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Oil price dynamics: Analyses of macro economy & stock markets for ten countries

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Emma Charlotte Visur **Zara Tajamal**

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Abstract:

In this paper, the aim of research is to investigate the effects of oil price upon economic growth and stock market returns in ten net oil-dependent countries. We apply four different modifications to crude oil price and use Structural Vector Autoregressive regressions to examine the relationships and effects of oil price dynamics.

The present research starts by introducing the topic of oil price, the macroeconomic variables and the stock markets. Further, some previous studies on the subject are presented followed by a section where the chosen data set along with variables are defined. Finally, the characteristics and properties of the econometric model and the modifications are presented. In result, 8 out of 10 countries showed a significant relationship between the oil price and the GDP growth whilst only half of the countries showed significant relationship of oil price and stock market returns across the net oil-dependency.

Key words: Oil prices, macro economy, stock market returns, Structural Vector Autoregression Model

1. Introduction

1.1 Motivation and objectives

Oil, often referred to as the black gold, is an extremely important commodity in the world economy. Since the first oil discovery in 1850s, millions of barrels of oil have been pumped. Even though oil was initially solely used as fuel, it is found everywhere in the society today. It is a topic for economic, social and environmental discussions. For instance, increase in oil prices have caused recessions, periods of inflation, reduced productivity and lower economic growth (Barsky and Kilian 2004). Therefore, we have chosen to account for the relevance of oil prices in world economies and the stock markets in the preceding sections.

1.1.1 Oil price and the macro-economy

Figure 1. below depict the nominal Brent crude oil prices in U.S. dollars from 1996 to 2016. As the graph demonstrates, the crude oil price is highly volatile and seemingly unpredictable. Especially the shocks, significantly noticed by the financial crises in the period 2008-2009, showed a steep volatility behavior in the oil prices. Connected with the oil price volatility, it is also well-known that the economies of several countries faced severe recessions during the financial crises.

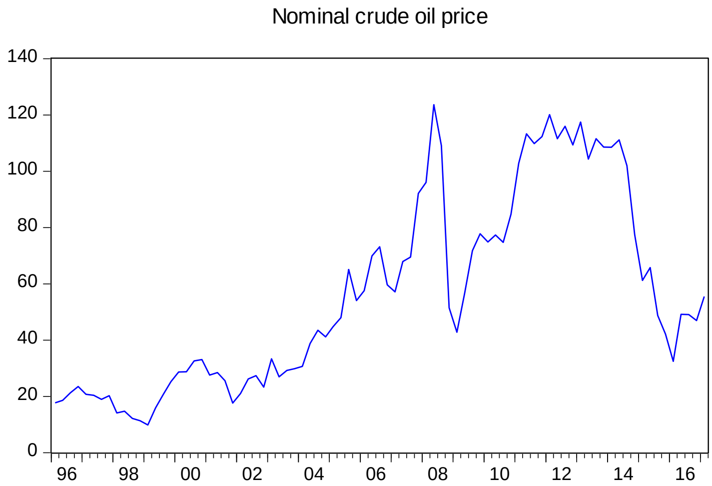
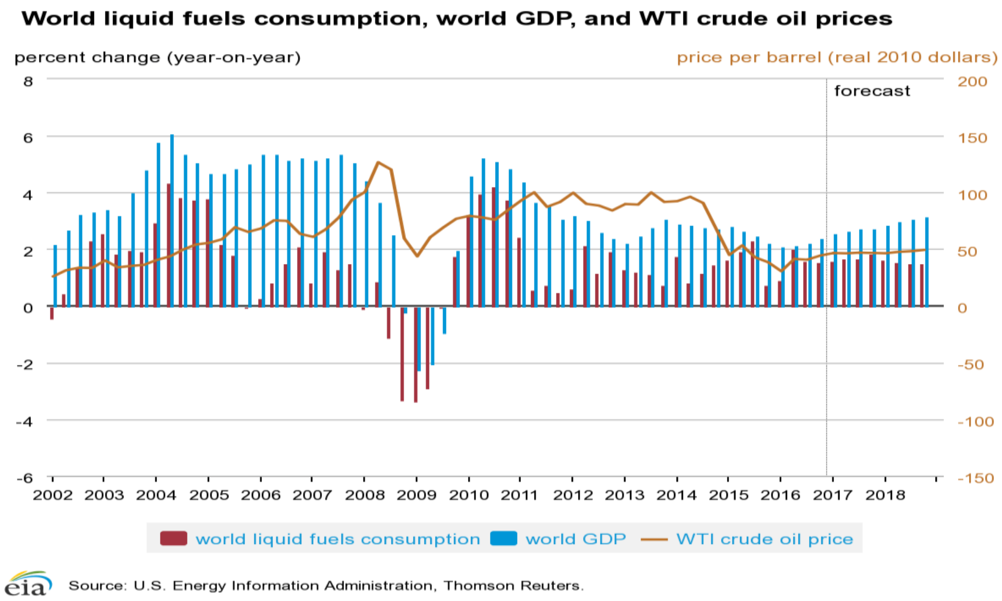


Figure 1 Nominal crude oil price by year

The most recent oil shock was recognized in 2014 where the oil price plummeted due to factors such as worldwide slow economic growth, the removal of sanctions on Iran's oil production and the production increase in Iraq and Libya (Oilprice, 2016). Moreover, 50% decline in oil prices in year 2014 led to exchange rate shocks, instability in worldwide economies at macro level, and political uncertainty. Therefore, the recency and scale of consequences in combination with the increasing volume of oil as a traded commodity were considerations taken when we chose oil as a subject of our research.

Other noticeable effects of shifts in oil prices are observed on several decisions such as foreign policy decisions, change towards other energy resources, governmental managing of exchange rates with monetary tools, import and export- regulations, and governmental subsidies to companies in some industries. However, we will take into consideration the fact that the effects of oil price dynamics will vary depending on countries' oil dependency. Recent empirical research on this topic tends to find that an oil price increase would be great news for oil exporting countries but bad news for oil importing countries. If oil price decreased, this relationship would be reversed.

Figure 2. The patterns of World liquid fuels consumption, world GDP and oil price

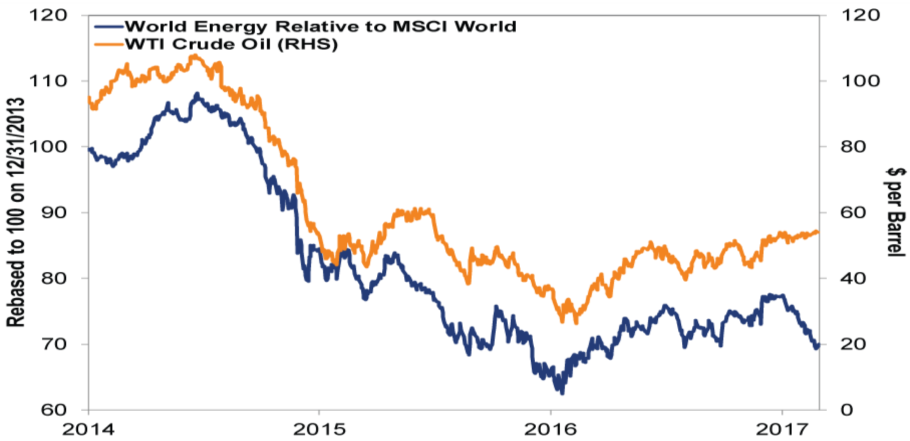


Confirmed by figure 2. above, oil price fluctuations and shocks have according to research noticeable consequences on economic activity (Chatziantoniou, Filis, Eeckels, Apostolakis 2012, Jiménez-Rodriguez and Sánchez 2004, and Becken 2011). Oil is not only traded as a commodity, but also used as an input in production, products and so forth. Therefore, if the price of crude oil used in production increases, firms would suffer higher production costs which in turn can lead to lower output. In addition, an increase in oil price could have an adverse effect on investment by increasing firm's costs. Consumption would most likely go down as well because of its relationship with disposable income (Hamilton 2009). These effects would be magnified if the oil price shock were believed to be long-lasting (Jiménez-Rodriguez and Sánchez 2004). Thus, it seems highly relevant for our research to test major macroeconomic variables connected to both consumption and the investment side against crude oil prices.

1.1.2 Oil price and the stock markets

The price of shares on the stock exchange is primarily dependent on basic supply and demand from investors. Macroeconomic factors such as interest rates and exchange rates for companies with cost or revenues denominated in another currency are examples of factors that may affect the stock market returns. Theoretically, the relationship between stock market returns and oil prices can be linked through changes in expected cash flows or discount rates. As oil is used as input in production, oil price may lead to changes in costs, which may affect earnings, dividends and thus stock market returns. For instance, when the oil price decreased by 50% in 2014, the energy sector lost a lot of money due to falling stock prices (Forbes 2016). The latter can be observed from figure 3. where the post 2014 period led to decrease in the stock index and the oil prices. In addition, an increasing oil price can lead to overestimation of the expected inflation and encourage central banks to raise interest rates, which can have a negative effect on stock market returns (Rafailidis and Katrakilidis 2014).

Figure. 3 Volatility of MSCI World index (developed countries) vs. WTI crude oil



Source: Federal Reserve Bank of St. Louis 2017.

1.2 Research question

In this thesis, the goal is to interpret the impact oil price dynamics have on the selected major macroeconomic variables, mainly real GDP growth, and the stock market returns for the respective ten chosen countries that are either net importer of oil, net exporter of oil or both in the period 1996 to 2016.

Historically, linear relations were tested for GDP growth and stock market returns with oil prices, which makes nonlinear modifications more interesting for further research. Hence, to find the best specifications for oil price, we construct four models with different oil price modifications. This would reveal which oil modification is best performing for different countries. Furthermore, our time series analysis conducted with the VAR model comprehensive of miscellaneous variables will show the direction of the relationship between the selected variables and the oil prices. Finally, we estimate the structural VAR models to attain the effects of oil price shocks on the variables. Accumulated impulse responses and variance decompositions analysis are executed with diverse results.

1.3 Thesis outline

This paper is constructed in 4 parts. Subsequently literature review, in Chapter 2 we attempt to identify and review relevant studies that have been studied within this topic. Hence, well-known and large theoretical and empirical studies that have explained the relationship of oil with either GDP growth or stock market returns are included. In Chapter 3, we present our research null hypotheses. Chapter 4 presents the information of the dataset used along with the methodology to provide our findings. Chapter 5 presents the empirical results that are divided into three main subsections, with foremost the results from the significance tests from the VAR model, followed by the additional sections of accumulated impulse responses and variance decomposition.

2. Literature review

Previous studies on the effects of oil price on macroeconomic variables and the stock market returns have shown different results. Below we list some relevant and interesting studies. However, one should be cautious in making conclusions about the results in this research topic. Clearly, it is a topic for further examination, which is the fact that makes this topic more interesting to study.

In the article “Oil and the Macroeconomy Since the 1970s” by Robert B. Barsky and Lutz Kilian (2004), the authors discuss the relationship between oil price shocks and the economy. The authors measure the investment and consumption against the oil prices which show that there are not always direct effects of oil price shocks on the economy. For instance, a recession may plausibly be a consequence of Federal Reserve’s policy response to the inflation triggered by an oil price shock. The authors also explain that oil price shocks are not always exogenous, but also endogenous. The endogenous effect is exemplified with respect to U.S. and its global macroeconomic conditions. The exogenous events could be, for instance, unpredictable political or military events in countries with oil as their main trade, representing the shift of the oil supply curve. In addition, it is emphasized that the behavior of commodity prices are closely intertwined with global monetary conditions (Ratti and Vespignani 2016).

One well-known research conducted by Hamilton (1983) defines the effect of oil shocks being significant for the output in an economy, arguing that different types of oil price changes have different effect on economic activities. Findings from his research show that seven out of eight recessions in U.S. during 1948 - 1972 were due to changes in the oil price. Moreover, the results showed that oil price Granger-caused changes in GNP where oil prices are exogenously decided in the global markets. However, the tests and correlations this study executed could not directly interpret the relationship between the oil prices and the economy.

Mork (1989) extended Hamilton's sample and used a seven-variable system consisting of real GNP growth, GNP deflator inflation, 3-month Treasury bill rate, unemployment rate, wage, inflation, import price inflation and real oil price changes. Moreover, by distinguishing the asymmetric oil price changes, the results showed that the variables had different coefficients. In addition to reinforcing the relationship between oil price increase (>0) and economic variables, the results also showed insignificance for the coefficients for oil price decrease (<0).

Hooker (1996) extended the sample of Hamilton by choosing year 1973 as a breaking point since many evident markings showed this year with important long-term changes in the economy. After which, oil price did not seem to affect the economy. This research used non-linearity which resulted in no stable relationship found after 1973, given that the relationship prior to 1973 was confirmed. Hamilton (1996) responded by introducing a new oil price measure, namely, Net oil price increase (NOPI). Thereafter, NOPI made the relationship between economic variables and the oil price statistically significant again.

Lee and Ni (1995) extended the sample to 1949 - 1992 from Hamilton's research and found that Hamilton's initial model does not longer hold the explanatory power in GNP. However, this time, the reason for getting different results was not the declining relationship between the Brent Crude oil price and a country's economy, but rather a required adjustment of the changes in oil price movements and the models. After changing the oil price into inflation levels, the research showed that oil price shocks depend on direction of a price shock (asymmetry) and the latest fluctuations.

Their empirical findings defined two plausible explanations to the former asymmetric effect. Firstly, "uncertainty effect" explains that low volatility prior to oil price shock provides additional information to investors and firms such that allocation of resources is performed accordingly. On the other hand, high oil price volatility does not perform as informative for future oil prices. Secondly, decrease in oil prices makes the countries react by reallocating their assets and profits initially instead of a sudden deflation.

Moreover, Jiménez-Rodriguez and Sánchez (2004) findings supported the aforementioned results, and indicated a significant relationship between oil price and the economic variables of G7 countries, Norway and Eurozone. Given the effects from asymmetric shocks in oil prices, the necessity for using non-linear VAR models occurred. Wherein, the scaled model provided the best results among the three non-linear VAR models.

This model, also used by Lee and Ni (1995), consisted of VAR model with the seven variables as following: real GDP, short- and long-term interest rates, real wage, inflation, real oil price and real effective exchange rate. This research's results showed significant relationship between the oil prices and the economy of selected countries that were distinguished between net importer and net exporters. The latter distinction showed opposite effects from oil price shocks where all the included countries showed causality at least in one direction.

In addition, Lee and Ni (1995) found a transmission mechanism through which effects of oil prices are found on the economy including a demand and supply side. The effects on supply comes from crude oil being an input of production where an oil price increase will lead to an increase in the production cost, hence, lower the output. The demand side defines consumption and investment where oil prices have an adverse relation to the investment options. If the firm's cost increases, it will also affect its stock value.

Jones and Kaul (1996) "Oil and the Stock Market" investigate the effect on the stock market reaction on new information in the oil price. Their research consisted of quarterly data for U.S., U.K., Japan and Canada. While Japan and U.K. did not give any clear results for interpretation, the results showed substantial impact from oil price dynamics in U.S. and Canada. In conclusion, the authors suggested that large changes in the oil price gave higher volatility in the stock market returns. Furthermore, Driesprong, Jacobsen and Maat (2008) study the relationship between oil price and 18 different countries over the period 1973 - 2003. They concluded by stating that an increase in oil price will affect the stock market negatively and positively for a decrease.

Sadorsky (1999) used a VAR model on monthly data to show that oil prices and oil price volatility play important roles in affecting the stock market returns. This study also shows the asymmetric effects of oil prices on the economy. However, this study contradicts the study of Huang, Masulis and Stoll (1996) and Kaneko and Lee (1995), since they found no significant relationship between the oil prices and the stock market even though they proceeded with the same model.

Moreover, Wang, Wu and Yang (2013) differentiate their research from the previous ones by distinctly differentiating oil-importing countries from oil-exporting countries. They address this limitation by using SVAR to investigate the effects of oil price shocks on stock market returns. Their study underlined the fact that to better observe the magnitude, duration and the direction of the oil price shock on the stock market, the effect of each type of shock depends on the country's net oil dependency in the world oil market.

3. Hypothesis

The main issue of this thesis is: Does oil price dynamics affect economic growth and stock market returns? Economic growth is represented by real GDP growth and other relevant macroeconomic variables. Whereas, stock market returns are represented by indices. Moreover, the hypothesis testing framework in this research will not only attempt to find a relationship, but also the direction and to some extent the magnitude of the relationship.

The hypothesis for the following regressions will be:
H_0^1: Oil price dynamics has no relationship with real GDP growth.
H_1^1: Oil price dynamics has a positive relationship with real GDP growth.
H_1^2: Oil price dynamics has a negative relationship with real GDP growth.

H_0^2: Oil price dynamics has no relationship with stock market returns.
H_2^1: Oil price dynamics has a positive relationship with stock market returns.
H_2^2: Oil price dynamics has a negative relationship with stock market returns.

4. Data

In this section, we will present the data set used further in the thesis, the variables in the model and the estimation technique used.

4.1 Selection of countries

We analyze the effects of oil price dynamics in industrialized oil-dependent countries. Thus, the countries are divided into three categories of either net oil exporters, net oil importers or both. During the time period of this research, country that tends to be equally oil-exporting and -importing is categorized as "oil-neutral country". We have chosen 10 countries, where six of them are G7 countries. Norway, South Korea, Russia and Mexico were chosen due to the key role oil plays in their economy. The distinctions of the countries are:

- Net exporters: Norway, Mexico, Russia and Canada.
- Net importers: Germany, Italy, U.S.A, Japan and South Korea.
- Neutral country: U.K.

Other large countries such as India, Saudi Arabia and China were excluded due to lack of availability of required data for some variables.

4.2 Data set, sources and time range

The data set were downloaded from Thomson Reuters Datastream, Federal Reserve Bank of St. Louis, and Bloomberg. For the data analysis, we used Microsoft Excel and Eviews. The time range for our research was set to minimize the effects (i.e. bias) of fluctuating economic cycles, thus to reduce the chance of misinterpretation of the results. All the analyses are made based on quantitative time series data, seasonally adjusted, on a quarterly frequency, in the twenty years period, i.e. from 1996 to 2016, which would give us 84 observations for each of the 10 countries. However, for some countries, there was not enough available data for certain variables, hence, the number of observations had to be reduced. In the table to the right, we list the number of sample observations for all selected countries.

Countries	Time period	Observations
Norway	1996Q1 - 2016Q4	84
Russia	2003Q1 - 2016Q2	54
Canada	1996Q1 - 2016Q3	83
Mexico	2002Q1 - 2016Q3	59
U.K.	1996Q1 - 2016Q4	84
Germany	1996Q1 - 2016Q4	84
Italy	1997Q4 - 2016Q4	77
USA	1996Q1 - 2016Q4	84
Japan	1996Q1 - 2016Q4	84
South Korea	1996Q1 - 2016Q4	84

4.3 Variables

The variables were chosen due to the purpose of our study that is to examine the relationship between oil price dynamics, stock market returns and economic growth. Most of these variables were also considered relevant by a large body of previous research (for example, research by Jiménez-Rodriguez and Sánchez 2004, and Chatziantoniou, Filis, Eeckels, Apostolakis 2012). The descriptive statistics for the variables for each country are shown in the appendix from 1.1 to 1.10.

4.3.1 Macroeconomic variables

One main part of the analysis is to capture the effect of oil price dynamics on the real GDP growth. However, it is also crucial to include other variables as explanatory variables to capture the effect on the economy by the oil prices. Hence, all variables included in our econometric model are real Gross Domestic Product (GDP_t), real inflation-adjusted crude oil price modification (OP_t), Consumer Price Index (CPI_t), 3-month Interbank deposit rate (IR_t), 10-year Government Bond rate (GBR_t), Gross Fixed Capital Formation ($GFCF_t$) and Real Effective Exchange rate ($REER_t$).

All variables in the analysis, apart from interest rates, are given by first log-differences. IR and GBR are given by simple rate of change. However, for the test on the macro economy we choose to add GFCF based on the idea that the effect of oil price fluctuations can affect GDP through multiple channels. By adding IR and GBR to our model, we include a monetary sector which is preferable in comparison to money supply indicators, since they may react to inflationary pressures (Jiménez-Rodriguez & Sánchez 2004). The remaining variables are included to capture how oil prices indirectly may affect economic activity, partly by inducing changes in economic policies.

4.3.2 Stock market returns variable

In addition to the aforementioned variables in our econometric model, total return index of real inflation-adjusted stock price (SP_t) is also added. The stock market indices chosen were Oslo stock exchange, Russia MICEX stock market index, Toronto stock exchange, Japan NIKKEI 225 stock market index, Frankfurt stock exchange, Italy stock market (FTSE MIB), New York S.E Composite Index, Korea SE Composite- price index, Mexico IPC (Bolsa) - price index, and London Stock Exchange FTSE 100 (UKX). The price indices were further converted into log (real) stock market returns.

For further structural factorization, some ordering of the aforementioned variables is suggested by Jiménez-Rodriguez and Sánchez (2004). We perform the following ordering: GDP, oil price modification, CPI, IR, GBR, stock market returns, GFCF and REER.

4.3.3 Oil price modifications

To strengthen the robustness of our results, following Park and Ratti (2008), we denominate the oil price in inflation-adjusted local currency of each country. In addition, we have included four models with different oil price modifications to find the best specifications for oil price. In addition to the description of the four models below, figure 2 to 5 in the appendix show the graphical representation of these models in U.S. dollars.

1: Linear specification: The nominal Brent Crude Oil price in national currency divided by CPI to get the real oil price.

2: Asymmetric specification: This model splits oil price into two separate variables – oil price increase, $\mathbf{o_t^+}$ and oil price decrease, $\mathbf{o_t^-}$, which are defined as follows:

$$\mathbf{o_t^+} = \begin{cases} o_t & if\ o_t > 0 \\ 0 & otherwise \end{cases}$$

$$\mathbf{o_t^-} = \begin{cases} o_t & if\ o_t < 0 \\ 0 & otherwise \end{cases}$$

Where o_t is the rate of change in real oil price.

Moshiri (2015), Ramos and Veiga (2013) and Jiménez-Rodriguez and Sánchez (2004) are among some of the researchers that have conducted research about the asymmetric effects in real activity in response to oil price shocks. Originally presented by Lilien (1982), the hypothesis of asymmetry assumes that oil price fluctuations change the equilibrium allocation across various sectors. Thus, an increase/decrease in oil prices will cause a contraction/expansion in oil dependent sectors. However, oil price shocks that force reallocation of resources come at a possibly significant cost. This may lead to an overall loss in output. Naturally, this loss will aggravate the contraction when oil price increases and constrain the expansion when oil price decreases, leading to an asymmetric effect.

3: Scaled specification: This model consists of two variables, scaled oil price increases (SOPI) and scaled oil price decreases (SOPD). It builds on an asymmetric specification, but in addition employs a transformation of the real oil price that standardizes the estimated residuals of the best performing Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model by its time-varying (conditional) variability:

$$o_t = \alpha_0 + \alpha_1 o_{t-1} + \alpha_2 o_{t-2} + \alpha_3 o_{t-3} + \alpha_4 o_{t-4} + e_t$$

$$e_t | I_{t-1} \sim N(O, h_t)$$

$$\mathrm{h_t} = \gamma_0 + \gamma_1 \mathrm{e_{t-1}^2} + \gamma_2 \mathrm{h_{t-1}}$$

$$SOPI_t = max(0, \sqrt{\frac{\hat{e}_t}{\hat{h}_t}})$$

$$SOPD_t = min(0, \sqrt{\frac{\hat{e}_t}{\hat{h}_t}})$$

Where $\hat{h}_t$ = time-varying (conditional) variability and $\hat{e}_t$ = estimated residuals of the autoregressive model. The residual values that SOPI and SOPD are extracted from comes from rate of change of real oil price. This model was intended to account for how long-term oil price increases affect macroeconomic variables in a more dramatic way than smaller oil price increases that are fluctuations in a long-term oil price decrease.

4: Net specification: This model uses the explanatory variable net oil price increase (NOPI) defined as the maximum value over the past 4 quarters, or 0 otherwise:

$$NOPI_t = max\{0, p_t - max(p_{t-1}, p_{t-2}, p_{t-3}, p_{t-4})\}$$

The NOPI variable is built on the rate of change of the real log oil price. It is also an asymmetric model as it focuses on oil price increase, while ignoring the impact of oil price decline.

5. Methodology

5.1 The regression model

Previous literature documents that the regression estimates can be biased by the order of the variables when using a simple Vector Autoregressive model (VAR) (Wang, Wu and Li 2013). In addition, the simple VAR provides no contemporaneous feedback term (Brooks 2014, 333). However, a structural VAR model (SVAR) imposes restrictions on the coefficients based on the relative importance of the variables, and it allows us to capture contemporaneous effects (Sims 2002, Pfaff 2007 and Brooks 2014, 332). This model can include constants and provides multivariate relations of variables with each other and their lagged values. Motivated by these advantages, and the previous research conducted, we employ a SVAR model to estimate the particular effect of oil price shocks on economic growth and stock market returns.

5.1.1 Structural VAR model (SVAR) and identifying assumptions

In order to estimate a SVAR model, we have to start with estimating a reduced VAR. We can interpret a VAR (p) model as a reduced form model (Pfaff 2007). Typically, a reduced form VAR model will have the form:

$$y_t = c + A_1 y_{t-1} + A_2 y_{t-2} + .. + A_p y_{t-p} + e_t$$

Where y is a (k x 1) vector of endogenous variables, c is a (k x 1) vector of constraints (intercept), A_i are (k x k) matrices for i=1,…p, and e is a (k x 1) vector of errors (white noise).

The standard structural VAR model is specified as:

$$A_0 y_t = c_0 + \sum_{i=1}^{p} A_i y_{t-i} \varepsilon_t$$

Where $y_t = (\Delta GDP_t, \Delta OP_t, \Delta CPI_t, \Delta IR_t, \Delta GBR_t, \Delta SP_t, \Delta GFCF_t, \Delta REER_t)$ is a (k x 1) vector including changes in variables. A_0 represents (k x k) contemporaneous matrix, c_0 is a (k x 1) vector of constants, A_i are (k x k) autoregressive coefficient matrices and ε_t is a (k x 1) vector of structural disturbances assumed to have zero covariance and to be uncorrelated.

To attain the reduced form of the structural model, we can multiply both sides by A_0^{-1}. Then we get:

$$y_t = a_0 + \sum_{i=1}^{p} B_i y_{t-i} + e_t$$

Here, $a_0 = A_0^{-1} c_0$, $B_i = A_0^{-1} A_i$ and $e_t = A_0^{-1} \varepsilon_t$, i.e. $\varepsilon_t = A_o e_t$.

Following Kilian and Park (2009), Wang, Wu and Yang (2013), and Chatziantoniou et al. (2012), we decompose the structural innovations in the model by imposing the following short-run restrictions on A_0. Thus, we define $\varepsilon_t = A_o e_t$ specifically:

$$\begin{pmatrix} \varepsilon_{1,t}^{GDS} \\ \varepsilon_{2,t}^{OPS} \\ \varepsilon_{3,t}^{IS} \\ \varepsilon_{4,t}^{IRS} \\ \varepsilon_{5,t}^{GBS} \\ \varepsilon_{6,t}^{SMS} \\ \varepsilon_{7,t}^{GFS} \\ \varepsilon_{8,t}^{RS} \end{pmatrix} = \begin{pmatrix} a_{11} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 & 0 & 0 & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 & 0 & 0 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} & 0 & 0 & 0 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & a_{55} & 0 & 0 & 0 \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & a_{66} & 0 & 0 \\ a_{71} & a_{72} & a_{73} & a_{74} & a_{75} & a_{76} & a_{77} & 0 \\ a_{81} & a_{82} & a_{83} & a_{84} & a_{85} & a_{86} & a_{87} & a_{88} \end{pmatrix} \times \begin{pmatrix} e_{1,t}^{\Delta GDP} \\ e_{2,t}^{\Delta OP} \\ e_{3,t}^{\Delta \pi} \\ e_{4,t}^{\Delta IR} \\ e_{5,t}^{\Delta GBR} \\ e_{6,t}^{\Delta SM} \\ e_{7,t}^{\Delta GFCF} \\ e_{8,t}^{\Delta REER} \end{pmatrix}$$

This matrix defines the shocks (impulses) by the selected variables and “S” at the end of variables on the left-hand side denotes shock. Therefore, we can relate the oil price shocks to the structural innovations in the following way:

- GDP shocks are innovations in Gross Domestic Product.
- Oil price shocks are innovations in crude oil prices that cannot be explained by GDP shocks.

- CPI shocks are innovations in Consumer Price Index that cannot be explained by GDP shocks or oil price shocks.
- And so forth.

5.2 Unit root tests, lag selection tests

One of the assumptions of VAR model is that input data are stationary. Hence, we initially investigate the stochastic properties by analyzing the order of integration of the series. We use the standard Augmented Dickey-Fuller test (ADF) to test for non-stationarity and the results are summarized in table 2.1 to 2.10. As you can observe in the tables, we have tested the variables for unit roots in levels and first log-differences. The results indicate that the first log-differences are stationary.

To find the suitable lag length, we use the standard Eviews Lag Selection test of the four oil modification models (linear, asymmetric, net and scaled). Due to a limited time sample, we include four lags in Lag Length Criteria, where Akaike information criteria (AIC) is used to determine how many lags should be tested for lag exclusion. These tests identify the best performing model and the suitable lag length for each country (tables 3.1-3.10).

6. Empirical results and discussion

6.1 Best performing model

The relative performance of the oil price modification models is displayed in table 4. As the results show, the asymmetric model has the lowest AIC and the highest Log likelihood ratio (LLR) for all 10 countries. Thus, we find support for asymmetric oil price shocks in this research. This contradicts research by Hamilton (1996), Jiménez-Rodriguez and Sánchez (2004), and Lee and Shawn (1995) who all claimed that scaled and net oil price specification would be a better choice. However, we find no support of this. Therefore, as our results identifies the asymmetric model as the most appropriate specification we focus on these models for our main findings and analysis.

6.2 Significance of relationships

Below we present our analysis of the results for the VAR estimates. For each country, we determine the significance of relationships with oil price dynamics based on the t-statistics and their respective critical values at three confidence intervals (1%, 5% and 10%). From this, we are able to decide whether the hypothesis can or cannot be rejected. As stated, significance of relations with the asymmetric model will be focused throughout our empirical results. However, when the results show no significant relationship in asymmetric model, we estimate the significant results for the other models. The VAR estimation results for GDP growth and stock market returns are summarized in table 5.1 to 5.4 and in tables 6.1 to 6.4 in the appendix. In addition, table 7 summarizes the results of testing the null hypothesis for all countries and in tables 8.1 to 8.10 you find the VAR estimations for the best performing models.

6.2.1 Relationship with oil-importing countries

Concerning the results for Germany and Japan, we see a slight positive relationship of GDP growth with negative oil price changes at respectively 5% and 1% confidence interval in asymmetric model (table 5.2). This means that for both countries, negative changes in oil price have a positive impact on GDP growth. Hence, hypothesis for positive relationship with GDP growth cannot be rejected for Germany and Japan.

These results are expected since a lower oil price would generally be good news for oil-importing countries. Thus, a lower oil price would lead to a lower cost level for oil-dependent industry sectors, reduce transportation costs and the cost of living (Driesprong, Jacobsen and Maat 2008). This in turn would increase revenues for business sectors and give people more money to spend, we may think of it as a tax cut. Probably, this will lead to an overall decrease in price level and therefore a lower inflation rate or even deflation (Barsky and Kilian 2004). Moreover, when consumers can spend more money, we generally expect that they buy more goods and services. For instance, the car sales and airline industries would probably experience a boost. Therefore, a direct consequence would be that negative oil price changes add to real GDP growth. This is exactly what our results indicate when we for Germany and Japan observe a positive relationship with negative oil price changes.

For Italy (table 5.2) and U.S.A (table 5.4), the results are different and rather unexpected. Concerning GDP growth in Italy, we find a slight negative relationship with negative oil price changes at 10% confidence interval in asymmetric model. For U.S.A, we find in scaled model a very small negative relationship of GDP growth to negative oil price change (SOPD) at 5% confidence interval. Thus, we cannot reject the hypothesis of a negative relationship with GDP growth for these countries. As we discussed above, depreciation of oil prices should in theory add to real GDP growth in oil-importing countries. Since this is not the case for Italy and U.S.A we must look further for a possible explanation.

Tuzel and Zhang (2017) present an interesting model concerning whether certain sectors belong to either a cyclical (high beta/risk) or a non-cyclical (low beta/risk) industry. We may extend the use of this model in order to give us some insight to why we observe such results for Italy and USA. Thus, based on the cyclicality, the industrial composition of local markets and national economies directly influence how shocks in, for example, oil prices affect industry sectors. It may be that different industry sectors respond to oil price shocks differently (due to their cyclicality), and therefore it is not straightforward what effect a depreciation in oil price will have on real GDP growth.

Regarding our results for stock market returns, we find for Germany a positive relation to a positive oil price change at 10% interval in asymmetric model (table 6.2). This is not what we would expect, since an oil price hike generally transfers revenues from oil-importing to oil-exporting countries. Thus, we would expect to see a negative relation. This is also confirmed by Driesprong, Jacobsen and Maat (2008) who prove that investors are attentive about this tendency, and a large increase in oil price for an oil-importing country usually means negative returns. For a further discussion concerning Germany's stock market returns, look at page 20 in the oil-exporting section 6.2.2.

On the other hand, the results for Japan show no significant relationship with stock market returns (tables 6). This means that the hypothesis for a positive relationship with stock market returns cannot be rejected for Germany and the hypothesis of no relationship with stock market returns cannot be rejected for Japan.

The results for the stock market returns of Italy show an opposing relation than the GDP growth (table 6.2). That is, the stock market returns have a positive relationship with negative oil price changes at 5% confidence interval in asymmetric model. However, for U.S.A.'s stock market returns, we find no significant results (tables 6). Therefore, we cannot reject the hypothesis of a positive relationship with stock market returns for Italy, and the hypothesis of no relationship with stock market returns for U.S.A.

Finally, for South Korea, there are no significant relationships of either GDP growth or stock market returns to oil prices in either of the four models (tables 5-6). Thus, we cannot reject the hypothesis of no relationship with GDP growth and the hypothesis of no relationship with stock market returns for South Korea.

6.2.2 Relationship with oil-exporting countries

The asymmetric model constructed for oil-exporting countries indicate positive relationships between oil price decrease and GDP growth for Russia (table 5.2) and Canada (table 5.2) at 1 % and 10 % level, respectively. Hence, hypothesis for positive relationship between oil price changes and GDP growth cannot be rejected for these countries.

According to Wang, Wu and Yang (2013), a depreciation in oil price should generally to some extent have a negative impact on economic growth in these countries. As our results seem to contradict this, we suggest looking further than to our discussion in the oil-importing countries section above. There, we claimed that a depreciation in oil price would lead to a lower overall price level in the economy. This in turn would, for instance, add to consumers spending more money and therefore adding to real GDP growth. However, there are some distinct differences regarding the results for the oil-exporting countries Russia and Canada. For instance, a lower oil price would directly result in lower tax revenues given the fact that tax revenues are essential for governmental spending.

Duffie, Pedersen and Singleton (2003) explain that the crude oil price have a direct effect on internal and external balances in the Russian economy. Since 2003, the Russian government has implemented a strategy to boost their oil sector until 2030 (Bahgat 2010). This long-term strategy consists of significantly increasing the investments into oil production approximately 10%, that is investing $625 billion over a period of 20 years. The crude oil production is therefore expected to be around 530-535 million tons in 2030, i.e. increase from 400 million tons in 2008. Overall, these investments are a part of a $2 trillion investment package planning to renew and develop the Russian oil and gas sector by 2030. Even though this does not explicitly explain the positive GDP growth in response to the oil price change, it may implicitly function as an indicator of what is going on in Russian oil sector. Thus, since the investments are on such an enormous scale, this may in turn add to the real GDP growth in the economy.

Surprisingly, and to the contradiction of earlier research and common expectations, there was no relationship found between oil price and GDP growth for Norway (tables 5.2) and Mexico (table 5.2) in the asymmetric model. However, net model showed a significant positive relationship between oil price increase (NOPI) and Mexico's GDP at 10 % level (table 5.3). Thus, the hypothesis for no significant relationship between oil price change and GDP growth cannot be rejected for Norway, whilst for Mexico, the hypothesis of a positive relationship between GDP growth and oil price change cannot be rejected.

The hypothesis of no significant relationship between Norwegian GDP growth and oil price changes holds for all of the other models (SOPI/SOPD, NOPI, linear) as well, since neither of them showed any significant relationship (tables 5). Especially for Norway, which is quite dependent on its oil export, the result seems to need some extra considerations. Evidently, the financial crises of 2007 - 2008 did not have a major negative impact on Norwegian economy and recovered from it within few years. However, since 2014, Norwegian economy has again faced a downturn in its economy which it has not completely recovered from yet in terms of its volatile exchange rates and increasing inflation and so forth. In addition, Norwegian Oil Fund activities as Norway's transmission mechanism might be an important point that should have been accounted for in our research. The latter consideration simply accounts for variables and uncertain time lags which make it difficult to precisely predict the effect of monetary policy implementation on Norway's economy and price levels (European central bank, 2017). Hence, the latter considerations along with larger lag selection in the model, insufficient data or observations of omitted variables could have given some different estimates.

Concerning Norway’s stock market returns, asymmetric model estimation for the relationship between oil prices and the stock returns showed no relationship (tables 6.2). However, scaled oil price decrease (SOPD) showed a negative relationship with Norway’s stock returns on 5 % significance level (table 6.4). Thus, the hypothesis of a negative relationship with stock market returns cannot be rejected. For Canada, none of the models showed any relationship between the stock market returns and oil prices (tables 6). Hence, the hypothesis of no significant relationship between oil price changes and stock market returns cannot be rejected for Canada.

On the other hand, a significant negative relationship between the oil price increase and the stock market returns of Russia at 10 % confidence interval is found with the asymmetric model (table 5.2). Asymmetric model estimating relationships within Mexican economy showed that the 2^{nd} lag (out of 4 lags) is leading an increase in the stock market returns at 5 % confidence interval from an oil price increase, and can explain approximately 52 % of change in GDP growth (table 6.2). In addition, the same model also shows a significant negative relationship of an oil price increase in lag 4 (out of 4 lags) at 5 % level. In this case, the hypotheses of significant negative and positive relationship of oil prices and stock returns cannot be rejected for short and long-term.

The results for stock market returns of Russia, Mexico, Norway and even Germany from the oil-importing countries section are not expected and rather puzzling. To further extend our understanding of these unexpected results, we can begin by looking at a model developed by Hong and Stein (1999). Their model shows that stock market underreacts to market fundamentals, in particular, to oil price changes, due to the rationality of investors. Further, Hong, Torous and Valkanov (2007) add to this model by explaining how information gradually spread from investor to investor and the information “hit” the investors in different points of time. That is, investors differ in their ability to “wake up” to information. They also add that the information must have a sufficient impact on economic activity and growth in order to actually be inclusive in the empirical results.

If we extend the idea behind these models, we can claim that it is not sufficient to simply state that stock market returns should have a positive relationship with negative oil price changes in oil-exporting countries and vice versa in oil-importing countries. Thus, we have to consider whether oil price changes actually have an overall significant effect on economic activity, whether investors correctly estimate the impact oil price changes on stock prices and if investors react to information at different points in time. That is, they may have an underreaction to information in oil price despite the fact that oil price changes are publicly known information.

Based on general knowledge and our previous results for real GDP, we can conclude that oil price changes in fact have an effect on economic activity. However, whether investors are able to correctly estimate the impact of oil price changes on stock value is not as straightforward. To begin with, we consider several ways oil price changes affect future earnings of companies. In addition, the changes may also affect the discount rates that investors use to discount future earnings.

An important factor to consider is how the effect will most likely be different for companies in oil-dependent sectors and companies that operate in non-oil-dependent sectors. Thus, for companies that do not operate in oil-dependent sectors, the effect of changes in future earnings and discount rates is more abstract. Taking this into account, it would be beneficial to know how oil price changes affect the overall economy. However, as we have mentioned several times in this research and as stated by, for instance, Hamilton (2003), the exact effect changes in oil prices have on overall economy still remains ambiguous. As mentioned, information “hit” investors in different points of time, and in addition, investors may not use the same oil price indices to gather information. Thus, we have provided an alternative way to use the model developed by Hong and Stein (1999) and the extensions of Hong, Torous and Valkanov (2007) in terms of providing an explanation and insight to the fact that the relationships for oil price changes and stock market returns are not straightforward as expected.

6.2.3 Relationship with oil-neutral country (U.K.)

The results for asymmetric model fail to reject the two hypotheses of no significant relationship between oil prices, GDP growth and stock market returns for U.K. (tables 5-6). However, the other model estimations for the relationship with GDP growth show otherwise. The linear model (table 5.1) estimate shows a positive significant relationship between oil prices and GDP growth at 1 % level, whilst net model (table 5.3) shows a negative significant relationship at 5 % level with oil price increase (NOPI). This means that we cannot reject neither hypotheses concerning the oil price relationships with stock market returns.

Empirical studies of the effects of oil price changes in oil exporting countries are usually puzzling (Bjørnland 2008). For instance, M. Jones and Kaul (1996) are unable to completely explain the stock market's reactions to oil price changes in U.K. They define two plausible explanations that support our results for U.K. and Canada as (a) oil price shocks affected the stock market returns in a way that is not captured by our study, or (b) U.K. and Canada's stock markets do not react to oil price shocks. Moreover, Bjørnland (1998, 2000) and Jiménez-Rodríguez and Sánchez (2004) support the latter by finding that U.K. and Canada behave more in line with the importing countries showing declining growth rates in their macroeconomy to increased oil prices.

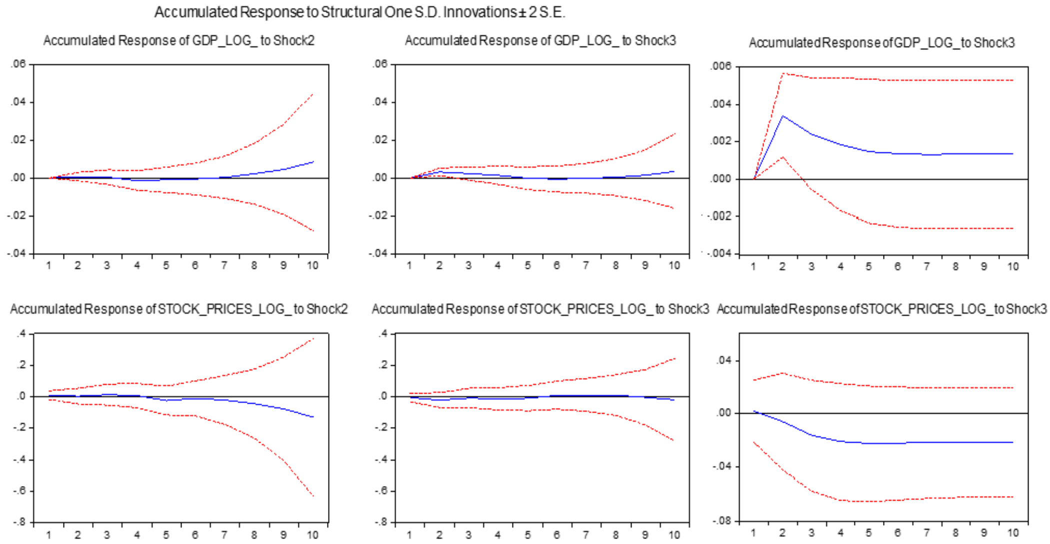
6.3 Accumulated responses of orthogonalized impulse responses

Impulse response analysis is employed on the SVAR models to forecast how oil price shocks affect real GDP growth and stock market returns, by looking at the accumulated responses of orthogonalized impulse responses (i.e. structural factorization on SVAR models) for the variables that have a significant relationship with the oil price modification models. In addition, we look at the contemporaneous effects. Figure 6.1 to 6.18 in the appendix show the accumulated responses of our variables to one standard deviation oil price shock with two standard error bands in form of the red dashed line.

6.3.1 Oil-importing countries

Concerning Germany, our accumulated responses for negative shock show a very small positive effect on GDP growth and a very small negative effect on stock market returns (figure 6.7). We find similar responses for Japan (figure 6.5-6.6);

however, the effects are very large in comparison to Germany. This confirms that the relationships indicated by our VAR estimates in section 6.2.1 transfers into a 10-period forecast of responses.

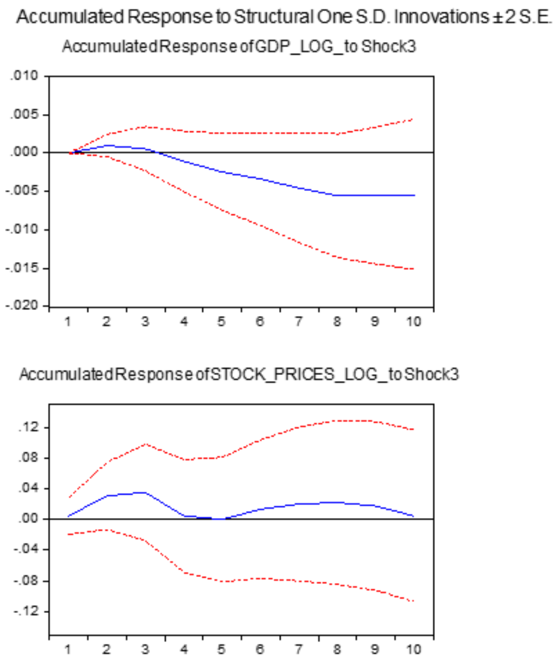


Two first rows: Accumulated responses for Germany. Third row: Accumulated responses for Japan. Both asymmetric model: Shock 2=Up, Shock 3=Down

In the case of positive oil price shocks, the accumulated responses show a very small positive effect on stock market returns for Germany (figure 6.7-6.7). Looking at the contemporaneous effects, we see a large depreciation in REER in response to the positive shock. This is similar to the results of Italy (figure 6.10) where we also observe a large depreciation in REER. That is, for these oil-importing countries, a positive shock has a large negative effect on real effective exchange rate. This indicates that the euro is weakened in comparison to other currencies in response to the shock. For Italy, this effect leads to long-term effect through the depreciation in 10-year government bond rate (GBR).

Continuing with our results for Japan, we can observe a strong appreciation of accumulated response in interbank rate (IR). As we know, short-term interest rates are mainly administered by nation's central banks. However, the interbank rate would not necessarily be directly interfered, but it should typically be correlated with other short-term interest rates and affected by the demand in monetary sectors. Thus, an increased demand of money transactions may be the reason for the large increase in IR. This may have a positive effect on inflation, and in response to the negative oil price shock, we see a strong positive effect in consumer price inflation. As previously discussed, a lower oil price would probably lead to an overall lower price level, that is lower inflation. However, as our accumulated responses for Japan contradict this, we cannot support the research claims made by Barsky and Kilian (2004).

Right: Accumulated responses for Italy. Asymmetric model: Shock 3=Down

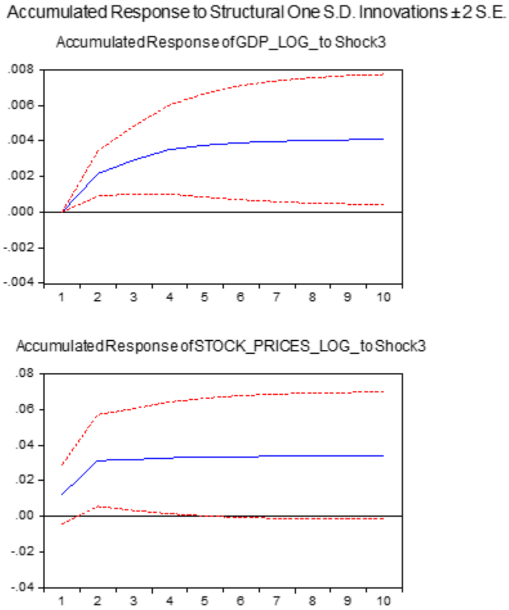


Regarding negative oil price shocks, Italy's GDP growth has a negative response (figure 6.9). This confirms our results from section 6.2.1 and indicates that the negative relationship we found with negative oil price indeed will have a future depreciating effect on real GDP growth.

When looking at the significant results for the remaining variables of Italy (figure 6.10), we find a decreasing effect on GBR and GFCF. This may indicate that a negative oil price shock affects the expectations of Italy's economy negatively, which could further explain the negative response of GDP growth. On the other side, the accumulated responses for stock returns show a small appreciation in response to the shock. In section 6.2.1 we discussed a model by Tuzel and Zhang (2017) which indicated that industry sectors respond differently to oil price shocks and therefore it was not given what effect a depreciation in oil price will have on real GDP growth. However, as we here observe a depreciation of GBR and GFCF, it serves as an indicator of the negative response of GDP

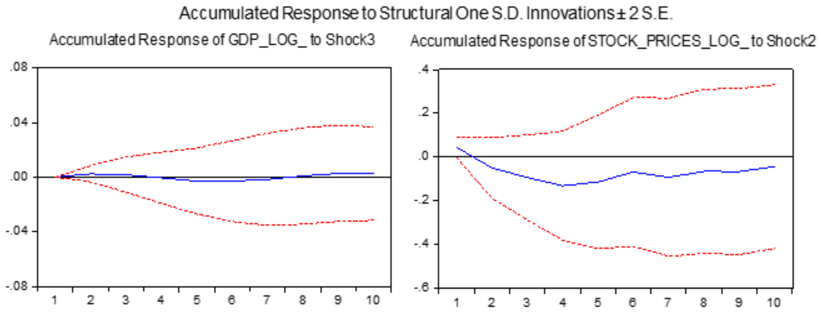
For U.S.A. (figure 6.3-6.4), the accumulated responses show that scaled negative oil price shock (SOPD) have a large positive effect on GDP growth. CPI and GFCF show large positive accumulated responses to the shock. On the other hand, REER show a very negative reaction. As we know, a higher price level can cause a weaker currency effect which may strengthen traded sectors. Thus, the increased inflation, together with a weaker dollar effect and an appreciation in GFCF, can be contributing factors in the positive effect on GDP growth.

Below: Accumulated responses for U.S.A. Scaled model: Shock 3=SOPD



The accumulated responses for U.S.A. contradict the results from the VAR estimation in section 6.2.1, as those results indicated a negative relationship. Therefore, we are unable to conclude on the relationship real GDP growth has with negative oil price shocks and changes for the next 2 ½ years. However, our accumulated response results are supported by Ready (2016) who also found a strong positive response of U.S.A.'s real GDP growth.

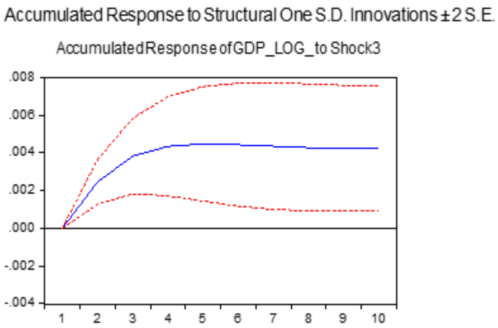
6.3.2 Oil-exporting countries



Above: Accumulated responses for Russia. Asymmetric model: Shock 2=Up, Shock 3=Down.

In Russia (figure 6.11-6.12), the accumulated responses show a very small fluctuating effect on GDP growth to negative oil price shock. On the other hand, in section 6.2.2, we found a positive relationship. In order to explain this unexpected result, we discussed the possibility that a strategy to boost the oil sector until 2030 and the following $2 trillion investment package may explain the positive relation of GDP growth and the oil price change. Interestingly, we initially observe positive fluctuating accumulated response, but around year 1 (period 4) it turns negative, and after year 2 (period 8) it is positive again. This adds dimension to our analysis by proving how modest yet volatile the response of GDP growth to the oil price shock is. Thus, we find no evidence that a negative shock in oil price have disastrous effects on real GDP growth in Russia.

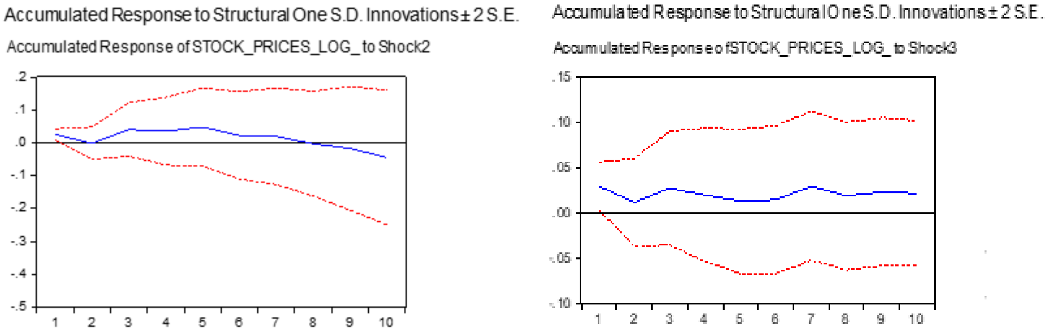
Continuing the results for Russia, a positive oil price shock has a negative effect on stock market returns. As we in section 6.2.2 found a negative relationship, we can confirm that this relation is present in the long-term response. Moreover, when looking at how the shock affects the other variables we see that CPI and GBR respond in the same way. Both variables have a positive reaction but after approximately 2 years, we can observe a depreciation. This may indicate a decrease in market's expectations of future consumer inflation after a period of two years. Thus, we would expect the long-term rate to decrease relative to the short-term interest rate. This may be a contributing factor to the surprising result of the negative effect on stock market returns. However, as our results for short-term interest in Russia were not significant, we are not able to draw any further conclusions.



Right: Accumulated response for Canada. Asymmetric model: Shock 3=Down

As we previously found similar results for Russia and Canada in section 6.2.2, the responses have broadened our analysis and we cannot longer confirm the similar response for these countries. Thus, our results for Canada (figure 6.13-6.14) show for GDP growth a large appreciation in response to negative shock. In addition, we observe a large increasing effect in REER. As mentioned above, this appreciation in local currency should weaken traded sectors and lead to decreasing GDP growth. Therefore, our unexpected results may indicate that the government of Canada have been successful in imposing stabilizing mechanisms. Further, it means that we find no support to the claims made by Wang, Wu and Yang (2013) in terms of a depreciation in oil price having a negative impact on economic growth.

The results for positive oil price shocks in Mexico (figure 6.15-6.16) show that stock market returns have a fluctuating response. That is, we observe a positive response until year 2 (period 8), and thereafter a sharp depreciation. This clarifies our contradicting results in section 6.2.2, where we found a positive relationship in 2nd lag and then a negative relationship in lag 4. Thus, in response to a positive oil shock, for the next 2 ½ years (period 10), Mexico's stock market returns are expected to appreciate and thereafter the returns will sharply depreciate.



Above: Left: Accumulated response for Mexico. Asymmetric model: Shock 2=Up. Right: Accumulated response for Norway. Scaled Model: Shock 3: SOPD.

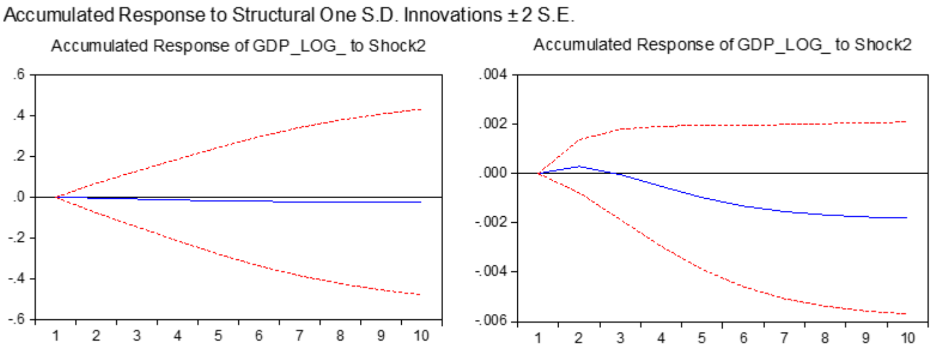
In Norway (figure 6.1-6.2), we see that stock market returns have a positive response to scaled negative oil price shock (SOPD). This is consistent with our previous results. In addition, similar to Canada, we observe a large increasing effect in REER.

Previously, we stated that the results for stock market returns for Russia, Mexico, Norway and even Germany were not expected and quite confusing. Therefore, we presented an analysis based on a model developed by Hong and Stein (1999) and the extensions of Hong, Torous and Valkanov (2007) in order to provide an explanation and insight to the fact that the relationships for oil price changes and stock market returns are not as expected. Thus, as the accumulated responses for Russia, Mexico and Norway proved to be similar to our relationship results in section 6.2.2, we can confirm that the relationship of stock market returns and oil price is indeed not straightforward and should not be over-simplified.

6.3.3 Oil-neutral country

Concerning our results for U.K. (figure 6.17-6.18) we found significant results in two oil specification models, that is linear and net model. The accumulated responses to a net positive oil price shock (NOPI) shows a very small negative effect on GDP growth. The latter confirms our results from section 6.2.3 that also showed a negative relationship with NOPI and proves the existence of relation exists for at least 2 ½ years. On the other hand, in findings from the linear model, GDP growth experiences a large depreciation to oil price shock. This is the opposite of our previous results which showed a positive relationship. Thus, we are unable to conclude on the relation between real GDP growth and oil prices in U.K.

Below: Accumulated response for UK. Left: net model. Shock 2: NOPI. Right: Linear model. Shock 2: Linear.



6.4 Variance decompositions

Moving from the effect of structural oil price shocks on the endogenous variables captured by impulse responses, the figures from 7.1 to 7.10 and the tables from 9.1 to 9.10 display the results of variance decompositions. Also called forecast error, variance decomposition provides us the percentage of how much oil price shocks contribute to the variance in GDP growth and stock market returns. We use 10 periods as the forecast time horizon along with a structural decomposition to capture the structural short- and long- term variance decompositions. As a common result for all countries, we observe that the first column depicting the standard error of the forecast error increases with the periods for all variables.

6.4.1 Oil-importing countries

Variance decomposition tests for Germany (table 9.5) show that a shock to GDP can cause 100 % (period 1) to 10.97 % (period 10) of fluctuations in the variability in GDP (own shock). Positive oil price shocks cause 0 to 5.13% of the variance in GDP growth, negative oil price shocks cause 14.6 to 3.51% of the variability in GDP and so forth. Hence, negative oil price shocks contribute more to change in GDP growth than positive oil price shocks which is also aligned with the results of significance of asymmetric model. Initially, GDP itself causes the variation of the fluctuation in GDP growth. However, towards the end of the chosen time horizon, interbank rates (IR) tends to cause largest percentage of volatility to GDP by 67.52 %.

Period	GDP (Germany)		SMR (Germany)		GDP (Italy)	
	Up	Down	Up	Down	Up	Down
1	0.000000	0.000000	0.700320	0.181043	0.000000	0.000000
2	0.770638	14.59519	0.790698	1.333386	3.613279	2.803371
3	0.823892	14.32113	1.119769	1.886029	3.272455	3.020759
4	4.245079	13.14583	1.131105	1.735186	2.496831	7.434840
5	3.451583	12.01434	4.428163	1.625120	1.987719	8.860348
6	3.192858	10.82609	4.670842	2.597157	1.924587	8.745757
7	2.959803	8.657143	3.955501	2.058275	1.756621	9.720485
8	3.974079	6.796341	4.750289	1.869306	1.771771	10.14907
9	3.996393	4.546712	4.732144	1.488912	2.489747	9.666054
10	5.130839	3.512071	5.256663	1.116572	2.612467	9.368552

Period	SMR (Italy)		GDP (Japan)		GDP (USA)
	Up	Down	Up	Down	SOPD
1	0.610520	0.187660	0.000000	0.000000	0.000000
2	1.571195	4.381106	0.278058	10.59306	12.56090
3	2.399779	4.065571	0.514998	10.60903	12.63480
4	3.135006	7.612615	0.511365	10.43504	13.06103
5	3.064555	7.107379	0.683307	10.34503	13.06816
6	3.785601	7.176571	0.760036	10.20561	13.07441
7	4.117813	6.982451	0.817548	10.12500	13.07359
8	4.272587	6.816727	0.858826	10.05755	13.07333
9	4.104424	6.616108	0.887859	10.01716	13.07324
10	4.018459	7.009524	0.907237	9.985617	13.07325

Above: Variance decompositions for Germany, Italy, Japan and USA.
GDP: Real GDP growth, SMR: Stock market returns.

Similarly, the results of variance decomposition for Germany's stock market (table 9.5) show that innovations to IR contributes with the highest variability to stock returns as the forecasting periods increases. This result is supported by Jiménez-Rodriguez and Sánchez (2004) findings which also explain IR as the largest source of shocks. Wherein, shocks in IR represent monetary shocks. Further, decrease in oil price explains between 0.18 % to 1.12 % of stock market variability, while for price increase the range extends with 0.70 % to 5.25 %.

For Italy (table 9.6) and Japan (table 9.8), shocks to GDP itself mainly explains the volatility in GDP growth, and innovations in stock returns are the primarily contribution to the variance in the stock returns in the long-term. Positive oil price shocks in Italy has a lower range of effect than Germany between 0 to 2.61 % on real GDP and 0.61 % to 4.01 % on the stock market returns. Further, an oil price decrease effects Italy's real GDP with a range of 0 % to 9.36 % and the stock returns by 0.18 % to 7.00 %, where the latter effect is higher than Germany but lower than U.S.

Japan's variance decomposition analysis suggest that an oil price decrease explains a bigger fraction of GDP movements from the 2nd period onwards by 10.59 % to 9.98 % than the oil price increase ranging from 0.27 % in period 2 to 0.90 % in period 10. Whereas the effect of oil prices on stock returns ranges between 0.426 % to 1.78 % for an increase in oil prices and 0.03 % to 1.37 % for a decrease.

Shocks in scaled oil price decrease contributes as the third highest source of unanticipated changes in GDP growth for U.S.A according to the variance decomposition (table 9.7). The primer source of volatility in GDP growth is shocks to GDP itself, followed by GFCF. This affirms the significant relationship of oil prices decrease and the volatility contribution for an importing country.

Hence, variance decomposition analysis show that the price of oil is not particularly the most relevant source of volatility for most of the oil importing countries. Only tiny fractions of GDP growth and stock return changes are explained by oil prices for the importing countries. From which, Germany shows the largest effect of any oil price shock in real GDP and the highest impact from an oil price increase, among other countries, on its stock market returns.

A reason why, for instance, U.S.A responded less than Germany on oil price shocks could be due to the differences in the structure of the economies which plausibly play an important role for the macroeconomic adjustments to oil price shocks. Countries with low consumption and production dependence of oil suffer less from oil price shocks on the GDP growth. (Bjørnland, 2000). Moreover, the other countries being less affected might also have higher duty on oil prices than Germany for instance, hence could have been replaced by another energy source.

6.4.2 Oil-exporting countries

Moving towards the exporting countries, structural shocks to real GDP is the main reason for the volatility in real GDP growth for Canada (table 9.4) and Russia (table 9.3). Here, variance decompositions on the asymmetric specifications exhibit the contribution of shocks in oil price increase to the volatility in GDP for Russia at 0 to 7.17 % and Canada by 0 to 1.68 %. Whilst shocks in oil price decrease explains the volatility in GDP growth for Russia and Canada by 0 to 2.9

% and 0 to 17.94 %. Hence, aligned with the results of significance, the effects of oil price decrease are more prominent for Canada than Russia. On the other side, innovations in GDP are the primary cause for the variance in the stock market returns in Russia as the forecasting horizon increases. In addition, the effect on the volatility on the stock market returns from a positive oil price shock is highest for Russia with a range between 5.14 % to 20.57 %.

	GDP (Canada)		GDP (Russia)		SMR (Russia)	
Period	Up	Down	Up	Down	Up	Down
1	0.000000	0.000000	0.000000	0.000000	5.141834	1.077368
2	1.760709	16.83864	1.727495	1.155919	19.15936	1.737415
3	1.547078	18.43942	1.833582	0.994875	19.46699	3.167273
4	1.611526	18.10528	4.837522	1.441669	20.15703	3.054988
5	1.661126	17.95625	6.794746	1.919936	19.84296	3.359099
6	1.679208	17.93165	6.542136	1.845398	20.48961	5.185138
7	1.683749	17.93848	6.692418	2.011011	20.52659	5.088208
8	1.683933	17.94347	6.616919	2.615265	20.75255	6.034336
9	1.683679	17.94455	6.503563	2.950897	20.39605	6.501802
10	1.683632	17.94444	7.173172	2.909545	20.57439	6.548334

	GDP (Nor)	GDP (Mex)	SMR (Mex)
Period	SOPD	NOPI	
1	6.002385	0.000000	12.12754
2	5.759566	4.169980	13.37862
3	6.163442	24.78285	35.04826
4	6.121539	16.80474	31.34108
5	6.089459	15.66147	31.06495
6	5.893465	13.65267	28.82247
7	6.517572	13.12525	30.34032
8	6.738022	12.71238	30.50993
9	6.724251	12.46146	30.41199
10	6.666121	17.47947	33.02561

Above: Variance decompositions for Canada, Russia, Norway and Mexico.
GDP: Real GDP growth, SMR: Stock market returns.

Variance decompositions conducted on NOPI specification for Mexico has shown that effect on GDP growth of a shock on net oil price increase has the second highest impact of 0 to 17.47 %, after own shock in GDP (table 9.2). Furthermore, the forecast error computed for Mexico's asymmetric relationship between oil price and the stock market returns showed an approximately similar effect of oil price increase and decrease in the long-term (period 10). However, shocks to real effective exchange rates and government bonds seem to have the major effects on the variance of Mexican stock market returns as the periods increase.

Forecast error variances measured for Norwegian stock market returns show that shocks to SOPD contributes approximately with the same magnitude in short- and long term (table 9.1). However, monetary shocks, in IR, contribute the most in the long-term.

As noticed, variance decomposition results for the SVAR model show that structural shocks in oil prices prevails the most for Mexican economy. In addition, such shocks also seem to affect the Canadian stock market returns and Russian GDP growth significantly. For Norway, shocks in inflation and GFCF tend to affect the stock market returns more than shocks in oil prices.

Right: Variance decompositions for UK GDP.

	U.K.	
Period	Linear	NOPI
1	0.000000	0.000000
2	0.287621	0.110612
3	0.558083	0.231210
4	1.111710	0.308093
5	1.567757	0.346733
6	1.817689	0.364214
7	1.924420	0.371490
8	1.962118	0.374376
9	1.973988	0.375519
10	1.977660	0.375992

6.4.3 Oil-neutral country

The linear relationship for U.K., as with Norway, shows that contribution of structural shocks in inflation to the variance in GDP growth increases with the forecasting horizon. Oil price shocks only have a minor percentage of 1.97 % of contribution to GDP growth's variance. Moreover, the same result is confirmed by the variance decomposition conducted on the NOPI estimations where shocks in inflation affects the variance of U.K.'s GDP growth the most (47%) in the long-term. Otherwise, oil price shocks do not affect the GDP growth as sufficiently.

7. Conclusion

The comparative analysis of different oil modifications indicated asymmetric model as better performing than the others, especially better than NOPI oil modification. The accumulated impulse responses and variance decompositions also visibly indicated asymmetric shocks affecting the economies and stock market returns of certain countries. Thus, we were able to construct asymmetric models that showed better performance than linear models which was the main reason behind conducting such modifications.

Concerning the significance of relationships, our t-tests showed statistically significant results for most of the countries. Among the oil importing countries, only 2 out of 5 importing countries showed positive significant relationship between oil prices and the stock market returns. The analysis confirmed that oil importers are positively affected by the oil price decrease, like for Germany and Japan. However, Italy showed a contradictory result of stock market returns being positively affected by negative oil price changes.

In the oil exporting countries, the results for GDP only show significant results for Russia and Canada. Thus, surprisingly we find no significant relationship for GDP in Norway and Mexico. As expected, the exporting countries showed a decrease in their economy from oil price decrease- in specific, Russia and Canada. Finally, U.K., as the neutral country showed positive linear relationship between oil prices and GDP but a negative relationship with NOPI oil modification.

Critique and limitations of research

As compared to many of previous researches, this study included two comprehensive components connected to oil prices, namely stock markets and the macro economies. Hence, given the limitation of this research and the time frame, only the main findings were discussed and tested for.

Basically, the aim was to collect twenty years data to get a fair comparison for each country. However, some countries had limited data for certain variables which led to, for instance, only 54 observations for Russia and 59 for Mexico. This might have further led to overfitting, identified by the gaps between R^2 and the adjusted R^2 for specific models. Hence, it might be that some results rather display the noise than the specific relations the present research opt to find.

Several former researches followed seven variable studies whilst Jiménez-Rodriguez and Sánchez (2004) added GFCF as an additional variable into the SVAR model. As noticed for Norway, GFCF did not contribute in explaining governmental actions or vital factors like oil funds which affects the economy and the stock markets enormously than solely changes in oil prices. Moreover, stock market indices were chosen to be the main index of the country. However, if we rather chose indexes specifically from the oil industry for each country, it could have provided more specific indication for the interpretation.

Further potential improvements

Given that this research topic needs further examinations, and the drawbacks and limitations of the present research identified, the following recommendations could provide more robust and fundamental relations:

- Supported from the research of Killian (2009), another way to expand the matrix of the SVAR model could have been to estimate the dynamic effects of the structural oil price shocks into three categories as oil supply shocks, global demand shocks for all industrial commodities and demand shock specific to the global crude oil market. Killian's research showed that it is not a beneficial method to hold other variables constant while solely varying oil prices to study the effects of oil prices on macro economy. The reason for it is, as Lee, Ni and Ratti (1995) also stated it, that different types of oil shocks affects differently from time to time and country to country.
- If accessed, longer time range for data would be beneficial to acquire more specific results. For some countries, such as Russia, where 10- year GBR was not provided before 1999 due to the default; and Mexico and Norway where the access was quite limited, bootstrapping could improve the results.
- Moreover, the present research did not include real wages to draw an insight to the employment of each country which could give us another indication of the effect from oil price changes. Hence, adding this variable along with other vital variables such as from the government sector or stock markets from different industries could have improved the quality of the models.
- Additional tests for significance such as Wald- and Likelihood Ratio Tests, and tests of Block-Exogeneity (Granger-Causality) could possibly improve our results. However, it is questionable whether this would give us more significant results.

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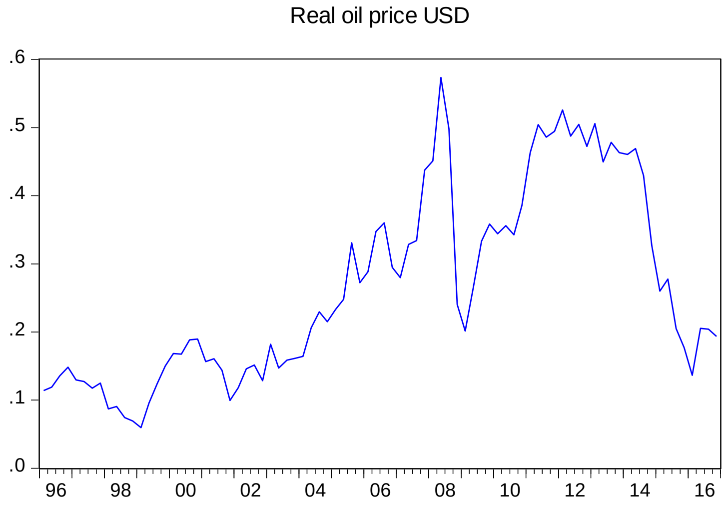
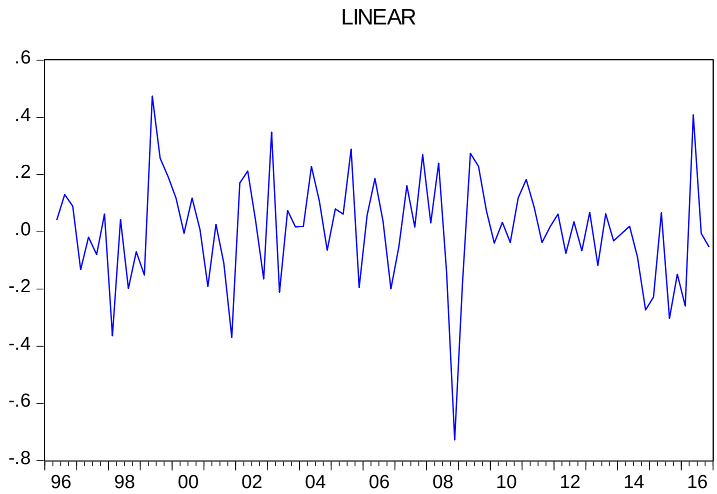
9. Appendix

Appendix 1 - Real oil price in USD: Figure 1

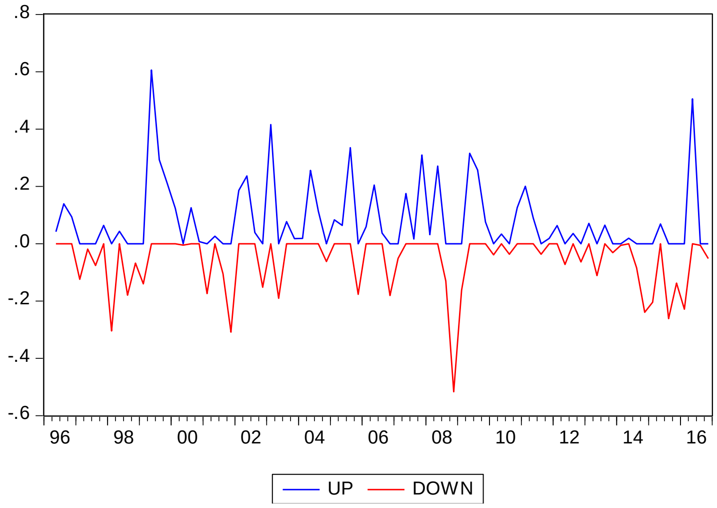


Appendix 2 - Oil price modifications in USD: Figure 2 to 5

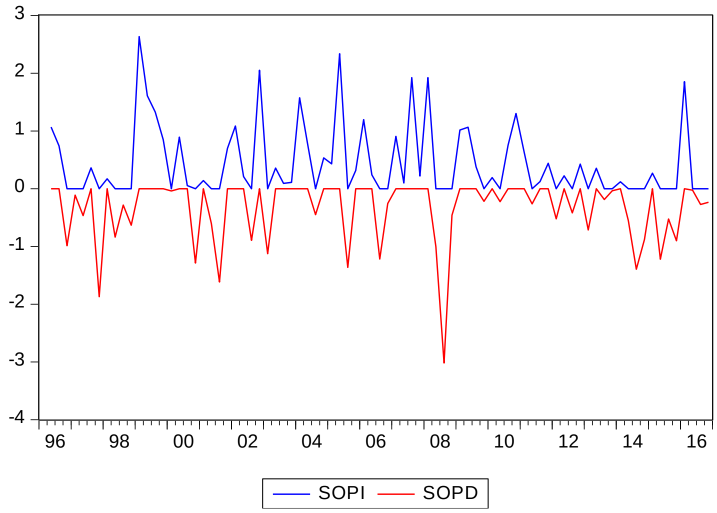
2 - Linear:



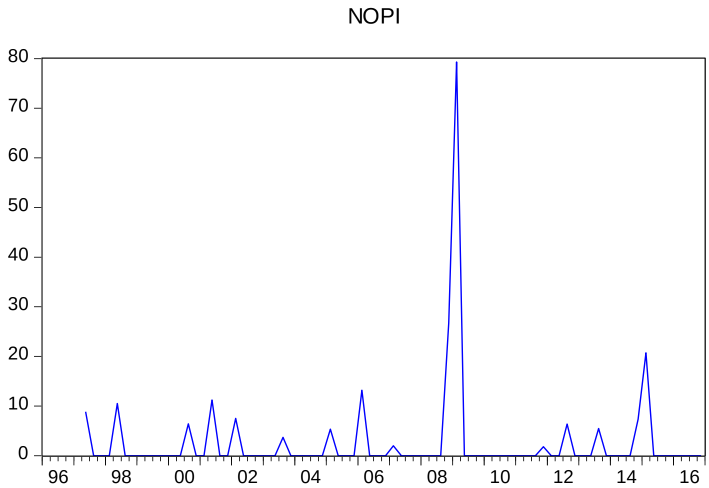
3 - Asymmetric:



4 - Scaled:

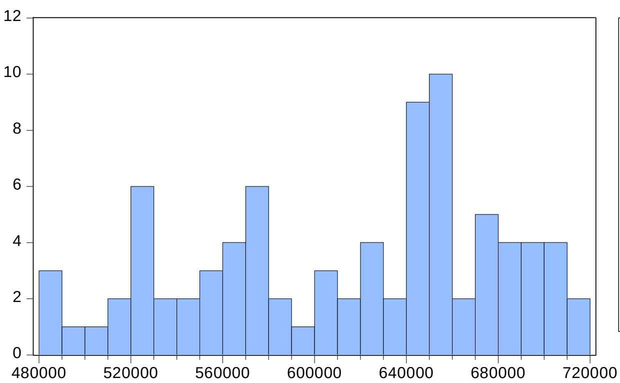


5 - Net:

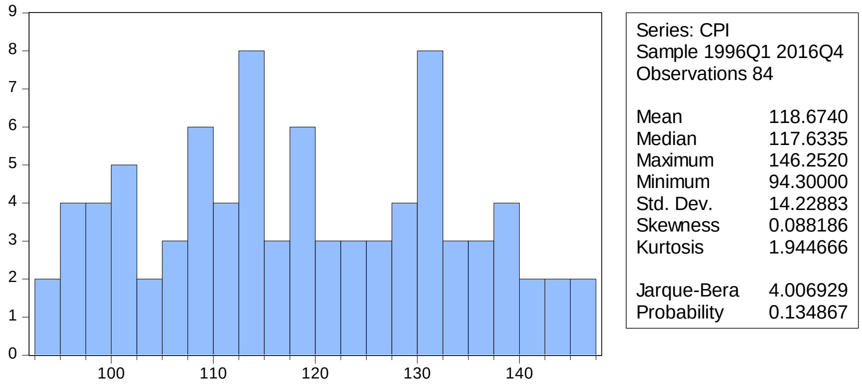


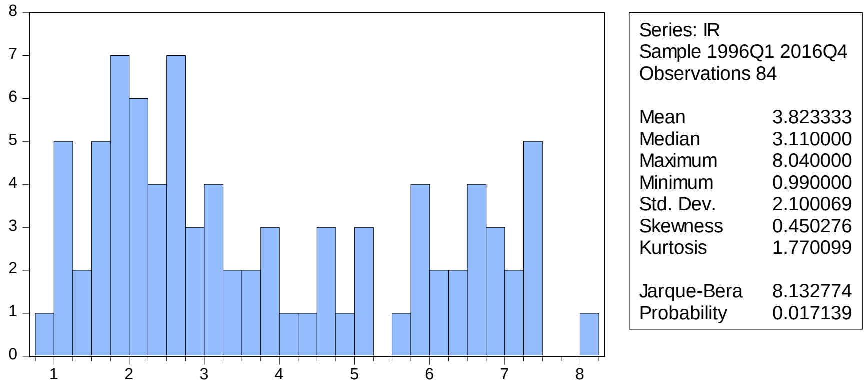
Appendix 3 - Descriptive statistics: Tables and graphs 1.1 to 1.10

1.1 Norway:



Series: REAL_GDP	
Sample 1996Q1 2016Q4	
Observations 84	
Mean	613659.3
Median	630043.5
Maximum	713639.5
Minimum	480747.8
Std. Dev.	64666.59
Skewness	-0.344447
Kurtosis	1.986275
Jarque-Bera	5.257745
Probability	0.072160


Series: CPI
Sample 1996Q1 2016Q4
Observations 84
Mean 118.6740
Median 117.6335
Maximum 146.2520
Minimum 94.30000
Std. Dev. 14.22883
Skewness 0.088186
Kurtosis 1.944666
Jarque-Bera 4.006929
Probability 0.134867


Series: IR
Sample 1996Q1 2016Q4
Observations 84
Mean 3.823333
Median 3.110000
Maximum 8.040000
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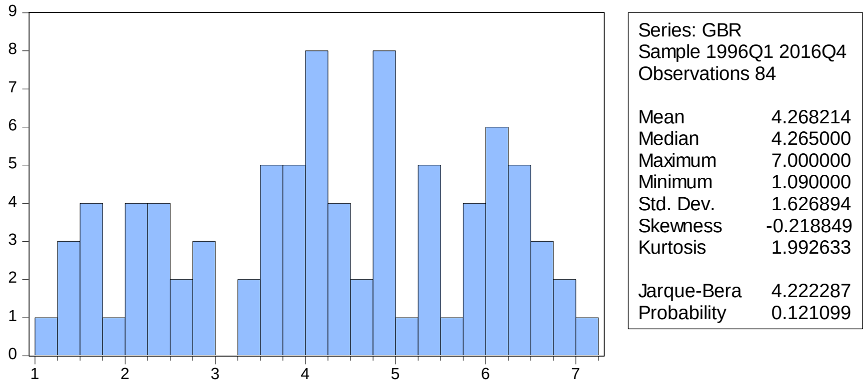
Std. Dev. 2.100069
Skewness 0.450276
Kurtosis 1.770099
Jarque-Bera 8.132774
Probability 0.017139


Series: GBR
Sample 1996Q1 2016Q4
Observations 84
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Median 4.265000
Maximum 7.000000
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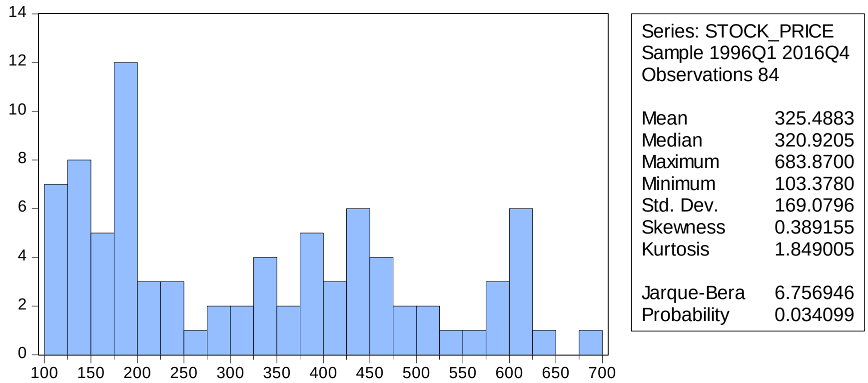
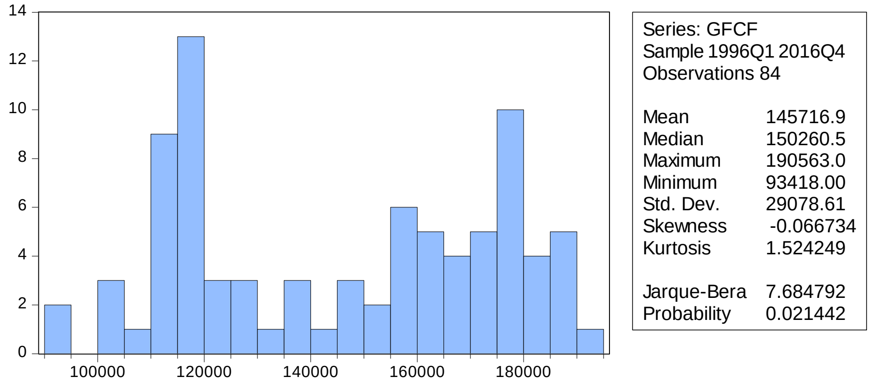
Kurtosis 1.992633
Jarque-Bera 4.222287
Probability 0.121099


Series: STOCK_PRICE
Sample 1996Q1 2016Q4
Observations 84
Mean 325.4883
Median 320.9205
Maximum 683.8700
Minimum 103.3780
Std. Dev. 169.0796
Skewness 0.389155
Kurtosis 1.849005
Jarque-Bera 6.756946
Probability 0.034099


Series: GFCF
Sample 1996Q1 2016Q4
Observations 84
Mean 145716.9
Median 150260.5
Maximum 190563.0
Minimum 93418.00
Std. Dev. 29078.61
Skewness -0.066734
Kurtosis 1.524249
Jarque-Bera 7.684792
Probability 0.021442
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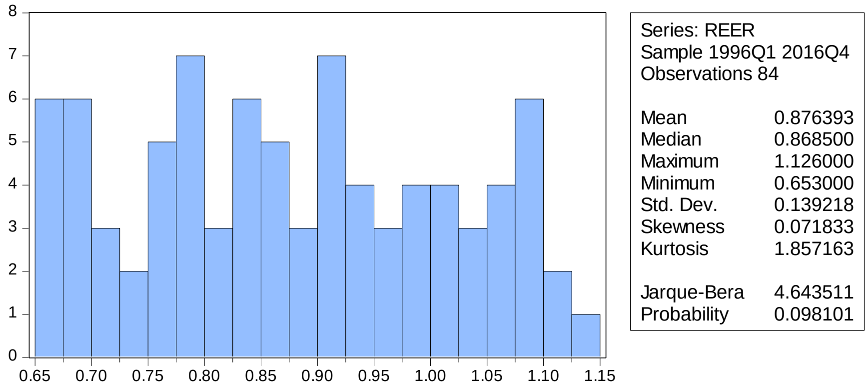
Series: REER
Sample 1996Q1 2016Q4
Observations 84
Mean 0.876393
Median 0.868500
Maximum 1.126000
Minimum 0.653000
Std. Dev. 0.139218
Skewness 0.071833
Kurtosis 1.857163
Jarque-Bera 4.643511
Probability 0.098101
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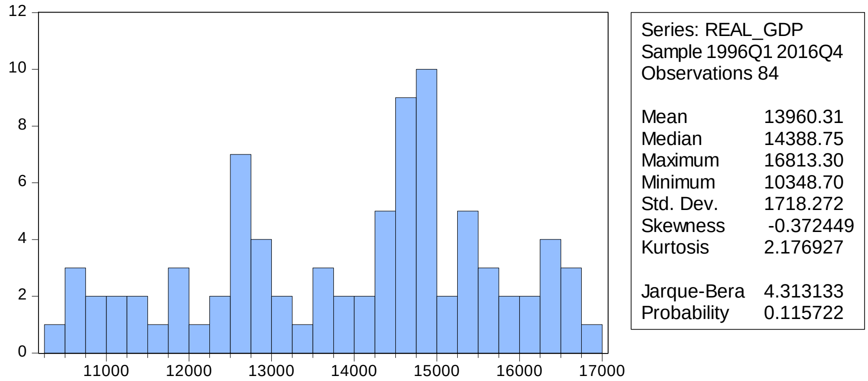
0.65 0.70 0.75 0.80 0.85 0.90 0.95 1.00 1.05 1.10 1.15

1.2 USA: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Sample 1996Q1 2016Q4
Observations 84
Mean 13960.31
Median 14388.75
Maximum 16813.30
Minimum 10348.70
Std. Dev. 1718.272
Skewness -0.372449
Kurtosis 2.176927
Jarque-Bera 4.313133
Probability 0.115722
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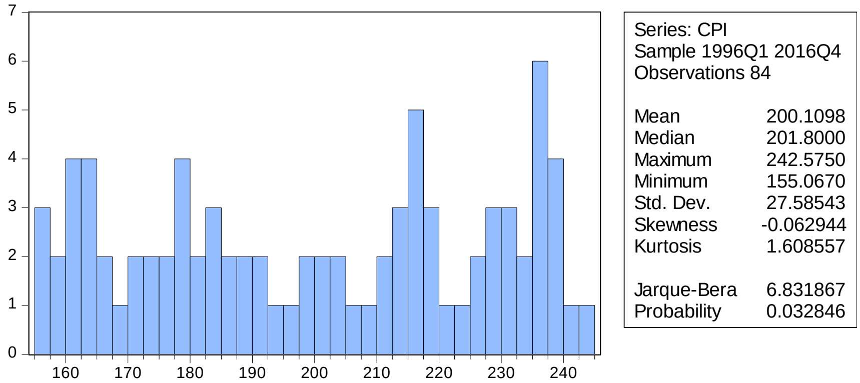
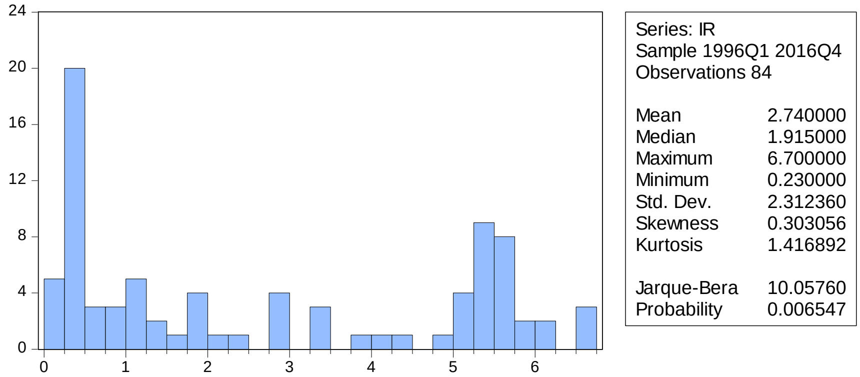
11000 12000 13000 14000 15000 16000 17000


Series: CPI
Sample 1996Q1 2016Q4
Observations 84
Mean 200.1098
Median 201.8000
Maximum 242.5750
Minimum 155.0670
Std. Dev. 27.58543
Skewness -0.062944
Kurtosis 1.608557
Jarque-Bera 6.831867
Probability 0.032846
0 1 2 3 4 5 6 7
160 170 180 190 200 210 220 230 240


Series: IR
Sample 1996Q1 2016Q4
Observations 84
Mean 2.740000
Median 1.915000
Maximum 6.700000
Minimum 0.230000
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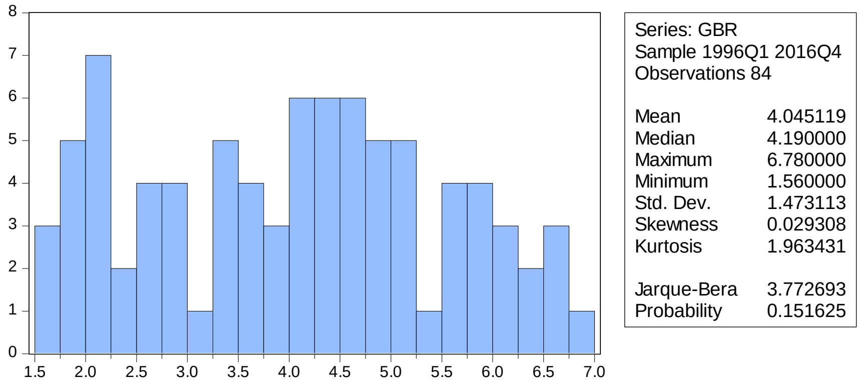
Jarque-Bera 10.05760
Probability 0.006547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Maximum 6.780000
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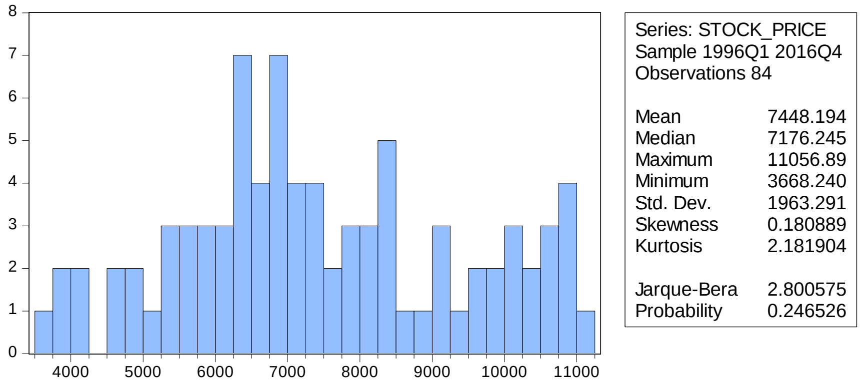
Kurtosis 1.963431
Jarque-Bera 3.772693
Probability 0.151625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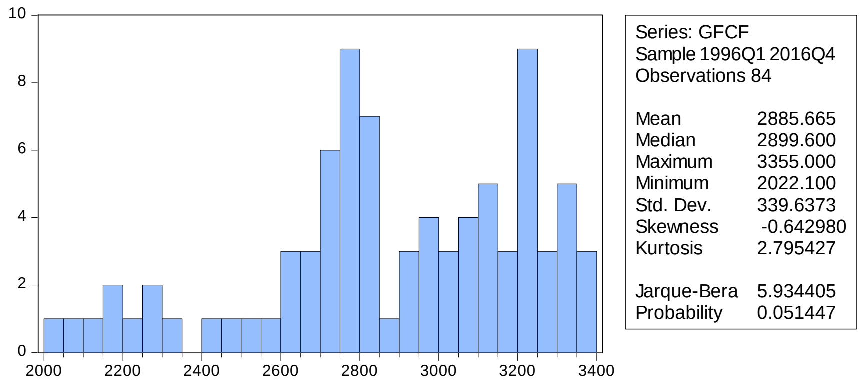
Sample 1996Q1 2016Q4
Observations 84
Mean 7448.194
Median 7176.245
Maximum 11056.89
Minimum 3668.240
Std. Dev. 1963.291
Skewness 0.180889
Kurtosis 2.181904
Jarque-Bera 2.800575
Probability 0.246526


Series: GFCF
Sample 1996Q1 2016Q4
Observations 84
Mean 2885.665
Median 2899.600
Maximum 3355.000
Minimum 2022.100
Std. Dev. 339.6373
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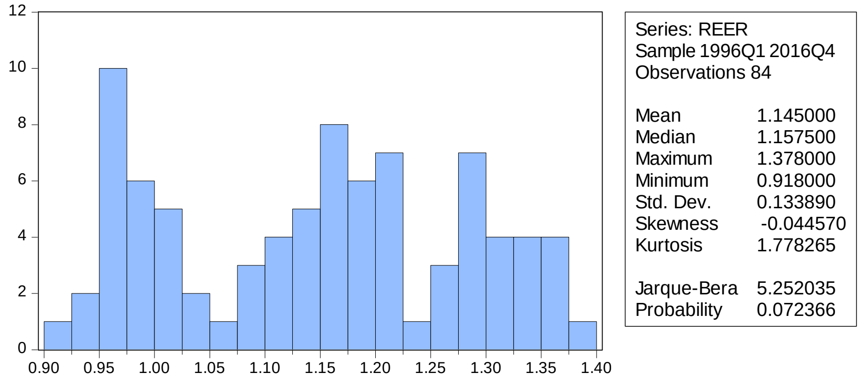
Kurtosis 2.795427
Jarque-Bera 5.934405
Probability 0.051447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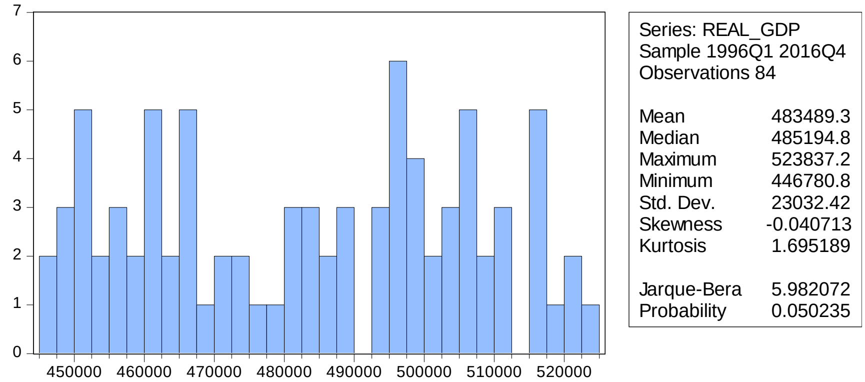
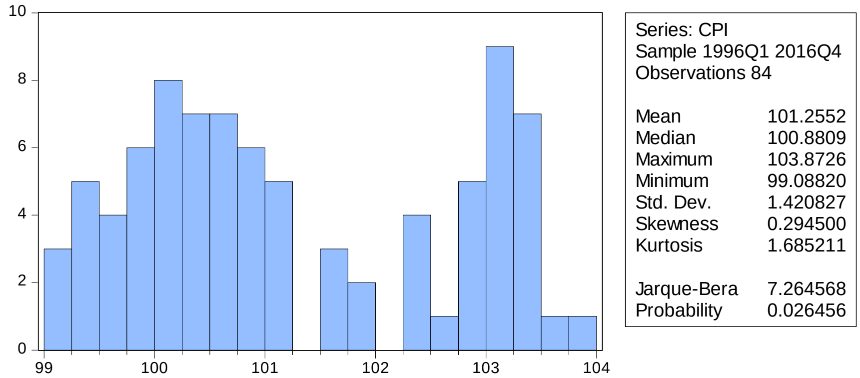
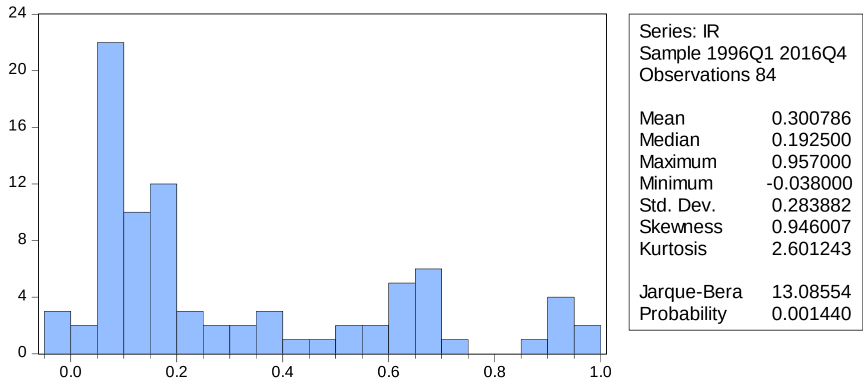
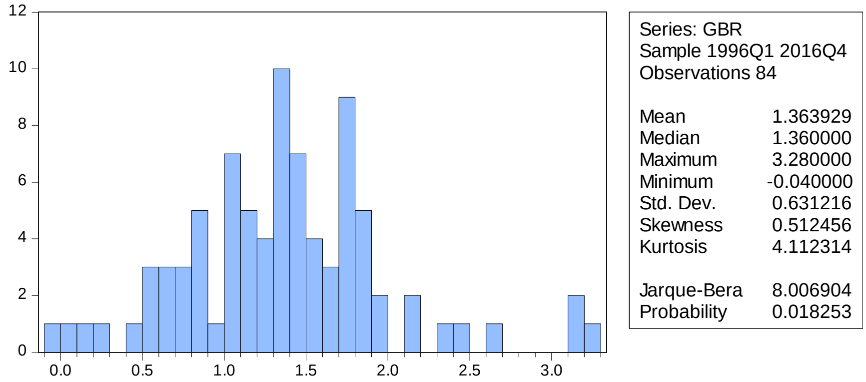
Sample 1996Q1 2016Q4
Observations 84
Mean 1.145000
Median 1.157500
Maximum 1.378000
Minimum 0.918000
Std. Dev. 0.133890
Skewness -0.044570
Kurtosis 1.778265
Jarque-Bera 5.252035
Probability 0.072366

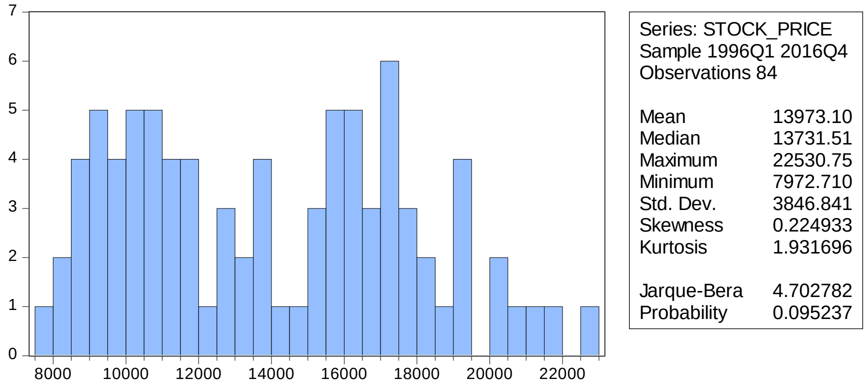
1.3 Japan:

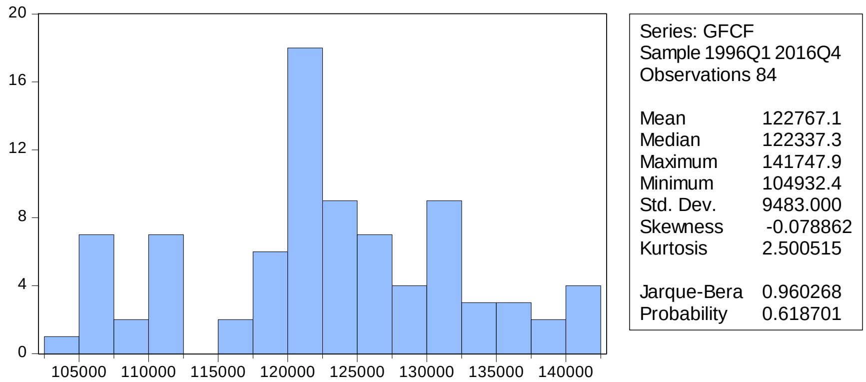

Series: REAL_GDP
Sample 1996Q1 2016Q4
Observations 84
Mean 483489.3
Median 485194.8
Maximum 523837.2
Minimum 446780.8
Std. Dev. 23032.42
Skewness -0.040713
Kurtosis 1.695189
Jarque-Bera 5.982072
Probability 0.050235

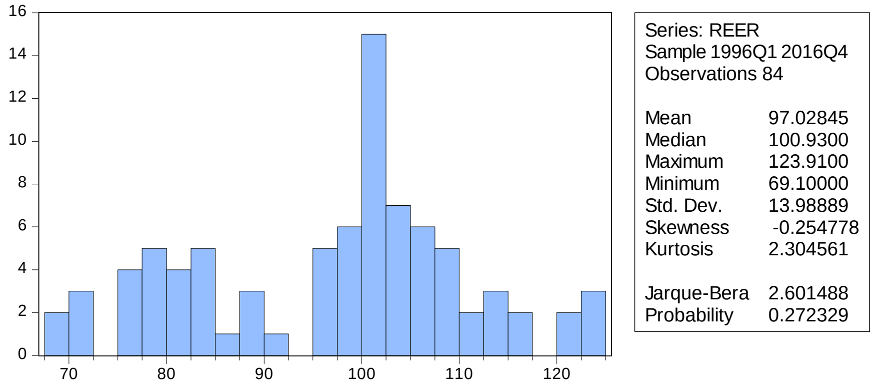

Series: CPI
Sample 1996Q1 2016Q4
Observations 84
Mean 101.2552
Median 100.8809
Maximum 103.8726
Minimum 99.08820
Std. Dev. 1.420827
Skewness 0.294500
Kurtosis 1.685211
Jarque-Bera 7.264568
Probability 0.026456


Series: IR
Sample 1996Q1 2016Q4
Observations 84
Mean 0.300786
Median 0.192500
Maximum 0.957000
Minimum -0.038000
Std. Dev. 0.283882
Skewness 0.946007
Kurtosis 2.601243
Jarque-Bera 13.08554
Probability 0.001440

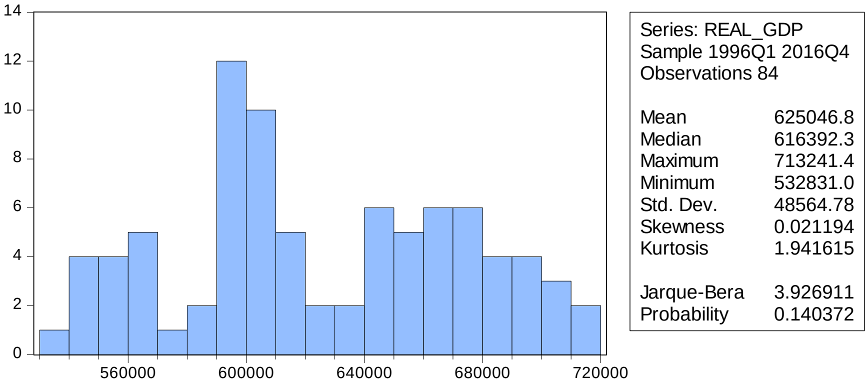

Series: GBR
Sample 1996Q1 2016Q4
Observations 84
Mean 1.363929
Median 1.360000
Maximum 3.280000
Minimum -0.040000
Std. Dev. 0.631216
Skewness 0.512456
Kurtosis 4.112314
Jarque-Bera 8.006904
Probability 0.018253

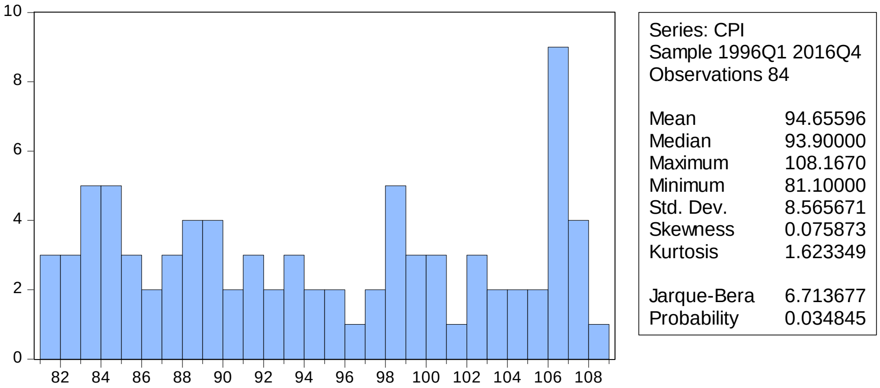

Series: STOCK_PRICE
Sample 1996Q1 2016Q4
Observations 84
Mean 13973.10
Median 13731.51
Maximum 22530.75
Minimum 7972.710
Std. Dev. 3846.841
Skewness 0.224933
Kurtosis 1.931696
Jarque-Bera 4.702782
Probability 0.095237


Series: GFCF
Sample 1996Q1 2016Q4
Observations 84
Mean 122767.1
Median 122337.3
Maximum 141747.9
Minimum 104932.4
Std. Dev. 9483.000
Skewness -0.078862
Kurtosis 2.500515
Jarque-Bera 0.960268
Probability 0.618701


Series: REER
Sample 1996Q1 2016Q4
Observations 84
Mean 97.02845
Median 100.9300
Maximum 123.9100
Minimum 69.10000
Std. Dev. 13.98889
Skewness -0.254778
Kurtosis 2.304561
Jarque-Bera 2.601488
Probability 0.272329

1.4 Germany:


0
2
4
6
8
10
12
14
560000
600000
640000
680000
720000
Series: REAL_GDP
Sample 1996Q1 2016Q4
Observations 84
Mean 625046.8
Median 616392.3
Maximum 713241.4
Minimum 532831.0
Std. Dev. 48564.78
Skewness 0.021194
Kurtosis 1.941615
Jarque-Bera 3.926911
Probability 0.140372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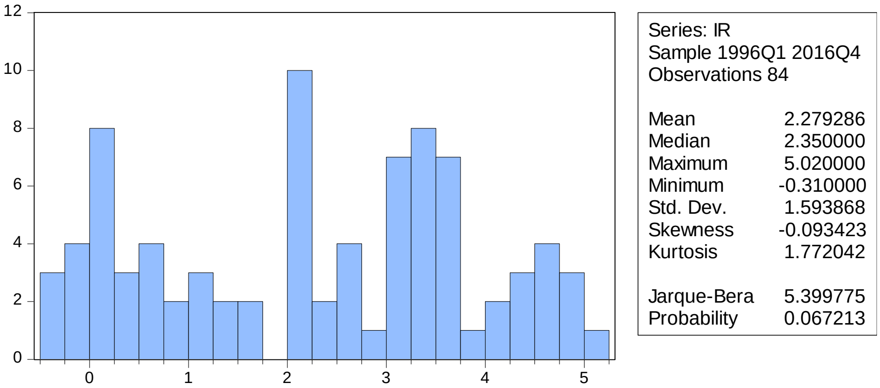
8
10
82
84
86
88
90
92
94
96
98
100
102
104
106
108
Series: CPI
Sample 1996Q1 2016Q4
Observations 84
Mean 94.65596
Median 93.90000
Maximum 108.1670
Minimum 81.10000
Std. Dev. 8.565671
Skewness 0.075873
Kurtosis 1.623349
Jarque-Bera 6.713677
Probability 0.034845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1
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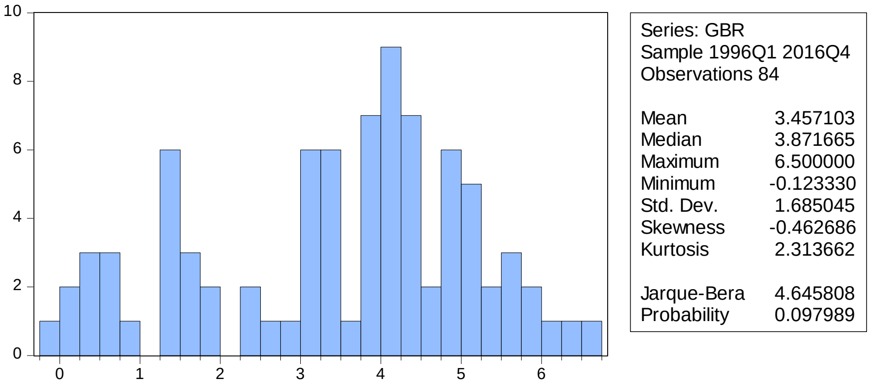
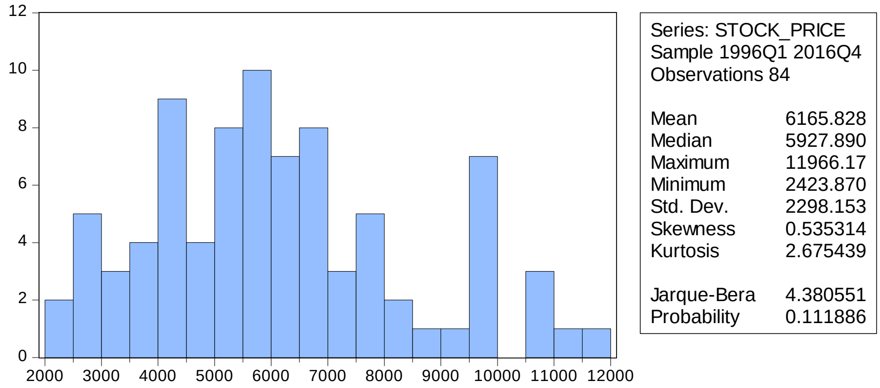
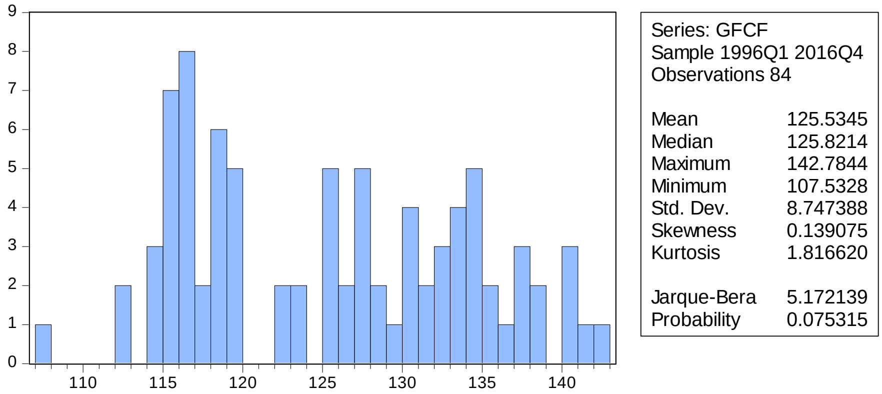
3
4
5
Series: IR
Sample 1996Q1 2016Q4
Observations 84
Mean 2.279286
Median 2.350000
Maximum 5.020000
Minimum -0.310000
Std. Dev. 1.593868
Skewness -0.093423
Kurtosis 1.772042
Jarque-Bera 5.399775
Probability 0.067213


0
2
4
6
8
10
0
1
2
3
4
5
6
Series: GBR
Sample 1996Q1 2016Q4
Observations 84
Mean 3.457103
Median 3.871665
Maximum 6.500000
Minimum -0.123330
Std. Dev. 1.685045
Skewness -0.462686
Kurtosis 2.313662
Jarque-Bera 4.645808
Probability 0.097989


Series: STOCK_PRICE
Sample 1996Q1 2016Q4
Observations 84
Mean 6165.828
Median 5927.890
Maximum 11966.17
Minimum 2423.870
Std. Dev. 2298.153
Skewness 0.535314
Kurtosis 2.675439
Jarque-Bera 4.380551
Probability 0.111886
0 2 4 6 8 10 12
2000 3000 4000 5000 6000 7000 8000 9000 10000 11000 12000


Series: GFCF
Sample 1996Q1 2016Q4
Observations 84
Mean 125.5345
Median 125.8214
Maximum 142.7844
Minimum 107.5328
Std. Dev. 8.747388
Skewness 0.139075
Kurtosis 1.816620
Jarque-Bera 5.172139
Probability 0.075315
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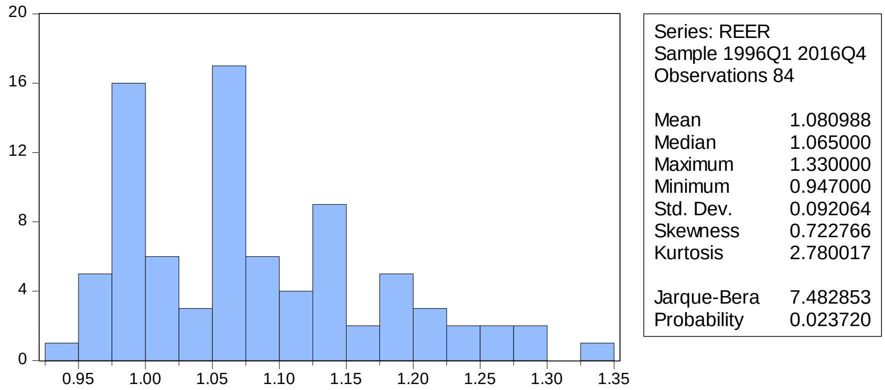
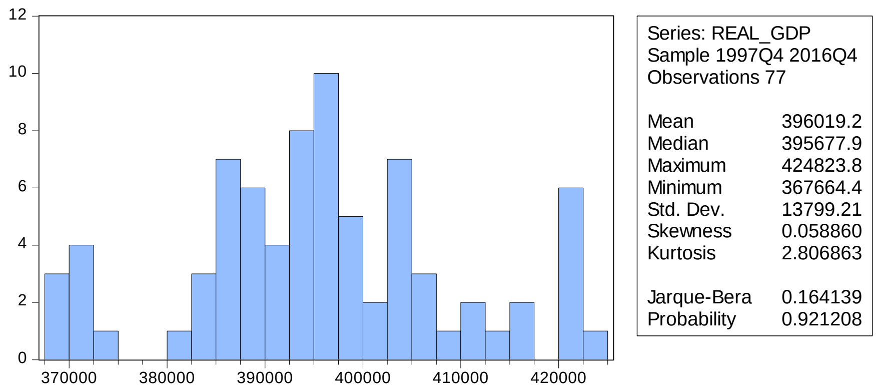
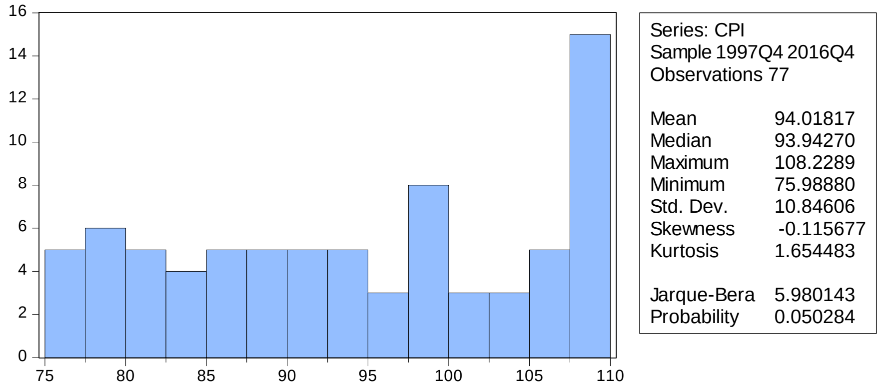
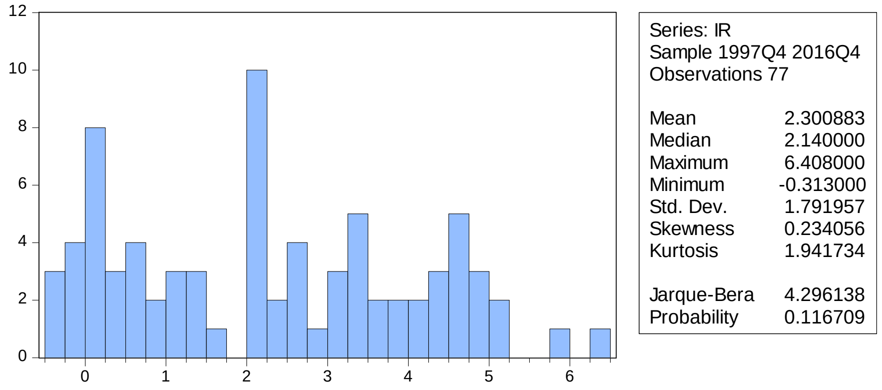
110 115 120 125 130 135 140


Series: REER
Sample 1996Q1 2016Q4
Observations 84
Mean 1.080988
Median 1.065000
Maximum 1.330000
Minimum 0.947000
Std. Dev. 0.092064
Skewness 0.722766
Kurtosis 2.780017
Jarque-Bera 7.482853
Probability 0.023720
0 4 8 12 16 20
0.95 1.00 1.05 1.10 1.15 1.20 1.25 1.30 1.35

1.5 Italy:


Series: REAL_GDP
Sample 1997Q4 2016Q4
Observations 77
Mean 396019.2
Median 395677.9
Maximum 424823.8
Minimum 367664.4
Std. Dev. 13799.21
Skewness 0.058860
Kurtosis 2.806863
Jarque-Bera 0.164139
Probability 0.921208
0 2 4 6 8 10 12
370000 380000 390000 400000 410000 420000


16
14
12
10
8
6
4
2
0
75
80
85
90
95
100
105
110
Series: CPI
Sample 1997Q4 2016Q4
Observations 77
Mean 94.01817
Median 93.94270
Maximum 108.2289
Minimum 75.98880
Std. Dev. 10.84606
Skewness -0.115677
Kurtosis 1.654483
Jarque-Bera 5.980143
Probability 0.050284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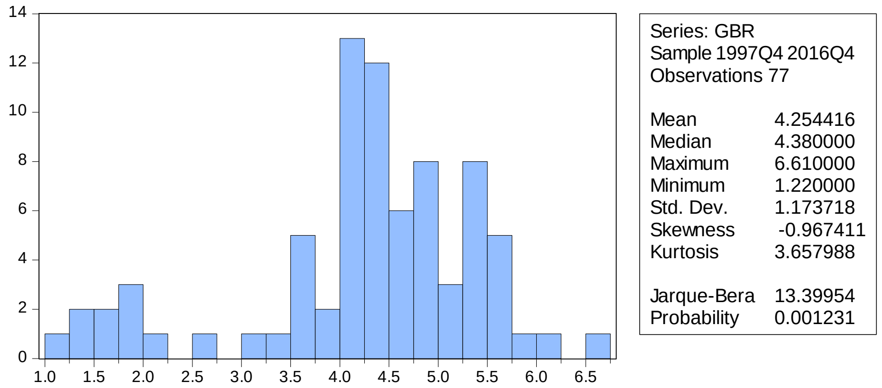
8
6
4
2
0
0
1
2
3
4
5
6
Series: IR
Sample 1997Q4 2016Q4
Observations 77
Mean 2.300883
Median 2.140000
Maximum 6.408000
Minimum -0.313000
Std. Dev. 1.791957
Skewness 0.234056
Kurtosis 1.941734
Jarque-Bera 4.296138
Probability 0.116709


14
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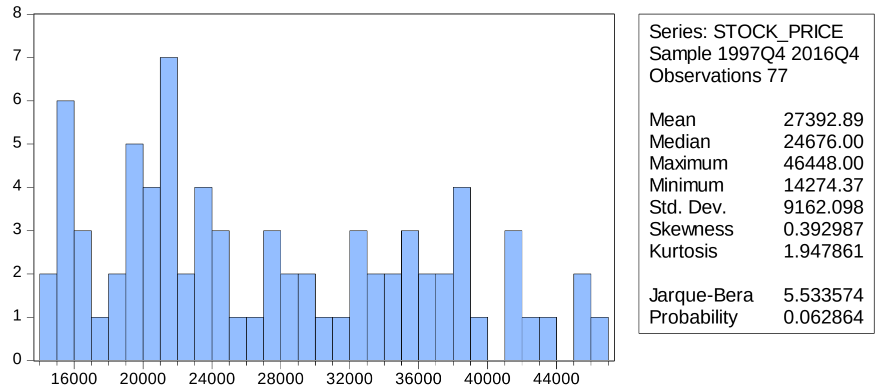
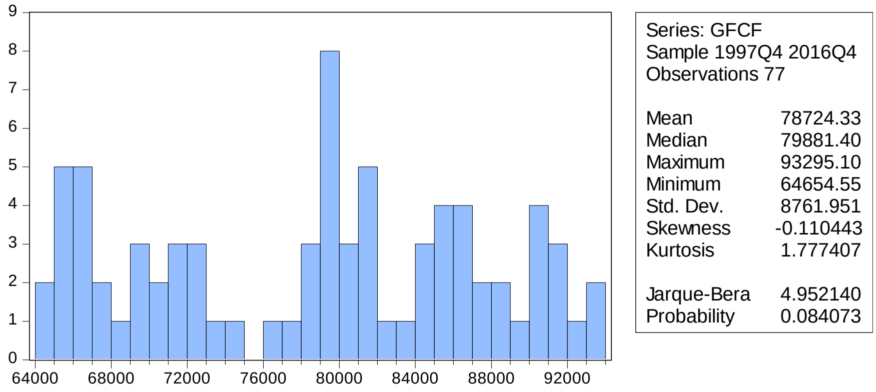
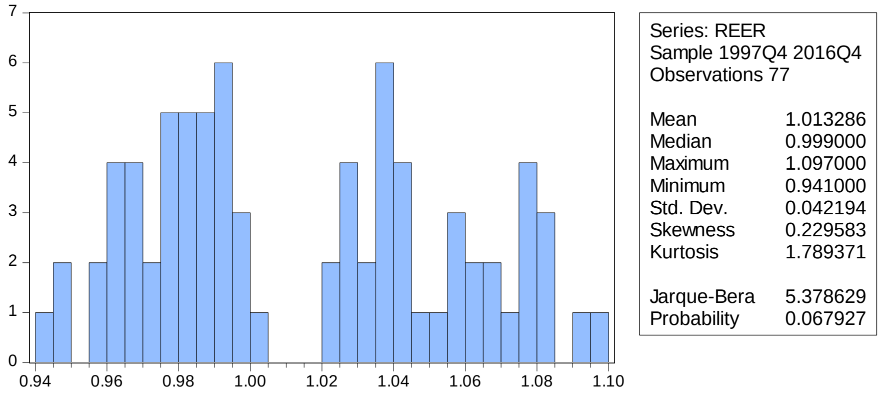
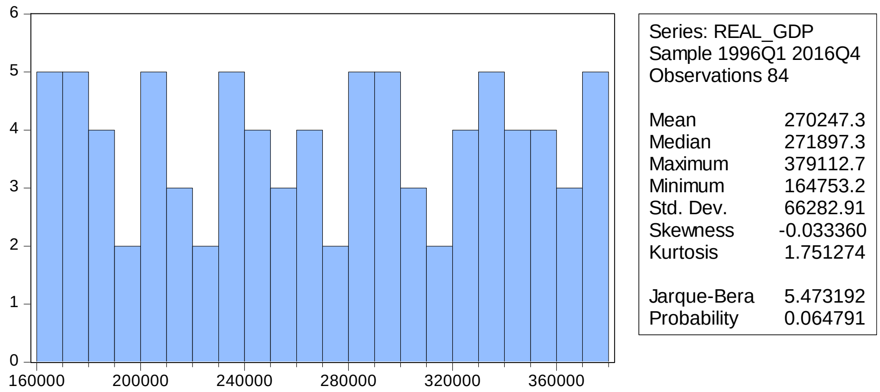
8
6
4
2
0
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
Series: GBR
Sample 1997Q4 2016Q4
Observations 77
Mean 4.254416
Median 4.380000
Maximum 6.610000
Minimum 1.220000
Std. Dev. 1.173718
Skewness -0.967411
Kurtosis 3.657988
Jarque-Bera 13.39954
Probability 0.001231

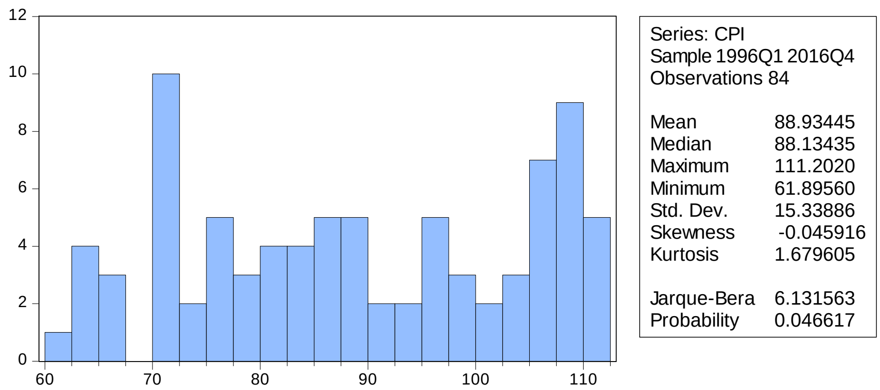

8
7
6
5
4
3
2
1
0
16000
20000
24000
28000
32000
36000
40000
44000
Series: STOCK_PRICE
Sample 1997Q4 2016Q4
Observations 77
Mean 27392.89
Median 24676.00
Maximum 46448.00
Minimum 14274.37
Std. Dev. 9162.098
Skewness 0.392987
Kurtosis 1.947861
Jarque-Bera 5.533574
Probability 0.062864

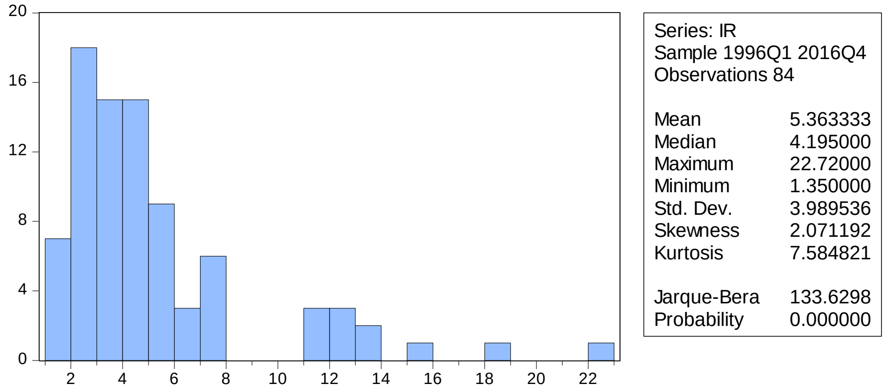


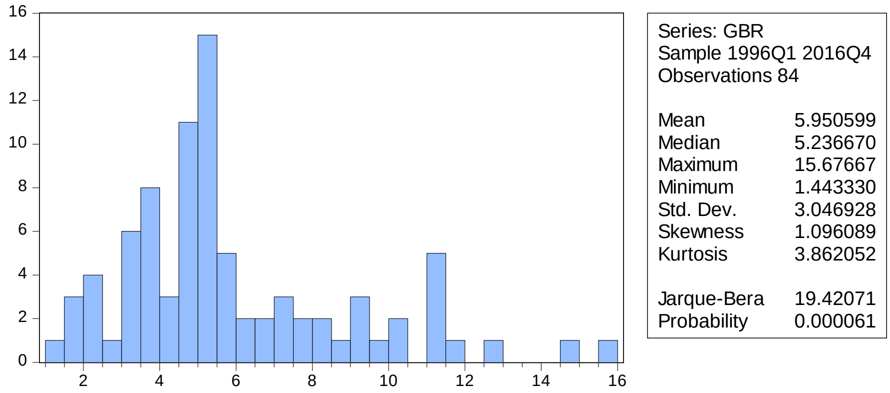


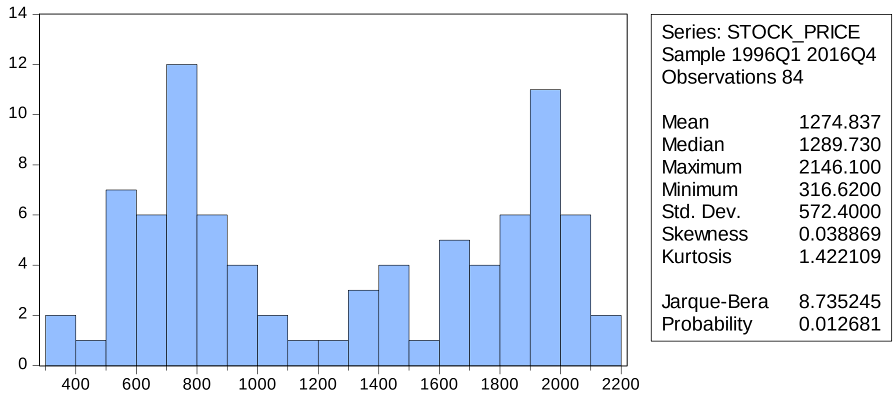
1.6 South Korea:

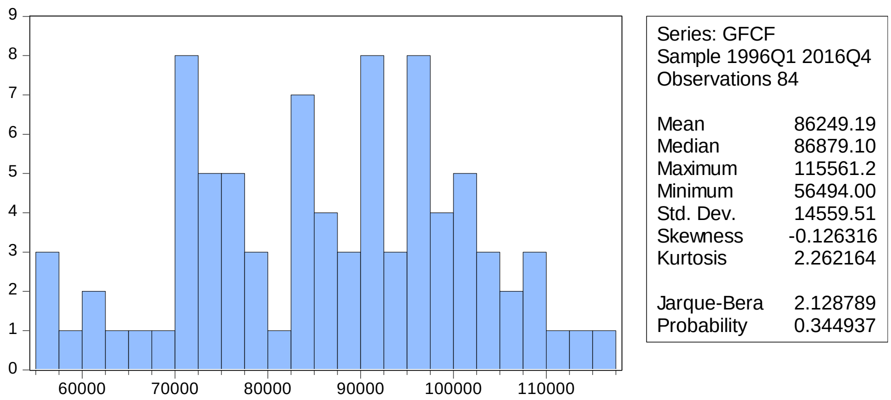


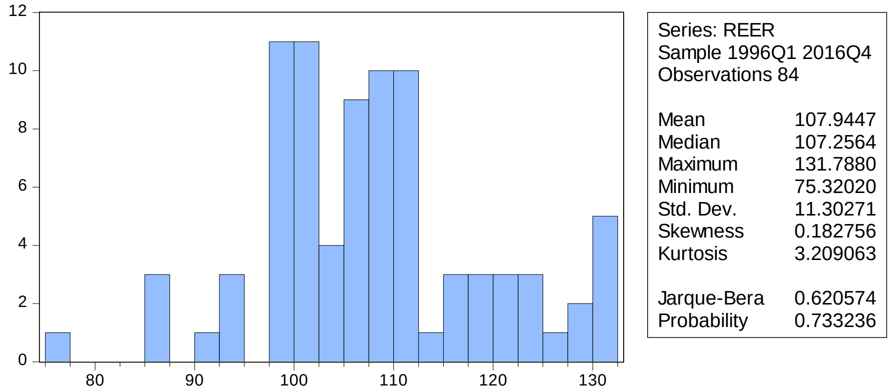



Series: IR
Sample 1996Q1 2016Q4
Observations 84
Mean 5.363333
Median 4.195000
Maximum 22.72000
Minimum 1.350000
Std. Dev. 3.989536
Skewness 2.071192
Kurtosis 7.584821
Jarque-Bera 133.6298
Probability 0.000000

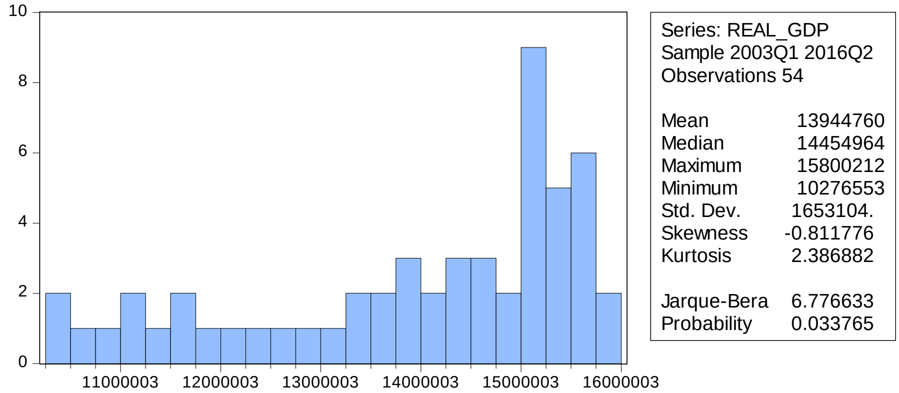

Series: GBR
Sample 1996Q1 2016Q4
Observations 84
Mean 5.950599
Median 5.236670
Maximum 15.67667
Minimum 1.443330
Std. Dev. 3.046928
Skewness 1.096089
Kurtosis 3.862052
Jarque-Bera 19.42071
Probability 0.000061

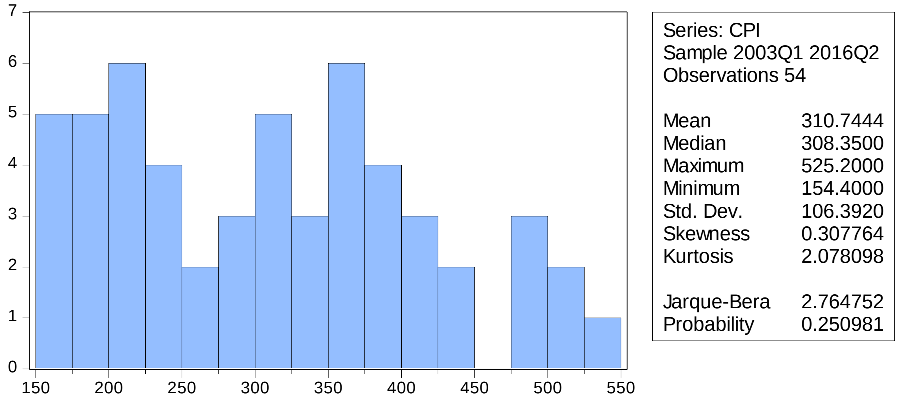

Series: STOCK_PRICE
Sample 1996Q1 2016Q4
Observations 84
Mean 1274.837
Median 1289.730
Maximum 2146.100
Minimum 316.6200
Std. Dev. 572.4000
Skewness 0.038869
Kurtosis 1.422109
Jarque-Bera 8.735245
Probability 0.012681


Series: GFCF
Sample 1996Q1 2016Q4
Observations 84
Mean 86249.19
Median 86879.10
Maximum 115561.2
Minimum 56494.00
Std. Dev. 14559.51
Skewness -0.126316
Kurtosis 2.262164
Jarque-Bera 2.128789
Probability 0.344937


Series: REER
Sample 1996Q1 2016Q4
Observations 84
Mean 107.9447
Median 107.2564
Maximum 131.7880
Minimum 75.32020
Std. Dev. 11.30271
Skewness 0.182756
Kurtosis 3.209063
Jarque-Bera 0.620574
Probability 0.733236
0 2 4 6 8 10 12
80 90 100 110 120 130

1.7 Russia:


Series: REAL_GDP
Sample 2003Q1 2016Q2
Observations 54
Mean 13944760
Median 14454964
Maximum 15800212
Minimum 10276553
Std. Dev. 1653104.
Skewness -0.811776
Kurtosis 2.386882
Jarque-Bera 6.776633
Probability 0.033765
0 2 4 6 8 10
11000003 12000003 13000003 14000003 15000003 16000003


Series: CPI
Sample 2003Q1 2016Q2
Observations 54
Mean 310.7444
Median 308.3500
Maximum 525.2000
Minimum 154.4000
Std. Dev. 106.3920
Skewness 0.307764
Kurtosis 2.078098
Jarque-Bera 2.764752
Probability 0.250981
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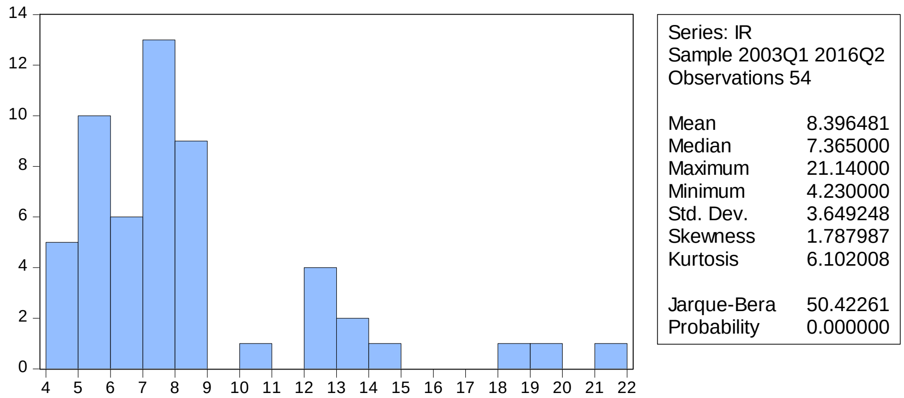
150 200 250 300 350 400 450 500 550


Series: IR
Sample 2003Q1 2016Q2
Observations 54
Mean 8.396481
Median 7.365000
Maximum 21.14000
Minimum 4.230000
Std. Dev. 3.649248
Skewness 1.787987
Kurtosis 6.102008
Jarque-Bera 50.42261
Probability 0.000000
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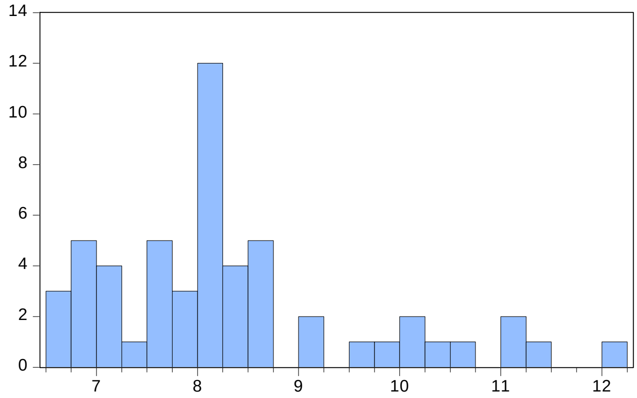
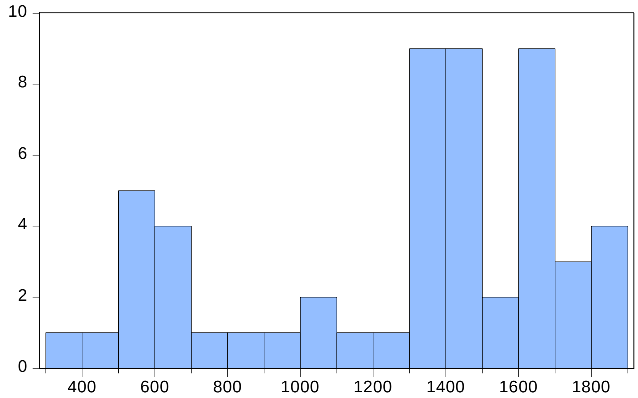
4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22



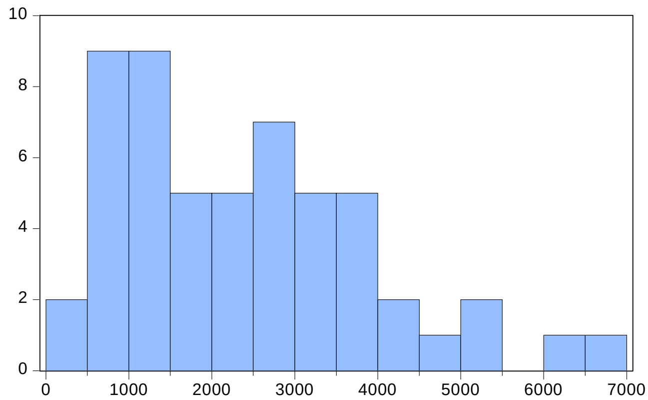
Series: GBR
Sample 2003Q1 2016Q2
Observations 54

Mean	8.351296
Median	8.145000
Maximum	12.11000
Minimum	6.680000
Std. Dev.	1.310433
Skewness	1.025826
Kurtosis	3.496574
Jarque-Bera	10.02569
Probability	0.006652



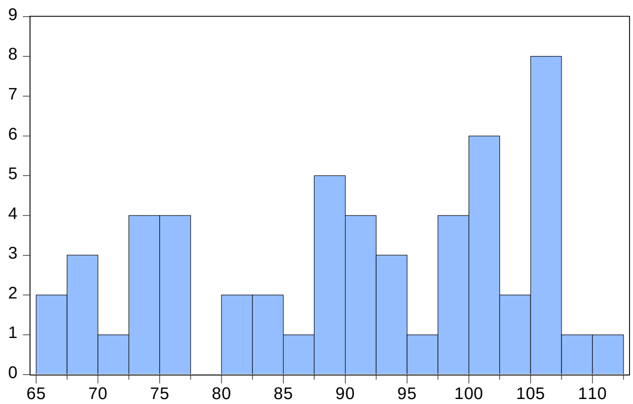
Series: STOCK_PRICE
Sample 2003Q1 2016Q2
Observations 54

Mean	1280.571
Median	1399.420
Maximum	1891.090
Minimum	325.5600
Std. Dev.	444.3543
Skewness	-0.671676
Kurtosis	2.202595
Jarque-Bera	5.491017
Probability	0.064216



Series: GFCF
Sample 2003Q1 2016Q2
Observations 54

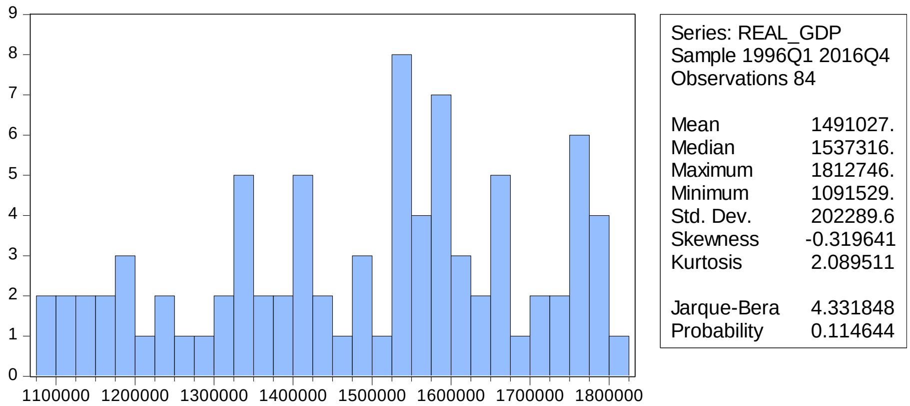
Mean	2407.722
Median	2154.500
Maximum	6938.000
Minimum	376.0000
Std. Dev.	1530.027
Skewness	0.910800
Kurtosis	3.531206
Jarque-Bera	8.100913
Probability	0.017414

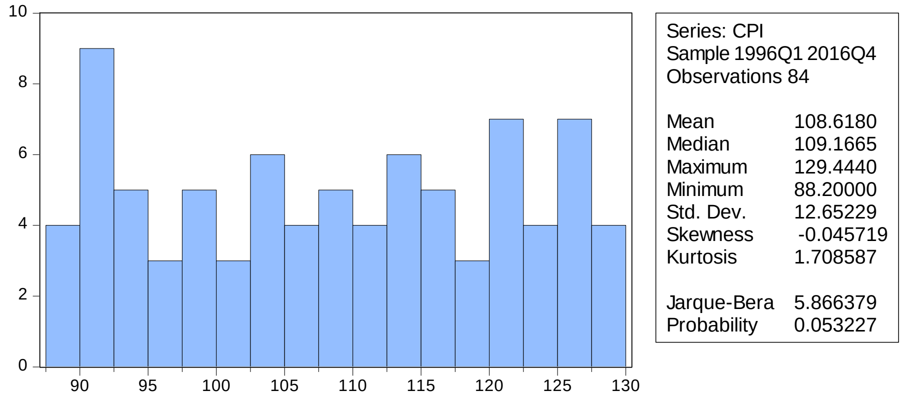


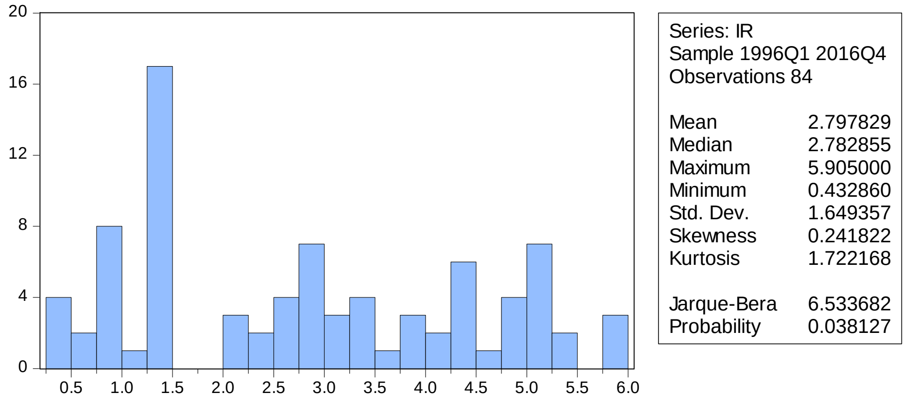
Series: REER
Sample 2003Q1 2016Q2
Observations 54

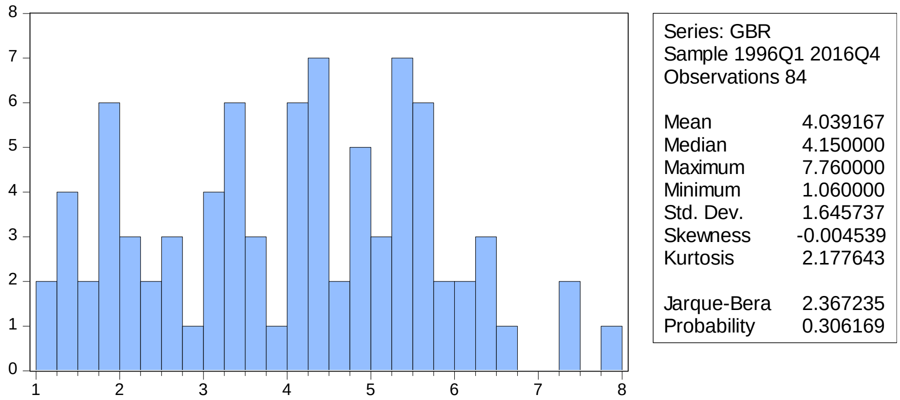
Mean	90.51566
Median	92.06725
Maximum	110.2009
Minimum	65.60550
Std. Dev.	13.24541
Skewness	-0.381621
Kurtosis	1.852346
Jarque-Bera	4.274209
Probability	0.117996

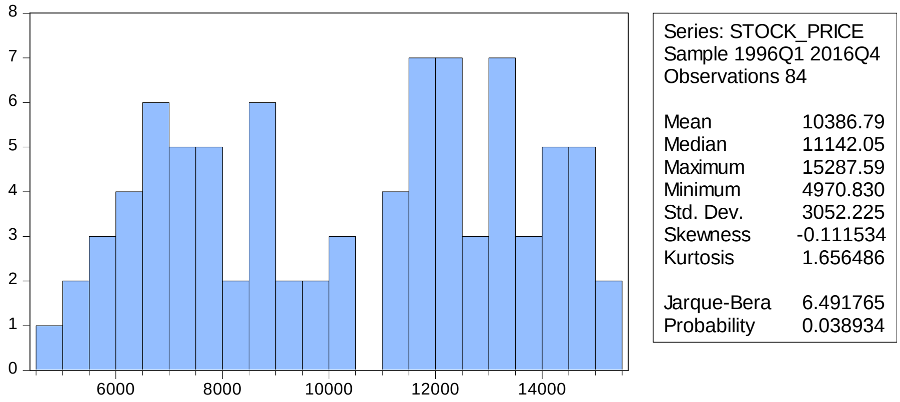
1.8 Canada:

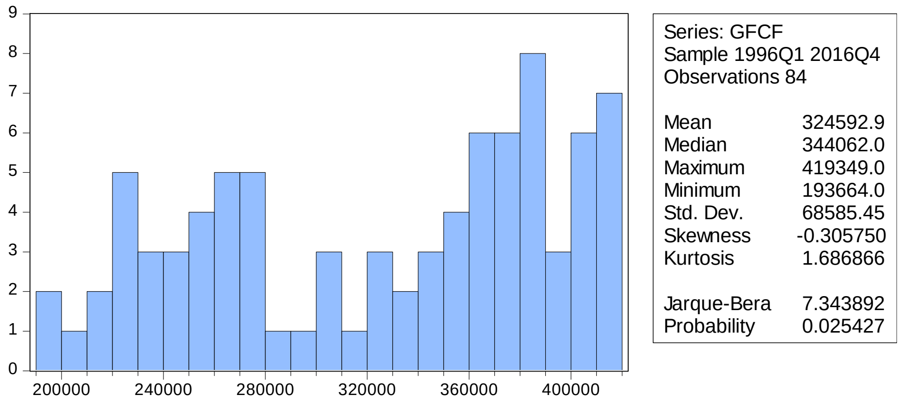

Series: REAL_GDP
Sample 1996Q1 2016Q4
Observations 84
Mean 1491027.
Median 1537316.
Maximum 1812746.
Minimum 1091529.
Std. Dev. 202289.6
Skewness -0.319641
Kurtosis 2.089511
Jarque-Bera 4.331848
Probability 0.114644

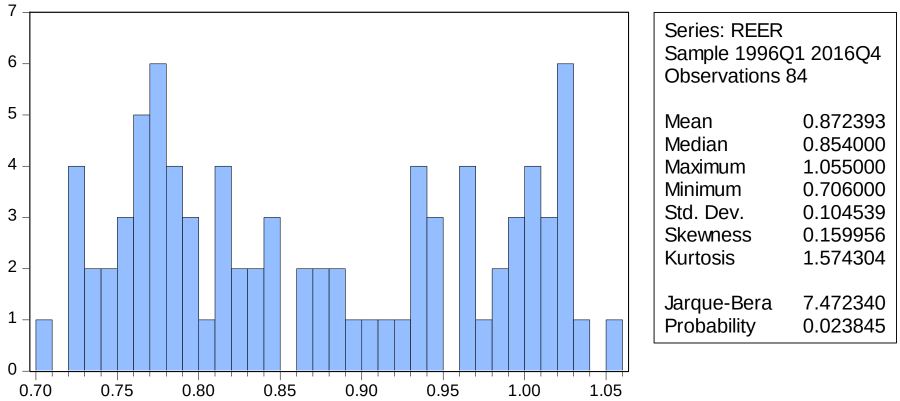

Series: CPI
Sample 1996Q1 2016Q4
Observations 84
Mean 108.6180
Median 109.1665
Maximum 129.4440
Minimum 88.20000
Std. Dev. 12.65229
Skewness -0.045719
Kurtosis 1.708587
Jarque-Bera 5.866379
Probability 0.053227


Series: IR
Sample 1996Q1 2016Q4
Observations 84
Mean 2.797829
Median 2.782855
Maximum 5.905000
Minimum 0.432860
Std. Dev. 1.649357
Skewness 0.241822
Kurtosis 1.722168
Jarque-Bera 6.533682
Probability 0.038127

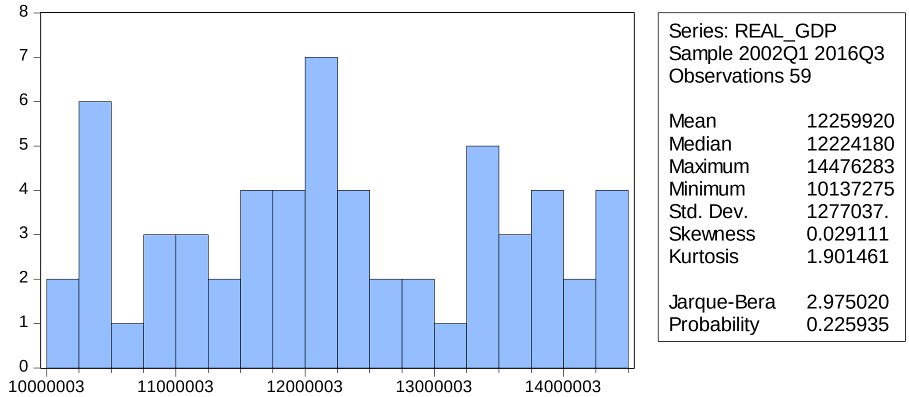

Series: GBR
Sample 1996Q1 2016Q4
Observations 84
Mean 4.039167
Median 4.150000
Maximum 7.760000
Minimum 1.060000
Std. Dev. 1.645737
Skewness -0.004539
Kurtosis 2.177643
Jarque-Bera 2.367235
Probability 0.306169

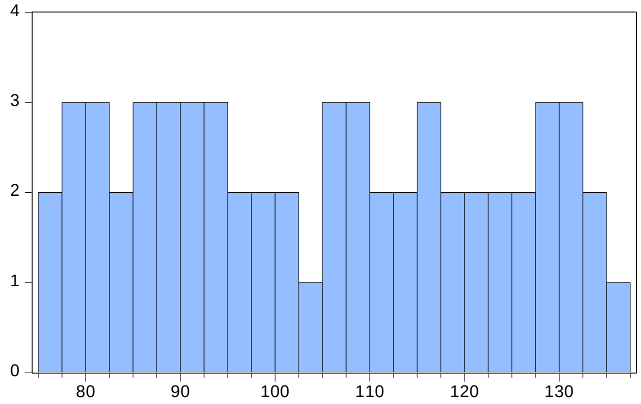

Series: STOCK_PRICE
Sample 1996Q1 2016Q4
Observations 84
Mean 10386.79
Median 11142.05
Maximum 15287.59
Minimum 4970.830
Std. Dev. 3052.225
Skewness -0.111534
Kurtosis 1.656486
Jarque-Bera 6.491765
Probability 0.038934


Series: GFCF
Sample 1996Q1 2016Q4
Observations 84
Mean 324592.9
Median 344062.0
Maximum 419349.0
Minimum 193664.0
Std. Dev. 68585.45
Skewness -0.305750
Kurtosis 1.686866
Jarque-Bera 7.343892
Probability 0.025427

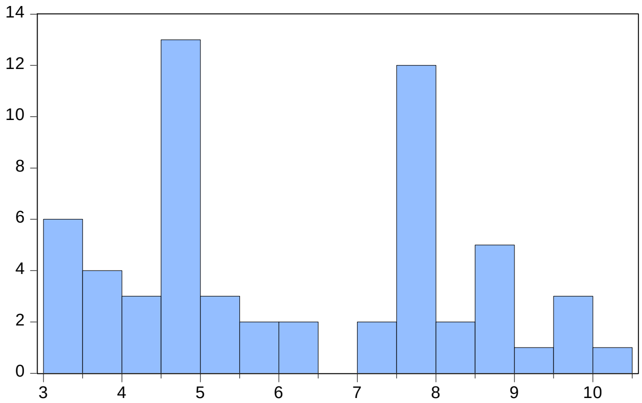

Series: REER
Sample 1996Q1 2016Q4
Observations 84
Mean 0.872393
Median 0.854000
Maximum 1.055000
Minimum 0.706000
Std. Dev. 0.104539
Skewness 0.159956
Kurtosis 1.574304
Jarque-Bera 7.472340
Probability 0.023845

1.9 Mexico:

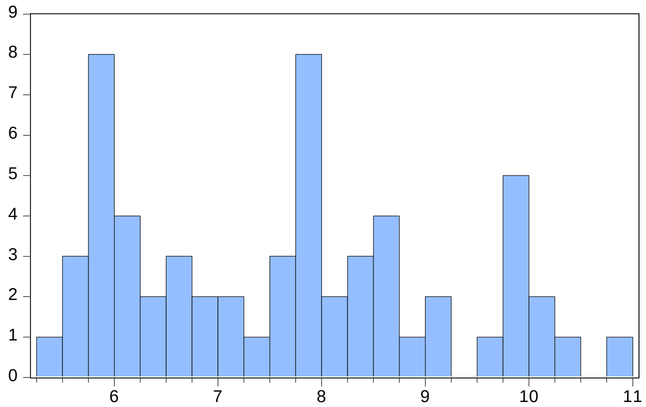

Series: REAL_GDP
Sample 2002Q1 2016Q3
Observations 59
Mean 12259920
Median 12224180
Maximum 14476283
Minimum 10137275
Std. Dev. 1277037.
Skewness 0.029111
Kurtosis 1.901461
Jarque-Bera 2.975020
Probability 0.225935



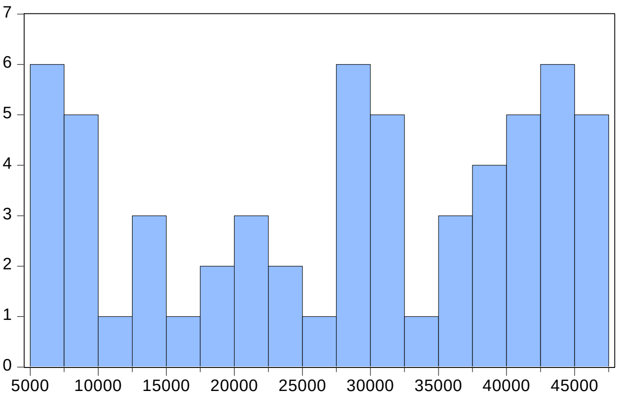
Series: CPI	
Sample 2002Q1 2016Q3	
Observations 59	
Mean	104.8480
Median	105.0650
Maximum	135.0680
Minimum	75.75900
Std. Dev.	18.03466
Skewness	0.084519
Kurtosis	1.716428
Jarque-Bera	4.120490
Probability	0.127423



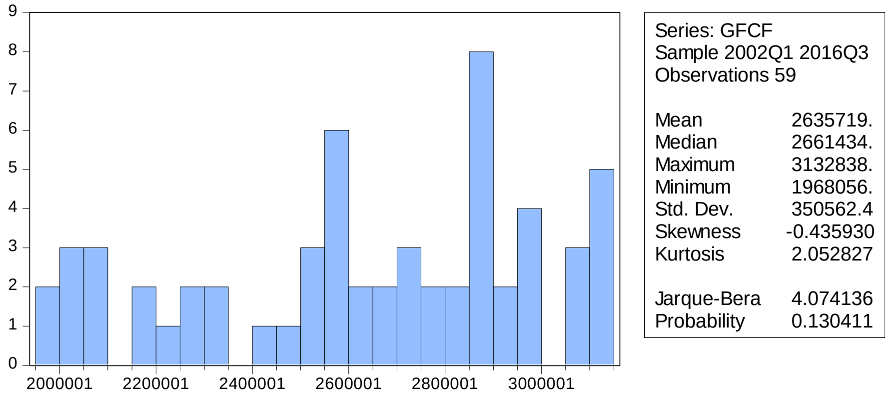
Series: IR	
Sample 2002Q1 2016Q3	
Observations 59	
Mean	6.198305
Median	5.580000
Maximum	10.15000
Minimum	3.300000
Std. Dev.	2.061676
Skewness	0.214809
Kurtosis	1.682979
Jarque-Bera	4.717825
Probability	0.094523

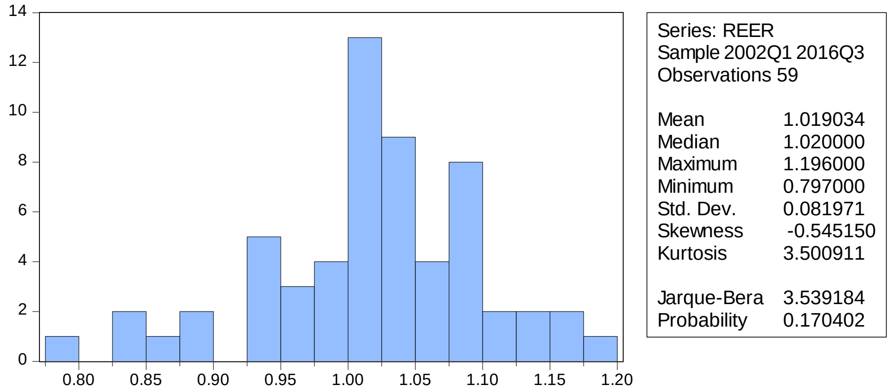


Series: GBR	
Sample 2002Q1 2016Q3	
Observations 59	
Mean	7.631875
Median	7.750120
Maximum	10.75000
Minimum	5.280000
Std. Dev.	1.503542
Skewness	0.284609
Kurtosis	1.952405
Jarque-Bera	3.494436
Probability	0.174258

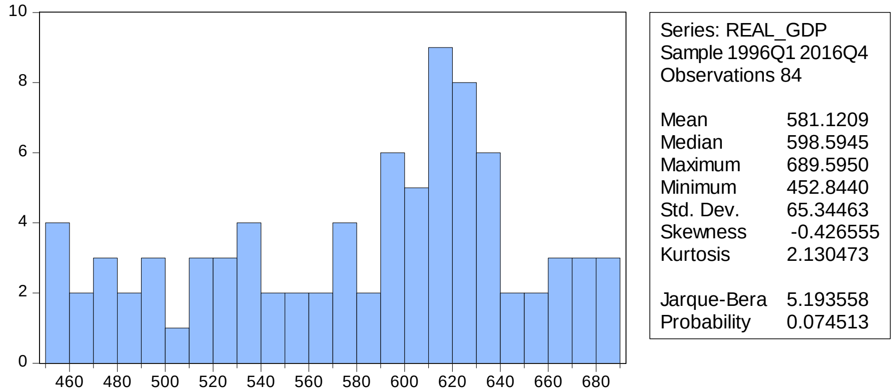


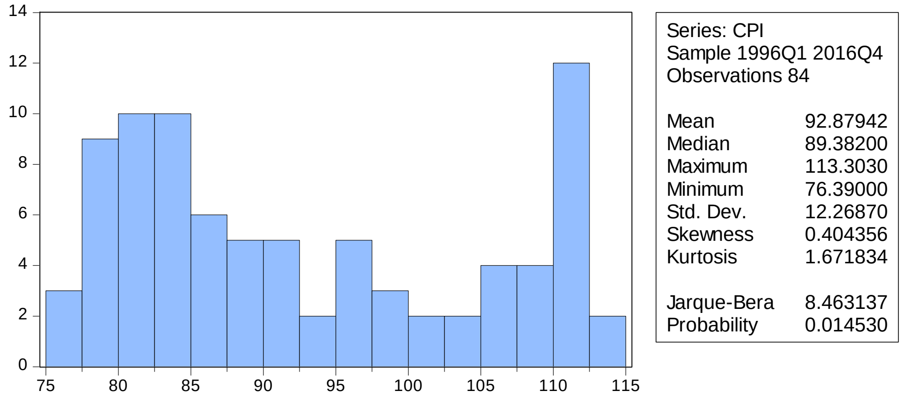
Series: STOCK_PRICE	
Sample 2002Q1 2016Q3	
Observations 59	
Mean	27950.79
Median	29868.62
Maximum	47368.65
Minimum	5866.030
Std. Dev.	13539.50
Skewness	-0.292606
Kurtosis	1.711815
Jarque-Bera	4.921322
Probability	0.085378

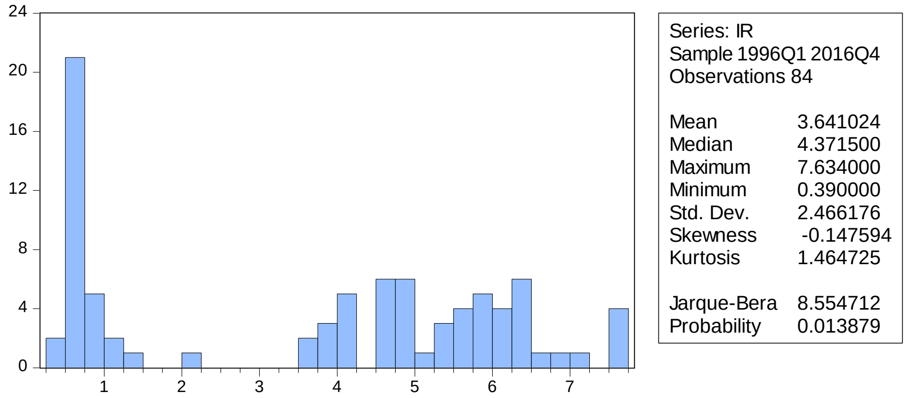

Series: GFCF
Sample 2002Q1 2016Q3
Observations 59
Mean 2635719.
Median 2661434.
Maximum 3132838.
Minimum 1968056.
Std. Dev. 350562.4
Skewness -0.435930
Kurtosis 2.052827
Jarque-Bera 4.074136
Probability 0.130411


Series: REER
Sample 2002Q1 2016Q3
Observations 59
Mean 1.019034
Median 1.020000
Maximum 1.196000
Minimum 0.797000
Std. Dev. 0.081971
Skewness -0.545150
Kurtosis 3.500911
Jarque-Bera 3.539184
Probability 0.170402

1.10 <u>U.K:</u>


Series: REAL_GDP
Sample 1996Q1 2016Q4
Observations 84
Mean 581.1209
Median 598.5945
Maximum 689.5950
Minimum 452.8440
Std. Dev. 65.34463
Skewness -0.426555
Kurtosis 2.130473
Jarque-Bera 5.193558
Probability 0.074513


Series: CPI
Sample 1996Q1 2016Q4
Observations 84
Mean 92.87942
Median 89.38200
Maximum 113.3030
Minimum 76.39000
Std. Dev. 12.26870
Skewness 0.404356
Kurtosis 1.671834
Jarque-Bera 8.463137
Probability 0.014530


Series: IR
Sample 1996Q1 2016Q4
Observations 84
Mean 3.641024
Median 4.371500
Maximum 7.634000
Minimum 0.390000
Std. Dev. 2.466176
Skewness -0.147594
Kurtosis 1.464725
Jarque-Bera 8.554712
Probability 0.013879
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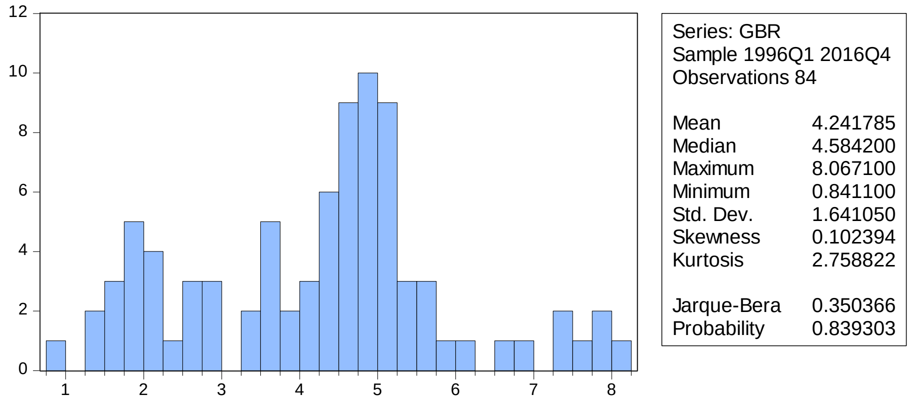
8
12
16
20
24
1
2
3
4
5
6
7


Series: GBR
Sample 1996Q1 2016Q4
Observations 84
Mean 4.241785
Median 4.584200
Maximum 8.067100
Minimum 0.841100
Std. Dev. 1.641050
Skewness 0.102394
Kurtosis 2.758822
Jarque-Bera 0.350366
Probability 0.839303
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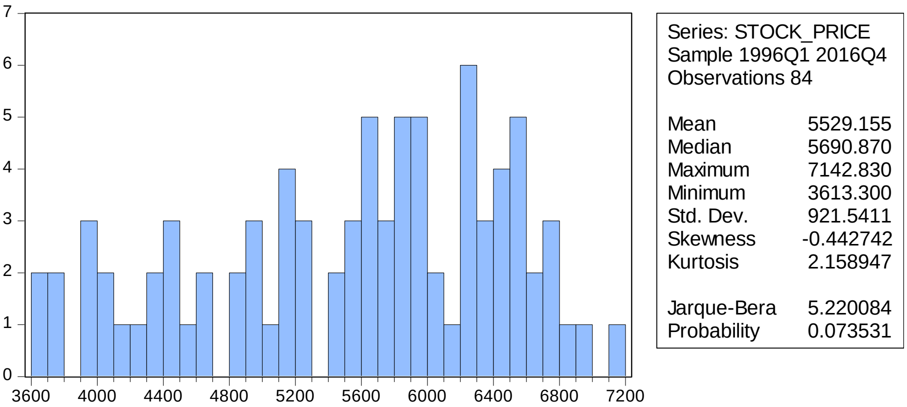
2
4
6
8
10
12
1
2
3
4
5
6
7
8


Series: STOCK_PRICE
Sample 1996Q1 2016Q4
Observations 84
Mean 5529.155
Median 5690.870
Maximum 7142.830
Minimum 3613.300
Std. Dev. 921.5411
Skewness -0.442742
Kurtosis 2.158947
Jarque-Bera 5.220084
Probability 0.073531
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3
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5
6
7
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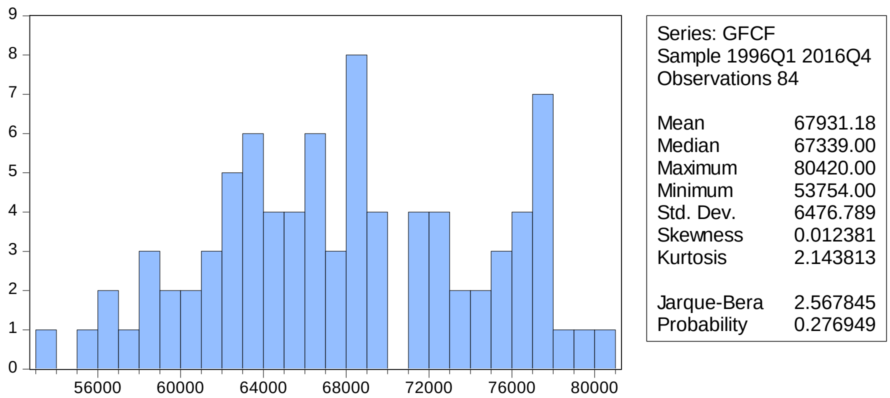
4400
4800
5200
5600
6000
6400
6800
7200


Series: GFCF
Sample 1996Q1 2016Q4
Observations 84
Mean 67931.18
Median 67339.00
Maximum 80420.00
Minimum 53754.00
Std. Dev. 6476.789
Skewness 0.012381
Kurtosis 2.143813
Jarque-Bera 2.567845
Probability 0.276949
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5
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7
8
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60000
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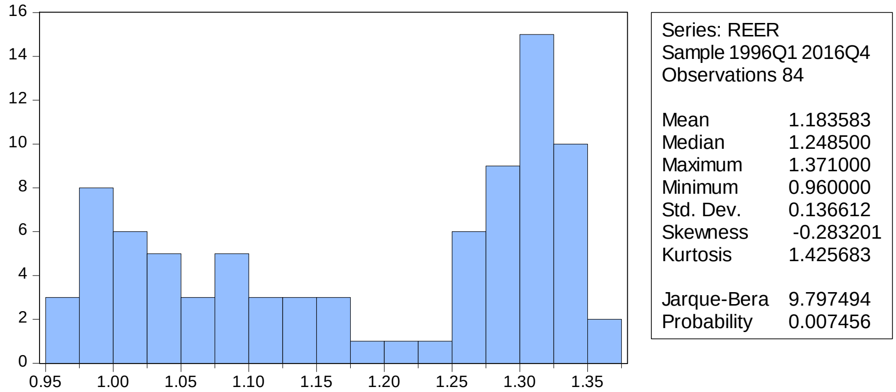
76000
80000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8
6
4
2
0
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1.00
1.05
1.10
1.15
1.20
1.25
1.30
1.35
Series: REER
Sample 1996Q1 2016Q4
Observations 84
Mean 1.183583
Median 1.248500
Maximum 1.371000
Minimum 0.960000
Std. Dev. 0.136612
Skewness -0.283201
Kurtosis 1.425683
Jarque-Bera 9.797494
Probability 0.007456

Appendix 4- Unit root tests.

Table 2.1 Results of unit root tests. Price variables.

	Models with constant and trend	Models with constant	Models without constant
Real oil price in first log-differences			
	-8.319456***	-8.328214***	-8.365427***
Real oil price in level			
	-1.774737	-1.75172	-1.004586
CPI in first log-differences			
NOR	-9.557748***	-9.612974***	-2.225918**
USA	-7.302313***	-7.197122***	-4.387179***
JPN	-6.957238***	-6.976684***	-7.003280***
GER	-8.008197***	-8.029388***	-1,809607*
ITA	-3.189408	-2.677152*	-1.525412
SK	-7.498413***	-6.791933***	-2.866976***
RUS	-5.706941***	-5.689631***	-0.931662
CAN	-8.216179***	-8.215169***	-1.292114
MEX	-3.264439*	-2.749491*	-1.211185
UK	-4.937799***	-4.917122***	-0.967837
CPI in levels			
NOR	-2.735411	-0.457593	8.947406
USA	-0.674740	-1.671717	9.245498
JPN	-1.501814	-1.581238	0.360263
GER	-1.186211	-0.909861	10.18988
ITA	-0.747230	-1.780197	2.097749
SK	-0.719307	-3.620388***	4.768417
RUS	-1.697972	-1.148853	12.21264
CAN	-1.400841	-1.009134	10.06644
MEX	-0.491766	-2.936727**	2.337162
UK	-1.646296	0.325232	3.966893
Stock prices in first-log differences			
NOR	-7.803229***	-7.855711***	-7.726719***
USA	-8.299612***	-8.329973***	-8.226823***
JPN	-8.020821***	-7.772937***	-7.817324***
GER	-9.114320***	-9.168016***	-9.058084***
ITA	-8.012992***	-8.116498***	-8.130491***
SK	-8.674971***	-8.543892***	-8.561111***
RUS	-6.027993***	-6.057116***	-6.029966***
CAN	-7.714340***	-7.737427***	-7.645731***
MEX	-6.430728***	-6.369938***	-5.956662***
UK	-9.013633***	-9.066886***	-9.048677***
Stock prices in levels			
NOR	-2.463622	-1.246083	-1.365747
USA	-2.823623	-2.185771	1.251784
JPN	-1.748963	-2.089040	-0.704761
GER	-2.500212	-1.874654	1.137859
ITA	-2.803991	-1.348039	-0.350414
SK	-1.523478	-2.028222	0.427179
RUS	-2.779502	-2.982791**	1.099616
CAN	-3.575888**	-1.939682	1.243554
MEX	-1.280517	-1.748208	2.343118
UK	-2.420307	-2.358929	0.456752

Table 2.2 Results of unit root tests. Output and exchange rate variables.

	Models with constant and trend	Models with constant	Models without constant
Real GDP in first log-differences			
NOR	-12.54011 ***	-12.14463***	10.03814***
USA	-6.211308***	-5.913141***	2.659673***
JPN	-8.001983***	-8.047283***	7.866233***
GER	-6.105819***	-6.150290***	5.578839***
ITA	-4.229964***	-4.032996***	3.998218***
SK	-6.241498***	-6.199545***	4.744344***
RUS	-4.946558***	-4.248783***	3.249401***
CAN	-1.221877	-0.547304	-1.089926
MEX	-4.775194***	-4.820356***	3.433168***
UK	-4.306576***	-4.178331***	3.042666***
Real GDP in levels			
NOR	-2.798760	-2.404488	3.679239
USA	-2.272174	-2.270815	3.794907
JPN	-2.454241	-0.836509	1.679227
GER	-3.273013*	-0.792059	2.260757
ITA	-2.733432	-2.912277**	0.664458
SK	-2.146562	-1.125750	3.529138
RUS	-1.427583	-2.683311*	1.665623
CAN	1.017801	-1.570437	-0.692067
MEX	-3.043818	-0.636686	2.960936
UK	-2.198147	-1.683537	2.692219
REER in first log-differences			
NOR	-6,677888***	-6,590395***	6,606103***
USA	-5.850690***	-5.850176***	5.886853***
JPN	-4.055939***	-4.076246***	4.077374***
GER	-6.930418***	-6.874957***	6.728629***
ITA	-7.166145***	-7.159248***	7.204734***
SK	-7.787243***	-7.808611***	7.853615***
RUS	-9.504041***	-8.651757***	8.722526***
CAN	-6.763458***	-6.737337***	6.778681***
MEX	-7.026678***	-7.059991***	6.952108***
UK	-6.038160***	-5.838044***	5.855762***
REER in levels			
NOR	-1.470299	-1.528755	-1.454060
USA	-1.446306	-1.411134	-0.877018
JPN	-3.112595	-1.670785	-0.678145
GER	-2.878290	-2.082499	-2.443882**
ITA	-2.007376	-1.528127	-1.526968
SK	-2.472456	-2.494993	-0.236137
RUS	-1.320898	-2.080007	0.283485
CAN	-1.507610	-1.619694	-1.106401
MEX	-2.131680	-1.387293	-1.666797*
UK	-2.978203	-1.008093	-0.943534
GFCF in first log-differences			
NOR	-1.092226	-1.003808	-1.136226
USA	-4.105658***	-4.080449***	3.875059***
JPN	-7.367972***	-7.088184***	7.034642***
GER	-9.256642***	-9.325266***	9.272537***
ITA	-6.207708***	-5.722129***	5.766066***
SK	-6.616891***	-6.616005***	6.452720***
RUS	-3.070187	-2.551751	-1.702770*
CAN	-5.325153***	-4.840144***	4.449965***
MEX	-4.332966***	-4.246225***	3.842718***
UK	-8.888551***	-8.945995***	8.881960***
GFCF in levels			
NOR	0.804191	-1.258995	-0.938784
USA	-2.340012	-2.174311	1.217905
JPN	-1.834699	-2.358895	-1.089566
GER	-2.406219	-1.740721	1.389995
ITA	-2.273905	-1.007155	0.027527
SK	-3.212816*	-0.538016	1.314626
RUS	-2.112465	-1.596294	0.920371
CAN	-1.810383	-2.525613	1.719885
MEX	-2.428565	-1.740601	1.654746
UK	-2.129342	-1.662606	1.165102

Table 2.3 Results of unit root tests. Monetary variables.

	Models with constant and trend	Models with constant	Models without constant
Interbank rate in first log-differences			
NOR	-5.351426***	-5.381197***	-5.377235***
USA	-4.738560***	-4.755798***	-4.734201***
JPN	-7.113976***	-7.158860***	-7.163927***
GER	-4.927994***	-4.933646***	-4.920293***
ITA	-4.421340***	-4.451002***	-4.393665***
SK	-7.994583***	-7.986473***	-7.902749***
RUS	-6.387691***	-6.414497***	-6.472870***
CAN	-6.011330***	-6.051099***	-6.046217***
MEX	-4.920405***	-4.964152***	-4.941522***
UK	-4.807805***	-4.831468***	4.789116***
Interbank rate in levels			
NOR	-3.599517**	-2.223233	-1.289635
USA	-2.5838064	-1.796010	-1.632690*
JPN	-2.203602	-2.106118	-1.859883*
GER	-3.197442*	-1.653015	-1.402570
ITA	-3.696656**	-2.200643	-1.975213**
SK	-2.820246	-2.355877	-2.273047**
RUS	-2.850577	-2.525353	-0.793570
CAN	-3.108199	-1.830771	-1.437067
MEX	-3.608103**	-1.753841	-0.845316
UK	-3.330458*	-1.319593	-1.350183
Government bond rate in first log-differences			
NOR	-7,801058***	-7,864469***	-7,646185***
USA	-7.723306***	-7.770131***	-7.523229***
JPN	-9.350739***	-9.356621***	-9.136865***
GER	-7.039440***	-7.078144***	-6.598495***
ITA	-6.867278***	-6.868414***	-6.845899***
SK	-7.715053***	-7.750374***	-7.445102***
RUS	-7.593301***	-7.750313***	-7.805840***
CAN	-8.302373***	-8.304918***	-7.804254***
MEX	-7.066254***	-7.129260***	-7.051047***
UK	-6.982896***	-7.009006***	-6.678143***
Government bond rate in levels			
NOR	-2.451959	-0.756316	-1.882715*
USA	-3.864452**	-1.068475	-1.475203
JPN	-2.973936	-2.369542	-2.311450**
GER	-3.057778	-0.488600	-2.194525**
ITA	-1.434633	-0.931279	-1.548465
SK	-1.975959	-1.213559	-2.135969**
RUS	-3.202210*	-2.332678	-0.471347
CAN	-4.516169***	-1.272679	-2.637345***
MEX	-3.370159*	-1.341604	-1.394077
UK	-3.639622**	-1.902453	-2.391129**

Critical levels for ADF test are the following:

In the model with constant and trend: -4.07% (1% level), -3.46 (5% level) and -3.16 (10% level)

In the model without constant: -2.59 (1%), -1.94 (5%) and -1.62 (10%)

1% level ***

5% level **

10% level *

Example: *** means that the null hypothesis of a unit root is rejected at a 1% level

Appendix 5 - Lag selection tests of the best performing models

Table 3.1 Lag selection test for asymmetric model of Mexico.

VAR Lag Order Selection Criteria
Endogenous variables: GDP_LOG_ UP DOWN CPI_LOG_ IR GBR STOCK_PRICES_LOG_ GFCF_LOG_ REER_LOG_
Exogenous variables: C
Date: 08/17/17 Time: 18:49
Sample: 2002Q1 2016Q3
Included observations: 54

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1001.142	NA	8.90e-28	-36.74598	-36.41448*	-36.61814*
1	1094.488	152.1210*	5.85e-28*	-37.20328	-33.88830	-35.92482
2	1149.664	71.52360	1.94e-27	-36.24681	-29.94836	-33.81774
3	1254.132	100.5989	1.68e-27	-37.11600	-27.83407	-33.53632
4	**1357.792**	**65.26773**	**4.22e-27**	**-37.95527***	**-25.68987**	**-33.22499**

Table 3.2 Lag selection test for asymmetric model of Norway.

VAR Lag Order Selection Criteria
Endogenous variables: GDP_LOG_ UP DOWN CPI_LOG_ IR GBR STOCK_PRICES_LOG_ GFCF_LOG_ REER_LOG_
Exogenous variables: C
Date: 08/17/17 Time: 17:58
Sample: 1996Q1 2016Q4
Included observations: 79

Lag	LogL	LR	FPE	AIC	SC	HQ
0	979.1187	NA	1.74e-22	-24.55997	-24.29003*	-24.45182*
1	**1074.469**	**166.5609***	**1.23e-22***	**-24.92326***	**-22.22389**	**-23.84181**
2	1141.764	102.2205	1.87e-22	-24.57630	-19.44750	-22.52155
3	1218.074	98.52705	2.58e-22	-24.45757	-16.89934	-21.42951
4	1310.427	98.19782	2.96e-22	-24.74499	-14.75731	-20.74362

Table 3.3 Lag selection test for asymmetric model of Russia.

VAR Lag Order Selection Criteria
Endogenous variables: GDP_LOG_ UP DOWN CPI_LOG_ IR GBR STOCK_PRICES_LOG_ GFCF_LOG_ REER_LOG_
Exogenous variables: C
Date: 08/17/17 Time: 18:53
Sample: 2003Q1 2016Q2
Included observations: 49

Lag	LogL	LR	FPE	AIC	SC	HQ
0	564.0150	NA	1.17e-21	-22.65367	-22.30620	-22.52184
1	673.3372	174.0231	3.89e-22	-23.80968	-20.33491	-22.49136
2	728.0564	67.00313	1.59e-21	-22.73700	-16.13493	-20.23218
3	936.5454	178.7049	2.42e-23	-27.94063	-18.21127	-24.24932
4	**1204.499**	**131.2425***	**1.80e-25***	**-35.57138***	**-22.71473***	**-30.69359***

Table 3.4 Lag selection test for asymmetric model of Canada.

VAR Lag Order Selection Criteria
Endogenous variables: GDP_LOG_ UP DOWN CPI_LOG_ IR GBR STOCK_PRICES_LOG_ GFCF_LOG_ REER_LOG_
Exogenous variables: C
Date: 08/17/17 Time: 18:55
Sample: 1996Q1 2016Q4
Included observations: 79

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1496.323	NA	3.59e-28	-37.65376	-37.38382*	-37.54561*
1	**1597.252**	**176.3061***	**2.19e-28***	**-38.15828***	**-35.45891**	**-37.07683**
2	1641.575	67.32548	5.98e-28	-37.22974	-32.10094	-35.17499
3	1711.128	89.80306	9.78e-28	-36.93995	-29.38172	-33.91189
4	1791.327	85.27443	1.53e-27	-36.91966	-26.93199	-32.91830

Table 3.5 Lag selection test for asymmetric model of Germany.

VAR Lag Order Selection Criteria
Endogenous variables: GDP_LOG_ UP DOWN CPI_LOG_ IR GBR STOCK_PRICES_LOG_ GFCF_LOG_ REER_LOG_
Exogenous variables: C
Date: 08/17/17 Time: 18:58
Sample: 1996Q1 2016Q4
Included observations: 79

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1213.151	NA	4.66e-25	-30.48484	-30.21490*	-30.37670
1	1334.021	211.1390	1.72e-25*	-31.49419	-28.79482	-30.41274*
2	1394.953	92.55515	3.08e-25	-30.98615	-25.85734	-28.93139
3	1491.398	124.5245	2.55e-25	-31.37717	-23.81893	-28.34911
4	**1590.326**	**105.1895***	**2.47e-25**	**-31.83105***	**-21.84338**	**-27.82968**

Table 3.6 Lag selection test for asymmetric model of Italy.

VAR Lag Order Selection Criteria
Endogenous variables: GDP_LOG_ UP DOWN CPI_LOG_ IR GBR STOCK_PRICES_LOG_ GFCF_LOG_ REE
Exogenous variables: C
Date: 08/17/17 Time: 19:02
Sample: 1997Q4 2016Q4
Included observations: 72

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1197.548	NA	3.71e-26	-33.01522	-32.73064*	-32.90193*
1	1307.146	188.7524	1.70e-26	-33.80961	-30.96378	-32.67668
2	1396.716	131.8670*	1.48e-26*	-34.04767	-28.64059	-31.89509
3	1464.680	83.06747	2.80e-26	-33.68557	-25.71724	-30.51335
4	**1566.838**	**99.32000**	**2.79e-26**	**-34.27328***	**-23.74370**	**-30.08142**

Table 3.7 Lag selection test for asymmetric model of USA.

VAR Lag Order Selection Criteria
Endogenous variables: GDP_LOG_ UP DOWN CPI_LOG_ IR GBR STOCK_PRICES_LOG_ GFCF_LOG_ REER_LOG_
Exogenous variables: C
Date: 08/17/17 Time: 19:08
Sample: 1996Q1 2016Q4
Included observations: 79

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1411.379	NA	3.08e-27	-35.50327	-35.23333*	-35.39512*
1	**1495.183**	**146.3914**	**2.91e-27***	**-35.57425***	**-32.87488**	**-34.49280**
2	1548.820	81.47383	6.26e-27	-34.88151	-29.75271	-32.82676
3	1642.588	121.0674*	5.55e-27	-35.20475	-27.64651	-32.17669
4	1734.118	97.32367	6.49e-27	-35.47135	-25.48368	-31.46998

Table 3.8 Lag selection test for asymmetric model of Japan.

VAR Lag Order Selection Criteria
Endogenous variables: GDP_LOG_ UP DOWN CPI_LOG_ IR GBR STOCK_PRICES_LOG_ GFCF_LOG_ REER_LOG_
Exogenous variables: C
Date: 08/17/17 Time: 19:13
Sample: 1996Q1 2016Q4
Included observations: 79

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1027.761	NA	5.09e-23	-25.79141	-25.52147*	-25.68326*
1	**1141.964**	**199.4938**	**2.22e-23***	**-26.63199***	**-23.93262**	**-25.55054**
2	1210.192	103.6385*	3.31e-23	-26.30867	-21.17986	-24.25391
3	1280.898	91.29131	5.26e-23	-26.04806	-18.48982	-23.02000
4	1343.647	66.71991	1.27e-22	-25.58600	-15.59832	-21.58463

Table 3.9 Lag selection test for asymmetric model of South Korea.

VAR Lag Order Selection Criteria
Endogenous variables: GDP_LOG_ UP DOWN CPI_LOG_ IR GBR STOCK_PRICES_LOG_ GFCF_LOG_ REER_LOG_
Exogenous variables: C
Date: 08/17/17 Time: 19:17
Sample: 1996Q1 2016Q4
Included observations: 79

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1259.903	NA	1.43e-25	-31.66844	-31.39850*	-31.56029*
1	**1374.701**	**200.5320**	**6.14e-26***	**-32.52406***	**-29.82469**	**-31.44261**
2	1442.890	103.5793*	9.14e-26	-32.19975	-27.07095	-30.14500
3	1520.878	100.6935	1.21e-25	-32.12350	-24.56526	-29.09544
4	1588.787	72.20666	2.57e-25	-31.79208	-21.80440	-27.79071

Table 3.10 Lag selection test for asymmetric model of United Kingdom.

VAR Lag Order Selection Criteria
Endogenous variables: GDP_LOG_ UP DOWN CPI_LOG_ IR GBR STOCK_PRICES_LOG_ GFCF_LOG_ REER_LOG_
Exogenous variables: C
Date: 08/17/17 Time: 19:21
Sample: 1996Q1 2016Q4
Included observations: 79

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1368.035	NA	9.23e-27	-34.40596	-34.13602*	-34.29781
1	**1495.780**	**223.1490***	**2.86e-27***	**-35.58937***	**-32.89000**	**-34.50792***
2	1545.386	75.35043	6.83e-27	-34.79457	-29.66577	-32.73982
3	1620.965	97.58355	9.59e-27	-34.65734	-27.09911	-31.62928
4	1699.076	83.05416	1.58e-26	-34.58419	-24.59652	-30.58282

Appendix 6 - Table 4: Lag selection test of the best performing models

Relative performance of the models. AIC: Akaike information criterion and LLR: Log likelihood ratio

		Linear	Asymmetric	Scaled oil price	Net oil price
Country					
Norway	**AIC**	-20.10947	**-24.92326**	-17.69659	-12.25571
	LLR	850.324	**1074.469**	1032.015	531.5870
	Lag length	1	**1**	4	1
USA	**AIC**	-32.98295	**-35.57425**	-28.82875	-25.20585
	LLR	1374.826	**1495.183**	1228.736	1017.219
	Lag length	1	**1**	1	1
Japan	**AIC**	-23.50570	**-26.63199**	-19.85540	-16.31020
	LLR	1000.475	**1141.964**	874.2882	683.6325
	Lag length	1	**1**	1	1
Germany	**AIC**	-28.58686	**-31.83105**	-24.47183	-21.13725
	LLR	1201.181	**1590.326**	1056.637	1056.647
	Lag length	1	**4**	1	4
Italy	**AIC**	-30.11870	**-34.27328**	-26.15060	-21.63907
	LLR	1348.273	**1566.838**	1031.422	851.0066
	Lag length	4	**4**	1	4
South Korea	**AIC**	-29.69809	**-32.52406**	-25.47585	-22.81323
	LLR	1245.075	**1374.701**	1096.296	927.4963
	Lag length	1	**1**	1	1
Russia	**AIC**	-25.67300	**-35.57138**	-25.20352	-20.31638
	LLR	892.9884	**1204.499**	950.4862	731.2767
	Lag length	4	**4**	4	4
Canada	**AIC**	-32.37437	**-38.15828**	-28.26905	-33.37437
	LLR	1350.788	**1597.252**	1206.627	1355.341
	Lag length	1	**1**	1	1
Mexico	**AIC**	-34.08162	**-37.95527**	-31.12667	-31.20453
	LLR	992.2036	**1357.792**	1173.420	1059.715
	Lag length	1	**4**	4	4
UK	**AIC**	-32.55618	**-35.58937**	-28.61560	-24.53106
	LLR	1357.969	**1495.780**	1220.316	991.9147
	Lag length	1	**1**	1	1

Appendix 7 - Effects of oil price variable on GDP growth in models.

Table 5.1 Effects of oil price variable on GDP growth in Linear models.

	Norway	UK	Russia	Canada	Mexico	Germany	Italy	USA	Japan	South Korea
Lag -1	-0.005109 (0.00884) [-0.57810]	**0.005733** **(0.00344)** **[1.66790]***	-0.011347 (0.02275) [-0.49867]	0.003805 (0.00447) [0.85039]	0.005597 (0.00590) [0.94889]	**0.017853** **(0.00574)** **[3.10917]*****	**0.009740** **(0.00541)** **[1.79971]***	0.002564 (0.00462) [0.55532]	**0.012339** **(0.00588)** **[2.09960]****	-0.010620 (0.00912) [-1.16421]
Lag -2	-	-	-0.029289 (0.02595) [-1.12856]	-	-	-	-0.004441 (0.00510) [-0.87135]	-	-	-
Lag -3	-	-	-0.032684 (0.02132) [-1.53330]	-	-	-	-0.000229 (0.00510) [-0.04494]	-	-	-
Lag -4	-	-	-0.017116 (0.02157) [-0.79348]	-	-	-	0.007298 (0.00504) [1.44738]	-	-	-

Table 5.2 Effects of oil price variable on GDP growth in Asymmetric models.

	Norway		**Mexico**		**Russia**		**Canada**		U.K	
Oil	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down
Lag -1	-0.019985 (0.01308) [-1.52785]	0.014811 (0.01719) [0.86143]	-0.012492 (0.01550) [-0.80571]	0.026190 (0.02341) [1.11888]	-0.046860 (0.05856) [-0.80018]	**0.119763** **(0.06722)** **[1.78169]***	0.000960 (0.01386) [0.06927]	**0.051270** **(0.01147)** **[4.46802]*****	0.007787 (0.00505) [1.54208]	0.002245 (0.00806) [0.27847]
Lag -2	-	-	0.020831 (0.01707) [1.22065]	0.009106 (0.02327) [0.39125]	-0.026382 (0.03952) [-0.66764]	-0.028574 (0.05175) [-0.55213]	-	-	-	-
Lag -3	-	-	-0.004933 (0.01879) [-0.26246]	0.017375 (0.02815) [0.61730]	-0.047962 (0.04137) [-1.15949]	-0.006394 (0.04706) [-0.13585]	-	-	-	-
Lag -4	-	-	-0.012439 (0.01630) [-0.76302]	0.018224 (0.02709) [0.67262]	-0.043280 (0.03309) [-1.30778]	-0.016488 (0.04781) [-0.34489]	-	-	-	-

	Germany		**Italy**		**USA**		**Japan**		**South Korea**	
Oil	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down
Lag -1	-0.005104 (0.01181) [-0.43221]	**0.035799** **(0.01545)** **[2.31768]****	0.007615 (0.00708) [1.07584]	0.010288 (0.01213) [0.84849]	0.004318 (0.00531) [0.81332]	-0.002931 (0.00904) [-0.32433]	-0.012930 (0.00885) [-1.46038]	**0.042995** **(0.01284)** **[3.34922]*****	-0.006351 (0.01211) [-0.52423]	-0.015175 (0.02095) [-0.72426]
Lag -2	0.004878 (0.01042) [0.46796]	-0.007007 (0.01627) [-0.43079]	0.005602 (0.00696) [0.80446]	**-0.020564** **(0.01116)** **[-1.84318]***	-	-	-	-	-	-
Lag -3	-0.012911 (0.00978) [-1.31971]	-0.007022 (0.01517) [-0.46304]	0.001319 (0.00658) [0.20056]	-0.007001 (0.01323) [-0.52904]	-	-	-	-	-	-
Lag -4	0.003774 (0.00967) [0.39036]	-0.010026 (0.01826) [-0.54913]	0.009678 (0.00683) [1.41705]	-0.000770 (0.01144) [-0.06726]	-	-	-	-	-	-

Table 5.3 Effects of oil price variable on GDP growth in Net models.

	Norway	Mexico	Russia	Canada	Germany	Italy	USA	Japan	South Korea	U.K
	-4.91E-05	0.000270	0.000241	0.005132	8.34E-05	**-7.87E-05**	0.000109	-9.99E-05	-0.000196	**-0.000130**
Lag -1	(6.8E-05)	(0.00122)	(0.00200)	(0.01010)	(0.00020)	**(4.1E-05)**	(7.9E-05)	(0.00017)	(0.00015)	**(5.8E-05)**
	[-0.71881]	[0.22191]	[0.12040]	[0.50802]	[0.41765]	**[-1.93898]***	[1.37042]	[-0.58488]	[-1.28302]	**[-2.23470]****
		0.004461	0.000794		0.000231	5.43E-05				
Lag -2	-	**(0.00144)**	(0.00152)	-	(0.00017)	(4.4E-05)	-	-	-	-
		[3.10205]***	[0.52157]		[1.36772]	[1.23833]				
		-0.001941	-0.000927		-0.000155	2.14E-05				
Lag -3	-	(0.00175)	(0.00134)	-	(0.00016)	(4.7E-05)	-	-	-	-
		[-1.11076]	[-0.69077]		[-0.95478]	[0.45320]				
		-0.000142	-0.000191		0.000193	-2.66E-05				
Lag -4	-	(0.00153)	(0.00112)	-	(0.00016)	(3.9E-05)	-	-	-	-
		[-0.09306]	[-0.16981]		[1.20187]	[-0.68815]				

Table 5.4 Effects of oil price variable on GDP growth in Scaled (SOPI/SOPD) models.

	Norway		Mexico		Russia		Canada		U.K	
Oil	SOPI	SOPD	SOPI	SOPD	SOPI	SOPD	SOPI	SOPD	SOPI	SOPD
	-0.003001	0.003868	-0.001953	0.002928	-0.011119	**0.019957**	0.000672	**0.003461**	0.000536	0.000450
Lag -1	(0.00240)	(0.00338)	(0.00340)	(0.00367)	(0.00792)	**(0.00722)**	(0.00111)	**(0.00118)**	(0.00128)	(0.00125)
	[-1.25259]	[1.14458]	[-0.57526]	[0.79726]	[-1.40419]	**[2.76451]*****	[0.60808]	**[2.92999]*****	[0.42053]	[0.36099]
	0.003315	0.00305	0.003576	0.002231	-0.002143	0.001028				
Lag -2	(0.00304)	(0.00363)	(0.00312)	(0.00411)	(0.00551)	(0.00546)	-	-	-	-
	[1.09182]	[0.84083]	[1.14637]	[0.54332]	[-0.38859]	[0.18847]				
	0.002130	-0.005760	-0.001768	0.003672	-0.006379	-0.000394				
Lag -3	(0.00342)	(0.00381)	(0.00352)	(0.00449)	(0.00514)	(0.00523)	-	-	-	-
	[0.62358]	[-1.51376]	[-0.50285]	[0.81795]	[-1.24164]	[-0.07534]				
	-0.004057	-0.000702	-0.000889	0.001952	-0.004265	0.001478				
Lag -4	(0.00328)	(0.00396)	(0.00321)	(0.00407)	(0.00459)	(0.00508)	-	-	-	-
	[-1.23794]	[-0.17736]	[-0.27699]	[0.47920]	[-0.92890]	[0.29058]				

	Germany		Italy		USA		Japan		South Korea	
Oil	SOPI	SOPD	SOPI	SOPD	SOPI	SOPD	SOPI	SOPD	SOPI	SOPD
	-0.000763	**0.007750**	0.000748	**0.003398**	-0.000166	**0.002822**	-0.003123	**0.008821**	-0.001280	-0.002447
Lag -1	(0.00137)	**(0.00165)**	(0.00115)	**(0.00124)**	(0.00097)	**(0.00123)**	(0.00168)	**(0.00209)**	(0.00222)	(0.00336)
	[-0.55762]	**[4.70456]*****	[0.65114]	**[2.74466]*****	[-0.17157]	**[2.30101]****	[-1.85858]	**[4.22136]*****	[-0.57578]	[-0.72770]
Lag -2	-	-	-	-	-	-	-	-	-	-
Lag -3	-	-	-	-	-	-	-	-	-	-
Lag -4	-	-	-	-	-	-	-	-	-	-

Appendix 8 - Effects of oil price variable on stock market returns in models.

Table 6.1 Effects of oil price variable on stock market returns in Linear models.

	Norway	UK	Russia	Canada	Mexico	Germany	Italy	USA	Japan	South Korea
Lag -1	0.018371 (0.10058) [0.18264]	0.000935 (0.05321) [0.01758]	-0.650337 (0.39053) [-1.66527]	0.021380 (0.07266) [0.29427]	-0.048996 (0.07969) [-0.61485]	0.154201 (0.10597) [1.45518]	0.100333 (0.12894) [0.77815]	-0.002823 (0.07882) [-0.03581]	-0.044311 (0.07048) [-0.62871]	0.008841 (0.09529) [0.09278]
Lag -2	-	-	-0.201492 (0.44542) [-0.45237]	-		-	0.138561 (0.12143) [1.14108]	-	-	-
Lag -3	-	-	0.298143 (0.36585) [0.81493]	-		-	0.171256 (0.12147) [1.40985]	-	-	-
Lag -4	-	-	0.350049 (0.37021) [0.94553]	-		-	0.181039 (0.12012) [1.50717]	-	-	-

Table 6.2 Effects of oil price variable on stock market returns in Asymmetric models.

	Norway		Mexico		Russia		Canada		U.K	
Oil	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down
Lag -1	0.076045 (0.15081) [0.50426]	-0.068438 (0.19822) [-0.34527]	-0.184140 (0.17696) [-1.04059]	0.335970 (0.26717) [1.25754]	**-1.694361** **(0.97239)** **[-1.74248]***	1.087789 (1.11613) [0.97460]	0.029256 (0.25148) [0.11634]	0.242923 (0.20821) [1.16673]	0.007787 (0.00505) [1.54208]	0.002245 (0.00806) [0.27847]
Lag -2	-	-	**0.521280** **(0.19478)** **[2.67620]*****	0.177515 (0.26564) [0.66826]	-0.416762 (0.65613) [-0.63518]	-0.673718 (0.85931) [-0.78402]	-	-	-	-
Lag -3	-	-	0.332180 (0.21452) [1.54846]	-0.223669 (0.32126) [-0.69622]	-0.989822 (0.68685) [-1.44111]	-0.114442 (0.78146) [-0.14645]	-	-	-	-
Lag -4	-	-	**-0.439314** **(0.18607)** **[-2.36106]*****	0.410733 (0.30924) [1.32821]	0.036517 (0.54952) [0.06645]	-1.190416 (0.79378) [-1.49968]	-	-	-	-

	Germany		Italy		USA		Japan		South Korea	
Oil	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down
Lag -1	**0.397423** **(0.22542)** **[1.76299]***	-0.075548 (0.29483) [-0.25625]	-0.061846 (0.16554) [-0.37360]	0.442643 (0.28359) [1.56085]	-0.050725 (0.09067) [-0.55946]	0.043681 (0.15435) [0.28300]	-0.116419 (0.11028) [-1.05569]	0.039849 (0.15989) [0.24922]	0.158817 (0.12437) [1.27697]	-0.274962 (0.21510) [-1.27830]
Lag -2	-0.054073 (0.19898) [-0.27175]	0.108564 (0.31047) [0.34968]	0.235891 (0.16286) [1.44844]	0.060804 (0.26093) [0.23303]	-	-	-	-	-	-
Lag -3	-0.208647 (0.18674) [-1.11731]	0.418154 (0.28946) [1.44459]	-0.050869 (0.15385) [-0.33064]	**0.659591** **(0.30952)** **[2.13104]****	-	-	-	-	-	-
Lag -4	0.046505 (0.18452) [0.25204]	0.172762 (0.34849) [0.49575]	0.234061 (0.15973) [1.46534]	0.129859 (0.26766) [0.48517]	-	-	-	-	-	-

Table 6.3 Effects of oil price variable on stock market returns in Net models.

	Norway	Mexico	Russia	Canada	Germany	Italy	USA	Japan	South Korea	U.K
Lag -1	0.000447 (0.00083) [0.53980]	0.026739 (0.01689) [1.58326]	-0.004226 (0.03958) [-0.10677]	0.205090 (0.16117) [1.27250]	**0.008585** **(0.00339)** **[2.53399]****	0.007615 (0.00708) [1.07584]	0.001779 (0.00135) [1.31957]	-0.000137 (0.00200) [-0.06850]	0.001423 (0.00168) [0.84596]	-0.000388 (0.00092) [-0.42173]
Lag -2	-	**0.061118** **(0.01996)** **[3.06143]*****	0.002791 (0.03011) [0.09269]	-	-3.60E-05 (0.00286) [-0.01259]	0.005602 (0.00696) [0.80446]	-	-	-	-
Lag -3	-	0.015272 (0.02425) [0.62967]	-0.007295 (0.02655) [-0.27474]	-	-0.000455 (0.00275) [-0.16541]	0.001319 (0.00658) [0.20056]	-	-	-	-
Lag -4	-	-0.025772 (0.02123) [-1.21379]	0.003411 (0.02225) 0.15326]	-	-0.000188 (0.00272) [-0.06901]	0.009678 (0.00683) [1.41705]	-	-	-	-

Table 6.4 Effects of oil price variable on stock market returns in Scaled models.

	Norway		Mexico		Russia		Canada		U.K	
Oil	SOPI	SOPD	SOPI	SOPD	SOPI	SOPD	SOPI	SOPD	SOPI	SOPD
Lag -1	-0.012859	-0.017946	-0.049765	0.063650	**-0.325700**	**0.218585**	0.016968	0.015200	0.003455	-0.004278
	(0.03893)	(0.03970)	(0.03796)	(0.04105)	**(0.13585)**	**(0.12385)**	(0.01887)	(0.02017)	(0.01945)	(0.01902)
	[-0.33029]	[-0.45201]	[-1.31114]	[1.55042]	**[-2.39748]****	**[1.76488]***	[0.89917]	[0.75365]	[0.17769]	[-0.22490]
Lag -2	0.025108	0.040060	**0.074224**	0.051274	-0.066289	-0.017289	-	-	-	-
	(0.03567)	(0.04262)	**(0.03488)**	(0.04592)	(0.09459)	(0.09360)				
	[0.70398]	[0.93983]	**[2.12819]****	[1.11671]	[-0.70078]	[-0.18471]				
Lag -3	0.021194	**-0.093126**	0.020739	-0.015017	**-0.157757**	0.014367	-	-	-	-
	(0.04012)	**(0.04470)**	(0.03932)	(0.05019)	**(0.08814)**	(0.08970)				
	[0.52824]	**[-2.08328]****	[0.52747]	[-0.29921]	**[-1.78979]***	[0.16016]				
Lag -4	-0.006868	-0.058337	**-0.103718**	**0.079611**	0.055269	-0.094493	-	-	-	-
	(0.03850)	(0.04653)	**(0.03586)**	**(0.04554)**	(0.07877)	(0.08724)				
	[-0.17839]	[-1.25377]	**[-2.89212]*****	**[1.74808]***	[0.70166]	[-1.08319]				

	Germany		Italy		USA		Japan		South Korea	
Oil	SOPI	SOPD	SOPI	SOPD	SOPI	SOPD	SOPI	SOPD	SOPI	SOPD
Lag -1	0.028049	0.021115	-0.003796	0.020553	-0.002181	0.032057	-0.030677	0.017248	0.024951	-0.032642
	(0.02722)	(0.03277)	(0.02700)	(0.02910)	(0.01684)	(0.02138)	(0.02162)	(0.02688)	(0.02297)	(0.03476)
	[1.03026]	[0.64431]	[-0.14057]	[0.70628]	[-0.12953]	[1.49952]	[-1.41912]	[0.64156]	[1.08601]	[-0.93911]
Lag -2	-	-	-	-	-	-	-	-	-	-
Lag -3	-	-	-	-	-	-	-	-	-	-
Lag -4	-	-	-	-	-	-	-	-	-	-

Appendix 9 - Results of testing null hypotheses

Table 7 Results of testing null hypothesis in each country.

Country	H_0^1: Oil price dynamics has no significant relationship with GDP growth	H_1^1: Oil price dynamics has a positive significant relationship with GDP growth.	H_1^2: Oil price dynamics has a negative significant relationship with GDP growth.
Norway	Not rejected	-	-
Mexico	-	Not rejected in NOPI	-
Russia	-	Not rejected in SOPD and asymmetric	-
Canada	-	Not rejected in SOPD and asymmetric	-
U.K.	-	Not rejected in linear	Not rejected in NOPI
Germany	-	Not rejected in linear and asymmetric	-
Italy	-	Not rejected in SOPD and linear	Not rejected in NOPI & asymmetric
USA	-	Not rejected in SOPD	-
Japan	-	Not rejected in all models except NOPI	-
South Korea	Not rejected	-	-

Country	H_0^1: Oil price dynamics has no significant relationship with stock market returns	H_1^1: Oil price dynamics has a positive significant relationship with stock market returns.	H_1^2: Oil price dynamics has a negative significant relationship with stock market returns.
Norway	-	-	Not rejected for SOPD
Mexico	-	Not rejected in NOPI & asymmetric	-
Russia	-	Not rejected in SOPD	Not rejected in SOPI & asymmetric
Canada	Not rejected	-	-
U.K.	Not rejected	-	-
Germany	-	Not rejected in NOPI and asymmetric	-
Italy	-	Not rejected in asymmetric	-
USA	Not rejected	-	-
Japan	Not rejected	-	-
South Korea	Not rejected	-	-

Appendix 10 - Results of the best performing VAR models

8.1 Mexico Table 8.1 Coefficients and parameters of asymmetric model of Mexico. Bold values denote significance at confidence intervals of 1 %* (t-stat over 1.6741), 5 % (t-stat over 2.0057), 10 %*** (t-stat over 2.6718).**

Vector Autoregression Estimates
Date: 07/11/17 Time: 14:58
Sample (adjusted): 2003Q2 2016Q3
Included observations: 54 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	GDP	UP	DOWN	CPI	IR	GBR	STOCK MARKET RETURN	GFCF	REER
GDP_LOG_(-1)	0.343156	-7.591126	-0.353311	-0.193737	-1.570173	-2.101750	2.532109	0.337426	-1.328499
	(0.33958)	(4.96402)	(4.93171)	(0.16030)	(3.58693)	(3.33374)	(3.87597)	(0.75114)	(2.12361)
	[1.01052]	[-1.52923]	[-0.07164]	[-1.20855]	[-0.43775]	[-0.63045]	[0.65328]	[0.44922]	[-0.62558]
GDP_LOG_(-2)	**-0.647147**	-4.279983	**-10.40609**	0.098359	4.110098	-1.477577	**-8.189600**	**-1.953131**	-3.607831
	(0.36572)	(5.34601)	**(5.31121)**	(0.17264)	(3.86295)	(3.59027)	**(4.17423)**	**(0.80894)**	(2.28703)
	[-1.76954]*	[-0.80059]	**[-1.95927]***	[0.56973]	[1.06398]	[-0.41155]	**[-1.96194]***	**[-2.41444]****	[-1.57752]
GDP_LOG_(-3)	-0.200014	-2.457168	-4.190276	-0.121654	-3.134672	-3.585043	-0.907766	0.406870	-0.083174
	(0.32582)	(4.76282)	(4.73182)	(0.15381)	(3.44155)	(3.19862)	(3.71888)	(0.72069)	(2.03754)
	[-0.61388]	[-0.51591]	[-0.88555]	[-0.79095]	[-0.91083]	[-1.12081]	[-0.24410]	[0.56455]	[-0.04082]
GDP_LOG_(-4)	0.037476	0.869107	2.803901	-0.004363	1.720194	0.233362	4.341759	0.395302	0.666793
	(0.26763)	(3.91215)	(3.88669)	(0.12634)	(2.82687)	(2.62732)	(3.05466)	(0.59197)	(1.67362)
	[0.14003]	[0.22216]	[0.72141]	[-0.03453]	[0.60852]	[0.08882]	[1.42136]	[0.66777]	[0.39841]
UP(-1)	-0.012492	-0.314112	**-0.443368**	-0.000378	-0.173752	-0.165429	-0.184140	-0.042403	-0.055790
	(0.01550)	(0.22663)	**(0.22516)**	(0.00732)	(0.16376)	(0.15220)	(0.17696)	(0.03429)	(0.09695)
	[-0.80571]	[-1.38600]	**[-1.96915]***	[-0.05170]	[-1.06101]	[-1.08690]	[-1.04059]	[-1.23648]	[-0.57543]
UP(-2)	0.020831	**0.527715**	0.359191	0.011279	-0.069756	0.082598	**0.521280**	0.031416	0.035534
	(0.01707)	**(0.24946)**	(0.24784)	(0.00806)	(0.18026)	(0.16753)	**(0.19478)**	(0.03775)	(0.10672)
	[1.22065]	**[2.11540]****	[1.44929]	[1.40006]	[-0.38698]	[0.49302]	**[2.67620]****	[0.83225]	[0.33297]

UP(-3)	-0.004933	-0.046571	**0.499003**	0.011389	0.172347	-0.036622	0.332180	0.010200	0.084310
	(0.01879)	(0.27474)	**(0.27295)**	(0.00887)	(0.19853)	(0.18451)	(0.21452)	(0.04157)	(0.11754)
	[-0.26246]	[-0.16951]	**[1.82815]***	[1.28361]	[0.86814]	[-0.19848]	[1.54846]	[0.24534]	[0.71732]
UP(-4)	-0.012439	0.124799	-0.330483	0.002849	-0.198026	-0.195391	**-0.439314**	-0.017439	-0.078001
	(0.01630)	(0.23830)	(0.23675)	(0.00770)	(0.17219)	(0.16004)	**(0.18607)**	(0.03606)	(0.10194)
	[-0.76302]	[0.52371]	[-1.39593]	[0.37028]	[-1.15003]	[-1.22091]	**[-2.36106]****	[-0.48363]	[-0.76514]
DOWN(-1)	0.026190	0.225918	0.567569	0.020600	0.057978	0.156583	0.335970	**0.096477**	0.177900
	(0.02341)	(0.34216)	(0.33994)	(0.01105)	(0.24724)	(0.22979)	(0.26717)	**(0.05177)**	(0.14638)
	[1.11888]	[0.66026]	[1.66963]	[1.86434]	[0.23450]	[0.68142]	[1.25754]	**[1.86340]***	[1.21535]
DOWN(-2)	0.009106	**-0.696389**	0.383639	0.005831	-0.311745	-0.300094	0.177515	0.039365	**0.405504**
	(0.02327)	**(0.34021)**	(0.33799)	(0.01099)	(0.24583)	(0.22848)	(0.26564)	(0.05148)	**(0.14554)**
	[0.39125]	**[-2.04696]****	[1.13505]	[0.53074]	[-1.26814]	[-1.31346]	[0.66826]	[0.76467]	**[2.78619]*****
DOWN(-3)	0.017375	0.145563	-0.389859	-0.000229	-0.196764	-0.130555	-0.223669	0.009150	0.097439
	(0.02815)	(0.41144)	(0.40877)	(0.01329)	(0.29730)	(0.27632)	(0.32126)	(0.06226)	(0.17602)
	[0.61730]	[0.35379]	[-0.95375]	[-0.01723]	[-0.66183]	[-0.47248]	[-0.69622]	[0.14697]	[0.55358]
DOWN(-4)	0.018224	0.141369	**0.795438**	0.006781	-0.157134	0.055262	0.410733	0.030173	0.169517
	(0.02709)	(0.39605)	**(0.39347)**	(0.01279)	(0.28618)	(0.26598)	(0.30924)	(0.05993)	(0.16943)
	[0.67262]	[0.35695]	**[2.02160]****	[0.53020]	[-0.54908]	[0.20777]	[1.32821]	[0.50348]	[1.00052]
CPI_LOG_(-1)	-0.323491	9.731358	-2.526526	-0.098285	8.542159	**9.576903**	-0.386566	0.092908	-4.383602
	(0.49377)	(7.21797)	(7.17099)	(0.23309)	(5.21560)	**(4.84744)**	(5.63588)	(1.09220)	(3.08785)
	[-0.65514]	[1.34821]	[-0.35233]	[-0.42166]	[1.63781]	**[1.97566]***	[-0.06859]	[0.08506]	[-1.41963]
CPI_LOG_(-2)	-0.534159	-12.15005	3.564342	0.218207	-0.640263	-1.282325	2.690828	-0.599192	-1.054397
	(0.51250)	(7.49167)	(7.44291)	(0.24193)	(5.41338)	(5.03126)	(5.84960)	(1.13361)	(3.20494)
	[-1.04227]	[-1.62181]	[0.47889]	[0.90194]	[-0.11827]	[-0.25487]	[0.46000]	[-0.52857]	[-0.32899]
CPI_LOG_(-3)	**-0.981761**	-9.356219	**-17.22778**	0.372954	-6.718902	-7.268556	-6.738631	-1.408607	-1.077544
	(0.55283)	(8.08118)	**(8.02858)**	(0.26097)	(5.83935)	(5.42716)	(6.30989)	(1.22281)	(3.45714)
	[-1.77590]*	[-1.15778]	**[-2.14581]****	[1.42912]	[-1.15063]	[-1.33929]	[-1.06795]	[-1.15194]	[-0.31169]

CPI_LOG_(-4)	-0.113890	-3.474623	-6.003971	-0.168889	-5.701914	-2.448341	-1.065731	-1.044943	0.603592
	(0.42341)	(6.18945)	(6.14917)	(0.19988)	(4.47241)	(4.15672)	(4.83281)	(0.93656)	(2.64785)
	[-0.26898]	[-0.56138]	[-0.97639]	[-0.84496]	[-1.27491]	[-0.58901]	[-0.22052]	[-1.11572]	[0.22796]
IR(-1)	0.036542	0.401870	0.567119	0.012007	**0.505564**	0.268573	**0.657997**	0.044105	0.194711
	(0.02809)	(0.41056)	(0.40789)	(0.01326)	**(0.29667)**	(0.27573)	**(0.32057)**	(0.06212)	(0.17564)
	[1.30105]	[0.97883]	[1.39037]	[0.90560]	**[1.70415]***	[0.97406]	**[2.05256]****	[0.70994]	[1.10858]
IR(-2)	-0.015264	**0.665903**	0.292766	0.000730	0.022357	0.070701	-0.216269	-0.015311	0.043083
	(0.02369)	**(0.34636)**	(0.34411)	(0.01119)	(0.25028)	(0.23261)	(0.27044)	(0.05241)	(0.14817)
	[-0.64420]	**[1.92257]***	[0.85080]	[0.06530]	[0.08933]	[0.30395]	[-0.79968]	[-0.29214]	[0.29076]
IR(-3)	0.008835	0.180850	0.438555	-0.013545	-0.112323	-0.029865	0.268728	0.034740	0.086682
	(0.02371)	(0.34666)	(0.34440)	(0.01119)	(0.25049)	(0.23281)	(0.27067)	(0.05245)	(0.14830)
	[0.37256]	[0.52170]	[1.27339]	[-1.20992]	[-0.44841]	[-0.12828]	[0.99281]	[0.66229]	[0.58451]
IR(-4)	0.016966	0.109866	0.003606	0.003390	0.099259	-0.018984	-0.037361	0.055638	0.017538
	(0.02144)	(0.31344)	(0.31140)	(0.01012)	(0.22649)	(0.21050)	(0.24474)	(0.04743)	(0.13409)
	[0.79123]	[0.35051]	[0.01158]	[0.33493]	[0.43825]	[-0.09018]	[-0.15266]	[1.17308]	[0.13079]
GBR(-1)	**-0.070601**	-0.166804	**-0.788721**	0.003014	0.124577	-0.231743	**-1.527205**	**-0.123293**	-0.234491
	(0.03088)	(0.45143)	**(0.44849)**	(0.01458)	(0.32620)	(0.30317)	**(0.35248)**	**(0.06831)**	(0.19312)
	[-2.28616]**	[-0.36950]	**[-1.75860]***	[0.20672]	[0.38190]	[-0.76439]	**[-4.33268]*****	**[-1.80493]***	[-1.21420]
GBR(-2)	0.002456	**-0.686022**	-0.145340	-0.009191	0.020393	-0.092272	-0.075998	0.035784	0.045904
	(0.02763)	**(0.40397)**	(0.40134)	(0.01305)	(0.29190)	(0.27130)	(0.31542)	(0.06113)	(0.17282)
	[0.08886]	**[-1.69822]***	[-0.36214]	[-0.70456]	[0.06986]	[-0.34012]	[-0.24094]	[0.58541]	[0.26562]
GBR(-3)	0.016720	-0.547594	-0.389845	-0.013864	0.006953	-0.145982	-0.152694	-0.002572	-0.155498
	(0.03003)	(0.43896)	(0.43611)	(0.01418)	(0.31719)	(0.29480)	(0.34275)	(0.06642)	(0.18779)
	[0.55678]	[-1.24747]	[-0.89392]	[-0.97804]	[0.02192]	[-0.49519]	[-0.44550]	[-0.03872]	[-0.82805]
GBR(-4)	-0.039293	-0.086486	-0.580012	-0.008612	0.079047	-0.029472	0.014322	-0.087124	-0.121159
	(0.03065)	(0.44805)	(0.44513)	(0.01447)	(0.32375)	(0.30090)	(0.34984)	(0.06780)	(0.19168)
	[-1.28197]	[-0.19303]	[-1.30300]	[-0.59522]	[0.24416]	[-0.09794]	[0.04094]	[-1.28506]	[-0.63210]

STOCK_PRICES_LOG_(-1)	**0.046299**	-0.108007	**0.558718**	0.003186	0.104461	0.218392	**0.405470**	**0.111084**	**0.387343**
	(0.02026)	(0.29617)	**(0.29425)**	(0.00956)	(0.21401)	(0.19890)	**(0.23126)**	**(0.04482)**	**(0.12670)**
	[2.28513]**	[-0.36468]	**[1.89882]***	[0.33311]	[0.48811]	[1.09798]	**[1.75334]***	**[2.47868]****	**[3.05709]*****
STOCK_PRICES_LOG_(-2)	**0.047252**	0.099016	0.399525	-0.019547	0.067972	-0.004389	**0.544519**	0.051540	0.105915
	(0.02505)	(0.36622)	(0.36383)	(0.01183)	(0.26462)	(0.24594)	**(0.28595)**	(0.05541)	(0.15667)
	[1.88612]*	[0.27038]	[1.09810]	[-1.65284]	[0.25686]	[-0.01784]	**[1.90426]***	[0.93008]	[0.67605]
STOCK_PRICES_LOG_(-3)	-0.015559	0.483863	0.020791	0.001786	0.139750	0.065508	0.129309	0.012600	-0.006411
	(0.02165)	(0.31654)	(0.31448)	(0.01022)	(0.22873)	(0.21258)	(0.24716)	(0.04790)	(0.13542)
	[-0.71851]	[1.52861]	[0.06611]	[0.17475]	[0.61100]	[0.30816]	[0.52319]	[0.26305]	[-0.04734]
STOCK_PRICES_LOG_(-4)	**0.033528**	0.143757	**0.432029**	0.001451	0.010210	-0.051766	**0.344760**	0.046523	**0.173483**
	(0.01640)	(0.23974)	**(0.23818)**	(0.00774)	(0.17323)	(0.16100)	**(0.18719)**	(0.03628)	**(0.10256)**
	[2.04436]**	[0.59964]	**[1.81389]***	[0.18736]	[0.05894]	[-0.32152]	**[1.84176]***	[1.28247]	**[1.69152]***
GFCF_LOG_(-1)	-0.124284	**5.778293**	-0.423653	-0.000406	-0.080355	0.602780	-1.330701	0.324930	-0.317736
	(0.13431)	**(1.96329)**	(1.95052)	(0.06340)	(1.41865)	(1.31851)	(1.53297)	(0.29708)	(0.83990)
	[-0.92537]	**[2.94316]*****	[-0.21720]	[-0.00640]	[-0.05664]	[0.45717]	[-0.86806]	[1.09375]	[-0.37830]
GFCF_LOG_(-2)	0.103506	-1.683686	3.529449	0.069859	0.657511	1.497734	1.142672	0.178840	0.849080
	(0.15374)	(2.24735)	(2.23273)	(0.07257)	(1.62391)	(1.50928)	(1.75476)	(0.34006)	(0.96142)
	[0.67325]	[-0.74919]	[1.58078]	[0.96259]	[0.40489]	[0.99235]	[0.65118]	[0.52591]	[0.88315]
GFCF_LOG_(-3)	0.079444	-0.880653	-2.505696	-0.025156	-0.120110	-1.110725	-0.048737	0.050565	-0.454981
	(0.11781)	(1.72218)	(1.71097)	(0.05561)	(1.24442)	(1.15658)	(1.34470)	(0.26059)	(0.73675)
	[0.67433]	[-0.51136]	[-1.46449]	[-0.45233]	[-0.09652]	[-0.96035]	[-0.03624]	[0.19404]	[-0.61755]
GFCF_LOG_(-4)	**-0.304983**	**-4.126034**	**-5.906021**	0.012499	-0.026001	-0.095755	**-4.753619**	**-0.739865**	**-1.891815**
	(0.15240)	**(2.22785)**	**(2.21335)**	(0.07194)	(1.60981)	(1.49618)	**(1.73953)**	**(0.33711)**	**(0.95308)**
	[-2.00114]*	**[-1.85203]***	**[-2.66836]****	[0.17373]	[-0.01615]	[-0.06400]	**[-2.73270]*****	**[-2.19473]****	**[-1.98496]***
REER_LOG_(-1)	-0.027092	**-1.400028**	**-1.602036**	0.000340	0.316382	-0.200537	**-1.895067**	**-0.269247**	**-0.654332**
	(0.05633)	**(0.82340)**	**(0.81804)**	(0.02659)	(0.59498)	(0.55298)	**(0.64292)**	**(0.12459)**	**(0.35225)**
	[-0.48096]	**[-1.70030]***	**[-1.95838]***	[0.01280]	[0.53176]	[-0.36265]	**[-2.94759]*****	**[-2.16100]****	**[-1.85758]***

REER_LOG_(-2)	-0.044926	0.787447	**-1.387695**	-0.010932	0.180682	0.195311	**-1.405751**	-0.091553	**-0.597940**
	(0.05453)	(0.79706)	**(0.79187)**	(0.02574)	(0.57595)	(0.53529)	**(0.62236)**	(0.12061)	**(0.34098)**
	[-0.82393]	[0.98794]	**[-1.75242]***	[-0.42471]	[0.31371]	[0.36487]	**[-2.25875]****	[-0.75910]	**[-1.75357]***
REER_LOG_(-3)	-0.029608	-0.905527	0.639392	-0.020023	-0.246341	0.713233	-0.102662	0.045096	-0.033605
	(0.05193)	(0.75914)	(0.75420)	(0.02452)	(0.54854)	(0.50982)	(0.59275)	(0.11487)	(0.32476)
	[-0.57012]	[-1.19283]	[0.84777]	[-0.81678]	[-0.44908]	[1.39898]	[-0.17320]	[0.39258]	[-0.10348]
REER_LOG_(-4)	0.057919	0.666289	0.664772	0.006117	-0.092903	0.584763	0.857897	0.065218	0.101445
	(0.05627)	(0.82255)	(0.81720)	(0.02656)	(0.59437)	(0.55241)	(0.64226)	(0.12447)	(0.35189)
	[1.02931]	[0.81003]	[0.81348]	[0.23027]	[-0.15631]	[1.05857]	[1.33575]	[0.52398]	[0.28829]
C	**0.030943**	0.262558	0.300276	0.007699	0.011738	0.051725	0.103155	0.046653	0.115790
	(0.01475)	(0.21565)	(0.21425)	(0.00696)	(0.15583)	(0.14483)	(0.16838)	(0.03263)	(0.09226)
	[2.09750]**	[1.21751]	[1.40153]	[1.10549]	[0.07533]	[0.35715]	[0.61261]	[1.42968]	[1.25509]
R-squared	0.848205	0.760581	0.647453	0.747693	0.797277	0.624610	0.795342	0.801627	0.703317
Adj. R-squared	0.526758	0.253575	-0.099118	0.213395	0.367980	-0.170335	0.361948	0.381544	0.075048
Sum sq. resids	0.000716	0.153092	0.151106	0.000160	0.079934	0.069048	0.093336	0.003505	0.028018
S.E. equation	0.006492	0.094897	0.094279	0.003065	0.068571	0.063731	0.074097	0.014359	0.040597
F-statistic	2.638709	1.500142	0.867235	1.399393	1.857170	0.785728	1.835149	1.908257	1.119452
Log likelihood	226.5927	81.75123	82.10384	267.1276	99.29685	103.2498	95.11186	183.7239	127.6025
Akaike AIC	-7.021954	-1.657453	-1.670513	-8.523243	-2.307291	-2.453696	-2.152291	-5.434220	-3.355648
Schwarz SC	-5.659131	-0.294631	-0.307690	-7.160420	-0.944468	-1.090873	-0.789469	-4.071398	-1.992826
Mean dependent	0.006232	0.067152	-0.058211	0.009723	-0.009519	-0.008827	0.036585	0.007552	-0.004839
S.D. dependent	0.009437	0.109840	0.089928	0.003455	0.086253	0.058911	0.092762	0.018259	0.042212

Determinant resid covariance (dof adj.)	3.85E-29
Determinant resid covariance	1.17E-33
Log likelihood	1357.792
Akaike information criterion	-37.95527
Schwarz criterion	-25.68987

8.2 Norway Table 8.2 Coefficients and parameters of asymmetric model of Norway. Bold values denote significance at confidence intervals of 1 %* (t-stat over 1.6638), 5 % (t-stat over 1.9896), 10 %*** (t-stat over 2.6378).**

Vector Autoregression Estimates
Date: 07/10/17 Time: 13:09
Sample (adjusted): 1996Q3 2016Q4
Included observations: 82 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	GDP	UP	DOWN	CPI	IR	GBR	STOCK MARKET RETURNS	GFCF	REER
GDP_LOG_(-1)	**-0.350747**	1.133091	0.858512	-0.003511	5.086796	-0.993813	-0.432988	0.200183	-0.269962
	(0.10332)	(1.03613)	(0.71427)	(0.05148)	(4.54498)	(3.03253)	(1.19121)	(0.47930)	(0.30947)
	[-3.39463]* **	[1.09358]	[1.20194]	[-0.06820]	[1.11921]	[-0.32772]	[-0.36349]	[0.41766]	[-0.87234]
UP(-1)	-0.019985	0.144245	0.048134	-0.001641	-0.268726	0.416189	0.076045	0.048085	-0.009645
	(0.01308)	(0.13117)	(0.09043)	(0.00652)	(0.57539)	(0.38391)	(0.15081)	(0.06068)	(0.03918)
	[-1.52785]	[1.09966]	[0.53231]	[-0.25185]	[-0.46703]	[1.08407]	[0.50426]	[0.79245]	[-0.24619]
DOWN(-1)	0.014811	-0.286839	-0.076521	-0.002847	**1.762919**	**-0.962868**	-0.068438	0.074141	0.054168
	(0.01719)	(0.17241)	(0.11886)	(0.00857)	**(0.75629)**	**(0.50462)**	(0.19822)	(0.07976)	(0.05150)
	[0.86143]	[-1.66367]	[-0.64382]	[-0.33239]	**[2.33102]****	**[-1.90812]***	[-0.34527]	[0.92960]	[1.05188]
CPI_LOG_(-1)	0.014069	-1.029217	-1.565282	-0.114922	-6.845591	-3.937887	-2.526582	-1.619918	0.108377
	(0.24961)	(2.50308)	(1.72553)	(0.12436)	(10.9797)	(7.32596)	(2.87771)	(1.15789)	(0.74762)
	[0.05636]	[-0.41118]	[-0.90713]	[-0.92409]	[-0.62348]	[-0.53752]	[-0.87798]	[-1.39903]	[0.14496]
IR(-1)	-0.000700	-0.022998	0.014993	0.001172	**0.457613**	-0.047875	**-0.051888**	0.007631	0.000729
	(0.00239)	(0.02394)	(0.01650)	(0.00119)	**(0.10500)**	(0.07006)	**(0.02752)**	(0.01107)	(0.00715)
	[-0.29339]	[-0.96075]	[0.90859]	[0.98509]	**[4.35823]*****	[-0.68336]	**[-1.88548]***	[0.68920]	[0.10196]
GBR(-1)	-0.000367	-0.006935	0.003399	0.003130	0.241850	0.121319	**-0.085441**	-0.020939	-0.007540
	(0.00421)	(0.04223)	(0.02911)	(0.00210)	(0.18522)	(0.12359)	**(0.04855)**	(0.01953)	(0.01261)
	[-0.08721]	[-0.16424]	[0.11676]	[1.49177]	[1.30572]	[0.98165]	**[-1.75999]***	[-1.07196]	[-0.59786]

STOCK_PRICES_LOG_(-1)	**0.033455**	0.124560	**0.333533**	0.003186	0.168540	**0.739733**	0.079321	0.028392	-0.037183
	(0.01069)	(0.10718)	**(0.07389)**	(0.00533)	(0.47015)	**(0.31370)**	(0.12322)	(0.04958)	(0.03201)
	[3.13004]* **	[1.16214]	**[4.51411]*** **	[0.59833]	[0.35848]	**[2.35812]** **	[0.64372]	[0.57264]	[-1.16149]
GFCF_LOG_(-1)	**0.056669**	**-0.545969**	-0.063059	-0.000113	1.040642	**1.415357**	0.331519	**-0.255949**	**-0.134129**
	(0.02498)	**(0.25047)**	(0.17267)	(0.01244)	(1.09870)	**(0.73308)**	(0.28796)	**(0.11587)**	**(0.07481)**
	[2.26880] **	**[-2.17974]** **	[-0.36520]	[-0.00907]	[0.94715]	**[1.93069]* **	[1.15126]	**[-2.20900]** **	**[-1.79289]* **
REER_LOG_(-1)	0.007454	-0.337509	-0.197615	**-0.048075**	-2.259673	0.020660	0.440062	-0.059116	**0.331335**
	(0.03771)	(0.37812)	(0.26066)	**(0.01879)**	(1.65863)	(1.10668)	(0.43472)	(0.17491)	**(0.11294)**
	[0.19767]	[-0.89259]	[-0.75812]	**[-2.55902]** **	[-1.36237]	[0.01867]	[1.01230]	[-0.33797]	**[2.93381]*** **
C	0.006421	0.019539	-0.042311	**0.010514**	-0.185224	**-1.067419**	**-0.124138**	0.002032	0.000204
	(0.00487)	(0.04880)	(0.03364)	**(0.00242)**	(0.21408)	**(0.14284)**	**(0.05611)**	(0.02258)	(0.01458)
	[1.31935]	[0.40036]	[-1.25761]	**[4.33604]*** **	[-0.86521]	**[-7.47285]*** **	**[-2.21245]** **	[0.09002]	[0.01397]
R-squared	0.277550	0.205060	0.312939	0.152006	0.435325	0.199803	0.195795	0.119913	0.169368
Adj. R-squared	0.187244	0.105693	0.227056	0.046006	0.364741	0.099778	0.095269	0.009903	0.065539
Sum sq. resids	0.008065	0.810998	0.385403	0.002002	15.60459	6.947031	1.071923	0.173542	0.072348
S.E. equation	0.010584	0.106131	0.073163	0.005273	0.465543	0.310623	0.122016	0.049095	0.031699
F-statistic	3.073438	2.063657	3.643796	1.434024	6.167450	1.997538	1.947707	1.090014	1.631221
Log likelihood	261.9528	72.91162	103.4147	319.0822	-48.32763	-15.14836	61.47489	136.1274	171.9995
Akaike AIC	-6.145190	-1.534430	-2.278406	-7.538591	1.422625	0.613375	-1.255485	-3.076278	-3.951206
Schwarz SC	-5.851688	-1.240927	-1.984904	-7.245088	1.716127	0.906877	-0.961983	-2.782776	-3.657704
Mean dependent	0.004818	0.074689	-0.052412	0.005274	-1.044878	-1.065000	0.020699	0.007100	0.002418
S.D. dependent	0.011740	0.112228	0.083218	0.005399	0.584096	0.327385	0.128279	0.049340	0.032792

Determinant resid covariance (dof adj.)	4.67E-23
Determinant resid covariance	1.45E-23
Log likelihood	1108.999
Akaike information criterion	-24.85363
Schwarz criterion	-22.21211

8.3 Russia Table 8.3 Coefficients and parameters of asymmetric model of Russia. Bold values denote significance at confidence intervals of 1 %* (t-stat over 1.6772), 5 % (t-stat over 2.0106), 10 %*** (t-stat over 2.6822).**

Vector Autoregression Estimates
Date: 07/12/17 Time: 11:36
Sample (adjusted): 2004Q2 2016Q2
Included observations: 49 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	GDP	UP	DOWN	CPI	IR	GBR	STOCK MARKET RETURNS	GFCF	REER
GDP_LOG_(-1)	-0.297280	3.291653	3.268684	0.107026	5.461266	2.444583	-7.541656	1.692619	-2.290497
	(0.52250)	(3.92326)	(4.13451)	(0.43049)	(11.0639)	(1.94155)	(8.67587)	(2.03907)	(2.87687)
	[-0.56895]	[0.83901]	[0.79058]	[0.24861]	[0.49361]	[1.25909]	[-0.86927]	[0.83010]	[-0.79618]
GDP_LOG_(-2)	0.185987	3.048291	-0.645124	-0.349587	-1.343117	**-2.968026**	0.136463	0.956121	2.575623
	(0.36600)	(2.74813)	(2.89611)	(0.30155)	(7.74993)	**(1.36000)**	(6.07721)	(1.42831)	(2.01517)
	[0.50816]	[1.10922]	[-0.22276]	[-1.15930]	[-0.17331]	**[-2.18237]****	[0.02245]	[0.66941]	[1.27812]
GDP_LOG_(-3)	-0.103250	-1.579613	0.098281	0.454476	6.890167	-0.473489	5.429883	0.834472	-0.385892
	(0.39344)	(2.95418)	(3.11325)	(0.32416)	(8.33099)	(1.46197)	(6.53286)	(1.53540)	(2.16626)
	[-0.26243]	[-0.53470]	[0.03157]	[1.40202]	[0.82705]	[-0.32387]	[0.83116]	[0.54349]	[-0.17814]
GDP_LOG_(-4)	-0.007393	-2.429212	-2.301877	0.033523	-7.297485	-1.275078	-1.237273	1.001958	0.952461
	(0.34889)	(2.61964)	(2.76070)	(0.28745)	(7.38757)	(1.29641)	(5.79307)	(1.36153)	(1.92095)
	[-0.02119]	[-0.92731]	[-0.83380]	[0.11662]	[-0.98781]	[-0.98354]	[-0.21358]	[0.73591]	[0.49583]
UP(-1)	-0.046860	**-0.809283**	-0.328784	-0.004819	-1.980583	-0.129995	**-1.694361**	-0.083477	0.229860
	(0.05856)	**(0.43972)**	(0.46339)	(0.04825)	(1.24003)	(0.21761)	**(0.97239)**	(0.22854)	(0.32244)
	[-0.80018]	**[-1.84047]***	[-0.70951]	[-0.09988]	[-1.59720]	[-0.59738]	**[-1.74248]***	[-0.36527]	[0.71288]
UP(-2)	-0.026382	-0.324255	0.017496	**0.066845**	-0.419808	0.175894	-0.416762	-0.060765	0.183986
	(0.03952)	(0.29671)	(0.31268)	**(0.03256)**	(0.83673)	(0.14683)	(0.65613)	(0.15421)	(0.21757)
	[-0.66764]	[-1.09285]	[0.05596]	**[2.05315]****	[-0.50173]	[1.19791]	[-0.63518]	[-0.39404]	[0.84564]

UP(-3)	-0.047962	-0.266572	-0.087707	0.047445	0.082089	**0.331997**	-0.989822	0.135084	-0.031017
	(0.04137)	(0.31059)	(0.32732)	(0.03408)	(0.87590)	**(0.15371)**	(0.68685)	(0.16143)	(0.22775)
	[-1.15949]	[-0.85826]	[-0.26796]	[1.39211]	[0.09372]	**[2.15993]****	[-1.44111]	[0.83681]	[-0.13619]
UP(-4)	-0.043280	-0.097558	-0.015269	0.025522	0.564183	**0.222920**	0.036517	-0.004464	0.008022
	(0.03309)	(0.24849)	(0.26187)	(0.02727)	(0.70077)	**(0.12297)**	(0.54952)	(0.12915)	(0.18222)
	[-1.30778]	[-0.39260]	[-0.05831]	[0.93602]	[0.80509]	**[1.81272]***	[0.06645]	[-0.03456]	[0.04403]
DOWN(-1)	**0.119763**	0.159903	0.095643	-0.076043	0.784904	-0.099066	1.087789	0.024831	0.289818
	(0.06722)	(0.50472)	(0.53190)	(0.05538)	(1.42334)	(0.24978)	(1.11613)	(0.26232)	(0.37010)
	[1.78169]*	[0.31682]	[0.17982]	[-1.37306]	[0.55145]	[-0.39662]	[0.97460]	[0.09466]	[0.78307]
DOWN(-2)	-0.028574	-0.490770	-0.466702	-0.040935	-0.699137	**-0.380154**	-0.673718	-0.009280	0.076820
	(0.05175)	(0.38858)	(0.40951)	(0.04264)	(1.09583)	**(0.19230)**	(0.85931)	(0.20196)	(0.28494)
	[-0.55213]	[-1.26298]	[-1.13967]	[-0.96005]	[-0.63800]	**[-1.97686]***	[-0.78402]	[-0.04595]	[0.26960]
DOWN(-3)	-0.006394	-0.406777	0.015287	-0.014441	0.587706	0.086113	-0.114442	**-0.358298**	-0.040125
	(0.04706)	(0.35338)	(0.37241)	(0.03878)	(0.99655)	(0.17488)	(0.78146)	**(0.18366)**	(0.25913)
	[-0.13585]	[-1.15111]	[0.04105]	[-0.37241]	[0.58974]	[0.49241]	[-0.14645]	**[-1.95083]***	[-0.15485]
DOWN(-4)	-0.016488	-0.292449	-0.298583	-0.049370	-0.524165	0.105513	-1.190416	-0.091117	0.052454
	(0.04781)	(0.35895)	(0.37828)	(0.03939)	(1.01226)	(0.17764)	(0.79378)	(0.18656)	(0.26321)
	[-0.34489]	[-0.81474]	[-0.78932]	[-1.25346]	[-0.51782]	[0.59398]	[-1.49968]	[-0.48841]	[0.19928]
CPI_LOG_(-1)	-0.232824	2.805041	0.488368	0.281989	-12.09325	-1.054387	-4.313589	0.218498	1.294341
	(0.38391)	(2.88258)	(3.03780)	(0.31630)	(8.12908)	(1.42654)	(6.37453)	(1.49819)	(2.11376)
	[-0.60646]	[0.97310]	[0.16076]	[0.89152]	[-1.48765]	[-0.73912]	[-0.67669]	[0.14584]	[0.61234]
CPI_LOG_(-2)	-0.163679	2.774243	2.149636	0.344604	**19.57655**	1.763858	4.928553	-1.136220	-2.535379
	(0.44989)	(3.37802)	(3.55992)	(0.37067)	**(9.52625)**	(1.67172)	(7.47014)	(1.75569)	(2.47706)
	[-0.36382]	[0.82126]	[0.60384]	[0.92969]	**[2.05501]****	[1.05512]	[0.65977]	[-0.64717]	[-1.02355]
CPI_LOG_(-3)	0.234432	0.404342	-3.621054	-0.417983	-4.761882	-1.089685	-0.218491	0.925136	2.292467
	(0.36894)	(2.77020)	(2.91937)	(0.30397)	(7.81216)	(1.37092)	(6.12601)	(1.43978)	(2.03135)
	[0.63542]	[0.14596]	[-1.24035]	[-1.37507]	[-0.60955]	[-0.79486]	[-0.03567]	[0.64255]	[1.12854]

CPI_LOG_(-4)	-0.086559	0.108677	-2.747785	-0.083835	5.190517	1.001237	3.247289	-1.696329	0.607959
	(0.38311)	(2.87663)	(3.03153)	(0.31565)	(8.11230)	(1.42359)	(6.36138)	(1.49510)	(2.10940)
	[-0.22594]	[0.03778]	[-0.90640]	[-0.26559]	[0.63983]	[0.70332]	[0.51047]	[-1.13460]	[0.28821]
IR(-1)	-0.012945	0.148714	0.173957	0.007505	0.196058	**0.125144**	0.262203	-0.018901	-0.090775
	(0.01676)	(0.12581)	(0.13259)	(0.01381)	(0.35480)	**(0.06226)**	(0.27822)	(0.06539)	(0.09226)
	[-0.77254]	[1.18204]	[1.31203]	[0.54365]	[0.55259]	**[2.00997]***	[0.94243]	[-0.28906]	[-0.98395]
IR(-2)	-0.007749	0.009860	-0.004958	-0.018209	0.014363	-0.032784	-0.174988	0.009968	-0.066297
	(0.01634)	(0.12266)	(0.12927)	(0.01346)	(0.34592)	(0.06070)	(0.27126)	(0.06375)	(0.08995)
	[-0.47436]	[0.08038]	[-0.03835]	[-1.35283]	[0.04152]	[-0.54006]	[-0.64510]	[0.15635]	[-0.73707]
IR(-3)	0.023555	-0.055751	0.139654	-0.007352	-0.155664	-0.013017	0.138111	-0.080049	0.005934
	(0.01579)	(0.11856)	(0.12494)	(0.01301)	(0.33434)	(0.05867)	(0.26218)	(0.06162)	(0.08694)
	[1.49182]	[-0.47025]	[1.11775]	[-0.56516]	[-0.46558]	[-0.22185]	[0.52678]	[-1.29909]	[0.06825]
IR(-4)	-0.006318	-0.160167	-0.155861	-0.009198	-0.290212	-0.075045	-0.292336	0.016258	0.064748
	(0.01635)	(0.12274)	(0.12935)	(0.01347)	(0.34614)	(0.06074)	(0.27143)	(0.06379)	(0.09001)
	[-0.38646]	[-1.30489]	[-1.20494]	[-0.68292]	[-0.83841]	[-1.23545]	[-1.07701]	[0.25485]	[0.71938]
GBR(-1)	0.062364	-0.245566	0.306867	-0.084391	1.165618	-0.127128	0.738308	0.060378	-0.143852
	(0.08150)	(0.61198)	(0.64493)	(0.06715)	(1.72582)	(0.30286)	(1.35333)	(0.31807)	(0.44876)
	[0.76517]	[-0.40127]	[0.47581]	[-1.25672]	[0.67540]	[-0.41976]	[0.54555]	[0.18983]	[-0.32056]
GBR(-2)	0.019119	-0.031890	-0.172736	-0.078766	-2.278646	-0.460681	-1.287881	0.099692	0.016292
	(0.07997)	(0.60044)	(0.63277)	(0.06589)	(1.69328)	(0.29715)	(1.32781)	(0.31207)	(0.44029)
	[0.23909]	[-0.05311]	[-0.27298]	[-1.19550]	[-1.34570]	[-1.55035]	[-0.96993]	[0.31945]	[0.03700]
GBR(-3)	0.022726	0.531822	0.282251	-0.024253	2.314804	-0.225444	0.335236	0.106982	0.012214
	(0.07227)	(0.54268)	(0.57190)	(0.05955)	(1.53038)	(0.26856)	(1.20007)	(0.28205)	(0.39794)
	[0.31444]	[0.98000]	[0.49353]	[-0.40729]	[1.51257]	[-0.83946]	[0.27935]	[0.37930]	[0.03069]
GBR(-4)	**0.125867**	-0.198854	0.281242	-0.019302	**-2.453317**	**-0.868361**	1.256229	0.075881	0.107543
	(0.06501)	(0.48811)	(0.51439)	(0.05356)	**(1.37649)**	**(0.24155)**	(1.07940)	(0.25369)	(0.35792)
	[1.93622]*	[-0.40740]	[0.54675]	[-0.36038]	**[-1.78230]***	**[-3.59489]*****	[1.16383]	[0.29911]	[0.30047]

STOCK_PRICES_LOG_(-1)	**0.061822**	0.022814	0.160337	0.005811	-0.366281	-0.114534	**0.653974**	0.105829	0.039992
	(0.02342)	(0.17586)	(0.18533)	(0.01930)	(0.49594)	(0.08703)	**(0.38890)**	(0.09140)	(0.12896)
	[2.63959]**	[0.12973]	[0.86514]	[0.30111]	[-0.73856]	[-1.31603]	**[1.68161]***	[1.15785]	[0.31012]
STOCK_PRICES_LOG_(-2)	0.020412	-0.069255	-0.176658	-0.011454	-0.007968	**-0.199213**	0.343712	0.037716	0.007135
	(0.02428)	(0.18233)	(0.19214)	(0.02001)	(0.51417)	**(0.09023)**	(0.40319)	(0.09476)	(0.13370)
	[0.84061]	[-0.37984]	[-0.91941]	[-0.57252]	[-0.01550]	**[-2.20785]****	[0.85247]	[0.39800]	[0.05337]
STOCK_PRICES_LOG_(-3)	0.029239	-0.259145	0.107986	-0.034909	0.069443	-0.074079	0.335484	-0.018755	-0.085059
	(0.02640)	(0.19824)	(0.20891)	(0.02175)	(0.55904)	(0.09810)	(0.43838)	(0.10303)	(0.14536)
	[1.10750]	[-1.30726]	[0.51690]	[-1.60484]	[0.12422]	[-0.75511]	[0.76529]	[-0.18203]	[-0.58515]
STOCK_PRICES_LOG_(-4)	0.029285	-0.139178	-0.028726	**-0.046287**	**-1.534285**	**-0.258410**	-0.676023	0.087099	0.163116
	(0.03090)	(0.23201)	(0.24450)	**(0.02546)**	**(0.65428)**	**(0.11482)**	(0.51306)	(0.12058)	(0.17013)
	[0.94778]	[-0.59989]	[-0.11749]	**[-1.81817]***	**[-2.34501]****	**[-2.25064]****	[-1.31763]	[0.72232]	[0.95878]
GFCF_LOG_(-1)	0.050049	-0.132050	-0.152489	0.067960	0.979444	0.441616	0.209613	-0.364390	-0.078443
	(0.07402)	(0.55576)	(0.58569)	(0.06098)	(1.56728)	(0.27504)	(1.22901)	(0.28885)	(0.40753)
	[0.67618]	[-0.23760]	[-0.26036]	[1.11442]	[0.62493]	[1.60567]	[0.17055]	[-1.26152]	[-0.19248]
GFCF_LOG_(-2)	0.050269	-0.167383	-0.122113	0.072788	0.956915	0.394068	0.153639	-0.354502	-0.094751
	(0.07098)	(0.53293)	(0.56163)	(0.05848)	(1.50291)	(0.26374)	(1.17853)	(0.27699)	(0.39079)
	[0.70825]	[-0.31408]	[-0.21743]	[1.24470]	[0.63671]	[1.49416]	[0.13036]	[-1.27985]	[-0.24246]
GFCF_LOG_(-3)	0.058622	-0.150818	-0.135387	0.056953	0.721814	0.366201	0.083962	-0.372306	-0.022089
	(0.07117)	(0.53440)	(0.56318)	(0.05864)	(1.50706)	(0.26447)	(1.18178)	(0.27775)	(0.39187)
	[0.82367]	[-0.28222]	[-0.24040]	[0.97124]	[0.47896]	[1.38468]	[0.07105]	[-1.34043]	[-0.05637]
GFCF_LOG_(-4)	0.050870	-0.117658	-0.238162	0.048423	0.922785	0.425624	0.055855	**0.608322**	-0.034838
	(0.07410)	(0.55642)	(0.58638)	(0.06105)	(1.56913)	(0.27536)	(1.23046)	**(0.28919)**	(0.40801)
	[0.68647]	[-0.21146]	[-0.40616]	[0.79311]	[0.58809]	[1.54570]	[0.04539]	**[2.10353]****	[-0.08539]
REER_LOG_(-1)	**0.146267**	0.403126	0.658300	**-0.144095**	-0.811876	-0.093263	1.005283	0.190289	-0.277628
	(0.07716)	(0.57938)	(0.61058)	**(0.06358)**	(1.63390)	(0.28673)	(1.28125)	(0.30113)	(0.42485)
	[1.89557]*	[0.69578]	[1.07815]	**[-2.26654]****	[-0.49689]	[-0.32527]	[0.78461]	[0.63192]	[-0.65347]

REER_LOG_(-2)	0.066567	0.799793	0.516953	-0.062975	-2.083309	**-0.823596**	0.521093	0.094103	-0.327601
	(0.09731)	(0.73069)	(0.77003)	(0.08018)	(2.06059)	**(0.36160)**	(1.61584)	(0.37977)	(0.53580)
	[0.68404]	[1.09458]	[0.67134]	[-0.78545]	[-1.01102]	**[-2.27762]****	[0.32249]	[0.24779]	[-0.61142]
REER_LOG_(-3)	0.119206	1.030233	0.689870	-0.091722	2.769902	**-0.735377**	1.813019	-0.322351	-0.239644
	(0.10085)	(0.75724)	(0.79802)	(0.08309)	(2.13547)	**(0.37474)**	(1.67456)	(0.39357)	(0.55527)
	[1.18201]	[1.36051]	[0.86448]	[-1.10388]	[1.29709]	**[-1.96234]***	[1.08268]	[-0.81905]	[-0.43158]
REER_LOG_(-4)	**0.191854**	0.505410	0.203176	**-0.224147**	-1.320843	**-1.080115**	1.353587	-0.160216	0.607268
	(0.11054)	(0.83003)	(0.87473)	**(0.09108)**	(2.34075)	**(0.41077)**	(1.83554)	(0.43140)	(0.60865)
	[1.73553]*	[0.60890]	[0.23227]	**[-2.46103]****	[-0.56428]	**[-2.62950]****	[0.73743]	[-0.37138]	[0.99772]
C	0.011426	-0.032349	0.048328	-0.000310	-0.155316	**-0.065474**	0.040258	0.043203	-0.041578
	(0.00868)	(0.06521)	(0.06872)	(0.00716)	(0.18390)	**(0.03227)**	(0.14421)	(0.03389)	(0.04782)
	[1.31563]	[-0.49608]	[0.70324]	[-0.04334]	[-0.84458]	**[-2.02885]****	[0.27917]	[1.27473]	[-0.86950]
R-squared	0.875833	0.759139	0.679177	0.866101	0.752196	0.884289	0.595409	0.997593	0.731801
Adj. R-squared	0.503332	0.036556	-0.283290	0.464404	0.008786	0.537155	-0.618365	0.990374	-0.072797
Sum sq. resids	0.001768	0.099669	0.110692	0.001200	0.792649	0.024410	0.487410	0.026923	0.053593
S.E. equation	0.012138	0.091136	0.096044	0.010000	0.257010	0.045102	0.201538	0.047367	0.066829
F-statistic	2.351225	1.050591	0.705662	2.156107	1.011818	2.547402	0.490543	138.1758	0.909524
Log likelihood	181.1024	82.31607	79.74614	190.5935	31.51478	116.7845	43.42850	114.3832	97.51680
Akaike AIC	-5.881729	-1.849636	-1.744740	-6.269122	0.223887	-3.256511	-0.262388	-3.158496	-2.470074
Schwarz SC	-4.453211	-0.421118	-0.316223	-4.840605	1.652404	-1.827993	1.166130	-1.729979	-1.041556
Mean dependent	0.006356	0.059525	-0.044331	0.022912	0.041172	0.007712	0.017933	0.041715	0.001709
S.D. dependent	0.017223	0.092849	0.084782	0.013664	0.258146	0.066294	0.158423	0.482775	0.064522

Determinant resid covariance (dof adj.)	1.14E-27
Determinant resid covariance	3.60E-33
Log likelihood	1204.499
Akaike information criterion	-35.57138
Schwarz criterion	-22.71473

8.4 Canada Table 8.4 Coefficients and parameters of asymmetric model of Canada. Bold values denote significance at confidence intervals of 1 %* (t-stat over 1.6638), 5 % (t-stat over 1.9896), 10 %*** (t-stat over 2.6378).**

Vector Autoregression Estimates
Date: 07/12/17 Time: 15:57
Sample (adjusted): 1996Q3 2016Q4
Included observations: 82 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	GDP	UP	DOWN	CPI	IR	GBR	STOCK MARKET RETURNS	GFCF	REER
GDP_LOG_(-1)	**0.279529**	-0.499496	0.033798	0.068051	**8.271823**	3.120860	1.560282	0.081530	0.082510
	(0.11367)	(1.16839)	(1.43506)	(0.10185)	**(3.47781)**	(2.21728)	(2.06258)	(0.33397)	(0.71654)
	[2.45906] **	[-0.42751]	[0.02355]	[0.66814]	**[2.37846]** **	[1.40752]	[0.75647]	[0.24412]	[0.11515]
UP(-1)	0.000960	-0.059102	-0.007042	0.009052	0.214582	-0.264581	0.029256	**-0.078269**	0.041240
	(0.01386)	(0.14245)	(0.17497)	(0.01242)	(0.42403)	(0.27034)	(0.25148)	**(0.04072)**	(0.08736)
	[0.06927]	[-0.41488]	[-0.04025]	[0.72898]	[0.50606]	[-0.97870]	[0.11634]	**[-1.92218]***	[0.47205]
DOWN(-1)	**0.051270**	0.075003	0.160755	0.013588	0.575192	0.149123	0.242923	**0.136523**	0.064868
	(0.01147)	(0.11794)	(0.14486)	(0.01028)	(0.35107)	(0.22383)	(0.20821)	**(0.03371)**	(0.07233)
	[4.46802]* **	[0.63592]	[1.10970]	[1.32162]	[1.63839]	[0.66625]	[1.16673]	**[4.04954]*** **	[0.89681]
CPI_LOG_(-1)	**-0.339596**	-0.660048	**-3.875941**	-0.068923	-0.895840	-0.806558	**-10.61239**	-0.216916	-0.745603
	(0.15800)	(1.62403)	**(1.99469)**	(0.14157)	(4.83406)	(3.08196)	**(2.86693)**	(0.46421)	(0.99597)
	[-2.14930] **	[-0.40643]	**[-1.94313]***	[-0.48685]	[-0.18532]	[-0.26170]	**[-3.70166]*** **	[-0.46728]	[-0.74862]
IR(-1)	-0.001200	-0.023795	-0.004931	0.001211	**0.278276**	-0.135135	0.010795	-0.010164	-0.027548
	(0.00346)	(0.03561)	(0.04374)	(0.00310)	**(0.10600)**	(0.06758)	(0.06287)	(0.01018)	(0.02184)
	[-0.34648]	[-0.66816]	[-0.11273]	[0.38993]	**[2.62517]** **	[-1.99957]	[0.17170]	[-0.99845]	[-1.26135]
GBR(-1)	0.008326	-0.048841	-0.023526	-0.009438	-0.143573	-0.069171	0.003506	-0.004186	-0.047683
	(0.00689)	(0.07078)	(0.08693)	(0.00617)	(0.21067)	(0.13432)	(0.12494)	(0.02023)	(0.04341)
	[1.20905]	[-0.69007]	[-0.27063]	[-1.52967]	[-0.68149]	[-0.51499]	[0.02806]	[-0.20691]	[-1.09854]

STOCK_PRICES_LOG_(-1)	**0.014375**	0.103262	**0.244719**	**0.010287**	0.223240	**0.236224**	0.109343	**0.039447**	**0.112546**
	(0.00678)	(0.06968)	**(0.08558)**	**(0.00607)**	(0.20740)	**(0.13223)**	(0.12300)	**(0.01992)**	**(0.04273)**
	[2.12052]**	[1.48200]	**[2.85952]*****	**[1.69360]***	[1.07637]	**[1.78648]***	[0.88895]	**[1.98060]***	**[2.63381]****
GFCF_LOG_(-1)	**0.067209**	0.006526	0.280524	0.006890	0.009720	-0.845048	0.044159	**0.228284**	-0.001728
	(0.03590)	(0.36899)	(0.45321)	(0.03217)	(1.09833)	(0.70024)	(0.65138)	**(0.10547)**	(0.22629)
	[1.87215]*	[0.01769]	[0.61898]	[0.21419]	[0.00885]	[-1.20680]	[0.06779]	**[2.16442]****	[-0.00764]
REER_LOG_(-1)	-0.029472	0.044342	-0.053116	-0.014626	0.460395	0.132174	0.022441	**0.216118**	0.165179
	(0.02322)	(0.23868)	(0.29316)	(0.02081)	(0.71046)	(0.45296)	(0.42135)	**(0.06822)**	(0.14638)
	[-1.26917]	[0.18578]	[-0.18119]	[-0.70295]	[0.64802]	[0.29180]	[0.05326]	**[3.16772]*****	[1.12845]
C	**0.007030**	**0.043033**	-0.015174	**0.004261**	-0.042888	-0.015222	**0.057071**	**0.013149**	0.001536
	(0.00126)	**(0.01294)**	(0.01589)	**(0.00113)**	(0.03851)	(0.02455)	**(0.02284)**	**(0.00370)**	(0.00793)
	[5.58467]***	**[3.32606]*****	[-0.95485]	**[3.77762]*****	[-1.11364]	[-0.61997]	**[2.49872]****	**[3.55558]*****	[0.19354]
R-squared	0.537636	0.072959	0.199751	0.139475	0.419488	0.162309	0.191813	0.608227	0.233289
Adj. R-squared	0.479841	-0.042921	0.099720	0.031909	0.346924	0.057598	0.090789	0.559256	0.137450
Sum sq. resids	0.001512	0.159745	0.240985	0.001214	1.415346	0.575298	0.497820	0.013052	0.060080
S.E. equation	0.004583	0.047103	0.057853	0.004106	0.140205	0.089388	0.083151	0.013464	0.028887
F-statistic	9.302398	0.629611	1.996888	1.296647	5.780939	1.550060	1.898697	12.42001	2.434173
Log likelihood	330.5881	139.5238	122.6664	339.5933	50.08020	86.99005	92.92072	242.2147	179.6179
Akaike AIC	-7.819223	-3.159116	-2.747960	-8.038860	-0.977566	-1.877806	-2.022457	-5.663772	-4.137022
Schwarz SC	-7.525720	-2.865614	-2.454458	-7.745358	-0.684063	-1.584304	-1.728954	-5.370270	-3.843519
Mean dependent	0.006102	0.034874	-0.032444	0.004591	-0.002855	-0.016219	0.012540	0.008157	0.000487
S.D. dependent	0.006354	0.046123	0.060973	0.004173	0.173493	0.092079	0.087204	0.020280	0.031103

Determinant resid covariance (dof adj.)	7.56E-29
Determinant resid covariance	2.34E-29
Log likelihood	1655.675
Akaike information criterion	-38.18720
Schwarz criterion	-35.54568

8.5 Germany Table 8.5 Coefficients and parameters of asymmetric model of Germany. Bold values denote significance at confidence intervals of 1 %* (t-stat over 1.6646), 5 % (t-stat over 1.9908), 10 %*** (t-stat over 2.6403).**

Vector Autoregression Estimates
Date: 07/12/17 Time: 13:51
Sample (adjusted): 1997Q2 2016Q4
Included observations: 79 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	GDP	UP	DOWN	CPI	IR	GBR	STOCK MARKET RETURNS	GFCF	REER
GDP_LOG_(-1)	0.360633	2.902791	0.875381	0.175994	-0.609449	1.378297	-0.030985	0.728804	-0.354021
	(0.22774)	(4.27668)	(3.02546)	(0.11015)	(9.72053)	(5.70144)	(4.34690)	(0.56128)	(0.50012)
	[1.58356]	[0.67875]	[0.28934]	[1.59772]	[-0.06270]	[0.24175]	[-0.00713]	[1.29846]	[-0.70787]
GDP_LOG_(-2)	-0.129005	-2.028859	1.579928	0.088179	-6.528941	-0.610033	-5.113706	-0.650898	-0.412884
	(0.22138)	(4.15731)	(2.94101)	(0.10708)	(9.44920)	(5.54229)	(4.22557)	(0.54561)	(0.48616)
	[-0.58273]	[-0.48802]	[0.53721]	[0.82350]	[-0.69095]	[-0.11007]	[-1.21018]	[-1.19296]	[-0.84927]
GDP_LOG_(-3)	0.101332	3.121594	**-5.481955**	-0.086956	3.460112	0.175102	-0.199142	0.770017	-0.096201
	(0.21706)	(4.07617)	**(2.88361)**	(0.10499)	(9.26478)	(5.43412)	(4.14310)	(0.53497)	(0.47668)
	[0.46684]	[0.76582]	**[-1.90107]***	[-0.82824]	[0.37347]	[0.03222]	[-0.04807]	[1.43938]	[-0.20182]
GDP_LOG_(-4)	0.000347	1.919382	**6.175474**	**0.221022**	**23.31915**	6.198111	**-7.882207**	-0.056502	0.556713
	(0.22651)	(4.25371)	**(3.00921)**	**(0.10956)**	**(9.66832)**	(5.67082)	**(4.32356)**	(0.55827)	(0.49744)
	[0.00153]	[0.45123]	**[2.05219]****	**[2.01732]****	**[2.41191]****	[1.09298]	**[-1.82308]***	[-0.10121]	[1.11916]
UP(-1)	-0.005104	0.148550	-0.034008	-0.004695	-0.740245	0.045102	**0.397423**	-0.001020	**-0.044966**
	(0.01181)	(0.22178)	(0.15690)	(0.00571)	(0.50409)	(0.29567)	**(0.22542)**	(0.02911)	**(0.02594)**
	[-0.43221]	[0.66980]	[-0.21675]	[-0.82183]	[-1.46847]	[0.15254]	**[1.76299]***	[-0.03504]	**[-1.73373]***
UP(-2)	0.004878	0.137330	0.043462	0.004415	0.558103	0.315843	-0.054073	-0.006308	0.008352
	(0.01042)	(0.19577)	(0.13849)	(0.00504)	(0.44496)	(0.26098)	(0.19898)	(0.02569)	(0.02289)
	[0.46796]	[0.70151]	[0.31382]	[0.87555]	[1.25429]	[1.21020]	[-0.27175]	[-0.24552]	[0.36482]

UP(-3)	-0.012911	0.068412	0.077578	0.001907	0.573563	-0.032426	-0.208647	-0.008635	-0.000596
	(0.00978)	(0.18372)	(0.12997)	(0.00473)	(0.41759)	(0.24493)	(0.18674)	(0.02411)	(0.02148)
	[-1.31971]	[0.37237]	[0.59689]	[0.40302]	[1.37352]	[-0.13239]	[-1.11731]	[-0.35814]	[-0.02776]
UP(-4)	0.003774	0.047592	0.086887	-0.001407	0.642168	-0.086767	0.046505	0.019268	-0.020291
	(0.00967)	(0.18154)	(0.12842)	(0.00468)	(0.41261)	(0.24201)	(0.18452)	(0.02383)	(0.02123)
	[0.39036]	[0.26216]	[0.67656]	[-0.30089]	[1.55634]	[-0.35852]	[0.25204]	[0.80875]	[-0.95581]
DOWN(-1)	**0.035799**	0.087274	0.127099	0.000246	-0.350840	-0.119507	-0.075548	**0.124384**	-0.022400
	(0.01545)	(0.29006)	(0.20520)	(0.00747)	(0.65929)	(0.38670)	(0.29483)	**(0.03807)**	(0.03392)
	[2.31768]**	[0.30088]	[0.61939]	[0.03296]	[-0.53215]	[-0.30905]	[-0.25625]	**[3.26737]*****	[-0.66035]
DOWN(-2)	-0.007007	-0.051577	-0.000326	0.007270	0.246908	-0.577216	0.108564	0.009650	-0.009219
	(0.01627)	(0.30545)	(0.21609)	(0.00787)	(0.69427)	(0.40721)	(0.31047)	(0.04009)	(0.03572)
	[-0.43079]	[-0.16885]	[-0.00151]	[0.92406]	[0.35564]	[-1.41747]	[0.34968]	[0.24072]	[-0.25809]
DOWN(-3)	-0.007022	-0.351723	-0.162895	-0.005242	-0.979491	**-0.736818**	0.418154	0.029120	**-0.062049**
	(0.01517)	(0.28479)	(0.20147)	(0.00734)	(0.64730)	**(0.37966)**	(0.28946)	(0.03738)	**(0.03330)**
	[-0.46304]	[-1.23504]	[-0.80855]	[-0.71471]	[-1.51321]	**[-1.94072]***	[1.44459]	[0.77911]	**[-1.86313]***
DOWN(-4)	-0.010026	0.056691	0.049222	0.004044	-0.898265	-0.105304	0.172762	0.006923	0.032807
	(0.01826)	(0.34286)	(0.24255)	(0.00883)	(0.77929)	(0.45708)	(0.34849)	(0.04500)	(0.04009)
	[-0.54913]	[0.16535]	[0.20293]	[0.45793]	[-1.15267]	[-0.23038]	[0.49575]	[0.15384]	[0.81825]
CPI_LOG_(-1)	0.280266	-11.92905	-0.712299	0.150542	**30.82471**	12.20066	**-13.72030**	-1.113096	**1.892765**
	(0.41871)	(7.86299)	(5.56252)	(0.20252)	**(17.8719)**	(10.4825)	**(7.99209)**	(1.03196)	**(0.91951)**
	[0.66936]	[-1.51711]	[-0.12805]	[0.74333]	**[1.72476]***	[1.16391]	**[-1.71673]***	[-1.07863]	**[2.05844]****
CPI_LOG_(-2)	-0.472386	-7.135466	-1.247687	-0.253389	-14.76135	-1.494394	5.552403	-1.284718	-1.395411
	(0.48080)	(9.02893)	(6.38735)	(0.23256)	(20.5220)	(12.0369)	(9.17718)	(1.18498)	(1.05586)
	[-0.98251]	[-0.79029]	[-0.19534]	[-1.08958]	[-0.71930]	[-0.12415]	[0.60502]	[-1.08417]	[-1.32159]
CPI_LOG_(-3)	-0.294526	1.576461	-1.344233	0.147714	-14.21604	14.83582	5.969411	0.288704	-0.040605
	(0.47723)	(8.96200)	(6.34000)	(0.23083)	(20.3699)	(11.9476)	(9.10915)	(1.17619)	(1.04803)
	[-0.61716]	[0.17590]	[-0.21202]	[0.63992]	[-0.69790]	[1.24174]	[0.65532]	[0.24546]	[-0.03874]

CPI_LOG_(-4)	**-0.757114**	2.230858	0.607535	0.175708	-4.845379	4.521240	**-15.38913**	-1.336892	0.529792
	(0.44697)	(8.39379)	(5.93803)	(0.21620)	(19.0784)	(11.1901)	**(8.53161)**	(1.10162)	(0.98159)
	[-1.69387]*	[0.26577]	[0.10231]	[0.81272]	[-0.25397]	[0.40404]	**[-1.80378]***	[-1.21357]	[0.53973]
IR(-1)	0.000167	-0.028074	0.024064	0.000667	**0.643821**	**-0.388039**	0.061946	0.001218	-0.005154
	(0.00430)	(0.08079)	(0.05715)	(0.00208)	**(0.18363)**	**(0.10770)**	(0.08211)	(0.01060)	(0.00945)
	[0.03878]	[-0.34750]	[0.42106]	[0.32045]	**[3.50617]***	**[-3.60287]***	[0.75438]	[0.11485]	[-0.54556]
IR(-2)	-0.001013	-0.060412	-0.097688	-0.000977	0.279871	**-0.273012**	-0.081694	0.006003	0.012537
	(0.00469)	(0.08813)	(0.06235)	(0.00227)	(0.20032)	**(0.11750)**	(0.08958)	(0.01157)	(0.01031)
	[-0.21591]	[-0.68544]	[-1.56678]	[-0.43021]	[1.39710]	**[-2.32357]****	[-0.91195]	[0.51901]	[1.21643]
IR(-3)	-0.006127	0.139988	0.019383	-0.000574	0.081935	**-0.402314**	-0.059301	0.001879	-0.002241
	(0.00518)	(0.09720)	(0.06876)	(0.00250)	(0.22093)	**(0.12958)**	(0.09880)	(0.01276)	(0.01137)
	[-1.18374]	[1.44019]	[0.28188]	[-0.22931]	[0.37087]	**[-3.10470]***	[-0.60023]	[0.14731]	[-0.19719]
IR(-4)	-0.004482	-0.105607	-0.002123	0.000945	-0.116826	**-0.555344**	0.020381	-0.009776	0.006654
	(0.00400)	(0.07504)	(0.05309)	(0.00193)	(0.17056)	**(0.10004)**	(0.07627)	(0.00985)	(0.00878)
	[-1.12174]	[-1.40734]	[-0.04000]	[0.48909]	[-0.68496]	**[-5.55125]***	[0.26722]	[-0.99266]	[0.75825]
GBR(-1)	-0.006167	-0.009104	-0.073830	-0.000730	**0.892284**	-0.210529	-0.000192	-0.002664	0.005002
	(0.00526)	(0.09877)	(0.06987)	(0.00254)	**(0.22450)**	(0.13168)	(0.10039)	(0.01296)	(0.01155)
	[-1.17245]	[-0.09217]	[-1.05661]	[-0.28691]	**[3.97452]***	[-1.59881]	[-0.00191]	[-0.20551]	[0.43303]
GBR(-2)	0.005148	0.074795	-0.003530	-0.000681	**-1.088277**	**0.489957**	-0.268348	0.024477	0.021371
	(0.01168)	(0.21931)	(0.15515)	(0.00565)	**(0.49848)**	**(0.29237)**	(0.22291)	(0.02878)	(0.02565)
	[0.44083]	[0.34105]	[-0.02276]	[-0.12055]	**[-2.18321]****	**[1.67579]***	[-1.20383]	[0.85039]	[0.83330]
GBR(-3)	-0.000683	0.120727	0.182751	0.001813	**-1.138935**	0.242543	0.032948	-0.046439	-0.020836
	(0.01166)	(0.21904)	(0.15495)	(0.00564)	**(0.49785)**	(0.29201)	(0.22263)	(0.02875)	(0.02561)
	[-0.05858]	[0.55117]	[1.17939]	[0.32141]	**[-2.28771]****	[0.83061]	[0.14799]	[-1.61544]	[-0.81346]
GBR(-4)	0.019584	-0.080245	0.157955	0.005413	**-1.247945**	0.419125	0.295668	-0.013328	-0.025291
	(0.01219)	(0.22893)	(0.16195)	(0.00590)	**(0.52034)**	(0.30520)	(0.23269)	(0.03005)	(0.02677)
	[1.60645]	[-0.35052]	[0.97532]	[0.91805]	**[-2.39834]****	[1.37330]	[1.27066]	[-0.44360]	[-0.94470]

STOCK_PRICES_LOG_(-1)	**0.017490**	-0.003387	**0.225843**	0.004855	-0.289338	0.084552	0.021400	**0.032053**	**-0.038776**
	(0.00758)	(0.14227)	**(0.10065)**	(0.00366)	(0.32337)	(0.18967)	(0.14461)	**(0.01867)**	**(0.01664)**
	[2.30862]**	[-0.02381]	**[2.24390]****	[1.32495]	[-0.89476]	[0.44579]	[0.14799]	**[1.71661]***	**[-2.33066]****
STOCK_PRICES_LOG_(-2)	0.001115	-0.009471	0.109530	0.002288	0.128199	-0.199936	0.264037	-0.019337	-0.006039
	(0.00938)	(0.17607)	(0.12456)	(0.00454)	(0.40020)	(0.23473)	(0.17896)	(0.02311)	(0.02059)
	[0.11891]	[-0.05379]	[0.87935]	[0.50446]	[0.32034]	[-0.85177]	[1.47538]	[-0.83681]	[-0.29330]
STOCK_PRICES_LOG_(-3)	-0.002325	-0.233964	0.124369	-9.06E-05	0.487891	-0.196609	-0.220077	0.031196	0.016297
	(0.00878)	(0.16497)	(0.11670)	(0.00425)	(0.37496)	(0.21993)	(0.16768)	(0.02165)	(0.01929)
	[-0.26465]	[-1.41824]	[1.06569]	[-0.02131]	[1.30119]	[-0.89398]	[-1.31251]	[1.44086]	[0.84477]
STOCK_PRICES_LOG_(-4)	-0.001335	0.130415	-0.048793	-0.002358	0.488470	-0.189133	0.127250	0.010274	-0.002264
	(0.00934)	(0.17542)	(0.12410)	(0.00452)	(0.39872)	(0.23386)	(0.17830)	(0.02302)	(0.02051)
	[-0.14293]	[0.74343]	[-0.39318]	[-0.52191]	[1.22510]	[-0.80874]	[0.71368]	[0.44625]	[-0.11038]
GFCF_LOG_(-1)	-0.075520	-0.712335	-0.095428	-0.048353	-0.254804	2.206646	1.564592	-0.245531	0.138074
	(0.08808)	(1.65410)	(1.17016)	(0.04260)	(3.75963)	(2.20516)	(1.68126)	(0.21709)	(0.19343)
	[-0.85738]	[-0.43065]	[-0.08155]	[-1.13493]	[-0.06777]	[1.00067]	[0.93061]	[-1.13102]	[0.71380]
GFCF_LOG_(-2)	0.061446	0.792638	-0.032842	-0.020726	3.850994	**3.900701**	-0.215378	0.090751	**0.311160**
	(0.08240)	(1.54746)	(1.09472)	(0.03986)	(3.51725)	**(2.06299)**	(1.57287)	(0.20309)	**(0.18096)**
	[0.74568]	[0.51222]	[-0.03000]	[-0.52000]	[1.09489]	**[1.89080]***	[-0.13693]	[0.44684]	**[1.71946]***
GFCF_LOG_(-3)	0.088643	-0.823945	0.738067	0.013804	-0.877781	3.242207	0.959916	0.040169	-0.202616
	(0.08697)	(1.63315)	(1.15534)	(0.04206)	(3.71202)	(2.17723)	(1.65997)	(0.21434)	(0.19098)
	[1.01929]	[-0.50451]	[0.63883]	[0.32816]	[-0.23647]	[1.48914]	[0.57827]	[0.18741]	[-1.06090]
GFCF_LOG_(-4)	0.021729	-0.234543	-1.607693	**-0.072398**	**-8.164891**	-0.322649	**4.160948**	0.041712	-0.236171
	(0.07811)	(1.46691)	(1.03774)	**(0.03778)**	**(3.33415)**	(1.95560)	**(1.49099)**	(0.19252)	(0.17154)
	[0.27817]	[-0.15989]	[-1.54923]	**[-1.91616]***	**[-2.44886]****	[-0.16499]	**[2.79072]*****	[0.21666]	[-1.37675]
REER_LOG_(-1)	0.086305	-1.092335	0.042935	0.000452	-2.886552	0.184332	**3.992960**	0.138335	-0.038666
	(0.07816)	(1.46776)	(1.03834)	(0.03780)	(3.33609)	(1.95673)	**(1.49186)**	(0.19263)	(0.17164)
	[1.10422]	[-0.74422]	[0.04135]	[0.01195]	[-0.86525]	[0.09420]	**[2.67650]*****	[0.71813]	[-0.22527]

REER_LOG_(-2)	-0.083036	1.680921	0.588188	0.013201	1.908451	-0.734340	-1.955653	0.056906	0.140977
	(0.07037)	(1.32157)	(0.93492)	(0.03404)	(3.00381)	(1.76184)	(1.34327)	(0.17345)	(0.15455)
	[-1.17992]	[1.27192]	[0.62913]	[0.38783]	[0.63534]	[-0.41680]	[-1.45589]	[0.32809]	[0.91219]
REER_LOG_(-3)	-0.033244	-0.544054	-0.776766	0.000427	**5.185304**	-2.043412	-1.515153	0.264313	0.032588
	(0.07243)	(1.36017)	(0.96222)	(0.03503)	**(3.09154)**	(1.81330)	(1.38250)	(0.17851)	(0.15906)
	[-0.45898]	[-0.39999]	[-0.80726]	[0.01218]	**[1.67725]***	[-1.12690]	[-1.09595]	[1.48065]	[0.20488]
REER_LOG_(-4)	-0.052976	0.848357	1.030248	0.005347	-0.814279	**-2.928544**	1.500240	-0.183305	-0.187797
	(0.06737)	(1.26513)	(0.89499)	(0.03259)	(2.87554)	**(1.68660)**	(1.28590)	(0.16604)	(0.14795)
	[-0.78636]	[0.67057]	[1.15112]	[0.16410]	[-0.28317]	**[-1.73635]***	[1.16668]	[-1.10399]	[-1.26936]
C	0.007516	0.077028	-0.065811	0.002087	-0.261966	**-0.313210**	0.123168	0.020491	-0.003763
	(0.00452)	(0.08495)	(0.06010)	(0.00219)	(0.19308)	**(0.11325)**	(0.08634)	(0.01115)	(0.00993)
	[1.66148]	[0.90676]	[-1.09512]	[0.95384]	[-1.35677]	**[-2.76569]*****	[1.42650]	[1.83792]	[-0.37882]
R-squared	0.648246	0.430312	0.488107	0.418870	0.739105	0.893376	0.492414	0.622792	0.529876
Adj. R-squared	0.346743	-0.057991	0.049342	-0.079242	0.515481	0.801984	0.057341	0.299471	0.126913
Sum sq. resids	0.001899	0.669807	0.335211	0.000444	3.460315	1.190432	0.691983	0.011537	0.009160
S.E. equation	0.006725	0.126285	0.089338	0.003253	0.287034	0.168356	0.128358	0.016574	0.014768
F-statistic	2.150048	0.881239	1.112458	0.840915	3.305126	9.775224	1.131796	1.926232	1.314948
Log likelihood	308.0143	76.32727	103.6704	365.3929	11.46334	53.61155	75.04068	236.7534	245.8674
Akaike AIC	-6.861123	-0.995627	-1.687857	-8.313745	0.646498	-0.420546	-0.963055	-5.057048	-5.287782
Schwarz SC	-5.751381	0.114114	-0.578116	-7.204004	1.756239	0.689196	0.146686	-3.947307	-4.178040
Mean dependent	0.003442	0.079831	-0.056096	0.003408	0.024324	-0.088348	0.014547	0.002899	-0.002648
S.D. dependent	0.008320	0.122775	0.091627	0.003131	0.412361	0.378336	0.132204	0.019802	0.015805

Determinant resid covariance (dof adj.)	7.79E-27
Determinant resid covariance	2.64E-29
Log likelihood	1590.326
Akaike information criterion	-31.83105
Schwarz criterion	-21.84338

8.6 Italy Table 8.6 Coefficients and parameters of asymmetric model of Italy. Bold values denote significance at confidence intervals of 1 %* (t-stat over 1.6665), 5 % (t-stat over 1.9939), 10 %*** (t-stat over 2.3800).**

Vector Autoregression Estimates
Date: 07/12/17 Time: 12:02
Sample (adjusted): 1999Q1 2016Q4
Included observations: 72 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	GDP	UP	DOWN	CPI	IR	GBR	STOCK MARKET RETURNS	GFCF	REER
GDP_LOG_(-1)	**0.369570**	0.060416	-1.225212	-0.019283	-6.448221	0.613315	4.939673	**1.375189**	0.842910
	(0.20997)	(5.36684)	(3.80514)	(0.11739)	(22.6125)	(5.01899)	(4.91072)	**(0.53972)**	(0.66004)
	[1.76011]*	[0.01126]	[-0.32199]	[-0.16426]	[-0.28516]	[0.12220]	[1.00590]	**[2.54796]*****	[1.27707]
GDP_LOG_(-2)	-0.336274	-6.688585	1.957197	0.060886	1.538912	8.246771	-7.924651	0.225683	-0.589052
	(0.25006)	(6.39159)	(4.53170)	(0.13981)	(26.9301)	(5.97732)	(5.84838)	(0.64278)	(0.78606)
	[-1.34477]	[-1.04647]	[0.43189]	[0.43549]	[0.05714]	[1.37968]	[-1.35502]	[0.35111]	[-0.74937]
GDP_LOG_(-3)	-0.077677	**-14.23388**	**-9.981618**	-0.108939	8.538169	-3.666332	-4.525674	-0.081492	0.000142
	(0.26503)	**(6.77417)**	**(4.80295)**	(0.14818)	(28.5421)	(6.33510)	(6.19845)	(0.68125)	(0.83312)
	[-0.29309]	**[-2.10120]****	**[-2.07823]****	[-0.73519]	[0.29914]	[-0.57873]	[-0.73013]	[-0.11962]	[0.00017]
GDP_LOG_(-4)	0.099661	-3.863714	-2.099930	0.087125	-1.900443	0.818885	5.552573	0.576469	0.271910
	(0.19975)	(5.10566)	(3.61996)	(0.11168)	(21.5120)	(4.77473)	(4.67174)	(0.51346)	(0.62792)
	[0.49893]	[-0.75675]	[-0.58010]	[0.78012]	[-0.08834]	[0.17150]	[1.18855]	[1.12272]	[0.43304]
UP(-1)	0.007615	-0.017754	0.021679	0.004118	-0.723022	-0.112925	-0.061846	0.013438	-0.022135
	(0.00708)	(0.18092)	(0.12827)	(0.00396)	(0.76226)	(0.16919)	(0.16554)	(0.01819)	(0.02225)
	[1.07584]	[-0.09813]	[0.16901]	[1.04059]	[-0.94852]	[-0.66745]	[-0.37360]	[0.73862]	[-0.99484]
UP(-2)	0.005602	0.010220	-0.011864	-0.003857	-0.490062	**0.338198**	0.235891	**0.033975**	0.007736
	(0.00696)	(0.17799)	(0.12619)	(0.00389)	(0.74992)	**(0.16645)**	(0.16286)	**(0.01790)**	(0.02189)
	[0.80446]	[0.05742]	[-0.09401]	[-0.99062]	[-0.65349]	**[2.03184]****	[1.44844]	**[1.89812]***	[0.35340]

UP(-3)	0.001319	-0.026005	0.016657	0.000422	0.016036	0.013229	-0.050869	0.006501	**-0.055808**
	(0.00658)	(0.16814)	(0.11921)	(0.00368)	(0.70842)	(0.15724)	(0.15385)	(0.01691)	**(0.02068)**
	[0.20056]	[-0.15466]	[0.13973]	[0.11471]	[0.02264]	[0.08414]	[-0.33064]	[0.38447]	**[-2.69886]*** **
UP(-4)	0.009678	**-0.302624**	-0.058057	-0.001813	-0.137480	**-0.284454**	0.234061	0.002304	-0.008520
	(0.00683)	**(0.17457)**	(0.12377)	(0.00382)	(0.73551)	**(0.16325)**	(0.15973)	(0.01756)	(0.02147)
	[1.41705]	**[-1.73357]***	[-0.46907]	[-0.47469]	[-0.18692]	**[-1.74242]***	[1.46534]	[0.13124]	[-0.39685]
DOWN(-1)	0.010288	-0.151390	-0.131042	0.007253	0.345603	0.262497	0.442643	0.020905	0.049638
	(0.01213)	(0.30993)	(0.21975)	(0.00678)	(1.30586)	(0.28984)	(0.28359)	(0.03117)	(0.03812)
	[0.84849]	[-0.48846]	[-0.59634]	[1.06982]	[0.26466]	[0.90565]	[1.56085]	[0.67072]	[1.30226]
DOWN(-2)	**-0.020564**	-0.072399	**-0.363494**	-0.003802	0.307183	**-0.637359**	0.060804	**-0.057253**	0.011051
	(0.01116)	(0.28517)	**(0.20219)**	(0.00624)	(1.20152)	**(0.26669)**	(0.26093)	**(0.02868)**	(0.03507)
	[-1.84318]*	[-0.25388]	**[-1.79781]***	[-0.60947]	[0.25566]	**[-2.38993]*** **	[0.23303]	**[-1.99639]** **	[0.31510]
DOWN(-3)	-0.007001	-0.039687	-0.263589	-0.008797	-1.175897	-0.245069	**0.659591**	-0.046894	0.032522
	(0.01323)	(0.33826)	(0.23983)	(0.00740)	(1.42523)	(0.31634)	**(0.30952)**	(0.03402)	(0.04160)
	[-0.52904]	[-0.11733]	[-1.09905]	[-1.18893]	[-0.82506]	[-0.77470]	**[2.13104]** **	[-1.37851]	[0.78176]
DOWN(-4)	-0.000770	0.486685	**0.554637**	0.006469	-1.598808	0.275125	0.129859	-0.047803	-0.022849
	(0.01144)	(0.29252)	**(0.20740)**	(0.00640)	(1.23248)	(0.27356)	(0.26766)	(0.02942)	(0.03597)
	[-0.06726]	[1.66378]	**[2.67428]*** **	[1.01100]	[-1.29723]	[1.00573]	[0.48517]	[-1.62499]	[-0.63512]
CPI_LOG_(-1)	0.250438	0.381939	7.969029	0.081530	-17.81145	-5.405277	**-20.57004**	-1.319667	**-2.024624**
	(0.36079)	(9.22188)	(6.53840)	(0.20172)	(38.8552)	(8.62416)	**(8.43813)**	(0.92741)	**(1.13415)**
	[0.69414]	[0.04142]	[1.21880]	[0.40418]	[-0.45841]	[-0.62676]	**[-2.43775]*** **	[-1.42296]	**[-1.78515]***
CPI_LOG_(-2)	0.037821	-6.317971	3.559041	**0.686918**	12.06508	8.411130	-3.092316	0.699399	-0.309011
	(0.37060)	(9.47267)	(6.71621)	**(0.20720)**	(39.9118)	(8.85869)	(8.66760)	(0.95263)	(1.16499)
	[0.10205]	[-0.66697]	[0.52992]	**[3.31516]*** **	[0.30229]	[0.94948]	[-0.35677]	[0.73418]	[-0.26525]
CPI_LOG_(-3)	-0.611753	10.55960	1.246956	0.046680	12.87652	6.609307	-5.546138	-0.289956	1.059332
	(0.37485)	(9.58131)	(6.79324)	(0.20958)	(40.3696)	(8.96029)	(8.76701)	(0.96355)	(1.17835)
	[-1.63198]	[1.10210]	[0.18356]	[0.22273]	[0.31897]	[0.73762]	[-0.63261]	[-0.30092]	[0.89900]

CPI_LOG_(-4)	-0.312926	-5.759313	**-15.03305**	**-0.598024**	-24.92693	-5.202845	3.206064	-0.324320	**2.333680**
	(0.35186)	(8.99364)	**(6.37658)**	**(0.19673)**	(37.8935)	(8.41071)	(8.22928)	(0.90445)	**(1.10607)**
	[-0.88935]	[-0.64038]	**[-2.35754]****	**[-3.03987]*****	[-0.65782]	[-0.61860]	[0.38959]	[-0.35858]	**[2.10988]****
IR(-1)	-0.000278	0.009993	0.011740	-0.001085	**0.396239**	0.009798	-0.020796	-0.004947	-0.004047
	(0.00165)	(0.04209)	(0.02984)	(0.00092)	**(0.17735)**	(0.03937)	(0.03852)	(0.00423)	(0.00518)
	[-0.16854]	[0.23740]	[0.39338]	[-1.17872]	**[2.23416]****	[0.24890]	[-0.53994]	[-1.16852]	[-0.78181]
IR(-2)	-0.000471	-0.040723	**-0.078352**	-0.001223	0.083999	**-0.075823**	-0.001211	-0.003406	0.007238
	(0.00184)	(0.04709)	**(0.03339)**	(0.00103)	(0.19842)	**(0.04404)**	(0.04309)	(0.00474)	(0.00579)
	[-0.25561]	[-0.86474]	**[-2.34661]****	[-1.18683]	[0.42334]	**[-1.72165]***	[-0.02809]	[-0.71910]	[1.24970]
IR(-3)	-0.000775	**0.085096**	0.051767	-0.000466	-0.108452	0.037832	-0.016277	-0.000726	-0.003151
	(0.00175)	**(0.04467)**	(0.03167)	(0.00098)	(0.18821)	(0.04178)	(0.04087)	(0.00449)	(0.00549)
	[-0.44335]	**[1.90496]***	[1.63449]	[-0.47718]	[-0.57622]	[0.90560]	[-0.39823]	[-0.16163]	[-0.57364]
IR(-4)	-0.000460	-0.061889	**0.045778**	0.000226	-0.042099	-0.002771	0.003761	-0.003806	-0.002723
	(0.00148)	(0.03795)	**(0.02691)**	(0.00083)	(0.15990)	(0.03549)	(0.03472)	(0.00382)	(0.00467)
	[-0.30955]	[-1.63079]	**[1.70134]***	[0.27256]	[-0.26329]	[-0.07809]	[0.10832]	[-0.99738]	[-0.58350]
GBR(-1)	-0.002962	0.107867	-0.010575	0.003373	**3.428017**	0.025292	**0.373227**	**-0.042171**	0.025951
	(0.00931)	(0.23788)	(0.16866)	(0.00520)	**(1.00229)**	(0.22247)	**(0.21767)**	**(0.02392)**	(0.02926)
	[-0.31824]	[0.45344]	[-0.06270]	[0.64818]	**[3.42018]*****	[0.11369]	**[1.71468]***	**[-1.76277]***	[0.88703]
GBR(-2)	-0.005690	0.174020	0.240146	0.006473	**-2.365284**	0.010760	0.008354	0.005496	0.009136
	(0.01182)	(0.30209)	(0.21419)	(0.00661)	**(1.27282)**	(0.28251)	(0.27642)	(0.03038)	(0.03715)
	[-0.48141]	[0.57605]	[1.12121]	[0.97962]	**[-1.85830]***	[0.03809]	[0.03022]	[0.18090]	[0.24590]
GBR(-3)	0.004270	0.139885	**0.402979**	0.004699	-0.595560	0.358056	-0.251220	-0.000917	-0.017606
	(0.01066)	(0.27252)	**(0.19322)**	(0.00596)	(1.14822)	(0.25486)	(0.24936)	(0.02741)	(0.03352)
	[0.40050]	[0.51330]	**[2.08561]****	[0.78833]	[-0.51868]	[1.40494]	[-1.00746]	[-0.03346]	[-0.52532]
GBR(-4)	0.012560	0.263814	0.170495	0.008352	-0.934368	-0.308558	0.265106	-0.000219	**-0.058661**
	(0.01075)	(0.27481)	(0.19484)	(0.00601)	(1.15786)	(0.25699)	(0.25145)	(0.02764)	**(0.03380)**
	[1.16822]	[0.96000]	[0.87505]	[1.38942]	[-0.80698]	[-1.20065]	[1.05431]	[-0.00794]	**[-1.73571]***

STOCK_PRICES_LOG_(-1)	**0.014978**	0.030466	**0.250279**	0.001265	0.160995	-0.008241	0.201834		-0.020719	-0.029879
	(0.00662)	(0.16915)	**(0.11993)**	(0.00370)	(0.71271)	(0.15819)	(0.15478)		(0.01701)	(0.02080)
	[2.26332]**	[0.18011]	**[2.08684]****	[0.34193]	[0.22589]	[-0.05209]	[1.30402]		[-1.21798]	[-1.43627]
STOCK_PRICES_LOG_(-2)	0.006490	0.168106	0.099053	-0.005608	0.592125	-0.202304	-0.112641		0.002357	-0.030487
	(0.00754)	(0.19272)	(0.13664)	(0.00422)	(0.81200)	(0.18023)	(0.17634)		(0.01938)	(0.02370)
	[0.86075]	[0.87228]	[0.72491]	[-1.33022]	[0.72922]	[-1.12248]	[-0.63877]		[0.12159]	[-1.28627]
STOCK_PRICES_LOG_(-3)	**0.019391**	0.030147	**0.416245**	0.000173	-1.079343	-0.063979	-0.208127		**0.035983**	-0.013518
	(0.00807)	(0.20625)	**(0.14623)**	(0.00451)	(0.86899)	(0.19288)	(0.18872)		**(0.02074)**	(0.02537)
	[2.40313]***	[0.14617]	**[2.84650]*****	[0.03829]	[-1.24206]	[-0.33171]	[-1.10285]		**[1.73484]***	[-0.53292]
STOCK_PRICES_LOG_(-4)	0.010284	0.230944	**0.286656**	0.003839	0.142833	-0.036519	-0.076953		-0.005438	**-0.070144**
	(0.00843)	(0.21548)	**(0.15278)**	(0.00471)	(0.90790)	(0.20151)	(0.19717)		(0.02167)	**(0.02650)**
	[1.21985]	[1.07177]	**[1.87630]***	[0.81452]	[0.15732]	[-0.18123]	[-0.39030]		[-0.25095]	**[-2.64690]*****
GFCF_LOG_(-1)	0.088058	1.967561	0.618797	0.046700	-1.697326	0.130086	2.626616		-0.133205	0.062833
	(0.07954)	(2.03308)	(1.44147)	(0.04447)	(8.56609)	(1.90130)	(1.86029)		(0.20446)	(0.25004)
	[1.10708]	[0.96778]	[0.42928]	[1.05011]	[-0.19814]	[0.06842]	[1.41194]		[-0.65150]	[0.25129]
GFCF_LOG_(-2)	-0.020080	**3.477495**	0.533705	0.003025	1.935336	-0.546185	-1.323695		-0.078425	0.336134
	(0.07683)	**(1.96389)**	(1.39241)	(0.04296)	(8.27457)	(1.83660)	(1.79698)		(0.19750)	(0.24153)
	[-0.26134]	**[1.77072]***	[0.38329]	[0.07042]	[0.23389]	[-0.29739]	[-0.73662]		[-0.39709]	[1.39171]
GFCF_LOG_(-3)	0.074895	**4.609794**	0.230795	-0.015146	4.510331	0.424634	1.846621		0.073886	-0.102391
	(0.07299)	**(1.86576)**	(1.32284)	(0.04081)	(7.86112)	(1.74483)	(1.70719)		(0.18763)	(0.22946)
	[1.02603]	**[2.47073]*****	[0.17447]	[-0.37112]	[0.57375]	[0.24337]	[1.08167]		[0.39378]	[-0.44623]
GFCF_LOG_(-4)	0.026545	2.228355	0.774798	0.020589	-0.372049	0.221941	-1.179946		0.128620	0.098755
	(0.06943)	(1.77453)	(1.25816)	(0.03882)	(7.47675)	(1.65952)	(1.62372)		(0.17846)	(0.21824)
	[0.38235]	[1.25574]	[0.61582]	[0.53043]	[-0.04976]	[0.13374]	[-0.72669]		[0.72073]	[0.45251]
REER_LOG_(-1)	**0.095652**	**-2.390962**	0.663719	**0.049978**	-5.233300	**-2.206195**	**3.267097**		0.117890	0.066456
	(0.05040)	**(1.28813)**	(0.91330)	**(0.02818)**	(5.42737)	**(1.20464)**	**(1.17866)**		(0.12954)	(0.15842)
	[1.89801]*	**[-1.85614]***	[0.72673]	**[1.77373]***	[-0.96424]	**[-1.83141]***	**[2.77188]*****		[0.91005]	[0.41949]

REER_LOG_(-2)	-0.019084	**2.292427**	0.390854	0.010572	-6.551776	0.487721	-0.770687	0.134361	-0.017483
	(0.05017)	**(1.28246)**	(0.90928)	(0.02805)	(5.40348)	(1.19934)	(1.17347)	(0.12897)	(0.15772)
	[-0.38036]	**[1.78752]***	[0.42985]	[0.37688]	[-1.21251]	[0.40666]	[-0.65676]	[1.04178]	[-0.11085]
REER_LOG_(-3)	-0.078960	-0.225734	-0.589565	-0.029126	-2.867264	1.077235	-0.118424	-0.199256	-0.012007
	(0.04881)	(1.24747)	(0.88447)	(0.02729)	(5.25605)	(1.16662)	(1.14145)	(0.12545)	(0.15342)
	[-1.61785]	[-0.18095]	[-0.66657]	[-1.06738]	[-0.54552]	[0.92338]	[-0.10375]	[-1.58829]	[-0.07826]
REER_LOG_(-4)	0.040594	0.066544	-0.395090	0.015130	-1.242325	-1.391584	**2.336739**	0.005064	-0.145237
	(0.05296)	(1.35372)	(0.95980)	(0.02961)	(5.70373)	(1.26598)	**(1.23867)**	(0.13614)	(0.16649)
	[0.76648]	[0.04916]	[-0.41164]	[0.51095]	[-0.21781]	[-1.09921]	**[1.88648]***	[0.03719]	[-0.87236]
C	0.001698	**0.172717**	-0.018230	**0.004387**	0.101135	-0.052075	**0.167232**	-0.008543	0.001750
	(0.00371)	**(0.09488)**	(0.06727)	**(0.00208)**	(0.39975)	(0.08873)	**(0.08681)**	(0.00954)	(0.01167)
	[0.45754]	**[1.82044]***	[-0.27101]	**[2.11388]****	[0.25299]	[-0.58691]	**[1.92634]***	[-0.89535]	[0.14996]
R-squared	0.804382	0.587897	0.598745	0.726060	0.642950	0.478357	0.573700	0.771959	0.560909
Adj. R-squared	0.603175	0.164019	0.186027	0.444293	0.275698	-0.058190	0.135220	0.537403	0.109273
Sum sq. resids	0.000714	0.466249	0.234381	0.000223	8.277053	0.407767	0.390365	0.004715	0.007052
S.E. equation	0.004516	0.115418	0.081833	0.002525	0.486300	0.107937	0.105609	0.011607	0.014195
F-statistic	3.997788	1.386948	1.450734	2.576807	1.750707	0.891547	1.308385	3.291147	1.241948
Log likelihood	312.6202	79.26569	104.0255	354.4827	-24.28913	84.09053	85.66063	244.6455	230.1561
Akaike AIC	-7.656117	-1.174047	-1.861819	-8.818964	1.702476	-1.308070	-1.351684	-5.767929	-5.365447
Schwarz SC	-6.486164	-0.004094	-0.691866	-7.649010	2.872429	-0.138117	-0.181731	-4.597976	-4.195494
Mean dependent	0.000926	0.087177	-0.053536	0.004680	0.050126	-0.006989	-0.009519	-0.000657	-0.001471
S.D. dependent	0.007168	0.126234	0.090703	0.003387	0.571405	0.104928	0.113566	0.017066	0.015040

Determinant resid covariance (dof adj.)	6.69E-28
Determinant resid covariance	1.01E-30
Log likelihood	1566.838
Akaike information criterion	-34.27328
Schwarz criterion	-23.74370

8.7 United States of America Table 8.7 Coefficients and parameters of asymmetric model of USA. Bold values denote significance at confidence intervals of 1 %* (t-stat over 1.6638), 5 % (t-stat over 1.9896), 10 %*** (t-stat over 2.6378).**

Vector Autoregression Estimates
Date: 07/12/17 Time: 16:00
Sample (adjusted): 1996Q3 2016Q4
Included observations: 82 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	GDP	UP	DOWN	CPI	IR	GBR	STOCK MARKET RETURNS	GFCF	REER
GDP_LOG_(-1)	-0.181455	-1.651515	-2.653065	-0.046657	2.188417	0.952549	0.682440	0.013355	0.254776
	(0.15826)	(3.97763)	(2.84974)	(0.15063)	(5.39665)	(3.12793)	(2.70273)	(0.36519)	(0.72479)
	[-1.14654]	[-0.41520]	[-0.93098]	[-0.30973]	[0.40551]	[0.30453]	[0.25250]	[0.03657]	[0.35152]
UP(-1)	0.004318	0.041859	0.061869	0.004110	-0.019566	-0.099628	-0.050725	-0.004430	-0.025863
	(0.00531)	(0.13343)	(0.09560)	(0.00505)	(0.18104)	(0.10493)	(0.09067)	(0.01225)	(0.02431)
	[0.81332]	[0.31370]	[0.64718]	[0.81325]	[-0.10808]	[-0.94946]	[-0.55946]	[-0.36161]	[-1.06373]
DOWN(-1)	-0.002931	-0.224869	0.020066	0.012611	-0.167851	0.026585	0.043681	0.014173	-0.037570
	(0.00904)	(0.22716)	(0.16275)	(0.00860)	(0.30820)	(0.17863)	(0.15435)	(0.02086)	(0.04139)
	[-0.32433]	[-0.98993]	[0.12330]	[1.46598]	[-0.54463]	[0.14883]	[0.28300]	[0.67956]	[-0.90766]
CPI_LOG_(-1)	-0.271292	-1.766551	**-7.159333**	-0.222014	7.271057	-3.002277	-3.963040	-0.280293	**1.946353**
	(0.16596)	(4.17101)	**(2.98828)**	(0.15796)	(5.65901)	(3.27999)	(2.83412)	(0.38295)	**(0.76002)**
	[-1.63471]	[-0.42353]	**[-2.39580]****	[-1.40553]	[1.28486]	[-0.91533]	[-1.39833]	[-0.73193]	**[2.56092]****
IR(-1)	-0.003019	0.029103	-0.017316	-0.000140	**0.353724**	-0.104749	-0.008291	-0.004189	-0.002264
	(0.00341)	(0.08563)	(0.06135)	(0.00324)	**(0.11618)**	(0.06734)	(0.05819)	(0.00786)	(0.01560)
	[-0.88609]	[0.33986]	[-0.28225]	[-0.04323]	**[3.04457]*****	[-1.55553]	[-0.14249]	[-0.53280]	[-0.14513]
GBR(-1)	0.003380	0.065027	0.019715	-0.005396	0.057068	0.057454	-0.016697	-0.004159	-0.014041
	(0.00675)	(0.16952)	(0.12145)	(0.00642)	(0.23000)	(0.13331)	(0.11519)	(0.01556)	(0.03089)
	[0.50110]	[0.38359]	[0.16232]	[-0.84053]	[0.24812]	[0.43098]	[-0.14495]	[-0.26722]	[-0.45456]

STOCK_PRICES_LOG_(-1)	0.007521	0.135676	0.173243	0.007486	-0.140399	**0.344021**	-0.016252	**0.047964**	-0.017149
	(0.00863)	(0.21692)	(0.15541)	(0.00821)	(0.29430)	**(0.17058)**	(0.14739)	**(0.01992)**	(0.03953)
	[0.87144]	[0.62548]	[1.11477]	[0.91129]	[-0.47706]	**[2.01680]****	[-0.11026]	**[2.40839]****	[-0.43387]
GFCF_LOG_(-1)	**0.300448**	-0.563074	**1.986072**	0.049692	2.977944	-0.653627	0.738604	**0.616565**	0.046286
	(0.05991)	(1.50567)	**(1.07872)**	(0.05702)	(2.04281)	(1.18403)	(1.02307)	**(0.13824)**	(0.27436)
	[5.01517]***	[-0.37397]	**[1.84113]***	[0.87147]	[1.45777]	[-0.55204]	[0.72195]	**[4.46015]*****	[0.16871]
REER_LOG_(-1)	-0.043030	-1.026088	**-1.439979**	**-0.072384**	0.154995	-0.317098	-0.525420	-0.007138	**0.507286**
	(0.03669)	(0.92210)	**(0.66063)**	**(0.03492)**	(1.25106)	(0.72512)	(0.62655)	(0.08466)	**(0.16802)**
	[-1.17285]	[-1.11278]	**[-2.17971]****	**[-2.07282]****	[0.12389]	[-0.43730]	[-0.83859]	[-0.08432]	**[3.01919]*****
C	**0.005811**	**0.085992**	-0.022083	**0.006736**	-0.075413	0.011544	0.031246	0.004029	-0.011885
	(0.00163)	**(0.04101)**	(0.02938)	**(0.00155)**	(0.05564)	(0.03225)	(0.02787)	(0.00377)	(0.00747)
	[3.56113]***	**[2.09671]****	[-0.75156]	**[4.33703]*****	[-1.35527]	[0.35794]	[1.12125]	[1.06996]	[-1.59030]
R-squared	0.408241	0.061275	0.190494	0.247952	0.332444	0.180570	0.058482	0.527914	0.252959
Adj. R-squared	0.334271	-0.056065	0.089305	0.153946	0.249000	0.078141	-0.059208	0.468903	0.159579
Sum sq. resids	0.001874	1.183523	0.607490	0.001697	2.178591	0.731881	0.546427	0.009976	0.039296
S.E. equation	0.005101	0.128210	0.091855	0.004855	0.173949	0.100822	0.087116	0.011771	0.023362
F-statistic	5.519024	0.522199	1.882566	2.637619	3.984022	1.762882	0.496917	8.946060	2.708914
Log likelihood	321.7973	57.41420	84.75776	325.8482	32.39672	77.12015	89.10108	253.2311	197.0246
Akaike AIC	-7.604812	-1.156444	-1.823360	-7.703614	-0.546262	-1.637077	-1.929295	-5.932466	-4.561575
Schwarz SC	-7.311310	-0.862942	-1.529858	-7.410112	-0.252759	-1.343574	-1.635792	-5.638963	-4.268073
Mean dependent	0.005707	0.080672	-0.057848	0.005352	-0.000963	-0.008686	0.012015	0.005821	0.000235
S.D. dependent	0.006252	0.124760	0.096254	0.005279	0.200725	0.105008	0.084647	0.016152	0.025483

Determinant resid covariance (dof adj.)	7.40E-28
Determinant resid covariance	2.30E-28
Log likelihood	1562.119
Akaike information criterion	-35.90534
Schwarz criterion	-33.26382

8.8 Japan Table 8.8 Coefficients and parameters of asymmetric model of Japan. Bold values denote significance at confidence intervals of 1 %* (t-stat over 1.6638), 5 % (t-stat over 1.9896), 10 %*** (t-stat over 2.6378).**

Vector Autoregression Estimates
Date: 07/12/17 Time: 12:46
Sample (adjusted): 1996Q3 2016Q4
Included observations: 82 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	GDP	UP	DOWN	CPI	IR	GBR	STOCK MARKET RETURNS	GFCF	REER
GDP_LOG_(-1)	**-0.205782**	-1.864497	1.090381	0.059554	-2.750924	-3.842536	-0.263674	-0.064616	0.804603
	(0.11002)	(1.57704)	(1.18103)	(0.05097)	(5.75172)	(6.44636)	(1.37030)	(0.14779)	(0.52839)
	[-1.87045]*	[-1.18227]	[0.92325]	[1.16845]	[-0.47828]	[-0.59608]	[-0.19242]	[-0.43722]	[1.52275]
UP(-1)	-0.012930	-0.110443	-0.061094	-0.004363	0.038725	**-1.228572**	-0.116419	-0.014224	**0.094825**
	(0.00885)	(0.12692)	(0.09504)	(0.00410)	(0.46288)	**(0.51878)**	(0.11028)	(0.01189)	**(0.04252)**
	[-1.46038]	[-0.87021]	[-0.64279]	[-1.06376]	[0.08366]	**[-2.36819]****	[-1.05569]	[-1.19594]	**[2.22997]****
DOWN(-1)	**0.042995**	-0.055194	0.159439	**0.010003**	**1.538558**	0.739257	0.039849	0.018695	-0.057384
	(0.01284)	(0.18402)	(0.13781)	**(0.00595)**	**(0.67113)**	(0.75218)	(0.15989)	(0.01724)	(0.06165)
	[3.34922]***	[-0.29994]	[1.15698]	**[1.68203]***	**[2.29249]****	[0.98281]	[0.24922]	[1.08410]	[-0.93074]
CPI_LOG_(-1)	**-0.890778**	**-9.315149**	**-6.269052**	**0.222034**	-2.703139	-28.21546	**-7.962826**	-0.480291	**3.229409**
	(0.25369)	**(3.63649)**	**(2.72332)**	**(0.11753)**	(13.2628)	(14.8646)	**(3.15977)**	(0.34078)	**(1.21841)**
	[-3.51132]***	**[-2.56158]****	**[-2.30199]****	**[1.88922]***	[-0.20381]	[-1.89817]	**[-2.52006]****	[-1.40938]	**[2.65052]*****
IR(-1)	0.003166	-0.019935	0.011777	0.000379	**0.202539**	**0.380526**	0.016716	0.000893	**-0.017644**
	(0.00220)	(0.03147)	(0.02356)	(0.00102)	**(0.11476)**	**(0.12862)**	(0.02734)	(0.00295)	**(0.01054)**
	[1.44229]	[-0.63353]	[0.49978]	[0.37290]	**[1.76486]***	**[2.95849]*****	[0.61139]	[0.30282]	**[-1.67359]****
GBR(-1)	-0.005092	0.046382	-0.004826	-0.000269	-0.007023	**-0.986061**	-0.046531	-0.005674	0.017609
	(0.00320)	(0.04591)	(0.03438)	(0.00148)	(0.16745)	**(0.18767)**	(0.03989)	(0.00430)	(0.01538)
	[-1.58984]	[1.01023]	[-0.14037]	[-0.18128]	[-0.04194]	**[-5.25420]*****	[-1.16640]	[-1.31875]	[1.14470]

STOCK_PRICES_LOG_(-1)	**0.027582**	0.222182	**0.348887**	-0.003718	-0.440467	**2.202957**	**0.270929**	**0.043292**	**-0.163756**
	(0.01005)	(0.14405)	**(0.10788)**	(0.00466)	(0.52537)	**(0.58882)**	**(0.12517)**	**(0.01350)**	**(0.04826)**
	[2.74476]* **	[1.54241]	**[3.23414]*** **	[-0.79868]	[-0.83840]	**[3.74132]*** **	**[2.16457]** **	**[3.20700]*** **	**[-3.39295]*** **
GFCF_LOG_(-1)	**0.172415**	0.010753	0.625171	-0.008616	2.601909	2.370487	0.085914	**0.633966**	-0.064574
	(0.07169)	(1.02765)	(0.76960)	(0.03321)	(3.74801)	(4.20066)	(0.89294)	**(0.09630)**	(0.34432)
	[2.40498] **	[0.01046]	[0.81234]	[-0.25941]	[0.69421]	[0.56431]	[0.09622]	**[6.58301]*** **	[-0.18754]
REER_LOG_(-1)	-0.015176	0.249479	**0.482440**	-0.016325	0.609471	1.305845	0.206881	-0.007161	0.097624
	(0.02568)	(0.36809)	**(0.27566)**	(0.01190)	(1.34248)	(1.50461)	(0.31984)	(0.03449)	(0.12333)
	[-0.59101]	[0.67777]	**[1.75014]* **	[-1.37225]	[0.45399]	[0.86790]	[0.64684]	[-0.20761]	[0.79158]
C	**0.004641**	**0.102333**	**-0.043826**	0.000962	0.081867	0.099715	0.010927	**0.004265**	**-0.016477**
	(0.00171)	**(0.02447)**	**(0.01832)**	(0.00079)	(0.08924)	(0.10002)	(0.02126)	**(0.00229)**	**(0.00820)**
	[2.71881]* **	**[4.18208]*** **	**[-2.39164]** **	[1.21693]	[0.91734]	[0.99694]	[0.51394]	**[1.85991]* **	**[-2.00978]** **

R-squared	0.370013	0.163569	0.216415	0.200177	0.158565	0.374341	0.128724	0.541663	0.251924
Adj. R-squared	0.291265	0.059015	0.118467	0.100199	0.053386	0.296133	0.019815	0.484371	0.158414
Sum sq. resids	0.005368	1.102941	0.618563	0.001152	14.67099	18.42863	0.832720	0.009686	0.123814
S.E. equation	0.008634	0.123768	0.092688	0.004000	0.451402	0.505918	0.107543	0.011599	0.041469
F-statistic	4.698678	1.564449	2.209482	2.002217	1.507567	4.786514	1.181940	9.454401	2.694097
Log likelihood	278.6443	60.30534	84.01716	341.7384	-45.79822	-55.14760	71.82791	254.4429	149.9704
Akaike AIC	-6.552301	-1.226959	-1.805297	-8.091180	1.360932	1.588966	-1.507998	-5.962022	-3.413911
Schwarz SC	-6.258798	-0.933457	-1.511794	-7.797677	1.654435	1.882468	-1.214496	-5.668520	-3.120409
Mean dependent	0.001842	0.086039	-0.056282	0.000226	0.008838	-0.002060	-0.002058	0.005821	-0.004164
S.D. dependent	0.010256	0.127591	0.098720	0.004217	0.463956	0.603025	0.108625	0.016152	0.045203

Determinant resid covariance (dof adj.)	6.26E-24
Determinant resid covariance	1.94E-24
Log likelihood	1191.349
Akaike information criterion	-26.86217
Schwarz criterion	-24.22064

8.9 South Korea Table 8.9 Coefficients and parameters of asymmetric model of South - Korea. Bold values denote significance at confidence intervals of 1 %* (t-stat over 1.6638), 5 % (t-stat over 1.9896), 10 %*** (t-stat over 2.6378).**

Vector Autoregression Estimates
Date: 07/12/17 Time: 11:41
Sample (adjusted): 1996Q3 2016Q4
Included observations: 82 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	GDP	UP	DOWN	CPI	IR	GBR	STOCK MARKET RETURNS	GFCF	REER
GDP_LOG_(-1)	-0.100621	**3.264757**	1.471185	**0.254853**	**4.183811**	1.073120	2.349128	-0.016175	**-1.946034**
	(0.15989)	**(1.71650)**	(1.08806)	**(0.07567)**	**(1.40679)**	(1.22479)	(1.64148)	(0.35364)	**(0.69144)**
	[-0.62931]	**[1.90198]***	[1.35212]	**[3.36813]*****	**[2.97400]*****	[0.87617]	[1.43110]	[-0.04574]	**[-2.81447]*****
UP(-1)	-0.006351	-0.009120	-0.049014	0.000587	0.026440	-0.040566	0.158817	-0.007061	-0.022633
	(0.01211)	(0.13005)	(0.08244)	(0.00573)	(0.10659)	(0.09280)	(0.12437)	(0.02679)	(0.05239)
	[-0.52423]	[-0.07012]	[-0.59455]	[0.10241]	[0.24806]	[-0.43714]	[1.27697]	[-0.26353]	[-0.43201]
DOWN(-1)	-0.015175	-0.322630	0.006213	**0.018035**	0.251316	0.031724	-0.274962	-0.015609	-0.011989
	(0.02095)	(0.22493)	(0.14258)	**(0.00992)**	(0.18435)	(0.16050)	(0.21510)	(0.04634)	(0.09061)
	[-0.72426]	[-1.43435]	[0.04357]	**[1.81890]***	[1.36328]	[0.19766]	[-1.27830]	[-0.33683]	[-0.13232]
CPI_LOG_(-1)	-0.201781	-2.061704	-1.188730	0.018955	-0.838837	-1.024116	**-11.73860**	-0.968980	-0.140066
	(0.30198)	(3.24190)	(2.05498)	(0.14291)	(2.65696)	(2.31321)	**(3.10021)**	(0.66791)	(1.30590)
	[-0.66820]	[-0.63596]	[-0.57846]	[0.13264]	[-0.31571]	[-0.44273]	**[-3.78639]*****	[-1.45076]	[-0.10726]
IR(-1)	-0.017440	0.253600	**0.199360**	1.78E-06	**0.328757**	-0.022510	-0.193360	-0.034778	-0.009399
	(0.01630)	(0.17502)	**(0.11094)**	(0.00772)	**(0.14344)**	(0.12489)	(0.16737)	(0.03606)	(0.07050)
	[-1.06974]	[1.44895]	**[1.79694]***	[0.00023]	**[2.29189]****	[-0.18024]	[-1.15526]	[-0.96447]	[-0.13331]
GBR(-1)	0.013170	-0.062260	0.024783	0.008527	0.099262	0.169178	0.004004	0.023086	-0.046957
	(0.01925)	(0.20662)	(0.13097)	(0.00911)	(0.16934)	(0.14743)	(0.19759)	(0.04257)	(0.08323)
	[0.68428]	[-0.30133]	[0.18922]	[0.93625]	[0.58618]	[1.14753]	[0.02026]	[0.54232]	[-0.56418]

STOCK_PRICES_LOG_(-1)	**0.041844**	0.145073	**0.140767**	**-0.015445**	0.117825	**0.172662**	0.092722	**0.067489**	**0.190271**
	(0.01032)	(0.11082)	**(0.07024)**	**(0.00488)**	(0.09082)	**(0.07907)**	(0.10597)	**(0.02283)**	**(0.04464)**
	[4.05373]* **	[1.30913]	**[2.00394]** **	**[-3.16182]*** **	[1.29731]	**[2.18361]** **	[0.87495]	**[2.95601]*** **	**[4.26243]*** **
GFCF_LOG_(-1)	0.030423	-0.700623	-0.135544	**-0.063220**	-0.523779	0.421219	-1.076861	-0.005013	0.114806
	(0.06893)	(0.74002)	(0.46909)	**(0.03262)**	(0.60650)	(0.52803)	(0.70768)	(0.15246)	(0.29810)
	[0.44135]	[-0.94676]	[-0.28895]	**[-1.93799]***	[-0.86361]	[0.79771]	[-1.52168]	[-0.03288]	[0.38513]
REER_LOG_(-1)	**0.078497**	-0.067151	0.001006	**-0.046509**	-0.261799	**-0.671794**	-0.550731	0.119580	**0.266671**
	(0.03466)	(0.37209)	(0.23586)	**(0.01640)**	(0.30495)	**(0.26550)**	(0.35582)	(0.07666)	**(0.14988)**
	[2.26483] **	[-0.18047]	[0.00426]	**[-2.83558]*** **	[-0.85850]	**[-2.53033]** **	[-1.54777]	[1.55990]	**[1.77920]***
C	**0.011560**	0.048325	-0.052732	**0.005806**	-0.031926	-0.017423	0.041541	0.012036	0.017442
	(0.00371)	(0.03987)	(0.02527)	**(0.00176)**	(0.03268)	(0.02845)	(0.03813)	(0.00821)	(0.01606)
	[3.11253]* **	[1.21199]	[-2.08639]	**[3.30306]*** **	[-0.97699]	[-0.61239]	[1.08947]	[1.46520]	[1.08594]
R-squared	0.406924	0.127479	0.185173	0.348064	0.391373	0.210422	0.392262	0.349379	0.262870
Adj. R-squared	0.332789	0.018414	0.083319	0.266572	0.315294	0.111724	0.316295	0.268051	0.170729
Sum sq. resids	0.009293	1.071081	0.430369	0.002081	0.719440	0.545323	0.979501	0.045463	0.173797
S.E. equation	0.011361	0.121968	0.077313	0.005377	0.099961	0.087028	0.116637	0.025128	0.049131
F-statistic	5.488989	1.168839	1.818033	4.271146	5.144332	2.131989	5.163567	4.295945	2.852905
Log likelihood	256.1392	61.50711	98.89016	317.4876	77.82311	89.18399	65.17172	191.0474	136.0671
Akaike AIC	-6.003396	-1.256271	-2.168053	-7.499699	-1.654222	-1.931317	-1.345652	-4.415789	-3.074807
Schwarz SC	-5.709893	-0.962769	-1.874550	-7.206196	-1.360720	-1.637815	-1.052149	-4.122287	-2.781305
Mean dependent	0.009943	0.077425	-0.054085	0.006970	-0.016688	-0.017128	0.007739	0.005884	-0.001212
S.D. dependent	0.013909	0.123106	0.080750	0.006278	0.120803	0.092339	0.141059	0.029371	0.053952

Determinant resid covariance (dof adj.)	2.20E-26
Determinant resid covariance	6.83E-27
Log likelihood	1423.023
Akaike information criterion	-32.51275
Schwarz criterion	-29.87123

8.10 United Kingdom Table 8.10 Coefficients and parameters of asymmetric model of United Kingdom. Bold values denote significance at confidence intervals of 1 %* (t-stat over 1.6638), 5 % (t-stat over 1.9896), 10 %*** (t-stat over 2.6378).**

Vector Autoregression Estimates
Date: 07/11/17 Time: 11:18
Sample (adjusted): 1996Q3 2016Q4
Included observations: 82 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	GDP	UP	DOWN	CPI	IR	GBR	STOCK MARKET RETURNS	GFCF	REER
GDP_LOG_(-1)	**0.489019**	1.297981	1.916121	0.066645	**5.756371**	3.003848	**4.701468**	**2.145958**	0.541256
	(0.11173)	(3.02675)	(2.03277)	(0.07270)	**(2.00789)**	(2.72042)	**(1.73778)**	**(0.64528)**	(0.56221)
	[4.37684]* **	[0.42884]	[0.94262]	[0.91674]	**[2.86688]*** **	[1.10418]	**[2.70545]**	**[3.32562]**	[0.96272]
UP(-1)	0.007787	0.124205	0.088562	-0.004341	**-0.160733**	-0.134768	-0.008782	-0.028280	**-0.081969**
	(0.00505)	(0.13679)	(0.09187)	(0.00329)	**(0.09075)**	(0.12295)	(0.07854)	(0.02916)	**(0.02541)**
	[1.54208]	[0.90797]	[0.96398]	[-1.32117]	**[-1.77122]**	[-1.09612]	[-0.11181]	[-0.96971]	**[-3.22593]**
DOWN(-1)	0.002245	-0.151844	-0.049549	0.005381	0.196005	0.134862	0.013838	0.048622	**0.086257**
	(0.00806)	(0.21840)	(0.14668)	(0.00525)	(0.14488)	(0.19630)	(0.12539)	(0.04656)	**(0.04057)**
	[0.27847]	[-0.69526]	[-0.33781]	[1.02578]	[1.35286]	[0.68704]	[0.11036]	[1.04426]	**[2.12629]**
CPI_LOG_(-1)	**-0.371620**	-1.924523	-0.366837	**0.532231**	1.384007	0.377274	-1.171641	-0.228747	**-1.926641**
	(0.18097)	(4.90263)	(3.29261)	**(0.11775)**	(3.25231)	(4.40646)	(2.81480)	(1.04520)	**(0.91065)**
	[-2.05344] **	[-0.39255]	[-0.11141]	**[4.51988]*** **	[0.42555]	[0.08562]	[-0.41624]	[-0.21885]	**[-2.11567]** **
IR(-1)	-0.002937	-0.121738	-0.058713	-0.003918	**0.501455**	**-0.346958**	**-0.225232**	0.007211	-0.007134
	(0.00504)	(0.13652)	(0.09169)	(0.00328)	**(0.09056)**	**(0.12270)**	**(0.07838)**	(0.02910)	(0.02536)
	[-0.58285]	[-0.89173]	[-0.64037]	[-1.19503]	**[5.53702]*** **	**[-2.82764]*** **	**[-2.87356]*** **	[0.24777]	[-0.28131]
GBR(-1)	-0.000312	-0.010560	-0.021428	-0.001502	**0.188004**	0.018745	-0.116315	0.003314	0.032301
	(0.00584)	(0.15814)	(0.10621)	(0.00380)	**(0.10491)**	(0.14214)	(0.09080)	(0.03371)	(0.02937)
	[-0.05348]	[-0.06678]	[-0.20175]	[-0.39549]	**[1.79207]* **	[0.13188]	[-1.28106]	[0.09829]	[1.09963]

STOCK_PRICES_LOG_(-1)	0.006173	0.146983	**0.380158**	0.006437	0.094206	0.254503	-0.109239	0.000155	-0.003137
	(0.00718)	(0.19459)	**(0.13069)**	(0.00467)	(0.12909)	(0.17490)	(0.11172)	(0.04148)	(0.03614)
	[0.85935]	[0.75535]	**[2.90893]*** **	[1.37719]	[0.72979]	[1.45517]	[-0.97778]	[0.00373]	[-0.08680]
GFCF_LOG_(-1)	0.025188	-0.258076	-0.089008	-0.013131	0.284261	0.187002	-0.261893	**-0.241732**	-0.107877
	(0.01920)	(0.52017)	(0.34934)	(0.01249)	(0.34507)	(0.46752)	(0.29865)	**(0.11090)**	(0.09662)
	[1.31178]	[-0.49614]	[-0.25478]	[-1.05102]	[0.82378]	[0.39998]	[-0.87693]	**[-2.17982]*** *	[-1.11651]
REER_LOG_(-1)	**0.038822**	-0.074792	-0.145372	-0.019559	-0.686207	-0.608481	**0.725342**	0.202331	**0.267509**
	(0.02303)	(0.62386)	(0.41898)	(0.01498)	(0.41386)	(0.56072)	**(0.35818)**	(0.13300)	**(0.11588)**
	[1.68578]**	[-0.11989]	[-0.34696]	[-1.30531]	[-1.65808]	[-1.08518]	**[2.02506]****	[1.52126]	**[2.30849]****
C	**0.003710**	0.060720	**-0.077860**	**0.002410**	-0.022229	-0.024472	-0.015073	0.000111	**0.017481**
	(0.00175)	(0.04728)	**(0.03175)**	**(0.00114)**	(0.03136)	(0.04249)	(0.02714)	(0.01008)	**(0.00878)**
	[2.12614]**	[1.28434]	**[-2.45216]****	**[2.12248]****	[-0.70877]	[-0.57592]	[-0.55530]	[0.01102]	**[1.99058]****
R-squared	0.502858	0.059127	0.161201	0.371356	0.571668	0.174694	0.224547	0.293583	0.326815
Adj. R-squared	0.440716	-0.058482	0.056351	0.292776	0.518127	0.071531	0.127615	0.205281	0.242667
Sum sq. resids	0.001527	1.120827	0.505547	0.000647	0.493247	0.905438	0.369466	0.050943	0.038671
S.E. equation	0.004606	0.124768	0.083794	0.002997	0.082769	0.112141	0.071634	0.026600	0.023175
F-statistic	8.091993	0.502741	1.537447	4.725805	10.67712	1.693379	2.316546	3.324752	3.883804
Log likelihood	330.1779	59.64578	92.28923	365.4185	93.29912	68.39534	105.1461	186.3818	197.6817
Akaike AIC	-7.809216	-1.210873	-2.007054	-8.668743	-2.031686	-1.424277	-2.320638	-4.301994	-4.577603
Schwarz SC	-7.515714	-0.917370	-1.713552	-8.375241	-1.738183	-1.130774	-2.027135	-4.008492	-4.284101
Mean dependent	0.005095	0.079676	-0.055959	0.004750	-0.023826	-0.015407	0.006937	0.003498	-0.001549
S.D. dependent	0.006158	0.121272	0.086260	0.003563	0.119234	0.116380	0.076695	0.029838	0.026631

Determinant resid covariance (dof adj.)	9.94E-28
Determinant resid covariance	3.08E-28
Log likelihood	1550.033
Akaike information criterion	-35.61057
Schwarz criterion	-32.96905

Appendix 11 - Accumulated responses (orthogonalized impulse responses)

Figure 6.1 Accumulated responses graphs of scaled model Norway – Shock 2: SOPI, Shock 3: SOPD

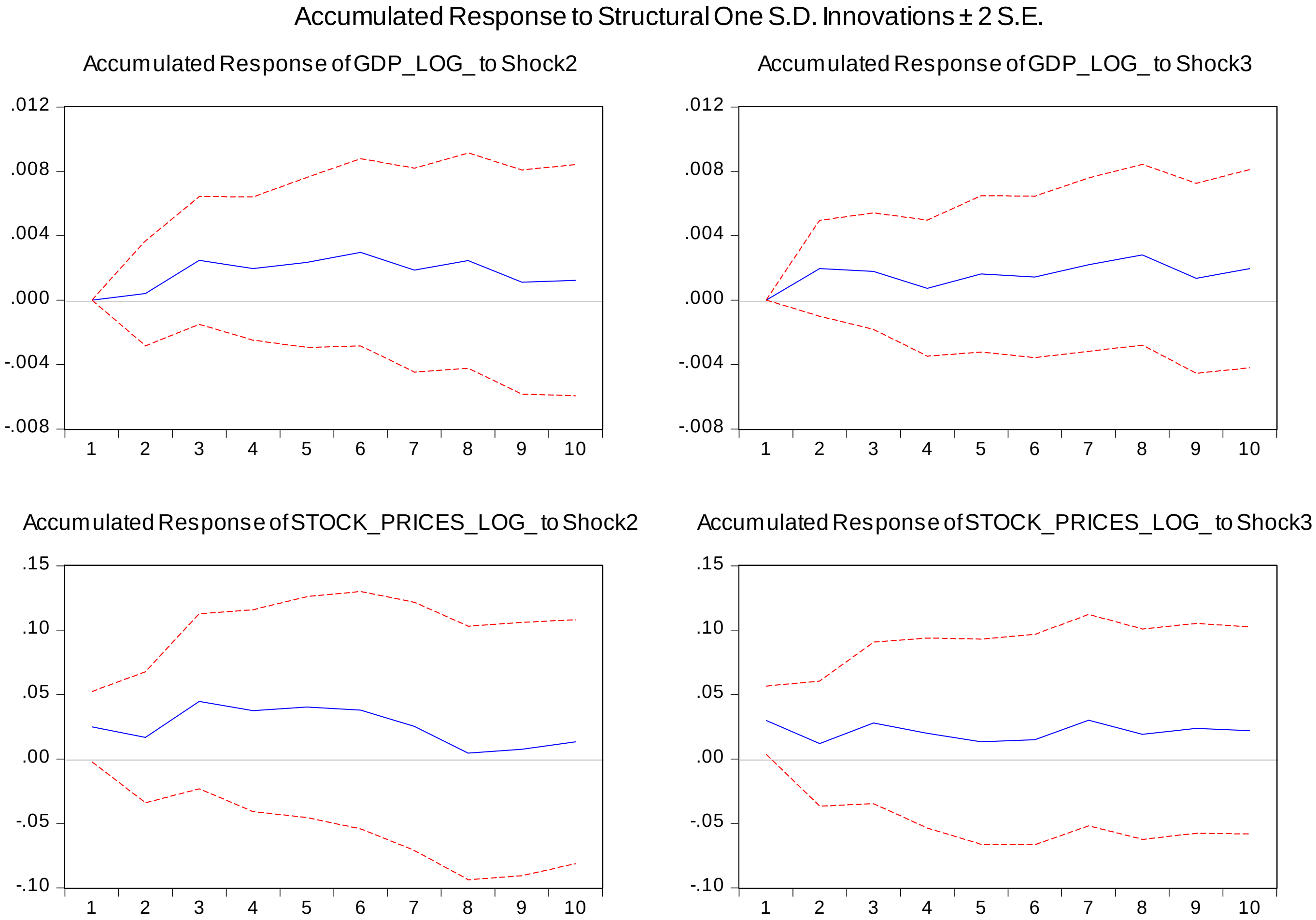


Figure 6.2 Accumulated responses graphs of scaled model Norway – Shock 2: SOPI, Shock 3: SOPD

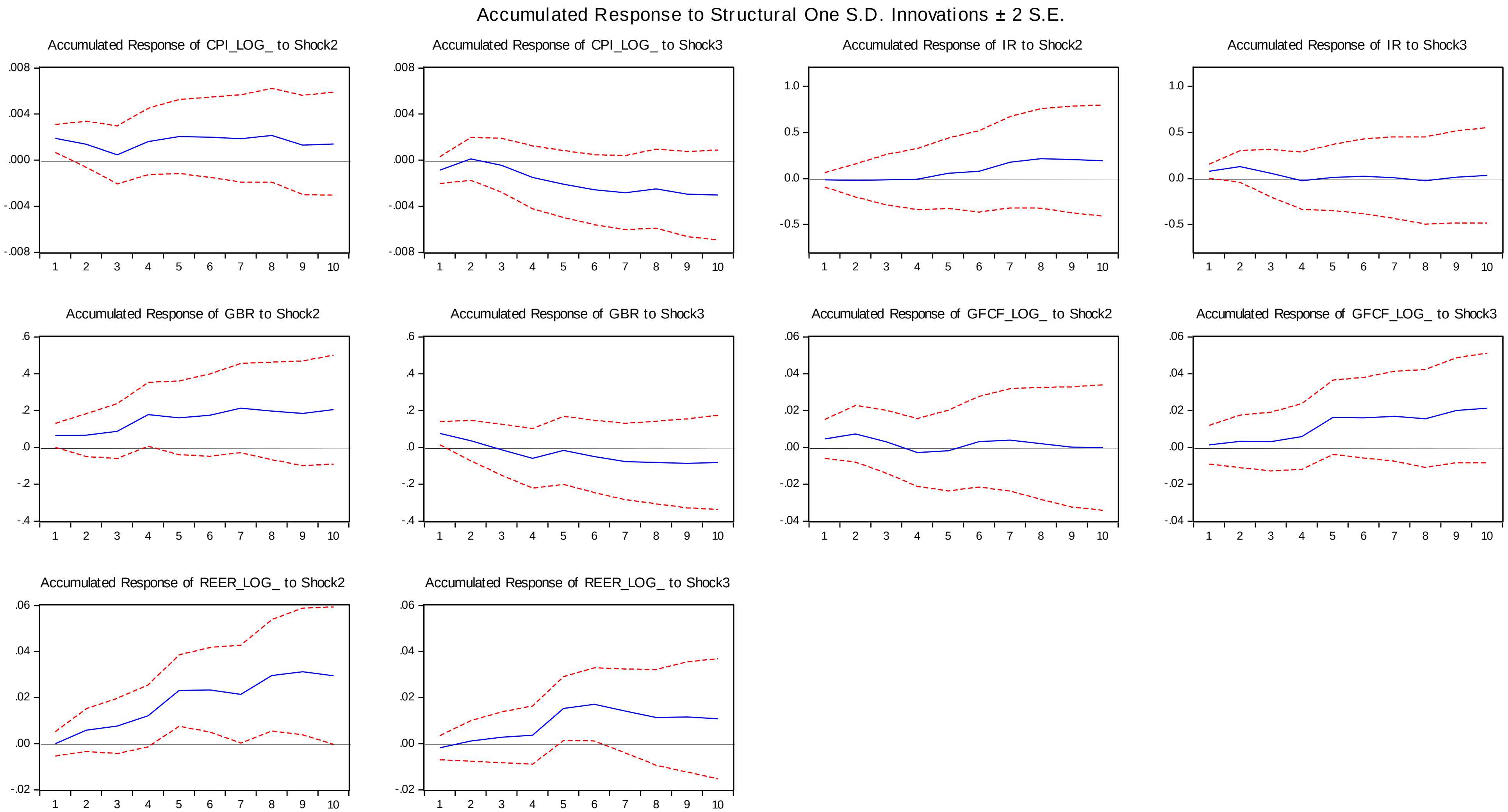


Figure 6.3 Accumulated responses graphs of scaled model USA – Shock 2: SOPI, Shock 3: SOPD

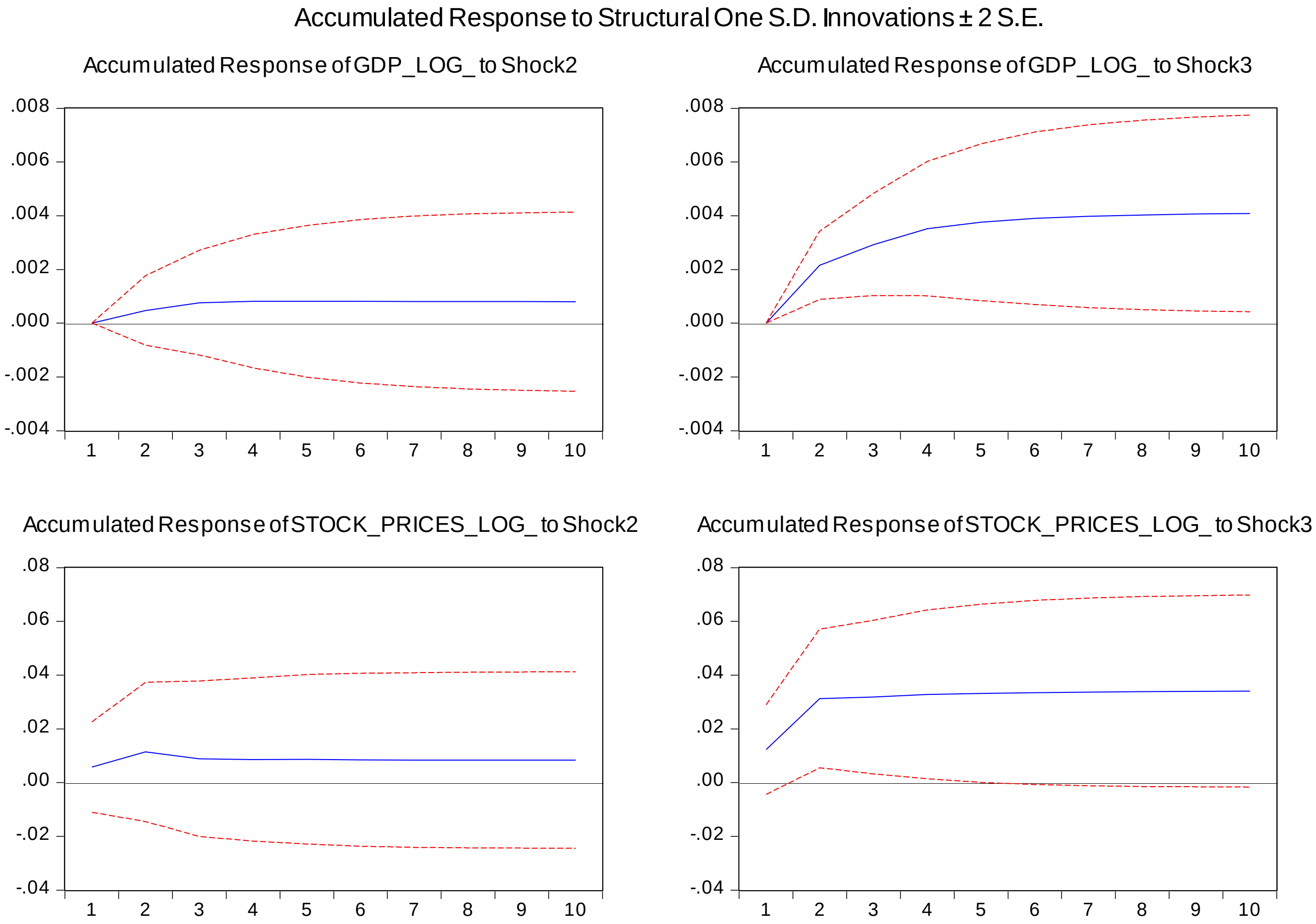


Figure 6.4 Accumulated responses graphs of scaled model USA – Shock 2: SOPI, Shock 3: SOPD

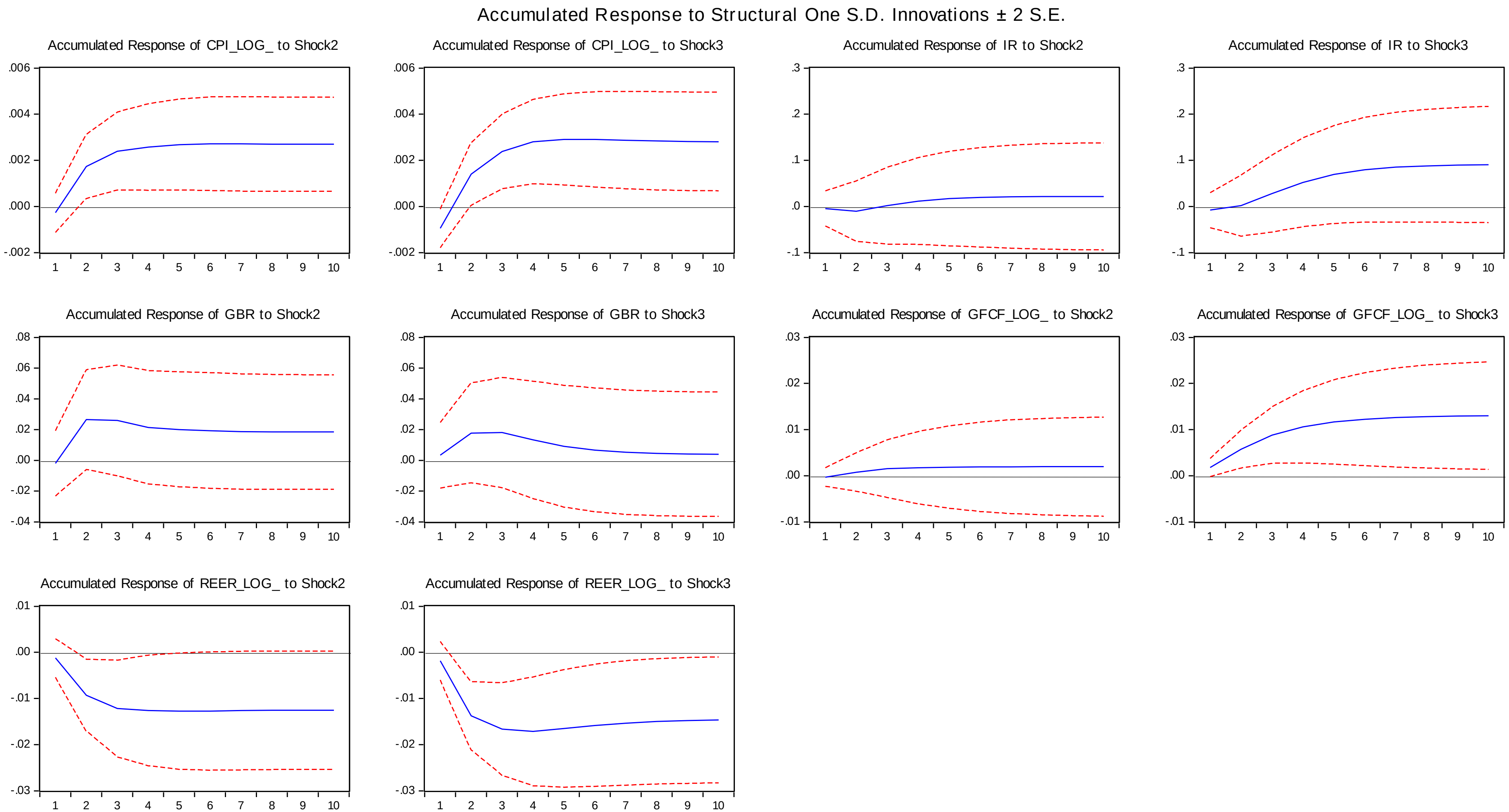


Figure 6.5 Accumulated responses graphs of asymmetric model Japan – Shock 2: UP, Shock 3: DOWN

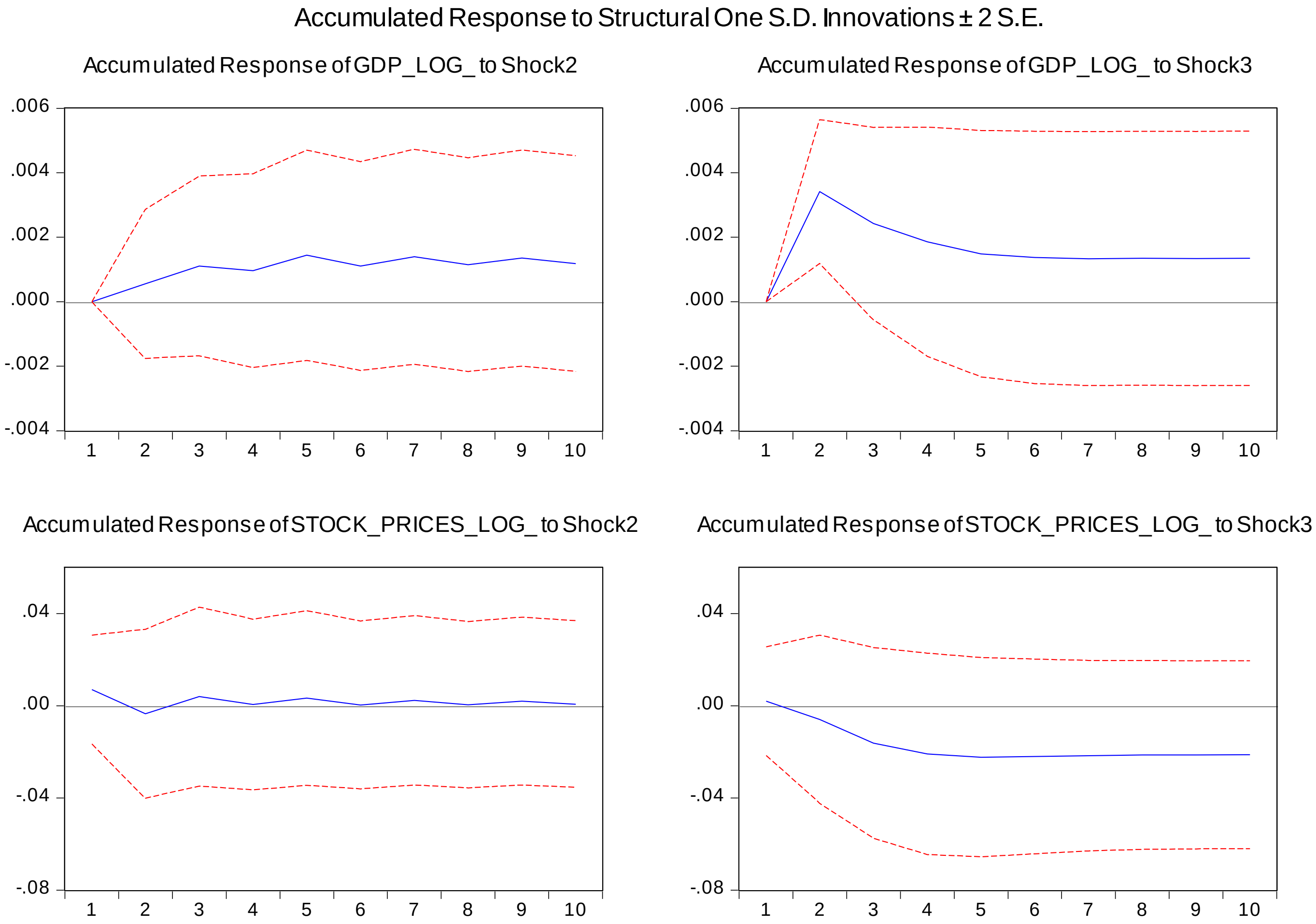


Figure 6.6 Accumulated responses graphs of asymmetric model Japan – Shock 2: UP, Shock 3: DOWN

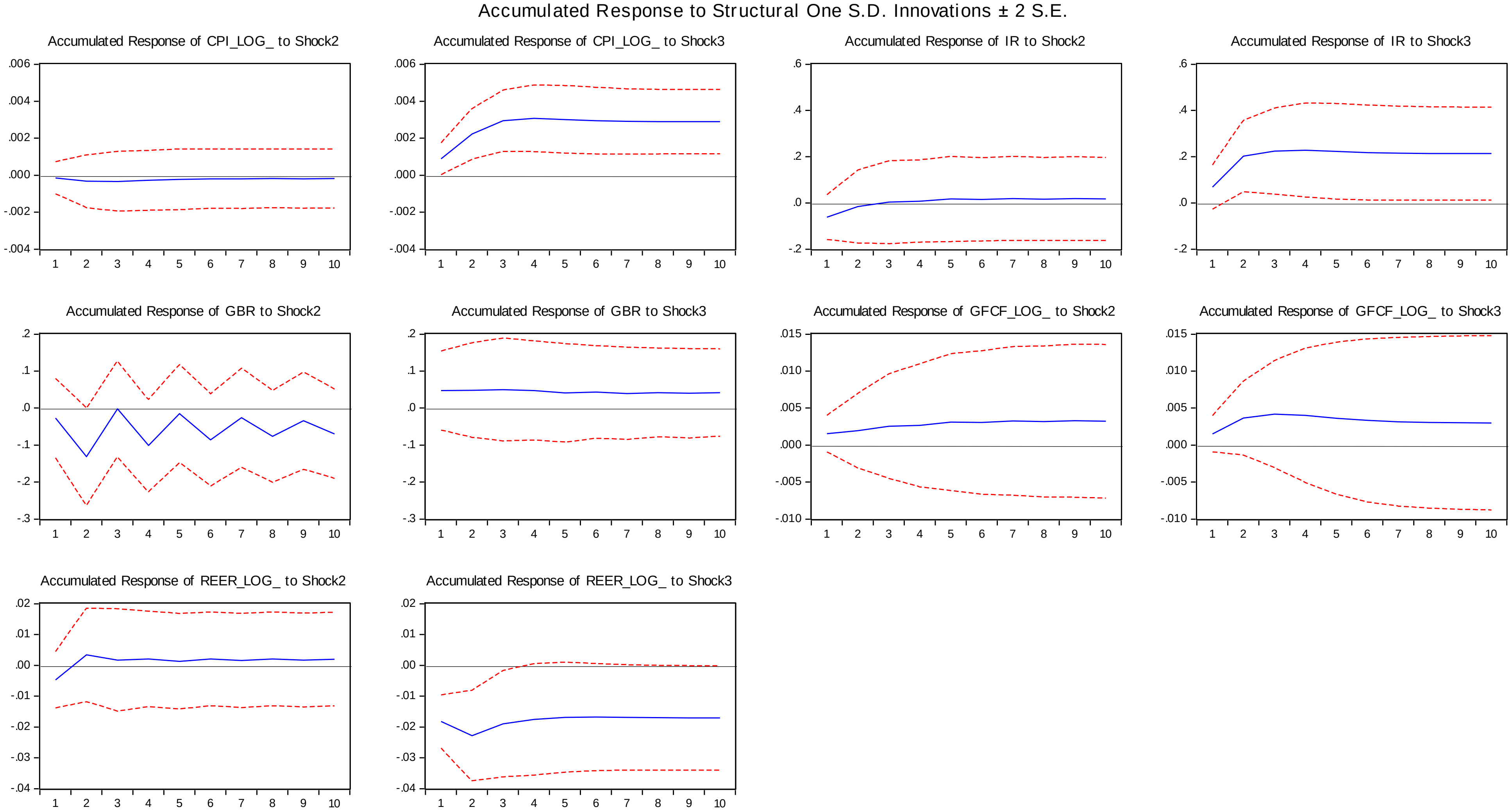


Figure 6.7 Accumulated responses graphs of asymmetric model Germany – Shock 2: UP, Shock 3: DOWN

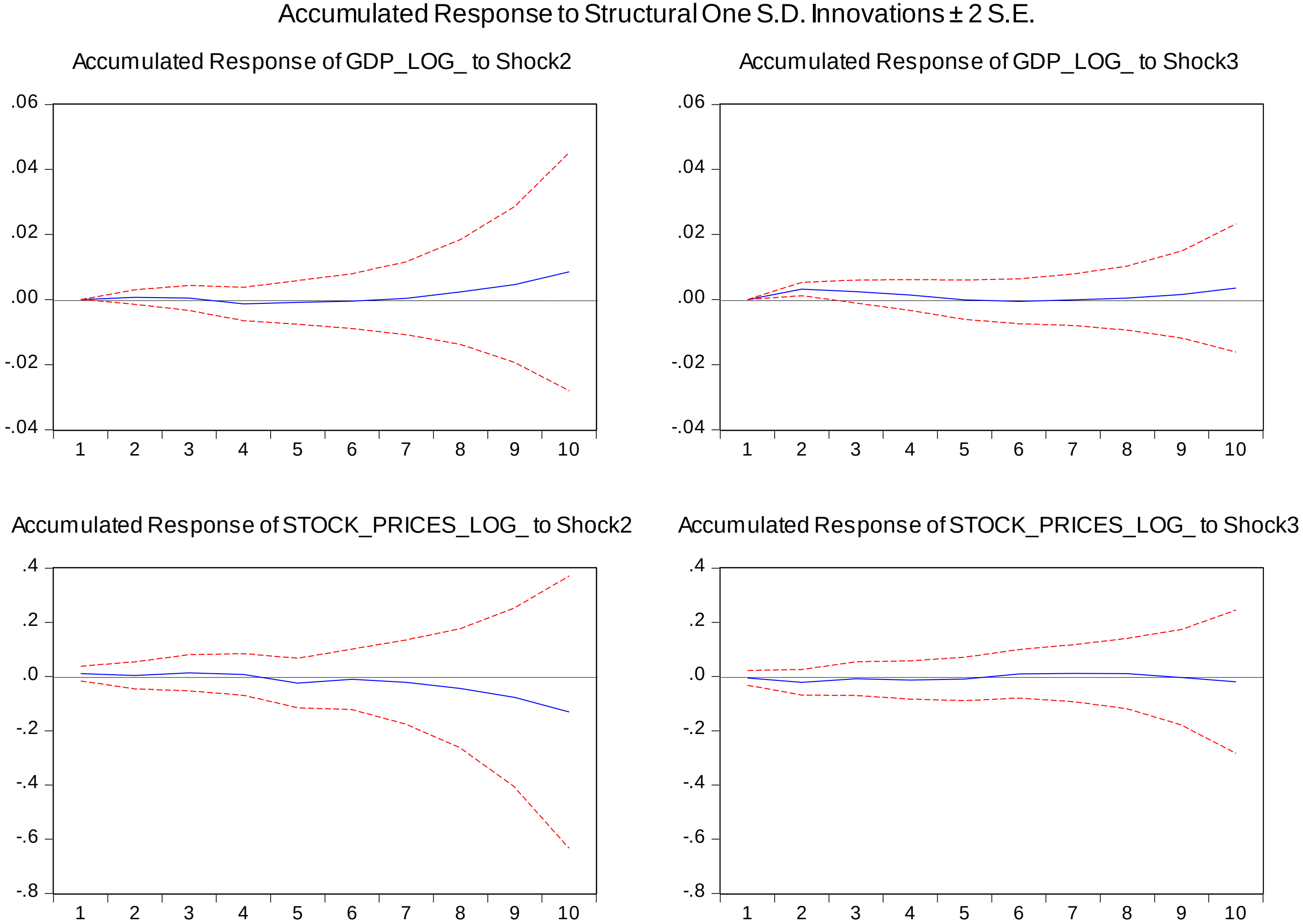


Figure 6.8 Accumulated responses graphs of asymmetric model Germany – Shock 2: UP, Shock 3: DOWN

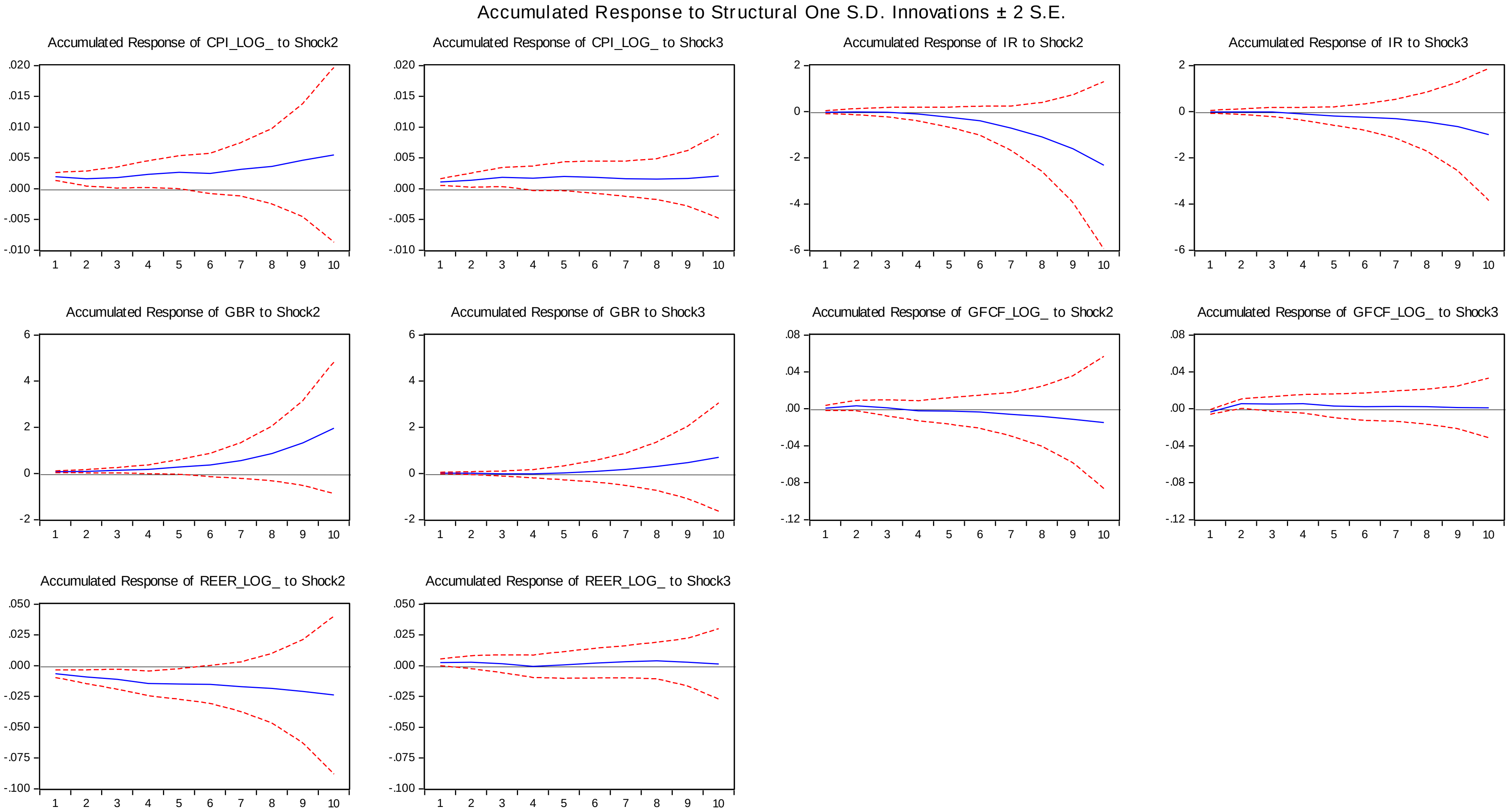


Figure 6.9 Accumulated responses graphs of asymmetric model Italy – Shock 2: UP, Shock 3: DOWN

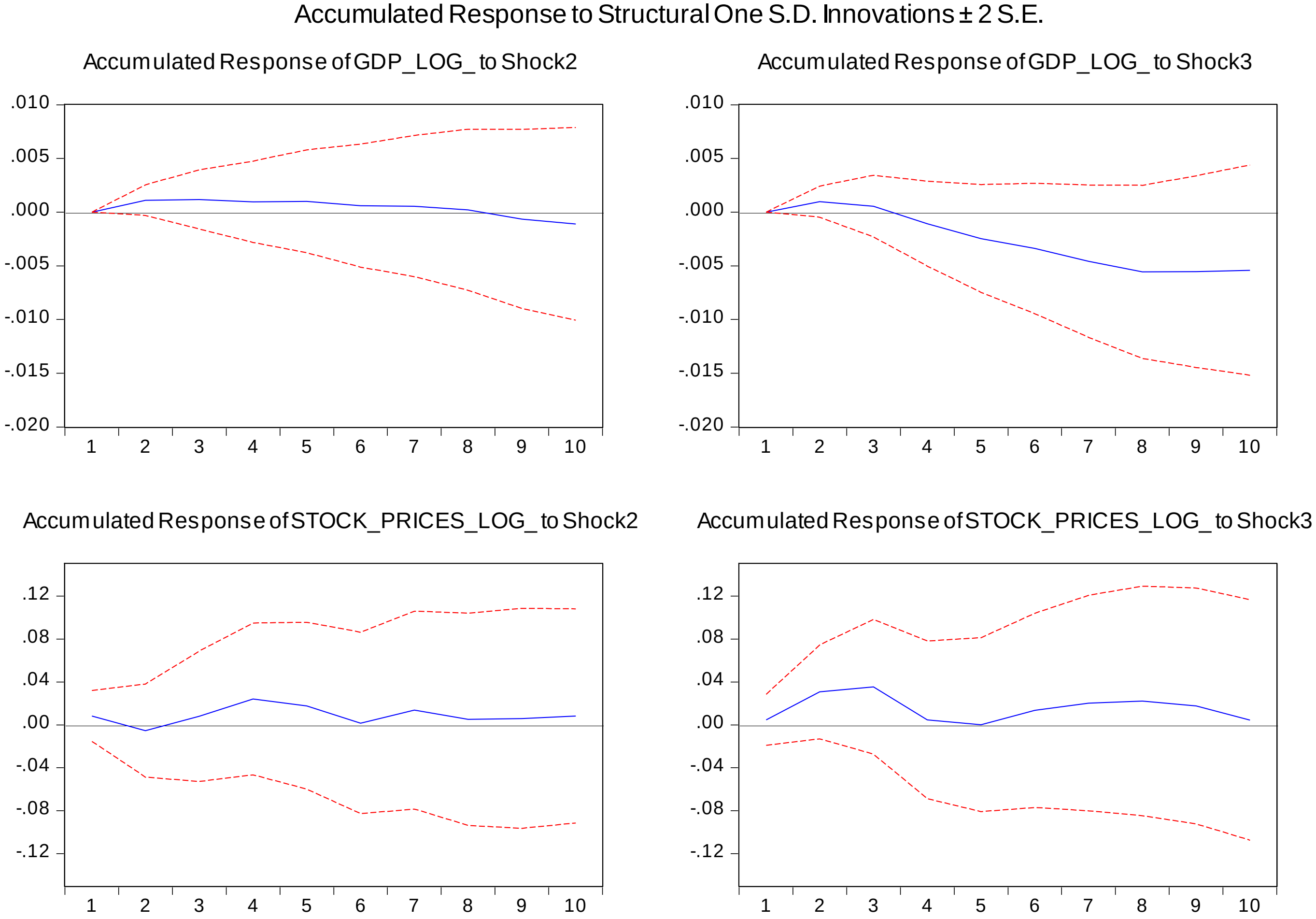


Figure 6.10 Accumulated responses graphs of asymmetric model Italy – Shock 2: UP, Shock 3: DOWN

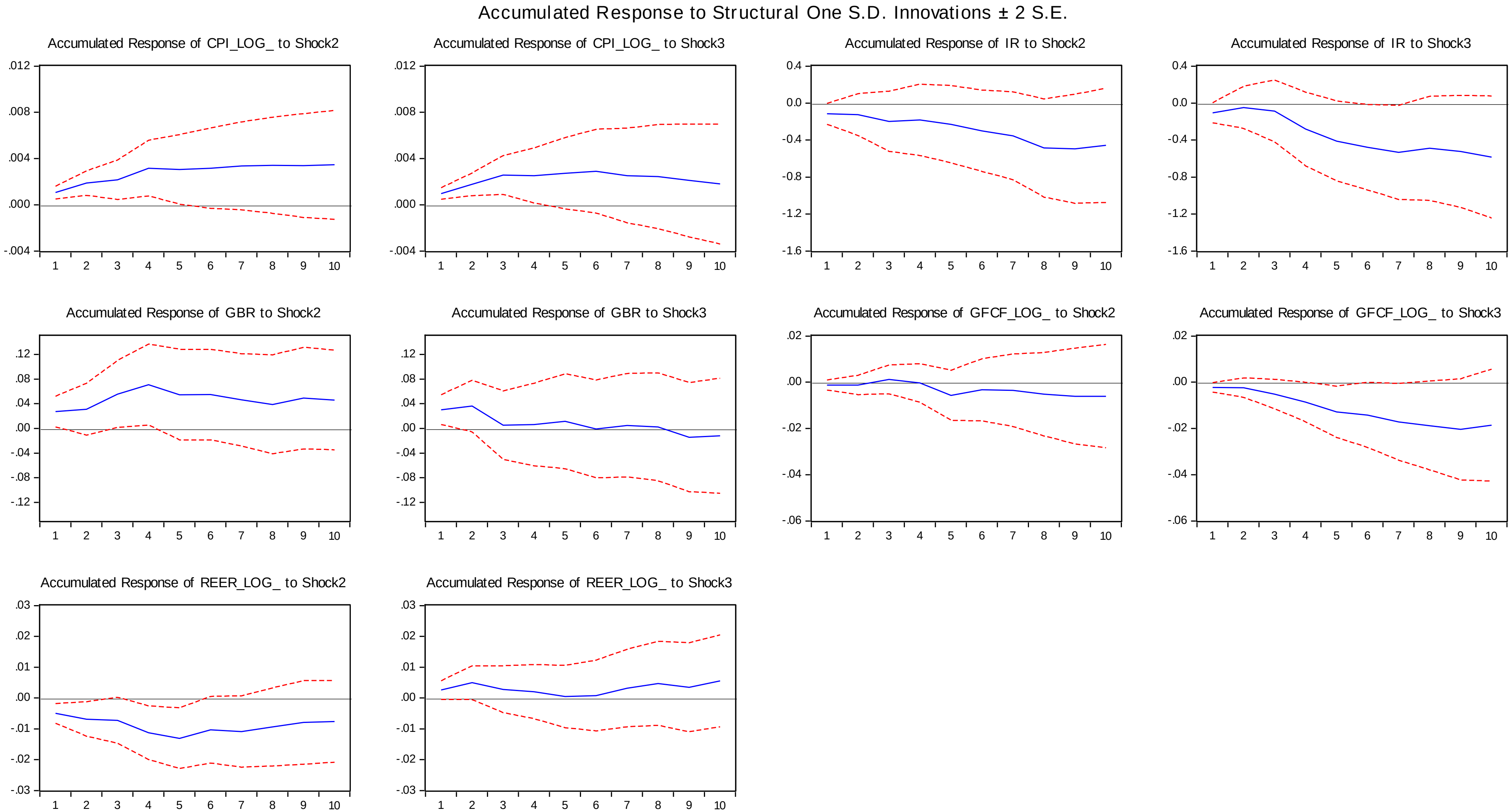


Figure 6.11 Accumulated responses graphs of asymmetric model Russia – Shock 2: UP, Shock 3: DOWN

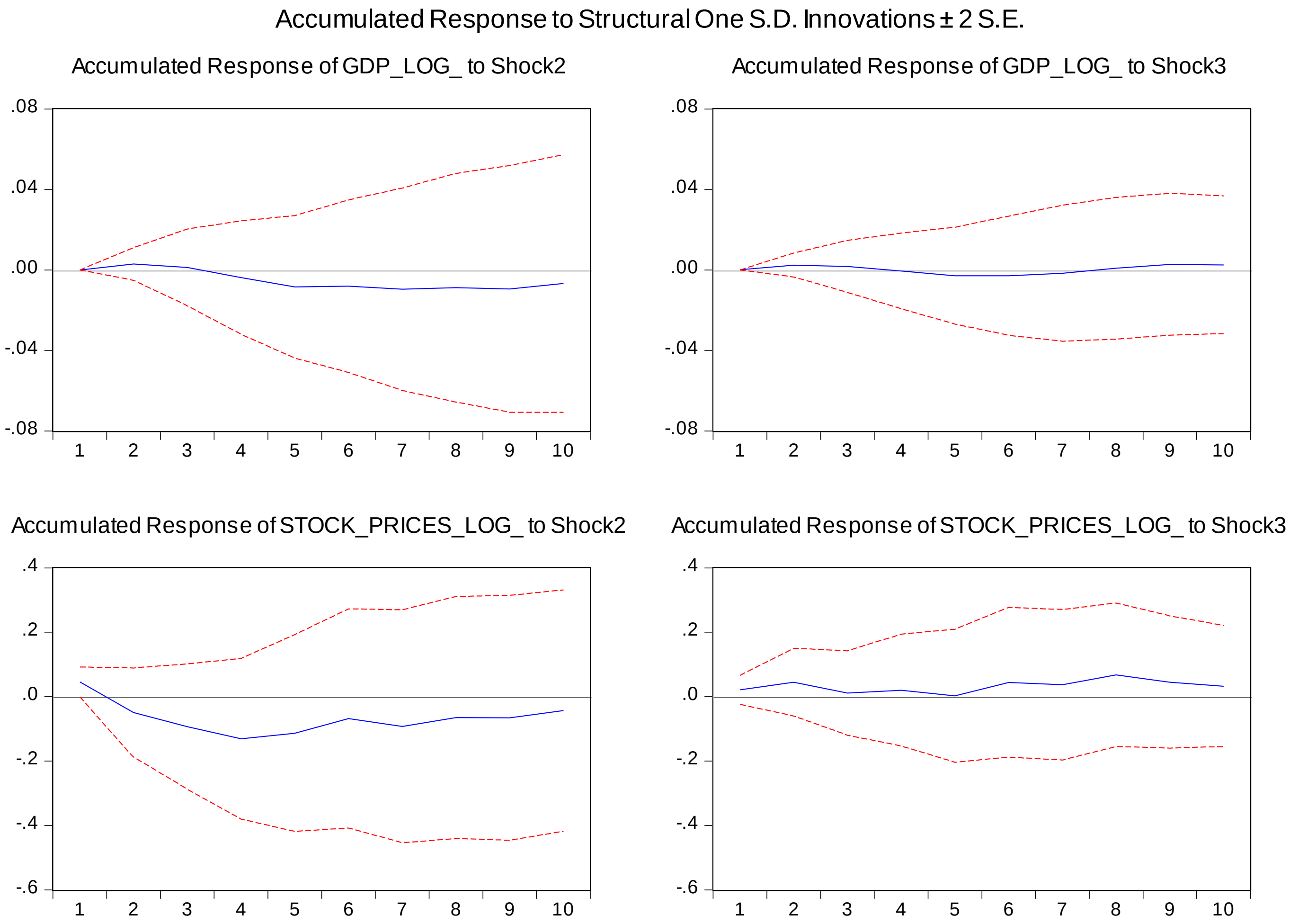


Figure 6.12 Accumulated responses graphs of asymmetric model Russia – Shock 2: UP, Shock 3: DOWN

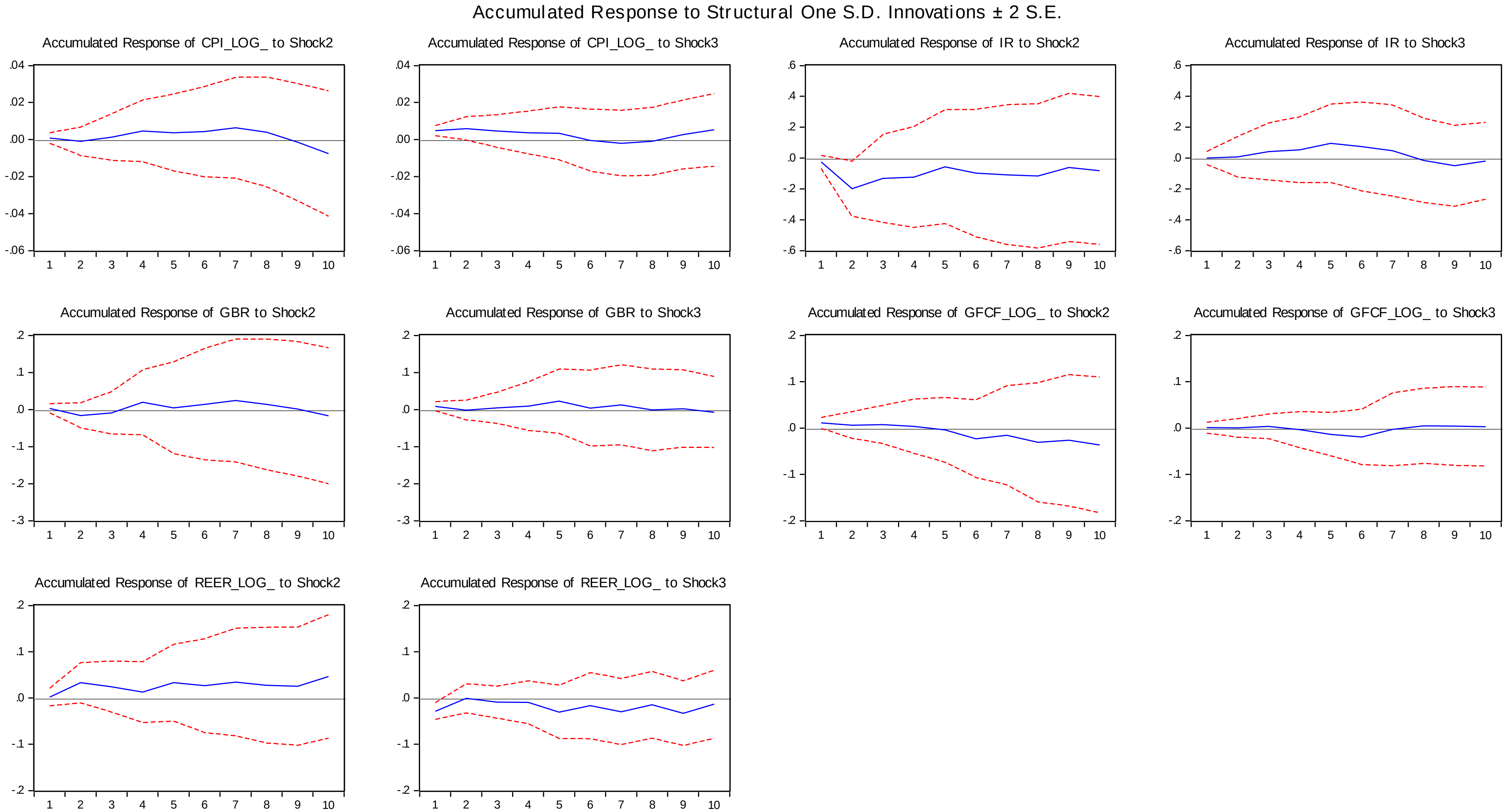


Figure 6.13 Accumulated responses graphs of asymmetric model Canada – Shock 2: UP, Shock 3: DOWN

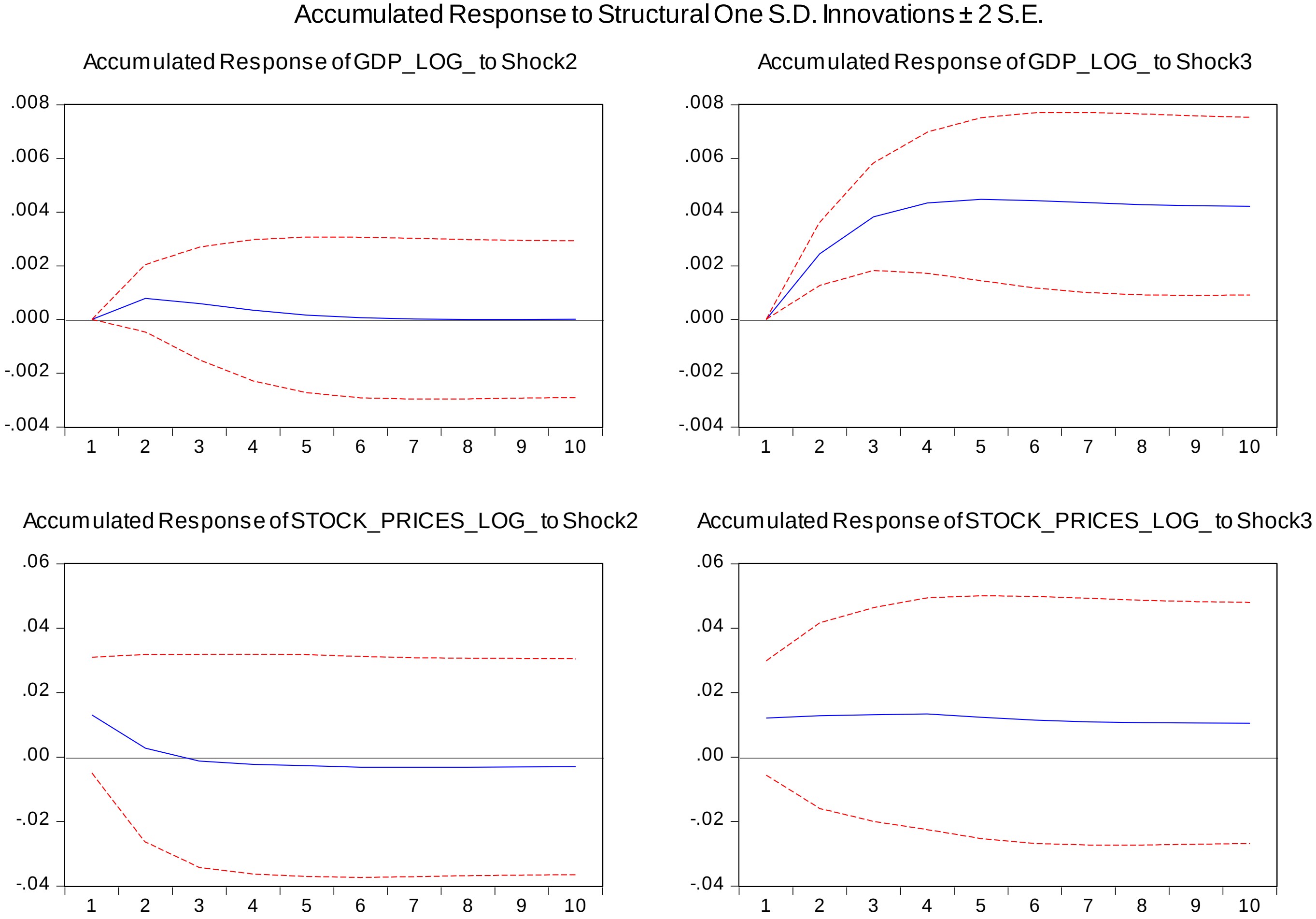


Figure 6.14 Accumulated responses graphs of asymmetric model Canada – Shock 2: UP, Shock 3: DOWN

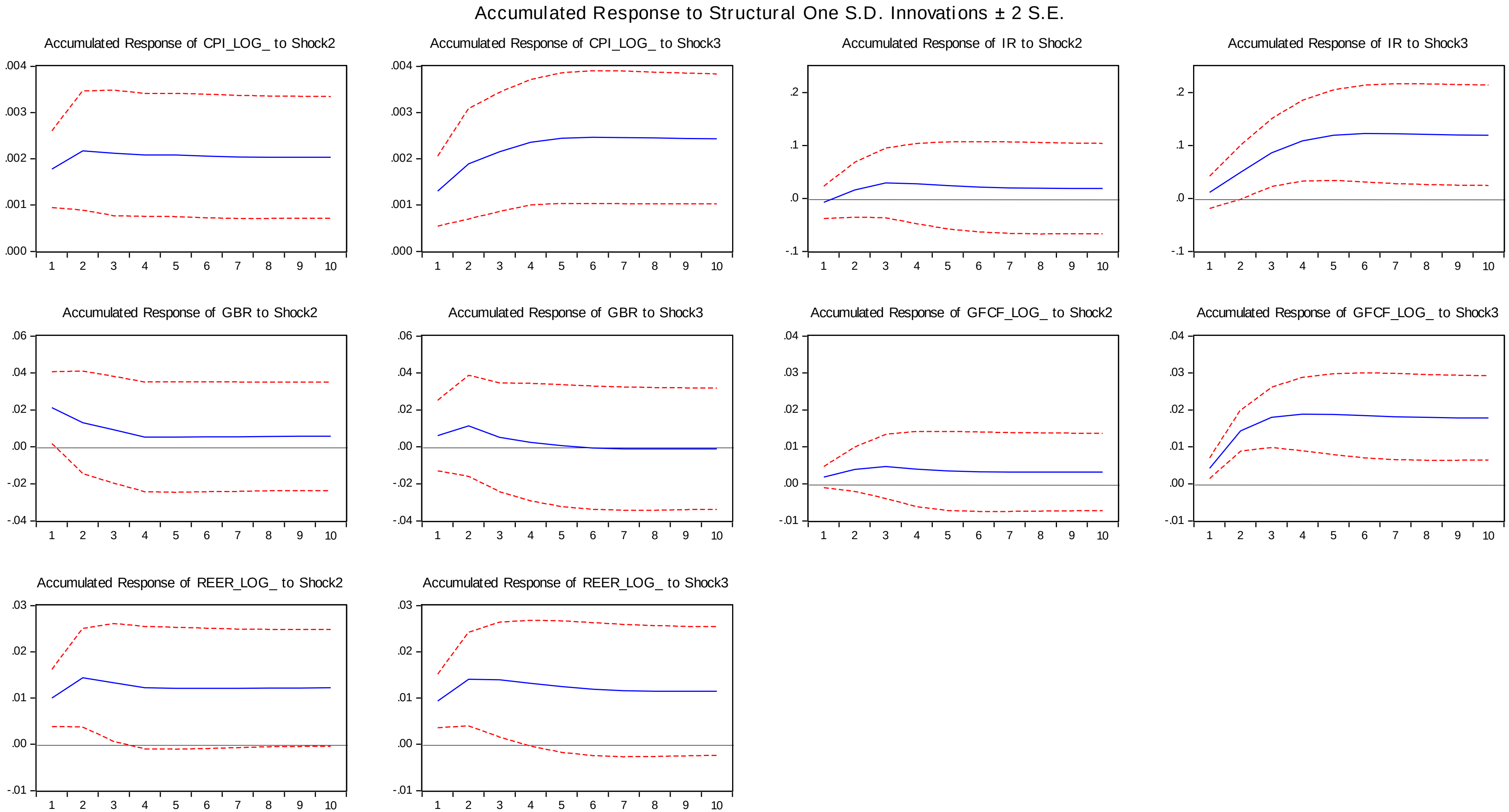


Figure 6.15 Accumulated responses graphs of asymmetric model Mexico – Shock 2: UP, Shock 3: DOWN

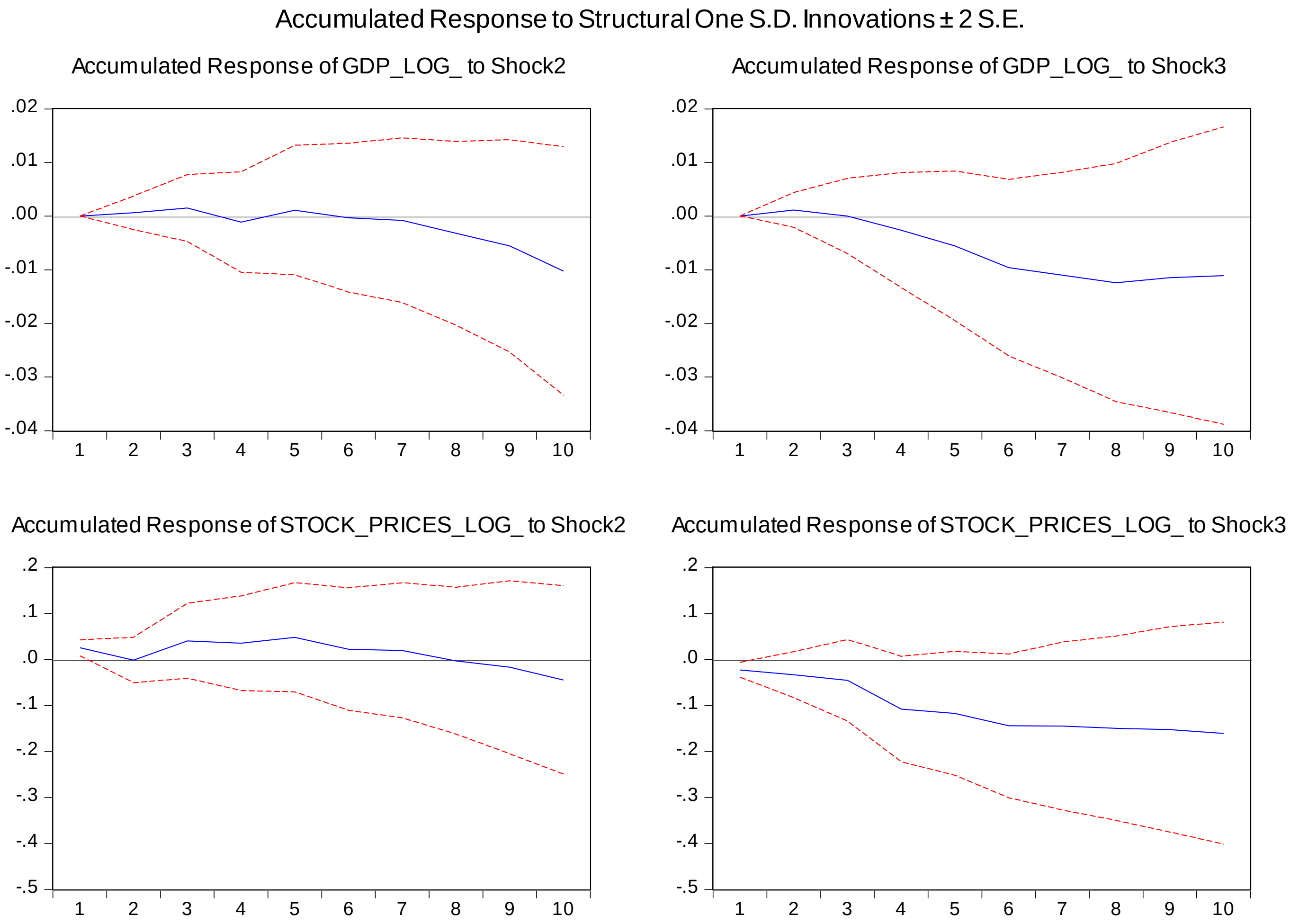


Figure 6.16 Accumulated responses graphs of asymmetric model Mexico – Shock 2: UP, Shock 3: DOWN

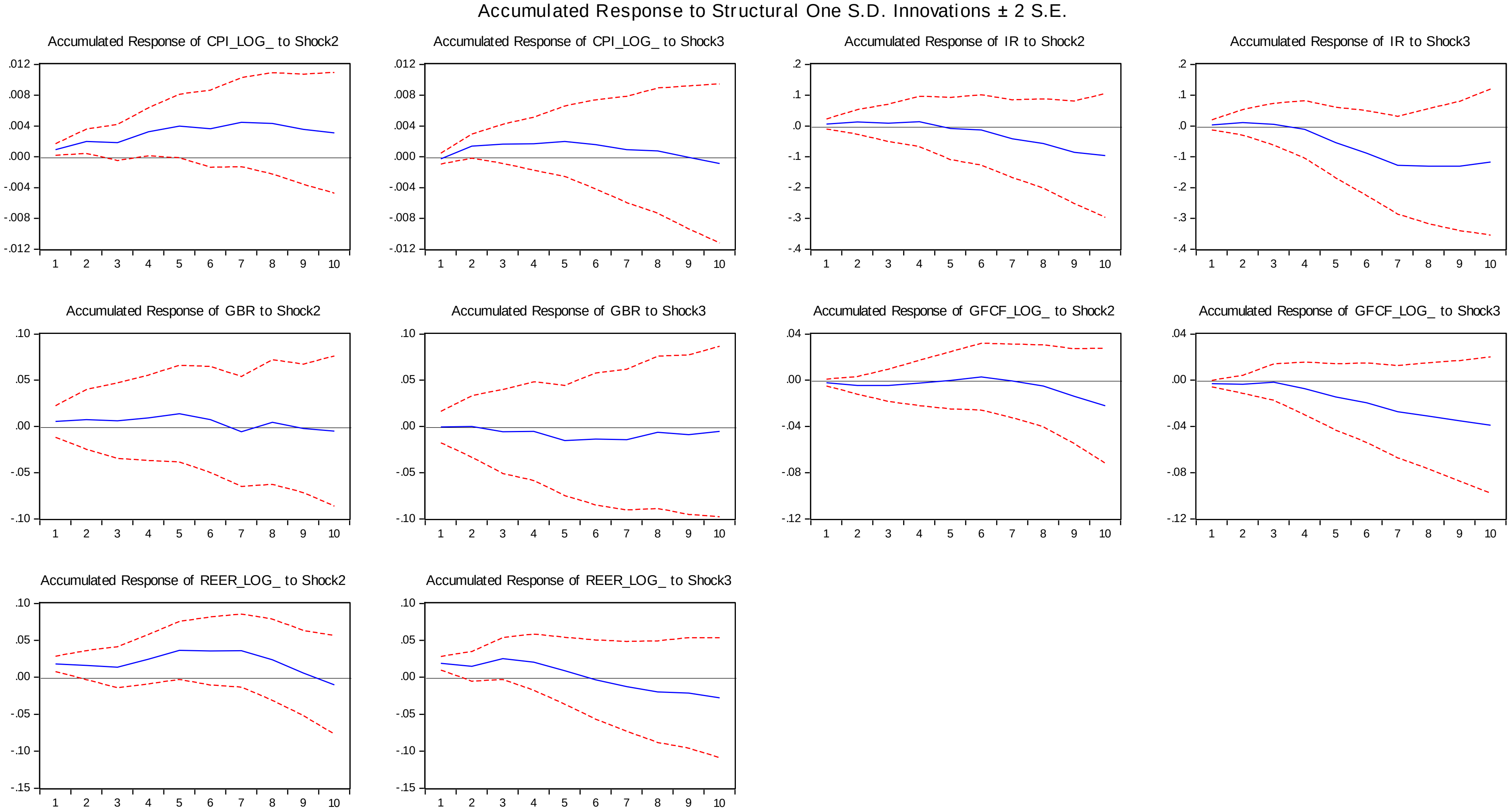
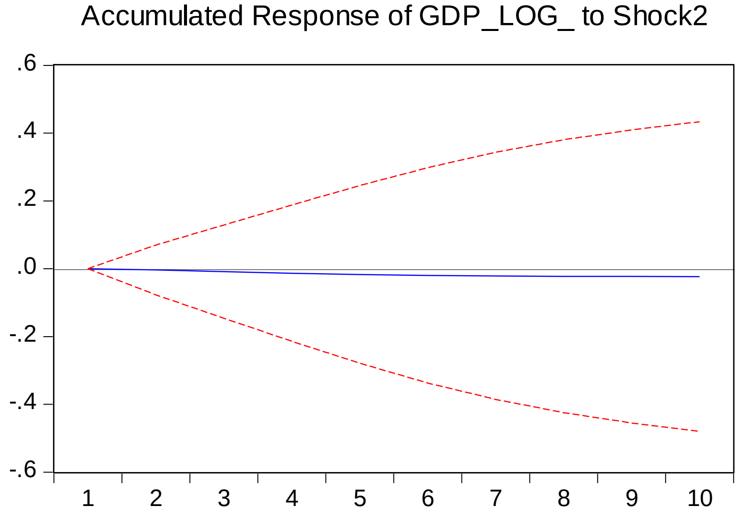


Figure 6.17 Accumulated responses graphs of net model UK – Shock 2: NOPI

Accumulated Response to Structural One S.D. Innovations ± 2 S.E.



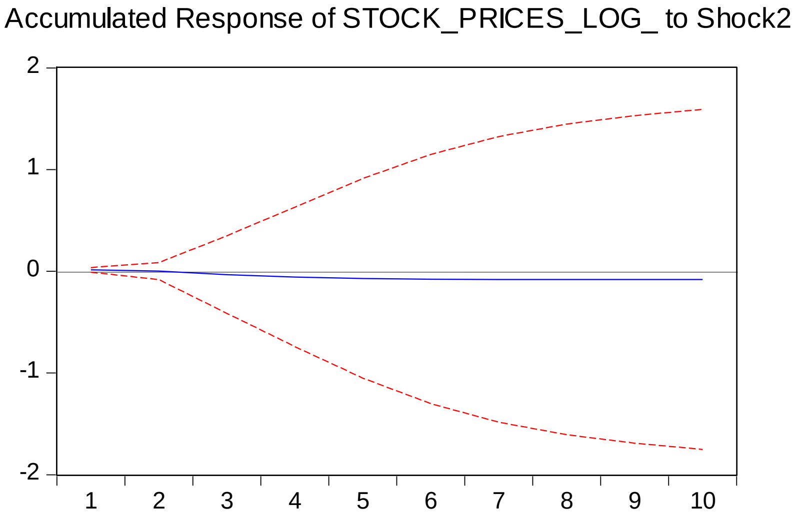
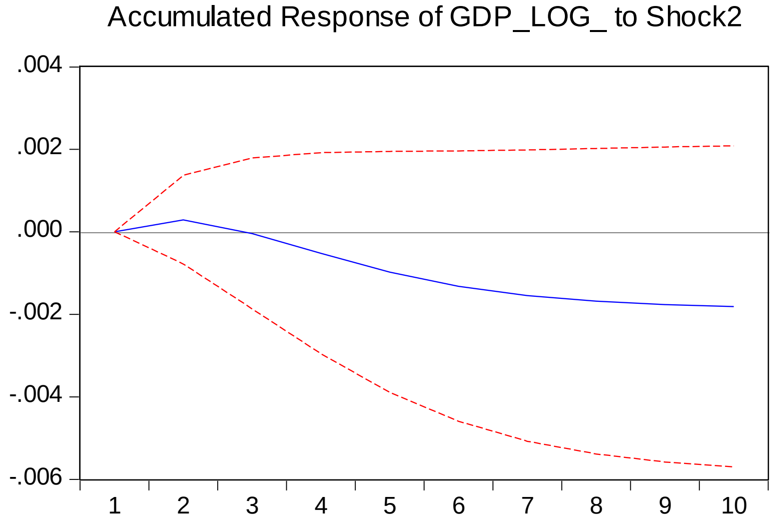
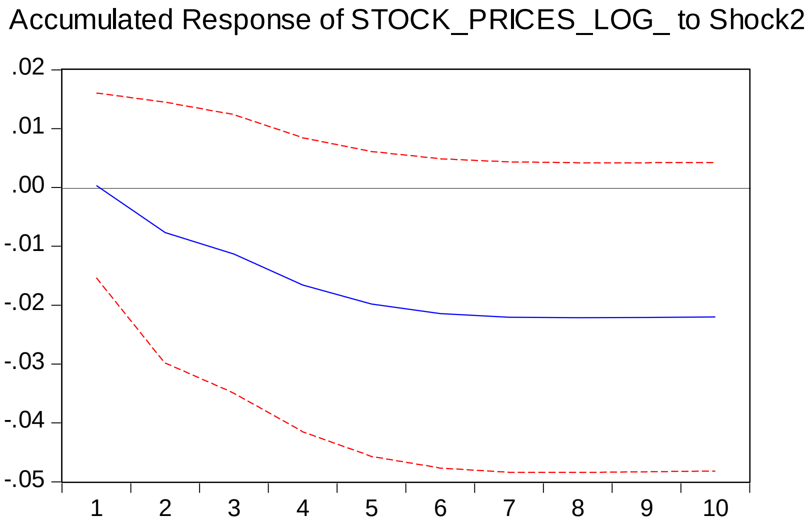


Figure 6.18 Accumulated responses graphs of linear model UK – Shock 2: Linear

Accumulated Response to Structural One S.D. Innovations ± 2 S.E.





Appendix 12 - Variance decomposition analysis – graphs and tables

Figure 7.1 Variance decomposition graph of Scaled (SOPD) model of Norway.

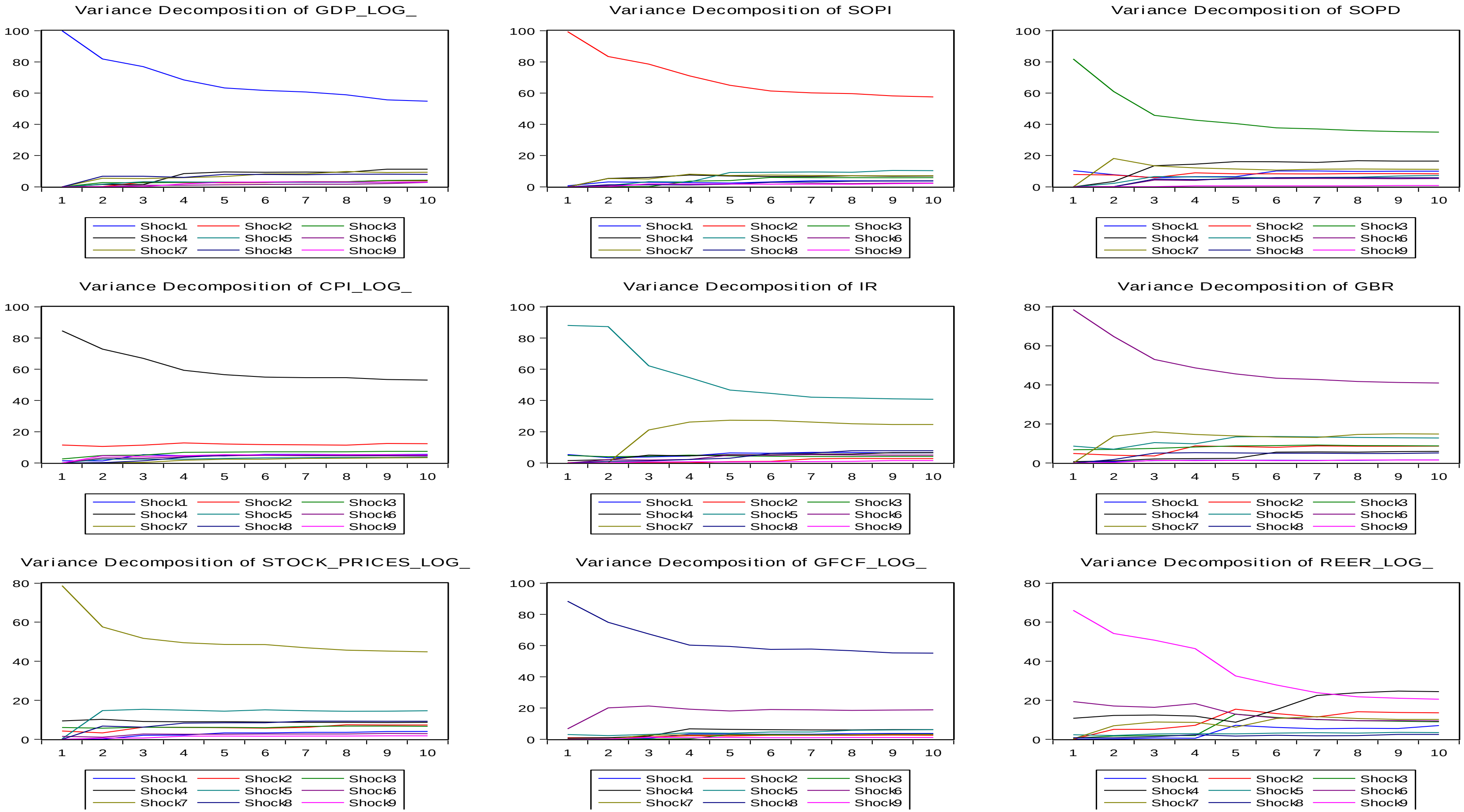


Table 9.1 Variance decomposition table of Scaled (SOPD) model of Norway.

Variance Decomposition of STOCK MARKET RETURN:

Period	S.E.	GDP	SOPI	SOPD	CPI	IR	GBR	Stock mark‹	GFCF	REER
1	0.122337	0.058098	4.161300	6.002385	9.360268	0.207569	1.470472	78.73991	4.00E-32	0.000000
2	0.145965	0.062392	3.247799	5.759566	10.24641	14.66421	1.047715	57.58103	6.773859	0.617024
3	0.155224	2.000389	6.141890	6.163442	9.154211	15.34692	2.694784	51.74902	6.178132	0.571211
4	0.159023	2.092996	6.063453	6.121539	8.907827	14.87653	2.617408	49.43156	8.304663	1.584029
5	0.161711	3.300137	5.894115	6.089459	9.025955	14.39890	2.633955	48.63097	8.413476	1.613031
6	0.164515	3.302402	5.716827	5.893465	8.858645	15.02851	2.646138	48.53269	8.448198	1.573121
7	0.167335	3.545177	6.090449	6.517572	8.674110	14.58061	2.688461	46.91580	9.328364	1.659458
8	0.169932	3.585330	7.391884	6.738022	8.675325	14.31065	2.670580	45.63160	9.297994	1.698619
9	0.171045	3.900236	7.329390	6.724251	8.568573	14.35947	2.953660	45.22141	9.179324	1.763685
10	0.171929	4.052239	7.365850	6.666121	8.627129	14.57104	2.923482	44.83316	9.169943	1.791035

Figure 7.2 Variance decomposition graph of Net (NOPI) model of Mexico.

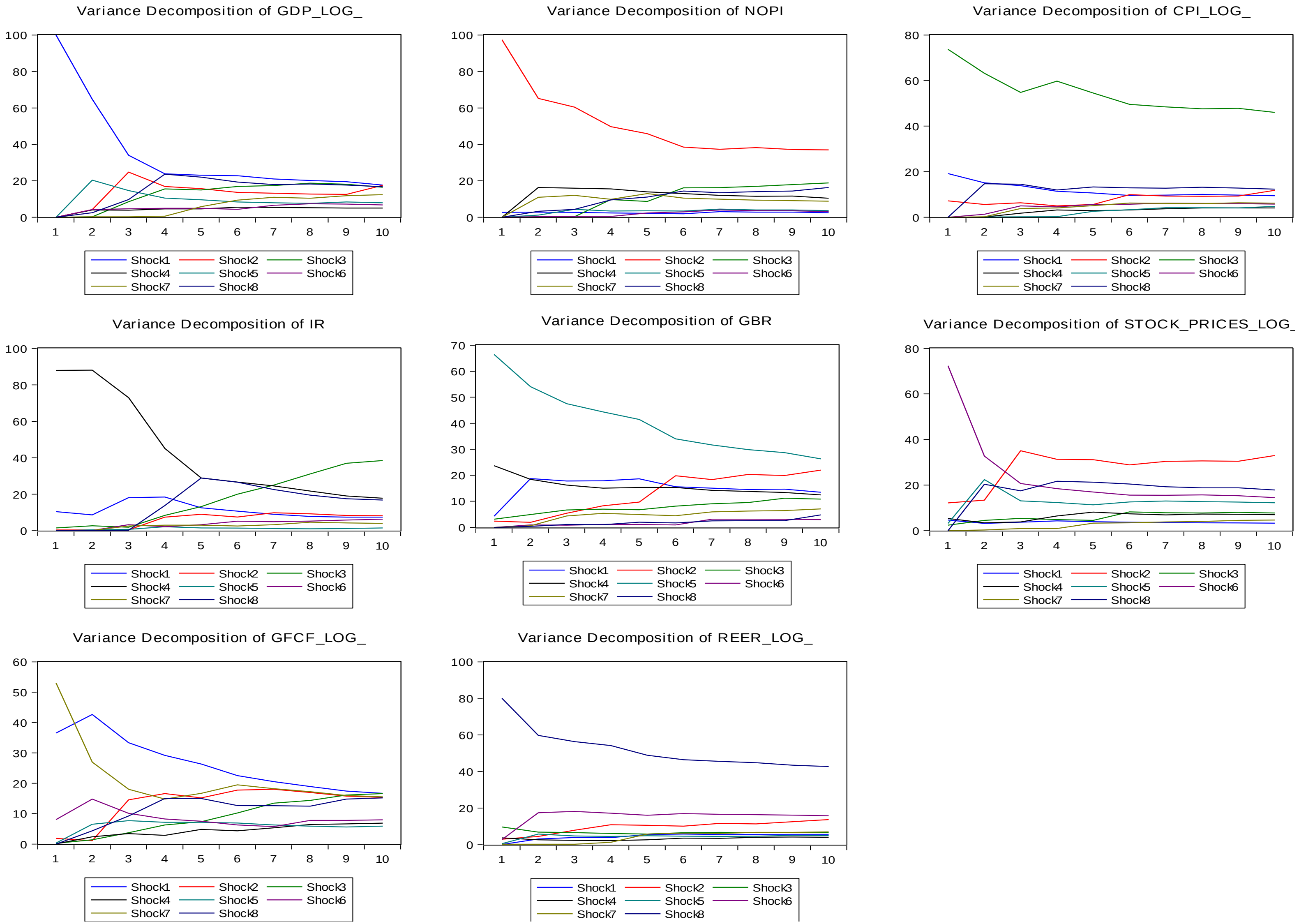


Table 9.2 Variance decomposition table of Net (NOPI) model of Mexico.

Variance Decomposition of GDP:

Period	S.E.	GDP	NOPI	CPI	IR	GBR	Stock market returns	GFCF	REER
1	0.005098	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.007570	64.70272	4.169980	0.158111	3.949083	20.27633	4.131586	0.162651	2.449544
3	0.011794	33.99004	24.78285	8.488485	3.795015	14.59142	4.562868	0.128286	9.661042
4	0.014379	23.84903	16.80474	15.51410	4.551810	10.45875	4.822943	0.470775	23.52786
5	0.015081	22.92941	15.66147	14.91386	4.477685	9.513387	4.861317	5.757231	21.88564
6	0.016152	22.79305	13.65267	16.83318	5.466622	8.380502	4.323729	9.289185	19.26105
7	0.016930	21.01208	13.12525	17.35687	5.347748	7.885734	6.513099	10.89818	17.86104
8	0.017331	20.05744	12.71238	18.62446	5.185698	7.532993	7.330313	10.40772	18.14900
9	0.017688	19.50882	12.46146	18.05747	5.028976	8.326568	7.246137	11.80138	17.56919
10	0.018663	17.55799	17.47947	16.48054	4.948466	7.839519	6.686029	12.34135	16.66664

Variance Decomposition of STOCK MARKET RETURNS:

Period	S.E.	GDP	NOPI	CPI	IR	GBR	Stock market returns	GFCF	REER
1	0.070778	4.639081	12.12754	2.400258	5.327942	3.138729	72.36645	2.09E-32	3.94E-31
2	0.106750	3.172276	13.37862	4.416779	3.373411	22.40449	32.68073	0.222378	20.35132
3	0.140471	3.719705	35.04826	5.377351	3.819076	13.01084	20.65169	0.910181	17.46290
4	0.148874	4.224268	31.34108	4.810301	6.380465	12.25827	18.40441	0.925824	21.65538
5	0.159243	3.888431	31.06495	4.470664	8.068493	11.24167	16.85376	3.251590	21.16045
6	0.166971	3.671780	28.82247	8.170860	7.374526	12.59620	15.54354	3.385705	20.43492
7	0.173363	3.500108	30.34032	7.815138	6.851332	12.96641	15.48864	3.819143	19.21890
8	0.175550	3.413462	30.50993	7.728222	7.281075	12.72259	15.62996	3.954805	18.75995
9	0.177413	3.345577	30.41199	8.013658	7.170028	12.53241	15.32966	4.471487	18.72519
10	0.182567	3.197583	33.02561	7.731782	6.929746	12.16983	14.49221	4.635259	17.81798

Figure 7.3 Variance decomposition graph of asymmetric model of Russia.

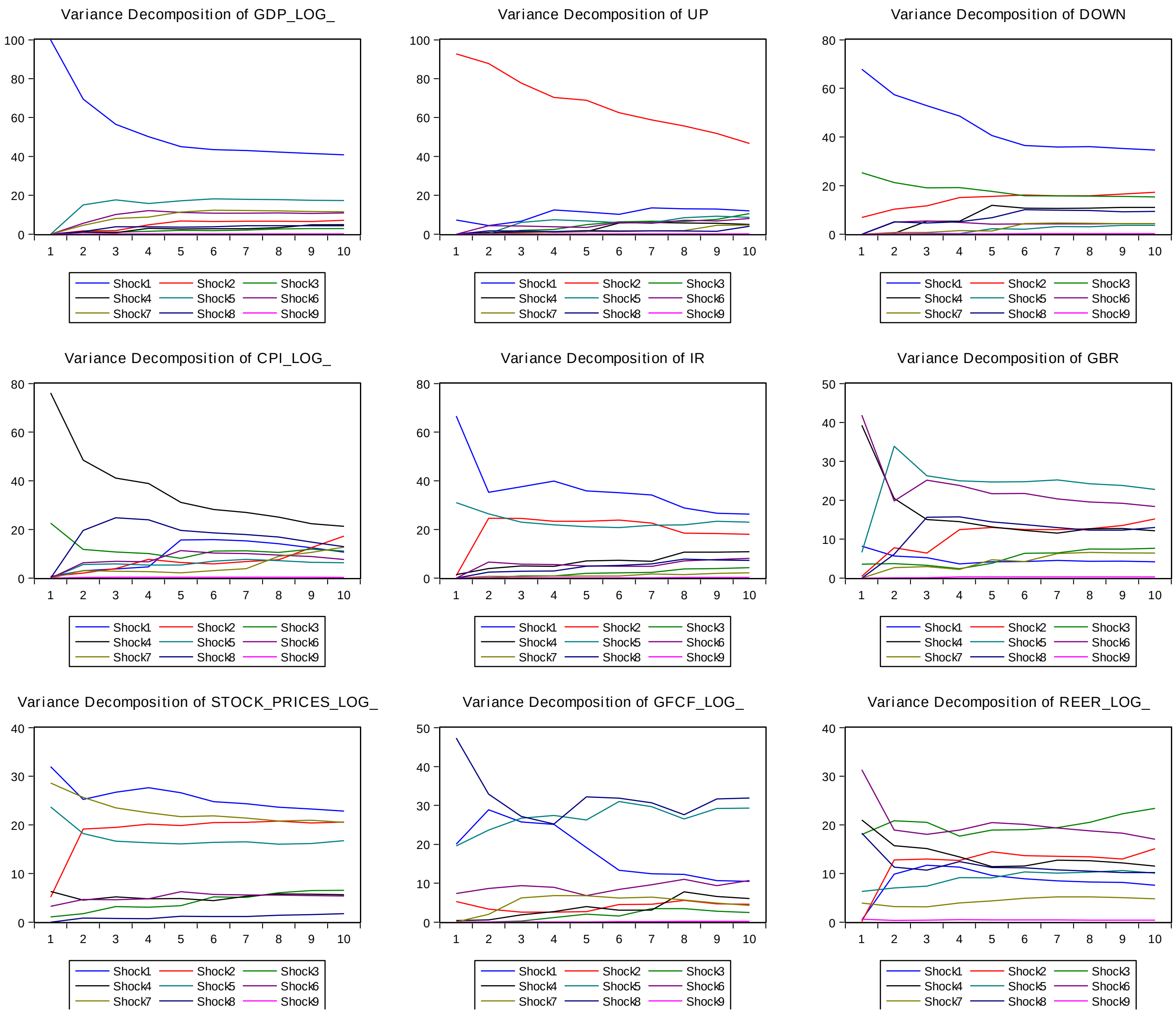


Table 9.3 Variance decomposition table of asymmetric model of Russia.

Variance Decomposition of GDP:

Period	S.E.	GDP	UP	DOWN	CPI	IR	GBR	STOCK MARKET RETURNS	GFCF	REER
1	0.012138	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.022149	69.49473	1.727495	1.155919	0.949932	15.08837	5.624803	4.518335	1.326317	0.114109
3	0.024993	56.47381	1.833582	0.994875	0.793647	17.70757	10.10900	8.071777	3.828894	0.186846
4	0.027667	50.07376	4.837522	1.441669	2.984934	15.74211	12.11364	8.752069	3.848340	0.205962
5	0.029362	45.04502	6.794746	1.919936	2.713429	17.23004	11.10828	11.37858	3.624072	0.185894
6	0.029955	43.52435	6.542136	1.845398	2.784893	18.15628	10.74696	12.37993	3.838135	0.181916
7	0.030181	43.06026	6.692418	2.011011	2.752117	17.92685	10.79369	12.22310	4.353430	0.187129
8	0.030507	42.18271	6.616919	2.615265	3.368950	17.79685	10.90949	11.96313	4.361330	0.185367
9	0.030878	41.49470	6.503563	2.950797	4.778479	17.41164	10.65950	11.67755	4.341795	0.181967
10	0.031139	40.80307	7.173172	2.909545	4.957812	17.23768	10.90622	11.52874	4.304826	0.178934

Variance Decomposition of STOCK MARKET RETURNS:

Period	S.E.	GDP	UP	DOWN	CPI	IR	GBR	STOCK MARKET RETURNS	GFCF	REER
1	0.201538	31.98739	5.141834	1.077368	6.283208	23.67243	3.245135	28.59264	5.15E-31	3.18E-33
2	0.240750	25.21971	19.15936	1.737415	4.497050	18.19784	4.649717	25.66509	0.828194	0.045624
3	0.258847	26.72451	19.46699	3.167273	5.148470	16.64665	4.598912	23.47997	0.726045	0.041175
4	0.268095	27.62802	20.15703	3.054988	4.801158	16.30946	4.806087	22.51412	0.683450	0.045683
5	0.273104	26.62514	19.84296	3.359099	4.843518	16.09255	6.274560	21.70805	1.208286	0.045836
6	0.286929	24.77777	20.48961	5.185138	4.405285	16.42836	5.684678	21.83089	1.155107	0.043157
7	0.291681	24.32930	20.52659	5.088208	5.310679	16.52472	5.594629	21.42499	1.158797	0.042099
8	0.296168	23.65877	20.75255	6.034336	5.783435	16.04128	5.528286	20.78092	1.379372	0.041053
9	0.298750	23.27293	20.39605	6.501802	5.723950	16.16056	5.442431	20.93199	1.529059	0.041230
10	0.301642	22.83333	20.57439	6.548334	5.625948	16.73816	5.367731	20.53924	1.729705	0.043171

Figure 7.4 Variance decomposition graph of asymmetric model of Canada.

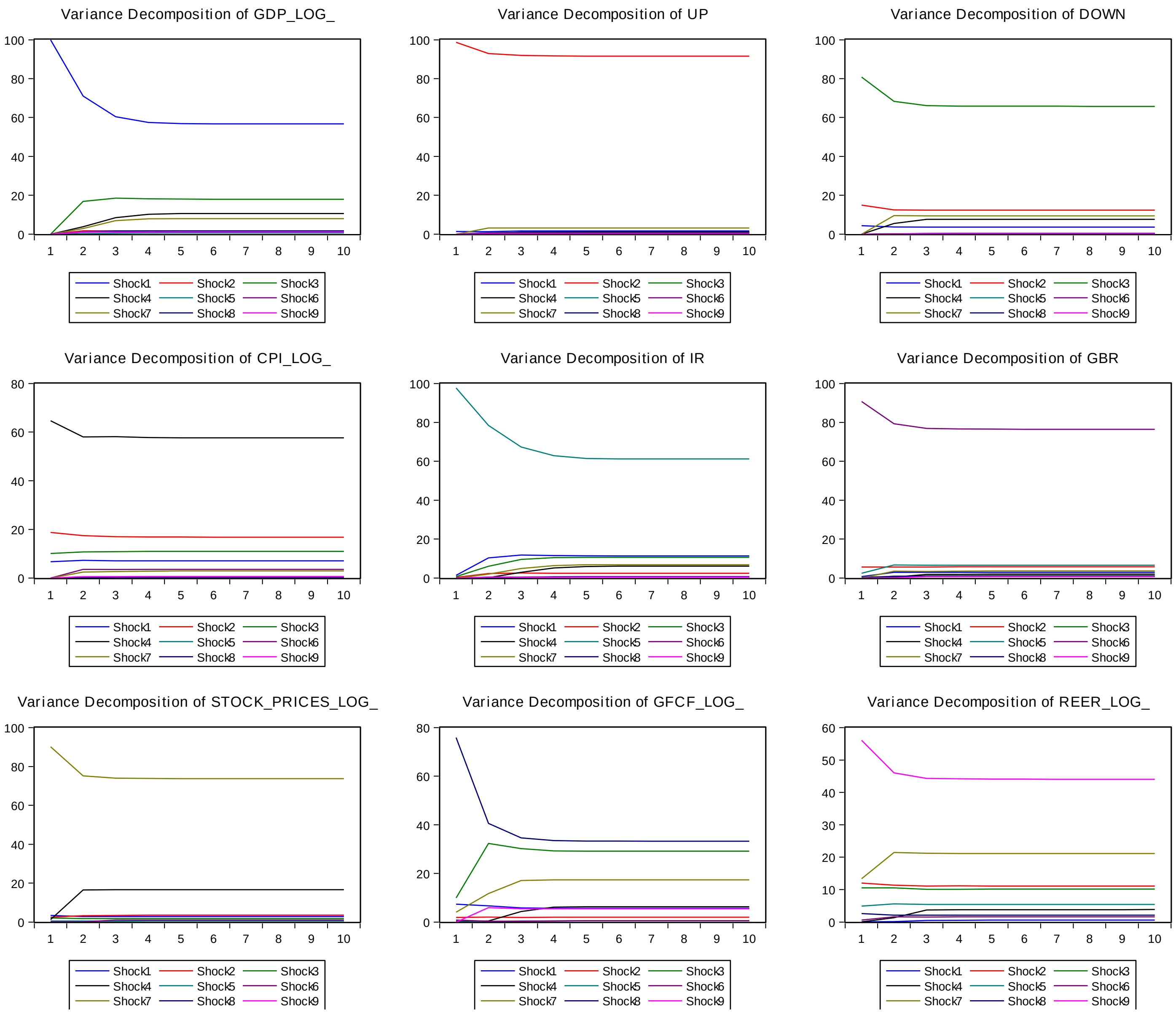


Table 9.4 Variance decomposition table of asymmetric model of Canada.

Variance Decomposition of GDP:

Period	S.E.	GDP	UP	DOWN	CPI	IR	GBR	STOCK MARKET RETURNS	GFCF	REER
1	0.004583	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.005954	71.05132	1.760709	16.83864	3.823524	0.303758	1.027181	2.852623	1.196072	1.146176
3	0.006540	60.39478	1.547078	18.43942	8.382716	0.466454	1.292844	6.955480	1.548415	0.972813
4	0.006712	57.42431	1.611526	18.10528	10.22924	0.547065	1.564676	7.866874	1.611249	1.039778
5	0.006746	56.83943	1.661126	17.95625	10.54227	0.619496	1.671887	8.011002	1.609955	1.088584
6	0.006752	56.76157	1.679208	17.93165	10.56623	0.653976	1.691576	8.011803	1.607439	1.096545
7	0.006753	56.74722	1.683749	17.93848	10.56134	0.661785	1.693280	8.010095	1.607561	1.096496
8	0.006754	56.73553	1.683933	17.94347	10.56318	0.662514	1.692786	8.014271	1.608103	1.096212
9	0.006755	56.72818	1.683679	17.94455	10.56645	0.662421	1.692745	8.017342	1.608376	1.096246
10	0.006755	56.72530	1.683632	17.94444	10.56804	0.662437	1.692888	8.018478	1.608441	1.096341

Figure 7.5 Variance decomposition graph of asymmetric model of Germany.

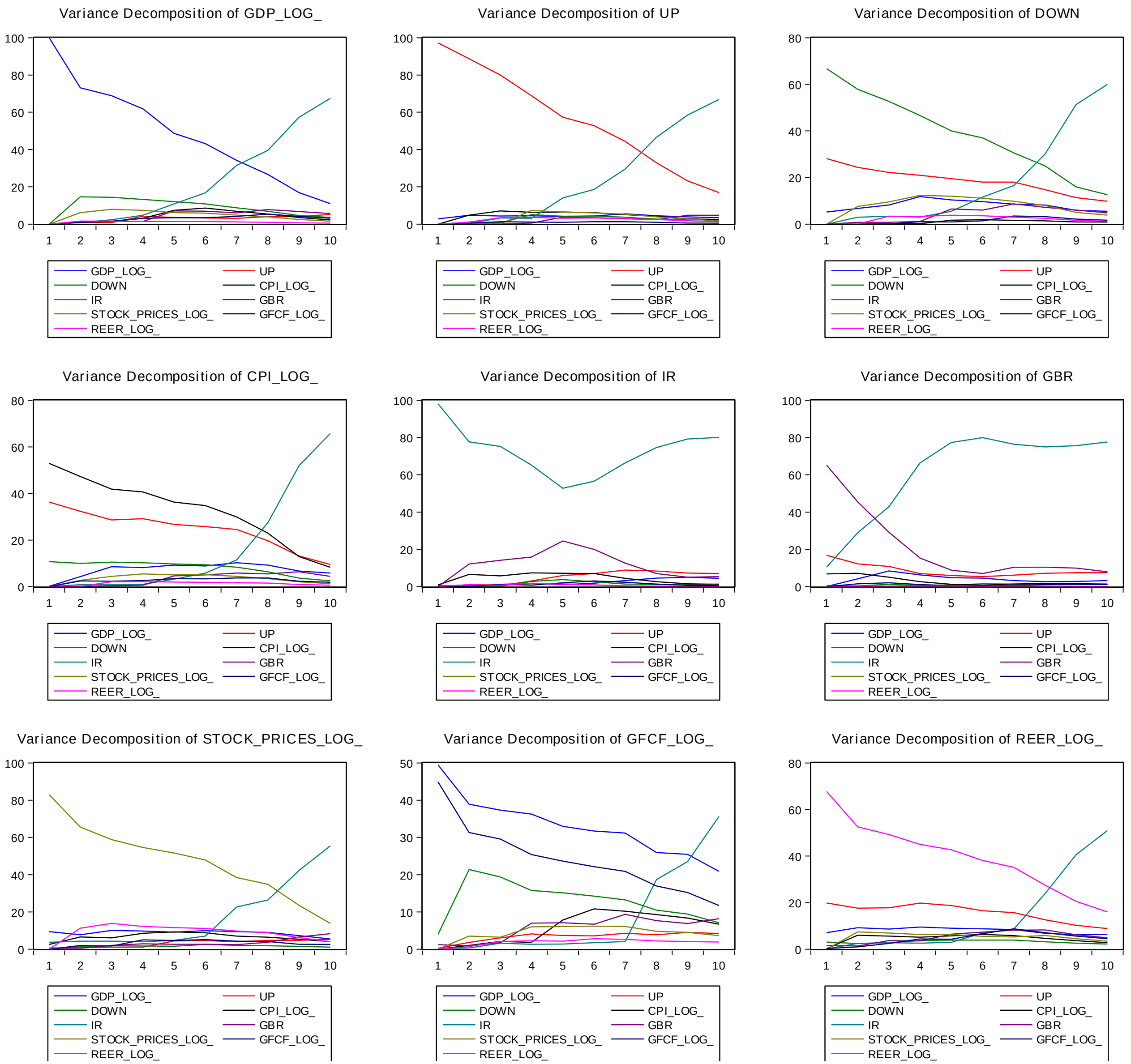


Table 9.5 Variance decomposition table of asymmetric model of Germany.

Variance Decomposition of GDP:

Period	S.E.	GDP	UP	DOWN	CPI	IR	GBR	Stock market returns	GFCF	REER
1	0.006725	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.008393	73.10396	0.770638	14.59519	0.910036	0.734201	1.341948	6.109987	0.870618	1.563418
3	0.008716	68.86963	0.823892	14.32113	1.316164	2.327898	1.573923	7.792413	1.506602	1.468346
4	0.009561	61.75102	4.245079	13.14583	3.022068	4.643029	1.390000	7.392520	3.037722	1.372732
5	0.010880	48.64609	3.451583	12.01434	7.354460	10.79136	6.969550	6.021838	3.386183	1.364593
6	0.011547	43.18279	3.192858	10.82609	8.559437	16.67419	6.951143	5.869203	3.389899	1.354393
7	0.013024	34.13948	2.959803	8.657143	6.790871	31.47288	5.961282	4.816745	4.029512	1.172279
8	0.014836	26.64913	3.974079	6.796341	5.312904	39.50918	7.700270	3.850888	5.287961	0.919245
9	0.018841	16.85793	3.996393	4.546712	3.481775	57.34845	6.701438	2.400585	4.041933	0.624788
10	0.024006	10.97403	5.130839	3.512071	2.235253	67.52087	5.569336	1.480070	3.178739	0.398798

Variance Decomposition of Stock market returns:

Period	S.E.	GDP	UP	DOWN	CPI	IR	GBR	Stock market returns	GFCF	REER
1	0.128358	9.408855	0.700320	0.181043	2.547624	3.745805	0.515788	82.90057	0.000000	0.000000
2	0.144322	7.719019	0.790698	1.333386	6.517292	4.287519	0.495841	65.62697	1.911284	11.31799
3	0.152662	10.13737	1.119769	1.886029	6.115567	4.251410	2.081662	58.80359	1.733237	13.87137
4	0.162644	9.790802	1.131105	1.735186	8.612976	3.985418	2.882564	54.60074	5.021122	12.24009
5	0.170672	9.130501	4.428163	1.625120	9.309556	4.769537	2.680138	51.70526	4.700265	11.65146
6	0.177658	10.01949	4.670842	2.597157	8.825952	7.058880	2.627665	47.86183	5.191974	11.14621
7	0.200168	9.355367	3.955501	2.058275	7.067777	22.62320	2.420000	38.39797	4.338025	9.783887
8	0.210264	9.025057	4.750289	1.869306	6.430321	26.40425	3.674008	34.90514	4.054985	8.886636
9	0.261000	7.246420	4.732144	1.488912	5.411034	42.19779	6.560848	23.53004	2.636095	6.196719
10	0.340188	5.494050	5.256662	1.116572	4.015590	55.52874	8.307346	13.85520	2.482301	3.943539

Figure 7.6 Variance decomposition graph of asymmetric model of Italy.

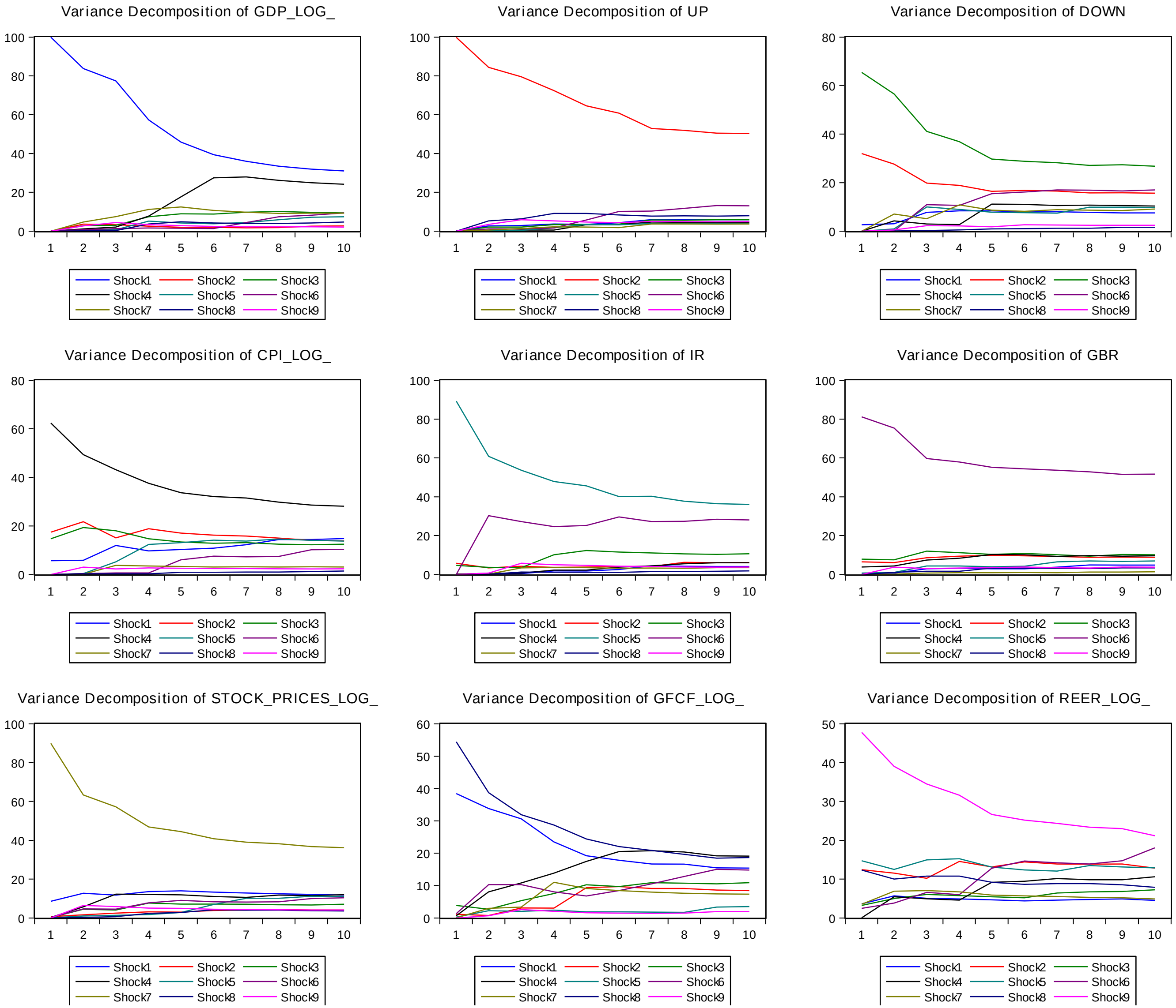


Table 9.6 Variance decomposition table of asymmetric model of Italy.

Variance Decomposition of GDP:

Period	S.E.	GDP	UP	DOWN	CPI	IR	GBR	Stock market returns	GFCF	REER
1	0.004516	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.005822	83.79479	3.613279	2.803371	1.090276	0.415874	0.825551	4.628656	0.228427	2.599780
3	0.006126	77.34894	3.272455	3.020759	2.067840	0.795347	1.197925	7.479763	0.341566	4.475402
4	0.007145	57.26182	2.496831	7.434840	7.777085	5.127683	1.609219	11.14202	3.745017	3.405483
5	0.008016	45.83494	1.987719	8.860348	17.60051	4.250096	1.467730	12.39897	4.820511	2.779182
6	0.008650	39.43044	1.924587	8.745757	27.45354	3.890990	1.318493	10.65398	4.195318	2.386906
7	0.009059	35.95250	1.756621	9.720485	27.90508	4.410621	4.414991	9.734867	3.928834	2.175997
8	0.009394	33.44166	1.771771	10.14907	26.19825	5.805673	7.338820	9.125099	4.002172	2.167481
9	0.009626	31.88807	2.489747	9.666054	24.95985	7.131594	8.168508	9.277991	4.240993	2.177191
10	0.009788	31.04562	2.612467	9.368552	24.14540	7.391856	9.398617	9.277141	4.654464	2.105888

Variance Decomposition of Stock market returns:

Period	S.E.	GDP	UP	DOWN	CPI	IR	GBR	Stock market returns	GFCF	REER
1	0.105609	8.547610	0.610520	0.187660	0.324038	0.076099	0.305626	89.94845	0.000000	0.000000
2	0.126737	12.71635	1.571195	4.381106	5.703397	0.996246	4.675537	63.31414	0.242388	6.399645
3	0.133621	11.80304	2.399779	4.065571	12.25074	1.300009	4.527599	57.18507	0.618927	5.849264
4	0.148400	13.54423	3.135006	7.612615	12.06822	1.769890	7.677821	46.84100	2.316086	5.035133
5	0.154507	14.03679	3.064555	7.107379	11.81315	2.805744	9.079497	44.46166	2.748335	4.882891
6	0.161652	13.33662	3.785601	7.176571	11.07511	6.857971	8.314292	40.83712	4.133330	4.483381
7	0.165890	12.82885	4.117813	6.982451	10.51900	10.14751	8.203509	39.00811	3.934087	4.258663
8	0.168046	12.50273	4.272587	6.816727	11.79326	10.07115	8.271185	38.22196	3.899859	4.150533
9	0.171503	12.04695	4.104424	6.616108	11.51524	11.16514	9.938183	36.74169	3.747186	4.125081
10	0.173719	11.80635	4.018459	7.009524	11.95778	10.98781	10.33824	36.16061	3.652311	4.068907

Figure 7.7 Variance decomposition graph of scaled model of USA.

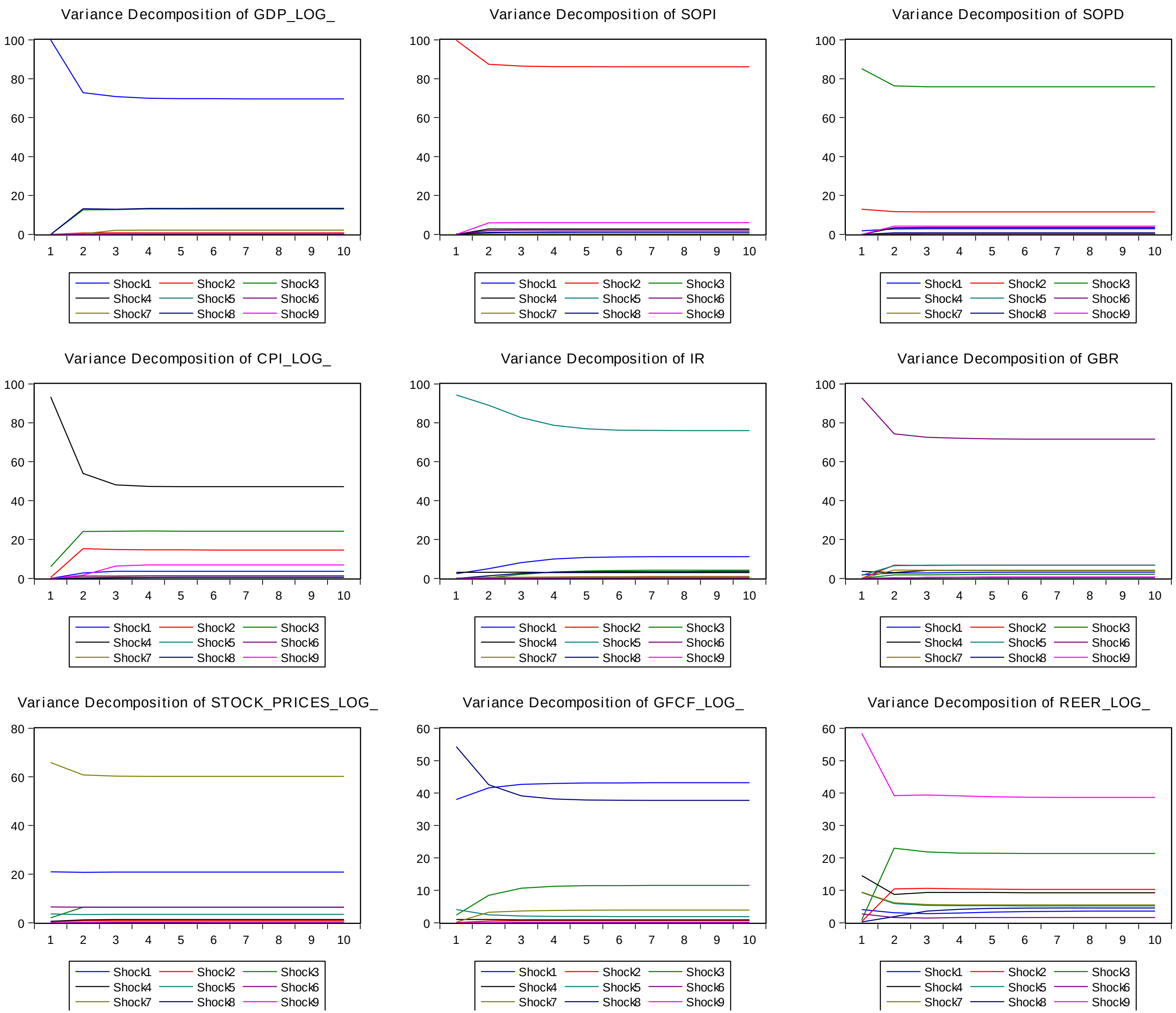


Table 9.7 Variance decomposition table of scaled model of USA.

Variance Decomposition of GDP:

Period	S.E.	GDP	SOPI	SOPD	CPI	IR	GBR	Stock Market Returns	GFCF	REER
1	0.004922	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.006078	72.77879	0.594708	12.56090	0.062093	0.001735	0.211913	0.346882	13.20803	0.234955
3	0.006440	70.81346	0.736909	12.63480	0.173330	0.071892	0.246714	2.071976	12.91160	0.339320
4	0.006542	69.94100	0.720524	13.06103	0.227673	0.069983	0.248209	2.142891	13.22434	0.364348
5	0.006573	69.74900	0.713727	13.06816	0.237609	0.069428	0.263028	2.212925	13.32354	0.362581
6	0.006583	69.67753	0.711419	13.07441	0.238511	0.069681	0.265100	2.230900	13.37067	0.361780
7	0.006587	69.65286	0.710629	13.07359	0.238762	0.069839	0.265272	2.237323	13.39019	0.361536
8	0.006589	69.64306	0.710350	13.07333	0.238750	0.069882	0.265294	2.239476	13.39835	0.361503
9	0.006589	69.63927	0.710233	13.07324	0.238731	0.069896	0.265289	2.240338	13.40151	0.361494
10	0.006590	69.63777	0.710185	13.07325	0.238723	0.069899	0.265284	2.240667	13.40274	0.361484

Figure 7.8 Variance decomposition graph of asymmetric model of Japan.

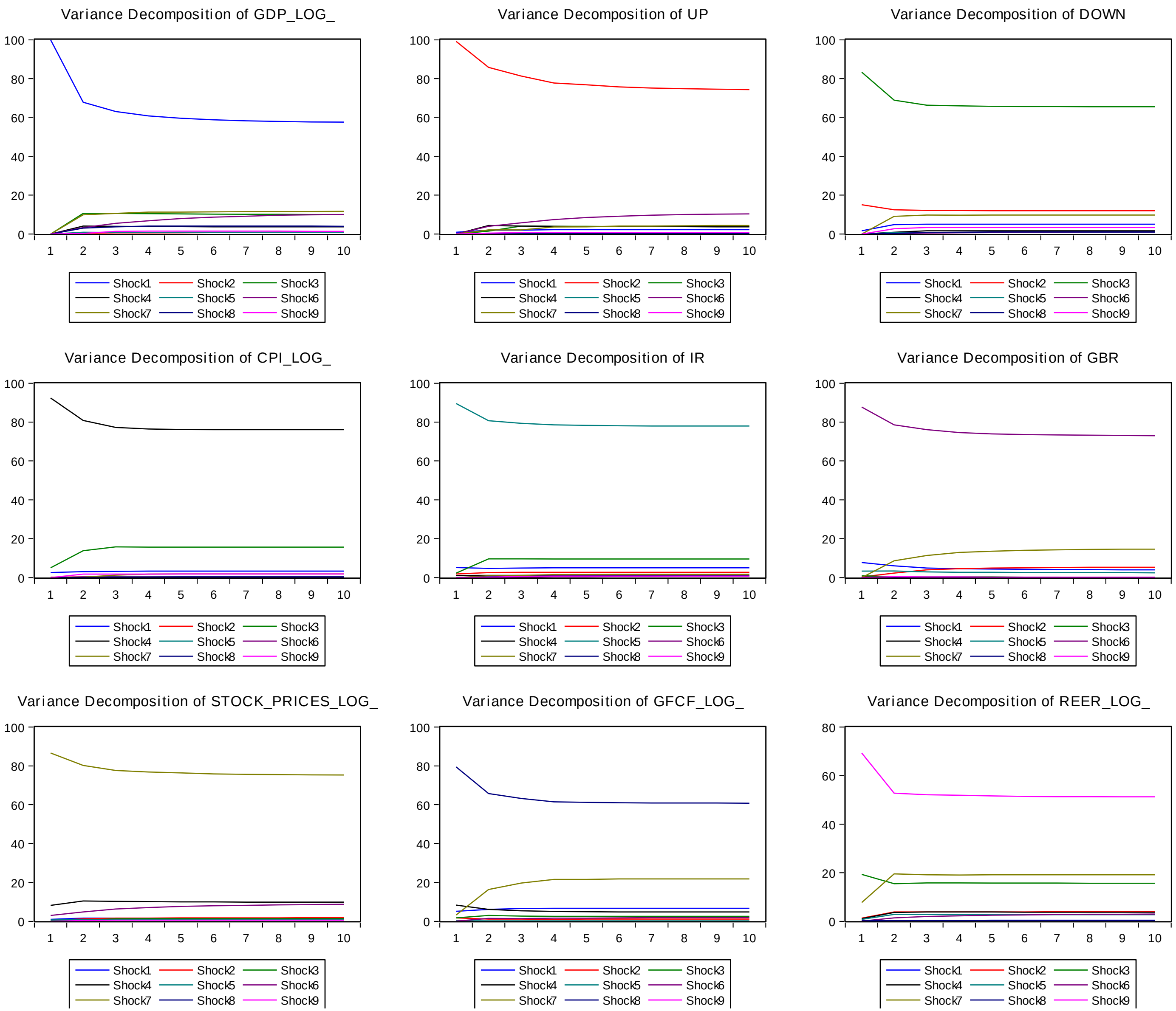


Table 9.8 Variance decomposition table of asymmetric model of Japan.

Variance Decomposition of GDP:

Period	S.E.	GDP	UP	DOWN	CPI	IR	GBR	Stock market returns	GFCF	REER
1	0.008634	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.010491	67.82508	0.278058	10.59306	4.033739	0.859210	3.266768	9.879776	3.014986	0.249330
3	0.010914	63.01973	0.514998	10.60903	3.968294	0.821417	5.501112	10.54351	3.672427	1.349486
4	0.011145	60.69450	0.511365	10.43504	3.895743	0.789383	6.847076	11.31450	4.034521	1.477875
5	0.011252	59.55320	0.683307	10.34503	3.824385	0.887026	7.940955	11.22078	4.086901	1.458416
6	0.011334	58.73519	0.760036	10.20561	3.769836	0.876892	8.698052	11.43196	4.084862	1.437565
7	0.011380	58.27803	0.817548	10.12500	3.743308	0.895752	9.198879	11.45417	4.059946	1.427368
8	0.011418	57.90706	0.858826	10.05755	3.718342	0.898057	9.565181	11.53758	4.039556	1.417847
9	0.011441	57.68138	0.887859	10.01716	3.703841	0.902388	9.814433	11.55696	4.023682	1.412291
10	0.011459	57.50765	0.907237	9.985617	3.692341	0.904544	9.991518	11.59085	4.012286	1.407952

Figure 7.9 Variance decomposition graph of linear model of U.K.

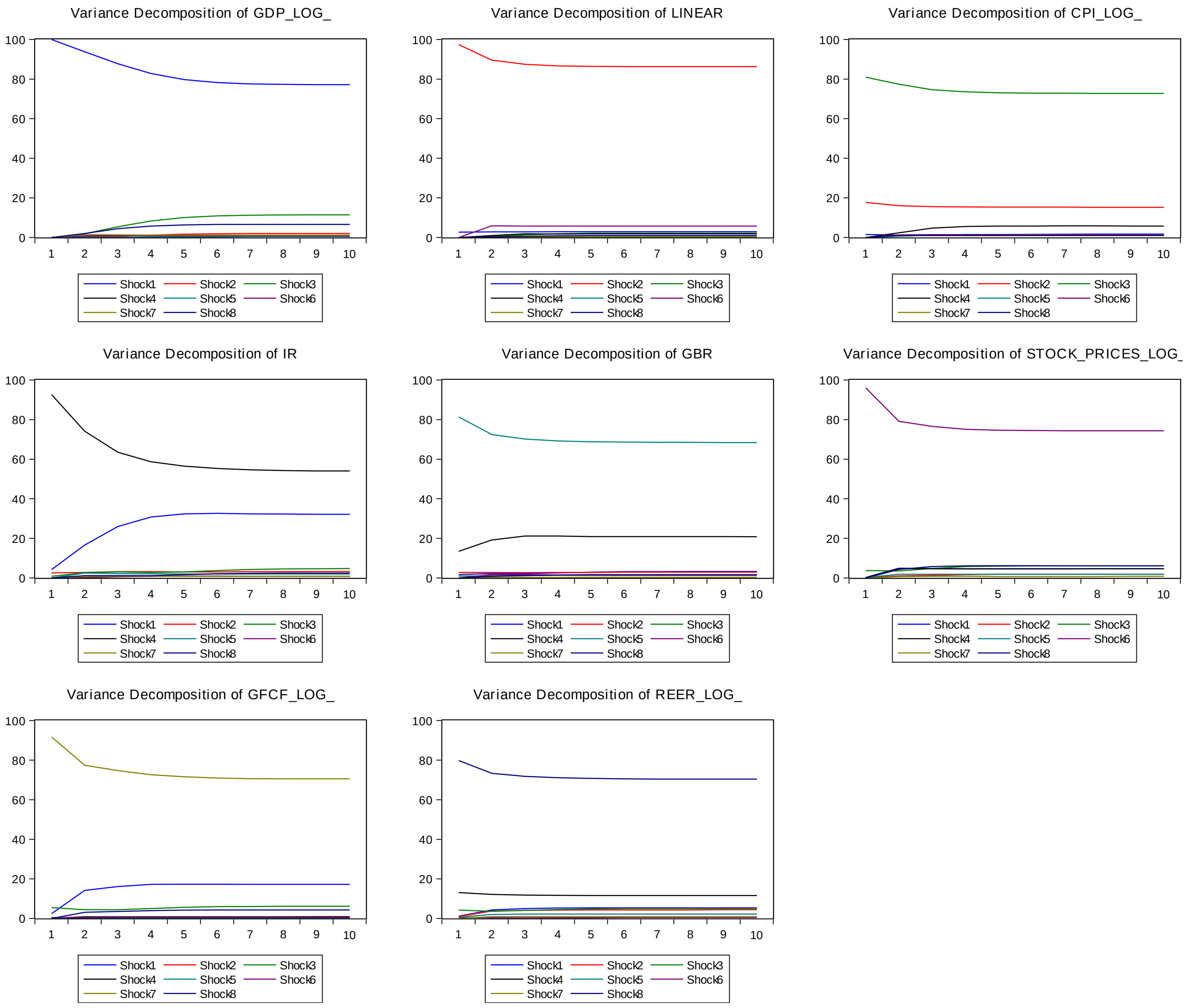


Table 9.9 Variance decomposition table of linear model of U.K.

Variance Decomposition of GDP:

Period	S.E.	GDP	Linear	CPI	IR	GBR	Stock mark	GFCF	REER
1	0.004597	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.005469	93.69154	0.287621	1.833241	0.041214	0.015938	0.783708	1.377177	1.969567
3	0.005947	87.62484	0.558083	5.291059	0.077041	0.055639	0.832995	1.186101	4.374239
4	0.006214	82.69392	1.111710	8.244372	0.174232	0.148838	0.763849	1.156584	5.706493
5	0.006360	79.66683	1.567757	10.02078	0.343934	0.256915	0.740606	1.130124	6.273057
6	0.006431	78.15322	1.817689	10.86792	0.505719	0.342602	0.741071	1.125271	6.446512
7	0.006462	77.49818	1.924420	11.21081	0.616067	0.393468	0.744481	1.125826	6.486749
8	0.006475	77.24229	1.962118	11.33535	0.675595	0.418397	0.745769	1.127778	6.492708
9	0.006480	77.14771	1.973988	11.37889	0.702689	0.429002	0.745775	1.129151	6.492797
10	0.006483	77.11253	1.977660	11.39491	0.713706	0.433161	0.745516	1.129874	6.492644

Figure 7.10 Variance decomposition graph of Net (NOPI) model of U.K.

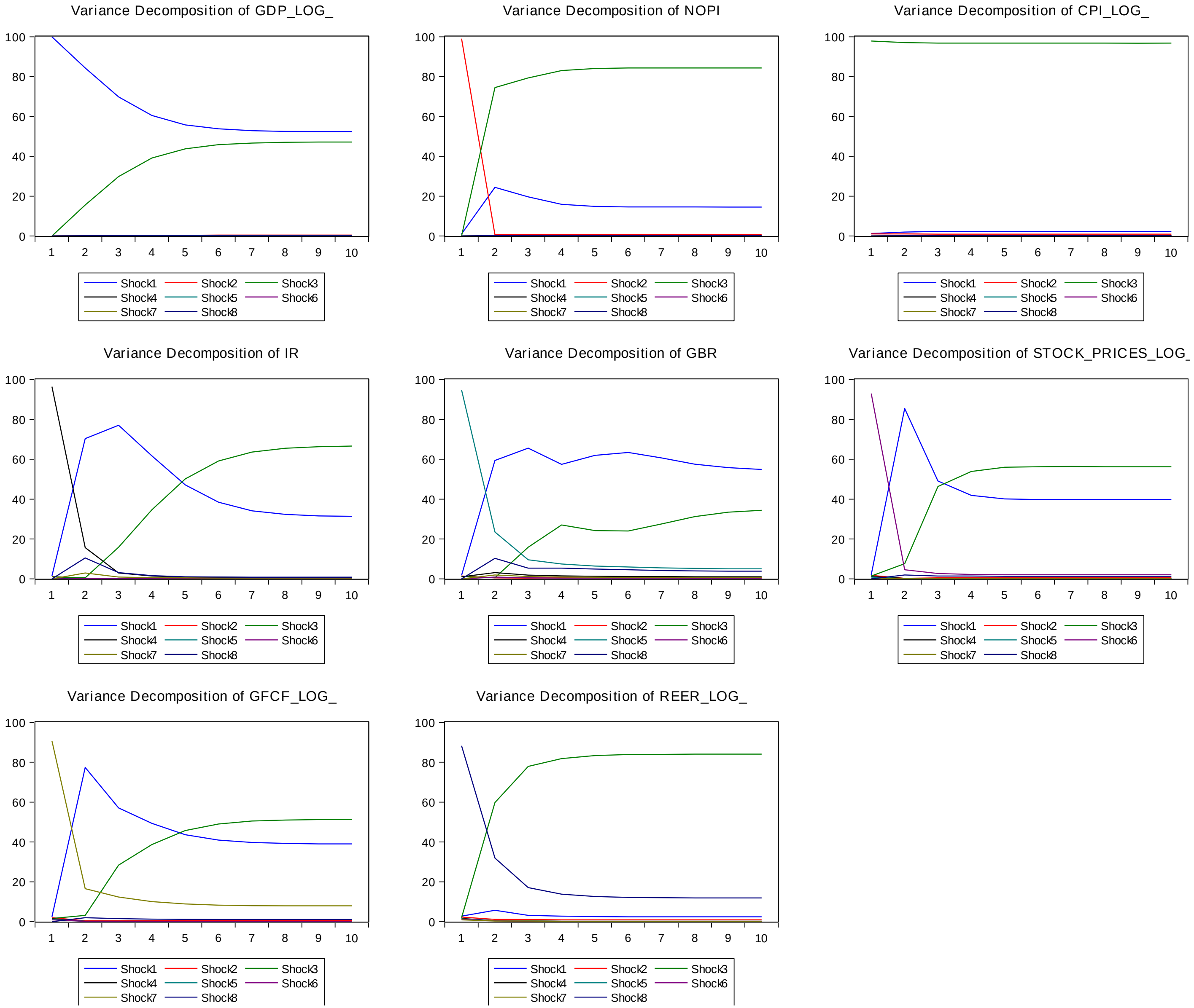


Table 9.10 Variance decomposition table of Net (NOPI) model of U.K.

Variance Decomposition of GDP:

Period	S.E.	GDP	NOPI	CPI	IR	GBR	STOCK MARKET RETURNS	GFCF	REER
1	0.100000	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.114668	84.28807	0.110612	15.46891	0.001804	0.005712	0.010160	0.110123	0.004607
3	0.129463	69.82383	0.231210	29.79041	0.001434	0.007103	0.010987	0.100031	0.034992
4	0.139722	60.43314	0.308093	39.08170	0.001366	0.008185	0.010013	0.099864	0.057632
5	0.145493	55.77327	0.346733	43.69257	0.001545	0.008772	0.009319	0.097035	0.070760
6	0.148295	53.68621	0.364214	45.75886	0.001812	0.009087	0.008975	0.096039	0.074803
7	0.149491	52.83596	0.371490	46.60129	0.002017	0.009225	0.008833	0.095632	0.075559
8	0.149965	52.50471	0.374376	46.92966	0.002134	0.009281	0.008777	0.095547	0.075518
9	0.150151	52.37541	0.375519	47.05786	0.002189	0.009303	0.008755	0.095542	0.075421
10	0.150227	52.32221	0.375992	47.11060	0.002211	0.009311	0.008747	0.095553	0.075366

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Preliminary Master Thesis Report

Hand-in date:

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Supervisor:

Paul Ehling

Programme:

Master of Science in Business- Major in Finance

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Abstract:

The aim of this research is to investigate the effects fluctuations and shocks in crude oil price have upon major macroeconomic variables and stock markets in ten oil-dependent countries that have crude oil as their main exported or imported good.

The research method chosen is the Structural Vector Autoregressive (SVARs) modelling technique. This method was chosen based on previous studies and the fit for our research. For each country, we shall construct four models with different oil price modification

Main findings of previous research are that there exists a relationship between oil price fluctuations, shocks, and macroeconomic indicators. However, due to differences in the direction of oil price change and differences in nature of the oil price shocks, the dynamics of the effects on economic activity vary. The findings concerning the relationship between stock prices and oil price are more inconclusive.

1. Introduction

Research ambition:

For our master thesis, we are to conduct an empirical study to quantify the effects fluctuations and shocks in the oil prices have upon macroeconomic variables and the stock markets in ten countries that have crude oil as their main exported or imported good.

In this paper we will investigate how crude-oil price fluctuations in 10 oil-dependent countries affect major macroeconomic variables, including the stock markets for each country, during 1996-2016 and what can we expect in near future?

Incentive behind the choice of topic is the major shocks in oil prices, especially in the time period 2007-2008 and the downturn in the oil prices in the recent years. In 2014, oil prices declined to historically low level with approximately 50% within half a year. Such dynamics in oil prices might affect the economy in countries that have oil as their mainly traded commodity or as an underlying good for other traded goods. The latter is due to the fact that oil is one of the most vital commodity traded in global markets, hence, the price changes in oil might also have a global impact on the world economy.

In addition, the macroeconomic variables for a country also consist of combination of consumption and investment. Given the companies´ stocks included in benchmark stock exchange for each country, it will be feasible to look upon the effects of oil price changes in the stock market for each country chosen. In specific, one industry from each stock exchange will be chosen to assess the impact oil prices have with the stock market.

The objectives of our study are the following:

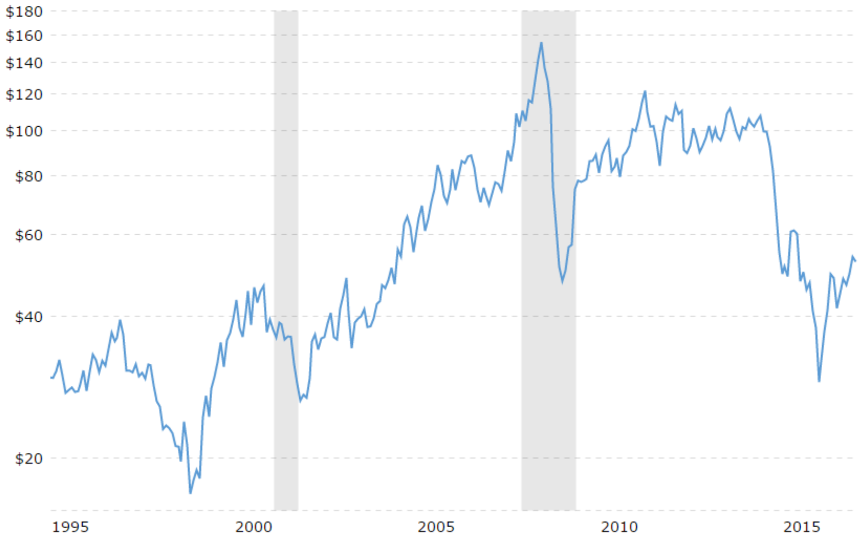
1. Selection of model and variables that provide the best possible accuracy when explaining the relationship between crude oil price, macroeconomic variables and stock prices.
2. Estimating the relationship between crude oil price and our variables in 10 countries (see Table 1) in the period of 1996-2016.
3. Economic interpretation of the empirical results

4. Interpretation of variance decompositions and impulse responses (statistics constructed to alleviate the a-theoretical nature of VAR (Brooks 2014, 333)).
5. Forecast the next few years based on a scenario analysis of oil price.

Table 1:

Countries	Oil-dependency: **export**	Oil-dependency: **import**
Norway	X	
Saudi Arabia	X	
Russia	X	
Venezuela	X	
Canada	X	
USA		X
Japan		X
Germany		X
Italy		X
Finland		X

Background and relevance of research:



The graph above depicts the crude oil price from 1996 to 2016 (Macrotrends, 2017). As we can see, there is high volatility and seemingly high unpredictability. Immediately we recognise the most recent oil shock. This was in 2014 when the oil price plummeted due to factors such as worldwide slow economic growth, the removal of sanctions on Iran's oil production and the production increase in Iraq and Libya (Oilprice, 2016). As we know, the magnitude of the impact of oil price on economies all over the world is significant. For example, when the oil price declined by 50% in 2014, this led to exchange rate shocks, instability in worldwide economics at macro level, and political uncertainty. Thus, the recency and scale of consequences in combination with the increasing volume of oil as a traded commodity, was taken into consideration when we chose oil as a subject of our research.

The change in oil prices affect many types of decisions, among others, foreign policy decisions, shift towards other energy resources, governmental managing of exchange rates with monetary tools, import and export regulations, and governmental subsidies to companies in some industries. However, the effects of changing oil price will vary depending on whether the countries mainly import or export oil. Thus, in general if the oil price increase then this would be great news for oil exporting countries but bad news for oil importing countries. If oil price decreased, this relationship would be reversed. Therefore, we choose to split our 10 oil dependent countries by whether they are oil-importers or oil-exporters. However, considering USA's position as the world's third largest oil producer (Wikipedia, 2016), and thus their powerful position, it is necessary to add USA as well.

The oil industry is sensitive to fluctuations and particularly shocks in the oil price. For example, when the oil price decreased by 50% in 2014, the energy sector lost a lot of money due to falling stock price (Patton 2016). Theoretically, the relationship between stock and oil prices can be linked through changes in expected cash flows or discount rates. As mentioned above, oil is used as input in production and oil price may lead to changes in costs. This may affect earnings, dividends and thus stock prices. An increasing oil price can lead to overestimation of the expected inflation, thus increase nominal interest rates, and since discount rates are negatively correlated with stock prices, have a negative effect on stock prices (Rafailidis and Katrakilidis 2014). In addition, the overestimation of inflation may encourage central banks to raise interest rates, which again negatively affect stock prices. Therefore, present research will investigate how oil prices affect stock prices.

Even though there exists previous research on our field, present research will attempt to answer how significant the influence of oil price changes is on major macroeconomic variables and stock prices in 10 countries. In addition, we will present short-term scenario analysis in order to provide analyst insight that could contribute to forecast economic situation further into the future. This analysis will include combining models.

Thesis progression:

Month	
January/February	1. Finish background and relevance of study. 2. Finish literature review. 3. Collect data
March/April	Start on objectives 1-5.
May/June/July	Continue work and finish objectives 1-5.

2. Literature review

One well-known research conducted by Hamilton (1983) defines the effect of oil shocks being significant for the output in an economy, arguing that different types of oil price changes do not always have the same effect on economic activities. Findings from the research of Hamilton (1983) show that oil price changes Granger-caused changes in GNP where oil prices are exogenously decided in the global markets. He moves on by arguing that the downward effect on the economy of an increase in the price of oil is more significant than the upward effect on the economy of a decrease in the oil prices. The latter is also supported by Jiménez-Rodriguez and Sánchez (2004) where they also found negative impact on the economy from oil price increase in almost all oil importing countries except Japan.

Most of the early researches on this topic started with defining linear negative relationship between oil prices in the countries importing oil and vice versa for the exporting countries. However, the former has shown to be an insignificant finding supported by the fact that decrease in oil prices have smaller positive effects on oil importing countries than the linear models depict (Jiménez-Rodriguez and Sánchez 2004). Hence, the asymmetry in the effects on economic activities from oil price changes formed two non-linear transformations further, scaled specification (Lee et al., 1995) and net specification (Hamilton, 1996). The scaled model outperformed the asymmetric and the net specification models in this research.

Moreover, the research by Jiménez-Rodriguez and Sánchez (2004) suggest a transmission mechanism through which effect of oil prices is found on the economy including a demand and supply side. The effects on supply comes from crude oil being an input of production where an increase in oil price will lead to an increase in the production cost, hence, lower the output. The demand side defines consumption and investment where oil prices have an adverse relation to the investment options. If the firm's cost increases, it will also affect its stock value. Nevertheless, the changes in oil prices also have an effect on the foreign exchange market and inflation.

Hamilton (1983) specifically describes oil shock as difference between the current oil price and the maximum price of a defined period of previous quarters. The latter finding introduced a new oil price measure, namely, Net oil price increase (NOPI). This measure took into account the fact that a previous decline in oil prices leads to an increase in oil prices as a correction to the decline. On the other hand, Killian (2009) estimated the dynamic effects of the structural oil price shocks into three categories as oil supply shocks, global demand shocks for all industrial commodities and demand shock specific to the global crude oil market. These effects were estimated for the real price of oil in the time period 1975 - 2007 with structural VAR method.

On the other hand, a study conducted about the relationship between oil prices and macro economy by Nacche (2010) examines the weakness of the former relationship. This study defines two types of oil price increases given that the price decline does not follow the same symmetry as a price increase. The first is simple increase defined as non-accelerating increase plausibly caused by a demand shock instead of oil production disruption. The second is accelerating increase. The weakening relationship between oil prices and macroeconomic variable, GDP, were thus tested by VAR model taken further with recursive exclusion tests confirming a distinction between simple increase and accelerating increase. In conclusion, the relationship between the oil price and macroeconomic variables, when assessed solely by the accelerating increase, have gradually strengthen according to this research. Whereas simple increase resulted as weakening the tested relationship.

Somehow, increase in oil prices increases the oil revenues for oil-exporting countries mostly leading to a currency appreciation. That can affect other non-oil export trades depending if the revenues are used for financing productive and social investments or for unsustainable activity leading to crises. Several researches have denoted such oil-exporting countries as suffering from “Dutch disease” (Mehrara, 2008). Such countries tend to be highly dependent on oil revenues, and at a price decline, risks to face a recession. Mehrara (2008) also underlines the fact that imports decline and the real exchange rate gets overvalued which will unlikely smoothen out.

As mentioned in background and relevance of research, technically, it seems likely that there is a relationship between crude oil prices and stock prices. This relationship depends on the underlying causes of the oil price change. If the oil price increases because of a demand shock in the oil market, then the stock prices have a negative response (Rafailidis and Katrakilidis 2014). Such a demand shock may for example be a rise in precautionary demand due to uncertainty of future crude oil supply shortfalls. On the other hand, increases in oil price driven by unanticipated global economic expansion have positive effects on stock prices within the first year (Kilian and Park 2009). This seem contradicting since higher oil price may indirectly slow economic activity down. However, because the stimulating effect of the economic expansion dominates in the short run, the stock market may still thrive during these conditions.

3. Data collection and research method

As we would like to examine the dynamic relationship between oil price fluctuations and oil price shocks among major macroeconomic factors, we choose to use a Structural Vector Autoregressive model (SVARs). This is considered more appropriate than the VAR model since SVAR allows us to estimate the underlying economic relationship between different factors in dynamics, including contemporaneous effects (Sims 2002 and Pfaff 2007). The SVAR model will allow us to estimate the particular effect of oil price shocks (Chatziantoniou, Filis, Eeckels, Apostolakis 2012).

Since the SVAR model departs from a reduced form of the VAR model (Pfaff 2007), then, in order to estimate a SVAR model, we have to start with estimating a reduced VAR. We can interpret a VAR (p) model as a reduced form model (Pfaff 2007). Typically, a reduced form VAR model will have the form:

$$y_t = c + A_1 y_{t-1} + A_2 y_{t-2} + .. + A_p y_{t-p} + e_t$$

Where y is a (k x 1) vector of endogenous variables, c is a (k x 1) vector of constraints (intercept), A_i are (k x k) matrices for i=1,...p, and e is a (k x 1) vector of errors (white noise).

When the reduced VAR is estimated, we are able to derive contemporaneous effects by structural factorization procedure that imposes short-run restrictions (Chatziantoniou, Filis, Eeckels, Apostolakis 2012). These short-run restrictions are applied according to their influence.

The structural representation of the VAR model take the general form:

$$A_0 y_t = c_0 + \sum_{i=1}^{p} A_i y_{t-i} \varepsilon_t$$

Where y is a (k x 1) vector of endogenous variables, A_0 represents (k x k) contemporaneous matrix, c_0 is a (k x 1) vector of constants, A_1 are (k x k) autoregressive coefficient matrices and /" is a (k x 1) vector of structural disturbances assumed to have zero covariance and to be uncorrelated.

To attain the reduced form of the structural model, we can multiply both sides by A_0^{-1}. Then we get:

$$y_t = a_0 + \sum_{i=1}^{p} B_i y_{t-i} + e_t$$

Here, $a_0 = A_0^{-1} c_0$, $B_i = A_0^{-1} A_i$ and $e_t = A_0^{-1} \varepsilon_t$.

In order to help find the best specifications, we plan to construct four models with different oil price modifications. Therefore, in addition to the real oil price, we will follow the example of previous research by Jiménez-Rodriguez and Sánchez

2004, and do three non-linear transformations to the oil price. These are the following: 1) asymmetric specification, 2) scaled specification (Lee and Shawn 1995), and 3) net specification (Hamilton 1996). In asymmetric specification, oil price increases and decreases are considered two separate variables. The scaled specification model takes into account the volatility of oil prices, builds on the asymmetric model and is constructed using a GARCH model. The last model is called net oil price increase (NOPI) and it consider the cumulative change over a *p* amount of periods. This model also builds on the asymmetric model as it focuses on the effect of oil price increase and neglect the effect of oil price decrease.

To find the best specifications, we will look at which models that returns the highest log-likelihood ratio and lowest AIC or BIC information criteria. We will also use variance decomposition and impulse response analysis to look further into the relationship between the oil price and our variables.

Based on previous research (Jiménez-Rodriguez and Sánchez 2004, Chatziantoniou, Filis, Eeckels, Apostolakis 2012), the variables we will consider for the model are the following: real GDP, CPI and REER. In addition, we suggest gross fixed capital formation (GFCF) and stock prices (total return index). We choose to add GFCF based on the idea that the effect of oil price fluctuations can affect GDP through multiple channels. We consider real GDP as a direct measure of economic activity. As we know, CPI is used as a measure of inflation, REER measures the real value of a country's currency compared to trading partners, and stock prices are dependent on supply and demand set by the market forces. Therefore, the remaining variables CPI, REER and stock prices (TRI), are included in order to capture how oil prices indirectly may affect economic activity.

Data for our research will be in form of time series on a monthly or quarterly basis (depending on what is available). We plan to use a sample range of 20 years, i.e. 1996 to 2016. The main source for our data we expect to be Datastream, U.S. Energy Information Administration, and other databases of statistical agencies. As mentioned above, we will collect data from ten countries and we have chosen the countries on behalf of their oil-dependency. They are all very dependent on oil import or oil export. Therefore, we have decided to separate the countries depending on whether oil is their main export or if oil is their main import.

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