

THE NEXUS BETWEEN STOCK MARKET
PERFORMANCE AND GOLD PRICE: THE CASE OF
HANG SENG INDEX

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- (2) No portion of this research project has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.
- (3) Equal contribution has been made by each group member in completing the research project.
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LIST OF ABBREVIATIONS

ADF	Augmented Dickey-Fuller
AIC	Akaike Information Criterion
APT	Arbitrage Pricing Theory
ARCH	Autoregression Conditional Heteroscedasticity
CAPM	Capital Asset Pricing Model
DUMMY	Financial Crisis
EIA	Energy Information Administration
EMH	Efficient Market Hypothesis
ER	Exchange Rate
EIEWS	Econometric Views
FOB	Free On Board
GARCH	Generalized Autoregression Conditional Heteroscedasticity
GP	Gold Price
HKD	Hong Kong Dollar
HSI	Hang Seng Index
JB	Jarque-Bera
JJ	Johansen-Juselius
LOG	Natural logarithm
MPT	Modern Portfolio Theory
OLS	Ordinary Least Square
CO	Crude Oil Price
PP	Phillips and Perron
SC	Schwarz Information Criterion
S&P	Standard and Poor
U.S.	United State
USD	United State Dollars
VAR	Vector Auto Regression
VECM	Vector Error Correction Model
WMR	Web Money Reuter

PREFACE

Patel (2013) found that there has causal relationship between stock market indices and gold price and gold price is a significant factor to predict the stock market indices. Gold price reacts differently to factors that impact the stock market. Therefore, the increased gold price tends to reduce the stock market price. This is because investors tend to focus on gold investment as gold can act as inflation hedge. Thus, when there are no market players in the stock market, it causes the stock market performance going down trends. As the result, they tend to engage into negative relationship.

On the other hand, some people perceived that gold prices will increase because of the market fear. During the bull market, the investors can bought in the gold with the low price and sell it with higher price in the bear market in order to earn maximum profit. Eventually, it will cause the gold price to rise. Therefore, the bi-directional relationships between them lead us to examine them in order to verify their relationship. However, gold price behavior tend not to be stable as past decade and surprisingly to say that, the gold price behavior is starting to fluctuate.

In conclusion, this paper will focus on examine the stock market movement with main independent variable as gold price and control variables like crude oil price, exchange rate and financial crises.

ABSTRACT

This research studies the relationship between Hong Kong stock market which proxy by Hang Seng Index (HSI) and four determinants including gold price, crude oil price and exchange rate as well as two financial crises which are Asian Financial Crisis 1997 and Subprime Mortgage Crisis 2007. A total of 5217 samples size ranging from 3 January 1994 to 31 December 2013 are used to run for the empirical analysis. This research adopts Unit Root Test to test unit root, Schwarz Information Criterion (SC) to obtain optimal lag length, Johansen-Juselius (JJ) Cointegration test and Vector Error Correction Model (VECM) to test long run relationship, Granger Causality to test short run relationship and last but not least, Ordinary Least Square (OLS) to determine the general relationship between Hang Seng Index (HSI) and its determinants. Based on the system equation generated through VECM output, gold, crude oil, exchange rate and financial crises are significantly affecting the Hong Kong stock market. Furthermore, gold is positively affecting Hong Kong stock market whereas crude oil, exchange rate and financial crises are negatively affecting it. Through the Granger Causality test, only gold and exchange rate have bidirectional causality with Hang Seng Index. The rest are only one way granger cause from gold to exchange rate, gold to crude oil and crude oil to Hang Seng Index.

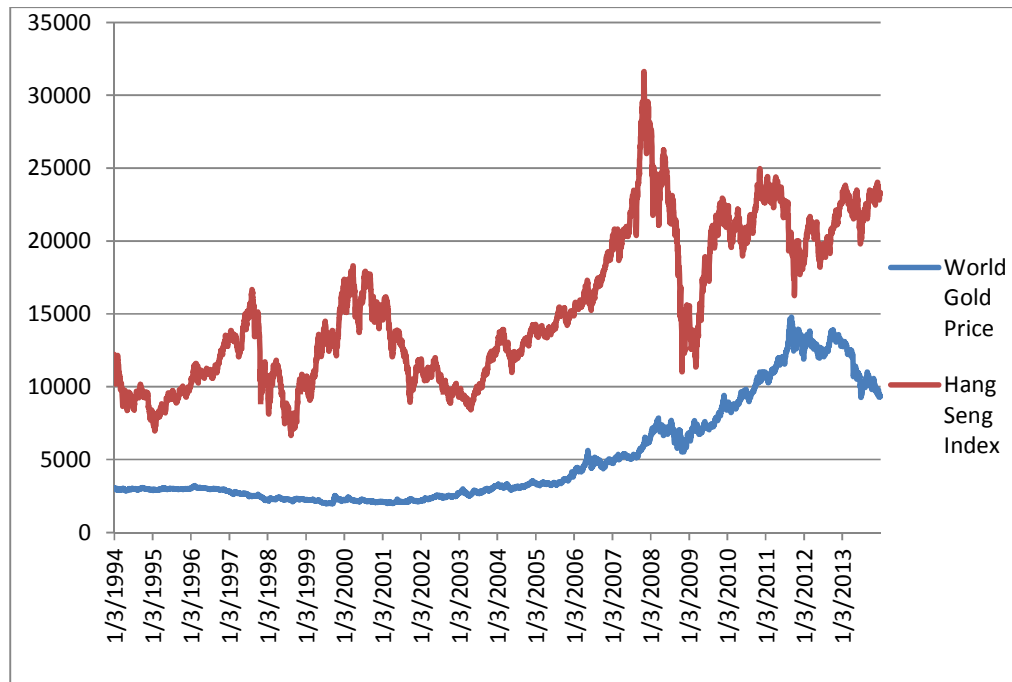
CHAPTER 1: RESEARCH OVERVIEW

1.0 Introduction

In this era of globalization, major economic policy makers, economists, government and academicians as well as investors are very concern on the behaviour of the stock market movement. This is due to the increases of liberalization among international capital markets and sophisticated technologies advancement. It has made the stock market to be more volatile compared to past decades. Therefore, it is vital to begin a research for market players in further understanding what factors contribute to the stock market movement. This is because stock market acts as a crucial indicator that can reflect the health of a country's economy. A strong foundation in understanding the movement of stock market can enhance the forecasting skills for public. In fact, Hong Kong stock market is a well-known international market that plays an important role in affecting Asian market. This research examines how the gold price, crude oil price and exchange rate can be used to study the Hong Kong stock market movement while taking the financial crises into account.

In this research, the main study area is whether Hong Kong stock market, gold price, crude oil price and exchange rate are cointegrated or not. Hang Seng Index (HSI) could be the indicator of Hong Kong stock market because it owns the biggest market capitalization in Hong Kong Stock Exchange (HKSE). Furthermore, Hang Seng Index consisted of 48 companies from Hong Kong or Mainland China enterprises that represented more than 60% of the values of all stocks trading in HKSE (Lee, 2012).

Figure 1: Movement of world gold price and Hang Seng Index



Adapted from:

World Gold Council – Interactive gold price chart (n.d.). Retrieved January 16, 2014, from <http://www.gold.org/investment/interactive-gold-price-chart>

Yahoo Finance – Hang Seng Index (n.d.). Retrieved January 16, 2014, from <http://finance.yahoo.com/echarts?s=^HSI+Interactive#symbol=^HSI;range=1d>

From Figure 1, it shows the relationship between Hang Seng Index and world gold prices per ounce Hong Kong Dollar (HKD). Generally, the graph illustrates that world gold price increasing steadily while Hang Seng Index tends to fluctuate over the 20 years. From the second half of 1997, it was obvious that Hang Seng Index was declining sharply from approximately 17,000 index points to approximately 8000 index points due to Asian Financial Crisis 1997. Meanwhile, the world gold price tends to have a slight fall in value. In mid of 1998, Hang Seng Index fell to a greater extend and stood at the lowest index point throughout the study period.

Afterward, the trend was going upward until second half of 2007. Unfortunately, there was a global financial crisis again, Subprime Mortgage Crisis 2007 that originated from burst of housing price in United States. Again, Hang Seng Index fell tremendously from approximately 32, 000 index point to 12, 000 index point at the end of year 2008. Surprisingly, the graph illustrated that the world gold price roses which contradict with the declining stock index. This unique relationship creates a motivation to begin the research to study the relationship between world gold price and Hong Kong stock market.

1.1 Research Background

1.1.1 Research Background of Hong Kong

Hong Kong is the newly industrialized and one of the most developed countries in growing region of economy. It is a great financial center with easy access for international and domestic investors and this lead many people to believe that Hong Kong is significance to further development of Asia. It was also well-known as open market economy with less regulatory barriers and transparent information flows among stock markets in Asia which allowed for international listing and trading (Agarwal, Liu and Rhee, 2007).

Furthermore, Hong Kong is a high concentration of largest banking institution in the world as it fully comprises of international bank and local bank which creates a strong global banking platform. When there is a good banking platform, it tends to be a strong backbone for the stability of Asia's economy. Thus, Hong Kong has high chances to become the major banking center and largest offshore center in Asia. As the result, Hong Kong stock market will achieve a higher level and represent Asia largest stock market to compete with Western stock market.

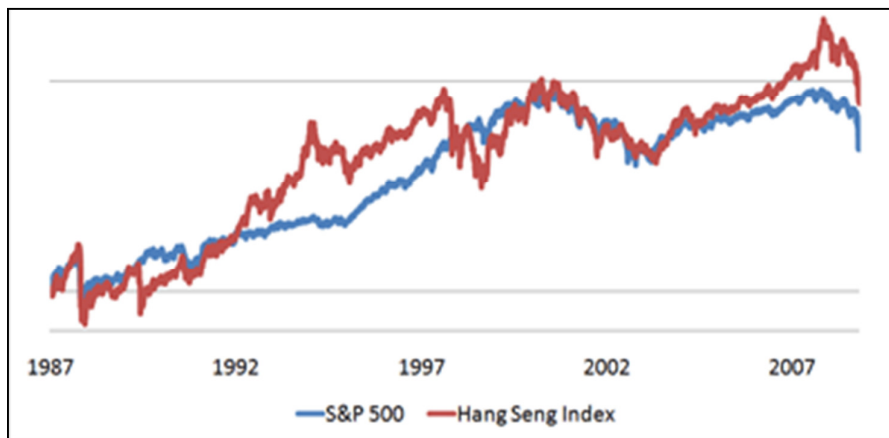
International capital markets are becoming more integrated due to the improvement of information technology. The sophisticated technology significantly reduces the cost of cross border financial transaction that allows investors to invest internationally. Thus, it causes the linkage of Hong Kong stock exchange with international exchange to become stronger and interdependence. According to Cheung and Sami (2000), Hong Kong has strong connection with China, a fast growing economy in which the whole world was paying attention on it. It also stands an important position as capital rising center for China. Thus, Hong Kong stock market becomes the passing bridge for international investors to invest into high potential China market. Therefore, Hong Kong turns to be vital in the evolution of global financial market. As the result, Hong Kong stock market is highly expected to be a good and attractive place for investment among domestic and foreign investors.

Besides, Hong Kong stock market is the information driven for London market. London market makers widely use Hong Kong price as the benchmark in determining their bid and ask quotes in trading shares (Agarwal, et al., 2007). London market maker will set their bid price lower than Hong Kong closing bid price and set ask price higher than Hong Kong's closing ask price (Agarwal, et al., 2007). As the result, Hong Kong stock market stands a very important position for the London stock market. Eventually, it motivates to begin this study to carry out research on Hong Kong stock market as it has superior effect in determining the bid and ask price for other country's stock market.

In facts, U.S. is a leading stock market in the world and normally it is negatively related with gold. It means that when U.S. stock market going downwards, investors will switch their investment toward gold commodity. Thus, gold price stood up and caused them tend to have negative relationship. The question arises here is that "Does the negative relationship between the two variables applicable in Hong Kong?" Does

U.S. stock market performance have influence on Hong Kong stock market performance?

Figure 2: Trend movement between S&P 500 and Hang Seng Index



Adapted from: Connection between Asian and US Stock Market Performance, Part I: Hong Kong's Hang Seng Index. (2008, October). Retrieved January 17, 2014, from <http://marketsci.wordpress.com/2008/10/22/connection-between-asian-and-us-stock-market-performance-part-i-hong-kong%E2%80%99s-hang-seng-index/>

From the figure above, both market performance for Standard & Poor 500 and Hang Seng Index are following through with each other. In other words, Hang Seng Index and the S&P 500 are related with each other as they have similar trend movement. On 12 February 2014, South China Morning Post reported that “Hong Kong Stock market has been heavily influenced by what happened in the U.S.”. Since U.S. and Hong Kong market is positively related, how does gold price will react towards Hong Kong stock market performance? This unfilled gap creates motivation to further investigate the existence of long run relationship, whether negatively or positively correlated.

1.1.2 Research Background of Hong Kong Stock Exchange

Hong Kong officially established its stock market once the Association of Stockbrokers was formed in year 1891 (Hong Kong Securities Market Fact Book, 1999). Then, it was renamed as Hong Kong Stock Exchange (HKSE) in year 1914. In year 1987, the market experienced crash and this led to the establishment of Securities and Futures Commission (SFC) as a sole market regulator. After the crash, HKSE becomes a well regulated market to keep the soundness of the system. Thus, when the order driven market was centralized and computerized, the market turned out to be very transparent for investors (Ahn and Cheung, 1999; Brockman and Chung, 1998). Unlike New York Stock Exchange (NYSE), HKSE was mainly relying on liquidity from public trading through limit order placement without intervene by any specialists, dealers and market maker (Ahn, Cai and Cheung, 2005).

In addition, it had been ranked as the 8th largest stock exchange markets in the world with its US\$ 1,063.9 trillion market capitalization (Garefalakis, Augustinos, Dimitris, and Konstantinos, 2011). While in term of Initial Public Offering (IPO) fundraising, Hong Kong Stock Exchange was among the top five in the world for 11 conservative years (Charlton, 2013). Today, HKSE was the third biggest in Asia after Tokyo Stock Exchange and Shanghai Stock Exchange that established at the end of 19th century (Lee, 2012).

1.1.2.1 Research Background of Hang Seng Index (HSI)

Surprisingly, Hang Seng Index (HSI) was one of the oldest stock indexes in Hong Kong that launched as early as 24th November 1969 (Garefalakis et al., 2011). HSI was managed by Hang Seng Indexes Company Limited, which fully owned by Hang Seng Bank Limited (Hang Seng Investment, 2013). It started to calculate on the base value of 100 as at 31st July 1964. Moreover, on 2nd January 1985, HSI Services Limited had categorized the

stocks into different sub-index which are Finance, Utilities, Commerce, Properties and Industry Sub-indexes in order to clearly reflect the price movement of stock from different sectors (Hang Seng Indexes Company Limited, n.d.).

HSI was not the only index that managed by HSI Services Limited, HSI Services also responsible in managing, computing and publishing for other stock indices that traded in Hong Kong. For example, Hang Seng Composite Industry Indexes, Hang Seng Composite Size Indexes, Hang Seng China Enterprises Index, Hang Seng China-Affiliated Corporation Index and so on (Hang Seng Indexes Company Limited, n.d.). Based on the Hang Seng Investment (2013), the top 2 largest weighting stocks in Hang Seng index were HSBC Holding Plc (15.22%) and China Mobile Limited (7.26%).

Effective from 6 May 2013, HSI will be updated on a 2-second basis during trading hours of HKSE and its closing price was based on official closing stock price announced by HKSE (Hang Seng Investment, 2013). In fact, HSI was a free floating stock index that listed in Hong Kong. It also had been widely used as determinant for performance of Hong Kong stock market (Hang Seng Investment, 2013). This was because it represented 60% of total market capitalization of stock that listed in HKSE (Lee, 2012). It also records the performances and monitors the daily stock price changes of the biggest and most liquid companies that listed in HKSE.

In conclusion, from all the factors mentioned above, it may perceive that HSI is one of the leading stock indexes that can represent Hong Kong stock market. As the result, this research includes Hang Seng Index as the proxy for Hong Kong Stock market.

1.1.3 Research Background of determinants that affect Hong Kong Stock Market

1.1.3.1 Gold Price

Unlike other commodities, gold has high acceptability and marketability in world wide. Basically, gold is a good investment which can be used as hedge vehicle against stock market performance. When stock price goes down, gold prices will rise. This is because that most of the investors will sell off their stock during the bear market and use the proceeds to invest in gold. They tend to park their fund in gold market to shelter it from any big losses as it act as store value (Baur and Lucey, 2010). It is more to an act of psychological where investors tend to worry about the downfall in stock market and switch into gold investment.

During crisis, demand for gold will increase as it has the features of safe haven (Joshi, 2012). In year 2008, subprime mortgage crisis that occurred in the United States had caused the demand for gold increase as gold tends to be less volatile investment compared to stock market. Thus, demand of gold rises which drive the prices to go up (*Refer to Figure 1*). Meanwhile, when the stock market starts to perform better and stable, they will disinvest from gold and reinvest back into stock market. Hence, demand of gold declines and lead to price reduction. In conclusion, U.S. stock market and gold price tend to have negative relationship (Smith, 2001). However, how about the relationship between gold price and Hong Kong stock market?

On the contrary, the behaviour of gold price starts to be volatile and not as stable as past years. Thus, it motivates the research to further determine whether they are still bound into this historical relationship or not. Based on the unique feature of gold, it perceives that gold is an alternative investment for stock. Consequently, it shows that there exists a significant

relationship between them. Thus, the concern arises whether they has positive or negative relationship. Does cointegration relationship exist between all the variables?

1.1.3.2 Crude Oil Price

According to Narayan, Narayan and Zheng (2010), international oil price was always been a leading indicator in the global economy. Crude oil is one of the most influential commodities which have a large impact on economic development and stock market stability. Campiche, Bryant, Richardson and Outlaw (2007) have showed that increase in oil price will lead to a higher cost of production. Therefore, it will eventually affect the stock market in the whole economic (Narayan and Narayan, 2007). Moreover, Jones and Kaul (1996) and Kling's study (as cited in Geralfakis et al., 2011) proved that oil price was significant in studying the stock market return.

Bina and Vo (2007) have claimed that oil crisis in year 1973 and 1974 was due to Organization of Arab Petroleum Exporting Countries (OAPEC) imposed oil embargo against U.S., and other countries as well. It had reduced half of the market value of tangible asset hold by U.S. companies (Alpanda and Alva, 2010). During the period, U.S. companies suffered lose and the stock market was negatively affected. Unfortunately, the financial attack in mid of 2000's had contributed 44% out of 65% of the increased real oil price (Morana, 2013). This was a disaster because it caused the stock market condition from worse to worst. From the big picture, it can conclude that oil was significant in affecting the stock market performance through the company daily operation. In fact, today's oil price is very volatile as it not only affected by traditional demand and supply forces but also affected by external forces such as speculation activities (Fan and Xu, 2011). As the result, it is important for this research to study how oil price will affect Hong Kong stock market.

However, some studies found that there were no significant relationship between stock returns and changes in the oil price (Al-Fayoumi, 2009; Huang, Masulis and Stoll, 1996). These inconsistent results were due to the nature economy of the country. Thus, to better understand the impact of oil price towards Hong Kong; this research will examine whether oil price will affect the Hong Kong stock market positively or negatively and do they have long run relationship? These enquiries lead to begin this research on Hong Kong stock market.

1.1.3.3 Exchange Rate

According to Tsai (2012), the increase or decrease of exchange rate affected stock market in two different ways which were international trading effect and foreign investment. First and foremost, based on international trading effect, the exporting firm in Hong Kong will benefit from the depreciation of local currency (exchange rate increase) due to higher exporting activities. In contrast, the importing firm in Hong Kong will be harmed from depreciation of domestic currency as they have to pay a higher cost for importing activities. This will eventually affect the country's economic growth and stock market performance (Miyakoshi, 2003).

It was supported by classical economic theory whereby it confirmed that currency fluctuation affect international competitiveness of firms and the balance of trade position and real output of the economy (Dornbusch and Fisher, 1980). Even though a company have minimal exposure to international activities, they can face exchange rate exposure if any of their input cost or output cost was affected by exchange rate movements (Pan, Fok and Liu, 2007). Besides, the other perspective is that the fluctuation of exchange rate will affect the firm transaction exposure (Pan et al., 2007). This is because it affects the firm's future payables or receivables denominated in foreign currency.

Meanwhile, when the domestic currency appreciates, investors will demand for it and drives up the inflow of foreign capital which led to a boost up for the stock market performance (Tsai (2012)). In contrast, this theory concluded that exchange rate tend to have negative relationship with stock market. Hence, the fluctuation in exchange rate will be followed by stock market movement. Therefore, will the movement of exchange rate has positive or negative relationship towards stock market movement in Hong Kong? As the result, this research is begun to figure out the question.

1.1.3.4 Research Background of Financial Crises

From past decades, there were few financial crises that have shaken the international financial market including both developed and developing markets (Gallali and Rim, 2012). These global financial crises had brought various level of impact to different countries. Since Hong Kong is not excluded from it, this research is taking into account of effects from both financial crises.

Asian Financial Crisis which happened between July 1997 and June 1998 was originated from Thai Baht being attacked by currency speculator that result a great depreciates of Thai Baht. After that, the contagion effect spread the impact to most of the Asian countries (Gallali et al., 2012). For example, Indonesia and South Korea were most affected whereas Hong Kong was also hurt by the slump. In the nutshell, this crisis was caused by credit bubbles and fixed exchange rates. Besides, breakdown of information in financial market was one of the factors that driven this crisis (Mishkin, 1999).

Apart from that, the second financial crisis that included in this study is Subprime Mortgage Crisis. The subprime crisis was one of the worst financial crises since 1930 which originated from United States started in

year 2007 (Okubu, Kimura and Teshima, 2014). This crisis triggered from the burst of the housing bubble and credit bubble which led to a collapsed of the financial market and equity market (Senbet and Grande, 2009). Although it was rooted in US, it has spread around the world including Asian countries. It has brought numerous effects on Asian countries such as Malaysia, Indonesia, Philippines, Singapore, Thailand and Hong Kong. Unfortunately, Hong Kong bank was badly affected from the crisis and stock prices were affected, resulting in lowering down the net profit of the Hang Seng Bank (South China Morning Post, March 2, 2014).

In conclusion, financial crises lead to loss of confidence in investor towards stock market and massive selloffs. This extreme investor's behavior leads to the collapse of stock market. Thus, the adverse consequences of crisis are significantly affecting the country's stock market and economy. As the result, this research aimed to study the effect of financial crises on Hong Kong stock market in order to make this research more reliable.

1.2 Problem Statement

Stock market is the backbone of the growth of economy as it facilitates the mobilization of funds across the financial market both domestically and internationally. In today's world, the high volatility and uncertainty of the stock price movement mirror the stock market performance. Hong Kong stock exchange is the backbone for Asian growing economy since it is the third biggest stock exchange market in Asia. Figure 1 clearly showed that Hang Seng Index experienced the biggest downturn during Subprime Mortgage Crisis in year 2007. A lesson learnt from the crisis is that macroeconomic factors did hardly affect the stock market condition. Thus, a well understanding of stock market movement is crucial in predicting the movement and how it is related with other macroeconomic variables.

Gold is one of the leading commodities which are very important not only for cultural purpose but also important for investment purpose as well. Academicians and investors tend to bring out the issue that gold is negatively correlated with stock market. It indicates that when the stock market is not performing well, investors will withdraw their fund from stock market and invest in gold. Whereas, when the stock market is recovered, they will switch back their investment from gold to stock market. Such switching strategy is widely practiced among investors and thus, gold was bounded into the inverse relationship with stock market as supported by Moore (1990). In addition, how does gold related to portfolio investment? Since they are negatively related, gold is a significant asset to be included into a portfolio investment. The inclusion of gold in a portfolio can act as a stabilizer and create a well-diversified portfolio. It helps investor to diversify their risk to avoid huge losses in the case of the stocks does not perform well. As saying goes, don't put all the eggs into one basket.

Besides, gold tends to be a hot issue as an alternative investment among the active investors especially during global financial crisis. When U.S. stock market was attacked by Subprime Mortgage Crisis 2007, Figure 1 revealed that the world gold price raised due to investors switched their investment from stock market to gold. Again, the statistical data has shown that they are negatively correlated and this would increase the validity of the statement. However, does this relationship resemble the same effect on Hong Kong stock market? Unfortunately, the behaviour of gold price started to be volatile since year 2007 or 2008. This changing price behaviour brought out the issue that does gold and stock market relationship remain as before? Do gold still hold its unique function as alternative instrument for stock market? The other dispute arises here is that does gold price and Hang Seng Index are cointegrated?

Indeed, no one can predict how the oil price move in future as it is very fragile towards various factors. According to Hamilton (2009), who claimed that the rising oil price was because of stagnating supply and high demand for it that associated with the rapid growing world. The author also declared that world Gross Domestic Product (GDP) increased by 9.4% from year 2004 to 2005. The

rising GDP caused the oil price to rise from USD 30 to USD 60 per barrel in just 2 years' time (Hamilton, 2009). Thus, given Hong Kong as a rapid growing country, does the rising oil price positively or negatively affecting its stock market performance?

Exchange rate is widely discussed in financial press as it played an important role in international trade and investment determination. For example, news on March 8, 2000, published by the Wall Street Journal stated that "United States stock market suffered dramatic losses for the second straight day when the dollar fell against yen and drop rapidly against major European currencies". Similarly to Hong Kong market, when Hong Kong dollar depreciate from HK\$6.50/USD to HK\$10/USD, Hang Seng Index fell from 1,102 indexes to 758 indexes in just few months (Chan, 2013). This financial news only provides on short term effect, but how about in long term toward Hong Kong stock market? As the result, it leads to begin this research to fulfil the unfilled gap.

In conclusion, this research aimed to study the nexus relationship between Hong Kong stock market with gold price, crude oil price and exchange rate. Furthermore, two period of global financial crisis will be taken into account for this research due to previous researchers had less concerned on the study of the impact of financial crisis on Hong Kong in this research area.

1.3 Research Objective

1.3.1 General Objective

This research examines the long run and granger causality relationship between Hang Seng Index with gold price, crude oil price as well as exchange rate by applying the Unit root test, Johansen-Juselius Cointegration test, Vector Error Correlation Model (VECM) and Granger Causality test. This research employed the daily data ranging from 3rd

January 1994 to 31st December 2013 with a total number of 5217 observations.

1.3.2 Specific Objective

This research tends to concentrate on:

- I. To study the relationship between daily gold price and Hang Seng Index.
- II. To study the relationship between daily crude oil price and Hang Seng Index.
- III. To study the relationship between daily exchange rate and Hang Seng Index.
- IV. To determine the significant of both financial crises (dummy variable) toward Hang Seng Index.
- V. To detect the long run relationship among all the variables.
- VI. To detect the granger causality relationship among all the independent and dependent variables.

1.4 Research Questions

- I. Should the investors include gold investment in their portfolio?
- II. Should the investors restructure their investment portfolio when there is oil price swing?
- III. How policy makers can intervene the stock market performance in response to fluctuation of exchange rate?
- IV. How do the investors protect their investment when there is financial crisis attack?
- V. Does the result provide the policy makers, investors, and corporate managers as a reference for them to study the stock market movement in long run?

- VI. Will it be unidirectional granger cause or bidirectional granger cause among the variables?

1.5 Hypotheses of the research

1.5.1 Gold Price

H₀: There is no relationship between the gold price and Hong Kong stock market (Hang Seng Index).

H₁: There is a relationship between the gold price and Hong Kong stock market (Hang Seng Index).

In Hong Kong, gold price was explained as a determinant that could influence the mean return of Hang Seng Index (Garefalakis et al., 2011). Given that gold commodity has the feature of inflation hedge, it motivates the investors to invest more in gold commodity which lead to a hike in price, stock market will turn to be less preferable and stock market performance will decline.

According to Adjasi and Biekpe (2009); Hood and Malik (2013); Joshi (2012); Shahzadi and Chohan (n.d.), they explained that stock market changes were closely related to market fear and gold act as a safe haven when there is a market downturn. Thus, their results showed that there was an inverse relationship between gold price and stock market. Based on the findings of those authors, the null hypothesis will be rejected and concludes that there is a relationship between gold price and Hang Seng Index.

1.5.2 Crude oil price

H₀: There is no relationship between the crude oil price and Hong Kong stock market (Hang Seng Index).

H₁: There is a relationship between the crude oil price and Hong Kong stock market (Hang Seng Index).

Crude oil is one of the most influential resources of raw materials and primary energies which have the strategies impacts on economic development and stability. According to Liao and Chen (n.d.), their result indicated that oil price was a significant variable to predict the stock price movement. When the oil price increases, it will reduce the output of a company as the cost of input has increases due to the increased oil price. The company will tend to reduce or cut the cost of production in order to save cost. Thus, this will reduce the economy activities of a subsequent country as oil prices have an inverse impact on real output (Nandha and Faff, 2008). Besides, the rising oil price will reduce profits and dividends. Hence, stock price tend to fall. Eventually, stock market performance of a country will be affected.

Furthermore, Hammoudeh and Alesia's study (as cited in Mollick and Assefa, 2013) supported the relationship by using daily data and found that oil prices have significant impact on the stock index in Saudi Arabia. Previous authors like Nandha and Hammoudeh (2007) and Park and Ratti (2008) have explained that rising in oil prices will reduce the stock market index. Hence, based on the studies of past researchers, they showed strong evidence that both variables were significant to each other. Thus, the null hypothesis will be rejected and concludes that there is a relationship between crude oil price and Hang Seng Index.

1.5.3 Exchange rate

H₀: There is no relationship between the exchange rate and Hong Kong stock market (Hang Seng Index).

H₁: There is a relationship between the exchange rate and Hong Kong stock market (Hang Seng Index).

U.S. Dollar (USD) was the biggest traded currency which also can be called as predominant currency (McKinnon and Schnabl, 2002). Furthermore, the majority reserve of currency is in USD. Thus, the movement of the currency may affect the economy environment of other countries. In the research of Garefalakis et al. (2011), their results showed that there exists an inverse relationship between USD/Yen exchange rate and the Hang Seng Index volatility. This has showed that exchange rate has a great influence on Hang Seng Index.

According to the research of past researchers, the relationship between exchange rate movement and stock market was negatively related (Johnson and Soenen, 2004). However, Lee (2012) and Tian and Ma (2010) had found that the relationship between exchange rate movement and stock market was positively related. Although the results obtained were inconsistent between the past researchers, but all this has proved that there is a significant relationship between them. Thus, the null hypothesis will be rejected which indicates that there is a relationship between exchange rate and Hang Seng Index.

1.5.4 Financial Crises

H₀: There is no relationship between the financial crisis and Hong Kong stock market (Hang Seng Index).

H₁: There is a relationship between the financial crisis and Hong Kong stock market (Hang Seng Index).

Asian Financial Crisis and Subprime Mortgage Crisis showed clear evidence that driven the economic slowdown. The crisis had an immediate effect on the financial market especially the collapsing of the stock markets will cause a huge loss in equity wealth. Pesaran and Pesaran (2010) found that the stock markets were highly significantly during the crisis. Chakrabarti and Roll (2002); Huyghebaert and Wang (2010); Morana and Beltratti (2008); Tuluca and Zwick (2001); Yang, Kolari and Min (2003) stated that the stock market tends to change during the period of financial crisis.

During the financial crisis, it showed a negative relationship towards stock price (Mollick et al., 2013). This is because when the financial crisis occurs, it will cause the investors to lose confidence towards stock market and switch to other commodities such as gold. Thus, the null hypothesis will be rejected and it indicates that crises are statistically significant to influence the stock market.

1.6 Significance of study

The primary objective of this research is to study the long run relationship between stock market and its determinants such as gold price, crude oil price and exchange rate with the existence of two financial crises by using daily data ranging from 3rd January 1994 to 31st December 2013.

Indeed, this research discovered a few researchers who had included gold price as one of the indicator to study stock market in their research on Hong Kong stock market. For example, Garefalakis et al. (2011) and Kazemi and Kazemikhasragh (n.d.) whom had included gold price as one of the determinant to examine Hong Kong stock market. Thus, this causes the inclusion of gold price in this research as one of the indicator to study Hong Kong stock market. Throughout this research, it may help investors to figure out that whether gold commodity is a good inflation hedge and good investment alternative or not. The research results may provide a declaration that whether gold is still a reliable investment instrument. Therefore, this research might provide meaningful information for investors in constructing their portfolio investment and allocation of resources.

Besides, this research also brings positive contribution to Malaysia investors. Throughout the research, it may provide a better understanding on how the determinants will affect the Hong Kong stock market in long term. Such information is crucial as given the rule of thumb in investment which is buying and holding the investment for some period of time and sell it off. Since the research objective is aligning with the rule of thumb which is focusing on long term perspective, the research result can facilitate the Malaysia investors in making investment decision.

Moreover, a better understanding linkage between exchange rate and stock market can help the government to better deal with the movement of stock market correspond to the changing in exchange rate. Due to high globalization, the exchange rate had become a crucial factor to determine the movement of stock market since exchange rate has the capabilities to influence the capital flow in international financial markets. This research may help the government to impose appropriate strategy to control the stock market performance by controlling the exchange rate through direct or indirect intervention.

On top of that, this research results are important for the policy makers too. This is because it may help to develop an appropriate monetary or fiscal policy to achieve the economy objective. The common objective would be foreign exchange market

stability whereby the policy maker has to make sure the currency is stable to maintain the purchasing power of consumers. The research may provide a result and become the references for them to understand how exchange rate will affect the stock market and economy as well. In fact, the research objective which is long run is totally consistent with the policy makers as they construct a policy in long term perspective.

In addition, the rising of oil price recorded a high level of impact on financial market (Liao et al., n.d.). In fact, the unexpected behaviour of crude oil price turns to be an interesting issue on how it affects the stock market movement. Hence, the further study of the impact of changes in crude oil price on Hong Kong stock market movement will be included in this research. Thus, the results from this research are meaningful for the oil user especially for company management because they can have better understanding on how oil price affecting the stock market performance through the business activities of a company.

On top of that, this research also studies the crisis effects by including a dummy variable to capture the effect of crisis towards Hong Kong stock market. In fact, to the best knowledge of authors, there is less past researchers study on the movement of stock market with concern on the financial crisis. The inclusions of financial crises are Asian Financial Crisis 1997 and Subprime Mortgage Crisis 2007 which are hardly impact on Hong Kong stock market (Al Rjoub and Azzam, 2010). This research may create awareness that every parties ranging from government to investors should prepare for future financial crisis.

Last but not least, this research will provide a clearer picture on the relationship between Hong Kong stock market and its determinants. Above all, a better understanding on Hong Kong stock market, financial manager and fund manager will be more observant and caution with the stock price movement in market to obtain useful information in assisting their company decision (Chen and Chen, 2007). However, for stock market speculator, they can enter into derivative contract such as forward or future contracts in order to obtain profit from

mispriced. Thus, it is a powerful tool for them to obtain crucial information in predicting the stock price movement.

1.7 Chapter layout

This research paper is structured as follows: Chapter 2 will presents an overview of relevant literature review which is related to this research topic, Chapter 3 shows about the data tested and methodologies that this research are going to employ, Chapter 4 presents the empirical findings for the data and lastly for Chapter 5 is the summary of this research paper and conclusion for the whole research.

1.8 Conclusion

The primary objective of this research is to detect the determinants that could influence the Hong Kong stock market in long run. Basically, in Chapter 1, it explains and introduces the background of Hong Kong, its stock market and its determinants. Besides, in this chapter, it also stated the reason to examine the relationship among Hong Kong stock market and its determinants. The determinants included gold price, crude oil price, exchange rate and financial crises. Next, in Chapter 2, it will provide an intensive literature reviews regarding how the independent variables impact on stock market.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

In previous chapter, the research topic has been introduced and it will proceed to Chapter 2 for literature review. In this research, gold price, crude oil price, exchange rate as well as financial crises (dummy variable) were included to study the Hong Kong stock market movement which proxy by Hang Seng Index. In this chapter, it will summarize the literature reviews that related to the field of study. This research had reviewed several series of journals related to the relationship between stock market with gold price, crude oil price, exchange rate and financial crises. In fact, relationship between U.S. stock market and gold price had been well studied by previous researchers. However, to the best knowledge of the authors, past researchers less concern on study on Hong Kong stock market. As the result, Hong Kong stock market is selected for this research as the main focus in this study area.

2.1 Review of the Literature

Stock market plays a crucial role in developing and reflecting a country's economy. This is because stock market facilitates the fund from spending surplus units to spending deficit units (Patel, 2013). The understanding of stock market movement is important because the behaviour is much more complex compared to previous decades. Therefore, it is a must for researchers to investigate the movement of stock market.

Most of the previous researchers were focusing on countries like United States (U.S.), China and Singapore as they perceived that those stock markets has more significant effects toward world's economy. Meanwhile, there were also numbers of researchers conducted their researches that focused on developing market like

India because of the burgeoning growth of their stock market tend to be very attractive. Besides, Kaliyamoorthy and Parithi (2012) and Patel (2013) had studied the relationship between gold price and stock market in India. Same goes to Omag (2012), but he focused on different country which is Turkey. Furthermore, Shahzadi et al. (n.d.) had studied the relationship between gold price and Karachi Stock Exchange (KSE) in Pakistan.

To the best knowledge of the authors, this research found out that majority of the past researchers more concerned on gold price and stock market in India due to Indians owned approximately 11% of total world gold stock (Patel, 2013). Besides, to the best knowledge of authors, the previous studies only took concern on how one independent variable in affecting the Hong Kong stock market. Indeed, the previous studies took less concern on research with the combination of gold price, crude oil price, exchange rate and both financial crises in explaining the Hang Seng Index with the huge sample size in daily basis. Therefore, this research will focus on the research period from 1994 to 2013.

2.1.1 HONG KONG STOCK MARKET (HANG SENG INDEX)

Statistic had shown that Hong Kong Stock Exchange (HKSE) and its economy are growing rapidly since the past two decades. Besides, Hong Kong had become the important market for China since many multinational companies from Hong Kong had invested in China and contributed to China's economy growth. HKSE had become the top six in the world and top two stock market in Asian based on its trading volume and trading value (Wong and Cheung, 1999). Therefore, HKSE is large enough to influence the global financial market.

Hang Seng Index had been chosen as proxy to represent Hong Kong stock market in this research. Hang Seng Index started trading in HKSE since year 1969 (Kwong and Coutts, 1997). Hang Seng Index is the value-

weighted index that traded the performance of 48 “blue-chips” companies from Hong Kong and China mainland. Besides, it was the large stock index in HKSE that represented over 60% of total stock value that trading in HKSE (Lee, 2012; Obienugh, 2010).

For U.S. stock market, Smith (2001) found that there was a negative relationship between gold price and U.S. stock market performance. Basically, removal of barriers and mobilization of capital caused the stock market move in same direction (David, 2011). This statement is supported by Garefalakis et al. (2011) whereby they found that there was a positive relationship between U.S.’s S&P500 index and Hong Kong stock market. From the big picture, it might suspect that the relationship between gold price and stock market in Hong Kong will be alike as in U.S.

The enquiry is answered by Garefalakis et al. (2011) who found that there was a negative relationship between gold return and the return for Hang Seng Index. This is because, the stability in price and safe heaven feature of gold lead to more people purchasing gold when they had lost confidence toward stock market (Smith, 2001). When more and more people demand for gold, the demand will drive up the price of gold. In the nutshell, this paper may make an initial assumption that Hang Seng Index is negatively related to gold price.

Moreover, David (2011) had studied the granger cause relationship between Hang Seng Index, Nikkei 225, S&P 500 and FTSE by using Granger Causality Test. The author found that Hang Seng Index and Nikkei 225 were granger cause by S&P 500 and FTSE. Furthermore, Lee (2006) studied the simultaneous interaction between U.S. (Dow Jones), Japan (Nikkei) as well as Hong Kong (Hang Seng) stock market. The author found that when U.S. stock returns increase, the stock return for Japan and Hong Kong will move in the same direction. Lastly, Chan, Lien and Weng (2008) studied the causal relationship between U.S. stock market and Hong Kong stock market. The authors found that before Asian

Financial Crisis, there was feedback relationship between U.S. and Hong Kong stock market. However, after '911' event, there is only one way causality from U.S. to Hong Kong stock market.

2.1.2 GOLD PRICE

Gold is the oldest international currency and had played an important role in many countries' monetary system (Kaliyamoorthy et al., 2012). Gold is well known by its price stability feature. However, gold price starts to fluctuate due to political instability, changes in interest rate, changes in exchange rate, financial recession and massive speculation. Such price behaviour is contradicts towards its safe investment feature. Besides, according to Shahzadi et al. (n.d.) and Kazemi et al. (n.d.) whereby the researches were focused on how gold price determine stock market index. Therefore, it leads to begin the research on gold price as one of the independent variable to figure out its relationship with stock market in Hong Kong.

Gold has unique feature such as security, liquidity and stabilizer in diversified portfolio. Besides, Baur and McDermott (2010) had found that gold was a strong safe heaven during recession in developing countries. Therefore, buying gold is part of the culture in India. It made India becomes the largest net demander for gold in the world (Ismail, Yahya and Shabri, 2009; Razin and Rosefielde, 2011). Thus, there were numbers of researchers have studied the relationship between the India stock market and gold price. This is because the researchers perceived that India gold market was significant to influence their stock market.

Firstly, Kaliyamoorthy et al. (2012) used Chi-square analysis to study the relationship between gold price and BSE Sensex index from India. The reason for using the gold price to study the stock index is that most of the people felt that changes in gold price may be caused by market fear from

investor. However, author's finding was inconsistent with their prediction. Through the Chi-Square analysis, they found that there was no relationship between gold price and BSE Sensex index. However, Joshi (2012) did not agreed with the result as they found that there was a negative relationship between gold price and stock index for the same country.

Secondly, Ray (2013) had studied the causal relationship between gold price and stock price in India. The study period is from year 1990 to 2010 with annual data by applying Johansen Cointegration test and Granger Causality test. The author found that there was long run relationship between these variables and there was only one way causality from gold price to stock price. Similarly, Patel (2013) agreed with the finding by using monthly data under the same methodologies.

However, Bhunia and Mukhuti (2013) do not agree with previous researchers even though they were using the same methodologies. By applying the same methodologies, the author found that there was no granger causality relationship existed between gold price and stock indexes in India. The contradict result may be due to the employ of different frequency of data in which this author used daily data with longer coverage period ranging from 2nd January 1991 to 10th August 2012.

Basically, in developed countries like U.S., the area of study between gold price and stock price had been well researched. For instance, Herbst (1983) had test the long run relationship between the gold price and U.S. stock market. The author had found that gold performed better than common stock when unexpected inflation happened. The author also claimed that gold price and stock price were negatively related but only in specific period. The negative relationship between variables is supported by Moore (1990) with sample size covering period from 1970 to 1988 on same country.

Besides, Hood et al. (2013) had employed daily data ranging from November 1995 to November 2010 with descriptive analysis like portfolio analysis and Generalized Autoregression Conditional Heteroscedasticity (GARCH) model. The author stated that when gold can act as hedge, it means that gold had inverse relationship with stock market under normal market condition, while gold is safe haven refers that gold is inversely correlated with stock market during extreme market downturn. Surprisingly, the result showed that gold and stock had strong negative relationship which indicated that gold is a good hedge and safe haven. This result was corresponding with Baur et al. (2010) which used the same methodology with daily, weekly and monthly data. Their researches are reliable as they have taken different frequency of data set into account.

In addition, the research on studying correlation and causality relationship had been well conducted for U.S. market. Smith (2001) used four gold prices and six stock indexes with daily data covered from January 1991 to October 2001. The author applied Error Correction Model (ECM) to study the relationship between the two variables. He found that there was no long run but only short run correlation between gold return and U.S. stock index return. Besides, there was only one way causality relationship from U.S. stock return to return on gold price. Similarly, Samanta and Zadeh (2012) also found that there was no long run relationship between oil, gold, exchange rate and stock under traditional error correction model, but when proceeded to Stock Watson's common trend test, long run relationship was found.

On the other hand, there were numbers of researchers have studied on emerging or developing market. For instance, based on the research from Shahzadi et al. (n.d.), they focused on how gold price impact on Karachi Stock Exchange (KSE) 100 Index, Pakistan. They employed monthly data covered from 1 December 2005 to 31 December 2010 with descriptive statistic and Cointegration test in their research. The empirical result shown that they have negative relationship while no long run relationship

between gold price and KSE. On top of that, Buyuksalvaci's study (as cited in Shahzadi et al., n.d.) whereby the author also obtained the same relationship between the variables in Turkey stock market.

From the previous literature review, majority of the researchers found negative relationship between gold price and stock market. However, Omag (2012) does not agree with the finding by using monthly data covered from January 2002 to December 2011 for Turkey market. He found positive relationship between gold price and Istanbul Stock Exchange 100 Index by using ANOVA model. The author himself aware that his result was contrast with the research hypothesis of gold could use as hedge vehicle for security purpose. He justified that the positive relationship was because of the investor behaviour and changing economic condition in Turkey.

Meanwhile, there are researchers did investigated on relationship between gold price and stock markets with bunch of several countries in the research instead on focusing on one country. For example, Ziaei (2012) investigated the influence of gold price on equity, bond and domestic credit in Indonesia, Malaysia, Philippines, Singapore, Thailand, China, Japan and South Korea by using Generalized Method of Moment (GMM) model with quarterly data ranging from Q1 2006 to Q4 2011. The author had found that the gold price was negatively related to bond and equity market. This result obtained for ASEAN country was same as U.S., Pakistan and Turkey done by previous researchers.

Besides, Smith (2002) crossed over his study area by studying stock market for Japan and European country. He aimed to examine the relationship between gold price and stock market index by using three London gold prices and 17 stock indexes from Japan and European. The methods applied were Ordinary Least Square (OLS), ARCH, Cointegration and Engle-Granger approach. The author claimed that generally there was weak negative short run correlation between gold price

and the stock indexes. However, no long run relationship was detected by Engle-Granger approach.

To the best knowledge of the authors, the past researchers less concern on studying the Hong Kong stock market. For example, Garefalakis et al. (2011) had included the equity, fuel, gold and currency as independent variable to explain the Hang Seng Index. The sample size of daily data covered from 1 January 2002 to 31 August 2009. Through the Autoregression Conditional Heteroscedasticity (ARCH) test, the author had found that gold return has negative impact on mean return of Hang Seng Index.

Besides, Kazemi et al. (n.d.) studied the impact of gold on Hang Seng Index with monthly data ranging from 2003 to 2010 by using ANOVA simple linear regression model. At the end, the author claimed that gold price and Hang Seng Index had bi-directional causality relationship and gold price was always positively related to Hang Seng Index.

Based on the review, majority of the past researchers found negative relationship between gold and stock market except for Kazemi et al. (n.d.). In a nutshell, due to inconsistent finding from various researchers, the valid relationship between gold and stock market is still remaining unclear.

2.1.3 Crude Oil price

Oil price is one of the independent variables that have been included in the model to study the Hong Kong stock market movement. In fact, most of the past researchers have studied the relationship between oil prices and stock prices in developed countries, while fewer studies focused on Asian countries. Therefore, it triggers this research to study how oil price will affect HSI movement. For example, Daniel (1997) who had used autocorrelation models and Vector Error Correlation Models (VECM) to

examine the relationship between oil price and stock market performance and results indicated that oil price is a major variable to predict the stock market movement. This has led to the inclusion of oil price in the model.

In fact, oil is an important factor in affecting economy output. Hamilton (1983) supported the above statement through granger causality test and stated that oil price will significantly affect the U.S. economy output (Liao et al., n.d.). Therefore, it was proven that the rising oil price did not benefit the overall economy. Stock markets performed badly due to low production of output when the oil price hiked up (Masih, Peters and Mello, 2011). The logical reasoning is that when the oil price hiked up, an oil-user firm will tend to reduce their cost by cutting down the production. This will reduce the economy activities of a subsequent country as oil prices have a negative effect on real output (Nandha et al., 2008). Thus, stock market performance of a country will be affected.

For instance, Hammoudeh's study (as cited in Mollick et al., 2013) supported the relationship by using daily data and found that oil prices have significant impact on the stock index in Saudi Arabia. Previous authors like Nandha et al. (2007) and Park et al. (2008) explained that rising oil prices tend to reduce the stock market index. This is because oil price movement will directly contribute to the level of inflation and reduce the performance of stock market. This statement is supported by Kaul and Seyhun (1990) in which they agreed that there was a significant negative relationship between the two variables.

For United States, Ciner's study (as cited in Anoruo, 2011) who used Hiemstra-Jones (1994) nonlinear Granger causality test to study the relationship between crude oil prices and stock market in United States. He found that both of the variables were nonlinearly related. Similarly, Jones et al. (1996) and Sadorsky's study (as cited in Lin, Fang and Cheng, 2009) both agreed that oil price shocks have significant impact on stock market returns for the U.S.

Furthermore, since oil price is significant indicator on stock market performance, there were few researchers did their investigation on the co-movement. Anouro and Mustafa's studies (as cited in Anoruo, 2011) in which they used daily data ranging from January 1993 to August 2006. In this research, they applied Cointegration techniques, VECM and granger causality test to study the long run relationship between oil and stock market returns for U.S. They found that the oil and stock market returns were cointegrated and causality test shown that unidirectional from stock market returns to oil market returns.

According to Anoruo (2011), he used monthly data from February 1974 to December 2009 to determine the linear and nonlinear causal relationships between crude oil price changes and stock markets for U.S. He used several tests for linear (ADF, DF-GLS and KPSS) and non-linear (NLADF) for unit root test and result indicated that the two variables were level stationary. Furthermore, he ran the Granger causality tests and proven that there was bidirectional causality between the two variables. Besides, he used symmetric M-G causality test shown that there was unidirectional nonlinear causality from crude oil prices changes to stock market returns. In addition to that, a negative value of crude oil price changes condition was set on the M-G test. The results showed that there was unidirectional causality from crude oil price changes to stock market return. However, when a positive values of crude oil price changes condition was set on the M-G test, evidence shown that there was bidirectional granger causality between the two variables.

Similarly, Huang et al. (1996) examined the relationship between daily oil futures return and stock market returns of U.S. using VAR model. Results using granger causality indicated that there was unidirectional relationship from daily oil futures return to stock of individual oil companies. However, they unable to prove that there was granger causality from daily oil futures return to stock market returns (S&P 500).

For Greater China region (China, Hong Kong, and Taiwan), according to Lin et al. (2009), they started their research using monthly data from 1997 to 2008 to study the impact of oil price shocks on Greater China region's stock market. By using Structural Vector Autoregression (SVAR) approach, they found that the impact on Taiwan's stock market was similar to U.S. stock market. This is due to Taiwan stock market absorbed the changes in the economy quickly and loose capital mobility constraint. Furthermore, they found that oil price shocks indicated a positive impacts on Hong Kong's stock return as capital mobility in Hong Kong is almost perfect. Besides, they show evidence proving that investors believed in the Chinese economy performing well and continuous capital inflow regardless of the increasing oil price.

Indeed, some researcher segmented their research based on different industries. According to Liao et al. (n.d.), they have used TGARCH models with daily data starts from 3 January 1998 to 30 December 2005. The research objective was to examine the relationship between oil prices, gold prices, and individual Industrial Sub-Indices. Results shown that commodity price (oil and gold) would affect the individual industry differently but not the entire economy. In addition, a positive relationship was found between oil price and Electronic Industrial Sub-indices and Rubber Industrial Sub-indices. Oil price has a moving uptrend due to the strong demand from the market based on the statistical data. Furthermore, high oil price will restrain the economy activities and detrimental to stock market of a country.

Furthermore, Sadorsky's study (as cited in Lin et al., 2009) applied Vector Autocorrelation models (VAR) to test the relationship between oil price and stock values. He found that oil price was a significant factor in predicting stock price. On top of that, Driesprong, Jacobsen and Maat (2005) used a thirty-year sample of monthly data for thirty developed stock markets and a shorter time period for some emerging markets to test if oil prices able to forecast stock returns. Results indicated that oil prices

able to predict the stock market returns. However, Al-Fayoumi (2009) who used VECM to investigate the relationship between the two variables changes for Turkey, Tunisia and Jordan. The results unable to prove that oil prices have influencing power on stock market returns for the three countries. Thus, the author suggested that investors should focus on other macroeconomic factors like exchange rate in forecasting the stock market returns movement.

Since Hamilton (1983) and Kling's study (as cited in Gerafakis et al., 2011) concluded that crude oil price and stock market consist of negative relationship whereas Lin et al. (2011) found there was a positive relationship in Hong Kong, thus, there were inconsistent result among them. Therefore, relationship between crude oil price and Hong Kong stock market still remain unclear.

2.1.4 Exchange Rate

According to Cambridge Dictionary Online (n.d.), exchange rate is the value for one currency that can trade or exchange for another country's currency. Over the past decades, the relationship between countries had become closer and it emerged the national's stock market due to the increase in flow of capital between international financial markets. Thus, exchange rate had become more significant to influence the stock market due to liberalization effect (Johnson et al., 2004).

According to research from Soenan et al's (as cited in Phylaktis and Ravazzolo, 2005), the author found that there was a negative relationship between exchange rate and stock market. Meanwhile, when currency depreciates (the exchange rate increase), the stock market tends to perform badly. This is because when currency depreciates, investor tends to pull out their investment from the country because of market fear. Therefore,

the authors hypothesize that there is a negative relationship between stock market and exchange rate.

The Journal from Wall Street stated that “the USD depreciate against Japan Yen, meanwhile exchange rate increase and fell marginally against major currencies in European as U.S. stock market drop significantly on second day. This statement had been supported by most of the researchers. For instance, Johnson et al. (2004) had studied the relationship between U.S. stock market and the value of USD by using restricted and unrestricted model. The author found that there was negative relationship between exchange rate and U.S. stock market. Meanwhile, when USD depreciated which means the exchange rate rose, the stock index will drop. This is because, when value of local currency depreciates, foreign investors tend to recall their funds due to market fear, and this caused stock market to fall.

Not only Johnson et al. (2004) had found the negative relationship between exchange rate and stock market, Soenen and Hennigar’s study (as cited in Tsai, 2012) also found that there was negative relationship between exchange rate and stock market by using data from 1980 to 1986. Apart from that, Kim (2003) had studied the long run relationship among stock price, industrial production, real exchange rate, interest rate and inflation in U.S. The author applied Johansen Cointegration test with monthly data ranging from January 1974 to December 1998. By applying the Cointegration test, the author found that stock price had long run relationship with all four variables and negatively related to exchange rate in U.S. From the empirical result, the author found that stock price was long run negatively related to real exchange rate in U.S. The result was supported by Soenen et al.’s studies as cited in Alhayky and Houdou (2009).

Besides, Tsai (2012) used the monthly data of the stock and foreign exchange markets in Singapore, Thailand, Malaysia, the Philippines, South

Korea and Taiwan from January 1992 to December 2009. The author had also found that there was inverse relationship between exchange rate and stock markets but no long run relationship had been detected by using the linear Cointegration test between stock price indexes and other variables. The empirical result showed that the 8 Asian countries have similar pattern and significant negative relationship when the exchange rates are extremely high or low.

Moreover, Ajayi and Mougoue (1996) had use the Cointegration test, ECM and Granger causality test to study the dynamic relationship between exchange rate and stock market for Canada, France, Germany, Italy, Japan, Netherland, U.K., and U.S. The empirical result showed that there was a negative relationship between exchange rate and stock market. In other words, when exchange rate increases, the stock market will tend to decline. The authors also found that there were two ways causality relationship between these two variables. Through the ECM, the authors claimed that there were short run and long run relationship between all the variables.

Wu (2000) had applied Cointegration test, VECM, and Granger causality test with structural break into pre-crisis, during-crisis and post-crisis. Through Cointegration test, there was a long run negative relationship between the stock market and exchange rate during normal economy condition. Besides, he claimed that there was one way granger cause from Singapore dollar exchange rate to stock price and the impact of power of variable is increasing over time. This is due to the greater interactions between exchange rates and stock prices during financial crisis.

Apart from that, Lee (2012) had employed the data of Exchange rate (Eurodollar against Hong Kong dollar) and Hang Seng Index from January 2009 to April 2012. He found positive relationship between exchange rate (indirect quote) and Hang Seng Index by using the Cointegration and Granger causality test. On the contrary, it would be negative relationship between exchange rate (direct quote) and Hang Seng Index. The author

also found that there was a long run relationship between exchange rate and Hang Seng Index and they have only one way causality from exchange rate to Hang Seng Index. Besides, Pan et al. (2007) also found that exchange rate granger caused stock market for Hong Kong.

Meanwhile, Tian et al. (2010) had studied the impact of liberalization on relationship between exchange rate and stock market in China by employing Renminbi against the U.S. dollar and Shanghai A share index. By using ARDL approach, the author found that there was a long run relationship between exchange rate and stock index in China. Besides, the author also found that there was a positive relationship between exchange rate and stock market. This was because, China is an exporting country, so when exchange rate increase (currency depreciate), China good will become cheaper for foreigner. Therefore, China's export will increase and lead to improvement in China stock market.

The fluctuation of the exchange rate played an important role in affecting country economy as stock market performance is relying heavily on foreign investment. This is because exchange rate can influence capital inflow and outflow. When currency depreciates, foreign investors tend to withdraw their fund due to currency lost in value. The devaluation of currency make the investor lost their confidence toward invested country. As a result, the exchange rate might be negatively related to stock index in this research. In addition, this research may assume that there is long run and bidirectional causality relationship between these variables as indicated by previous researchers' finding. This is because when stock market performed, foreigner investor tends to invest heavily and driving ups the demand of currency and exchange rate and visa verse.

Based on the review, there were some of the researchers found positive while others found negative relationship between exchange rate and stock market. In conclusion, the inconsistent findings from previous researchers

caused the relationship between exchange rate and Hong Kong stock market remained unclear.

2.1.5 Financial Crises

Financial crisis is a common term in this globalized finance environment, whereby it is applied on some financial institutions or assets that suddenly loses a portion of their value. There were several kinds of financial crisis such as bank panics, recessions, stock market crashes, currency crisis and so on (Seenivasan, 2013). The reason to study the effect of financial crisis is that major economic events can influence the stock market performance. Any financial crisis may bring a huge impact to global financial market (Chang and Kuo, 2010). Thus, it is important to investigate the impact of unpredictable event such as financial crisis and recession on stock market performance.

This research is taking into account of both Asian financial crisis in year 1997 and Subprime Mortgage crisis in year 2008 to study Hong Kong stock market movement. First and foremost most, Asian Financial Crisis or recognized as twin crisis was caused by depreciating in currency and failed in banking system (Kenourgios, Asterioub and Samitas, 2013). This crisis was triggered by Japanese banks withdrew their loan from Thailand and then lead to a great depreciated of Thai Baht and followed by collapsed of stock market (King, 2001). The Japanese commercial banks withdrew their funds in sudden which stunted the economy of Thailand. It caused a great depreciated of Thai Baht that led to stock market fear. In short, these two factors had contributed to the collapse of Thailand stock market. In addition, the contagion effect had transmitted or spread the crisis to Asian countries and caused them to face the same problem (Kenourgios et al., 2013). This contagion effect had made the failure of Thailand financial market to become a nationwide financial crisis.

The Subprime Mortgage crisis was the most severe crisis after Great Depression in 1929 (Hui and Chan, 2014). The story of Subprime Mortgage crisis was begun with the rise in U.S. interest rate triggered the default of subprime borrowers and then followed by failure of financial institutions in US as well and followed by the stock market slump (Sembet et al., 2009). This is because financial institution is the “heart” of financial market, when financial institution fails to perform their role whole economy and financial market will collapse. In addition, the impact of collapse in financial institutions had spread to the rest of the world rapidly and it became a global crisis (Okubu et al., 2014).

Economic event like financial crisis have significant effect on the stock market performance, supported by John and Morgenstern (1970). Furthermore, Gjika and Horvath (2013) used daily data to examine the correlations between Czech stock market and STOXX50 index and found that the correlation strength increases during financial crisis period. More to the point, Eichengreen and Park (2008) and Eichengreen, Mody, Nedeljkovic and Sarno (2012) stated that the stock market tends to be more instable during the financial crisis. Besides, Caballero and Kurlat (2009) have investigated that financial crisis has caused a serious wealth loss because of the slowdown in the stock market. Therefore, many professional economist and policymakers have reemphasized the importance of this issue. As a result, financial crisis became a very important variable for them to study in order to create prevention strategies for cases of financial crisis happening in the future.

Referring to Figure 1 in Chapter 1, it showed that the movement of Hang Seng Index from year 1994 to 2013. During this period, there were two financial crisis happened and absorbed into the Hang Seng Index movement. Initially, the trend for Hang Seng Index was increasing steadily before July, 1997. However, in mid of 1997, Asian Financial Crisis happened and led Hang Seng Index movement to decline. It can be observed that Hang Seng Index dropped by approximate 50%. Meanwhile,

during the financial crisis in U.S. starting from year 2007 to 2008, the movement of Hang Seng Index was showing a higher fluctuation as compared to Asian Financial Crisis. It has dropped more than 50%. From this, it can say that crisis do create a large impact towards Hang Seng Index.

Basically, during the financial crisis period, the performance of the stock market will decline. According to Al Rjoub (2011), financial crisis will negatively affect the stock market performance. This result showed that there was a negative relationship between financial crisis and stock market as agreed by Xu and Hamori (2012). Moreover, Nikkinen, Piljak and Aijo (2012) agreed to the result as their research found an inverse relationship between stock price and economy downturn.

Furthermore, Gjika et al. (2013) used daily data ranging from 20th December, 2001 to 31st October, 2011, a total of 2533 observations by applying OLS to study the time-varying stock market co-movements in three Central European countries. Their results indicated that the crisis can influence the stock market performance. In addition, Yurdakul (2014) used monthly data starting from January 1998 to July 2012 by applying probit model to determine the variables that could lead crisis to happen. The author found that the stock index in Turkey has significant linkage with crisis. Moreover, Tan and Tse (2002) and Yang et al. (2003) supported the above result as they found that there was a linkage causal relationship between stock market and financial crisis.

According to Huyghebaert et al. (2010), they examined the integration and causality of interdependencies among seven major East Asian stock exchanges before, during, and after the 1997 to 1998 Asian financial crisis. They found that Hong Kong and Singapore responded significantly to shocks in most of the East Asian markets, including Shanghai and Shen Zhen during the crisis. There is evidence showing that financial crisis would play a role in affecting the changes in stock market movements.

In conclusion, the hypothesis for financial crisis should be significantly negative affecting the Hong Kong stock market performance.

2.2 Review of Relevant Theoretical Models

2.2.1 Stock Market

2.2.1.1 Efficient Market Hypothesis (EMH)

This theory was developed by Professor Eugene Fama in year 1960. Theoretically, Efficient Market Hypothesis (EMH) is use to analyse financial behaviour and estimate the stock market movement (Mishkin and Eakins, 2011). EMH was defined as the prices of securities fully reflect all available information (Mishkin et al., 2011). According to Fama (1970), an efficient market is a market whereby the stock price reflected the publicly available information.

Malkiel's study (as cited in Timmermann and Granger, 2004) stated that a capital market is only considered fully efficient if it correctly reflecting all relevant information into the stock price. The author also stated that the level of efficient is depending on the information itself. There are three levels of market efficiency which are weak, semi strong and strong form. Weak form of market efficiency is that the stock price movement can be predicted by using past price movement. This is based on the analysis of historical data and from the pattern of the movement, then to predict the future price movement. Semi strong form is fully reflecting public available information. Lastly, strong form indicated that none of the information either public or private source that will let the investors earn an abnormal return (Mishkin et al., 2011). This is due to all the public and private available information will reflect in stock price immediately.

According to the implication of EMH, all the investors could not able to earn abnormal return or return which is higher than equilibrium return. In conclusion, EMH has been used to predict stock market movement and it also stated that stock market that performed well in the past does not mean that it will perform better or worse in the future as stock market movement is unpredictable.

2.2.1.2 Capital Asset Pricing Model (CAPM)

Formula:

$$\text{CAPM} = R_f + \beta_a (R_m - R_f)$$

Where:

R_f = Risk free rate

β_a = Beta of the security

R_m = Market risk premium

Capital Asset Pricing Model (CAPM) was developed by William F. Sharpe and John Lintneer in year 1965 and it stated that the linkage between risk and the return of an asset based on beta. It is used to explain the behaviour of stock security and it helps investors to identify the impact of adding new investment instruments on their portfolio's risk and return (Smart and Graham, 2012). The model consists of three components which are the risk free rate, the expected return on the overall stock market and the stock's beta. This model has given out a concept which a higher beta indicated a higher risk should be rewarded with a higher return.

The CAPM shows a positive linear relationship between expected return and beta of security (Sharpe, Alexander and Bailey, 1998). For example, stocks with larger beta will have a higher return. When CAPM is interpreted graphically, the relationship between stock return and beta can be seen with security market line. For each level of non-diversifiable risk

(beta), the security market line reflected the required return that investor can earn in the market.

Furthermore, CAPM can act as a tool to measure systematic risk of a particular asset whereby the higher the systematic risk, the higher the return (Smart et al., 2012). However, Fama and French (1988) showed that beta cannot be saved as it has other characteristics to predict the stock return. This is because other factors like firm size, earnings yield, leverage, stock liquidity may affect the stock return at a particular time (Dempsey, 2013).

In conclusion, CAPM generally relied on historical data. The beta may not predict the stock returns accurately. This is because there is other anomaly that may affect the stock return. In overall, the result can only be viewed as approximations and reference or guidance which can be used to reflect the investor's expectation towards the future.

2.2.1.3 Random Walk Theory

Random walk theory was introduced by Maurice Kendall in year 1953 and it stated that future stock returns are unpredictable and the investors cannot forecast based on historical stock data (Mishkin et al., 2011). This is because stock price do not follow a mean reverting process whereby the stock returns do not follow the trend path over time (Chaudhuri and Wu, 2003). Stock market is considered following a random walk behaviour given the three conditions. First, it responded to news and information quickly, share prices reflected all the available information and lastly the market movement is impossible to predict (Mishkin et al., 2011).

This can be seen in the research paper of Oskooe, Li, and Shamsavari's study (as cited in Dritsaki, 2011) they used Iran stock market as an emerging market to examine the presence of random walk process. The

result from ADF, PP and KPSS unit root tests implied that Iran daily stock price index followed the random walk behaviour. However, Fama et al. (1988) and Poterba and Summers (1988) found out that U.S. stock price follow mean reverting process. Apart from that, technical analysis can be used to predict stock returns by studying past stock price data and search for patterns such as trends and regular cycles (Mishkin et al., 2011).

In a nutshell, stock market follows the random walk behaviour in which the stock returns are unpredictable in future. Although random price movements might be a sign that showed stock market does not perform properly, but in naturally, it indicates the stock market was performing in a higher degree of efficiency (Gitman, Joehnk and Smart, 2010).

2.2.1.4 Modern Portfolio Theory (MPT)

Modern portfolio theory (MPT) was developed by Harry Markowitz in year 1950 which was dedicated for the mean and variance of a portfolio of assets. Basically, MPT is a type of financial framework that act as a guidance for investors to select and construct the investment portfolio in order to obtain a maximize return while at the same time minimize the investment risk (Fabozzi, Gupta and Markowitz, 2002). The core concept of this theory is about diversification which selects a collection of investments assets together will have a lower risk compare to a singular or individual asset (Veeneya, 2006).

According to MPT, it based on basic statistically measures to develop portfolio structure such as expected return and standard deviations of return for both securities and portfolios and the correlation between returns (Gitman et al., 2010). With the help of MPT, an investor can develop his or her own portfolio based on the risk preference. Thus, this has led to the formation of efficient frontier which is an important aspect in MPT (Elton and Gruber, 1997). Graphically, portfolios which lie on a boundary

indicate that the portfolios provided the best trade-off between risk and return whereby the boundary was named as efficient frontier (Gitman et al., 2010).

In a conclusion, Harry Markowitz has developed this theory which was nearly 60 years ago and his contribution has become an important financial tool. His theoretical conclusion has become the stepping stone of development of other theoretical analysis by other investment experts (Mangram, 2013).

2.2.2 Gold Price

2.2.2.1 The Price of Gold: A Global Required Theory

This theory was developed by Faugere and Erlach in year 2005. Gold is view as a global real store of wealth. Until year 2004, there has no theory of gold valuation shows how inflation, exchange rate and other asset classes which may affect the gold price or how gold and other assets may be affected by common underlying factors. In their research paper, the authors have extended the purpose of Required Yield theory which is derived from Erlach, in 2003 by adding in the value of gold and the way of determine its return. Required theory explained the valuation of financial assets via investors' general requirement to earn a minimum expected after tax real return equal to the long term GDP per capita growth.

There are specific predictions from the result in the research paper (Faugere and Erlach, 2005). Firstly, the real price of gold varies proportionately to the change in long term economic productivity as measured by GDP per capita growth. Second, real gold prices vary proportionately to changes in foreign exchange rate when the domestic yield is constant. Thirdly, when foreign exchange rate is constant and there

are no major geopolitical or natural crises, real domestic gold price increases with domestic inflation. Fourth, when new exchange rate parity holds, then effectively the real domestic price of gold is mostly determined by the domestic required yield. Fifth, in the long term, gold per capita supply remains constant. Lastly, average long term absolute price of gold is the marked up cost. The profit margin is associated with the global average long term per capita rate of capital growth (Faugere et al., 2005).

In conclusion, Required Yield Theory stated that global assets will yield a constant return and since gold can act as global store of value, the price will vary directly to the required yield and also the global inflation rate.

2.2.2.2 Theory of Gold Price Movements

This theory was introduced by Kelechi Adibe and Fan Fei in year 2009. Gold is a unique commodity in the world. It is a precious metal which has a lot of usage such as store of wealth, act as a measurement for the economic power of nations in the past and also the cornerstone of international monetary regimes. Recently, gold price movement is rising aggressively and has drawn more attentions from the world. In this theory, there are two common facts that need to be considered before analyzing the gold price movement (Fei and Adibe, 2010).

Firstly, gold is known as safe haven in financial market. Gold can act as a safe haven during financial crisis and also in global uncertainty due to the volatility of world stock market index (Baryshevsky, 2004; Baur et al., 2010; Capie, Mills and Wood, 2005). Investors will switch their investment into gold market during financial crisis because they had lost confident to stock market. Thus, this has showed that stock market has a negative relationship with gold price when there is a negative shock in stock market.

Secondly, gold can act as a hedging commodity. Many researchers had done research on gold to examine how it reacts towards inflation. Surprisingly, gold has a unique feature which is hedging mechanism. This statement is supported by Frankel (2011) as the author said that gold cannot be repudiated and undermined by inflation rate. According to Trivedi and Behera (2012), the author said that if gold price rise faster than general price level, then gold can consider as superior hedge against inflation. This is because in India, the demand for gold is high as gold serves a lot of purposes and it is use as investment purposes for the government. If any uncertainty happens, the gold will act as hedge for the risk or provide insurance which will protect the investors from the inflation.

In conclusion, investors can base on the two features of gold in order to analyse the movement of gold price.

2.2.3 Crude Oil Price

2.2.3.1 Markov-switching Model

Kuan (2002) stated that the Markov-switching model was developed by Hamilton (1983). This model is one of the renowned nonlinear time series models and contains multiple equations which show the characteristic of time series behaviours in different regime. This model has the capabilities to capture more complex dynamic patterns through switching between equations. Furthermore, the foregoing studies show evidence of using the Markov-switching model in stock market data to capture the high volatility and obtain a better result. Thus, it is important to present the Markov-switching model in this research to study the impact of crisis on oil price and examine the reaction in oil price movement that could affect the movement in stock market.

Paliouras (2007) applied Markov-switching model in determining the relationship between crude oil and heating oil futures price in unobserved regime. Results indicated that the model able to capture high volatility given that the features of this model which enable the switching between equations. Hence, this Markov-switching model framework would be able to capture the high volatility in oil price especially during financial crisis. Besides, Chen et al. (2007) who used this framework to study the monthly stock returns (S&P 500) and oil price indicated that the stock returns reacted more responsively with the increasing oil price. Thus, stock returns reacted towards the change in oil price given the uncertain condition of financial crisis.

In conclusion, the movement of oil price is volatile and it may cause a negative impact to the economy during oil price increase. This model can capture the volatility of oil price and it may useful to the investors to act as an indicator for them.

2.2.3.2 Discounted Cash Flow Model

This model was introduced by Irving Fisher in year 1930. There were a lot of researchers like Adam and Tweneboah, (2008) and Rault and Arouri, (2009) used the discounted cash flow model to study the relationship between oil price and stock return. This framework explained that the changes in oil price movements could affect the cash flow on the companies which indirectly affecting their stock price. The model is shown as below:-

$$P_0 = D_1 / (1+r)^1 + D_2 / (1+r)^2 + D_3 / (1+r)^3 + \dots + D_n / (1+r)^n$$

Where, P_0 = Current price
 D_i = Expected dividend in period I
 R_j = Required rate of return on the asset j

Rault et al. (2009) used this discounted cash flow model framework to explain the changes in stock prices by using oil price as a variable. Theoretically, stocks value is dependent on the discounted cash flow of the company as the results indicated the stock's value. In conclusion, this model is important to explain the cash flow of a company given the impact of oil price changes. Moreover, oil price changes are vary depending on the market condition and uncertain events such as financial crisis. Therefore, stock prices may vary depending on the changes of oil price in market.

2.2.4 Exchange Rate

2.2.4.1 Flow Oriented Model

Flow oriented model was developed by Dornbusch & Fisher in 1980 which suggested the relationship between stock market performance and exchange rate behaviour (Phylaktis et al., 2005). The theory stated that the movement of currency of a country will affect the international competition and the import and export activities and lastly the real output of the country's economy which will then affect current and future cash flow of the companies (Lee, 2012). As the result, it eventually will affect their stock prices as well (Lee, 2012).

Based on the 'flow' approach which was reported by Phylaktis and Ravazzolo in year 2005, depreciation of one country's currency, will cause a rise in their real exchange rate and thus local stock market will rise due the effect of increase in their domestic economic activity. This is because the export activity will increase due to the domestic products become cheaper for the foreign consumers. Thus, exchange rate movement will affect the stock price because the movement may induce the equity flow.

In conclusion, the movement of exchange rate may generate an impact to the productivity of the firms and will affect the overall economy of the country.

2.2.4.2 Portfolio Balance Approach

Portfolio balance approach which also known as stock oriented model was developed by Branson (1981) and Frankel (1983). This approach has established a directional effect on exchange rate by stock prices (Chkili and Nguyen, 2014). This theory explained that the exchange rate may be affected by the changes in the stock price through the adjustments in exchange rate towards the changes in supply and demand of foreign and domestic assets in internationally diversified portfolio.

According to this approach, exchange rate is determined by market mechanism. A growing stock market will attract more capital flow from international investors and this will cause the demand of a country's currency to increase. As a result, increasing in stock price is related to appreciation in exchange rate (Pan et al., 2007). Furthermore, according to Gavin's study (as cited in Phylaktis et al., 2005), when the stock price rises, it will increase the wealth of investors and money demand will depend on the performance of stock market. For example, during financial crisis, the investors will switch their investment on domestic assets to foreign assets due to lose of confidence to economic and politic stability of a country. When this happened, the demand of money will decrease, resulting in the decrease of interest rate. Thus, value of currency will depreciate and exchange rate will increase.

In conclusion, according to this theory, country's exchange rate can be determined by the changes of stock price through the adjustments in supply and demand of foreign and domestic assets under the international portfolios.

2.2.5 Financial Crisis (Dummy)

2.2.5.1 Contagion Theory

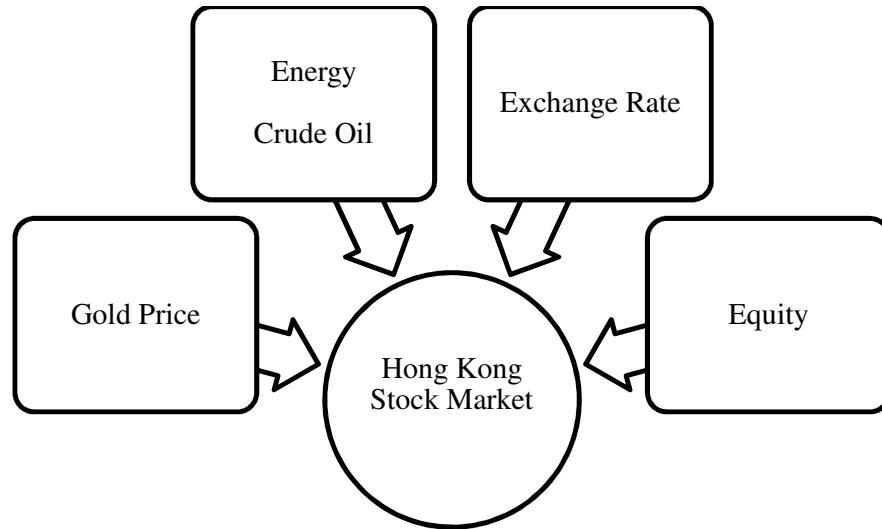
This theory was developed by Forbes and Rigobon in year 2000. Generally, according to Marais's study (as cited in Pericoli and Sbracia, 2003) contagion is defined as the disturbance of a country's financial market transmitting to other country's financial market. The process of transmission happened when the volatility from the country's financial market in crisis was stretched to another country (Pericoli et al., 2003). This theory was focused on investor's behaviour (Masson, 1998). According to Forbes and Rigobon (2000), this theory was divided into two which were contingent theory and non-contingent theory.

Contingent theory stated that the financial crises' effects exist before the shock and do not exist during the financial stability period, whereas non-contingent theory stated that the effect is not significant before the crisis and it only existed during or after the crisis. Besides, contingent theory is based on multiple equilibrium, endogenous liquidity and political contagion. Apart from that, Forbes et al. (2000) stated that these theories can be categories into four fundamental channels which are trade, coordination of economic policy, learning and random shocks.

In conclusion, this theory stated the effect of crisis will spread to the other region which is nearby to the affected country.

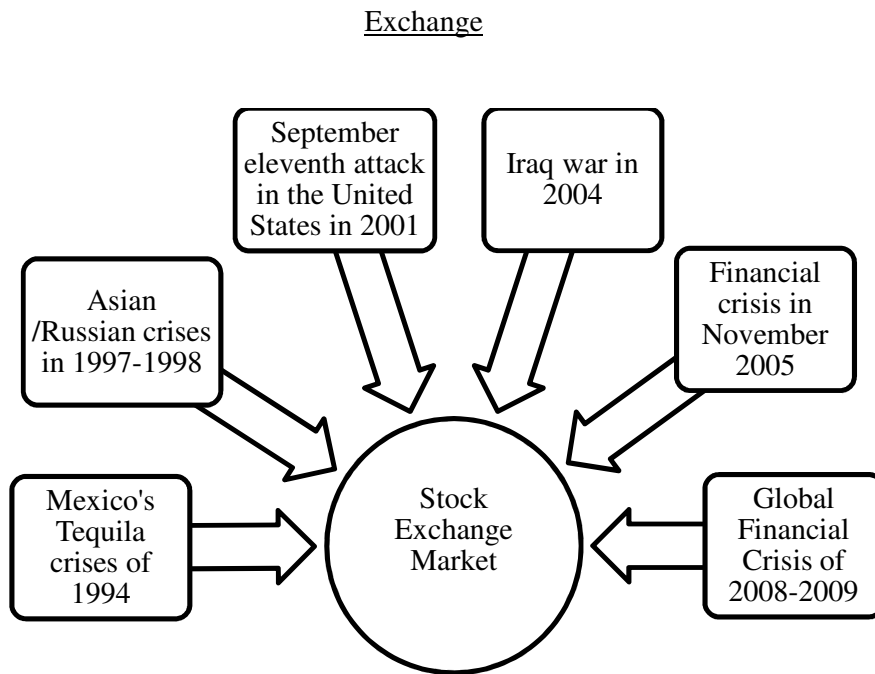
2.3 Proposed Theoretical / Conceptual Framework

Figure 3: Determinant Factors of Hong Kong Stock Market



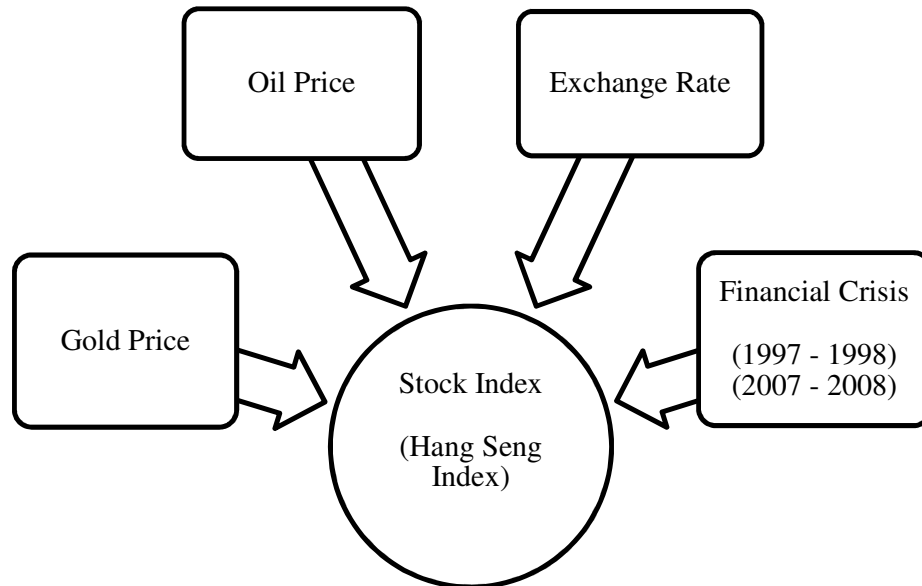
Adapted from: Garefalakis, A. E., Dimistras, A., Koemtzopoulos, D., & Spinthiropoulos, K. (2011). Determinant Factors of Hong Kong Stock Market. *International Research Journal of Finance and Economics*, (62), 50-60.

Figure 4: Business Cycles, Financial Crises, and Stock Volatility in Jordan Stock



Adapted from: Al Rjoub, S. A. M. (2011). Business Cycles, Financial Crises, and Stock Volatility in Jordan Stock Exchange. *International Journal of Economic Perspectives*, 5(1), 83-95.

Figure 5: Structure of determinant factors affecting stock prices in Hong Kong Stock Market from 1994 to 2013



Adapted from:

Garefalakis, A. E., Dimistras, A., Koemtzopoulos, D., & Spinthiropoulos, K. (2011). Determinant Factors of Hong Kong Stock Market. *International Research Journal of Finance and Economics*, (62), 50-60.

Al Rjoub, S. A. M. (2011). Business Cycles, Financial Crises, and Stock Volatility in Jordan Stock Exchange. *International Journal of Economic Perspectives*, 5(1), 83-95.

2.4 Conclusion

Apart from that, past researcher often obtain an inconsistent result in Granger Causality test even though for the same country. For example, the case in U.S., Anoruo and Mustafa (2007) with approximately 3500 sample size found that stock market return granger caused oil market return while Huang et al., (1996) found the other way round. In contrast, Anoruo (2011) with 420 sample size found there was bidirectional causality relationship. These inconsistent results might due to different coverage period. Therefore, this research will begin with more than 5000 total observation which covered both 1997 and 2007 financial crises. Then, it will undergo the same test again for further verification because the more sample size in one research, the higher the accuracy of the result.

On top of that, according to Ray (2013), the author has to use only 21 annual observations when he faced inconsistent periodic quarterly or monthly data. This limitation will have the big impact on the empirical result as it based on low sample size. Indeed, this research will collect daily data for every closing day to overcome the inconsistent periodic problem. Thus, this paper may provide better quality of research as it resembled greater sample size without inconsistent periodic problem.

Moreover, to the best knowledge of the authors, the previous study do not took concern on financial crisis. Even the previous study do concern on it, majority of them only concern on one crisis which is Subprime Mortgage Crisis 2007 as done by Ray (2013). As mentioned, gold price tend to be more significant during the financial crisis, thus this research will be able to provide more reliable result by taking both financial crises into account. Therefore, the empirical results tend to be more reliable and meaningful because the main focus of this research is to study how gold price affect the stock market.

In addition, majority of past researchers such as Anoruo (2011); Hamilton (1983); Herbst (1983); Johnson et al. (2004); Patel (2003); Ray (2013) only construct a simple regression model in their research. They did not include other relevant

variables like exchange rate and crude oil together in their study. In other words, past researchers study may not provide big and clear picture on how various exogenous variable in affecting stock market. As the result, this research developed a multiple regression model with inclusion of gold, crude oil, exchange rate and dummy variable in one model to explain the stock market movement. This is because a multiple regression model can provide detailed information on how the variables were affecting each other through Granger Causality test. It is important not to only focus on simple regression model because in today's worlds, stock market performance is fragile in response to other variables.

Instead of looking at how independent variable will affect the Hong Kong stock market, this study also pay attention on the researchers' methodology. Throughout the literature review, there were only Omag (2012) and Kazemi et al. (n.d.) obtained positive relationship between gold price and stock market under ANOVA model with monthly data. This result was inconsistent with others past researchers that applied other methodologies such as Generalized Autoregression Conditional Heteroscedasticity (GARCH), Autoregression Conditional Heteroscedasticity (ARCH) and Generalized Method of Moment (GMM). This brought out the issue that does selection of model affect the consistency of the result? Thus, this paper has the courtesy to begin the research with Vector Error Correction Model (VECM) to figure out the answer. This is because VECM considered dynamic relationship among the variables that may provide better information than ANOVA which only analysis on differences between the mean and variance of the variables. Besides, result provided by VECM can provide bigger contribution to public especially to policy makers as VECM can figure out how fast the stock market will returns to its equilibrium after a change in the independent variables.

In conclusion, this chapter emphasize and focus on literature review of gold, crude oil, exchange rate and financial crises with various methodology that applied by past researchers. It is crucial to review and refer past researcher's work before moving into a deeper research in order to ensure this research is on the correct path. Through this chapter, review of various past researches will eventually

motivate, encourage and giving hints to improve the next research for the same area. Therefore, this paper will begin a research that may provide more detailed information compared to past researches. Last but not least, this chapter also reviewed the important theoretical frameworks as done by past researchers. For better illustration, the relationship among all the variables and theoretical framework are shown in diagram form. In addition, the next Chapter 3 will emphasize on the data collected and methodology that going to be applied throughout the whole research.

Chapter 3: METHODOLOGY

3.0 Introduction

After reviewed past researcher's finding and methodology in Chapter 2, it helps the research to gain a strong foundation in understanding all the determinant and research area. This chapter is focusing on data description and methodology that going to be undergoing in this research to achieve the research objective.

This study initially employed total of six macroeconomics variables which are Hong Kong Hang Seng Share Price Index, Hong Kong gold closing price, Exchange rate in HKD against USD, Hong Kong Treasury Bill 3month rate, International Raw Material Price Index World Crude Oil and Hong Kong Composite Price Index. All the data for these variables are monthly frequency with 192 sample size. Next, several test have been tested and found out that the monthly data have inconsistent result in Johansen-Juselius Cointegration Test. This is because Trace test shown that there is cointegration equation in the model whereas Maximum Eigenvalue test has no cointegration equation. Furthermore, the set of data have inconsistent time horizon for each variables. Therefore, this research may suspect that there has data problem that lead to such unfavourable condition.

As the result, this research changed to daily data in order to avoid such inconsistency result and to improve the research quality. Then, four macroeconomic variables are employed which are Hang Seng Index (HSI), World Gold per ounce in HKD, Crude Oil-Brent Spot Free On Board (FOB) USD per barrel and Exchange Rate in HKD against USD (WMR) with one Dummy variable to capture to global financial crisis.

3.1 Research Design

This research is a quantitative research with time series data which involves a series of empirical analysis. The data for each of the variables consists of 5217 sample size. In this research, E-Views 6 software is used to facilitate the study in analysis and investigation. The research design is on descriptive and causal research since the objective is to identify the cointegration relationship between Hong Kong stock market, gold price, crude oil price and exchange rate.

3.2 Data Collection Method

3.2.1 Data Source

Secondary data are collected for this research study and they are ranging from 3 January 1994 to 31 December 2013. The main reason of using secondary data is because it is reliable and quality assured as they obtained from authorized sources.

The details are summarized as Table 3.1 below:

Data	Unit Measurement	From	Sourced
Hang Seng Index (HSI)	Index	Internet	finance.yahoo.com
World Gold Price	HKD per ounce	Internet	www.gold.org
Crude Oil-Brent Spot (FOB)	USD per barrel	Data Stream 5.1	Energy Information Administration (EIA), U.S.
Hong Kong Exchange Rate	HKD against USD (WMR)	Data Stream 5.1	Census and Statistic Department, Hong Kong
Dummy Variable	0 or 1	Journal Articles	Journal Articles

3.2.2 Frequency of Data

In this research, the daily data is collected with the total sample size of 5217. In fact, research based on daily data is quite interesting as it can capture how the daily movement of macroeconomic variable is affecting the Hang Seng Index through the Vector Error Correction Model (VECM).

3.2.3 Coverage Period/Period of the Study

The research data is obtained from a total of 20 years ranging from 1 January 1994 to 31 December 2013. According to Kim and Mei (1994), the Hong Kong stock market experienced a big political shock from 1989 to 1993 due to various factors. The authors claimed that China's progress on human rights, cancellation of China's status as a most-favoured nation trading (MFN) by the U.S., and cancellation of the 1989 agreement with Britain by China itself did seriously jeopardize the Hong Kong stock market position as China

trading window to the West (Kim et al., 1994). As the result, in order to avoid such external political issue, this research study is started from year 1994. Besides, the sample size period is quite interesting as it included the Asian Financial Crisis 1997 and Subprime Mortgage Crisis 2007. The data obtained are aligned with the research objective as it is focusing on how's the Hang Seng Index movement with other independent variables while taken into account of financial crisis attack.

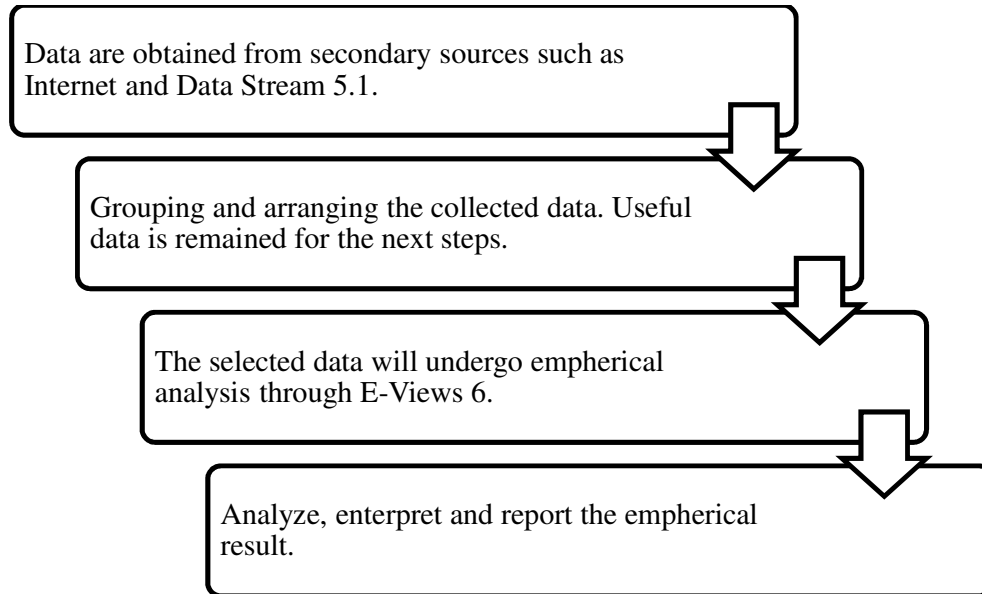
3.3 Sampling Design

3.3.1 Target Population Hong Kong

This research paper emphasize on the Hong Kong Stock Exchange (HKSE). It aims to examine the long run relationship between the independents variable and the Hang Seng Index (HSI) which known as a the third biggest in Asia after Tokyo Stock Exchange and Shanghai Stock Exchange that establish at the end of 19th century (Lee, 2012). Thus, HSI can well represent Hong Kong stock market index. The main objective in this research is focuses on how the movement of Hang Seng Index is affected by the independent variables. Besides, it is a free float-adjusted market capitalization-weighted stock market index in Hong Kong which used to record and monitor daily changes of the largest companies of the Hong Kong stock market. Therefore, this allows the investors to track the performance of the Hang Seng Index and acts as an indicator for Hong Kong overall economy.

3.4 Data Processing

The data processing is organized as follow in Figure 6 below:



3.5 Variable Description

3.5.1 Hang Seng Index (HSI)

First and foremost, the dependent variables in this research are Hang Seng Index in index form as a proxy to Hong Kong stock market. Stock index is a set of stock constructed that used to track a market or sector (Mark Kennedy, n.d.). HSI is a free-float capitalization-weighted index of selection of companies from the Hong Kong Stock Exchange that established since year 1964 (Bloomberg, n.d.). So, it can represent Hong Kong stock market as it is the biggest stock index in Hong Kong Stock Exchange. This is because it consists of 48 listed companies from Hong Kong or Mainland China enterprises that represent more than 60% of the values of all stocks trading in HKSE (Lee, 2012). Thus, the fact mentioned

above indicates the data is reliable to represent the research country which is Hong Kong.

3.5.2 World Gold Price per Ounce in HKD

In this study, daily world gold price per ounce in HKD are collected as proxy to represent gold price. In Hong Kong market, gold is the best commodity to preserve capital and combat recession (Chang, Chang and Huang, 2013). Many past researchers claimed that gold price has relationship with stock market and their relationship is very obvious when taking into account of global financial crisis.

3.5.3 Crude Oil-Brent Spot (FOB) in USD

In this research, Hong Kong crude oil price is unable to be collected for the research purpose. Then, Crude Oil-Brent Spot FOB per barrel in USD is collected as proxy to represent the crude oil price. In fact, past researchers like Zhang and Wei (2010) also used Brent crude oil price in USD per barrel too. Besides, FOB stands for Free On Board which defined as the actual price paid to seller without taking into account of discount, transportation, insurance and credit cost (Energy Information Administration, n.d.). Thus, this research can avoid those unrelated extra cost that pertained in the crude oil price.

According to Narayan et al. (2010) international oil price have always been leading indicator in the global economy. Moreover, Jones et al. (1996) proved that oil price will affect the stock market return. The rationale behind is that oil price and lead to inflation rate rise tremendously which hardly affect the stock market condition. This statement is supported by Liao et al. (n.d.) whereby inflation rate rise correspond with rising oil price and it reduces US economy output. As the result, it perceived that oil price

is an important indicator for stock market. Thus, it included as one of the independent variable for the research to study how oil price will affect Hang Seng Index.

3.5.4 Hong Kong Dollar against USD (WMR)

WMR is predominant benchmark in the foreign currencies market in which it independent produced, unbiased and trustable (Dinnage, 2012). This research employed Hong Kong direct quote which is HKD against USD for the exchange rate variable. Exchange rate is known as the exchange rate of currencies among the countries globally. It is important because it plays an important role in international trade and financial account of a country (Jabara, Lemmers and Vancauteran, 2009; Miyakoshi, 2003). This is because the cost of domestic product and foreign product are determined by exchange rate of both currencies. Thus, it may affect the import and export of a country that eventually link to stock market performance.

Moreover, as learnt from past decade, appreciation and depreciation of exchange rate did hardly affect the country economy in term of foreign investment. For example, during Asian Financial Crisis in 1997, Thailand economy collapse due to Thai Baht depreciates more than 50%. This followed by collapse of stock market because the many investors sell Thai Baht for U.S. Dollar. As the result, from the past lesson it may conclude that exchange rate is critical in affecting the economy's health which reflected by stock market performance.

3.5.5 Dummy Variable

D=0 indicate there is no global financial crisis and D=1 indicate there is global financial crisis. The main purpose of using dummy variable is to

capture the global financial crisis effect on Hong Kong stock market which proxy by Hang Seng Index. This variable is vital in explaining the research model because global financial crisis has significant negative effect on stock market performance. It is very important to determine the best period for the dummy variable to be counted as $D=1$ in order to maintain the quality of research.

Since this study are using daily data, it is quite hard to determine the exact date as $D=1$. Therefore, some specific journal article are collected and selected for references purpose. This is because past researchers can provide which date to be counted as $D=1$. This research referred on Huyghebaert et al. (2010) for Asian Financial Crisis and Wang (2014) for Subprime Mortgage Crisis. In conclusion, this research marked $D=1$ on 1 July 1997– 30 June 1998 for Asian Financial Crisis and 7 August 2007– 2 April 2009 for Subprime Mortgage Crisis. For further details please refer to Appendix 2.

3.6 Econometric Model Description

This research aimed to study the movement of Hong Kong stock market by using Hang Seng Index (Y_t) when taking into account of three independent variables which are World Gold Price per ounce in HKD (χ_{1t}), Crude Oil price per barrel in USD (χ_{2t}) and HKD against USD as exchange rate (χ_{3t}) and lastly is Dummy variable to capture the financial crises (χ_{4t}). Since Vector Error Regression Model (VECM) is employed for the research purpose, it is very important to include optimum lag length in the dynamic model.

The estimated regression model is given as below:

$$y_t = f(x_{1t}, x_{2t}, x_{3t}, x_{4t}, \dots, \chi_{t-n})$$

$$\text{LOG (HSI)} = f(\text{LOG (GP)}, \text{CO}, \text{ER}, \text{Dummy})$$

Sample size, N= 5217

Where,

LOG y_t = Natural Logarithm of Hang Seng Index at period t,

LOG x_{1t} = Natural Logarithm of World Gold Price per Ounce in HKD at period t,

χ_{2t} = Crude Oil Price per Barrel in USD at period t,

χ_{3t} = Exchange rate HKD against USD (WMR) at period t,

χ_{4t} = Dummy variable, D=1 or D=0

χ_{t-n} = Number of lag variables to be included in the model

In this setting, the estimated coefficients for the time trend have their theoretically anticipated signs.

3.6.1 World Gold Price per Ounce in HKD

H₀: There is no relationship between world gold price and Hang Seng Index.

H₁: There is a relationship between world gold price and Hang Seng Index.

The null hypothesis will be rejected when test statistic value is greater than critical value at 5% level of significant otherwise do not reject. Thus, it has sufficient evidence to conclude that Hang Seng Index has relationship with gold price. According to Omag (2012), the author found that there was a positive relationship between gold price and Istanbul Stock Exchange 100 Index in Turkey. It means that the researcher found the positive sign for the coefficient which is contradict to the role of gold as substitute for stock. The role of gold is fully utilize only when during the crisis while during

the uptrend stock market, gold is just a common investment commodity. In other words, stock market has negative short run relationship with gold price only during the crisis. In contrast, since this research study the long run relationship between them, it is expected that this research will obtain a positive sign as found by previous researcher. The statement is supported by graph in Appendix 3.

3.6.2 Crude Oil-Brent Spot FOB USD per Barrel

H₀: There is no relationship between crude oil price and Hang Seng Index.

H₁: There is a relationship between crude oil price and Hang Seng Index.

The null hypothesis will be rejected when test statistic value is greater than critical value at 5% level of significant otherwise do not reject. Thus, it has sufficient evidence to conclude that Hang Seng Index has relationship with crude oil price. In today's world, oil price change tremendously due to the supply and demand factors and it impact differently to different market. According to Hamilton (1983) and Kling's study (as cited in Geralfakis et al., 2011), they conclude that crude oil price and stock market have negative relationship. However, some of the past researcher found the other way round. Even though there have inconsistency result, this research is expected to obtain the negative sign for Hong Kong market. The expected negative sign is supported by various theories. For example, when oil price increase; company will incur higher cost in manufacturing and transportation. This may lead to high price in goods and service in affected country as oil is the essential cost of conducting business.

3.6.3 Exchange Rate in HKD against USD (WMR)

H_0 : There is no relationship between exchange rate and Hang Seng Index.

H_1 : There is a relationship between exchange rate and Hang Seng Index.

The null hypothesis will be rejected when test statistic value is greater than critical value at 5% level of significant otherwise do not reject. Thus, it has sufficient evidence to conclude that Hang Seng Index has relationship with Hong Kong exchange rate (HKD/USD). Furthermore, exchange rate and stock price have different relationship depending on either export or import dominant country. Based on the review, it concluded that Hong Kong is a trade-oriented economy (HSBC Global Connection, 2013). When HK dollar depreciates, it benefits the exporting company in Hong Kong as the import-dominant country will imports from Hong Kong due to lower cost. The further illustration is that when higher demand in Hong Kong domestic products, the economy condition will improve and eventually stock market going uptrend too. Since this research is using direct quote which is HKD against USD, the devaluation of HKD currency means that the exchange rate (HKD/USD) rise. As the result, it is expected that exchange rate and stock price have negative sign in affecting Hang Seng Index.

3.6.4 Global Financial Crisis, Dummy Variable

H₀: There is no relationship between global financial crisis and Hang Seng Index.

H₁: There is a relationship between global financial crisis and Hang Seng Index.

D=0 when there is no global financial crisis and D=1 when there is global financial crisis. The null hypothesis will be rejected when test statistic value is greater than critical value at 5% level of significant otherwise do not reject. Thus, it has sufficient evidence to conclude that Hang Seng Index has relationship with global financial crisis. Global financial crisis has strong impact to stock returns and it brings inverse effect to stock market (Wen, Wei and Huang, 2012). For example, when Subprime Mortgage Crisis 2007 spread to Hong Kong, Hong Kong stock market has dropped significantly as shown in the graph in Chapter 1. Therefore, it suspects that this dummy variable is relevant and it negatively affects Hang Seng Index.

3.7 Data Analysis

3.7.1 Unit Root Test

H₀: Hang Seng Index/ World Gold Price/ Crude Oil Price and Exchange Rate are not stationary and have a unit root.

H₁: Hang Seng Index/ World gold price/ Crude Oil Price and Exchange Rate are stationary and do not have a unit root.

The null hypothesis will be rejected if test statistic is greater than critical value at 1% level of significant otherwise do not reject it. If the null hypothesis is rejected, it has sufficient evidence to conclude that the

subsequent variables is stationary and do not have unit root. Gujarati and Porter (2009) claimed that stationary movement indicates that the mean, variance, covariance of series are constant across different periods. Nevertheless, Nelson and Plosser (1982) stated that most of the macro-economic variables such as exchange rate are not stationary in nature.

Throughout the unit root test, the rules of thumb are all the variables must be stationary at same differences and error term must be stationary at level form. A difference stationary series is said to be integrated and then it only can proceed to Johansen-Juselius Cointegration test and Vector Error Correction Model (VECM). This is because time series model required a stationary data. According to Ray (2013), the author is highly encouraged to conduct unit root test on most of the time series data in order to prevent econometric problems and invalid results. Otherwise, it will lead to a spurious regression (Granger and Newbold, 1974).

Thus, it is crucial to carry out the unit root test to verify the stationary status of the dependent variable as well as independent variables. This research applied the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root test to determine the stationary status of each variable. ADF is the first unit root test introduced by Dickey and Fuller (1979, 1981) and then the test is extended by Said and Dickey (1984) (Kim and Kim, 2008). In fact, the both unit root test was done by various past researchers like Gilmore, McManus, Sharma and Tezel (2009) and Wang, Lee and Nguyen Thi (2011).

According to Al-Zoubi and Al-Sharkas (2011), the ADF designed to run the regression of the first difference of the series against the series lagged one and lagged difference terms either with constant or time trend. Whereas, PP test is a similar unit root test with ADF but it does not taking into account of lagged difference terms. Indeed, PP test is robust in correcting for any serial correlation and heteroscedasticity in the error term (Gujarati et al., 2009).

3.7.2 Optimum Lag Length

Since the research objective has to be undergo a dynamic model, VECM, therefore the lag variables have to be clearly determined for the model. This is essential to obtain the optimum lag length before go for further procedures. The main reason to undergo this process is to ensure the accuracy and reliability of the model. In this research, it will base on two criterions which are widely used by past researchers. First and foremost, is minimum Akaike Information Criterion (AIC) which is introduced by Hirotugu Akaike in 1973 (Kitagawa, 2008). Secondly is minimum Schwarz Information Criterion (SC) or known as Bayesian Information Criteria (BIC) which proposed by Schwarz in 1978 (Cavanaugh and Neath, 1999).

Based on Acquah (2010), AIC is designed in obtaining best approximating model without depending on the sample size. On the other hand, SC is designed in obtaining true model while taking into account of sample size and has the properties of asymptotic consistency. Therefore, SC does provide simple and better model than AIC does (Acquah, 2010). This statement is supported by Johnson and Omland (2004) in which they stated that SC result is better in forming simpler model if compared to AIC. As the result, it can maintain a high degree of freedom with the best lag length in the dynamic model.

3.7.3 Johansen-Juselius (JJ) Cointegration Test

Trace test	Maximum Eigenvalue test
H0: The cointegrating vector is $\leq r$.	H0: The cointegrating vector is equal to r .
H1: The cointegrating vector is $\geq r$.	H1: The cointegrating vector is equal to $r+1$.
Where r is the numbers of cointegrating relationships, 0,1,2,3 and etc.	

After verifying the stationary status of each variables and error term and defining the optimum lag length for the model, the data analysis will proceed to Johansen-Juselius Cointegration test. The null hypothesis will be rejected if the test statistic value is greater than critical value at 1% or 5% level of significant otherwise do not reject it. The rule of thumb in this test is that the cointegration vector, (r), should not less than zero or more than the number of independent variable. If the rule of thumb holds, the test indicates the long run relationship may exist (Gujarati et al., 2009). This test is vital because it matched with this research objective in studying the long run or cointegration relationship among the variables. It can help and facilitate in determining whether a group of non-stationary series have long run relationship or not.

In other words, it helps to identify the significant of variables in time series data and the connection among variables. Besides, it can be used to find out which variable have effect on causing other variables to change either in long run or short run. Past researchers, for example, Wang et al. (2011) and Ray (2013) also used this method to figure out is there any long run association among the variables in their research on stock market.

In this test, it will be based on both Trace test and Maximum Eigenvalue test. According to Hjalmarsson and Osterholm (2007), for the Trace test, it

is a joint test based on log-likelihood ratio in which the null hypothesis is the number of cointegrating vectors less than or equal to r , against the alternative hypothesis of there are more than r . Meanwhile, for Maximum Eigenvalue test, it is a separate test on individual Eigen value in which the null hypothesis is the numbers of cointegrating vectors is equal to r against the alternative hypothesis of $(r+1)$. Throughout the both test, they can help this research to identify the existence of long run relationship and the numbers of cointegrating vector.

3.7.4 Vector Error Regression Model (VECM)

After unit root test and Johansen's Cointegration test are employed and passed, the following step is VECM. This is the major concern for this research as VECM can help to fulfill the research objective which is to identify does Hang Seng Index cointegration with other independent variable and how Hang Seng Index affected. Thus, VECM result can figure out the uncertainty about their relationship. On top of that, VECM can provide a better understanding of the nature of any non-stationary series and also better longer term forecasting result.

High frequency data is not best suit in VECM as claimed by Gujarati et al. (2009). Since this research study is aim to examine long run relationship among the variables, VECM is enough and appropriate in this research as it matched with the study objective. Similarly, there have numbers of past researchers used VECM with daily data in their research too like Cheung (2007); Cheung, Cheung and Wan (2009); Pati and Padhan (2009); Sarno and Valente (2005) (*Refer to Appendix 4 for further details*). Since past researchers used the similar frequency of data and model with this research, this research can be go on without a big problem.

3.7.5 Granger Causality Test

H_0 : X does not Granger cause on Y.

H_1 : X does Granger cause on Y.

and

H_0 : Y does not Granger cause on X.

H_1 : Y does Granger cause on X.

In addition, this research will examine the two channel link among all the variables through Granger Causality test. This test is proposed by Clive Granger in year 1969 aimed to detect causality between two time series (Abu-Libdeh and Harasheh, 2011). Granger Causality test is used to determine whether one variable is significant in forecasting another variable (Granger, 1969). According to Wang et al. (2011) this test has been frequently used by past researcher to study the short run relationship between two or more variables. Similarly, the test can achieve the research objective which is to investigate is there any granger cause relationship among the variables. The result can determine which variables have granger causality on each other's. Hence, the null hypothesis will be rejected if Chi-square test is greater than the critical value at 1%, 5% or 10% level of significant.

3.7.6 Ordinary Least Square (OLS) Model

H₀: Log (Gold Price), Crude Oil Price/ Exchange Rate/ Financial Crisis have no relationship with Hang Seng Index.

H₁: Log (Gold Price), Crude Oil Price/ /Exchange Rate/ Financial Crisis have relationship with Hang Seng Index.

The null hypothesis will be rejected if test statistic is greater than the critical value at 1%, 5% or 10% level of significant. Ordinary Least Square (OLS) model is well known statistical model which widely used by various researchers as it is easy to understand, analysis and interpret. It is a generalized linear modeling technique use to examine the response of variables that has been recorded on an interval scale (Hutcheson, 2011). In other words, OLS can provide how on dependent variable will change on average in response to changes on average in independent variables.

According to Gujarati et al. (2009), there are seven fundamental assumptions in OLS model. First and foremost, the model is linear regression, the number of sample size is greater than independent variable, the value of independent variable is fixed and residual has zero mean value. Not only that, the error term must have constant variance, no autocorrelation and the last assumption is that there is positive number for variance of independent variable and no outlier.

3.7.7 Diagnostic Checking

3.7.7.1 Jarque-Bera (JB) Test for Normality Test

H₀: The error term is normally distributed.

H₁: The error term is not normally distributed.

The null hypothesis will be rejected if p-value is less than 5% level of significant otherwise do not reject. Error term that normally distributed is a very common criterion to be fulfilled in a statistical model. JB test is very common among econometrician in testing the normality of error term in a model. The normally distributed error term is very crucial in a model for analysing economic model (Thadewald and Buning, 2007). For a good econometric model, it should pass JB test in order to achieve estimator with unbiased, minimum variance and consistent (Gujarati et al., 2009). Besides, JB test which focus on skewness and kurtosis computed based on the sample size which can be easily obtained from E-Views 6. As the result, JB test can facilitate in determining the normality of error term in order to ensure the quality of hypothesis testing in this research.

3.7.7.2 Auto-Regressive Conditional Heteroscedasticity (ARCH) Test for Heteroscedasticity Test

H₀: There is no heteroscedasticity problem in the model.

H₁: There is heteroscedasticity problem in the model.

The null hypothesis will be rejected if p-value is less than 5% level of significant otherwise do not reject. If there is heteroscedasticity problem occur, the variance of distribution of coefficient will be increased which violate the minimum variance criteria (Gujarati et al., 2009). Thus, checking for heteroscedasticity is important too in order to make sure the coefficient is efficient. ARCH test is suitable to be used in time series data

as it can capture the serial periods of fluctuation followed by serial periods of stability (Shazam, n.d.). Since the research topic is on stock market movement which the behaviour is very uncertain, ARCH test will be applied for the diagnostic checking purpose. As the result, it can ensure the reliability of the hypothesis testing in this research.

3.7.7.3 Breusch-Godfrey Serial Correlation LM Test for Autocorrelation Test

H_0 : There is no autocorrelation problem in the model.

H_1 : There is autocorrelation problem in the model.

The null hypothesis will be rejected if p-value is less than 5% level of significant otherwise do not reject. Autocorrelation is defined as the error term of each observation is correlated with each other (Gujarati et al., 2009). Testing for serial correlation of the error term in linear regression model has become a vital procedure in every research since past decades. This research will use Breusch-Godfrey LM test that designed by Breusch and Godfrey in 1978 (Levich and Rizzo, 1998). Its unique feature is it can capture the autocorrelation problem in higher orders of series correlation and lagged dependent variables (Godfrey, 2007). Besides, it also can take into account of effect of omitted variables as well (Godfrey, 2007). According to Baltagi, Seuck, Jung and Koh (2007), they also applied LM test to test for serial correlation and spatial autocorrelation in their research. Thus, this research would not exclude this diagnostic checking in order to ensure that the estimators are unbiased, efficient and consistent. As the result, it can avoid this paper from making false hypothesis testing in this research.

3.7.7.4 Ramsey RESET Test for Model Specification Test

H₀: Model specification is correct.

H₁: Model specification is not correct.

The null hypothesis will be rejected if p-value is less than 5% level of significant otherwise do not reject. Model specification test is the last diagnostic checking to be conducted in order to ensure that the model is correctly specified. The model is correctly specified reflects that the constructed model does not exclude important variables, does not include irrelevant variables and correct functional form (Gujarati et al., 2009). Ramsey RESET was developed by Ramsey (1969) to test nonlinearities and for omitted significant variables (Vaona, 2010). According to DeBenedictis and Giles (1996), they also applied Ramsey Reset test in their diagnostic checking too. As the result, this test is included in this research in order to avoid misleading hypothesis testing.

3.8 Conclusion

In conclusion, this research has included Hang Seng Index, World Gold Price per ounce (HKD), Crude Oil Price per Barrel (USD), Exchange rate HKD against USD (WMR) in the study of nexus relationship between them. All the data are collected from authorized sourced in Data Stream 5.1 and authorized website as well. Whereas, the period selected for dummy variable are referred from journal article. There are 5217 total number of observation from year 1994 to 2013 that to be examined, analysed and interpreted through Unit Root Test, Johansen-Juselius Cointegration Test, Granger Causality Test, Vector Error Correction Model and Ordinary Least Square (OLS). All these test will be undergo by E-Views 6 software and the empirical result will be determined and discuss in coming Chapter 4.

CHAPTER 4: DATA ANALYSIS

4.0 Introduction

This chapter will be more focused on reporting, analysing and interpreting the empirical results generated from E-Views 6 software. The empirical results are based on Unit Root Test, Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), Johansen-Juselius Cointegration test. The next phase will be followed by Vector Error Correction Model (VECM) and Granger Causality test, Ordinary Least Square and diagnostic checking. A through detail of explanation will be discussed under each of the section below.

4.1 Unit Root Test

The stationary of series is the essential step as it can avoid the spurious result (Brooks, 2008). According to Cheung and Lai (1995), if the variables are in stationary form, the effect of lag order on critical value can reduce to zero when increasing sample size. For this research, the stationary status for each of the variables is examined by using Augmented Dickey Fuller Test (ADF) and Phillips Perron Test (PP).

Table 4.1: Summary of Unit Root Tests (Refer to Appendix 5.1 and 5.2)

	ADF test		PP test	
	Level	First Difference	Level	First Difference
Variables	Constant with trend	Constant without trend	Constant with trend	Constant without trend
Hang Seng Index	-3.166669(0) *	-73.10477(0) ***	-3.151173(1) *	-73.11769(5) ***
World Gold Price	-1.841845(0)	-72.88168(0) ***	-1.798782(7)	-72.93101(7) ***
Crude Oil Price	-2.928487(5)	-28.07809(4) ***	-2.935696(23)	-75.24674(23) ***
Exchange Rate	-3.214004(1) *	-74.70386(0) ***	-3.225533(2)*	-74.78792(6) ***
Residual	-4.406656(0) ***	—	-4.023309 (12) ***	—

***, **, * denotes rejection at 1%, 5%, and 10% significance level respectively.

Source: Developed for the research

From Table 4.1, both results from ADF and PP unit root test are unable to reject the null hypothesis of all variable at level form. This is because the test statistics of ADF and PP are less than critical value at 1%, 5% or 10% level of significant. When proceeds to the first difference, the both ADF and PP results for all the variables are able to reject the null hypothesis of unit root test at first difference. This is because the test statistic of ADF and PP are greater than critical value at 1% level of significant. Thus, it has sufficient evidence to conclude that all the variables are stationary at first difference and do not have unit root at 1% level of significant.

Besides, in order to use Vector Error Correction Model (VECM), it has to ensure that residual stationary at level form. This is because it indicated that there tend to

have long run relationship. From the results reported in Table 4.1, ADF and PP result showed that null hypothesis is rejected at level form. This is because the test statistic for residual is greater than critical value at 1% level of significant. It has sufficient evidence to conclude that residual is stationary at level form at 1% level of significant. Hence, it indicated that the variables tend to have long run relationship. Then, the research will proceed to next step which is determining the lag length before moving on to VECM.

4.2 Determine Optimum Lag Length

Table 4.2: VAR Lag Order Selection Criteria (*Refer to Appendix 5.3*)

Lag	Log L	LR	FPE	AIC	SC	HQ
0	- 12875.72	NA	9.67e-05	4.945564	4.951859	4.947766
1	58244.08	142075.8	1.35e-16	-22.35134	-22.31357 *	-22.33813 *
2	58286.56	84.78828	1.34e-16	-22.35806	-22.28881	-22.33384
3	58314.31	55.33438	1.34e-16	-22.35911	-22.25839	-22.32389
4	58349.99	71.06224	1.33e-16	-22.36321	-22.23102	-22.31698
5	58379.77	59.27428	1.33e-16	-22.36505	-22.20138	-22.30781
6	58498.84	236.7144	1.29e-16	-22.40117	-22.20602	-22.33291
7	58525.64	53.23413 *	1.28e-16 *	-22.40186 *	-22.17524	-22.32260
8	58540.18	28.85578	1.29e-16	-22.39784	-22.13975	-22.30757

Source: Developed for the research

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Based on Table 4.2, the optimum lag length of one is selected based on the result given by Schwarz Information Criterion (SC). This is because it provided a lower lag length compared to Akaike Information Criterion (AIC). Therefore, the highest degree of freedom can be maintained in the model.

The regression model will be as below:

$$Y_{t-1} = \alpha + \beta_1 \chi_{1t-1} + \beta_2 \chi_{2t-1} + \beta_3 \chi_{3t-1} + \text{DUMMY} + \varepsilon_t$$

χ_{1t-1} = Lagged valued for World Gold Price

χ_{2t-1} = Lagged valued for Crude Oil-Brent Spot FOB USD per barrel

χ_{3t-1} = Lagged valued for Exchange Rate, HKD against USD (WMR)

DUMMY = Dummy variable for global financial crisis

4.3 Johansen-Juselius (JJ) Cointegration Test

Table 4.3: Johansen-Juselius Cointegration Test result (*Refer to Appendix 5.4*)

Hypothesized no. of CE(s)	Trace Statistic	Max-Eigen Statistic	Critical value (5%)	
			Trace	Max-Eigen
R=0	73.98241*** (0.0000)	42.00614*** (0.0004)	47.85613	27.58434
R≤1	31.97627** (0.0276)	25.92274*** (0.0098)	29.79707	21.13162
R≤2	6.053525 (0.6892)	6.051210 (0.6066)	15.49471	14.26460
R≤3	0.002315 (0.9596)	0.002315 (0.9596)	3.841466	3.841466

***, **, and * denotes rejection at 1%, 5%, and 10% significance level respectively.

Source: Developed for the research

Next, the data analysis proceeds to Johansen-Juselius (JJ) Cointegration Test with the optimum lag length based on Schwarz Information Criterion (SC). The purpose of JJ test is to obtain the cointegration properties of the data series. Cointegration test is to identify whether the time series data has long run equilibrium relationship or not (Johansen and Juselius, 1990). Thus, it means that JJ test can facilitate to answer the research objective.

Trace test	Maximum Eigenvalue test
H0: The cointegrating vector is $\leq r$.	H0: The cointegrating vector is equal to r .
H1: The cointegrating vector is $\geq r$.	H1: The cointegrating vector is equal to $r+1$.
Where r is the numbers of cointegrating relationships, 0,1,2,3 and etc.	

The result of critical value of Trace test and Maximum Eigenvalue test are presented in Table 4.3. Based on the two proposed set, this paper rejects the null hypothesis of the cointegrating vector ≤ 0 and equal 0 respectively since the test statistic value are greater than critical value at 1% level of significant. Same goes to null hypothesis of the cointegrating vector ≤ 1 or equal to 1. Thus, it has sufficient evidence to conclude that there is more than 1 cointegrating vector in the model.

However, for both test, the null hypothesis of the cointegrating vector ≤ 2 and equal to 2 are unable to reject since the test statistic value is less than the critical value 5% level of significant. Thus, it has sufficient evidence to conclude that there are at most 2 cointegrating vectors. As the result, the model shows that they tend to have long term association among the variables.

These findings were supported by Samanta et al. (2012) whereby they stated that stock price, gold price, exchange rate for dollar and crude oil price have long run relationship under the same methodology. Besides, according to Patel (2013) and

Ray (2013) also claimed that long relationship existed between stock price and gold price.

In conclusion, consistent results are obtained from both Trace Test and Maximum Eigenvalue Test. Hence, this research concluded that the variable tend to have at most two cointegration relationship. This research goes further with Vector Error Regression Model (VECM) in order to verify their long run relationship.

4.4 Vector Error Regression Model (VECM)

Since cointegration relationship among the variables has been tested through Johansen-Juselius (JJ) Cointegration Test, VECM will be the next step to further determine the long run relationship and the coefficient sign of each independent variable in effecting the Hang Seng Index.

Table 4.4: VECM output result (*Refer to Appendix 5.5.1*)

Independent Variables	Coefficient	Test statistic	P-value	Decision
Lagged 1 of Gold Price, C(4)	0.061035	2.741665	0.0061	Reject at 1%
Lagged 1 of Crude Oil Price, C(5)	-0.000375	-1.799915	0.0719	Reject at 10%
Lagged 1 of HKD against USD, C(6)	-0.378518	-3.613032	0.0003	Reject at 1%
Dummy variable, C(8)	-0.001866	-2.696153	0.0070	Reject at 1%
F-statistic		4.567699	0.000043	Reject at 1%

Source: Developed for the research

Hypothesis:

H₀: Lagged of world gold price/ crude oil price/ exchange rate and dummy variable are not significant in model.

H₁: Lagged of world gold price/ crude oil price/ exchange rate and dummy variable are significant in model.

This research will reject null hypothesis if test statistic is greater than critical value at 1%, 5% and 10% level of significant. The null hypothesis for lagged of gold price, exchange rate and dummy variable are rejected since their test statistic, 2.741665, -3.613032 and -2.696153 respectively, are greater than critical value at 1% level of significant. It has sufficient evidence to conclude that lagged of gold price, lagged of exchange rate and dummy variable are significant in explaining the model. Meanwhile, null hypothesis for lagged of crude oil price is rejected since the critical value is greater than critical value at 10% level of significant. Thus, it has sufficient evidence to conclude that crude oil price is significant in explaining the model at 10% level of significant.

From the Table 4.4, it shows that lagged of gold price is positively affecting the Hang Seng Index. Surprisingly, the result obtained is contradict with numbers of past researcher's findings such as Garefalakis et al. (2011) and Hood et al. (2013) under the same frequency of data. Meanwhile, the positive result is supported by Kazemi et al. (n.d.) in which the author also found the same result for Hang Seng Index. In fact, Omag (2012) justified that the gold price is positively affect stock market is because of the changing investor behaviour and the economy condition of a subsequent country.

In addition, for lagged of crude oil price, it is negatively affecting the Hang Seng Index. This negative result is supported by Masih et al. (2011) and Nandha et al. (2008). This is because when crude oil price increase, it will lead to higher cost of production and a decrease in level of output. As the result, stock market performance will decline. The result obtained in this research is aligned with the theoretical concept of Discounted Cash Flow Model.

Besides, lagged of exchange rate is negatively affecting the Hang Seng Index. This result is supported by various authors such as Johnson et al. (2004) and Soenen et al.'s study (as cited in Tsai, 2012) who studied based on U.S. When exchange rate (HKD/USD) increase, it means that Hong Kong Dollar is depreciating which will cause the Hang Seng Index to drop. In other words, Hong Kong stock market performance is badly affected. Again, the result obtained can be explained by common theoretical concept, Flow Oriented Model.

Last but not least, dummy variable that captured the effect of financial crises do have inverse effect on Hang Seng Index. The result obtained is relevant as when Hong Kong stock market is attack by financial crisis, its performance will drop significantly. Hence, this result is also supported by Caballero et al. (2009) and Al Rjoub (2011) and consistent with Contagion Theory.

Hypothesis:

H₀: All slope coefficients are simultaneously zero

H₁: Not all slope coefficients are simultaneously zero

The F-test statistic, 4.567699 is greater than critical value at 1% level of significant. So, the null hypothesis is rejected. It has sufficient evidence to conclude that all the independent variables can jointly explain the model. In other words, it is a good sign as the model is significantly explaining Hang Seng Index.

4.5 Granger Causality Test

Table 4.5: Granger Causality Test Result (Refer to Appendix 5.6)

Dependent Variable	Independent Variables				ECT (t-ratio)
	X^2 -statistic of lagged 1 st differenced term				
	$\Delta\text{LOG}(\text{HSI})$	$\Delta\text{LOG}(\text{GP})$	ΔCO	ΔER	
$\Delta\text{LOG}(\text{HSI})$	--	7.516726 *** [0.0061]	3.239693 * [0.0719]	13.05400 *** [0.0003]	-0.000624 [-0.49316]
$\Delta\text{LOG}(\text{GP})$	2.769638 * [0.0961]	--	0.032312 [0.8573]	0.302468 [0.5823]	0.000119 [0.14964]
ΔCO	2.067493 [0.1505]	5.198355 ** [0.0226]	--	0.005803 [0.9393]	0.450284 [5.35962]
ΔER	4.173437 ** [0.0411]	8.914702 *** [0.0028]	0.119922 [0.7291]	--	0.000589 [3.52045]

***, **, and * denotes rejection at 1%, 5%, and 10% significance level respectively.

Source: Developed for the research

Where,

$\Delta\text{LOG}(\text{HSI})$ = Difference of natural logarithm of Hang Seng Index

$\Delta\text{LOG}(\text{GP})$ = Difference of natural logarithm of Word Gold Price per ounce in HKD

ΔCO = Difference of Crude Oil-Brent Spot FOB USD per barrel

ΔER = Difference of Exchange rate, HKD against USD (WMR)

Granger Causality interpretation

Summary of Short-term Granger Causality Test Results among All the Variables

Variables	$\Delta LOG(HSI)$	$\Delta LOG(GP)$	ΔCO	ΔER
$\Delta LOG(HSI)$		1%	10%	1%
$\Delta LOG(GP)$	10%		-	-
ΔCR	-	5%		-
ΔER	5%	1%	-	

Source: Developed for the research

Table 4.5 showed Granger Causality result for the research model. The null hypothesis is independent variables do not granger cause on dependent variables. The null hypothesis of $\Delta LOG (GP)$ does not granger cause on $\Delta LOG (HSI)$ is rejected. This is because the F-statistic value is greater than critical value at 1% level of significant. Therefore, it has sufficient evidence to conclude that $\Delta LOG (GP)$ granger cause on $\Delta LOG (HSI)$ at critical value at 1% level of significant.

In addition, the null hypothesis of $\Delta LOG (HSI)$ do not granger cause on $\Delta LOG (GP)$ is rejected at 10% level of significant. As the result, it can conclude that $\Delta LOG (HSI)$ and $\Delta LOG (GP)$ are granger cause each other. The two way causality result is supported by Kazemi et al. (n.d.). However, this research finding is not consistent with some researchers as they found only one way granger cause from gold price to stock price such as Patel (2013) and Ray (2013). Similarly, only one way causality from stock return on gold return was found by Smith (2001).

Furthermore, the null hypothesis of ΔCO does not granger cause $\Delta LOG (HSI)$ is rejected since the F-statistic value is greater than critical value at 10% level of

significant. In contrast, it fails to reject null hypothesis of $\Delta\text{LOG}(\text{HSI})$ do not granger cause on ΔCO since the F-statistic value is less than critical value at 10% level of significant. Thus, this research concluded that ΔCO only granger cause on $\Delta\text{LOG}(\text{HSI})$. This finding is supported by Anoruo (2011) via Vector Auto Regression (VAR) Model.

Meanwhile, it failed to reject the null hypothesis of ΔCO granger cause on $\Delta\text{LOG}(\text{GP})$ since the F-statistic is less than critical value at 10% level of significant. Thus, ΔCO does not granger cause on $\Delta\text{LOG}(\text{GP})$ at 10% level of significant. On the other hand, the null hypothesis of $\Delta\text{LOG}(\text{GP})$ does not granger cause on ΔCO is rejected since the F-statistic is greater than the critical value at 5% level of significant. Therefore, it has sufficient evidence to conclude that $\Delta\text{LOG}(\text{GP})$ does granger cause ΔCO at 5% level of significant. As the result, there is only existed one way granger causality from $\Delta\text{LOG}(\text{GP})$ on ΔCO at 5% level of significant.

Moreover, it fails to reject the null hypothesis of ΔER does not granger cause ΔCO since the F-statistic is less than critical value at 10% level of significant. Therefore, it concluded that ΔER does not granger cause ΔCO at 10% level of significant. Similarly, this research also failed to reject the null hypothesis of ΔCO granger cause on ΔER since the F-statistic is less than critical value at 10% level of significant. Thus, it has sufficient evidence to conclude that both ΔCO and ΔER do not have any granger causality relationship. This finding is similar with Tse and Zhao (2011) in which they claimed that granger causality relationship between commodity and exchange rate does not exist.

In addition, the null hypothesis of $\Delta\text{LOG}(\text{GP})$ does not granger cause ΔER is rejected since the F-statistic value is greater than the critical value at 1% level of significant. Therefore, this research concluded that $\Delta\text{LOG}(\text{GP})$ does granger cause on ΔER at 1% level of significant. On the other hand, it failed to reject ΔER does not granger cause $\Delta\text{LOG}(\text{GP})$ since the F-statistic values is lesser than the critical value at 10% level of significant. Therefore, this research concluded that there is only $\Delta\text{LOG}(\text{GP})$ granger cause on ΔER . This finding is supported by

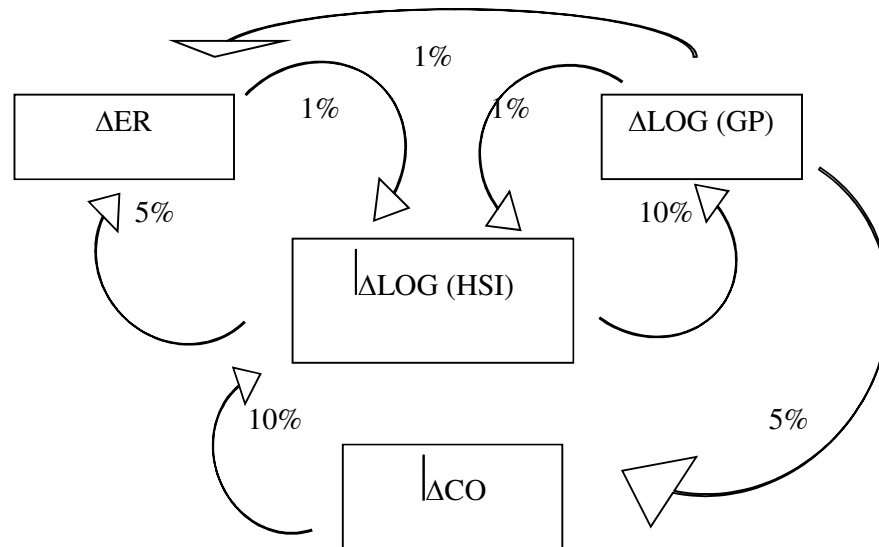
Ozturk and Acikalin (2008) in which the author claimed that gold price unigranger cause on Lira against U.S. dollar in Turkish.

Moreover, the null hypothesis of ΔER does not granger cause on ΔLOG (HSI) is rejected since the F-statistic value is greater than the critical value at 1% level of significant. This result is consistent with Wu (2000) whereby he stated that exchange rate did granger cause on stock price. Besides, the null hypothesis of ΔLOG (HSI) does not granger cause ΔER is rejected since the F-statistic value is greater than the critical value at 5% level of significant. Therefore, it has sufficient evidence to conclude that ΔLOG (HSI) does granger cause on ΔER at 5% level of significant.

This result is supported by Islami and Welfens (2013) as they claimed that when there is a huge capital inflow into the market, it will affect the country exchange rate and vice versa is applicable too. As the result, both ΔLOG (HSI) and ΔER have two way granger causality relationships with each other. This result is consistent with Lean, Narayan and Smyth (2011) whereby they obtained short run bidirectional granger cause between exchange rate and stock market for eight Asian countries.

In conclusion, this research only found bidirectional relationships exist between ΔLOG (HSI) and ΔER and ΔLOG (HSI) and ΔLOG (GP) as shown in Diagram 1. This is supported by Kazemi et al. (n.d.) and Mok (1993) for both pair respectively.

Figure 7: Granger causal relationship



Source: Developed for the research

4.6 Ordinary Least Square (OLS) Model

Table 4.6: Ordinary Least Square result (Refer to Appendix 5.7)

Variable	Test statistic	Expected	Actual	Result
LOG (GP)	2.896979	Negative	Positive	Significant
CO	32.83531	Negative	Positive	Significant
ER	12.11358	Negative	Positive	Significant
DUMMY	8.866935	Negative	Positive	Significant
F-statistic = 0.0000	3725.617	-	-	Significant

Source: Developed for the research

Ordinary Least Square Model:

$$\text{LOG (HSI)}_t = -1.891198 + 0.035574 \text{ LOG(GP)}_t + 0.007205 \text{ CO}_t + 1.391090 \text{ ER}_t + 0.063135 \text{ DUMMY}$$

Where,

LOG (HSI) = Natural logarithm of Hang Seng Index at t day

LOG (GP) = Natural logarithm of World Gold Price per ounce in HKD at t day

OP = Crude Oil-Brent Spot (FOB) per USD at t day

ER = Exchange rate, HKD against USD (WMR) at t day

DUMMY = 1 if there is a financial crisis in year 1997 until 1998 and year 2008 until 2009, 0 if there is no financial crisis

4.7 Diagnostic Checking

4.7.1 Normality Test: Jarque-Bera Test (*Refer to Appendix 5.8.1*)

The null hypothesis will be rejected if p-value is less than 5% level of significant. Since the P-value less than 5% level of significant, the null hypothesis is rejected. Thus, it has sufficient evidence to conclude that the error term is not normally distributed in the model at 5% level of significant.

4.7.2 Heteroscedasticity Test: ARCH Test (*Refer to Appendix 5.8.2*)

The null hypothesis will be rejected if p-value is less than 5% level of significant. Since the P-value less than 5% level of significant, the null hypothesis is rejected. Thus, it has sufficient evidence to conclude that there is heteroscedasticity problem in the model at 5% level of significant.

4.7.3 Autocorrelation Test: Breusch-Godfrey Serial Correlation LM Test (*Refer to Appendix 5.8.3*)

The null hypothesis will be rejected if p-value is less than 5% level of significant. Since the P-value less than 5% level of significant, the null hypothesis is rejected. Thus, it has sufficient evidence to conclude that there is autocorrelation problem in the model at 5% level of significant.

4.7.4 Model Specification Test: Ramsey RESET Test (*Refer to Appendix 5.8.4*)

The null hypothesis will be rejected if p-value is less than 5% level of significant. Since the P-value less than 5% level of significant, the null hypothesis is rejected. Thus, it has sufficient evidence to conclude that the model specification is not correct at 5% level of significant.

This research obtained significant result for each of the independent variable (Log (GP), CO, ER, and DUMMY) in explaining the dependent variable (Log HSI) based on OLS model. Besides, this research able to pass the F-test statistic whereby the independent variables can jointly explain the dependent variable. Unfortunately, the model failed to pass all diagnostic checking test including normality test, heteroscedasticity test,

autocorrelation test and model specification test. Thus, it might suspect that the result obtained is biased and not reliable.

First and foremost, this research failed in model specification test is because of choosing the wrong form of model. In reality, a linear model could not best fit in today's world as the variables nowadays are in non-linear form. Therefore, the selected linear model could not be able to explain the non-linear behaviour of the variables which caused the failure in model specification test. In other words, the coefficient of long run among the variables detected by the OLS is inaccurate and biased. Eventually, the wrong specified model led to impure autocorrelation problem occurred. Hence, the result obtained in OLS is biased, inefficient and inaccurate. As the result, this research may suggest future researcher to use non-linear model for future research which might provide a better result in detecting the long run effect.

4.8 Conclusion

In conclusion, this chapter reported all the empirical result obtained through E-Views 6. Besides, all the statistical analysis and interpretation are well presented in this section. Next, the summary of the whole research will be fully presented in Chapter 5.

CHAPTER 5: DISCUSSION, CONCLUSION AND IMPLICATION

5.0 Introduction

This research aims to investigate how the Hong Kong stock market can be explained by its determinants such as gold price, crude oil price, exchange rate and financial crises. This research paper uses daily data ranging from 3rd January 1994 to 31st December 2013. When undergo data analysis, the results indicated that these determinants are significant and there exist causal relationships with Hong Kong stock market. In this chapter, a summary of the finding of previous chapter and justification on the results will be provided. A table form will be drawn based on the results for easier understanding purpose. Furthermore, this section will further elaborate and discuss on the findings in align with the research objective. Thereafter, implication of this research paper will be explained and followed by limitation. Lastly, recommendations are provided for further improvement in future research and followed by conclusion for Chapter 5.

5.1 Summary of Statistical Analysis

This research investigates the relationships between all the variables by using daily data ranging from 3th January 1993 to 31th December 2013. The Table 5.1, 5.2, 5.3 and 5.4 summarized all the relationships between Hong Kong stock market and its determinants such as gold price, crude oil price, exchange rate and financial crises.

Table 5.1 Summary Results from Unit Root and Cointegration Tests

Dependent Variable	Independent Variables	Unit root test	Cointegration
LOG(HSI)	LOG(GP)	Stationary (at first different)	At most two long run relationship
LOG(HSI)	CO	Stationary (at first different)	
LOG(HSI)	ER	Stationary (at first different)	
LOG(HSI)	DUMMY	Stationary (at first different)	
Error term		Stationary (at level form)	

Source: Developed for the research

For time series data, it is vital to detect the stationary of variables by using Unit Root test to avoid spurious result in time series data. According to the result from Augmented Dickey Fuller and Phillips Perron test, it shown that all the variables is stationary at first differences while error term is stationary at level form. After that, based on SC, it provides only 1 lag length to be included in the model. Furthermore, the Johansen's Cointegration test is used to test the long run relationships between all the variables and it shown there are at most two cointegration equations among all the variables.

Table 5.2 Summary Results from VECM

VECM			
Dependent Variable	Independent Variables	Relationships	Significant level
LOG(HSI)	LOG(GP)	Positive	1%
LOG(HSI)	CO	Negative	10%
LOG(HSI)	ER	Negative	1%
LOG(HSI)	DUMMY	Negative	1%

Source: Developed for the research

Since, the Johansen-Juselius Cointegration test proven that there are cointegration relationships. Thus, the data analysis proceeds to Vector Error Correction Model (VECM) instead of Vector Autoregressive Regression (VAR). This research had reported all the relationships between independent and dependent variables that detected by VECM in Table 5.2.

The VECM shown that gold price is significant at 1% and positively related to Hang Seng Index and this result is consistent with Kazemi et al. (n.d.) and Omag (2012). The exchange rate and financial crises are significant at 1% and negatively related to Hang Seng Index and these results are supported by Al Rjoub (2011); Caballero et al. (2009); Johnson et al. (2004). Lastly, the Crude oil price is also negatively related to Hang Seng Index but it just significant at 10% and this result is consistent with Nandha et al. (2008) and Park et al. (2008).

Table 5.3 Summary Results from Short-term Granger Causality Test

Variables	$\Delta\text{LOG}(\text{HSI})$	$\Delta\text{LOG}(\text{GP})$	ΔCO	ΔER
$\Delta\text{LOG}(\text{HSI})$		1%	10%	1%
$\Delta\text{LOG}(\text{GP})$	10%		-	-
ΔCR	-	5%		-
ΔER	5%	1%	-	

Source: Developed for the research

Furthermore, the Granger Causality test from VECM suggested that there are bidirectional granger causality relationships between Hang Seng Index and gold price and this result are supported by Omag (2012) and Smith (2001). Mok (1993) also found the same result with this research, which there are bidirectional granger causality relationship between Hang Seng Index and exchange rate in same country as well. Besides, the bidirectional granger causality relationship between Hang Seng Index and exchange rate seem to be agreeing with Lee (2012). Besides, this result seems to be consistent with both Flow Oriented Model and Portfolio Balance Approach.

The Granger Causality tests also shown that the gold price ganger caused exchange rate in Hong Kong and the gold price is also granger caused the crude oil price. This two finding seem to be similar with Liu (2010)'s finding that gold price only granger caused exchange rate and oil price in long run. Last but not least, the tests also shown that there is unilateral granger cause from crude oil to Hang Seng Index and this result is consistent with Sbeiti and Hadadd (2011). This finding of crude oil price granger caused stock index seems to be agreed by Kilian et al. (2008)'s finding that stock return is depending on the fluctuation on crude oil price.

Table 5.4 Summary of The Relationships from Ordinary Least Square (OLS)

Dependent Variable	Independent Variables	Ordinary Least Square (OLS)	Long run relationship
LOG(HSI)	LOG(GP)	Positive (Significant at 1%)	Failed to detect
LOG(HSI)	CO	Positive (Significant at 1%)	Failed to detect
LOG(HSI)	ER	Positive (Significant at 1%)	Failed to detect
LOG(HSI)	DUMMY	Positive (Significant at 1%)	Failed to detect

Source: Developed for the research

The OLS results shown that, all the determinants are significant at 1% and all determinants are positively correlated with Hang Seng Index. However, this model is compressed with model specifications error. Thus, there are very high chances that the coefficients generated by this OLS model tend to be inaccurate and misleading results.

5.2 Discussion of Major Findings

Gold plays an important role in financial market due to investors perceived gold as alternative investment mechanism (Baur et al., 2010; Wang et al., 2011). The primary objective is to investigate the relationship between gold price and Hong Kong stock market (Hang Seng Index). Based on the VECM model, it is identified that there is a positive relationship at 1% significant level. This is because the international investors might perceive that gold as inflation hedge.

It is explain that during dot com crisis, the economy downturn and economic growth stunted in year 2000. U.S. Government intervened by lowering down

the interest rate from 6.5% to 1.75% in order to increase money supply to promote economic growth (Holt, 2009; Kazemi et al., n.d.). Hence, companies gained their capital through borrowing and carried on their activities to increase the productivity. Therefore, U.S. economic growth showed a positive sign whereby stock market performance followed the uptrend. Due to excess supply of money in market, inflation happened and this caused the price and demand of gold to increase since year 2000 as investors tend to invest in gold to hedge the inflation.

Since U.S. is the leading market in the world, when U.S. market performance well definitely the performance of Hong Kong Stock market will follow the uptrend as well. In short, stock market performance improved in aligns with the economic growth and demand for gold continued to increase as investors perceived it as inflation hedge.

On top of that, Theory of Gold Price Movements stated that gold is a hedging tool against commodities (Frankel, 2011). In other words, inflation hedge refer to continuous increase in gold price at a rate higher than inflation rate (Trivedi et al., 2012). However, this theory might not be fully applicable in this research since gold might not act as an inflation hedge in Hong Kong. This is because gold price fluctuated due to massive speculation activities and does not consistently showing an uptrend (*Refer to Figure 1*).

Furthermore, most of the household prefer to invest in gold market as they presumed a higher knowledge regarding gold than stock investment. On the contrary, investors prefer stock investment because they assumed that stock market provides a higher return. As a result, investors retained their investment in stock market and households retain their investment in gold. Thus, both have a positive demand and indicating a positive relationship between gold price and Hang Seng Index which similar with this research findings.

Moreover, empirical result from previous chapter shown that exchange rate and Hang Seng Index are negatively related. When exchange rate increases, Hong Kong Dollar will depreciate against U.S. dollar and lead to a decrease in Hang Seng Index. This is because depreciation in Hong Kong Dollar will cause foreign investors to lose confidence toward Hong Kong stock market. Therefore, they tend to withdraw their funds because of market fear. This will lead to a decline in Hong Kong stock market due to the stock market return for foreign investor might be harmed by depreciation in Hong Kong Dollar.

Besides, the negative correlation between stock market performances and exchange rate is supported by Dornbusch and Fisher's Flow Oriented Model in 1980. This model stated that exchange rate is significantly influence stock market performance. Besides, Phylaktis et al. (2005) found there was negatives relationship between stock market and exchange rate by using this model. When there is an increase indirect quote exchange rate, home currency value will depreciate. Investors would be panic and assume that there will be a negative movement in the market. Therefore, investors tend to withdraw their capital from Hong Kong stock market and lead to a decline in stock market (Johnson et al., 2004). Similarly, this empirical result supported the negative relationship indicating that this model is applicable in Hong Kong market.

Primarily, hiked up in oil price had leads to cost of production and cost of conducting the business to increase. The affected industries tend to lower down their cost; they will reduce the production activities (Nandha et al., 2008). Hence, economic growth will be stunted and stock market performance will fall. Thus, there is an inverse relationship between stock market performance and oil price movement and this is supported by the empirical result from previous chapter.

Likewise, this finding is consistent with the Discounted Cash Flow Model which stated that stock price is negatively influenced by oil price (Adam et al., 2008 and Rault et al., 2009). When oil price increases, it will increase the cost of operating activities and tend to a decrease in company's profit or future

cash inflow. Therefore, poor companies' performance will lead a fall in their share price as well as the stock market performance.

Several financial crises have shaken the international financial market in both developed and developing countries (Gallali et al., 2012). The VECM model indicates a significant negative relationship between financial crisis and Hang Seng Index. During global financial crisis, economy growth will be stunted given that most of the countries will suffer from capital mobility constraint. Investors fear to invest as the economy environment is discouraging. Furthermore, investors will withdraw their investment to retain their asset value from losses. This behaviour drives the stock market performance to fall when investors disinvest and economy performing badly given the condition during financial crisis. Thus, when there is financial crisis happens, Hong Kong Stock market will fall as the environment is driving the situation to happen.

The contagion theory had been defined as the impact of financial crisis is transmitting from originator's financial market into financial market in other countries. This theory is fully applicable in Hong Kong stock market since both Asian Financial Crisis and Subprime Mortgage crisis are not originated from Hong Kong but Hong Kong stock market also can feel the negative shock from both crises. For example, Hang Seng Index was drop more than 50% in both Asian Financial and Subprime Mortgage crisis (*Refer to Figure 1*).

Besides, Johansen-Juselius cointegration test hinted that at most only 2 long run relationships exist in the model. Thus, the research proceeded to OLS in order to further detect the coefficient of long run relationship. However, this research fails to detect coefficient of the long run relationship among all the independent and dependent variables by applying OLS regression model. This is because the OLS regression model contain model specification error which constraints it to capture the coefficient long run. Samanta et al. (2012) also faced same problem, in their research the Johansen-Juselius cointegration test

hinted that there was long run relationship but the traditional ECM result was inconclusive whether there was long run relationship exist.

Hang Seng Index and exchange rate have bi-directional causality relationship according to Granger Causality test. This is because when Hong Kong stock market performs well, foreign investor tends to invest more funds drive up the demand and value of Hong Kong Dollar. Thus it leads to a decrease in exchange rate. This finding is supported by Portfolio Balance Approach Theory by Branson and Frankel in 1983. This theory stated that that there is a directional effect on exchange rate by stock prices (Chkili and Nguyen, 2014). This theory justify that changes in the stock price tend to affect the exchange rate through certain adjustments in exchange rate. It is influences by the changes in supply and demand of foreign and domestic assets in internationally diversified portfolios. In contrast, when there is an increase in exchange rate, Hong Kong Dollar will depreciate. Investors might withdraw their funds from Hong Kong stock market. As a result, foreign investment and stock market performance will decline.

In addition, gold price and Hang Seng Index shows a bidirectional causality relationship. It is explained by the gold as an alternative investment mechanism during any negative market shock stock market. This is because, when there is negative shock in Hong Kong stock market, the investor will perceive that Hong Kong stock market tend to decline. Thus they will disinvest their fund in Hong Kong stock market and reinvest in gold market. It will cause a raise in gold price and a decline in Hong Kong stock market. In contrast, when there is negative shock in gold market it will caused a decline in gold price due to some investor might selloff their investment in gold and reinvest in stock market. Thus, it leads to a decline in gold price and a raise in stock market. This negative relationship only applicable in short run as proved through Granger Causality test but not in long run as proved through VECM.

Furthermore, it is determined that gold price granger cause exchange rate indicating a unilateral causality relationship. When there is a rise in gold price,

investors as well as speculators tend to foresee a positive movement in gold price. Therefore, it causes domestic demand in gold investment and speculation to increase. Thus, Hong Kong needs to import gold from other countries to fulfil the domestic demand. Thus, Hong Kong will sell off Hong Kong Dollar to purchase foreign currency to pay for gold invoice. Thus, it results in an increase in exchange rate. Generally, this proves that unilateral causality relationship exists from gold price to exchange rate.

In addition, Granger Causality test results showed a unilateral causal relationship from gold price to crude oil price. In order to justify the relationship, it is explained that both of the variables fall under the commodities category. If there is rise in one commodity price it will follow by a rise in other commodity price (Bhar and Malliaris, 2011). Thus, it can be seen that a movement in gold price will tend to affect the movement in crude oil price.

Moreover, this research found that oil price granger cause stock market in a unilateral causality relationship. It is determined that oil price has an influence on stock market. When there is an upward movement in oil price, company will suffer a higher cost of production. Therefore, reducing the profit of the company and bringing down the economy performance. Thus, stock market performance will fall as the productivity fall. As stated by Driesprong et al. (2005) and Sadorsky's study (as cited in Lin et al., 2009) who found that oil price has major predictive power on stock price. When oil price fluctuates, stock market will be affected as oil is one of the major influencing commodities.

5.3 Implication of the study

The research is focusing on studying the movement of Hong Kong stock market (Hang Seng Index) by using gold price (gold price per ounce in Hong Kong Dollar), crude oil price (Crude Oil-Brent Spot (FOB) per barrel in USD),

exchange rate (Hong Kong Dollar against USD) and Dummy (Financial crises) as indicators to Hong Kong stock market. Besides, this research also aims to study the relationship between all the variables. The result from this research may provide some useful information and knowledge which may assist the participants in stock market and policy makers in their decision making process.

Besides, with the findings from this research, public may have better picture on how the movement of the Hong Kong stock market (Hang Seng Index) caused by changes in those stock market's indicators. Thus, the market players may increase the accuracy of their forecasting skills on Hong Kong stock market. Lastly, this research also provides the relationships between all the variables to facilitate investment decision making for government, policy maker as well as investors.

5.3.1 Implication on Government

This research had shown the effect of crude oil prices towards Hang Seng Index given the large impact on the stock market stability. Hence, this research suggest that Hong Kong government may try to control the oil price from deviated too much from the public expectation to avoid the panic that detrimental to stock market performance. Furthermore, this research suggests that government may try to control the excessive oil price rise right after the economy recovered from financial crisis as learnt from past during Subprime Mortgage crisis in 2007. For example, Hong Kong government may impose new system of oil subsidiary to reduce the burden of oil users.

Exchange rate is a relevant indicator to determine the stock market performances since it can influence the international capital inflow or outflow of the country. The assumption stated that when the currency appreciates, it tends to drive up the stock market performance. The research result indicates that exchange rate is negatively related to Hang Seng Index. Meanwhile, when exchange rate drop or currency appreciates will lead to increase in Hang Seng Index. This is because when the

currency appreciates, foreign investors tend to invest heavily in Hong Kong by demanding HKD and then burst up the Hong Kong stock market.

The research empirical result might be useful for Hong Kong government when they conducting the economy policies that impose to intervenes the Hong Kong stock market. This research might suggest that Hong Kong government to consider raising the value of their currency by reducing the interest rate during stock market decline or devaluing their currency if there is bubble in stock market in order to cool down the stock market for being over heat.

Besides, this research might suggest that the central bank of Hong Kong which is Hong Kong Monetary Authority to consider reserve more foreign currencies to conduct sterilize or unsterilized exchange rate intervention. Based on sterilize intervention, in order to strengthen the HKD to boost up capital inflow, Hong Kong central bank may demand home currency in the foreign exchange market and buy Treasury securities so that the total money supply remain constant in order to avoid inflation. This may a good strategy to protect the Hong Kong stock market by controlling the value of their currency during negative shock through the foreign exchange market without changing the money circulation.

5.3.2 Implication on Policy Maker

This research had shown that oil price is negatively related to Hang Seng Index. This is because the hike in oil price could increase the cost of production and reduce the operating profit of the company as well as decline in share price. Thus, it leads to stock market decline. From the finding, this research may suggest that the policies makers might pay more attention on level of oil price before implement any monetary and fiscal policies. This is because the oil price not only influences the cost of product but also inversely affect the stock market performance.

From the VECM output in previous chapter, it shown that the financial crises are significant negatively related to Hong Kong stock market and this is consistent with the theoretically view. This implied that, when crises happen, Hong Kong stock market tends to decline. Thus, the policy makers are recommended to aware the adverse effects of future financial crises on stock market performance.

Therefore, this research might suggest that the policy makers to implement appropriate monetary or fiscal policy during crises to protect their economy and avoid the collapse in stock market. For example, the policy market might consider to implement loose monetary policy to protect their stock market by increasing the money supply or reduce the interest rate to burst up or avoid the economy continue to further decline. Besides, this research might suggest that the policy makers have to consider the impact on stock market resulted by changing the money supply and interest rate. Lastly, policy for crisis prevention is also important as saying goes, prevention is better than cure.

5.3.3 Implication on Investors

Gold price is a vital determinant to investors in studying the stock market movement. As perceived theoretically, most of the investors hold the assumption that gold price serve as hedge again stock market movement. Thus, stock market and gold price is negatively related.

Theoretically, it is argue that gold can be used as one of the mechanism to hedge the stock market. However, the research empirical result shown that gold price is positively affecting Hong Kong stock market. This may implied that gold may not be useful to be the hedge against Hong Kong stock market. Hence, this research may suggest that investors may look for other mechanism in hedging the Hong Kong stock market such as derivative financial product like future and forward contract on stock index.

Most of the investors assume that gold price is always increasing steadily. However, from Figure 1 it shown that the movement of gold price does not always show uptrend and stable. This may show the household is suggested not to over invest in gold to protect their purchasing power since massive speculation attack altered the behaviour of gold price.

Besides, crude oil price is one of the important determinants that investors can rely on in forecasting the movement of stock market performance. Daniel (1997) has proven that oil price is a major variable in predicting the stock market movement based on his results of studies.

Since the oil price and stock market are significantly negative correlated, this research may recommend that investor may restructure their portfolio investment by reducing the exposure to stock market once the oil price is announced to be increased. Zhu, Li and Li (2014) also provide the similar opinion. In other words, investors may try to switch their investment from stock to less risk investment such as bond, Treasury bill and fixed deposit. Not only that, investors may go for financial derivative to hedge the price risk as supported by Arouri (2011). The suggestions proposed in this paper might be useful for investors in building profitable investment portfolio.

Last but not least, Bianconi, Yoshino and Sousa (2013) stated that bond market return is negatively correlated with return from stock market. Thus, this research might encourage the investor to switch to less risk investment such as bond market and money market during financial crisis rather than holding their investment in stock market. This is because money market is a good place to park their money while waiting for economy to recover.

5.4 Limitations of the study

There is nothing can be perfect in the world, thus sometime people should learn how to see the imperfect things in a perfect way. In reality, a perfect research

paper does not exist in most of the research paper. Throughout the research, there are several limitations in this research that have prevented from move forward to obtain a better outcome.

First and foremost, the lack of independent variables to investigate the relationship between Hong Kong stock market and its exogenous variables are also one of the limitations this paper is facing. There is only four variables had been taken as indicators to Hong Kong stock market in this research such as gold price, crude oil price, exchange rate and financial crises. However, these four variables might not be able to fully explain the changes in Hong Kong stock market because there might have other omitted variables that can use to study the Hong Kong stock market. Initially, the model has included six independent variables such as gold price, crude oil, exchange rate, inflation rate, interest rate and the financial crises. However, the problem of data constraint caused this research to exclude two variables which are interest rate and inflation from the model. This might affect the accuracy of the result as other relevant and important variables are excluded from this research.

Unfortunately, this paper was failed to detect the long run effects between Hong Kong stock market with gold price, crude oil price, exchange rate, and financial crises. This is because the OLS model we use to detect the long run relationship failed to pass the diagnostic checking included normality test, heteroscedasticity test, autocorrelation test and model specification test. As the result, the estimators in this OLS model were biased, inefficient and inconsistent which lead to misleading hypothesis testing. We actually aware how serious the problem is, thus, in order to avoid biased information to public, we willing to report that our statically result is not reliable. As the result, we failed to achieve one of the research objectives in detecting the coefficient of estimators in affecting the Hong Kong stock market.

Besides, lack of econometrics knowledge had become one of the limitations that hinder this study to obtain a better result. Currently, VECM model is used in this paper since the outcome provided by VECM is matched with the objective of this

research. In fact, VECM is a liner model which used to study the long run relationship between all the variables. However, in the real world the relationship between these variables are not in linear form. Thus, GARCH or ARCH model might be more preferable for this kind of relationships and it might provide a better result. Unfortunately, this is beyond the ability of the undergraduate students.

Moreover, the result from this research might only applicable in Hong Kong market and only beneficial Hong Kong policy makers and participants in Hong Kong stock market. This is because, this research is only focus on Hong Kong stock market and the stock market react is different from country to country due to differences in background of country, cultural, political, regulations, development stages and etc. Therefore, this research might only serve as reference for policy maker and stock market participants for other countries but the finding from this research may not be applicable on other countries.

Last but not least, due to insufficient of time and unavailable of data this study only able to run two sets of data which are monthly data and daily data to test the consistency of the findings. However, this study is running out of time to analyze the weekly, quarterly as well as annual data and thus, this research failed to test the consistency of the empirical result for each set of data.

5.5 Recommendations for Future Research

From the limitations mentioned above, this research has come out with some recommendations for the future researcher that may help to extend this research. Hopefully, these recommendations could give a guideline for future researchers to obtain a better result in their research and prevent them from repeating same mistakes as made in this research.

Unfortunately, due to unavailable of data, inflation and interest rate were excluded from this research. Although it might reduce the accuracy of the results, but there

is no other alternatives. Thus, future researchers are encouraged to collect data from various sources if they are allowed to access. For example, they may obtain from World Bank, International Monetary Fund, Yahoo Finance or other databases which have more sufficient of data.

Besides, future researchers are encouraged to include more independent variable to study the Hong Kong stock market. This is because stock market may be influence by various macroeconomic variables. Therefore, by including more independent variables will improve the quality of study as it can improve the accuracy of empirical results. However, future researchers are suggested to examine the significant of independent variables toward stock market before taking those independent variables into account to study the stock market.

Furthermore, this research failed to detect the coefficient of the long run relationships between Hong Kong stock market and its indicators due to the OLS model failed to pass all the diagnostic checking. Therefore, there is a high chance that this model consists of impure autocorrelation and it might provide misleading results. Thus, future researchers are encouraged to solve the multicollinearity, autocorrelation, heteroscedasticity and specification error problems by changing the data set to increase the quality of their researches. Besides, future researchers may refer to Samanta et al. (2012) in which Stock-Watson's common trend test was employed to overcome the failure of detecting the long run coefficients in this research. However, this method is beyond the ability of undergraduate students.

Moreover, as the undergraduate students, the insufficient knowledge on econometrics field turns to be an obstacle to go for more advance model such as GARCH and ARCH models. This is because the two proposed models can able to capture the high volatility of data especially in stock market which may provide a better quality of empirical result. Besides, GARCH and ARCH models are more applicable to today's world as most of the relationship between variables is in non-linear form. Next, more sophisticated econometric software such as STATA is highly encouraged for the research purpose as it can work well with a complex

model and can better explain the complexity of the real world. Thus, it can increase the quality of the research.

Apart from that, the research area of this paper is too narrow as it only focuses on one country which is Hong Kong. For the future research, it is preferable if focus wider perspective on different status of the countries ranging from developed, developing and emerging countries. For example, future researchers may select several countries to represent their own subsequent status. This would probably make the research more interesting as it cover different region that might provide different findings. As the result, it can contribute more meaning and relevant information for policy makers, economist and investor in the worldwide.

5.6 Conclusion

In conclusion, the paper implied that the variables tend to have cointegration relationships. Throughout the research, Unit Root Test, Johansen-Juselius Cointegration Test, Vector Error Correction Model (VECM), Granger Causality test, Ordinary Least Square (OLS) and appropriate diagnostic checking have been conducted. These entire tests help the research to check for unit root status of the variables, long run and granger causality of the variables and reliability and significance of variables in explaining the dependent variables. Hence, the research objectives are being fulfilled. On top of that, this chapter also reported the weakness of this research in term of skills and knowledge and thus, recommendation to prospective researchers are provided for future research in order to improve this research.

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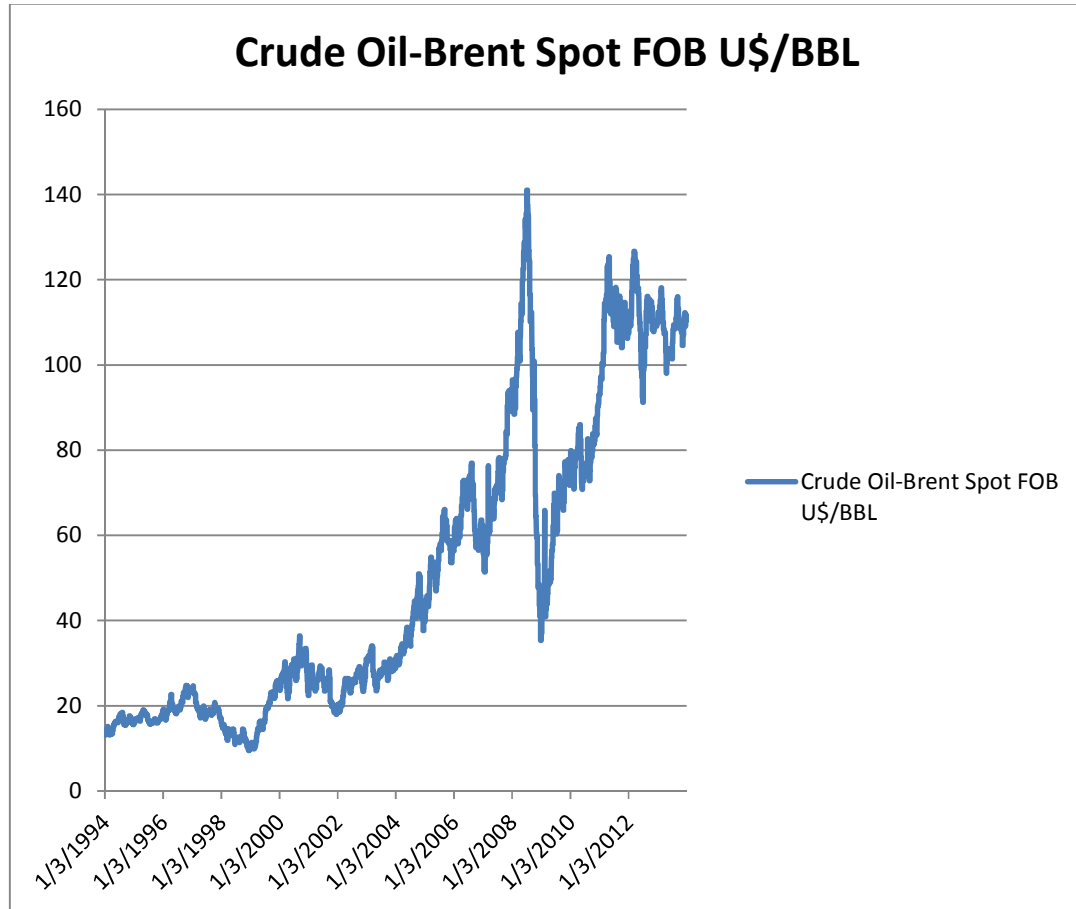
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APPENDICES

Appendix 1



Adapted from: Crude oil – Brent spot (FOB) (n.d.) *Energy Information Administration (EIA)*. Retrieved January 18, 2014, from Data Stream 5.1.

Appendix 2

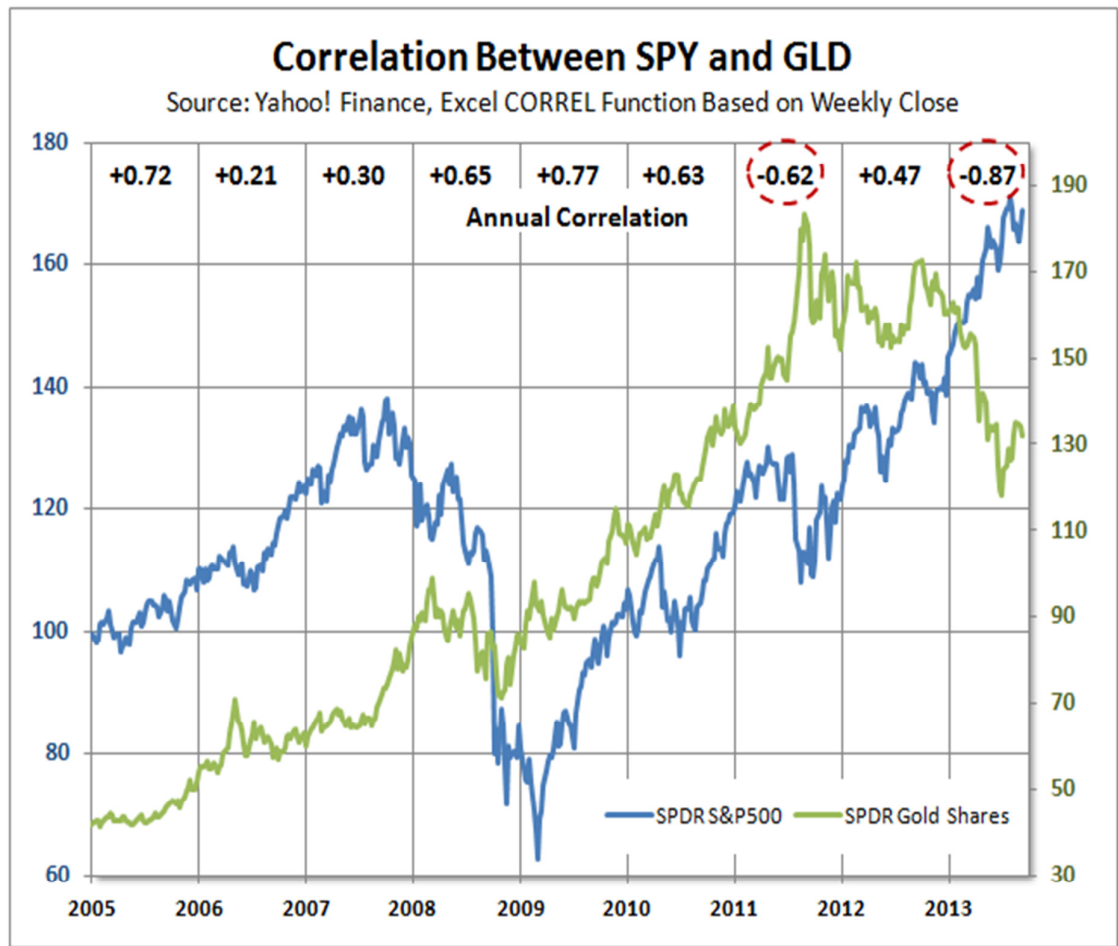
For Asian Financial Crisis 1997 Journal Article:

Research Topic	Author (year)	Period of D=1
The linkage of Asian & the U.S. stock market.	Royfaizal, Lee and Azali (2009)	July 1997 – June 1998
Diversification strategy, capital structure & the Asian financial crisis (1997-1998): Evidence from Singapore firms.	Lim, Das and Das (2009)	2 July 1997 – June 1998
The co-movement of stock market in East Asia- Did the 1997-1998 Asian financial crisis really strengthen stock market integration.	Huyghebaert, Nancy and Wang (2010)	1 July 1997– 30 June 1998

For Subprime Mortgage Crisis 2007 Journal Article:

Research Topic	Author (year)	Period of D=1
Effect of subprime crisis on stock markets integration: Nonlinear VECM model.	Majdoub (2011)	23 October 2007 – 25 February 2009
Who has more influence on Asian stock market around the subprime crisis: US or China?	Nieh, Yang and Kao (2012)	14 March 2007 – 31 March 2010
Who moves East Asian stock market? The role of the 2007-2009 global financial crisis.	Wang (2013)	7 August 2007– 2 April 2009

Appendix 3



Adapted from: Lacano, T. (2013). The changing relationship between U.S. stocks and gold is good for gold. Retrieved February 14, 2014, from seekingalpha.com/article/1690412-the-changing-relationship-between-u-s-stocks-and-gold-is-good-for-gold

Appendix 4

Adoption of VECM with daily data by past researchers:

Research Topic	Authors (year)
Modelling And Forecasting Stock Returns: Exploiting The Futures Market, Regime Shifts And International Spillovers	Lucio Sarno & Giorgio Valente (2005)
An Empirical Model Of Daily Highs And Lows	Yin-Wong Cheung (2007)
Information, Price Discovery and Causality in the Indian Stock Index Futures Market	Pratap Chandra Pati & Purna Chandra Padhan (2009)
A High-Low Model of Daily Stock Price Ranges	Yan-Leung Cheung, Yin-Wong Cheung & Alan T. K. Wan (2009)

Appendix 5.0 Econometric Views 6 (E-View) Empirical Result

Appendix 5.1 Unit Root Test Result

Appendix 5.1.1 Hang Seng Index

Augmented Dickey-Fuller Test (Level)

Null Hypothesis: HSI has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 0 (Automatic based on SIC, MAXLAG=32)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.166691	0.0913
Test critical values:		
1% level	-3.959797	
5% level	-3.410666	
10% level	-3.127115	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(HSI)
 Method: Least Squares
 Date: 03/20/14 Time: 00:45
 Sample (adjusted): 1/04/1994 12/31/2013
 Included observations: 5216 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
HSI(-1)	-0.003683	0.001163	-3.166691	0.0016
C	29.65797	11.86010	2.500650	0.0124
@TREND(1/03/1994)	0.011134	0.003957	2.813726	0.0049
R-squared	0.001957	Mean dependent var		2.151054
Adjusted R-squared	0.001574	S.D. dependent var		254.7923
S.E. of regression	254.5917	Akaike info criterion		13.91777
Sum squared resid	3.38E+08	Schwarz criterion		13.92155
Log likelihood	-36294.56	Hannan-Quinn criter.		13.91909
F-statistic	5.111103	Durbin-Watson stat		2.021313
Prob(F-statistic)	0.006060			

Augmented Dickey-Fuller Test (First Differences)

Null Hypothesis: D(HSI) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=32)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-73.10477	0.0001
Test critical values:		
1% level	-3.431423	
5% level	-2.861899	
10% level	-2.567004	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(HSI,2)

Method: Least Squares

Date: 01/22/14 Time: 02:31

Sample (adjusted): 1/05/1994 12/31/2013

Included observations: 5215 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(HSI(-1))	-1.012424	0.013849	-73.10477	0.0000
C	2.156075	3.528712	0.611009	0.5412
R-squared	0.506219	Mean dependent var		-0.010178
Adjusted R-squared	0.506124	S.D. dependent var		362.5927
S.E. of regression	254.8168	Akaike info criterion		13.91935
Sum squared resid	3.38E+08	Schwarz criterion		13.92187
Log likelihood	-36292.71	Hannan-Quinn criter.		13.92023
F-statistic	5344.307	Durbin-Watson stat		2.000519
Prob(F-statistic)	0.000000			

Phillips-Perron Test (Level)

Null Hypothesis: HSI has a unit root
 Exogenous: Constant, Linear Trend
 Bandwidth: 1 (Newey-West using Bartlett kernel)

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-3.151173	0.0947
Test critical values:		
1% level	-3.959797	
5% level	-3.410666	
10% level	-3.127115	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	64779.66
HAC corrected variance (Bartlett kernel)	64087.39

Phillips-Perron Test Equation
 Dependent Variable: D(HSI)
 Method: Least Squares
 Date: 03/20/14 Time: 00:49
 Sample (adjusted): 1/04/1994 12/31/2013
 Included observations: 5216 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
HSI(-1)	-0.003683	0.001163	-3.166691	0.0016
C	29.65797	11.86010	2.500650	0.0124
@TREND(1/03/1994)	0.011134	0.003957	2.813726	0.0049
R-squared	0.001957	Mean dependent var		2.151054
Adjusted R-squared	0.001574	S.D. dependent var		254.7923
S.E. of regression	254.5917	Akaike info criterion		13.91777
Sum squared resid	3.38E+08	Schwarz criterion		13.92155
Log likelihood	-36294.56	Hannan-Quinn criter.		13.91909
F-statistic	5.111103	Durbin-Watson stat		2.021313
Prob(F-statistic)	0.006060			

Phillips-Perron Test (First Differences)

Null Hypothesis: D(HSI) has a unit root
 Exogenous: Constant
 Bandwidth: 5 (Newey-West using Bartlett kernel)

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-73.11769	0.0001
Test critical values:		
1% level	-3.431423	
5% level	-2.861899	
10% level	-2.567004	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	64906.69
HAC corrected variance (Bartlett kernel)	63598.12

Phillips-Perron Test Equation
 Dependent Variable: D(HSI,2)
 Method: Least Squares
 Date: 01/22/14 Time: 02:31
 Sample (adjusted): 1/05/1994 12/31/2013
 Included observations: 5215 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(HSI(-1))	-1.012424	0.013849	-73.10477	0.0000
C	2.156075	3.528712	0.611009	0.5412
R-squared	0.506219	Mean dependent var		-0.010178
Adjusted R-squared	0.506124	S.D. dependent var		362.5927
S.E. of regression	254.8168	Akaike info criterion		13.91935
Sum squared resid	3.38E+08	Schwarz criterion		13.92187
Log likelihood	-36292.71	Hannan-Quinn criter.		13.92023
F-statistic	5344.307	Durbin-Watson stat		2.000519
Prob(F-statistic)	0.000000			

Appendix 5.1.2 World Gold Price

Augmented Dickey-Fuller Test (Level)

Null Hypothesis: GP has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic based on SIC, MAXLAG=32)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.841845	0.6842
Test critical values:		
1% level	-3.959797	
5% level	-3.410666	
10% level	-3.127115	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(GP)

Method: Least Squares

Date: 03/20/14 Time: 00:46

Sample (adjusted): 1/04/1994 12/31/2013

Included observations: 5216 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GP(-1)	-0.001013	0.000550	-1.841845	0.0656
C	-0.086315	2.115387	-0.040804	0.9675
@TREND(1/03/1994)	0.002481	0.001297	1.913362	0.0558
R-squared	0.000737	Mean dependent var		1.210334
Adjusted R-squared	0.000354	S.D. dependent var		76.38147
S.E. of regression	76.36795	Akaike info criterion		11.50958
Sum squared resid	30402552	Schwarz criterion		11.51335
Log likelihood	-30013.98	Hannan-Quinn criter.		11.51090
F-statistic	1.923312	Durbin-Watson stat		2.018190
Prob(F-statistic)	0.146226			

Augmented Dickey-Fuller Test (First Differences)

Null Hypothesis: D(GP) has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic based on SIC, MAXLAG=32)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-72.88168	0.0001
Test critical values: 1% level	-3.431423	
5% level	-2.861899	
10% level	-2.567004	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(GP,2)
 Method: Least Squares
 Date: 01/22/14 Time: 02:34
 Sample (adjusted): 1/05/1994 12/31/2013
 Included observations: 5215 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GP(-1))	-1.009377	0.013850	-72.88168	0.0000
C	1.218506	1.057981	1.151728	0.2495
R-squared	0.504691	Mean dependent var		-0.003605
Adjusted R-squared	0.504596	S.D. dependent var		108.5352
S.E. of regression	76.39242	Akaike info criterion		11.51003
Sum squared resid	30422035	Schwarz criterion		11.51254
Log likelihood	-30010.40	Hannan-Quinn criter.		11.51091
F-statistic	5311.739	Durbin-Watson stat		2.000667
Prob(F-statistic)	0.000000			

Phillips-Perron Test (Level)

Null Hypothesis: GP has a unit root
 Exogenous: Constant, Linear Trend
 Bandwidth: 8 (Newey-West using Bartlett kernel)

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-1.798782	0.7055
Test critical values:		
1% level	-3.959797	
5% level	-3.410666	
10% level	-3.127115	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	5828.710
HAC corrected variance (Bartlett kernel)	5341.093

Phillips-Perron Test Equation

Dependent Variable: D(GP)
 Method: Least Squares
 Date: 03/20/14 Time: 00:50
 Sample (adjusted): 1/04/1994 12/31/2013
 Included observations: 5216 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GP(-1)	-0.001013	0.000550	-1.841845	0.0656
C	-0.086315	2.115387	-0.040804	0.9675
@TREND(1/03/1994)	0.002481	0.001297	1.913362	0.0558
R-squared	0.000737	Mean dependent var		1.210334
Adjusted R-squared	0.000354	S.D. dependent var		76.38147
S.E. of regression	76.36795	Akaike info criterion		11.50958
Sum squared resid	30402552	Schwarz criterion		11.51335
Log likelihood	-30013.98	Hannan-Quinn criter.		11.51090
F-statistic	1.923312	Durbin-Watson stat		2.018190
Prob(F-statistic)	0.146226			

Phillips-Perron Test (First Differences)

Null Hypothesis: D(GP) has a unit root
 Exogenous: Constant
 Bandwidth: 7 (Newey-West using Bartlett kernel)

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-72.93101	0.0001
Test critical values:		
1% level	-3.431423	
5% level	-2.861899	
10% level	-2.567004	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	5833.564
HAC corrected variance (Bartlett kernel)	5507.849

Phillips-Perron Test Equation
 Dependent Variable: D(GP,2)
 Method: Least Squares
 Date: 01/22/14 Time: 02:34
 Sample (adjusted): 1/05/1994 12/31/2013
 Included observations: 5215 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GP(-1))	-1.009377	0.013850	-72.88168	0.0000
C	1.218506	1.057981	1.151728	0.2495
R-squared	0.504691	Mean dependent var		-0.003605
Adjusted R-squared	0.504596	S.D. dependent var		108.5352
S.E. of regression	76.39242	Akaike info criterion		11.51003
Sum squared resid	30422035	Schwarz criterion		11.51254
Log likelihood	-30010.40	Hannan-Quinn criter.		11.51091
F-statistic	5311.739	Durbin-Watson stat		2.000667
Prob(F-statistic)	0.000000			

Appendix 5.1.3 Crude Oil Price

Augmented Dickey-Fuller Test (Level)

Null Hypothesis: CO has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 5 (Automatic based on SIC, MAXLAG=32)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.928487	0.1534
Test critical values: 1% level	-3.959798	
5% level	-3.410667	
10% level	-3.127116	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(CO)

Method: Least Squares

Date: 03/20/14 Time: 00:46

Sample (adjusted): 1/11/1994 12/31/2013

Included observations: 5211 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CO(-1)	-0.002864	0.000978	-2.928487	0.0034
D(CO(-1))	-0.038434	0.013618	-2.822222	0.0048
D(CO(-2))	0.008063	0.013627	0.591653	0.5541
D(CO(-3))	-0.068536	0.013594	-5.041640	0.0000
D(CO(-4))	0.008746	0.013627	0.641800	0.5210
D(CO(-5))	0.187898	0.013616	13.80015	0.0000
C	-0.010557	0.030549	-0.345584	0.7297
@TREND(1/03/1994)	6.59E-05	2.31E-05	2.857927	0.0043
R-squared	0.042877	Mean dependent var		0.018718
Adjusted R-squared	0.041590	S.D. dependent var		1.109939
S.E. of regression	1.086613	Akaike info criterion		3.005542
Sum squared resid	6143.325	Schwarz criterion		3.015611
Log likelihood	-7822.939	Hannan-Quinn criter.		3.009063
F-statistic	33.29791	Durbin-Watson stat		2.004797
Prob(F-statistic)	0.000000			

Augmented Dickey-Fuller Test (First Differences)

Null Hypothesis: D(OP) has a unit root
 Exogenous: Constant
 Lag Length: 4 (Automatic based on SIC, MAXLAG=32)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-28.07809	0.0000
Test critical values: 1% level	-3.431424	
5% level	-2.861899	
10% level	-2.567004	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(OP,2)
 Method: Least Squares
 Date: 01/22/14 Time: 02:36
 Sample (adjusted): 1/11/1994 12/31/2013
 Included observations: 5211 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(OP(-1))	-0.908760	0.032365	-28.07809	0.0000
D(OP(-1),2)	-0.131117	0.028610	-4.582867	0.0000
D(OP(-2),2)	-0.124452	0.024251	-5.131775	0.0000
D(OP(-3),2)	-0.194294	0.019646	-9.889619	0.0000
D(OP(-4),2)	-0.186746	0.013618	-13.71320	0.0000
C	0.017018	0.015075	1.128895	0.2590
R-squared	0.538818	Mean dependent var		-1.23E-17
Adjusted R-squared	0.538375	S.D. dependent var		1.600351
S.E. of regression	1.087326	Akaike info criterion		3.006470
Sum squared resid	6153.753	Schwarz criterion		3.014022
Log likelihood	-7827.358	Hannan-Quinn criter.		3.009111
F-statistic	1216.245	Durbin-Watson stat		2.004210
Prob(F-statistic)	0.000000			

Phillips-Perron Test (Level)

Null Hypothesis: CO has a unit root
 Exogenous: Constant, Linear Trend
 Bandwidth: 23 (Newey-West using Bartlett kernel)

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-2.935696	0.1512
Test critical values:		
1% level	-3.959797	
5% level	-3.410666	
10% level	-3.127115	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	1.228935
HAC corrected variance (Bartlett kernel)	1.457390

Phillips-Perron Test Equation

Dependent Variable: D(CO)
 Method: Least Squares
 Date: 03/20/14 Time: 00:50
 Sample (adjusted): 1/04/1994 12/31/2013
 Included observations: 5216 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CO(-1)	-0.002701	0.000995	-2.714792	0.0067
C	-0.008212	0.031101	-0.264054	0.7917
@TREND(1/03/1994)	6.26E-05	2.35E-05	2.670234	0.0076
R-squared	0.001463	Mean dependent var		0.018894
Adjusted R-squared	0.001080	S.D. dependent var		1.109492
S.E. of regression	1.108892	Akaike info criterion		3.045175
Sum squared resid	6410.126	Schwarz criterion		3.048948
Log likelihood	-7938.817	Hannan-Quinn criter.		3.046495
F-statistic	3.819561	Durbin-Watson stat		2.076323
Prob(F-statistic)	0.021999			

Phillips-Perron Test (First Differences)

Null Hypothesis: D(OP) has a unit root
 Exogenous: Constant
 Bandwidth: 23 (Newey-West using Bartlett kernel)

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-75.24674	0.0001
Test critical values:		
1% level	-3.431423	
5% level	-2.861899	
10% level	-2.567004	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	1.229057
HAC corrected variance (Bartlett kernel)	1.536802

Phillips-Perron Test Equation
 Dependent Variable: D(OP,2)
 Method: Least Squares
 Date: 01/22/14 Time: 02:37
 Sample (adjusted): 1/05/1994 12/31/2013
 Included observations: 5215 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(OP(-1))	-1.039446	0.013839	-75.10762	0.0000
C	0.019643	0.015357	1.279085	0.2009
R-squared	0.519723	Mean dependent var		-1.23E-17
Adjusted R-squared	0.519631	S.D. dependent var		1.599859
S.E. of regression	1.108841	Akaike info criterion		3.044891
Sum squared resid	6409.530	Schwarz criterion		3.047406
Log likelihood	-7937.553	Hannan-Quinn criter.		3.045771
F-statistic	5641.154	Durbin-Watson stat		2.000299
Prob(F-statistic)	0.000000			

Appendix 5.1.4 Exchange Rate

Augmented Dickey-Fuller Test (Level)

Null Hypothesis: ER has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 1 (Automatic based on SIC, MAXLAG=32)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.214004	0.0817
Test critical values: 1% level	-3.959797	
5% level	-3.410666	
10% level	-3.127115	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(ER)

Method: Least Squares

Date: 03/20/14 Time: 00:47

Sample (adjusted): 1/05/1994 12/31/2013

Included observations: 5215 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ER(-1)	-0.004113	0.001280	-3.214004	0.0013
D(ER(-1))	-0.032106	0.013846	-2.318733	0.0204
C	0.031923	0.009920	3.218073	0.0013
@TREND(1/03/1994)	1.17E-08	2.18E-08	0.537592	0.5909
R-squared	0.003222	Mean dependent var		5.70E-06
Adjusted R-squared	0.002648	S.D. dependent var		0.002210
S.E. of regression	0.002207	Akaike info criterion		-9.393665
Sum squared resid	0.025380	Schwarz criterion		-9.388634
Log likelihood	24497.98	Hannan-Quinn criter.		-9.391905
F-statistic	5.614120	Durbin-Watson stat		2.001431
Prob(F-statistic)	0.000771			

Augmented Dickey-Fuller Test (First Differences)

Null Hypothesis: D(ER) has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic based on SIC, MAXLAG=32)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-74.70386	0.0001
Test critical values: 1% level	-3.431423	
5% level	-2.861899	
10% level	-2.567004	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(ER,2)
 Method: Least Squares
 Date: 01/22/14 Time: 02:38
 Sample (adjusted): 1/05/1994 12/31/2013
 Included observations: 5215 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ER(-1))	-1.034087	0.013842	-74.70386	0.0000
C	5.91E-06	3.06E-05	0.193104	0.8469
R-squared	0.517032	Mean dependent var		-2.11E-07
Adjusted R-squared	0.516939	S.D. dependent var		0.003178
S.E. of regression	0.002209	Akaike info criterion		-9.392367
Sum squared resid	0.025433	Schwarz criterion		-9.389852
Log likelihood	24492.60	Hannan-Quinn criter.		-9.391488
F-statistic	5580.667	Durbin-Watson stat		2.001659
Prob(F-statistic)	0.000000			

Phillips-Perron Test (Level)

Null Hypothesis: ER has a unit root
 Exogenous: Constant, Linear Trend
 Bandwidth: 2 (Newey-West using Bartlett kernel)

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-3.225533	0.0795
Test critical values: 1% level	-3.959797	
5% level	-3.410666	
10% level	-3.127115	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	4.87E-06
HAC corrected variance (Bartlett kernel)	4.59E-06

Phillips-Perron Test Equation

Dependent Variable: D(ER)
 Method: Least Squares
 Date: 03/20/14 Time: 00:52
 Sample (adjusted): 1/04/1994 12/31/2013
 Included observations: 5216 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ER(-1)	-0.004248	0.001278	-3.323140	0.0009
C	0.032975	0.009911	3.327073	0.0009
@TREND(1/03/1994)	1.30E-08	2.18E-08	0.596257	0.5510
R-squared	0.002192	Mean dependent var		5.70E-06
Adjusted R-squared	0.001809	S.D. dependent var		0.002210
S.E. of regression	0.002208	Akaike info criterion		-9.393208
Sum squared resid	0.025407	Schwarz criterion		-9.389435
Log likelihood	24500.49	Hannan-Quinn criter.		-9.391888
F-statistic	5.726567	Durbin-Watson stat		2.063879
Prob(F-statistic)	0.003279			

Phillips-Perron Test (First Differences)

Null Hypothesis: D(ER) has a unit root

Exogenous: Constant

Bandwidth: 6 (Newey-West using Bartlett kernel)

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-74.78792	0.0001
Test critical values:		
1% level	-3.431423	
5% level	-2.861899	
10% level	-2.567004	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	4.88E-06
HAC corrected variance (Bartlett kernel)	4.64E-06

Phillips-Perron Test Equation

Dependent Variable: D(ER,2)

Method: Least Squares

Date: 01/22/14 Time: 02:39

Sample (adjusted): 1/05/1994 12/31/2013

Included observations: 5215 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ER(-1))	-1.034087	0.013842	-74.70386	0.0000
C	5.91E-06	3.06E-05	0.193104	0.8469
R-squared	0.517032	Mean dependent var		-2.11E-07
Adjusted R-squared	0.516939	S.D. dependent var		0.003178
S.E. of regression	0.002209	Akaike info criterion		-9.392367
Sum squared resid	0.025433	Schwarz criterion		-9.389852
Log likelihood	24492.60	Hannan-Quinn criter.		-9.391488
F-statistic	5580.667	Durbin-Watson stat		2.001659
Prob(F-statistic)	0.000000			

Appendix 5.2 Residual Checking

Appendix 5.2.1 Augmented Dickey-Fuller Test (Level)

Null Hypothesis: RESID01 has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic based on SIC, MAXLAG=32)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.406656	0.0021
Test critical values:		
1% level	-3.959797	
5% level	-3.410666	
10% level	-3.127115	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(RESID01)

Method: Least Squares

Date: 03/20/14 Time: 00:48

Sample (adjusted): 1/04/1994 12/31/2013

Included observations: 5216 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID01(-1)	-0.007346	0.001667	-4.406656	0.0000
C	-3.097084	8.196717	-0.377844	0.7056
@TREND(1/03/1994)	0.001082	0.002722	0.397503	0.6910
R-squared	0.003720	Mean dependent var		-0.273782
Adjusted R-squared	0.003338	S.D. dependent var		296.2556
S.E. of regression	295.7607	Akaike info criterion		14.21755
Sum squared resid	4.56E+08	Schwarz criterion		14.22133
Log likelihood	-37076.38	Hannan-Quinn criter.		14.21887
F-statistic	9.732760	Durbin-Watson stat		2.010454
Prob(F-statistic)	0.000060			

Appendix 5.2.2 Phillips-Perron Test (Level)

Null Hypothesis: RESID01 has a unit root
 Exogenous: Constant, Linear Trend
 Bandwidth: 12 (Newey-West using Bartlett kernel)

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-4.036123	0.0078
Test critical values:		
1% level	-3.959797	
5% level	-3.410666	
10% level	-3.127115	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	87424.10
HAC corrected variance (Bartlett kernel)	72943.78

Phillips-Perron Test Equation
 Dependent Variable: D(RESID01)
 Method: Least Squares
 Date: 03/20/14 Time: 00:54
 Sample (adjusted): 1/04/1994 12/31/2013
 Included observations: 5216 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID01(-1)	-0.007346	0.001667	-4.406656	0.0000
C	-3.097084	8.196717	-0.377844	0.7056
@TREND(1/03/1994)	0.001082	0.002722	0.397503	0.6910
R-squared	0.003720	Mean dependent var		-0.273782
Adjusted R-squared	0.003338	S.D. dependent var		296.2556
S.E. of regression	295.7607	Akaike info criterion		14.21755
Sum squared resid	4.56E+08	Schwarz criterion		14.22133
Log likelihood	-37076.38	Hannan-Quinn criter.		14.21887
F-statistic	9.732760	Durbin-Watson stat		2.010454
Prob(F-statistic)	0.000060			

Appendix 5.3 Optimum Lag Length AIC & SC

VAR Lag Order Selection

Criteria

Endogenous variables: LOG(HSI) LOG(GP)

CO ER DUMMY

Exogenous variables: C

Date: 02/26/14 Time: 22:03

Sample: 1/03/1994 12/31/2013

Included observations: 5209

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-12875.72	NA	9.67e-05	4.945564	4.951859	4.947766
1	58244.08	142075.8	1.35e-16	-22.35134	-22.31357*	-22.33813*
2	58286.56	84.78828	1.34e-16	-22.35806	-22.28881	-22.33384
3	58314.31	55.33438	1.34e-16	-22.35911	-22.25839	-22.32389
4	58349.99	71.06224	1.33e-16	-22.36321	-22.23102	-22.31698
5	58379.77	59.27428	1.33e-16	-22.36505	-22.20138	-22.30781
6	58498.84	236.7144	1.29e-16	-22.40117	-22.20602	-22.33291
7	58525.64	53.23413*	1.28e-16*	-22.40186*	-22.17524	-22.32260
8	58540.18	28.85578	1.29e-16	-22.39784	-22.13975	-22.30757

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Appendix 5.4 Johansen-Juselius (JJ) Cointegration Test Result

Date: 02/26/14 Time: 22:05
 Sample (adjusted): 1/05/1994 12/31/2013
 Included observations: 5215 after adjustments
 Trend assumption: Linear deterministic trend
 Series: LOG(HSI) LOG(GP) CO ER
 Exogenous series: DUMMY
 Warning: Critical values assume no exogenous series
 Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.008023	73.98241	47.85613	0.0000
At most 1 *	0.004958	31.97627	29.79707	0.0276
At most 2	0.001160	6.053525	15.49471	0.6892
At most 3	4.44E-07	0.002315	3.841466	0.9596

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.008023	42.00614	27.58434	0.0004
At most 1 *	0.004958	25.92274	21.13162	0.0098
At most 2	0.001160	6.051210	14.26460	0.6066
At most 3	4.44E-07	0.002315	3.841466	0.9596

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b*S11*b=I):

LOG(HSI)	LOG(GP)	CO	ER
-5.487488	-1.114839	0.062334	10.75697
0.283374	-4.126656	0.071794	-46.80447
2.114714	-2.912082	0.034024	11.24945
0.010759	-0.691463	-0.017125	3.365736

Unrestricted Adjustment Coefficients (alpha):

D(LOG(HSI))	0.000114	1.14E-06	-0.000489	5.50E-06
D(LOG(GP))	-3.14E-05	-0.000189	0.000148	6.04E-06
D(CO)	-0.084112	-0.039811	-0.004738	-4.74E-05
D(ER)	-0.000101	0.000132	6.85E-06	1.60E-07

1 Cointegrating Equation(s): Log likelihood 47005.90

Normalized cointegrating coefficients (standard error in parentheses)

LOG(HSI)	LOG(GP)	CO	ER
1.000000	0.203160	-0.011359	-1.960271
	(0.14641)	(0.00262)	(1.36884)

Adjustment coefficients (standard error in parentheses)

D(LOG(HSI))	-0.000624
	(0.00126)
D(LOG(GP))	0.000172
	(0.00079)
D(CO)	0.461566
	(0.08395)
D(ER)	0.000552
	(0.00017)

2 Cointegrating Equation(s): Log likelihood 47018.87

Normalized cointegrating coefficients (standard error in parentheses)

LOG(HSI)	LOG(GP)	CO	ER
1.000000	0.000000	-0.007717	-4.205835
		(0.00085)	(1.17511)
0.000000	1.000000	-0.017928	11.05317
		(0.00137)	(1.88389)

Adjustment coefficients (standard error in parentheses)

D(LOG(HSI))	-0.000624	-0.000132
	(0.00126)	(0.00098)
D(LOG(GP))	0.000119	0.000814
	(0.00079)	(0.00062)
D(CO)	0.450284	0.258060
	(0.08401)	(0.06535)
D(ER)	0.000589	-0.000432
	(0.00017)	(0.00013)

3 Cointegrating Equation(s): Log likelihood 47021.89

Normalized cointegrating coefficients (standard error in parentheses)

LOG(HSI)	LOG(GP)	CO	ER
1.000000	0.000000	0.000000	-221.0027
			(71.3887)
0.000000	1.000000	0.000000	-492.5871

			(164.573)
0.000000	0.000000	1.000000	-28093.04
			(9215.41)
Adjustment coefficients (standard error in parentheses)			
D(LOG(HSI))	-0.001658	0.001292	-9.46E-06
	(0.00135)	(0.00119)	(2.3E-05)
D(LOG(GP))	0.000432	0.000383	-1.05E-05
	(0.00085)	(0.00075)	(1.5E-05)
D(CO)	0.440264	0.271858	-0.008262
	(0.09001)	(0.07907)	(0.00154)
D(ER)	0.000604	-0.000452	3.42E-06
	(0.00018)	(0.00016)	(3.1E-06)

Appendix 5.5 Vector Error Regression Model (VECM)

Vector Error Correction Estimates

Date: 02/26/14 Time: 22:28

Sample (adjusted): 1/05/1994 12/31/2013

Included observations: 5215 after adjustments

Standard errors in () & t-statistics in []

Cointegrating Eq:	CointEq1	CointEq2		
LOG(HSI(-1))	1.000000	0.000000		
LOG(GP(-1))	0.000000	1.000000		
CO(-1)	-0.007717 (0.00085) [-9.06173]	-0.017928 (0.00137) [-13.1312]		
ER(-1)	-4.205835 (1.17523) [-3.57875]	11.05317 (1.88407) [5.86666]		
C	23.47815	-93.29354		
Error Correction:	D(LOG(HSI))	D(LOG(GP))	D(CO)	D(ER)
CointEq1	-0.000624 (0.00127) [-0.49316]	0.000119 (0.00079) [0.14964]	0.450284 (0.08401) [5.35962]	0.000589 (0.00017) [3.52045]
CointEq2	-0.000132 (0.00098) [-0.13364]	0.000814 (0.00062) [1.32013]	0.258060 (0.06536) [3.94843]	-0.000432 (0.00013) [-3.31400]
D(LOG(HSI(-1)))	-0.011805 (0.01393) [-0.84725]	0.014533 (0.00873) [1.66422]	1.330550 (0.92536) [1.43788]	-0.003767 (0.00184) [-2.04290]
D(LOG(GP(-1)))	0.061035 (0.02226) [2.74166]	-0.009798 (0.01395) [-0.70228]	3.370812 (1.47843) [2.27999]	-0.008797 (0.00295) [-2.98575]
D(CO(-1))	-0.000375 (0.00021) [-1.79991]	2.34E-05 (0.00013) [0.17976]	-0.041264 (0.01382) [-2.98611]	-9.54E-06 (2.8E-05) [-0.34630]
D(ER(-1))	-0.378518 (0.10476) [-3.61303]	-0.036111 (0.06566) [-0.54997]	0.529997 (6.95750) [0.07618]	-0.037519 (0.01386) [-2.70606]

C	0.000370 (0.00025) [1.49160]	0.000197 (0.00016) [1.26545]	0.028155 (0.01648) [1.70870]	4.08E-05 (3.3E-05) [1.24182]
DUMMY	-0.001866 (0.00069) [-2.69615]	0.000137 (0.00043) [0.31579]	-0.070457 (0.04597) [-1.53259]	-0.000243 (9.2E-05) [-2.64904]
R-squared	0.006103	0.000992	0.011124	0.009906
Adj. R-squared	0.004767	-0.000351	0.009794	0.008575
Sum sq. resids	1.439352	0.565369	6348.111	0.025210
S.E. equation	0.016626	0.010420	1.104151	0.002200
F-statistic	4.567699	0.738389	8.367403	7.442371
Log likelihood	13968.96	16405.59	-7912.446	24515.53
Akaike AIC	-5.354156	-6.288627	3.037563	-9.398859
Schwarz SC	-5.344094	-6.278564	3.047625	-9.388797
Mean dependent	0.000124	0.000215	0.018897	5.70E-06
S.D. dependent	0.016666	0.010418	1.109598	0.002210
Determinant resid covariance (dof adj.)		1.74E-13		
Determinant resid covariance		1.73E-13		
Log likelihood		47018.87		
Akaike information criterion		-18.01682		
Schwarz criterion		-17.96651		

Appendix 5.5.1 Vector Error Regression Model (VECM) Result

Dependent Variable: D(LOG(HSI))

Method: Least Squares

Date: 02/26/14 Time: 23:22

Sample (adjusted): 1/05/1994 12/31/2013

Included observations: 5215 after adjustments

$$D(\text{LOG}(\text{HSI})) = C(1) * (\text{LOG}(\text{HSI}(-1)) - 0.00771710195053 * \text{CO}(-1) - 4.20583527167 * \text{ER}(-1) + 23.4781451162) + C(2) * (\text{LOG}(\text{GP}(-1)) - 0.0179275814004 * \text{CO}(-1) + 11.0531736157 * \text{ER}(-1) - 93.2935352143) + C(3) * D(\text{LOG}(\text{HSI}(-1))) + C(4) * D(\text{LOG}(\text{GP}(-1))) + C(5) * D(\text{CO}(-1)) + C(6) * D(\text{ER}(-1)) + C(7) + C(8) * \text{DUMMY}$$

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.000624	0.001265	-0.493155	0.6219
C(2)	-0.000132	0.000984	-0.133645	0.8937
C(3)	-0.011805	0.013934	-0.847252	0.3969
C(4)	0.061035	0.022262	2.741665	0.0061
C(5)	-0.000375	0.000208	-1.799915	0.0719
C(6)	-0.378518	0.104765	-3.613032	0.0003
C(7)	0.000370	0.000248	1.491603	0.1359
C(8)	-0.001866	0.000692	-2.696153	0.0070
R-squared	0.006103	Mean dependent var		0.000124
Adjusted R-squared	0.004767	S.D. dependent var		0.016666
S.E. of regression	0.016626	Akaike info criterion		-5.354156
Sum squared resid	1.439352	Schwarz criterion		-5.344094
Log likelihood	13968.96	Hannan-Quinn criter.		-5.350637
F-statistic	4.567699	Durbin-Watson stat		2.004210
Prob(F-statistic)	0.000043			

Appendix 5.6 Granger Causality Test Result

VEC Granger Causality/Block Exogeneity Wald Tests

Date: 02/26/14 Time: 22:34

Sample: 1/03/1994 12/31/2013

Included observations: 5215

Dependent variable: D(LOG(HSI))

Excluded	Chi-sq	df	Prob.
D(LOG(GP))	7.516726	1	0.0061
D(CO)	3.239693	1	0.0719
D(ER)	13.05400	1	0.0003
All	24.48227	3	0.0000

Dependent variable: D(LOG(GP))

Excluded	Chi-sq	df	Prob.
D(LOG(HSI))	2.769638	1	0.0961
D(CO)	0.032312	1	0.8573
D(ER)	0.302468	1	0.5823
All	3.231313	3	0.3573

Dependent variable: D(CO)

Excluded	Chi-sq	df	Prob.
D(LOG(HSI))	2.067493	1	0.1505
D(LOG(GP))	5.198355	1	0.0226
D(ER)	0.005803	1	0.9393
All	7.743135	3	0.0516

Dependent variable: D(ER)

Excluded	Chi-sq	df	Prob.
D(LOG(HSI))	4.173437	1	0.0411
D(LOG(GP))	8.914702	1	0.0028
D(CO)	0.119922	1	0.7291
All	14.19394	3	0.0027

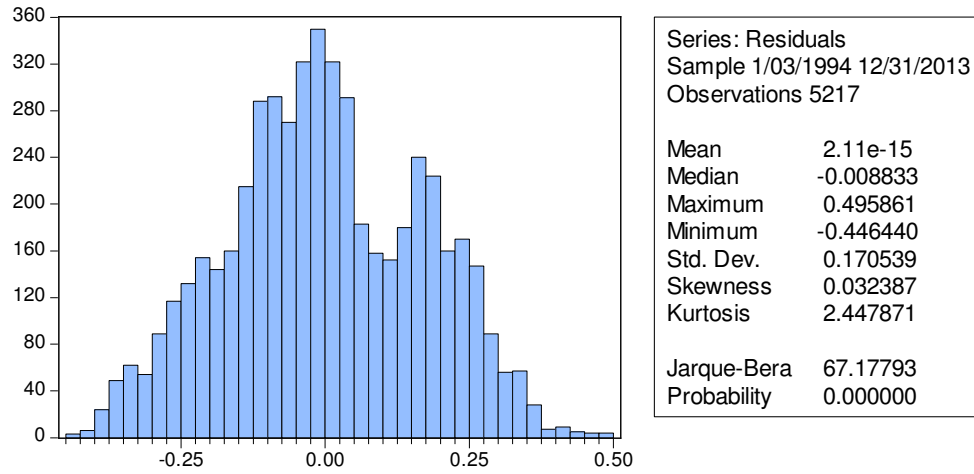
Appendix 5.7 Ordinary Least Square (OLS) Result

Dependent Variable: LHSI
 Method: Least Squares
 Date: 03/08/14 Time: 15:46
 Sample: 1/03/1994 12/31/2013
 Included observations: 5217

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.891198	0.946675	-1.997725	0.0458
LGP	0.035574	0.012280	2.896979	0.0038
CO	0.007205	0.000219	32.83531	0.0000
ER	1.391090	0.114837	12.11358	0.0000
DUMMY	0.063135	0.007120	8.866935	0.0000
R-squared	0.740883	Mean dependent var		9.583638
Adjusted R-squared	0.740684	S.D. dependent var		0.335023
S.E. of regression	0.170604	Akaike info criterion		-0.697983
Sum squared resid	151.6994	Schwarz criterion		-0.691696
Log likelihood	1825.689	Hannan-Quinn criter.		-0.695784
F-statistic	3725.617	Durbin-Watson stat		0.012226
Prob(F-statistic)	0.000000			

Appendix 5.8 Diagnostic Checking

Appendix 5.8.1 Normality Test



Appendix 5.8.2 Heterocedasticity Test

Heteroskedasticity Test: ARCH

F-statistic	118047.5	Prob. F(1,5214)	0.0000
Obs*R-squared	4995.362	Prob. Chi-Square(1)	0.0000

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 03/08/14 Time: 15:48

Sample (adjusted): 1/04/1994 12/31/2013

Included observations: 5216 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000615	0.000130	4.744505	0.0000
RESID^2(-1)	0.978682	0.002848	343.5805	0.0000
R-squared	0.957700	Mean dependent var		0.029078
Adjusted R-squared	0.957692	S.D. dependent var		0.034995
S.E. of regression	0.007198	Akaike info criterion		-7.029585
Sum squared resid	0.270159	Schwarz criterion		-7.027070
Log likelihood	18335.16	Hannan-Quinn criter.		-7.028706
F-statistic	118047.5	Durbin-Watson stat		1.993488
Prob(F-statistic)	0.000000			

Appendix 5.8.3 Autocorrelation Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	208530.2	Prob. F(2,5210)	0.0000
Obs*R-squared	5152.632	Prob. Chi-Square(2)	0.0000

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Date: 03/08/14 Time: 15:49

Sample: 1/03/1994 12/31/2013

Included observations: 5217

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.049561	0.105180	0.471207	0.6375
LGP	0.002735	0.001365	2.004404	0.0451
CO	-5.14E-05	2.44E-05	-2.107071	0.0352
ER	-0.008962	0.012759	-0.702412	0.4825
DUMMY	-0.001009	0.000791	-1.275679	0.2021
RESID(-1)	0.994870	0.013854	71.81124	0.0000
RESID(-2)	-0.001046	0.013855	-0.075479	0.9398
R-squared	0.987662	Mean dependent var		2.11E-15
Adjusted R-squared	0.987648	S.D. dependent var		0.170539
S.E. of regression	0.018954	Akaike info criterion		-5.092282
Sum squared resid	1.871677	Schwarz criterion		-5.083481
Log likelihood	13290.22	Hannan-Quinn criter.		-5.089204
F-statistic	69510.05	Durbin-Watson stat		1.981911
Prob(F-statistic)	0.000000			

Appendix 5.8.4 Model Specification

Ramsey RESET Test:

F-statistic	885.9980	Prob. F(1,5211)	0.0000
Log likelihood ratio	819.1981	Prob. Chi-Square(1)	0.0000

Test Equation:

Dependent Variable: LHSI

Method: Least Squares

Date: 03/08/14 Time: 15:49

Sample: 1/03/1994 12/31/2013

Included observations: 5217

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-125.1591	4.232756	-29.56917	0.0000
LGP	0.636582	0.023164	27.48100	0.0000
CO	0.156713	0.005027	31.17476	0.0000
ER	28.11177	0.903957	31.09857	0.0000
DUMMY	1.366323	0.044274	30.86083	0.0000
FITTED^2	-1.055514	0.035461	-29.76572	0.0000
R-squared	0.778537	Mean dependent var	9.583638	
Adjusted R-squared	0.778325	S.D. dependent var	0.335023	
S.E. of regression	0.157737	Akaike info criterion	-0.854624	
Sum squared resid	129.6549	Schwarz criterion	-0.847080	
Log likelihood	2235.288	Hannan-Quinn criter.	-0.851986	
F-statistic	3663.781	Durbin-Watson stat	0.014812	
Prob(F-statistic)	0.000000			