC + \gamma b_{EG}gGDP_t + \gamma b_{EC}DEC_t + \gamma b_1 lsS_t + \gamma b_2 gTA_t \\ & + \gamma b_3 OITA_t + \gamma b_4 DEPTA_t + \gamma b_5 INVFATA_t - \gamma DR_{t-1} + e_t \end{aligned} \quad (3)$$

where, dDR_t: annual adjustment of debt ratios at year t, b: regression coefficient on each independent variable, DFC: dummy variable with the value of 1 and 0 for the financial constraint of over-leverage and under-leverage relative to the target debt ratios, γ: the rate of adjustment toward the target debt ratios, DEC: 0 and 1 for economic trough and peak, respectively, *ln*S: natural logarithm of sales in thousand dollars, gTA: annual growth rate of total assets, OITA: operating income/total assets, DEPTA: depreciation/total assets, INVFATA: inventory plus fixed assets/total assets, DR_{t-1}: debt ratios at year t-1, and *e*: error term.

Based on Equation 3, it is expected that the proxy for the financial constraint of over-leverage and under-leverage (DFC) will be negatively related to the adjustment of debt ratios (dDR). The proxy for economic growth (gGDP) will be positively related to the adjustment of debt ratios, as suggested by Feidakis and Rovolis (2007). The proxy for macroeconomic conditions (DEC) will be negatively related to the adjustment of debt ratios, as suggested by recent prior studies (Hackbarth et al., 2006; Korajczyk and Levy, 2003; Levy and Hennessy, 2007).

4. Results

The sample includes 122 observations for the listed firms in the steel industry of Taiwan at years of

economic peaks and troughs during the period of 1981-1996. In the sample, there are 74 and 48 observations for firms with the financial constraint of over-leverage and under-leverage that made negative and positive adjustment of debt ratios, respectively, during the sample period. The summary descriptive statistics is reported in Table 1.

Further, the regression results with and without the financial constraint of over-leverage and under-leverage taken into account for the adjustment of debt ratios of firms in the steel industry are presented in Table 2. As shown in columns (1) and (2) of Table 2, the value of variance inflation factor is lower than 10. This shows no serious problem of multicollinearity in the model. Further, for the result with the financial constraint of over-leverage and under-leverage taken into account, the Durbin-Watson test statistic shown in the Notes of the table is close to 2. This shows no serial correlation. But, for the result without the financial constraint of over-leverage and under-leverage taken into account, the Durbin-Watson test statistic shown in the Notes of the table is close to 1 and this indicates serious problem of serial correlation. In addition, based on the chi-square value, the test of heteroscedasticity does not reject the null hypothesis that the variance of the error term in the model is constant. Moreover, as shown in the Notes of Table 2, the adjusted R-square for the result with the financial constraint of over-leverage and under-leverage taken into account is much higher than that for the result without the financial constraint of over-leverage and under-leverage taken into account in the model. This suggests that the financial constraint of over-leverage and under-leverage relative to the target should be taken into account in the application of the partial adjustment model to examine the adjustment of debt ratios of firms.

Table 1 The summary descriptive statistics

Variable	**N**	**Mean**	**St**an**d**ard **Dev**iation	**Minimum**	**Maximum**
dDR	122	-0.01484	0.09944	-0.32250	0.35887
DR	122	0.53703	0.16960	0.11294	0.90301
gGDP	122	0.06544	0.01065	0.04953	0.08447
D**EC**	122	0.45902	0.50037	0	1.00000
***ln*S**	122	21.35272	2.37043	0	25.17030
gTA	122	0.10856	0.40253	-0.99820	1.38114
OITA	122	0.05177	0.04676	-0.04061	0.24028
DEPTA	122	0.02215	0.01732	0	0.07525
INVFATA	122	0.60001	0.18248	0.08713	0.97665

Note: dDR: annual adjustment of debt ratios, DR: total debt ratio, gGDP: annual growth rate of GDP, DEC: binary dummy variable with the value of 0 and 1 for years at economic trough and peak, respectively, *ln*S: natural logarithm of sales, gTA: annual growth rate of total assets, OITA: operating income/total assets, DEPTA: depreciation/total assets, and INVFATA: inventory plus fixed assets/total assets.

4.1 The Effect of Financial Constraint of Over-leverage and Under-leverage

As shown in column (1) of Table 2, the binary dummy proxy for the financial constraint of over-leverage and under-leverage (DFC) is statistically significant and negatively related to the dependent variable (dDR) at the significance level of 1%. The result shows that firms with the financial constraint of over-leverage have lower debt ratios than firms with the financial constraint of under-leverage relative to target debt ratios. This finding suggests that firms with the financial constraint of over-leverage relative to the target tend to finance less debt in order to reduce the risk and costs of bankruptcy than do firms with the financial constraint of under-leverage relative to the target.

4.2 The Effect of Economic Growth and Conditions

As can be seen in column (1) of Table 2, the proxy for economic growth (gGDP) is statistically significant and positively related to the dependent variable (dDR) at the significance level of 5%. The result indicates that the adjustment of debt ratios is positively affected by economic growth. This finding supports Feidakis and Rovolis (2007) and Yeh and Roca (2007).

Further, the dummy proxy for the shifts in macroeconomic conditions (DEC) is statistically significant and negatively related to the dependent variable at the significance level of 10%. This suggests that the adjustment of debt ratios is counter-cyclical during the period of 1981-1996. This supports recent prior studies (Hackbarth et al., 2006; Korajczyk and Levy, 2003; Levy and Hennessy, 2007) but is not in line with the finding by Yeh and Roca (2007) in the plastics and textile industries of Taiwan. This finding suggests that industry characteristics may cause the difference in the adjustment of capital structure. Further evidence of the industry effect on the adjustment of capital structure leaves for future research.

Table 2 Regression results for the listed firms in the steel industry of Taiwan at years of economic peak and trough during the period of 1981-1996

Dependent variable: the adjustment of debt ratios (dDR)

	(1) result with financial constraint taken into account				(2) result without financial constraint taken into account			
	Coefficient	Standard Error	t Value	VIF	Coefficient	Standard Error	t Value	VIF
Intercept	-0.15155	0.09496	-1.60	0	-0.07123	0.12475	-0.57	0
DFC	-0.12819	0.01393	-9.20[a]	1.20588				
gGDP	2.92353	1.24440	2.35[b]	4.53416	3.91186	1.63555	2.39[b]	4.50038
DEC	-0.04675	0.02693	-1.74[c]	4.68745	-0.04800	0.03552	-1.35	4.68734
lnS	-0.00065	0.00289	-0.22	1.20895	-0.00079	0.00381	-0.21	1.20891
gTA	-0.02428	0.01563	-1.55	1.02255	-0.01544	0.02059	-0.75	1.01870
OITA	0.06473	0.14673	0.44	1.21566	0.14447	0.19324	0.75	1.21142
DEPTA	-1.00858	0.49629	-2.03[b]	1.90861	-1.99410	0.63930	-3.12[a]	1.81971
INVFATA	0.00079	0.03948	0.02	1.34037	0.01352	0.05206	0.26	1.33872
DR_1	-0.08808	0.04408	-2.00[b]	1.42360	-0.23643	0.05412	-4.37[a]	1.23315

Notes:

	(1)	(2)
(a) Sample size	122	122
(b) Durbin-Watson d value	1.802	1.095
(c) Heteroscedasticity test: Chi-square value, (P-value)	51.16, (0.5071)	42.38, (0.4979)
(d) Adjusted R-square	0.5261	0.1752

(e) dDR: annual adjustment of debt ratios, DFC: binary dummy variable with the value of 1 and 0 as the proxy for the financial constraint of over-leverage and under-leverage, respectively, that firms face, gGDP: annual growth rate of GDP, DEC: binary dummy variable with the value of 0 and 1 for years at economic trough and peak, respectively, *ln*S: natural logarithm of sales, gTA: annual growth rate of total assets, OITA: operating income/total assets, DEPTA: depreciation/total assets, and INVFATA: inventory plus fixed assets/total assets, and DR_1: the lagged total debt ratio.

(f) [a], [b] and [c] indicate the significance level of 1%, 5% and 10%, respectively.

4.3 The Effect of Firm Characteristics

As shown in column (1) of Table 2, regarding the firm-specific effect on the adjustment of debt ratios, the proxy for non-tax shields (DEPTA) is statistically significant and negatively related to the dependent variable at the significance level of 5%. It is likely that steel industry is capital-intensive and, thus, the factor of non-debt tax shields plays a critical role in their adjustment of debt ratios toward the target. Future research may provide evidence on the adjustment of capital structure for firms in the labor-intensive and technology-intensive industries.

4.4 The Adjustment Rate of Debt Ratios

As can be seen in column (1) of Table 2, the lagged annual debt ratio (DR_1) of firms is statistically significant and negatively related to the dependent variable (dDR) at the significance level of 5%. In addition, the regression coefficient on the lagged annual debt ratio is -0.08808. The result shows that the annual average rate of adjustment toward the target is only 8.8% of the difference between target debt ratios and previous debt ratios for firms in the steel industry at years of economic trough and peak during the period of 1981-1996. This finding suggests that, due to high costs of adjustment, firms in the steel industry adjusted at a very slow rate toward their target debt ratios during the period of 1981-1996.

5. Conclusion

Recent studies have found that firms may deviate away from their target capital structure over time but they adjust toward the target capital structure in the long run. In the process of adjustment toward the target, capital structure is influenced by macroeconomic conditions over the business cycles. However, little attention has been given to examine the adjustment of capital structure of firms over the business cycle, in particular within the context of steel industry that is a cyclical industry. Controlling for the potential effect of financial crisis on capital structure, this paper utilized the modified partial adjustment model with the financial constraint of over-leverage and under-leverage taken into account to investigate the adjustment of capital structure of firms in the steel industry for years at economic trough and peak over the business cycles during the period of 1981-1996. The findings show that, first, controlling for the effects of firm characteristics, economic growth and macroeconomic conditions, firms with above-target debt ratios finance less debt than do firms with below-target debt ratios due to the risk and costs of bankruptcy. Second, the results show that economic growth has a significant positive effect on the adjustment of debt ratios at years of economic trough and peak during the period of 1981-1996. The finding is in line with Feidakis and Rovolis (2007) and suggests that firms in the steel industry should take account of economic growth in the process of their adjustment toward the target capital structure. In addition, macroeconomic conditions have a significant negative effect

on the adjustment of debt ratios of firms in the steel industry. This suggests that capital structure of firms in the steel industry is counter-cyclical over the business cycles. Finally, the results show that, on average, firms in the steel industry adjusted very slowly toward their target debt ratios during the period of 1981-1996. Due to the difference in debt financing between firms with above-target and below-target leverage, future research may provide evidence on whether the adjustment rate varies with the financial constraint of above-target and below-target leverage for firms in the steel industry of Taiwan.

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An Empirical Analysis of Voluntary and Mandatory Disclosure of Financial Forecasts and Accuracy

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ABSTRACT

This study examines the relationship between information disclosure and forecast accuracy. Prospective financial information disclosed in prospectuses for initial public offerings is examined according to Financial Reporting Standard No. 29. Disclosure Levels of prospective financial information are further categorised into three groups, namely, total disclosure items recommended by FRS-29 (TSR), total disclosure items not recommended by FRS-29 (TSV) and overall disclosure items recommended and not recommended by FRS-29 (TSRV). The three groups of disclosure levels are then investigated for their significant relationships with forecast accuracy.

The results show that the disclosure level of prospective financial information, measured by total disclosure items recommended by FRS-29, has a significantly negative relationship with forecast accuracy. It indicates that IPOs with more disclosure of prospective financial information tend to have lower forecast errors, while IPOs with less disclosure of prospective financial information tend to have higher forecast errors. When level of disclosure is measured by items not recommended by FRS-29 and is measured by overall disclosure items, both recommended and not recommended by FRS-29, level of disclosure does not have a significant relationship with forecast accuracy.

Keywords: Information Disclosure, Forecast Accuracy, Initial Public Offerings, Prospectus

1. Introduction

Initial public offerings (IPOs) play a crucial role in equity markets and the economy, as companies are able to raise capital from members of the public. A prospectus, which details the terms of issue and information about the issuing company, is sent to potential investors and is one of the most important documents for investors making investment decisions. Among information disclosed in

prospectuses, prospective financial information[1] enables investors to evaluate a company's future performance and is perceived as the most important item (Ho and Wong, 2001) as IPOs generally do not, or are unable to, provide historical financial information on which potential investors can base predictions about future performance.

Prospective financial information is normally presented as a forecast or a projection and is based on assumptions regarding future events. Since the Securities and Exchange Commission (SEC), in the early 1970s, changed its long-held position prohibiting the release of prospective financial information in prospectuses and recognized that information regarding a company's future is of interest to the investing public, the disclosure of such information has received much attention in the literature. Many studies have focused on earnings forecasts, little effort, however, has been made to investigate overall disclosure of prospective financial information in an IPO context and their relation to forecast accuracy. In order to provide a better understanding of information disclosure on IPOs, this study is aimed to examine the information disclosure of prospective financial information in IPO prospectuses for companies newly listed on the New Zealand Stock Exchange for the period of 1987 to 2001.

The association between information disclosure and forecast accuracy in IPO prospectuses is explored in order to establish the linkage between disclosure literature and forecast accuracy literature. Among disclosure literature, research often focuses on the quantity of the disclosure, but does not always include an assessment of its credibility (Wiedman 2000). The study investigates not only the disclosure levels of prospective financial information but also their accuracy of such information.

1.1. Importance of the Study and Contribution to the Literature

Previous voluntary disclosure studies tend to focus on general information disclosed in annual reports. However, there are clear differences across types of information and countries, with the variables that explain levels of disclosure varying among different types of information (Meek, et al., 1995). No studies have attempted to comprehensively explore the extent of voluntary disclosure of prospective information in prospectuses. This may be due to the difficulties in obtaining data, as companies are reluctant to disclose voluntarily more prospective financial information than is necessary, out of fear of lawsuits that might arise due to unattained forecasts. Consequently, investigating the overall disclosure of prospective financial information would be a desirable and important contribution to the extant literature.

Previous studies examining voluntary disclosure have mainly focused on information in annual or interim reports of listed companies (Chow and Wong-Boren 1987; Bradbury 1991; Hossain, Perrera and Rahman 1995; Botosan 1997). As Botosan (1997) indicated, annual reports may not provide a powerful proxy for overall disclosure level as listed companies may provide information through other channels. On the other hand, companies making initial public offerings have less information available

[1] Prospective financial information has different labels, including forward-looking information, future-oriented information and financial forecasts.

to the public than existing listed companies. Consequently, information in the IPO prospectuses may be a better proxy for the overall disclosure of prospective financial information. Examining the extent of disclosure information in IPO prospectuses may therefore shed further light on company disclosure practices.

This study contributes to the existing literature by integrating the voluntary disclosure and forecast accuracy literature to provide a comprehensive model, which explains levels of disclosure of prospective financial information. By establishing the relationship between disclosure level of prospective financial information and forecast accuracy, the benefits of disclosure of prospective financial information may be justified. The findings of this study may also provide a clear connection between voluntary disclosure of prospective financial information and forecast accuracy, and may, therefore, supplement the relatively few studies in the area of examining the relationship between disclosure attributes and disclosure impact.

The remainder of the paper is organized as follows. The second section provides an overview of the theoretical and empirical literature relating to the disclosure of prospective financial information. The third section describes the theoretical framework and hypotheses development. The fourth section outlines the research methodology of the study. The results are presented in the fifth section. The final section summarizes the major findings of the study and their implications.

2. Literature View

Prospective financial information, with its value relevant relationship to stock prices, is linked to various areas of studies. The capital market literature pay much attention to management earnings forecasts, as the forecasts affect the information environment and influence the level and variability of security prices (Kothari 2001; Healy and Palepu 2001)[2]. On the other hand, the accounting choice literature addresses the issues of earnings management and the incentives of management's accounting choices and their influences on share prices (Fields et al. 2001). The voluntary disclosure literature, however, rarely focuses on prospective financial information, but rather on general financial information in annual reports. This may be due to the difficulty in obtaining prospective financial information, as the provision of such information is not prevalent. In order to examine the voluntary disclosure of prospective financial information, it is essential to understand the underlying theories of voluntary disclosure literature. This section begins with an overview of the theories on which the voluntary disclosure literature is based. Several models focusing on the incentives for voluntary disclosure and the costs associated with voluntary disclosure are then discussed. This section ends with a review of related empirical research.

2.1 Theories Underlying Voluntary Disclosure Literature

Although there are arguments about whether there is a comprehensive theory of disclosure (Verrecchia 2001; Dye 2001), signaling and agency theories are often utilized to provide theoretical guidance in interpreting empirical analyses of voluntary disclosure studies.

2 See Kothari (2001), who reviews capital markets' research and Healy and Palpu (2001), who evaluate empirical research on corporate disclosure.

2.1.1 Signaling Theory

The concept of signaling was first introduced by Spence (1973) in his analysis of the role of education in the labor market and was then applied widely in finance and accounting literature. Spence's educational signaling model suggests that more talented workers will attempt to signal this fact to potential employers by acquiring more education (Spence 1973). By altering some of the observable characteristics, the activities of signaling convey favorable information to potential employers. Nevertheless, signaling costs arise when job applicants make certain adjustments to convince potential employers of their quality. Applying signaling theory to modeling voluntary disclosure of financial information is based on the notion that managers, due to their better position in obtaining inside knowledge, have superior information about the company's current and future performance than do investors.

Leland and Pyle (1977) applied signaling theory and constructed a univariate signaling model in which risk-adverse entrepreneurs communicate private information about expected future cash flows through the retention of a portion of firm ownership. Hughes (1986) extended Leland and Pyle's (1977) model by introducing a bivariate signaling model in which the entrepreneur discloses inside information through two signals: the percentage of retained ownership (α), and a direct disclosure about expected future cash flow (Y). With the existence of informational asymmetry between investors and managers about the value of a firm, Hughes (1986) assumed that managers have incentives to disclosure inside information to investors. The disclosed information is perceived as a credible signal by investors, as the entrepreneur is penalized if ex post observable cash flow of the firm indicates the disclosure to be fraudulent (Hughes 1986). With the model, IPO valuation increases in both Y and α. The two signals are related through their cost structures and are chosen simultaneously to minimize the cost of signaling firm value. If one signal becomes more costly, the other signal will be used relatively more to maintain the maximum disclosure.

Trueman (1986) argues that a firm's market value is a function of investors' perceptions of management's ability to anticipate and respond to future changes in the firm's economic environment. Therefore, capable managers have incentives to voluntarily disclosure earnings forecasts to signal their competence and, therefore, to boost the firm's market value. Blacconiere and Patten (1994) examined the effect of a firm's environmental disclosures on share prices and found that firms with more extensive environmental disclosures suffered less in their share prices. This is consistent with signaling theory, in that the market interprets accounting disclosures as 'good news' signals, whereas their absence is interpreted as 'bad news'.

2.1.2 Agency Theory

Agency theory is widely applied in voluntary disclosure literature to explain the incentives for voluntary disclosure. Agency theory suggests that the level of information voluntarily disclosed by a

company is a function of its costly contracting relations between shareholders and managers (Jensen and Meckling 1976). Voluntary disclosure of financial information can be regarded as a cost effective way to monitor the activities of managers, and therefore, to reduce the conflicts of interest between shareholders and managers, i.e. to mitigate agency costs (Holthausen and Leftwich 1983; Kelly 1983; Watts and Zimmerman 1986). Managers therefore have incentives to disclose more financial information to investors to reduce agency costs.

2.1.3 Incentives for Voluntary Disclosure

There are several hypotheses under which the incentives for voluntary disclosure are investigated. Based on the proprietary cost hypothesis, research on voluntary disclosure assumes that managers have superior information to outside investors about a firm's expected future performance. The question arising from this assumption is: under what circumstances will a manager disclose or withhold this information?

Milgrom (1981) addresses this question and considers whether the possessor of superior information about product quality can influence a buyer by selectively disclosing what he knows. The findings suggest that, with the adverse-selection problem, the possessor of information about a product or asset would be obliged to fully disclose information to a buyer. The notion underlying this is that a rational buyer interprets information about the asset's value or quality that is withheld as "unfavorable". Consequently, the possessor of information is forced to reveal what he knows.

While Milgrom's (1981) results provide an insight into voluntary disclosure, other studies provide different evidence. Verrecchia (1983), in an attempt to examine incentives for managers to provide discretionary disclosures, finds that a "threshold level of disclosure"[3] exists where the increase in firm value associated with providing a signal is greater than the proprietary costs of the disclosure. The proprietary costs are costs associated with disclosures that provide rival firms with a competitive advantage. If the proprietary cost goes to zero (i.e. in the absence of a proprietary cost), a manager will choose a policy of full disclosure. In other words, there exists an equilibrium level at which not all information is disclosed (Verrecchia 2001).

While there are costs associated with disclosing information that is proprietary in nature, the decision of whether or not to disclose such information depends on the nature of the competition in which proprietary costs arise (see Darrough and Stoughton 1990; Feltham and Xie 1992; Darrough 1993).

The incentives for firms to disclose information are also influenced by the competitive position in product markets[4]. For firms engaged in an entry game, where one firm contemplates producing a

[3] Above the threshold a manager discloses what he observes; below the threshold he withholds his information (Verrecchia 1983, 179).
[4] See Verrecchia (2001) and Dye (2001); they provide a detailed review of different models in different competitive markets.

good already produced by another firm, greater competition encourages more disclosure (Darrough and Stoughton 1990; Verrecchia 1990). On the other hand, for firms engaged in a post-entry game, where firms are both currently producing goods, greater competition inhibits more disclosure (Clinch and Verrecchia 1997).

Hayes and Lundholm (1996) provide a model to explain how firms choose to disclose their segmental information for trading off the benefit of informing the capital market about their firm value against the proprietary costs of aiding rival firms. More detailed segment reports provide investors with more information about the future value of the firm. However, there are costs arising from the more detailed reporting, as the firm's competitors will use the information to the disclosing firm's disadvantage. Therefore, firms have incentives to disclose disaggregated information only when each segment has similar performance, but to conceal differences in segmental performance by reporting only aggregate information. Harris (1998) further reports that operations in less competitive industries are less likely to be reported as industry segments, which is consistent with Hayes and Lundholm's (1996) results. Harris (1998) also reports that firms cite fear of competitive harm as a disincentive to detailed segment reporting, as well as the desire to protect abnormal profits and market share in less competitive industries.

Under the capital market perspective, studies report that voluntary disclosure decisions are related to capital transactions[5], corporate control mechanisms[6], stock-based compensation, shareholder litigation and proprietary costs. There is also evidence that investors perceive voluntary disclosure as credible information (Hughes 1986; Clarkson et al. 1992).

3. Hypothesis Development

In an attempt to analyse the impact of litigation cost on managers' discretionary disclosure decisions, Hughes and Sankar (1998) found that managers with high reputation costs tend to bias the company's expected future cash flows negatively to avoid the cost of litigation-related reputation loss. Companies that disclose more prospective financial information may be more closely scrutinised by future shareholders. To reduce possible reputation costs from unattained forecasts, companies which disclose more prospective financial information may be associated with less forecast errors and may tend to under-estimate profits.

In order to examine the relationship between prospective financial information disclosed in prospectuses and forecast accuracy, the disclosure levels of prospective financial information are categorized into three groups: total disclosure items recommended by FRS-29 (TSR), total disclosure items not recommended by FRS-29 (TSV) and overall disclosure items recommended and not

[5] See Kothari (2001) for a detailed review of capital market research in accounting.
[6] See a detailed review by Bushman and Smith (2001) on financial accounting information and corporate governance.

recommended by FRS-29 (TSRV). TSR is the information that is required by FRS-29, while TSV is information that is disclosed voluntarily. The three groups of disclosure levels are investigated for their significant relationships with forecast accuracy. Accordingly, to test the relationship between levels of information disclosure and accuracy of forecasts, the following alternative hypotheses are developed:

H_a1: More *voluntary* prospective financial information Disclosed in IPO prospectuses tends to be associated with more accurate forecasts.

H_a2: More *mandatory* prospective financial information Disclosed in IPO prospectuses tends to be associated with more accurate forecasts.

H_a3: More prospective financial information Disclosed in IPO prospectuses tends to be associated with more accurate forecasts.

4. Research Methodology

4.1 Measurement of the Dependent Variable –Disclosure Level of Prospective Financial Information

There are two kinds of indices: weighted or unweighted. More recent studies tend to use an unweighted score as the measure for level of disclosure. Weighted indices are subject to certain limitations. For example, it is argued that a great deal of subjectivity exists in the assignment of weights and that users in different countries are likely to assign different weights to similar items (Cooke, 1989; Hossain *et al*., 1995; Meek *et al*., 1995). Furthermore, the importance attached to rankings by a particular group of users may not necessarily reflect the information needs of other users of financial reports (Chow and Wong-Boren, 1987). This approach has become the norm in annual reports' studies (Courtis, 1996). Accordingly, the unweighted disclosure index is used in the study.

The total points earned by a given company are computed by the following formula:

$$TSCORE_j = \sum_{i=1}^{4} SCORE_{ij} \quad \text{……} \quad (1)$$

Where TSCORE is the total score for items disclosed by company j across all prospective financial statements.

4.2 Measurement of the Independent Variables and Control Variables

The forecast accuracy is measured as the absolute relative error. The formula is shown as follow:

(1) Forecast Accuracy: Absolute relative error

$$ARE = \frac{|Actual\ Profit - Forecast\ Profit|}{|Forecast\ Profit|} \quad \text{..... (2)}$$

Previous studies have found that the variables of leverage, company size, rate of return, number of IPOs, forecast bias, previous trading history, listing status and auditor are related information disclosure level. Therefore, these variables are included as control variables to control for their impact on level of disclosure of prospective financial information. The measurements of control variables are operationalized as shown as follows:

1. Company size is measured as the log of total assets.

2. Leverage is defined as the ratio of total debt, both current and long-term, to total assets, using figures extracted from the IPO prospectuses.

3. Rate of Return is measured as net profit after tax and interest divided by total shareholders' equity.

4. The number of IPOs is defined as the number of new listings for each year during the study period. Information is obtained through the Sharemarket Review and Fact Book issued by the New Zealand Stock Exchange (NZSE, 1989-1995, 1995-2001).

5. Forecast bias is defined as signed relative error (SRE) and is operationalized as the follow formula:

$$SRE = \frac{Actual\ Profit - Forecast\ Profit}{|Forecast\ Profit|} \quad \text{.....(3)}$$

6. Previous trading history is a dummy variable and is defined as "1" if company age $\geqq$ 1 year, "0" otherwise.

7. Listing status is a dummy variable and is defined as "1" if companies listed on the stock exchange, "0" otherwise.

8. Auditor is dummy variable and is defined as "1" if auditor is a big 6 auditor, "0" otherwise.

Accordingly, the final equation is as follow:

$$Level\ of\ Disclosure = \beta_0 + \beta_1 SIZE + \beta_2 LEV + \beta_3 RETURN + \beta_4 IPO + \beta_5 ACCURACY + \beta_6 BIAS + \beta_7 HISTORY + \beta_8 LISTING + \beta_9 AUDITOR + \varepsilon \text{ ..... (4)}$$

where:

Level of Disclosure represents: Model 1: TSR, Model 2: TSV and Model 3: TSRV.

SIZE represents the transformed measure of company size.

LEV represents leverage.

RETURN represents the transformed measure of rate of return.

IPO represents the transformed measure of number of initial public offerings.

ACCURACY represents the transformed measure of forecast accuracy.

BIAS represents the transformed measure of forecast bias.

HISTORY representing previous trading history defined as the days between incorporation and prospectus date with $1 \geq 1$ year and 0 otherwise.

LISTING represents listing status with 1 for firms that are still listing on the stock exchange and 0 for firms that are delisted.

AUDITOR represents the use of a big6 auditor, with 1 for firms using a big6 auditor and 0 otherwise.

β_0 is the regression intercept.

β_1 …. β_9 are regression coefficients.

$\varepsilon$is the unexplained variable error term.

4.3 Data Collection

The sample population of the study consists of New Zealand companies making initial public offerings between 1 January 1987 and 31 December 2001. Companies newly listed on the New Zealand Stock Exchange (NZSE) during this 15-year period are identified from various sources. As a result, a total number of 159 IPOs are identified. A number of companies are excluded from the study, resulting in a final sample of 72 companies.

5. Results

The ordinary least squares (OLS) regression is used to measure the simultaneous effect of the independent variables on the disclosure levels of prospective financial information in prospectuses. The multivariate regression analysis allows an assessment of the relative importance of each explanatory variable. The data in the multivariate analysis contain sixty-three companies after removing seven

companies[7], which did not have valid data on the seven variables and two potentially influential outliers[8].

A transformation[9] proposed by Cooke (1998) that transforms the actual observations to normal distributions was applied to the independent variables with non-normal distributions. The approach is to create new rankings based on the actual values, which are assigned a normal score for each case using the van der Waerden approach[10]. The main advantage of replacing ranks by normal scores is that the results from the statistical tests have the same statistical properties "because significance levels can be determined, the F and t-tests are meaningful, the power of the F and t-tests may be used and the regression coefficients derived using normal scores are meaningful" (Camfferman and Cooke, 2002, p. 14). Before running regressions, correlation coefficients for each pair of independent variables are calculated and are all under 0.4. The results indicate that there is no evidence of multicollinearity problems.

(1) Model 1: TSR as the Dependent Variable

The results of the multiple regression model with the TSR as the dependent variable, including R, R^2, adjusted R^2, t, F and the Durbin-Watson d test[11] are presented in Table 2. Accordingly, the equation for model 1 with the TSR as the dependent variable is as follows:

$$TSR = 11.177 - 1.450\,LEVERAGE - 0.980\,SIZE + 0.297\,RETURN - 1.289\,IPO - 0.995\,ACCURACY + 0.348\,BIAS - 0.284\,HISTORY. + 1.535\,LISTING + 0.602\,AUDITOR \quad \ldots\ldots(5)$$

[7] The seven companies are Crowe Corp. (1987), Environ Corp. Ltd. (1987), Finance and Resources Ltd. (1987), St. Lukes Group Ltd. (1993), Infratil Ltd. (1994), Sky City Ltd. (1996), Infratil International Ltd. (1997).

[8] Telecom Corp. Ltd (1991) and Northland Port Corp. (NZ) Ltd. (1992).

[9] A log transformation was first applied to attempt to resolve the problem of non-normal distribution. However, only the transformed formats for sales turnover and total assets appeared to have normal distributions. Another problem arising from the log transformation is that some variables, such as rate of return and profit margin, contain negative values and thereby suffer data loss after transformation. Adding a constant value to the raw data when performing logarithmic transformations, as suggested by Wall (1986), is also tried with no better results than using the normal score transformation.

[10] The normal scores can be derived using SPSS for Windows. There are also other approaches for deriving normal scores, including Blom, Rankit and Turkey (SPSS, 2001).

[11] The Durbin-Watson *d* statistic is to detect the presence of autocorrelation among the residuals. The value of *d* always falls in the interval from 0 to 4, with the closer *d* gets to 0 or 4, the stronger the autocorrelation (positive or negative, respectively). For a detailed discussion of the Durbin-Watson *d*, refer to Gujarati (1995). The critical *d* values for seven explanatory variables with 63 observations at a significance level of 0.01 are 1.218 (d_L) and 1.680 (d_U) respectively. If $d_u < d < 4\text{-}d_U$, there is no evidence of autocorrelation, either positive or negative (Gujarati, 1995).

Table 2. Results of Multiple Regression Analysis for Model 1 (N=63)

Independent Variables	Predicted Sign	Unstandardized Coefficients	Standard Error	t	Sig.	Tolerance	VIF
Constant		11.177	1.112	10.049	.000**		
Accuracy	–	-0.995	0.432	-2.301	.025*	.615	1.627
Leverage	+	-1.450	1.218	-1.190	.239	.762	1.313
Size	+	-0.980	0.460	-2.131	.038*	.537	1.862
Rate of Return	+	+0.297	0.353	0.842	.404	.843	1.186
Number of IPOs	+	-1.289	0.428	-3.011	.004**	.652	1.533
Bias	+	0.348	0.354	0.982	.330	.832	1.202
History	n/a	-0.284	0.824	-0.344	.732	.692	1.444
Listing	n/a	1.535	0.713	2.152	.036*	.789	1.268
Auditor	n/a	0.602	0.766	0.786	.435	.901	1.109

Model summary:

$R = 0.617$[12] $R^2 = 0.380$[13] Adjusted $R^2 = 0.301$[14] Standard Error = 2.492

Durbin-Watson d test = 1.475

Analysis of Variance:

Model	Sum of Squares	df	Mean Square	F[15]	Significance
Regression	209.597	7	29.942	4.820	0.000**
Residual	341.673	55	6.212		
Total	551.270	62			

* Significant at $p \leq 0.05$

**Significant at $p \leq 0.001$

The regression equation indicates a strong relationship between the dependent variable and the independent variables (R = 0.647). The R^2 is 0.418, indicating that the equation explains about 42 percent of the variance in level of disclosure as measured by the TSR. After considering the sample size and the number of independent variables in the equation, the adjusted R^2 is 0.320. The entire model is significant at a $p \leq 0.001$ level (p =0.000) with an F ratio of 4.235.

[12] *R*, the multiple correlation coefficient, is the linear correlation between the observed and model-predicted values of the dependent variable. Its large value indicates a strong relationship.

[13] R^2, the coefficient of determination, is the squared value of the multiple correlation coefficient. It shows the model's explanatory power. The larger the value of R^2, the better the model fits the data.

[14] The adjusted R^2 measure is more conservative than R^2. It is the modified measure of the R^2 that takes into account both the sample size and the number of predictor variables in the model

[15] The *F*-test examines the overall significance of the model, based on the hypothesis that all the slope coefficients in the model are simultaneously equal to zero.

Four variables are statistically significant. Company size, as measured by sales turnover, is significant at the $p \leq 0.05$ level ($p = 0.038$), with a negative coefficient ($r = -0.980$). The negative sign is the opposite of the predicted direction. This result indicates that companies with higher sales turnover tend to disclose less prospective financial information as recommended by FRS-29.

The Number of IPOs is significant at the $p \leq 0.01$ level ($p = 0.004$), with a negative coefficient ($r = -1.289$). This implies that as the number of IPOs increases, the level of disclosure of prospective financial information decreases, which is opposite to the predicted direction. This implies that managers are reluctant to provide more prospective financial information in a year with many IPOs. This could be due to the fear that disclosing sensitive information may harm a firm's competitive position, as prospective financial information is value-relevant and price sensitive. The disincentive for more disclosure may arise from the desire to protect abnormal profits and to avoid political attack by rival companies.

The variable of ACCURACY, as measured by the absolute forecast error, is significant at the $p \leq 0.05$ level ($p = 0.025$), with a negative coefficient ($r = -0.995$)[16]. The negative relationship with the level of disclosure suggests that companies with less disclosure of the prospective financial information recommended by FRS-29 have higher forecast errors. This finding is consistent with the predicted direction.

Listing status is significant at $p \leq 0.05$ level ($p = 0.036$), with a positive coefficient ($r = 1.535$). This suggests that companies that are still listed on the Stock Exchange disclose more items of prospective financial information as recommended by FRS-29.

The remaining independent variables – leverage, rate of return, forecast bias, previous trading history and auditor – do not have a significant relationship with the dependent variable. However, it is noticeable that the coefficients for leverage is negative, indicating that companies with higher leverage tend to disclose less recommended prospective financial information, although this relationship is not significant.

(2) Model 2: TSV as the Dependent Variable

The results of the multiple regression model with the TSV as the dependent variable, including R, R2, adjusted R2, t, F and the Durbin-Watson d test are presented in Table 3.

Consequently, the equation for model 2 with the TSV as the dependent variable is as follows:

TSV = 7.274 + 0.574 LEVERAGE + 0.667 SIZE – 0.619 RETURN – 1.353 IPO - 0.169 ACCURACY + 0.206 BIAS-0.931 HISTORY.+ 0.043 LISTING + 0.478 AUDITOR……..(10)

[16] This significant relationship, however, disappered, after introducing a dummy variable (pre-1993=0; post-1993 = 1), indicating that after 1993 companies disclose significantly more prospective financial information.

The coefficient of determination (R^2) is 0.134, indicating that the amount of explained variation in disclosure of prospective financial information not recommended by FRS-29 is 13.4%. However, the F value is not significant (p = 0.521).

None of the slope coefficients is individually statistically significant. Moreover, two variables have different signs compared to model 1, with TSR as the measure of disclosure level. From the results of model 2, leverage and company size both have positive coefficients. This contradicts the results obtained in model 1, but the signs for leverage and company size are now consistent with the hypothesised directions. It is also apparent that the independent variables that are significant in model 1 (company size, number of IPOs, forecast accuracy and listing status) are not statistically significant in model 2. This implies that different factors are relevant in explaining the different types of disclosure - voluntary as opposed to compulsory.

The number of IPOs is the only variable that has a marginally significant relationship with the TSV at a $p \leq 0.1$ level (p = 0.081). The coefficient is negative, which is consistent with the results in model 1, implying that the higher the number of IPOs in the year of flotation, the less the disclosure of voluntary prospective financial information.

Table 3. Results of Multiple Regression Analysis for Model 2 (N=63)

Independent Variables	Predicted Sign	Unstandardized Coefficients	Standard Error	t	Sig.	Tolerance	VIF
Constant		7.274	1.973	3.687	.001**		
Accuracy	–	-0.169	0.767	-0.220	.827	.615	1627
Leverage	+	0.574	2.161	0.265	.792	.762	1.313
Size	+	0.667	0.816	0.818	.417	.537	1.862
Rate of Return	+	-0.619	0.627	-0.987	.328	.843	1.186
Number of IPOs	+	-1.353	0.759	-1.782	.081*	.652	1.533
Bias	+	0.206	0.628	0.328	.744	.832	1.202
History	n/a	-0.931	1.462	-0.637	.527	.692	1.444
Listing	n/a	0.043	1.265	0.034	.973	.789	1.268
Auditor	n/a	0.478	1.359	0.352	.726	.901	1.109

Model summary:

R = 0.366 R^2 = 0.134 Adjusted R^2 = -0.013 Standard Error = 4.363

Durbin-Watson d test = 1.860

Analysis of Variance:

Model	Sum of Squares	df	Mean Square	F	Significance
Regression	156.474	9	17.386	0.913	0.521
Residual	1008.954	53	19.037		
Total	1165.429	62			

*Significant at $p \leq 0.1$

**Significant at $p \leq 0.01$

(3) Model 3: TSRV as the Dependent Variable

The results of the multiple regression model with the TSRV as the dependent variable, including R, R^2, adjusted R^2, t, F and the Durbin-Watson d test are presented in Table 4.

The equation for model 3 with the TSRV as the dependent variable is as follows:

TSRV = 18.557 – 1.134 LEVERAGE – 0.311 SIZE - 0.245 RETURN – 2.570 IPO– 1.114 ACCURACY + 0.560 BIAS - 1.151 HISTORY.+ 1.525 LISTING + 1.048 AUDITOR ……..……...(11)

The correlation coefficient (R) is 0.502, indicating that there is a moderate relationship between the dependent variable and the independent variables. The R^2 is 0.252, signifying that the amount of explained variation in disclosure of prospective financial information recommended and not recommended by FRS-29 is 25.2%. The adjusted R^2 is decreased to 0.126, implying that the independent variables together explain only 12.6% of the variation in disclosure of prospective financial information that is recommended and not recommended by FRS-29. The value of the Durbin – Watson d test is 1.684, which lies between dU(1.680) and 4-dU (2.320) and therefore provides no evidence of autocorrelation, either positive or negative (Gujarati, 1995). The F value is 1.989 and is significant at a $p \leq 0.1$ level (p =0.059).

Table 4. Results of Multiple Regression Analysis for Model 3 (N=63)

Independent Variables	Predicted Sign	Unstandardized Coefficients	Standard Error	t	Sig.	Tolerance	VIF
Constant		18.557	2.386	7.777	.000**		
Accuracy	–	-1.114	0.928	-1.201	.235	.615	1.627
Leverage	+	-1.134	2.613	-0.434	.666	.762	1.313
Size	+	-0.311	0.987	-0.315	.754	.537	1.862
Rate of Return	+	-0.245	0.758	0.324	.747	.843	1.186
Number of IPOs	+	-2..570	0.918	-2.798	.007**	.652	1.533
Bias	+	0.560	0.760	0.737	.464	.832	1.202
History	n/a	-1.151	1.769	-0.651	.518	.692	1.444
Listing	n/a	1.525	1.530	0.996	.324	.789	1.268
Auditor	n/a	1.048	1.644	0.638	.527	.901	1.109

Model summary:

R = 0.502 R^2 = 0.252 Adjusted R^2 = 0.126 Standard Error = 5.277

Durbin-Watson d test = 1.684

Analysis of Variance:

Model	Sum of Squares	df	Mean Square	F	Significance
Regression	498.486	7	55.387	1.989	0.059*
Residual	1475.832	55	27.846		
Total	1974.317	62			

*Significant at $p \leq 0.1$

**Significant at $p \leq 0.01$

Consistent with the results of model 1 and model 2, the number of IPOs is significant, at a $p \leq 0.01$ level ($p = 0.007$), with a negative coefficient. The significant, negative relationship indicates that the more IPOs there are in the year of listing, the less prospective financial information, either recommended or not recommended by FRS-29, companies are willing to disclose.

Company size and forecast accuracy, which were previously found to be significant in model 1, are not significant in model 3. The negative signs are consistent with the results in model 1, although the signs are opposite to the predicted directions for model 3.

The remaining variables – leverage, rate of return, forecast bias and the control variables – do not appear to be significant in explaining disclosure levels of prospective financial information.

Diagnosis of the Regression Models

The residuals are examined by plotting them against the predicted values to see if the models are under-fitted by omitting a relevant variable. The results did not indicate any signs of misspecification errors. Further, the F-test, t test and the partial correlation coefficients are examined and the regression models are re-run by dropping one non-significant independent variable each time to compare the value of the F-test for each model. The results do not have any indication of the presence of unnecessary variables.

The basic assumptions underlying regression models are also examined. The results indicate no signs of violation of the assumptions. The condition index (CI), the tolerance value and the variance inflation factor (VIF) are used to diagnose multicollinearity. There is no evidence to support the existence of multicollinearity in any of the models.

6. Discussion and Conclusion

The results of the study have established a significant relationship between the disclosure level of prospective financial information and forecast accuracy. The significant, negative relationship indicates that companies that disclose more recommended prospective financial information tend to have less forecast errors. That is, their profit forecasts are more accurate than those that disclose fewer items of prospective financial information. The findings are consistent with signalling theory, in that management have superior information about the company's future performance and are willing to send such signals of credibility[17]. By disclosing prospective financial information, managers convey signals of a firm's future value. Management are in a better position to obtain information about a company, and, may, therefore, be willing to disclose more prospective financial information if they are

[17] In considering the impact of FRS-29 on forecast accuracy, the measure of forecast accuracy was also compared between 1992 and 1993. The finding does not, however, indicate any significant difference between 1992 and 1993 in terms of forecast accuracy.

confident about the company's future performance. Thus, companies that disclose more prospective financial information may be associated with less forecast errors.

Furthermore, it is noticeable that when analysing the relationship between level of disclosure and the independent variables, forecast accuracy was found to have a significant, negative relationship with level of disclosure in model 1, with TSR as the dependent variable. This negative relationship, however, becomes positive in model 2, with the TSV as the dependent variable, although it is not significant. This could imply that with items recommended to be disclosed by FRS-29, companies may exercise more caution in preparing this information, which will therefore have less forecast errors, i.e. it will be more accurate. However, with items voluntarily disclosed by companies, companies may be too optimistic and therefore not as cautious in preparing the information, which may result in more forecast errors.

The abnormal and extraordinary items may play an important role in forecast accuracy and forecast bias and may have an impact on the relationship between levels of disclosure and forecast accuracy and bias. In considering the impact of abnormal and extraordinary items on forecast accuracy and bias, correlation tests and regressions were re-run by replacing the measures of forecast accuracy and bias with the values of net profit after tax before abnormal and extraordinary items. The significant relationship between forecast accuracy and levels of disclosure measured by the TSR no longer existed, both in the univariate and multivariate regression analyses. The results of forecast bias using the value of net profit after tax before abnormal and extraordinary items do not change the conclusions.

Company size, numbers of IPOs in a year, forecast accuracy and listing status are found to be significantly associated with level of disclosure of prospective financial information recommended by FRS-29. As the variable of forecast accuracy is discussed in section 6.4.2, this section focuses on the discussion of the other significant variables and the entire models.

The results of regression model 1 suggest that larger companies tend to disclose less prospective financial information recommended by FRS–29 than smaller companies. The findings are inconsistent with the evidence of previous studies that larger companies tend to disclosure more information than smaller companies (Hossain et al., 1995; Meek et al., 1995; Raffournier, 1995). However, in model 2, which examined the level of disclosure measured by the total scores that are not recommended by FRS-29, the negative relationship turned to a positive one, which is consistent with previous findings that larger companies tend to disclose more information (Hossain et al., 1995; Meek et al., 1995; Raffournier, 1995). The different results may be due to the attributes of the disclosed prospective financial information. In model 1, the items disclosed (for example, total operating revenue and operating surplus) may be more sensitive to prices and therefore likely to provide a ready basis for lawsuits against larger companies. As a result, larger companies may tend to disclose less recommended prospective financial information. However, in model 2, the items disclosed are arbitrary and voluntary (for example, depreciation and expenditure) and are less price sensitive with less risk of

incurring a lawsuit. Therefore, larger companies may be willing to disclose more prospective financial information that is not recommended by FRS-29, although the relationship is not significant as tested in model 2.

Although company size was found to be a significant variable that explains the disclosure level of prospective financial information recommended by FRS-29, the significant relationship may also be explained by other variables. This can be established from the results of model 1. The tolerance value for company size is 0.537, indicating that about 46% of the variance can be explained by the other independent variables.

Number of IPOs is found to be the most significant variable in the multivariate regression analysis that is associated with the level of disclosure of prospective financial information in all three of the models tested. The negative coefficients in the three regression models imply that the disclosure level of prospective financial information is lower in years when more IPOs are made to the market. This is contradictory to the hypothesised direction, which expects more disclosure of prospective financial information in a year with more IPOs. It is possible that as the number of IPOs increases, the exposure to political attacks by competitors rises. Companies may therefore be reluctant to disclose more prospective financial information than is necessary.

A further noteworthy finding is how the directions of some of the variables differ in explaining disclosure levels for model 1 mandatory disclosure according to FRS-29, and for model 2 voluntary disclosure. In model 1, leverage, company size and profit margin all have negative coefficients, which contradicts the expected directions, whereas in model 2 the three variables have positive coefficients, which is consistent with the hypothesised directions.

It is also apparent that the same independent variables are not consistently significant in explaining the level of disclosure across the three models. This implies that different factors are important in explaining different types of disclosure. The factors that help to explain the level of disclosure that is voluntary may not be the same factors that explain mandatory disclosure.

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A Study on Dynamic Structure between Economic Indicators and Stock Market Indices-An Example of Hong Kong- An Application of Grey VAR

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ABSTRACT

This study takes the Hang Seng Index and the four belonging indices from Hong Kong stock market and Hong Kong marcro-economic indices as examples. The monthly closing stock indices and marcro-economic from January 2000 to January 2010 were sampled, which were adopted from the census and statistics department; Government of the Hong Kong Special Administrative Region and the Global Financial Database. We applied GM(1,1) on VAR into a GVAR to realize the dynamic structure between economic indices and Hong Kong stock market indices.

According to the empirical results, I found that interest rates, CPI's, foreign reserves, M1's, M2's and M3's have a Granger causality relationship with stock market indices respectively. Based on the AIC rule, stock market indices are a leading index to economic indices for eight months. By using Granger causality, decomposition variance and the impact response analysis, we realized the existence of the dynamic structure between economic indices and stock market indices in Hong Kong. And we discovered this dynamic structure is interacted and matched frequently at the state in Hong Kong economic.

Keywords：Hong Kong's Economic Indices, The Hang Seng Index, GM(1,1), Grey Vector Autoregression Model (GVAR).

1. Introduction

Stock market is a mirror to economy. We could understand a nation's economy from the variations in stock market. There are a lot of economic factors which affect each other's and the stock market as well. It must be a close relationship between economic variables and stock market indices. The economy in Hong Kong grew since 1970s, and now has a highly developed economy in financial markets, logistics, and trading, traveling and commercial industry.

Chang and Wu(1996), and Chang, Wu, and Lin(1998, 2000) studied the interaction between

stock market, monetary market, and foreign exchange market using a grey vector autoregression model (GVAR). The conclusion denoted that the noise in financial markets could be erased and forecasting accuracy could be increased.

This paper takes Hong Kong as an example and studies the dynamic structure between economic Indices and stock market Indices using GVAR. We try to understand the dynamic relationship between economic variables and stock market indices in Hong Kong.

2. Reference review

2.1 Relationship between economic variables and stock market indices

There are numerous economic variables which affect the stock markets. A lot of scholars have studied the relationship between them. The economic variables selected in the past studies consist of foreign exchange rate, interest rate, consumer price index (CPI), monetary supply, export and import, and foreign exchange reserves. Some references were reviewed as below.

1) Currency exchange rate: Chiou, Lee & Chiou (1998), Chan (2001), Jan (2002), Mok (1993), Ajayi, Friedman & Mehdian (1998) study the relationship between currency exchange rate and stock market using Granger Causality in Hong Kong. Lee (2001) used MA-GARCH(1, 1), Chen (2002) and Pan, Fok, & Liu(2007)used EGARCH-M separately on the relationship between currency exchange rate and stock market as well. They found that the relationship between them was obvious.

2) Interest rate: Mok (1993) and Chan (2001) study the relationship between interest rate and stock market using the Granger Causality in Hong Kong. They denoted that the relationship between them was obvious.

3) Consumer price index (CPI): Chang (2004) study the relationship between consumer price index and stock market using a vector autoregression model (VAR) in Hong Kong. The conclusion showed that there is a positive relationship between them, and inflation rate had causality on stock market.

4) Monetary supply, export and import, and foreign exchange reserves: few references about affection of monetary supply, export and import, and foreign exchange reserves on stock market in Hong Kong. But studies on other nations denote that monetary supply, export and import, and foreign exchange reserves had causality on stock market. Like research from Pearce & Raley (1985), Hung (1993), Unro Lee (1994), Tsai (1994), Mukherjee & Naka (1995), Lin (1997), Deng (1998), Wang & Hsue (1998), Chang (2000), Flannery & Protoppadakis (2002), Wei (2003), Liu (2005), Patra & Poshakwale (2006), Chen, Lin & Lin (2006), Ratanapakorn & Sharma (2007), Chuang (2010) are

on monetary supply. Researches from Hsu & Tsai (1993), Kuu (1996), Hseng (1996), Kao (2000), Wang (2000), Lee (2001), Graham, Nikkinen & Sahlstrom (2003), Lee (2004), Wan (2004), and Chang (2009) are on export and import. And researches from Mookerjee & Yu (1997), Tsai (2004), and Chen (2006) are on foreign exchange reserves. We consider monetary supply, export and import, and foreign exchange reserves as variables in this study.

2.2 Applications of grey forecasting model on economic and finance issues

In the finance studies, a grey forecasting model was first used in the VAR model intending to eliminate noise and increase the accuracy of forecasting stocks' prices.（Chang, 1997; Chang and Wu, 1998; Chang, Wu, and Lin, 2000） The results showed that the Grey forecasting model could capture the securities' price impulse and make the process of price discovery stable. The out-of-the-period forecasting accurate also had been increased.

Chang and Wu (1998) have discussed the seasonality about Chinese Festival in Taiwan's Security Market using Grey Forecasting Model. The results showed that the forecasting accurate was better than a Moving Average Model.

Cheng and Chan (2002) built a Grey foreign exchange model. The forecasting ability of that was better than a random walk model and a GARCH model, especially in a 3-month-period. But a random walk model' forecasting accurate was best within them. The results showed that a Grey forecasting model is better in a short time horizon.

Chang (2004, 2005) used a GM (1,1) to forecast the out-of-period beta, using Dow Jones 30 Industrial Index' component stocks and component securities markets indexes of the MSCI World Index from 1998 to 2003 as samples separately. The results show that a grey β is a good indicator of a systematic risk in the stocks market. A GM (1,1) decreases 39.8599% and 57.63% on estimation error rather than the classical Moving Average separately.

Besides, a lot of studies find that grey technical analysis indices can increase investment performance than original ones in China, Hong Kong, Singapore, Taiwan, USA, UK, Japanese, German, and Canada. (Likes Chang & Lu (2007), Chou (2008), Chang & Lin (2009), Chang & Hsu (2009), Cheng (2009), Lee (2009), Chang & Lin (2010), Chang & Hung (2010), and Chang & Chen (2010) separately)

3. Methodology

This study builds a Grey vector autoregression model (GVAR) to understand the dynamic relationship between economic variables and stock market indices in Hong Kong. Some studies using autoregression model (VAR) had have been applied successfully in Hong Kong stock market. (Likes

Lin, Pan, & Fung (1996), Yu (1997), and Chang (2004).)

First of all, we select the history data of economic variables and Hang Seng Index in Hong Kong. Then, we get a whitened data base through a Grey forecasting model GM (1, 1). In order to ensure that the data is identical to the stationary process, an ADF unit root test is used before Granger Causality test. After Granger Causality test, related economic variables and Hang Seng Indices are selected into the vector autoregression model (VAR). In the VAR model, we could understand the dynamic relationship between economic variables and stock market indices in Hong Kong. Prediction error variance decomposition and impact response module are used.

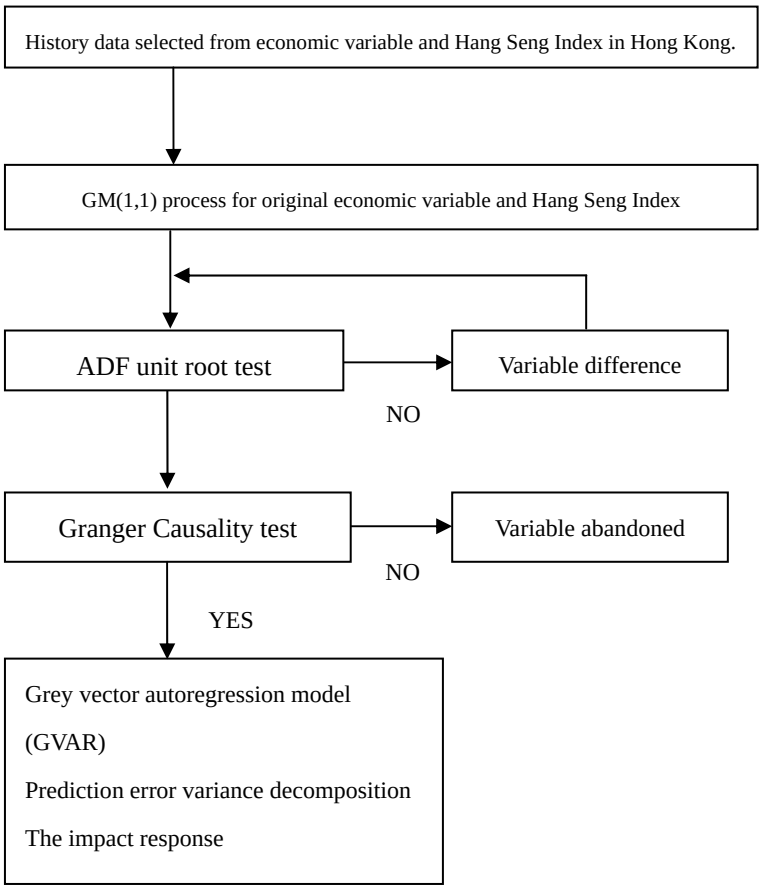


Figure 1 The Study Frame

4. Results

4.1 Granger Causality test

Granger (1980), Ng and Perron(1995) denoted that a lag period selection is important within a time series model. This paper uses Akaike information criterion (AIC) to decide auto regression lag. All of the economic variables and stock market indices are identical to stationary process after difference, we find eight period lagged is suited to Granger Causality test. The results are showed as table 1.

Table 1 An AIC Suited Lag Period Test.

Lag	HSID	HSNCD	HSNFD	HSNPD	HSNUD
	AIC	AIC	AIC	AIC	AIC
0	142.4881	141.4689	143.4713	143.3830	142.5171
1	141.2729	140.3344	142.2097	142.3657	141.5415
2	141.0485	140.1550	141.8956	142.3000	141.6927
3	141.0877	140.2149	141.8604	142.2845	141.7704
4	141.1311	140.2347	141.8987	142.1352	141.4249
5	140.0595	139.3161	140.6905	140.9649	140.2264
6	138.8715	138.2010	139.4077	140.1677	139.1914
7	137.6340	136.6044	138.5374	138.9922	137.3399
8	**134.9759***	**133.6201***	**136.4447***	**135.7401***	**135.6993***

We found that almost all of the economic variables and stock market indices have one-way causality relationship after Granger Causality test. But some of them have a two-way causality relationship. The results are showed on tables 2 to 3.

Table 2 The Granger Causality Relationship between Economic Variables and Stock Market Indices

CPI ↔ Financial index	Export ↔ M1
CPI ↔ Real estate index	M1↔ M2
Currency exchange rate ↔import	M1↔ M3
Currency exchange rate ↔ M1	M1↔ Financial index
Currency exchange rate ↔ M2	Hang Seng index↔ Real estate index
Currency exchange rate ↔ M3	Commercial index↔ Real estate index
Import ↔ Utility industry index	Financial index ↔ Real estate index

Table 3 Granger Causality Test between Economic Variables and Stock Market Idices

Lead-lag	CPI	FOREX	Import	Export	Reserves	Interest	M1	M2	M3	Hang Seng	Commercial	Financial	Real estate	Utility	sum
CPI					***	**						*	*		4
Currency exchange rate (FOREX)			***		***		*	**	*						5
Import	***	*												***	3
Export		**	**				*	*							4
Foreign exchange			*												1
Interest rate													*		1
M1		*	***	*				***	***			**			6
M2	***	*	*				***			**		***	**		7
M3	***	*	*				***			**		***	**		7
Hang Seng index	**						***						***	***	4
Commercial index	**						***			**			***	***	5
Financial index	*		*				***						**	**	5
Real estate index	***				***		**			**	**	***		***	7
Utility industry index			***		***										2
sum	7	5	8	1	4	1	8	3	2	4	1	5	7	5	61

Note：***,**and *denote 1%, 5%, and 10% significant respectively.

Period	S.E.	DCPI	DFOREX	DIMPORT	DEXPORT	DFOREIGN	DINTEREST	DM1	**DM2**	DM3	DHSID	DHSNCD	DHSNFD	DHSNPD	DHSNUD
1	99368.48	2.772013	21.61410	2.510614	0.668075	11.23440	1.672103	17.09333	**42.43537**	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	122051.8	1.989298	27.36326	2.356540	0.959749	8.424523	2.241571	16.78918	**33.05131**	0.192568	1.549983	2.860609	0.104307	2.056634	0.060469
8	146463.3	2.257793	26.46239	3.262043	2.117277	7.948661	2.210125	18.34798	**25.44860**	0.815758	1.293211	3.638524	1.815042	3.268008	1.114586
12	147517.8	2.447384	26.48064	3.225141	2.123509	7.884103	2.238458	18.16719	**25.13475**	0.857613	1.479165	3.728381	1.808895	3.306570	1.118200

Table 7 Prediction Error Variance Decomposition of M2

From the empirical result of table 7, we understand that M2 could explain itself by 42.43 percentages, and 57.57% is regulated by other variables, likes FOREX and M1. Within the second-month period, M2 explains itself decreasingly to 33.05% and 66.95% and is regulated by other variables. The percentage M2 explains itself by 25.44% only within the eighth-month period. The results show that M1 and M2 interact with each other closely.

Period	S.E.	DCPI	DFOREX	DIMPORT	DEXPORT	DFOREIGN	DINTEREST	DM1	DM2	DM3	**DHSID**	DHSNCD	DHSNFD	DHSNPD	DHSNUD
1	1274.262	5.447105	4.426365	0.593286	0.043425	14.85910	0.330755	1.709805	25.65387	0.512331	**46.42396**	0.000000	0.000000	0.000000	0.000000
2	1454.950	6.517097	5.133677	0.552653	0.033417	13.84271	0.281500	1.392906	19.68960	0.406992	**48.81745**	1.354200	1.797921	0.021304	0.158573
8	1786.684	5.564608	10.22773	0.493385	0.962345	11.70988	2.249566	3.224925	16.38763	0.382400	**34.07350**	4.108315	7.913819	1.422747	1.279153
12	1802.700	5.516511	10.27724	0.523177	1.223628	11.54446	2.240707	3.179701	16.16542	0.424902	**33.50618**	4.164924	8.054870	1.633719	1.544551

Table 8 Prediction Error Variance Decomposition of Hang Seng Index

From the empirical result of table 8, we understand that Hang Seng index could explain itself by 46.42 percentages, and 53.58% be regulated by other variables, like M2 and FOREX. Within the second-month period, Hang Seng index explains itself increasingly to 48.81%. The percentage Hang Seng index explains itself deeply decreases by 34.07% within the eighth-month period.

4.2 Prediction Error Variance Decomposition

We could get a prediction error from the variance decomposition of variables in a vector autoregression model (VAR). According to relative percentage of the variance decomposition of variables, we can understand that the variance source from itself or others. After a Granger Causality test, some stronger variables likes CPI, Forex, M1, M2, Hang Seng Index, and Real Estate Index as examples, we know that their prediction error variance is from decomposition by the first, second, eighth, and twelfth interval separately. Due to the eight-month period lag, which was identical to stationary process, the eight-month period's prediction error variance decomposition will be steady. The results are shown on tables 4 to 9.

Period	S.E.	**DCPI**	DFOREX	DIMPORT	DEXPORT	DFOREIGN	DINTEREST	DM1	DM2	DM3	DHSID	DHSNCD	DHSNFD	DHSNPD	DHSNUD
1	0.727981	**100.0000**	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.837389	**84.78187**	1.824997	0.427768	0.498355	0.058874	0.492751	0.784475	1.210674	0.150504	5.641102	3.469011	0.433095	0.220643	0.005879
8	0.965244	**68.58073**	3.185882	0.604251	1.391114	0.927033	2.254432	1.370580	2.340835	0.990324	7.040733	5.685607	1.938922	1.275118	2.414435
12	0.973075	**67.75991**	3.303314	0.605268	1.421508	0.973321	2.240723	1.372459	2.351861	0.990075	7.026544	5.741176	2.306804	1.322000	2.585035

Table 4 Prediction Error Variance Decomposition of CPI

From the empirical result of table 4, we can understand that the CPI could explain itself by 100 percentages. Within the second-month period, the CPI explains itself decreasingly to 87.78%, and 15.22% have been regulated by other variables, like the Hang Seng index. The percentage of CPI explains itself by the 68.58% within the eighth-month period.

Period	S.E.	DCPI	DFOREX	DIMPORT	DEXPORT	DFOREIGN	DINTEREST	DM1	**DM2**	DM3	DHSID	DHSNCD	DHSNFD	DHSNPD	DHSNUD
1	99368.48	2.772013	21.61410	2.510614	0.668075	11.23440	1.672103	17.09333	**42.43537**	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	122051.8	1.989298	27.36326	2.356540	0.959749	8.424523	2.241571	16.78918	**33.05131**	0.192568	1.549983	2.860609	0.104307	2.056634	0.060469
8	146463.3	2.257793	26.46239	3.262043	2.117277	7.948661	2.210125	18.34798	**25.44860**	0.815758	1.293211	3.638524	1.815042	3.268008	1.114586
12	147517.8	2.447384	26.48064	3.225141	2.123509	7.884103	2.238458	18.16719	**25.13475**	0.857613	1.479165	3.728381	1.808895	3.306570	1.118200

Table 7 Prediction Error Variance Decomposition of M2

From the empirical result of table 7, we understand that M2 could explain itself by 42.43 percentages, and 57.57% is regulated by other variables, likes FOREX and M1. Within the second-month period, M2 explains itself decreasingly to 33.05% and 66.95% and is regulated by other variables. The percentage M2 explains itself by 25.44% only within the eighth-month period. The results show that M1 and M2 interact with each other closely.

Period	S.E.	DCPI	DFOREX	DIMPORT	DEXPORT	DFOREIGN	DINTEREST	DM1	DM2	DM3	**DHSID**	DHSNCD	DHSNFD	DHSNPD	DHSNUD
1	1274.262	5.447105	4.426365	0.593286	0.043425	14.85910	0.330755	1.709805	25.65387	0.512331	**46.42396**	0.000000	0.000000	0.000000	0.000000
2	1454.950	6.517097	5.133677	0.552653	0.033417	13.84271	0.281500	1.392906	19.68960	0.406992	**48.81745**	1.354200	1.797921	0.021304	0.158573
8	1786.684	5.564608	10.22773	0.493385	0.962345	11.70988	2.249566	3.224925	16.38763	0.382400	**34.07350**	4.108315	7.913819	1.422747	1.279153
12	1802.700	5.516511	10.27724	0.523177	1.223628	11.54446	2.240707	3.179701	16.16542	0.424902	**33.50618**	4.164924	8.054870	1.633719	1.544551

Table 8 Prediction Error Variance Decomposition of Hang Seng Index

From the empirical result of table 8, we understand that Hang Seng index could explain itself by 46.42 percentages, and 53.58% be regulated by other variables, like M2 and FOREX. Within the second-month period, Hang Seng index explains itself increasingly to 48.81%. The percentage Hang Seng index explains itself deeply decreases by 34.07% within the eighth-month period.

Variance Decomposition of DHSNPD:															
Period	S.E.	DCPI	DFOREX	DIMPORT	DEXPORT	DFOREIGN	DINTEREST	DM1	DM2	DM3	DHSID	DHSNCD	DHSNFD	**DHSNPD**	DHSNUD
1	1837.909	2.758989	1.680083	0.882016	0.006378	18.05875	1.210098	0.611474	16.19055	0.009661	37.51646	1.680978	12.03084	**7.363713**	0.000000
2	2155.294	4.742435	3.776204	0.642958	0.005670	18.89217	0.931975	1.014551	13.65498	0.535638	38.29422	2.194699	8.757826	**5.443022**	1.113646
8	2717.182	4.439353	6.273826	1.535229	0.843356	15.55769	4.384563	1.356634	10.14506	0.550328	26.73647	7.395416	13.08613	**4.482043**	3.213904
12	2750.590	4.558680	6.458232	1.527813	1.111081	15.19388	4.291530	1.344327	9.943172	0.611030	26.15549	7.368654	13.15449	**4.590059**	3.691559

Table 9 Prediction Error Variance Decomposition of Real Estate Index

From the empirical result of table 8, we understand that the Real Estate index could explain itself by 7.36 percentages only, and 92.64% be regulated by other variables, mainly by the Hang Seng index. Within the second-month period, the Real Estate index explains itself by 5.44% decreasingly. The percentage Real Estate index explains itself by 4.48% within the eighth-month period.

According to the open economy, stock market indices in Hong Kong are affected by macro economic variables easily, especially that the Real Estate index is affected by Hang Seng index and other variables significantly, and M1 and M2 interact with each other closely.

4.3 Impact responses analysis

An empirical result for impact responses analysis based on the Word principal is obtained. (Sim, 1980) From the results showed by the impact responses analysis, we could ascertain that the impact responses are shortly or not, positively or negatively. The following are some empirical results:

Table 3 Granger Causality Test between Economic Variables and Stock Market Idices

Lead-lag	CPI	FOREX	Import	Export	Reserves	Interest	M1	M2	M3	Hang Seng	Commercial	Financial	Real estate	Utility	sum
CPI					***	**						*	*		4
Currency exchange rate (FOREX)			***		***		*	**	*						5
Import	***	*												***	3
Export		**	**				*	*							4
Foreign exchange			*												1
Interest rate													*		1
M1		*	***	*				***	***			**			6
M2	***	*	*				***			**		***	**		7
M3	***	*	*				***			**		***	**		7
Hang Seng index	**						***						***	***	4
Commercial index	**						***			**			***	***	5
Financial index	*		*				***						**	**	5
Real estate index	***				***		**			**	**	***		***	7
Utility industry index			***		***										2
sum	7	5	8	1	4	1	8	3	2	4	1	5	7	5	61

Note：***,**and *denote 1%, 5%, and 10% significant respectively.

From the empirical result of figure 3, we can understand that whenever a unit M2 spontaneous interference happens, the impact responses exist until the eight-month interval.

- When a unit positive M2 interference happens, it has a 38% delayed effect in the first-month period. A 26% and 30% revivification can happen in the second-month period and the third-month period respectively, and vanish in the fifth-month period.
- M2 has an impact on FOREX by 20%, and a 15% revivification in the fifth-month period.
- M2 has impact on M1 and Financial index by 48% and -22% respectively in the first-month period.
- M2 has a negative impact on the Hang Seng index by 19% in the third-month period.

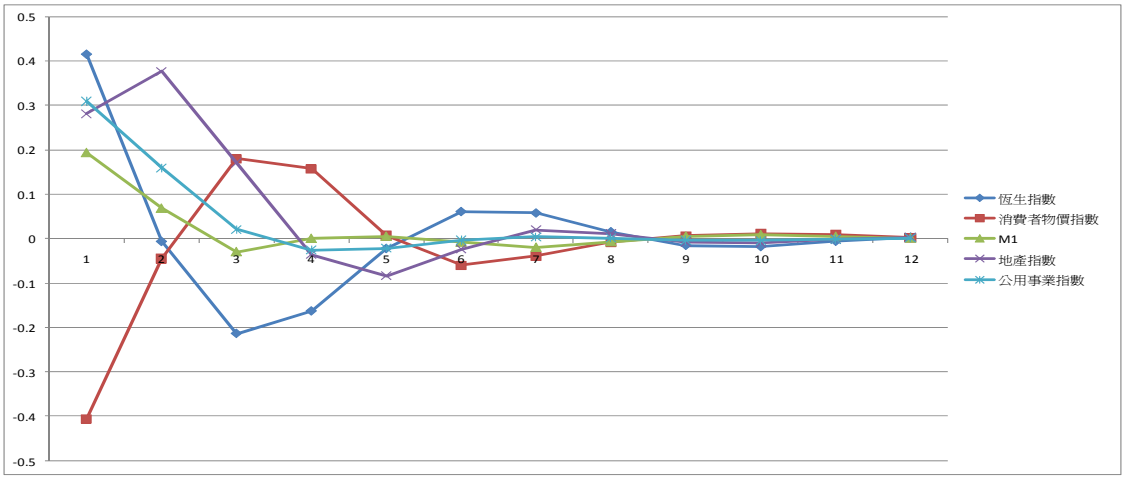


Figure 4 Impact Responses from Hang Seng Index

From the empirical result of figure 4, we can understand that whenever a unit Hang Seng index spontaneous interference happens, the impact responses exist till seventh-month interval.

- When a unit positive interference of Hang Seng index happens, it has a 42% delayed effect in the first-month period. A 21% revivification happens in the third-month period, and vanishes in the sixth-month period.
- The Hang Seng index has an impact on CPI, M1 and Utility index by -41%, 19%, and 31% respectively in the first-month period.
- The Hang Seng index has a negative impact on the Real Estate index by 38% in the second-month period.

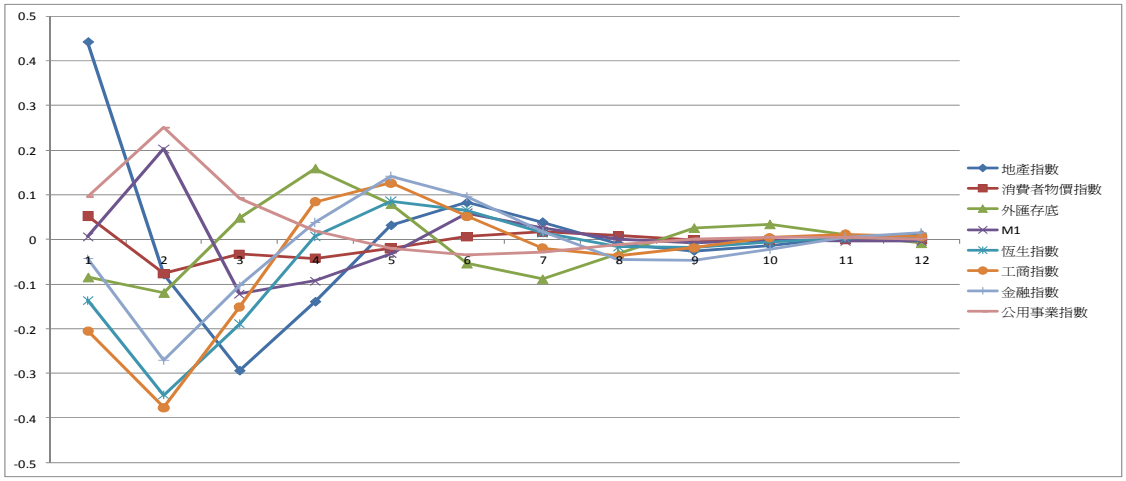


Figure 5 Impact Responses from Real Estate Index

From the empirical result of figure 5, we understand that whenever a unit Real Estate index spontaneous interference happens, the impact responses exist until the eighth-month interval.

- When a unit positive interference of Real Estate index happens, it has a 44% delayed effect in the first-month period. A 29% revivification happens in the third-month period, and vanishes in the fifth-month period.
- The Real Estate index has an impact on M1, Hang Seng index, Commercial index, Financial index, and Utility index by 20%, -35%, -38%, -27%, and 25% respectively in the second-month period.

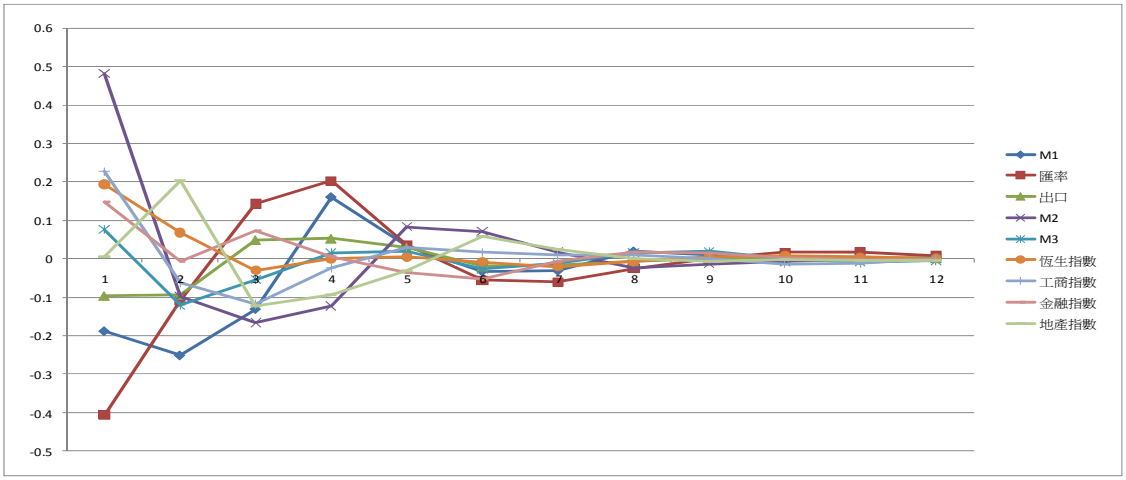


Figure 6 Impact Responses of M1 from Other Eight Variables

From the empirical result of figure 6, we can understand that whenever a unit spontaneous interference from other variables happen, how the M1 responses. The impact response exists until the eight-month interval.

- When unit M1 interference happens, it has a 19% and 25% revivification in the first and second-month period respectively.
- FOREX has the greatest impact on M1 by -41% in the first-month period.
- M3 and Real Estate index have the greatest impact on M1 by -12% and 20% respectively in the second-month period.
- M2, Hang Seng index, Commercial index, and Financial index have the greatest impact on M1 by 48%, 19%, 23%, and 15% respectively in the first-month period.

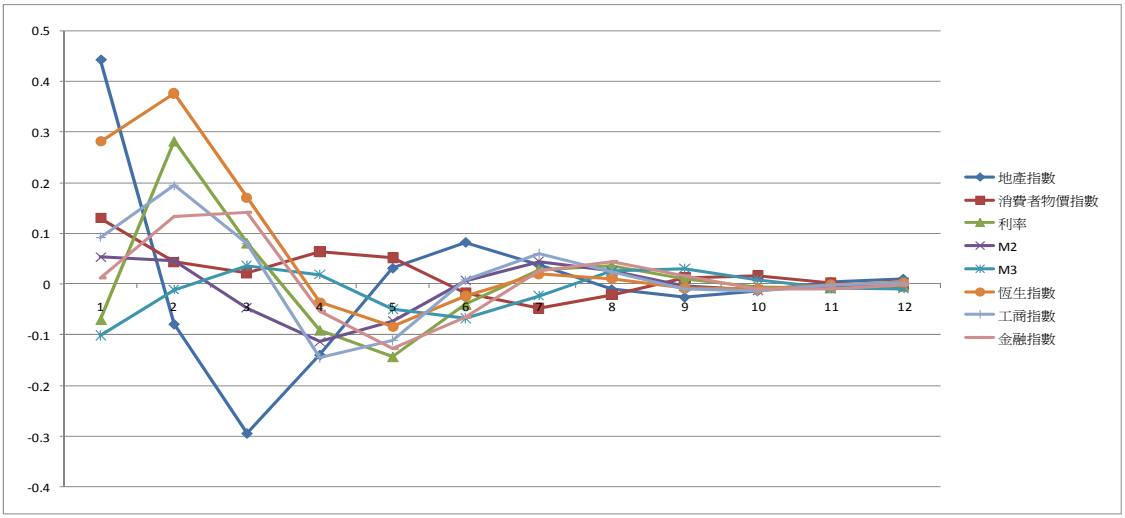


Figure 7 Impact Responses of Real Estate Index from Other Seven Variables

From the empirical result of figure 7, we can understand that whenever a unit spontaneous interference from other variables happen, how the Real Estate index responses. The impact response exists until the eight-month interval.

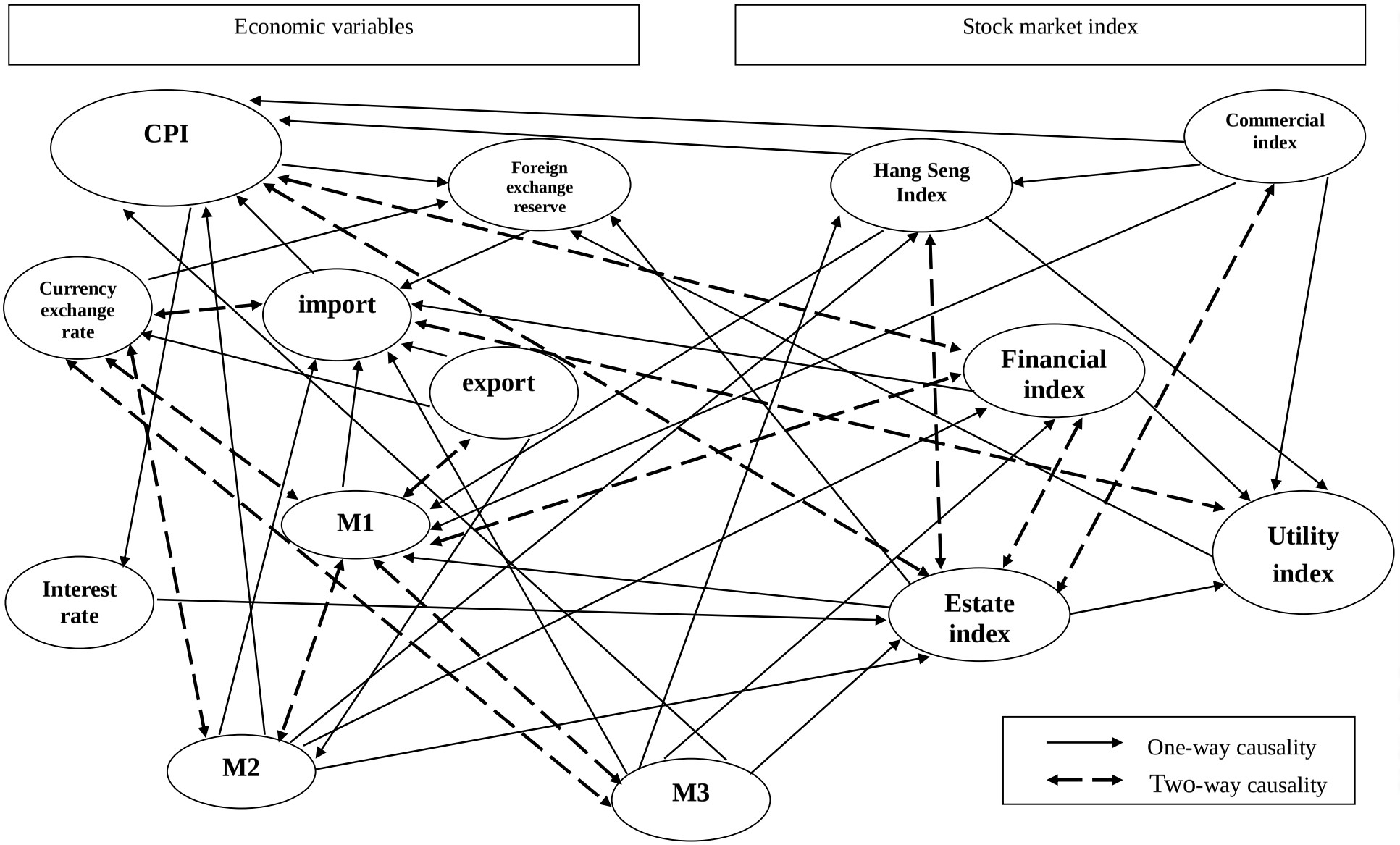
- When unit CPI interference happens, it has a 13% impact on Real Estate index in the first-month period.
- Hang Seng index, Commercial index, Interest, and Financial index have the greatest impact on the Real Estate index by 38%, 19%, 28%, and 14% respectively in the second-month period.

5. Concluding Remarks

This paper studies the dynamic structure between economic indices and Hong Kong stock market indices, using the Hang Seng Index and four belonging indices from Hong Kong stock market and Hong Kong marcro-economic indices as examples. The monthly closing stock indices and marcro-economic variables from January 2000 to January 2010 are sampled.

1. Based on AIC rule, stock market indices is a leading index of economic indices for eight months.
2. According to the empirical results from GVAR, We found that the interest rate, CPI, foreign reserves, M1, M2 and M3 have a Granger causality relationship with stock market indices respectively.
3. By using the Granger causality, decomposition variance and the impact response analysis, we can understand the existence of the dynamic structure between economic indices and stock market indices in Hong Kong. And we discovered this dynamic structure is interacted and matched frequently at the state of Hong Kong's economy.

Figure 10 Causality Relationships between Economic Variables and Stock Market Indices



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