Stock Return Response to Monetary and Fiscal Policy Interaction in Singapore

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Abstract

The objective of the study is to examine the monetary and fiscal policies' shock on house price variable by using the structural vector autoregressive (SVAR) model for Singapore economy. In addition, the study used international oil prices and gold prices in the SVAR model because concurrent development in oil and gold prices have central influenced over macroeconomic activities that are closely linked with the stock returns. The results indicate that oil price has significant positive effect on gold prices, interest rates and stock returns. Exchange rate and government expenditure shows a negative impact on oil prices. The inverse relationship between gold prices, exchange rate and stock return supports that gold used as a hedge against both markets. However, there is no evidence has been found for crowding out effect through increase in government expenditures. Interaction between exchange rate and stock return is supportive to both stock-oriented and flow oriented models.

Keywords: *Stock return; Fiscal policy; Monetary Policy.*

1. Introduction

The economy of Singapore is considered as an economic and financial hub among South-East Asian countries. This economy mainly depends on international trade. Traditionally, the manufacturing and service sectors of this country is very strong and therefore, it has emerged with highest per capital gross domestic products (GDP) over the globe (Dfat, 2013). Over the years, Singapore encouraged financial institutions through multiple incentives and opportunities to establish their businesses (Credit-suisse, 2013).

Singapore is highly developed and free market economy with corruption free environment. During 2004-07, the country maintained its real GDP as 8.6% on average, but after global financial crises its economy starts contracting. House prices are showing an increasing trend after 2010 and government expenditure demonstrates consistent increase every year. Extra-ordinary decrease in short-term interest rate shows expansion in monetary policy. A rapid appreciation in exchange rate can be seen since global crisis of 2008, whereas stock prices demonstrate varying but rising trend since 2008 crisis. Figure 1 shows the current financial trends in Singaporean economy.

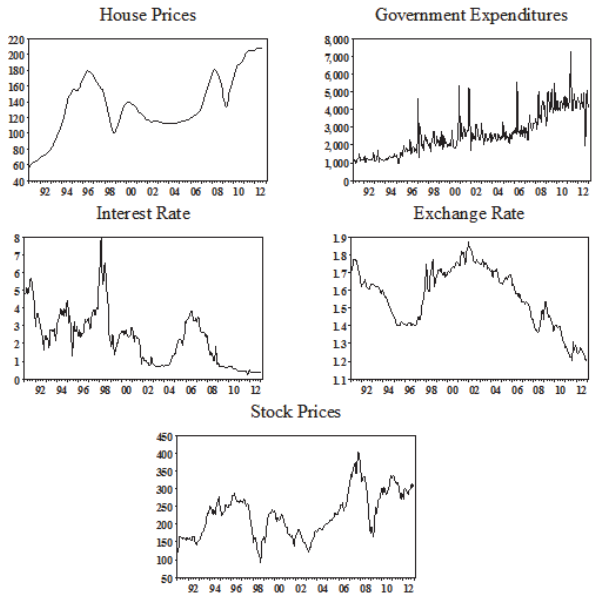

Figure 1: Current Financial Trends in Singapore

House prices in Singapore are skyrocketing and it is forecasted that this country is on the brink of property crisis. The reason of rapid growth in property prices is ease in loans because of lowest mortgage rate (i.e. 1 percent) as compared with other Asian countries such as Hong Kong, China and South Korea where mortgage rate is 2.15 percent, 7.43 percent and 5 percent respectively. Therefore, residential home become more attractive to households. According to News Asia Channel (2013) that household debt is increased from 64.4 percent to 77.2 percent of gross domestic product from early 2008 to early 2013. As regards to public debt, Singapore is listed in top eleven country having 111.40 percent public debt of gross domestic product (World Factbook, 2013).

Over the years, monetary policy is exchange-based and monetary authority of Singapore (MAS) has deep concern with their exchange rate. It is maintained and managed by MAS in consideration of trade competitors and partners' trade-weighted basket currencies Basket. Excessive fluctuations in exchange rate are prevented through government intervention. The main purpose is to stabilize the price level to achieve sustainable economic growth. MAS are not very much concerned with interest rate as compared to exchange rate. They believe that the economy is based on international trade, therefore, monetary system should be managed through stable exchange rate rather interest rate.

The government expenditures are focused by fiscal policy to provide goods and services. National security, health care and public housing is on the priority of Singaporean government. Over the last three decades, one-third of expenditures are spent on development. The primary focus of fiscal policy is to achieve long-term economic growth; therefore, government concentration is on private sector, considering it as the engine of growth (MAS, 2013).

Singapore main index is performing better than expected earnings but this situation is not free from headwinds (e.g., property bubble and squeeze in banking system). Inflation rate is 4 percent over the past two year due to surge in rent and car prices, whereas unemployment rate is increased from 1.8 percent to 1.9 percent during 2012-2013. Weak global economic picture is susceptible for Singapore as being an export-dependent economy. Performance of Singapore index is laggard as compared to China and Korea during this year. Property, financial and agricultural stocks are dominant in index but recent performance of these stocks is lacklustre (Holliday, 2013).

Considering above scenario, it is the need of time to conduct a study which consider the above matter of Singaporean economy. Current study is considering four blocks of variables: international block, property block, monetary block and fiscal block. Keeping in mind the above facts, six variables (oil and gold price from international block, house prices from property block, government expenditures from fiscal block and short-term interest rate & exchange rate from monetary block) are selected to examine the impact of these variables on stock returns. Because stock market is forward-looking market that captures the impact of all changes immediately comes through public policies or private sector (Bjørnland & Leitemo, 2009). Through survey of literature does not disclose any study which captures this set of variables with stock returns in Singapore.

This study fills this void and this study will provide fresh information to policy makers, investors and financial

specialists. As pointed by Dungey and Fry (2009) that each stock market is contemporaneously responsive to external and international shocks. The success of government policy makers depends on deep understanding of monetary and fiscal shocks in combination with stock markets. It is realised by academic circles that the impact of monetary and fiscal policies should be analysed in tandem rather in insolation because both policies have vital role in economic and financial activities of the economy and resulting in stock market performance (Chatziantoniou *et al.*, 2013).

Thorough review of literature shows that a large number of recent studies examined the association of monetary policy and stock prices (Berg, 2012; Bhuiyan, 2012; Bjørnland & Leitemo, 2009; Bouakez *et al.*, 2013; Cassola & Morana, 2004; Challe & Giannitsarou, 2012; Galí & Gertler, 2007; Patelis, 1997; Pirovano, 2012). Contrarily, few studies investigated the impact of fiscal policy on stock prices (Afonso & Sousa, 2011, 2012; Agnello & Sousa, 2013; Darrat, 1988; Laopodis, 2009). Additionally, some researchers have analysed the impact of monetary and fiscal policy in tandem on the economy (Dungey & Fry, 2009; Fetai, 2013). A recent study is conducted by Chatiantonious et al., (2013) employing SVAR model using data from Germany, UK, and US. They highlighted in the study that examining the effect of monetary and fiscal policies insolation, cannot help us to reach at the truth because this type of analysis shows only the one side of the picture and unable to explain the whole phenomena. Therefore, they suggested that we should examine the impact of fiscal and monetary policies in one model to explore the contemporaneous interaction of both policies with stock prices.

2. Literature Review

This study endeavoured to cover the four more relevant variables blocks to examine the impact on stock returns. Therefore, the review of previous studies is also divided into four parts in the following i.e.,

2.1 International Block and Stock Returns

Over the last decade, the role of commodity markets (especially oil and gold) is increased recently in stock markets. On the one hand, oil market has critical role in determining the stock market returns and simultaneously it functions as a predictor of stock prices (Narayan & Sharma, 2011; Thuraisamy *et al.*, 2013). A large body of researchers investigated association of stock prices and oil prices using data from developed and emerging economies (Akoum *et al.*, 2012; Aloui *et al.*, 2012; Apergis & Miller, 2009; Arouri *et al.*, 2011; Arouri *et al.*, 2013; Basher *et al.*, 2012; Ciner *et al.*, 2013; Fayyad & Daly, 2011; Filis, 2010; Filis & Chatziantoniou, 2013; Fowowe, 2013; Hammoudeh & Choi, 2006; Lee & Zeng, 2011; Mohanty *et al.*, 2010; Mudakkar & Zaman, Forthcoming; Park & Ratti, 2008; Wang & Chueh, 2013). By the same token, gold market is considered as a safe haven in stormy weather and hedge against risky investments. It is an ancient wisdom that gold does not lose its value and used as an investment instrument. Due to bad performance of financial markets, investors have diverted their investments in gold market and it entailed hikes in the gold prices (Baur & McDermott, 2010; Hood & Malik, 2013). It is noted in findings of previous studies that oil and gold prices influence the stock prices equally in all regions (Souček, Forthcoming; Thuraisamy *et al.*, 2013). As Mensi *et al.* (2013) concluded that gold and oil prices have strong role in the volatility of S&P 500. Beckmann and Czudaj (2013b) also revealed that oil and gold markets are positively influencing the prices in US. Additionally, Beckmann and Czudaj (2013a) suggested that gold acts as hedge commodity in developed markets. Similar findings are reported by Creti *et al.* (2013) that gold acts as a safe-haven in turmoil regime. Ewing and Malik (2013) findings suggest that information about interaction between oil and gold markets is beneficial for financial market investor for hedging. Among other international variables, oil and gold prices have significant association with stock returns. Therefore, world oil and gold prices are used in the current study.

2.2 Property Block and Stock Returns

Recent global boom and bust developments in house prices attracted the attention of financial researchers to investigate the dynamic behaviour of house prices (Cesa-Bianchi, 2013; Crowe *et al.*, 2013). Prior to global crisis, the prices of house property rose unprecedently and collapsed during the financial crisis (Kose *et al.*, 2012). The association between stock and real estate property is a contestable issue in the eyes of researchers and policy makers because of inconsistent results. Liu *et al.* (1990) pointed out two concepts, namely segmentation and integration about the relationship of stock prices and house prices. According to them, segmentation is a situation when investors are not earning the same expected return on house market and stock market. On the other hand, integration exists when investors is earning the similar risk-adjusted expected returns from house market and stock market. A body of researchers investigated the linkage between stock prices and house prices (e.g., Caporale & Souza, 2011; Darrat & Glascock, 1989; Green, 2002; Li

& Wang, 1995; Lin & Lin, 2011; Ling & Naranjo, 1999; Liu *et al.*, 1990; Lu *et al.*, 2007; Nawawi *et al.*, 2010).

2.3 Fiscal Policy Block and Stock Returns

Influence of fiscal policy over stock market is theorized in three different stances. First is classical stance which views that expansion in fiscal policy generates the crowding out effect in the economy as the loanable fund become expensive for private sector due to high demand of funds by public. Interest initiate to surge and loanable fund become out of the reach of private sector. This situation effect economic activities negatively and resultantly to stock prices. Second is Keynesian stance that suggests that expansion in fiscal policy supportive to boost aggregate demand in economies that become the cause of positive trend in economic activities. In the result of this stock markets performance also become positive due to health corporate sector. Third is Ricardian stance that describe that role of fiscal policy is irrelevant and nothing is contributed by fiscal policy in stock prices (Afonso & Sousa, 2011; Barro, 1979; De Castro, 2006; Giorgioni & Holden, 2003). In a nutshell, influence of fiscal policy on stock market may be negative, positive or irrelevant (Chatiziantoniou et al., 2013).

On the other hand, literature is not reckoned the appropriate tool to estimate the fiscal policy innovations out of three, namely, borrowing, taxation, and expenditures (Afonso and Sousa, 2011). Government expenditures are used by Fatás and Mihov (2001) to capture the impact of fiscal policy shocks. Chan and Karim (2012) suggested that government expenditure has vital role in economic stability. Belo *et al.* (2013) also supported that government expenditures are more relevant to investigate the connectivity of fiscal policy with stock returns. In the similar fashion, Chatiaztoneous et al., (2013) used government expenditure as a measure of fiscal policy with stock returns. Valuing the above references, current study applied government expenditures as appropriate measure of fiscal policy.

Potentially fiscal policy stance has significant role in stock prices but interestingly little attention is given to explain role of fiscal policy with stock prices (Jansen *et al.*, 2008). Theoretically, fiscal and monetary policies have mutually significant effect on stock returns as explained by Blanchard (1981). On the one side, role of monetary policy on stock returns is well documented in previous literature but it is mentioned by Canzoneri *et al.* (2011) that role of fiscal to determine asset prices is emphasized by researchers. But joint interaction between monetary and fiscal policy with stock prices is ignored by previous researchers and it remained neglected part of empirical literature (Agnello & Sousa, 2010; Darrat, 1988; Jansen *et al.*, 2008; Linnemann & Schabert, 2004).

Interestingly, examining the effect of monetary and fiscal policies with stock price in independently is only the half picture of the story which is practically powerless to present the true picture (Chatziantonious et al., 2013). Fiscal policy influence significantly monetary policy through exchange rate and interest rate channels. Both policies interacted indirectly via different channels (e.g. inflation, deficit financing). Therefore, their interaction becomes more complex to investigate (Canzoneri *et al.*, 2011). Furthermore, Reade (2011) highlighted that both policies are rarely investigated theoretically vis-à-vis empirically. Therefore, study of fiscal and monetary policies is fruitful to find out the stability in financial markets in addition in economies.

2.4 Monetary Policy Block and Stock Returns

Monetary policy and stock market relation is examined extensively by previous studies (e.g., Bjørnland & Leitemo, 2009; Cassola & Morana, 2004; Guo *et al.*, 2013; Laopodis, 2013; Patelis, 1997; Pirovano, 2012; Sellin, 2001; Thorbecke, 1997). Among several channels, short-term interest rate and exchange rate channels are most relevant stock returns. These channels have feedback relation with stock return (Mishkin, 2001).

Present value model developed by Gordon (1962) which explains that stock prices are determined by the sum of future discounted cash flows. This model consists of two parts: estimated future flows and discount factor.

$$P_t = E_t\left\{\sum_{j=1}^{K}\frac{D_{t+j}}{(1+R)^j}\right\}$$

Where P_t is denoted current price of a stock and D_{t+j} is discount value of future expect cash flows over the K periods. E_t is express available information set at time t, whereas R_t is the discount factor used for discounting future cash flows.

Therefore, interest rate channel of monetary policy determines stock prices. When monetary policy rate is changed that directly influence the discount factor (i.e. cost of capital) and eventually the discounted cash flow of the firm. Theoretically, negative relationship between interest rate channel and stock prices is hypothesized in the literature (Bjørnland & Leitemo, 2009). Many previous studies found the similar relation empirically (Alam & Uddin, 2009; Chen *et*

al., 1986; Geske & Roll, 1983; Lee, 1992; Sellin, 2001). On other hand, some studies among other recent studies found asymmetric results about relationship between interest rate channel of monetary policy and stock prices (e.g., Berg, 2012; Bouakez *et al.*, 2013; Guo *et al.*, 2013; Hsu & Chiang, 2011; Jansen & Tsai, 2010; Tsai, 2013; Yao *et al.*, 2012). In next turn the second channel of monetary policy i.e., exchange rate channel is discussed.

Relationship between exchange rate and stock prices is topic interest of interest for academic researchers as well as for international portfolio investors for eighties due to liberalized global movement of capital. Theoretically, two groups of researchers which present two models that explain the relationship between both markets. First, "Flow-oriented model" that posit that stock prices are positively influenced by exchange rates. It is believed that this process is initiated by a change in price of foreign exchange. When devaluation occurs in a currency, consequent local currency to become cheaper in the international market and resultantly the exporting products of that country will also become cheaper. Therefore, if the country is export-dominate then the demand for its products becomes high, this lead to increase in exports and firm's profitability and this process ultimately leads a positive change in the stock prices (see, Dornbusch & Fischer, 1980). Second, "Stock-oriented model" that purports that exchange rates are negatively influence by stock prices. Model states that rising trend in the stock prices attract foreign investors for investment that not only increase the demand of foreign exchange, but also appreciate exchange rates and vice versa (Branson, 1981, 1983; Frankel, 1983).

Support for flow-oriented model is found by various researchers (e.g., Abdalla & Murinde, 1997; Chiang *et al.*, 2000; Diamandis & Drakos, 2011; Fang, 2002; Jiranyakul, 2011; Phylaktis & Ravazzolo, 2005; Solnik, 1987; Wongbangpo & Sharma, 2002). Support for stock-oriented model is found by Bartov and Bodnar (1994); Soenen and Hennigar (1988); Tai (2007); Tsai (2012); Liang *et al.* (2013). However, it is evident from these studies that relationship between exchange and stock prices needs consensus and therefore, it should be further investigated.

3. Data and Methodology Description

3.1 Data Description

Monthly data is collected and analysed from period January 1991 to December 2012. Seven variables namely world oil prices (WOP), gold prices (GP), government expenditure (GE), house price index (HP), short-term interest rate (IR), exchange rate (ER) and stock returns (SR) are used for analysis. All variables data is collected from reliable databases. World oil and gold prices data is retrieved from U.S. Energy Information administration (EIA) and Bank of England respectively. House prices data is retrieved from Bank for International settlement (BIS). Other series data is collected from DataStream database. Data used in analysis is seasonally adjusted and are used in natural logarithm except interest rate which is in percentages.

3.2 Methodology

Dynamic interaction of variables is selected from four channels, namely international channel, property channel, fiscal policy channel and monetary policy channel. Structural VAR model is employed with seven variables by selecting two variables from international channel: world oil prices, gold prices. One variable for property channel is house prices and similarly one variable for fiscal policy channel is government expenditures. Two variables are selected for monetary policy channel are short-term interest rate and real effective exchange rate and stock returns are used as an arbitrage variable. This combination of variable is chosen considering previous SVAR models as well as theoretical interaction among the variables. According to best of our knowledge this combination of variables is not examined by previous researchers.

Many studies have examined the impact of oil prices on economy as well as stock performance (Basher *et al.*, 2012; Cavalcanti & Jalles, 2013; Kilian & Park, 2009). Rising oil prices increase the cost of capital; therefore, a negative relationship between oil prices and stock prices is expected. Since 2001 a persistent rise in gold prices has significantly influenced investors' behavior towards equity investment (Mulyadi *et al.*, 2012). House property is emerged a new for last one decade and it is considered as an alternative investment channel by the investors. However, a very close relationship between house prices and equity prices is found by previous studies (Belke *et al.*, 2008; Cheng & Jin, 2013; Liow, 2012). Government expenditure is considered a most appropriate variable to capture the impact of fiscal policy channel (Chatziantonious *et al.,* 2013). Short-term interest rate is believed to be a major tool for monetary policy to control the inflationary trend in the economy and influenced by fiscal policy channel and international channel as well. However, linkage of exchange rate channel with all variables is assumed in the model (Basher *et al.,* 2012).

The general form of Structural VAR (P) is presented in the following:

$$A_0 y_t = C_0 + \sum_{i=1}^{P} A_i Y_{t-1} + \varepsilon_t \quad (1)$$

Where y_t is a 7×1 vector for endogenous variables and $y_t = (WOP_t, GP_t, HP_t, GE_t, IR_t, ER_t, SR_t)$. A_0 shows a 7×7 contemporaneous matrix; A_i are 7×7 autoregressive coefficient matrices. ε_t represents 7×1 structural disturbance vector with zero covariance. However, covariance matrix for structural disturbances can be presented in this form $E(\varepsilon_t \varepsilon_t') = D \equiv [\sigma_1^2, \sigma_2^2, \sigma_3^2, \sigma_4^2, \sigma_5^2, \sigma_6^2, \sigma_7^2] \times 1$. The general form model in equation (1) will be converted into reduced form model by multiply both sides of equation by A_0^{-1} and shown as:

$$y_t = a_0 + B_i y_{t-i} + e_t \quad (2)$$

Where, $a_0 = A_0^{-1} c_0$, $B_i = A_0^{-1} A_i$, and $e_t = A_0^{-1} \varepsilon_t$, i.e. $\varepsilon_t = A_0 e_t$. e_t, the reduced form errors represent the linear function of structural errors ε_t with a covariance matrix i.e. $E[e_t e_t'] = A_0^{-1} D A_0^{-1'}$.

We imposed appropriate restrictions on A_0 to acquire structural disturbance. The short-run restrictions are imposed in the model in the following way:

$$\begin{bmatrix} \varepsilon_{OP} \\ \varepsilon_{GP} \\ \varepsilon_{HP} \\ \varepsilon_{GE} \\ \varepsilon_{IR} \\ \varepsilon_{ER} \\ \varepsilon_{SR} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & a_{34} & a_{35} & 0 & a_{37} \\ a_{41} & 0 & 0 & 1 & 0 & 0 & 0 \\ a_{51} & 0 & 0 & a_{54} & 1 & 0 & 0 \\ a_{61} & a_{62} & 0 & 0 & a_{65} & 1 & a_{67} \\ a_{71} & a_{72} & a_{73} & a_{74} & a_{75} & a_{76} & 1 \end{bmatrix} \begin{bmatrix} e_{OP} \\ e_{GP} \\ e_{HP} \\ e_{GE} \\ e_{IR} \\ e_{ER} \\ e_{SR} \end{bmatrix}$$

where $\varepsilon_{WOP}, \varepsilon_{GP}, \varepsilon_{HP}, \varepsilon_{GE}, \varepsilon_{IR}, \varepsilon_{ER}, \varepsilon_{SR}$ are showing the structural disturbances that are gold price shocks, World oil price shocks, house price shocks, government expenditure shocks, interest rate shocks, exchange rate shocks, and stock return shocks respectively. On the other hand, $e_{WOP}, e_{GP}, e_{HP}, e_{GE}, e_{IR}, e_{ER}, e_{SR}$ are the residuals of reduced for equations that measure the unexpected movements of variables separately with the information given in the system.

Prior to explain the restrictions plan for Singaporian economy SVAR model, it is noteworthy that these restrictions are considered to be contemporaneous that were imposed on A matrix whereas no restriction is imposed on lagged structural parameters of model. First two equations of the model do not hold any restriction except a_{21} being treating them as exogenous variables in the economy. It is assumed that surge in oil prices impact positively on gold prices (Reboredo, 2013). The impact of both variables is assumed for Singapore economy but no inverse impact of other variables is expected for these variables (Kim & Roubini, 2000). Third equation is used for house prices and assumed to be influenced by government expenditures, short-term interest rate and stock returns through restrictions a_{34}, a_{35} and a_{37} respectively. Major part of government spending is concentrated on housing development in Singapore and therefore a_{34} is imposed to examine the impact of government expenditures on house prices (Afonso & Sousa, 2009). Current interest rate is an important determinent of house prices (Elbourne, 2008). The borrowing cost is increased due to increase in interest rate that leads to fall in demand for property resulting decrease in prices. Additionally, rising interest rates increase the default in mortgage payment and households start to sell their house property and supply side of house property push down the house prices (Nneji *et al.*, 2013). Making an allowance for wealth effect hypotheses, equity market leads changes in house prices. Therefore, impact of stock prices is included in this equation. In fourth equation, Impact of fiscal policy is measured through government expenditures as it is used by previous research because there is no consensus that which one of measures (i.e., borrowing, taxation and expenditures) is appropriate to examine the impact of fiscal policy shocks (see, Afonso and Sousa, 2011). In this equation, impact of world oil prices is included using a_{41} restriction as the rise in oil prices negatively influences the government expenditures and government face difficult to maintain its expansionary fiscal policy and budget deficit is increased due to higher government expenditures (Benedictow *et al.*, 2013; Cologni & Manera, 2013). In fifth equation, interest rate channel of monetary policy is used. Oil prices restriction through a_{51} is imposed because it is considered that oil prices impact contemporaneously to short-term interest rates similar restrictions are imposed by (Cologni & Manera, 2009). Currently expansionary fiscal policy exists in Singapore which impulses in the interest rates. Three responses are expected (classical, Keynesian, and Ricardian) are theorized in literature (details, Chatiziantoniou *et al.,* 2013). Therefore, Restriction a_{54} is used to capture the impact of fiscal policy (through government expenditures) on interest rate channel of monetary policy. Equation six represents exchange rate channel of monetary policy and four restrictions a_{61}, a_{62}, a_{65} and a_{67} are imposed. Theoretical relation

between exchange rates and oil prices is assumed due to changes in current account balance and transfer of wealth from oil-importing countries to oil exporting countries, therefore, this contemporaneous effect of oil price changes through a_{61} is empirically investigated (Bashir *et al.,* 2012). Similarly, gold price changes have contemporaneous effect on exchange rates and these innovations are capture through a_{62} (Han *et al.*, 2012). Gold is used as hedge against currency markets and protect the investors from loss of devaluation. However, a negative relation is expected for exchange rate and gold price (Ciner *et al.*, 2013). Interest rate and exchange rates are closely related due to uncovered interest rate parity which investigated using a_{65} restriction. Interdependency exist between exchange rates and equity prices as explained in Flow-orient model vis-à-vis Stock-orient model and this linkage is measured through a_{67} (Phylaktis and Ravazzalo, 2005 for detail). In the last equation, it is supposed that all above variables contemporaneously influence the stock returns (Bjornland, 2008; Chatziantoniou et al., 2013).

The IS-LM frame suggests that stock market activities are interrelated with fiscal and monetary policy actions through interest rate and government spending. Changes in policy and interest rates instantaneously force the investors to revise their portfolios because of change carried out through tightening or easing the policy (Geraldo, 2012). Exchange rates and short-run interest rates are key monetary transmission channels that influence the stock prices in ASEAN-5 countries. Therefore, it is suggested that Impulse Response Function (IRF) should be used to examine to identify the impact of shocks when they appear (Poon, 2010). In post crisis, ASEAN-4 accumulated foreign exchange reserves to resolve the panic in financial stability. The returns on these funds provided a strong support to government expenditures for these countries to regain economic momentum as before crisis. However, the positive impact of government expenditure is expected for financial stability (Park & Estrada, 2011).

4. Empirical Findings

First of all lag-length order of variables is determined for analysis. Normally, information criteria are used to determine the lag-length order of variables. But econometrics theory shows a picture of controversy about the selection of appropriate lag length order for VAR models (Gredenhoff & Karlsson, 1999; Hafer & Sheehan, 1989; Thoma, 2008). Amongst all information criteria Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), and Hannan-Quinn information criterion (HQ) are widely used by the researchers. While debating on the above mentioned criteria, Brooks (2008) pointed that there is no concrete principle for the selection of superior information criteria as some of the information criteria are efficient but not consistent, while others are consistent but not efficient. The results of lag length according to information criteria are mentioned in Table 1.

Table 1: Lag Length results according Information criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	149.7113	NA	7.63e-10	-1.128152	-1.030391	-1.088819
1	2356.523	4274.063	2.98e-17	-18.18596	-17.40386	-17.87129
2	2646.732	546.0050	4.44e-18*	-20.09274*	-18.62632*	-19.50275*
3	2683.786	67.66473	4.88e-18	-19.99831	-17.84755	-19.13299
4	2719.029	62.40501	5.47e-18	-19.88955	-17.05446	-18.74890
5	2761.800	73.37056	5.78e-18	-19.84032	-16.32089	-18.42433
6	2799.943	63.32022	6.36e-18	-19.75449	-15.55073	-18.06318
7	2828.985	46.60460	7.55e-18	-19.59672	-14.70863	-17.63007
8	2888.446	92.12966*	7.08e-18	-19.67941	-14.10699	-17.43744

* indicates lag order selected by the criterion

Cheung and Lai (1993) criticized information criteria methods for selection of optimal lag length by arguing that information criteria do not perform well in empirical analysis when data series are representing moving average dependence. Based on the above mentioned information and criticism, information criteria procedure is not considered as an appropriate criterion to determine lag length as it may lead to poor performance, inefficiency and inconsistency. Instead, Hall (1989) and Johansen (1992) are of the view that the stage where VAR residuals are not serially correlated is the best point to select lag length order. On the other hand, selection of low or high lag lengths are not problem free as low lag length leads to the problem of serial correlation, whereas high lag length leads to the problem of finite sample bias (Hall, 1991). Current study applied information criteria method vis-à-vis residual test. Thus, based on above arguments about selection of appropriate lag length, the present study used lag orders where VAR residuals are serially uncorrelated

and these lag lengths are varying country wise using residual test in accordance with (Ibrahim, 2006). Examining the residual tests lag 8 is selected for analysis.

Going ahead for SVAR analysis, stationary of the variables was estimated through ADF and PP tests. A problem of unit root was found in the variables except stock returns and results are presented in Table 2. Following the practice of previous researchers, level series are preferred by researchers to maintain consistency on the cost of efficiency. They argued that most of the information is lost if stationary series with differences are used in analysis (Basher *et al.*, 2012; Pirovano, 2012).

Table 2: Testing for unit roots (ADF and PP tests)

	Augmented Dickey Fuller Test		Philip Perron Test	
Variables	**Level**	**1st Difference**	**Level**	**1st Difference**
OP	0.52	-18.31*	-0.43	-18.22*
GP	2.37	-13.97*	1.74	-18.59*
HP	-2.15	-4.03*	-2.33	-4.38*
GE	-1.64	-14.77*	-3.48*	-86.95*
IR	-2.20	-12.65*	-2.27	-14.53*
ER	-0.41	-15.71*	-0.43	-15.71*
SR	-13.47*	-10.85*	-13.45*	-65.24*

*significant at 1 percent level

4.1 Results for Contemporaneous restrictions

The likelihood test of over-identification restriction test shows chi-square value ($\chi^2(4) = 0.66$) with significance level of 95.61 percent that means that the over-identification restrictions cannot be rejected at any conventional significance level. Contemporaneous coefficients with standard error are presented in Table 3.

Table 3: Summary of Contemporaneous Coefficients

a_{21}	a_{34}	a_{35}	a_{37}	a_{41}	a_{51}	a_{54}	a_{61}	a_{62}
-2.9419 (0.9211)	-3.6667 (11.1546)	-0.1400 (0.0953)	5.5120 (12.1877)	-0.5543 (0.9120)	-0.5439 (0.9126)	1.9481 (0.0597)	0.6886 (1.1938)	7.5634 (1.6310)
a_{65}	a_{67}	a_{71}	a_{72}	a_{73}	a_{74}	a_{75}	a_{76}	
-0.0585 (0.0886)	-3.5989 (10.3297)	-1.5293 (0.9935)	1.1706 (3.9987)	-9.1127 (36.4736)	-1.1549 (11.3196)	0.0760 (0.1309)	2.8463 (23.5612)	

This study focused on four blocks of variables (international block, house property block, monetary block and fiscal block). Two important variables from international block are used i.e. oil price and gold price. While, only single contemporaneous restriction a_{21} is imposed to examine the impact of oil price on gold price. Co-efficient is -2.9419 (note that this sign is negative because restrictions are imposed on A_0 matrix which is on left-hand side of the equation (1). When it is shifted on right-hand side of equation, this negative sign will be changed to positive) (see, Badshah *et al.*, 2013). Coinciding movement of both variables has already identified by the previous studies and inflation is identified the reason behind this identical movement (Reboredo, 2013; Souček, Forthcoming). However, it is hypothesized that oil price has positive impact on commodity prices including gold price. There are a number of reasons for hike in gold price and one of them is surge in oil prices and therefore, gold is used as a hedge against inflation. The results of the present study are in accordance with previous studies as they also noted a positive impact of oil price on gold prices (Beckmann & Czudaj, 2013b; Le & Chang, 2011; Zhang & Wei, 2010). Additionally, contemporaneous impact of oil price is also examined on government expenditures, short-term interest rates, exchange rates and stock returns through a_{41}, a_{51}, a_{61} and a_{71} respectively. Positive impact of oil price on government expenditures and short-term interest rate is investigated which indicates that upsurge in oil prices causes inflation. When already economy is facing inflation pressure, the expansion in fiscal expenditures inflation put more fire in the fuel (Ayadi, 2005; Farzanegan, 2011; Hamdi & Sbia, 2013). Negative influence of oil prices on exchange rate is found in Singapore. Similar effect is reported by (Narayan *et al.*, 2008) while studying the impact of oil prices on exchange rate using data from Fiji and results derived by (Turhan *et al.*, 2013) are also in accordance with this finding. Positive impact of oil prices on stock returns is observed through high profitable level which raises the stock price (Wang *et al.*, Forthcoming). Second international variable is gold prices. Contemporaneous impact of gold prices is observed on exchange rates and stock returns through a_{62} and a_{72}. Relationship between

exchange rate and gold prices is found to be negative which is the evidence of hedge against the currency. Inverse relation of exchange rate and gold prices is found by (Joy, 2011). Relationship between gold price and stock returns is found to be negative that clear shows that gold is used as hedge against stocks and similar result are witnessed by various previous studies (e.g., Baur & Lucey, 2010; Hillier *et al.*, 2006; Hood & Malik, 2013; Miyazaki & Hamori, 2013). Impact of house property block is examined through house price variable. Contemporaneous impact of house price is investigated on stock returns using a_{73} restriction. Results revealed a positive impact of house price on stock returns. This result suggests that house property income has positive effect on stock prices whereas negative impact of stock returns is visualized in the results using a_{37} which show the evidence of stock wealth has no effect on house property. It can be derived that surplus earned by equity investors are invested in housing market (Hui & Ng, 2012; Peltonen *et al.*, 2012). In fiscal policy block, government expenditures are used as a fiscal variable because recently, every economy focuses on fiscal package to promote the economic growth to redress the evils of financial panic. Impact of government expenditures is also applied on house price, interest rates and stock returns via restrictions a_{34}, a_{54} and a_{74} respectively. Results identified that government expenditures influence positively to house prices and stock returns and negatively to interest rates. These results are in the favour of Keynesian stance (Belo *et al.*, 2013; Dungey & Fry, 2009).

Monetary block encompasses interest rates and exchange rate. Contemporaneous impact of interest rate is analysed with house prices, exchange rates and stock returns via a_{35} a_{65} a_{75} respectively. Positive impact of interest rate is observed on house prices. This result is puzzling for Singapore because house prices are increasing but interest is low. Therefore, both variables are inversely related which are presented by results (Aoki *et al.*, 2004; Tsai, 2013). Result a_{65} is presenting positive results which are not strange for Singapore because exchange rate is adjusted according to interest rate. Restriction a_{75} is showing negative relationship between interest rate and stock return which is desirable and in accordance with theory (Pirovano, 2012). Relationship between exchange rate and stock return is examined through a_{67} and a_{76}. These restrictions are helpful to investigate the impact of both models ("Flow-oriented and Stock-oriented). When a country is leading in exports, it causes an appreciation of the currency leading towards increased firm's profitability but negatively affecting exchange rates. However, Singapore is net exporter country; therefore this relationship is not surprising for this country.

4.2 Impulse Responses

The section covers impulse response function in respect of oil price, gold price, house price, government expenditures, interest rate, exchange rate and stock return and these shocks are shown in Figure 2. Oil prices are assumed to have contemporaneous impact on gold prices, government expenditures, interest rates, exchange rates, and stock returns. Oil prices show constant positive impact on gold and short-term interest rate throughout the horizon but the immediate impact on exchange rate is negative up to 6 months after that effect become positive for rest of the time horizon. However, initial oil price impact on government expenditure is very low which becomes negative onward; whereas, stock returns demonstrate contemporaneous increase in early three months and afterward convert to negative and get weaker with the passage of time. These shocks show that oil price has strong influence on these variables. Similarly, gold prices are assumed to have contemporaneous effect on exchange rate and stock returns. Negative innovation appears in exchange rates and going to weak gradually at the end of horizon. Stock returns demonstrated positive response to gold price up to 7 months and in follow up diverted negatively and get weaker till the end of horizon. House prices exerted positive impact on interest rates within first 10 months and subsequently, it continues to move forward positively but very close to zero. It is evident that influence of house prices is not significant on stock returns. Influence of government expenditure used as proxy for fiscal policy is hypothesized on house price, interest rate, and stock returns. Results demonstrate that government expenditures reveal positive impact on house prices with lag of two months and this impact shows rising trend up to end of horizon. Contrarily, government expenditure display negative shocks in short-term interest consistently and impact on stock returns is hybrid over the horizon, but negative impact becomes strong during 4 to 7 months. Short-term interest is used as a proxy for monetary policy implementations. It is assumed in the SVAR baseline model that interest rate impacts house prices, exchange rates and stock returns instantaneously. Impulse response displays that short-term interest rate innovation has positive impact on house price for initial 10 months. However, exchange rates demonstrated a positive response to interest rate in the entire horizon except with a downfall in sixth month, whereas stock returns show hybrid reaction in earlier 10 months and subsequently a positive but weak response continue till sixth months and after that it remain close to zero at the end of horizon. Contemporaneous influence of exchange rate is assumed on stock returns. Result displayed a heterogeneous response of stock returns to exchange rates. Finally, it was hypothesized that stock returns impact contemporaneously to house prices and exchange rates.

Hence, reaction of house price is negative in early four months and subsequently this response changed and become positive to continue till the end of horizon. On the other hand, response of exchange rates is positive and this response die away at the end of horizon. Positive response is in the favour of "flow-oriented model".

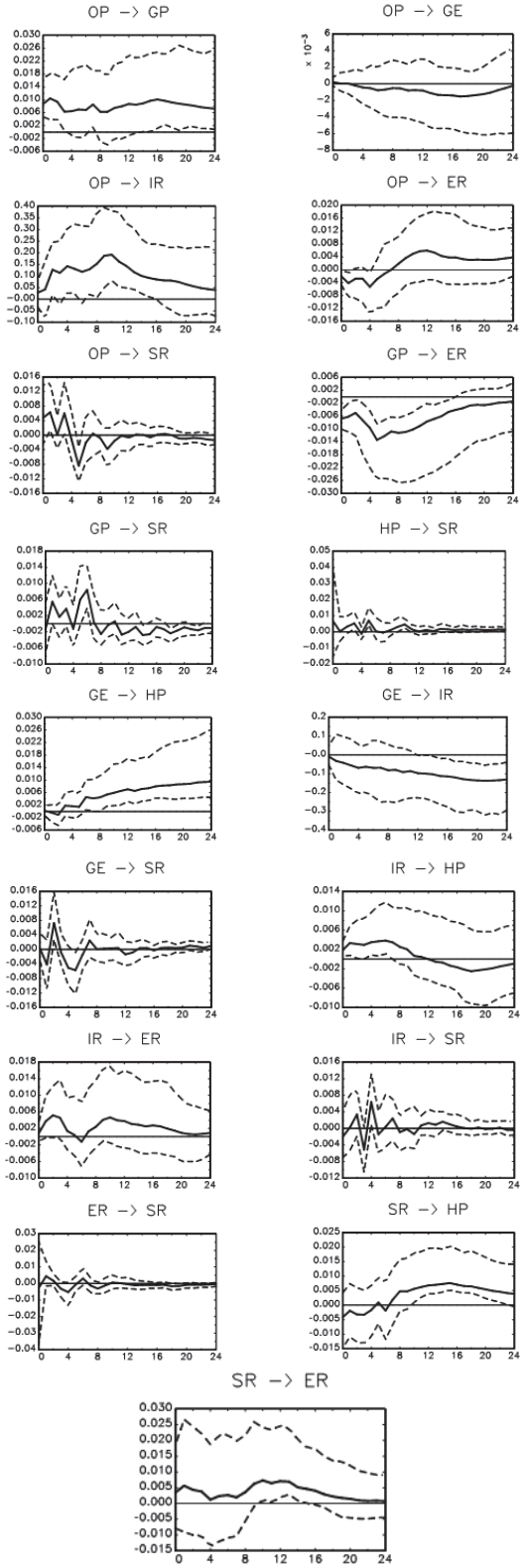

Figure 2: Impulse Responses in Singapore

4.3 Variance Decomposition

Variance decomposition (VDC) is used to split overall changes in a variable caused by other variables. Table 4 represents the detail of variance decomposition results covering period of 24 months with four six monthly intervals.

Table 4: Variance Decomposition: Basic SVAR Model-Singapore

VAR Decomposition	Period	OP	GP	HP	GE	IR	ER	SR
HP	6	0.00	0.00	0.24	0.01	0.23	0.04	0.49
	12	0.00	0.01	0.16	0.06	0.38	0.04	0.35
	18	0.00	0.01	0.11	0.11	0.46	0.03	0.27
	24	0.03	0.03	0.08	0.16	0.44	0.02	0.24
GE	6	0.00	0.00	0.01	0.97	0.00	0.00	0.01
	12	0.01	0.01	0.04	0.88	0.00	0.02	0.05
	18	0.01	0.02	0.04	0.83	0.00	0.04	0.05
	24	0.01	0.04	0.03	0.79	0.01	0.07	0.05
IR	6	0.04	0.00	0.73	0.01	0.01	0.09	0.12
	12	0.09	0.01	0.59	0.02	0.02	0.18	0.10
	18	0.10	0.03	0.54	0.04	0.02	0.17	0.10
	24	0.10	0.04	0.51	0.07	0.02	0.15	0.10
ER	6	0.02	0.09	0.01	0.03	0.01	0.83	0.01
	12	0.02	0.13	0.00	0.03	0.01	0.74	0.07
	18	0.02	0.13	0.00	0.03	0.01	0.71	0.10
	24	0.03	0.12	0.01	0.03	0.02	0.69	0.12
SR	6	0.06	0.03	0.11	0.04	0.59	0.02	0.14
	12	0.06	0.06	0.11	0.04	0.56	0.03	0.14
	18	0.06	0.06	0.11	0.04	0.56	0.03	0.14
	24	0.06	0.06	0.11	0.04	0.55	0.03	0.14

Note: OP=Oil Price; GP=Gold Price; HP=House Price; GE=Government Expenditure; IR=Interest Rate; ER=Exchange Rate; SR=Stock Return

Variance decomposition of house prices, government expenditure, interest rate, exchange rate and stock returns is estimated in analysis. House prices are showing significant change of 23% and 49% in first interval through interest rates and stock returns respectively. Changes by interest rate are increased in each subsequent interval and its contribution is 44% in last interval but changes by stock returns show downward trend which 24% in fourth interval. Government expenditure demonstrated small change in house prices, but increased gradually and reached at 16% in fourth interval. Oil price, gold price, and exchange rate made invisible changes in house prices.

Government expenditure is showing a constant change of 5% by stock returns. Other variables are not showing any notable change except exchange rate which increased up to 7% in fourth interval. However, all change in government expenditure is its own. It is notable that all variables are affecting interest rate with different portion but house price has significant effect of 73% in first interval and decreased up to 51% in last interval. Oil price effect is 4% in first interval and rose to 10% in fourth interval. Similarly, government expenditure and exchange rate effects are 7% and 15% in last interval whereas stock returns are showing constant effect i.e. 10%. In case of exchange rate, only gold price is showing notable effect of 12% and stock returns contribution increased to 12% in last interval and other variables have not demonstrated any visible change in this variable. However, all variables are influencing stock returns and it is interesting that each variable innovation has constant effect on this variable. Out of these, interest rate has significant effect of 56% over the horizon. Oil prices and gold prices have similar effect at the rate of 6% whereas house price, government expenditure and exchange rate have very minor effect of 11%, 4%, and 3% respectively.

5. Conclusion

The selected monetary and fiscal policy variables were analysed in tandem with stock returns. Short-term interest rate and exchange rate are used as monetary policy variables while government expenditure is used for fiscal policy. Gold and oil prices are included with house prices. Gold prices, oil prices and house markets' importance have increase recently because of their influence in financial markets and crucial impact on economy growth. Impact of oil price is

significant increased on gold prices and monetary & fiscal policies variables are also influenced by oil prices. In case of house prices, government expenditure has significant effect to make positive change in house prices. Interaction of monetary and fiscal did not prove any crowding out effect. Significant wealth effect on house prices by stock returns but house prices impact is very weak on stock returns. Interaction of exchange rate and stock prices is supporting the portfolio model as foreign direct investment is encouraging in the economy. The current study is helpful to account instant information to enhance the understanding of government macroeconomic policy makers vis-a-vis the prospective and existing investors. In future, investors and policy makers should contemplate the impact of monetary and fiscal policies jointly to strength the financial markets, especially, considering interaction between house and stock markets in Singapore.

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