INVESTIGATION OF THE IMPACT OF FINANCIAL VARIABLES ON THE AGRICULTURAL COMMODITY PRICES IN MALAYSIA

BY

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A research project submitted in partial fulfillment of the requirement for the degree of

BACHELOR OF ECONOMICS (HONS)

UNIVERSITI TUNKU ABDUL RAHMAN

FACULTY OF BUSINESS AND FINANCE
DEPARTMENT OF ECONOMICS

AUGUST 2014

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(1) This undergraduate research project is the end result of our own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.
(2) No portion of this research project has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.
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ACKNOWLEDGEMENT

First and foremost, I might want to thank my supervisor of this research, Mr. Thurai Murugan Nathan for the significant direction and counsel. He had inspired me greatly to finish up this research. His eagerness to motivate me contributed tremendously to my project. Furthermore he always has time to meet me frequently for the progress of my report. I also would like to thank him for showing me on where to get the data needed for my report, teach me how to utilize E-views and Microfit 4.0 to conduct the test and not forgetting the proper format for doing the research.

I also like to grab this chance to thank for approving my Student Assistanship application and financially support me under UTAR Research Fund, at Faculty of Business and Finance, UTAR for the project title "Does the world energy prices and financial factors have impact on the energy incentive agricultural commodities in Malaysia?" under the supervision of Mr Thurai Murugan Nathan as the grant holder.

Besides, I would like to thank the authority of Universiti Tunku Abdul Rahman (UTAR) Perak campus for providing with the best environment and facilities such like library books, online journals and data stream to complete this project.

I likewise might want to take this opportunity to express my deepest feeling of appreciation to UTAR lecturers and tutors, friends and family who helped me in completing this task through various stages. Not forgetting my academic advisor who supported me all the way.

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ABSTRACT

Commodity prices explosions, as those recorded in the last decade, may affected by financial variables of its home country. My analysis produces new estimates of this relationship by focusing on Malaysia which is one of the countries specialized in agricultural sector. This paper aims at investigating the relationship between selected financial variables and the price of the agricultural commodities such as wheat, corn, soybean and sugar. Agricultural commodity prices are particularly vulnerable to financial variables of the country. I use the ARDL method to test for long-run relationship and causality effect by using Toda Yamamoto non-granger causality test. In addition, employ impulse response function to check for the shock of financial variables and the agricultural commodity prices. My analysis based on quarterly time series data over the period of 2000Q1-2014Q1 with 57 observations. The findings able to contribute to the policy reformation for the agricultural commodity price in Malaysia.

CHAPTER 1: INTRODUCTION

1.0 Introduction

From the point of view of monetary powers, this association gives a basic idea of investigating the connection among the commodity prices and financial variables. Cases of financial variables are such as interest rate, inflation rate and exchange rate. Financial variables, for instance, the prices of financial instruments, are regularly connected with desires of future economic occasions (Arturo & Frederic, 1996). Long term interest rate, for example, is oftentimes examined as weighted midpoints of wanting future short-term interest rate. Policymakers and market members can profit in a few routes by taking a gander at a brace of well-picked financial variables. The variables may be utilized to double-check both econometric and judgmental expectations. The intention behind getting a gander at financial variables, as it is fast and basic. Evidently, this reason presupposes that the final results are correct (Arturo & Frederic, 1996).

In the other hand, an Agricultural Commodity might be characterized as grain, stock, poultry, apples and oranges, timber or some viable things transformed from agricultural activities. The general price level of an agricultural commodity, whether at a real terminal, port, or commodity prospects exchange, is moved by a miscellaneous bag of business constraints that can alter the present or wanted harmony between supply and need. Vast numbers of these powers radiate from household sustenance, food, and streamlined utilization advertises and incorporate buyer inclination and the altering needs of end clients; variables influencing the preparation methods, for example, climate, input costs, bugs and illnesses. Comparative prices of outputs that can substitute in either preparation or

use; government policies; and components influencing stockpiling and transportation, (Richard, 2009). There has been a sharp increasing speed in the rate of expansion in world monetary values for agricultural commodities since 2006, advancing following fifteen years of climbing consistently yet respectably (Tresor-Economics, 2008). Ramaprasad & Shawkat (2010) explains that, since commodities are the essential inputs for numerous produced products and certain are imperative to facilities, commodity prices straight affect the overall cost level.

Commodity prices have as of recent re-surfaced in the discourses of the inflationary viewpoint for economic. The well-known perspective appears designate that variations in commodity prices are an effect of improvements happening exclusively in the pertinent commodity marketplace, (Frank & David, 2010). Gagner (1989) suggest that accomplishing strength in good costs may prompt general price steadiness. In whatever event, despite the fact that the financial establishments can't mediate in the commodity price framing procedure, indicators from the commodity prices might hold convenient data for the financial establishments in overseeing price steadiness strategies. The global commodity prices are closely identified with macroeconomic variables through the job cycle, exchange rate and budgetary channels. For example, as an input, commodity value is determined by the business cycle.

Additionally, broken that the general commodity prices are meant in the US dollar, a modification in the worth of US dollar will influence the worldwide commodity prices. Worldwide liquidity, interest rate and stock market will additionally influence the universal commodity cost through business and budgetary channels (Won et al., 2013). The author also mentions that, there were

studies that concentrated on the association between macroeconomic variables, for example, exchange rate, interest rate, money supply and stock, and global commodity prices. Also, commodity prices might additionally have climbed because of spillover-effects between distinctive commodity prices (Farooq, 2009). He also mentions that, needed commodity prices might just ascent in extent to the going with ascent in impiled by monetary theory.

Investigators mostly utilize commodity price index for their empirical analysis and these incorporate Gagner (1989) too as Cody & Mills (1991) and Awokuse & Yang (2003). Yet the financial establishments, it might additionally remain of interest in the commodity-consuming and exporting countries, portfolio executives and dealers make an apprehension of the interrelation amid the commodity prices and the financial variables, especially now and again of diverse stages of indecision in the economic situation (Ramaprasad & Shawkat, 2010). The author likewise includes that, the lead/lag relationship and data transmission among the financial variables and commodity prices might fluctuate, contingent upon whether the predominating setting is commanded through fleeting, profoundly unpredictable stuns or by all the more enduring, more stable essentials.

Hamilton (1996, 2003) & Hooker (1996) studied the relationship between oil and US macroeconomic variables, for example, exchange rate, interest rate and money supply. Happening the other hand, there were studies that discovered significant affiliation between macroeconomic variables and universal commodity prices. Gubler & Hertweck (2011), for example, found that commodity value stuns clarify an expansive offer of cyclical growth in inflation. Killian (2009) found that oil value stun influenced U.S. business cycle in the oil crisis period.

Index investment in good prospects is spurred, in any event on a basic level, by standard Markowitzian portfolio broadening contentions (Gilbert, 2010; Stoll & Whaley, 2010).

1.1 Country Background

The commodities market in Malaysia is constantly assumed a critical part in the financial progress of the nation, (Department of Statistics Malaysia). Statistics by the Department of Statistics Malaysia demonstrated that export income from goods and commodity-based items between 2011 and 2012 consumed diminished by RM13.8 billion from RM141.2 billion to RM127.5 billion. Commodity prices emulated generation and exchange designs and were by and large lower by right on time 2013. Assumed that Malaysia's economy has become reliant on commodities, some important decrease in ware prices might posture impending hazards as far as shortages in present and economic records and in addition, more sluggish economic development from postponements in vitality related speculations, the World Bank opened in its economic report.

As argued by the United States Department of Agriculture (USDA) pattern projection, Malaysian economy was the onus of the worldwide recession started in 2009 because of its critical reliance on outside trade. Malaysia additionally had a much greater force than expected because of the soak fall in the world trade and agricultural commodity costs. Downright agricultural exports are required to decrease. Additionally, Malaysia was distinguished as one of the crisis-affected countries, prompting the surprising currency depreciation. The currency

depreciation would raise agricultural prices; expand interest rate and decreasing credit availability, for instance, money supply by the Central Bank.

In this way, financial variables have been considered to be one of the huge components influencing agricultural economy in Malaysia. For example, lower interest rates in Malaysia encourage in higher agricultural pay and lower generation costs without fundamentally remunerating with the decrease in prices of outputs. Moreover, creating nations are expected to experience slower agricultural development coming about because of the value intercessions through trade, exchange rate and other financial variables (Schiff & Valdes, 1992). Subsequently, it is vital to inspect the relationship between financial variables and agricultural commodity prices to better understand both the reasons and results of progressions in Malaysia agricultural riches.

The aftereffect of this work would yield valuable data and rules, especially for the government and policy makers in organizing, policy framework and setting up processes for future agricultural improvement. The effects of financial variables on the relative exhibitions of agricultural segments were explained.

1.2 Problem Statement

Based on the review, had found that most of the research is based on countries such as United States (Farroq, 2009; Frank, 2010; Gunther, 2011; and Cetin, 2011), Asian countries (Katsushi, 2010), Ethiopia (Dick et al., 2013), Zimbabwean (Edwin, 2009), Austraslia (Kamrul & Ruhul, 2011), China (Won et al., 2013) and South Africa (Asfaha & Jooste, 2007). The extent of knowledge,

there are no studies on the relationship between financial variables and agricultural commodity prices in Malaysia. Due to this, for sure there is no clear recommendation for policymakers, regarding the relationship between these two variables in Malaysia. This is because most of previous researches are more concentrated in effect, of crude oil and energy prices towards the agricultural commodities since agricultural commodities used as the alternative energy (Qiang & Ying, 2011; Saban, 2011; Zibin et al., 2009; Saban & Ugur, 2011; and Magali, 2013). This study can create a new sight in determining the effect of financial variables on agricultural commodity prices in Malaysia.

The negative evidence of the kinship between the actual interest rate and commodity prices is not supported by proof dependent upon information since the 1980's (Farooq, 2009). Essay on the association among commodity prices & supplementary financial variable not researched additional (Kyrtsou, 2008). At the same time, in that respect are less studies that supply the info on which financial variables have an impact on agricultural commodity prices (Farooq, 2009; Cetin, 2011; Joseph et al., 2013; Jeffrey, 2013; Bodart et al., 2012; Julie, 2006). By identifying this, this study able to give idea to policy makers in formulating the government policies in stabilizing the price. At the same time, the finding of this study able to provide important information for the investors in forecasting the investment opportunities in Malaysia.

1.3 Research Objectives

1.3.1 General Objective

The objective of the study is to investigate the relationship between selected financial variable and the price of the agricultural commodity such as wheat, corn, soybean and sugar in Malaysia.

1.3.2 Specific Objective

Our specific objectives are:-

(i) To examine the long-run relationship between the selected financial variables and

agricultural commodity prices.

(ii) To find the causality effect of price volatility between the variables.

(iii) To find out the impulse response between the financial variables and agricultural

commodity prices.

1.4 Significant of the Study

The implication of this work centres on identifying the relationship of financial variables towards agricultural commodity costs. Financial variables are important towards agricultural commodity costs to find the movements of this crisis in order to decide the most appropriate means to speak it (Tresor-Economics, 2008). Other than that, this study may provoke some contributions to

the policy makers in term of stabilizing the cost of agricultural commodities using the financial variables. Price stability helps achieving elevated amounts of economic action and job by improving the transparency of the price instrument. Under price stability individuals can identify changes in relative prices, without being confounded by progressions in the general cost level. This permits them to make generally informed consumption and investment choices and to apportion resources all more efficiently; reducing inflation risk premium in interest rates.

This work also helps investors to distinguish the economic stance of the country which give them a clean picture of the investment opportunities in this state. Malaysian agriculture has generally drawn up a great opportunity in discussion about Malaysia's future. It doesn't still take lots of consideration in the tenth Malaysia Plan (2011-2015). Yet, actually agriculture, alongside fisheries and forestry, still registers for certain per cent of Malaysia's gross domestic product, which is a big sum for a nation at Malaysia's phase of investment advancement (Colin & Guest, 2012). The agriculture and investment are pivotal for Malaysia, both as significant a piece of the economy and source of employment.

Agricultural development is hugely significant for any endeavour to end neediness and push shared prosperity. Economic movement in agriculture normally represents 30 to 40 per cent of GDP, and there is worldwide proof demonstrating that profit upgrades in agriculture can have a poverty effect near three times that of different segments of social order (The State of Food Insecurity in the World, 2003). Farming has taken its assigned position in the advancement strategy discussions. In the meantime, Malaysia must enhance the percentage of public investment into agriculture. As a close, when the investment in Malaysia

increases will result in an increment in the development of the nation. This will lead to increase in goodness activities which might be more beneficial to all the households in Malaysia and increase the existing style of the Malaysian citizens.

1.5 Chapter Layout

This research report will be split up into five sections. Chapter one as you have read above was the initiation and the purpose of us holding out this inquiry. Chapter two outlines a brief review of empirical and theoretical literature review. Next, in Chapter three have mentioned about the methodology and data set that have collected. Later, the results of applying the data in the methodology will be presented in Chapter four. Finally, Chapter five concludes the research and have provided some policy implication and recommendation for future researchers.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

The determination of this section is to gather ideas on choosing the variables and appropriate method. This is based upon the inspections that have observed by getting together and receiving the journals related to this research subject and this research aims. Some of the authors have the same perspective and findings while some experience an alternate contention. This critique will provide for a crude idea to put the theoretical framework and methodology to be used within the exploration. This chapter is categorized into four parts where the first part reviews about theoretical and conceptual framework. The second part will be empirical testing procedures on financial variables and agricultural commodity costs and the last part will review on empirical evidences of research about financial variables and the prices of agricultural commodities in Malaysia, and finally the concluding remark.

2.1 Framework of the Study

In this part, would like to explain about the theories that have been used in past studies. There are many theories used such as monetary theory (Farooq, 2009); standard quantity theory (Frank & David, 2010); exchange rate theory (Angsar et al., 2012); Keynes' theory (Phillipp et al., 2012); and the traditional speculative theory (Bernadina, 2012).

Farooq (2009) has been used monetary theory is his research. Monetary theory recommends that distinctive monetary policies can profit countries relying upon their extraordinary set of assets and limits. It is dependent upon center plans regarding how elements such as the size of the money supply, price levels and standard interest rates influence the economic system. He mentioned that nominal interest rates and real interest rate might fall because of advanced real money supply in the short run. Predictable commodity prices might only ascend in extent to the gin with a scent in (nominal) money supply, by way of suggested by financial philosophy.

On the other hand, the reaction of the GDP variable accepts a slight, brief help from the cash supply stuns previously returning to its first value. This is in streak by a standard quantity theory which introduced by Frank & David (2010). This theory shows that an optimistic alteration in the money line will bring the real output up in the short run just with no long run consequences for the sequence real output receipts. The short-run climb in aggregate yield might reproduce yield change in commodity and purchaser great markets because of comparative price variations.

Angsar et al., (2012) in their exploration highlights Dornbusch's (1976) theory of exchange rate overshooting, while this theory also helps Frankel (1986) to indicate the overshooting in commodity costs. Goods are switched on quick touching sale markets and, as needs be, or to react right away to any weight affecting on these marketplaces. Claiming after a modification in financial strategy, their value responds additional than proportionally, i.e., they overshoot

their new long run balance, in light of the fact that the prices of other great are sticky.

Phillipp et al., (2012) clarifies Keynes' theory in the two real demonstrations of abnormal speculative profit where the risk-takers get rewarded by hedgers for bear unwanted risk exposures, likewise called such as Keynes' theory of ordinary backwardation, and that investors have unrivaled determining capabilities (Chang, 1985; Leuthold et al., 1994; Wang, 2001, 2003). By distinction, different studies preclude the legitimacy from securing risk best movements (Hartzmark, 1987; Chatrath et al., 1997; Bryant et al., 2006) or predominant estimating capacities (Khan, 1986; Hartzmark, 1991; Sanders et al., 2003, 2009; Sanders & Irwin, 2010). A linked quarrel is complete by Stoll and Whaley (2010) who focus on the wheat market and discovery that commodity index moves have the slight prospects price effect, and that inflows and outflows from commodity index speculation don't result in fates prices to vary.

Bernadina (2012) employs the traditional speculative theory highlights that speculation, which involves purchasing once the cost is little and offering when the price is high, has a stabilizing impact on the fiscal markets. This is on account of when purchasing, speculators expansions discouraged prices, while when they offer they decline expanded prices. In this sight, movement smoothes the price process, thus decreasing volatility (Keynes, 1923; Friedman, 1953). Recent studies having a space with the traditional speculative theory are those by Brunetti at al., (2011) and Deuskar & Johnson (2011), which have found that speculative movement does not prompt any price changes, yet it rather decreases market volatility and liquidity.

2.2 Modeling Frameworks

There are many modelling techniques have been used by researchers. In this part, we will discuss about the procedures that researches uses for determining the relationship on financial variables and agricultural commodity prices.

Farooq (2009) determines that it is basic to expect that commodity market to carry on similar businesses for monetary assets with adaptable prices which have a propensity to be efficacious. This was also agreed by Frankel (2006) and Kellard at al., (1999). In well-organized markets, hazard balanced net profits for economic and real assets ought to be equivalent. As needs be, one might put the accompanying association among good prices (in logarithms) and interest rates:

$$E_t pc_{t+1} - pc_t = i_t + s(i_t) \qquad (1)$$

where, $E_t pc_{t+1} - pc_t$ is the predictable reappraisal of a commodity over a period, measured by the predictable value increments since period *t* to *t*+1, given data accessible at time *t*. On the right hand side, "*i*" is the nominal interest rate while s(*i*) speak to capacity expenses of assumed commodity remaining of convenience yield, potentially notwithstanding a fixed risk premium, for straightforwardness. We expect that storing cost increment with the interest rate by Deaton and Laroque (1996).

Julie (2006) alludes an econometric model of supply response to world price unsteadiness which is:

$$Y = \alpha_0 + \alpha_1 . P_w + \alpha_2 . IP_w + \alpha_3 . X + \epsilon \qquad (2)$$

where *Y* is the supply *Pw* is the world price flimsiness, *X* is a vector of non-price variables, and ϵ is the residual term. Julie (2006) research how this example might be adjusted so as to contain the impact of the domesticated macroeconomic environment on supply reaction to insecurity. To what accompanies, they relate agricultural supply to unsteadiness of real world prices changed over into the nearby coin on the grounds that world value of protection should be transmitted to makers whose ability to adapt to value risk is weak. Without a doubt, agricultural supply should be influenced by real maker value precariousness, this one being all the more influenced by real world value shakiness since business sectors are changed (International Task Force, 1999).

Bodart et al., (2012) utilization model that comprises of a straightforward univariate association among true exchange rate and commodity costs. Officially they connected:

$$REER_{i,t} = \alpha_i + \beta COM_{i.t} + \varepsilon_{i,t} \qquad (3)$$

where $REER_{i,t}$ is the real effective exchange rate (in logarithm) of nation i, $\beta COM_{i.t}$ the price of the heading fare commodity (in logarithm) of the nation i and the error term εi,t is I.I.D. over periods yet connected crossways cross-sectional components. As in Chen & Rogoff (2003) or Cashin at al., (2004), this model just incorporates a single regressor. This is propelled by the way that few traditional explanators of real exchange rate are acknowledged as being immaterial for little creating nations. Case in point, given that a portion of people minor emerging nations are crudely combined to the world monetary business sector, it is

impossible that real interest rate differences or net improbable that real interest rate differences or the net outside assets amassing be a huge determinant of real trade rates. Moreover, ought to certain of these different factors be applicable, in the same manner as the Balassa-Samuelson impact, the information are all the time not accessible or of low tone. No matter, the non-stationary panel method that we employ ensures that effects are in any event reliable.

Through reference to Pindyck (1993), we can utilize fates prices to value the convenience issue, sketch along the alleged cost-of-carry comparison. Below no arbitrage, the (promoted) row of convenience yield net of capacity expenses from T1 to T2 per unit of commodity CY_{T1}^{T2}, is:

$$CY_{T1}^{T2} = F_t^{T1} (1+ r_t(T_2 - T_1)/ 365) - F_t^{T2}, \qquad (4)$$

where F_t^{T1} and F_t^{T2} are the first and second close futures prices for distribution at T1 and T2, correspondingly, and rt is the risk-free interest rate. Dividing CY_{T1}^{T2} by (T_2 - T_1) at that point prompts the institutionalized convenience yield CYt. Equation (4) states that in balance the fates cost at T2 necessity equivalent the futures price at T1 balanced by the chance expenses and the profits of having got the physical good. Place diversely, capitalizing obtained cash just and captivating no risk fundamentally prompt a fatal abundance of nothing.

Ayca and Emiliano (2013) use competitive storage model in their inquiry. Market essentials utilized in demonstrating price volatility within the agricultural part are mostly related to the data accessible on supply, request and inventories. Specifically, both theoretical and exact writings concur that data on inventories is a key variable to clarify price volatility for storable merchandise, for example,

cereals. The theoretical base that contributed by the well-known intense stockpiling model initially presented by Gustafson (1958) who had suggested a negative relationship between lines and price volatility because of the way that request and supply stuns are better retained by the business throughout high stock periods (Williams and Wright, 1991). From an exact perspective, the effect of inventories on the unpredictability of the agricultural commodity costs is mostly captured by utilizing the stock-to-use ratio (Roache, 2010; Karali & Power, 2013; Ott, 2013).

2.3 Empirical Testing Producers

2.3.1 Unit Root Test

Unit root purposed to check the stationarity of the commodity prices (Ramaprasad & Shawkat, 2010). The unit root test is to figure out if the variables are stationary or non-stationary (Gujarati & Porter, 2009). According to the same author, a stationary model will have the 3 properties of constant mean, constant variance and constant covariance. This shows that the arrangement will have a limited variety and don't rely on upon a time. Besides, the impact of stuns will vanish. On the other hand, non-stationary model does not have a long run mean because of the variance is time ward and it goes to interminability when the example period approaches boundlessness. At the point when the regression model comprises of non-stationary variable, spurious regression issue will happen. There is a important connection among the variables in the test statistic consequence. However, under hypothetical, the outcomes don't have a significant impact between the variables. Subsequently, the outcome may be deluding when

spurious regression issue happens with the highR^2, high test statistic esteem and low Durbin-Watson (DW) statistic will acquire in the consequence. Because of this importance, in this study, Augmented Dickey Fuller (ADF) test and Kwaitowski, Phillips, Schmidt and Shin (KPSS) tests has been utilized to test the unit root.

One of critical point of interest of unit root test is that it empowers to gauge in only one stage how the level of fare concentration influences the commodity price bounciness of the actual exchange rate, specified by Bodart et al., (2010). Other than that, checking the stationarity of the commodity prices also able to show the structural break in the data series (Rabah et al., 2013)[1]. The unit root test is a popular test among the researchers such as Frank & David, (2010); Cetin, (2011); Ramaprasad & Shawkat, (2010); Joseph et al., (2012); Angsar & Ingo (2012); Philipp et al., (2012); Bryce & Miguel (2009); Edwin, (2009); Kamrul & Ruhul (2011); Asfaha & Jooste (2007); and Dawson & White (2002).

2.3.1.1 Augmented Dickey Fuller (ADF) test

Augmented Dickey Fuller (ADF) test does by including slacked qualities of dependent variable into the model (Gujarati and Porter, 2009).

$$\Delta y_t = \psi y_{t-1} + \sum_{i=1}^{p} {}_i \alpha_i \Delta y_{t-i} + \varepsilon_t \quad (1)$$

Where Δ is a first change operator, α is the continuous term, T is a time trend, p is lags of dependent variable and ε_t is a white noise error term. The null hypothesis and another hypothesis are as below:

[1] A structural break infers that there are multiple regression relationship between the dependent and independent variables with distinctive intercepts and slopes. With the goal that, we have to recognize conceivable structural breaks and control for them by utilizing dummies.

$H_0 : \psi = 0$ The variable is unit root/ non-stationary

$H_A : \psi < 0$ The variable is stationary

If H_0 is being rejected, we conclude that the variables do not contain a unit root.

ADF test has considerable force to distinguish intermittently blasting bubbles, which are described by a hazardous ejection emulated by a sudden accident (Philipp et al., 2012). In the ADF test, lagged contrasts are incorporated to take into consideration autocorrelation in the error termε_t[2]. ADF test is utilized to checkered stationarity of the commodity prices. The inspiration to test stationarity is to verify that utilize the correct form of the VAR construction (Ramaprasad & Shawkat, 2010).

2.3.1.2 Kwaitowski, Phillips, Schmidt and Shin (KPSS) tests

KPSS test is the most famous system that being utilized to direct stationarity test. It has contrasts from the other unit root tests. The null hypothesis that a sequence have is I (0) in contradiction of elective that the series is I (1), (Gujarati and Porter, 2009).

The test statistic for the KPSS test is given as below:

$$\hat{\eta}_\mu = \frac{\eta_\mu}{s^2} = T^{-2} \sum \frac{s_t^2}{s^2(l)} \qquad (2)$$

The null hypothesis and alternative hypothesis are as below:

$H_0 : \sigma^2 = 0$ the variable is stationary

$H_A : \sigma^2 \neq 0$ the variables is non-stationary

[2] The ideal lag length, K, is dictated by beginning with $K_{max} = [T^{(1/3)}]$, where [.] Indicates the number a piece of its contention (Philipp et al., 2012).

2.3.2 Ordinary Least Squares (OLS) estimator

Helene & Samuel (2012) had affirmed that, Ordinary Least Squares (OLS) estimator gets conflicting on the evidence that the lagged level of taxable income is correlated with the error term because of the vicinity of nation altered impacts (Nickell, 1981). One approach to handle these subjects is to utilize the Generalized Method of Moments (GMM) system (Blundell & Bond, 1998). In the result that together time series are incorporated of the similar request, continue onward by consecutively a straightforward OLS regression (Philipp et al., 2012). Antanio & Allan (2013), reports the slope coefficient assessed by OLS utilizing commodity returns as the dependent variable and consistent variable. Lags of the price return are the exogenous variables, and the unexplained part of the price return assessed utilizing OLS, yet the most clear complaint to this methodology is that the price returns fluctuation of numerous commodity prospects show times of high and low unpredictability, or heteroscedasticity. This abuses the suspicions of OLS and prompts wasteful estimators (Shaun & Marco, 2010). This estimator has been used by Jeffrey, (2013); Helene & Samuel, (2012); Philipp et al., (2012); Antonio & Allan (2013); Shaun & Marco (2010) and Dawson & White (2002).

2.3.3 Cointegration Test

According to Gujarati & Porter (2009) cointegration is a linear blending of non-stationary variables with all the variables must integrate in the same request. With a specific end goal to counteract spurious regression issue in non-stationary model, first separation procedure of I (1) is needed by evolving non-stationary

variables to get stationary variables. However, by utilizing first contrast, the model does not have a long run relationship yet, just comprise of the short run relationship between the variables. According to the same author, in the event that the variables are cointegrated with one another, the genuine long run relationship must exist in the model by offering a normal trend and the variables are moving together between one another. The estimator of cointegrating parameter is super reliable and the request of joining in blunder term is one level easier than alternate variables in the long run regression. Yet, in the event that the variables are not cointegrated, the model will just comprise of short run result, Gujarati & Porter (2009).

2.3.3.1 Johansen Cointegration Method

The Johansen method for cointegration test is more famous than different systems for cointegration testing, for instance, the Engle and Granger and autoregressive distributed lag (ARDL) methods. Ace of the intentions behind its prevalence is that it allows one to focus the amount of cointegrating relationships introduce in the data (Fedderke, 2001). Johansen cointegration method is the maximum likelihood estimator of the so-called reduced rank model (Bent, 2005). In the research by Astafa & Jooste, (2007) this method was utilized to focus and assessment the cointegrating connections between the agricultural and mechanical costs, exchange rate and money supply. Based on Dawson & White (2002), assuming that two value arrangement were incorporated of the same request, Johansen cointegration (1988) method was used to test for cointegration in the vector autoregressive (VAR) model. Johansen method used by Frank & David,

(2010); Cetin, (2011); Asfaha & Jooste, (2007); and Dawson & White, (2002) so far, as we mentioned above.

VAR model is the most used models which used in many articles based on our observation, such as Farooq, (2009); Frank & David (2010); Gunther & Dramane, (2011); Ramaprasad & Shawkat, (2012); Jeffrey, (2013); Angsar & Ingo, (2012); Christopher & Simone, (2012); Scott, (2008); Kamrul & Ruhul, (2011); Won et al., (2013); Asfaha & Jooste, (2007); and Dawson & White, (2002). The vector autoregression (VAR) model is a standout amongst the best, adaptable, and simple to employ models for the testing of multivariate time series. It is a characteristic broadening of the univariate autoregressive model of element multivariate time series, (Gujarati & Porter, 2009). The VAR models permit Farooq (2009) to look at the reaction of commodity values to surprising stuns especially with interest rates and the dollar exchange rate and also the element communication between commodity prices and macroeconomics variables. Johansen's maximum likelihood system gives a united outline for the appraisal and testing of cointegrating connection around such variables in the challenge of VAR, (Frank & David, 2010). Gunther & Dramane (2011) suggests that the relationship between futures prices and index trader's net long position could be mulled over utilizing bivariate finite-order (VAR) model.

2.3.3.2 Autoregressive Distributed Lag (ARDL) approach

Edwin (2009) has been using the ARDL method to cointegration planned by Pesaran et al., (2001) beats certain of these events. Initially, it trips up both short run and long-run elements once trying out for the presence of cointegration.

Furthermore, it allows the approximation of cointegration connections when variables are I(0), I(1) or a combination of the two, so it is pointless to pretest for the request of integration of the variables in the model gave that the most noteworthy request of integration is I(1). Thirdly, it proposals explicit tests for the comportment of a special cointegration course as opposed to admitting there is stand out. At the terminal, it regards the likelihood of opposite causality (i.e. the nonappearance of frail exogeneity of the regressors), consequently guaranteeing that the limitation assessments are proficient and thus substantial. The intrigued onlooker is alluded to Pesaran et al. (2001) for a definite description of the ARDL method. ARDL method has been used by Edwin, (2009) and Pesaran et al., (2001) in the field of agricultural commodity prices.

2.3.4 Panel Unit Root test

Other than time series unit root, panel unit root test also conducted by Bodart et al., (2010) and Angsar et al., (2012) in their journals. Bodart et al., (2010) who have been utilization panel unit root test. An alternate point of interest of utilizing panel methodology is that it assurances that the unit root created test achieve a large strength. Angsar et al., (2012) smear Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) test statistics which backs the provision of the cointegration framework for the time series under attention are integrated of request one. Said & Dickey (1984) created a methodology in which the requests of the AR and MA segments in the error terms are obscure, yet might be approximated by an AR(k) process where k is vast enough to permit great close estimation to the obscure ARMA(p,q) process. A vital pragmatic subject for the

execution of the ADF test is the detail of the lag length p. In the event that p is excessively little, then the outstanding serial correlation in the errors will bias the test. On the off chance that p is excessively huge, and then the force of the test will endure. On the off chance that the test detail is certain, you can consequently choose to not dismiss the null hypothesis of a unit root.

2.3.5 Panel Granger Causality Test

Panel Granger causality test quite used frequently in journals such as Gunther & Dramane, (2011); Irwin & Scott, (2012); Bernadina, (2012); Byrce & Miguel, (2009); and Kamrul & Ruhul, (2011) to explain the relationship between variables. According to Gunther & Dramane (2011), there are three advantages of the Granger causality test. In the inaugural post, it doesn't assume homogeneity in the panel, and then it empowers to test for Granger-causality on every individual market independently by considering the conceivable contemporaneous reliance crosswise over business sectors. Second, since bootstrap basic qualities are developed, this methodology does not oblige preparatory test for unit roots and cointegration. At finally, this panel Granger causality methodology empowers to discover for which markets of the panel there exists one-way Granger-causality, two-way Granger-causality or no Granger- causality. Irwin & Scott (2012) using Granger-causality test that exhibit that there are no causal connections between variables where this proclamation likewise affirmed by Bernadina (2012). Byrce & Miguel (2009) also used Granger-causality test to test whether how solid is the variables are exogenous. Granger causality is concerned with short run unoriginality where in the wake of inspecting stationarity and cointegration,

Kamrul & Ruhul (2011), look at whether macroeconomic variables are brought about by commodity prices.

2.4 Empirical evidences

There is few studies use the interest rate to represent the financial factor. The association amid the real interest rate and agricultural commodity prices shown by the findings of few studies. Farooq (2009) recommends that stuns to the real interest rate and the dollar, real exchange rate help essentially to fail in just values. He also finds that commodity prices climb when the real interest rates move down and when the real appreciation of the dollar devalues. Joseph et al., (2012) gives essentialness proof of co-movement in commodity prices and critically recognizes a common element. Their effects confirm the pertinence of the real interest charge per unit of commodity prices, and are consistent with the view that monetary manoeuvring may prompt higher commodity prices. Jeffrey (2013) stated that the real interest rate and inventories both frequently appear with the estimated negative coefficients in the mathematical statements at the literal costs of singular commodity cost. He additionally studied that around the economic action variables, the positive coefficient on Global GDP is huge when the linear trend time term is supplemented by a quadratic. Joseph & Robert (2012) have been found that price volatility attributable to short lived stuns decays with interest rate, while, for some commodity sets, price correlation expands as interest rates decline.

Other than that, the index also playing a function as financial variable which affect agricultural commodity costs. Gunther & Dramane (2011) finds that,

in agricultural prospect markets, in that respect is no confirmation of a causality relationship from index funds to fates prices. These finding indicate that an index based exchanging has not been a paramount driver in the generous build in items prices. High volatility throughout financial crisis is the primal wellspring of the high association of farming commodity index and valuable technique index and the heterogeneous structure of the commodity business sector conveys better portfolio enhancement chance throughout the quiet period contrast with turmoil time of financial crisis by Fatih & Nadir (2013). A reasonable proof that index investment does impact returns in this less liquid markets by Christopher & Simone (2011). They additionally add on a finding that an acceptable confirmation that index investment has been a factor affecting the level and volatility of grains and livestock costs.

Inflation rate is another financial variable which affect the agricultural commodity costs. There is some evidence by previous researches regarding inflation rate. Cetin (2011) found that, in that respect is a positive contemporaneous effect of long term, lasting stuns in commodity advertises on customer inflation, which is not confirmed in linear regressions. So, from commodity costs of inflation exists just at low frequencies. Negative and significant impact of world price unsteadiness of aggregate agrarian supply found by Julie (2006). The author likewise found that there is a high inflation; frail foundation and crudely created budgetary framework help fortify this impact. Dick et al., (2013), found that developments in worldwide sustenance and great costs, measured in down home currency, decided the long run advancement of residential prices. In short-run, agricultural supply shocks influenced nourishment inflation, initiating substantial deviations from long-run price patterns. The author

additionally found that monetary policy seems to have suited price shocks, yet cash supply development influenced short-run non-sustenance price inflation. The modification in the impact of good prices on core inflation is influenced by the change in the securing of inflation desires (Scott, 2008). Kamrul & Ruhul (2011) finds that inflation focusing on experience has so far been hit by positive supply shocks.

Katsushi et al., (2010) showed about input prices where there is a huge negative impact of higher oil prices on yield, directed through higher data prices and transportation cost. This is predictable with the finding in The State of Agricultural Commodity Markets (2009). Frank & David finds about money stock that long run proportionality amongst currency and purchaser prices and between money and commodity prices, a moderate rate of connecting up to counterbalance around the variables taking after stuns and commodity prices responding generally rapidly emulating a money stuns and tending to overshoot the new equilibrium values.

Bodart et al., (2012) shows that real exchange rate acknowledges once the value of the heading commodity exported by the nation expansions, gave that the prevailing commodity represents no less than 20 percent of the aggregate export of the nation. They additionally indicated that the bigger the offer of the primary exported commodity, the more potent is the effect on the actual exchange rate. Won et al., (2013) observes that US real exchange rate shows positive and measurably significant correlation with all the worldwide commodity prices think about in their inquiry.

2.5 Concluding Remarks

All in all, numerous studies utilized the time series technique to discover the relationship between the financial variables and the agricultural commodity prices. Unit root test such as ADF, KPSS and PP test being conducted by most of the studies. Other than that OLS estimator been handled by using utilize the Generalized Method of Moments (GMM) system. The most used models besides unit root test is a VAR model which also frequently used by authors. Example of cointegration test used are Johansen cointegration model and ARDL method.

Other than time series, panel data technique also being quite famous in this study. Examples of panel unit root test used are ADF, KPSS and PP test. Panel Granger-causality test also frequently used to determine the relationship between variables. As for the above observation, we still found that there are very few studies conducting ARDL method. And we also found based on our knowledge that there is no studies on financial variables and agricultural commodity prices in Malaysia while most studies concentrate on countries such as United States (Farroq, 2009; Frank, 2010; Gunther, 2011; and Cetin, 2011), Asian countries (Katsushi, 2010), Ethiopia (Dick et al., 2013), Zimbabwean (Edwin, 2009), Austraslia (Kamrul & Ruhul, 2011), China (Won et al., 2013) and South Africa (Asfaha & Jooste, 2007).

CHAPTER 3: METHODOLOGY

3.0 Introduction

This chapter going to discuss about the econometric method that going to employed to achieve the objective of this study. Chapter 3 will discuss about the data methodology description and that being utilized within this research is to identify the objective of the study. Furthermore, this section additionally depicts the term and conditions of utilizing methodology.

3.1 Methodology

3.1.1 Empirical Model

Methodology of this study starts with the function of:

Agricultural commodity prices = f (Financial variables)

where the function of agricultural commodity prices equals to the function of financial variables. The model of the study has been developed as below follow by Roslina et al., 2010.

$$\log Corn_t = \beta_1 + \beta_2(X_t); \quad (1)$$

$$\log Sugar_t = \gamma_1 + \gamma_2(X_t); \quad (2)$$

$$\log Soybean_t = \delta_1 + \delta_2(X_t); \quad (3)$$

$$\log Wheat_t = \varphi_1 + \varphi_2(X_t); \quad (4)$$

The above equation is utilized to study the association among financial variables and agricultural commodity prices in Malaysia. In the above equation corn, sugar, soybean and wheat represent the agricultural commodity prices and X represent financial variables such as CPI, inflation rate, exports, import, M0, M1, M2, M3, market rate, trade balance, domestic credit, international reserves, and stock market[3]. Those types of agricultural are chosen in this study because these are energy intensive goods.

3.1.2 Empirical Testing Procedures

At first, the checking on the stationary of the data is important in time series data. Unit root test is use to determine whether variables are stationary or non-stationary. For this research the Phillips–Perron (PP) unit root test is been used. Next, the autoregressive distributed lag (ARDL) approach is conducted in this study to examine the cointergration employed here gives consistent estimate financial variables in the attendance of regressor endogeneity and also licenses the approximation of separate approximations of both long-run and short-run elasticities once exogenous variables are not integrated of the similar direction. Then Toda Yamamoto (non-granger causality test) to examine the direction of causality between variables. At last, VAR model will be used in this study to find the impulse response between variables.

[3] Other financial have been collected and dropped due to found missing variables in data. The variables are such as BOP, House price index, Government budget surplus/ deficit, External government debt and GNI.

3.1.2.1 Unit Root Test

The unit root test is a test that has been used to determine whether the variables are stationary or non-stationary (Gujarati & Porter, 2009). A stationary model will have the 3 properties of constant mean, constant variance and constant covariance. This indicates that the series will have a finite variance and do not depend on time. Moreover, the effect of shocks will die out over time. However, non-stationary model does not have a long run mean due to the variance is time dependent and it goes to infinity when the sample period approaches infinity. The effect of shocks will not die out over time. When the regression model consists of non-stationary variable, spurious regression problem will occur. There is a significant relationship between the variables in the test statistic result. However, under theoretical, the results do not have a significant effect between the variables. Therefore, the result may be misleading when spurious regression problem happens with the high R^2, high test statistic value and low Durbin-Watson (DW) statistic will obtain in the result. In this study, Phillips–Perron (PP) test has been used to test the unit root.

3.1.2.1.1 Phillips–Perron (PP) test

Phillips and Perron (1988) created various unit root tests that have gotten famous in the dissection of money related time series. The Phillips-Perron (PP) unit root tests contrast from the ADF tests predominantly by the way they manage serial correlation and heteroskedasticity in the errors. Specifically, wherever the ADF tests utilize a parametric autoregression to estimate the ARMA construction

of the errors in the test regression, the PP tests disregard some serial correlation in the test regression. The test regression for the PP tests is:

$$\Delta yt = \beta_1 + \pi y_{t-1} + u_t \quad (5)$$

where error term (u_t) is I (0) and might be heteroskedastic. The PP tests precise for some serial correlation and heteroskedasticity in the errors u_t of the test regression by straight adapting the test statistics $t_{\pi=0}$ and $T_{\hat{\pi}}$. These adapted statistics, meant Z_t and Z_π, are assumed by

$$X_t = \left(\frac{\hat{\sigma}^2}{\hat{\lambda}^2}\right)^{1/2} \cdot t_{\pi=0} - \frac{1}{2}\left(\frac{\hat{\lambda}^2 - \hat{\sigma}^2}{\hat{\lambda}^2}\right) \cdot \left(\frac{T \cdot SE(\hat{\pi})}{\hat{\sigma}^2}\right)$$

$$X_\pi = T_{\hat{\pi}} - \frac{1}{2}\frac{T^2 \cdot SE(\hat{\pi})}{\hat{\sigma}^2}\left(\hat{\lambda}^2 - \hat{\sigma}^2\right) \quad (6)$$

Under the null hypothesis that $\pi = 0$, the PP Z_t and Z_π statistics have the identical asymptotic conveyances as the ADF t-statistics and standardized prejudice statistics. The gain of the PP tests over the ADF tests is that the PP tests are powerful to overall manifestations of heteroskedasticity in the error term u_t. An alternate preference is that the client does not need to tag a lag length for the experiment regression (Gujarati & Porter, 2009).

The PP test does not oblige to define the type of the serial correlation of Δyt under the null. Also, the PP test does not oblige that the u_t's are restrictively homoskedastic (a certain assumption in the ADF test). A pragmatic issue in using ADF is the choice of lag length in (1). Said and Dickey (1984) recommended change to the DF test on the grounds that they perceived that most macroeconomic time series have huge MA terms and, they contended, if

unaccounted for, make the DF circulations inapplicable even asymptotically. While the ADF test does not experience the ill effects of as extreme size mutilations, it is not as capable as the PP test.

The DF test does not have genuine size mutilations; however it is less effective than the PP test (Maddala & Kim, 1998). According to Choi and Chung (1995) attest that for low recurrence data, as is the situation with this study, the PP test gives off an impression of being more compelling than the ADF test. In like manner, the PP methodology is received to test unit roots in the variables.

3.1.2.2 Autoregressive Distributed lag (ARDL) approach

In order to empirically analyze the long-run relationships and short run dynamic interactions among the financial variables and agricultural commodity prices this study applies the autoregressive distributed lag (ARDL) cointegration method. The ARDL cointegration approach was developed by Pesaran and Shin (1999) and Pesaran et al. (2001). It has three benefits in comparison with other previous and traditional cointegration methods. The first one is that the ARDL does not need that all the variables under study must be integrated of the similar order and it can be applied once the under-lying variables are integrated of order one, order zero or marginally integrated. The second advantage is that the ARDL test is relatively more efficient in the case of small and finite sample data sizes.

The last and third advantage is that by applying the ARDL technique obtains impartial estimations of the long-run model (Harris & Sollis, 2003). The bounds test is mainly based on the joint F-statistic which its asymptotic circulation is non-standard below the null hypothesis of no cointegration. The first stage in

the ARDL limits approach is to approximation the equations by ordinary least squares (OLS). The estimation of the equations tests for the existence of a long-run relationship among the variables by conducting an F-test for the joint significance of the coefficients of the lagged levels of the variables. Two groups of critical values for a assumed significance level can be strong-minded (Pesaran et al., 2001).

The first level is calculated on the assumption that all variables comprised in the ARDL model are integrated of order zero, while the another one is calculated on the supposition that the variables are integrated of order one. The null hypothesis of no cointegration is rejected when the value of the test statistic surpasses the upper critical bounds value, while it is accepted if the F-statistic is lower than the lower bounds value. In this study, ARDL approach used in Bound Cointegration Test. By using ARDL test, identify the long-run and short-run Error-Correction Model and the Stability test.

3.1.2.3 Non-Granger Causality Test (Toda Yamamoto procedure)

It has been renowned that the customary Granger (1969) causality test for surmising clues and laughs amongst combined variables will wind up in false regression consequences, and the F-test is not substantial if the variables in stages are cointegrated. Innovative advances in econometric proposals the error correction model (because of Engle and Granger (1987)) and the vector auto regression error-correction model (because of Johansen and Jesulius, 1990) as options for the trying of non-causality among economic time series. Shockingly, these examinations are lumbering and delicate to the ideas of the aggravation

restrictions in limited examples and in this way their consequences are problematic (Toda & Yamamoto, 1995; Zapata & Rambaldi, 1997). The equations of Toda Yamamoto non-granger causality models for each agricultural commodity prices for this study are given as below:

$$X_t = \sum_{i=1}^{n} \alpha_i \, Corn_{t-i} + \sum_{j=i}^{n} \beta_j \, X_{t-j} + \mu_{1t} \quad (7.1)$$

$$Corn_t = \sum_{i=1}^{m} \gamma_i \, Corn_{t-i} + \sum_{j=i}^{m} \delta_j \, X_{t-j} + \mu_{2t} \quad (7.2)$$

$$X_t = \sum_{i=1}^{n} \alpha_i \, Sugar_{t-i} + \sum_{j=i}^{n} \beta_j \, X_{t-j} + \mu_{1t} \quad (8.1)$$

$$Sugar = \sum_{i=1}^{m} \gamma_i \, Sugar_{t-i} + \sum_{j=i}^{m} \delta_j \, X_{t-j} + \mu_{2t} \quad (8.2)$$

$$X_t = \sum_{i=1}^{n} \alpha_i \, Soybean_{t-i} + \sum_{j=i}^{n} \beta_j \, X_{t-j} + \mu_{1t} \quad (9.1)$$

$$Soybean = \sum_{i=1}^{m} \gamma_i \, Soybean_{t-i} + \sum_{j=i}^{m} \delta_j \, X_{t-j} + \mu_{2t} \quad (9.2)$$

$$X_t = \sum_{i=1}^{n} \alpha_i \, Wheat_{t-i} + \sum_{j=i}^{n} \beta_j \, X_{t-j} + \mu_{1t} \quad (10.1)$$

$$Wheat = \sum_{i=1}^{m} \gamma_i \, Wheat_{t-i} + \sum_{j=i}^{m} \delta_j \, X_{t-j} + \mu_{2t} \quad (10.2)$$

Toda and Yamamoto (1995) projected a basic methodology obliging the approximation of an 'augmented' VAR, actually when there is cointegration, which ensures the asymptotic dissemination of the MWald statistic. Thus, the Toda-Yamamoto causality system has been commemorated as the long-run causality exams. Everything one wants to fix is to focus the best order of integration dmax, which hope to happen in the model and build a VAR in their stages with a sum of (k + dmax) lags. Toda and Yamamoto call attention to that, for d=1, the lag assortment process is continuously lawful, at minimum asymptotically, subsequently k > =1=d. If d=2, then the process is legal unless k=1. Furthermore, rendering to Toda and Yamamoto, the MWald statistic is legal

irrespective whether a sequence is I (0), I (1) or I (2), non-cointegrated or cointegrated of a random order.

3.1.2.4 Impulse Response

Impulse response function (IRF) of an element framework is its yield when introduced with a concise data indicator, called an impulse. All the for the most part, an impulse response alludes to the response of any dynamic framework in response to some outer change. Regarding the impulse response functions, the beginning stun in Xt that causes Yt and ΔYt to change is step by step dissolved about whether again to the initial equilibrium. As far as the unit response function, the starting stun in presidential endorsement causes ΔYt to change. It then slowly methodologies its new equilibrium where ΔYt is changing by a given sum every period. A comparative story might be told with the unit response function on Yt. The impulse response is similarly applied to evaluate the viability of a policy change.

3.2 Data description

In this study, quarterly data will be utilized. This research is conducted by using a total of 57 observations. This is because the utilization of quarterly data offers a few focal points over studies that utilize annual variables. Firstly, it takes into account vital intra-year motion. Financial choices are taken during the time and are frequently focused around monthly and quarterly data. In this manner, quarterly data will be more qualified to catch the rich element example of the choice making procedure than the total yearly data, which frequently hold huge

contemporaneous impacts that confuse the dissection and the elucidation of results.

Furthermore, it tries to moderate the issue of vanishing degrees of freedom in the VAR model by significantly expanding the sample size[4]. Thirdly, this methodology tries to enhance the vigor of empirical results by concentrating on a period that has been generally steady as far as economic policy. Consequently, the model is less inclined to be influenced by significant administration changes, which thusly influence the steadiness of the evaluated parameters (a pivotal suspicion in most relapse models). Subsequently, this study trusts that the economic connections found in the quarterly economic information are significantly more powerful than its annual complements. The time series data that being used in our study is from year 2000Q1 to 2014Q1. This is because; the strong economic recovery was accomplished in an environment of relative price stability. During this stop, the Malaysian economy had recovered from the 1997 Asian financial crisis and was on the way of more potent growth. Quarterly data has been used by many researchers to find the relationship between financial variable and agricultural commodity prices (Frank & David, 2010; Bernadina, 2012; Antonio & Allan, 2013; Browne & Cronin, 2010; Farooq, 2009). The summary of the data is listed in the table below:

[4] The issue of small (annual) samples is aggravated by the absence of element data held in such total data.

Table 3.1: Summary of the data

Number of variables	Variables	Unit
	Dependent variables	
1	Corn price	Price per metric ton
2	Sugar price	Price per pound
3	Soybean price	Price per metric ton
4	Wheat price	Price per metric ton
	Independent variables	**Unit**
5	Consumer Price Index (CPI)	Price index
6	Inflation rate	Price index
7	Market rate	Unit value
8	Export	Unit value
9	Import	RM
10	Currency in circulation (M0)	RM
11	Cash & checking account deposit (M1)	RM
12	M1, saving accounts & money market accounts (M2)	RM
13	M2, large deposits & long term deposits (M3)	RM
14	Trade balance	RM
15	Domestic credit	RM
16	International reserves	RM
17	Stock market	RM

3.3 Concluding Remarks

In conclusion, in this work we are conducting Phillips Perron (PP) tests, ARDL approach, Granger causality based on the Toda Yamamoto approach, and impulse response function to study the relationship between financial variables and agricultural commodity prices in Malaysia.

CHAPTER 4: DATA ANALYSIS

4.0 Introduction

In this section, this study concentrate on the results and interpretation of the relationship between chosen financial variables and the price of the agricultural commodities, such as, wheat, corn, soybean and sugar in Malaysia. The results are partitioned into four parts. The first part will be the discussion about the order of integration of the variables by utilizing Phillips-Perron (PP) test. Next, the second part will depict the long run cointegration relationship between the variables by utilizing ARDL test. The third part is depicts about the causality relationship between the variable by utilizing Granger causality test. Finally, it will be the testing the impulse response between the variables.

4.1 Empirical Result

4.1.1 Unit Root Test (Phillips-Perron test)

As notice prior, unit root test is a stationary test that used to focus the order of integration of the variables. Stationary test is exceptionally essential to time series data. On the off chance that the variables are not stationary, spurious regression problem will prompt misleading of the results. Consequently, we utilize Phillips-Perron (PP) test at level and first difference structure by making into note of both trend & intercept and intercept without trend for level and for the first difference we took intercept and none to analyze the stationary status for every

variables (Phillips & Perron, 1988). Table 4.1 is the results of unit root test under level structure, and first difference.

Table 4.1: PP Unit Root Test Result for Malaysia

Variables	Phillips-Perron test statistic			
	Level		First Difference	
	Intercept	Trend and Intercept	None	Intercept
Financial variables				
CPI	-	-2.703(4)	-	-6.192(7)*
Inflation rate	-1.083(2)	-	-6.603(3)*	-
Exports	-	-2.479(1)	-	-6.783(6)*
Imports	-	-2.788(1)	-	-6.735(2)*
M0	-	-4.151(4)*	-	-
M1	-	-4.805(2)*	-	-
M2	-0.051(4)	-	-2.573(3)**	-
M3	-	-3.231(5)	-	6.066(6)*
Market rate	-	-2.141(3)	-	-7.021(3)*
Trade	-	-3.881(2)**	-	-
Domestic	5.409(11)	-	-2.127(4)**	-
Reserves	-0.8.61(2)	-	-4.599(2)*	-
Stock	-	-4.295(2)*	-	-
Agricultural commodities				
Corn	-	-3.144(1)	-	-6.138(7)*
Sugar	-2.131(4)	-	-7.339(22)*	-
Soybean	-	-3.388(6)	-	-14.692(54)*
Wheat	-	-3.200(1)	-	-7.124(6)*

Critical	Level			First Difference		
Value	10%	5%	1%	10%	5%	1%
CPI	-3.175	-3.492	-4.131	-2.596	-2.916	-3.555
Inflation	-2.560	-2.915	-3.553	-1.613	-1.947	-2.608
Exports	-3.175	-3.492	-4.131	-2.596	-2.916	-3.555
Imports	-3.175	-3.492	-4.131	-2.596	-2.916	-3.555
M0	-3.175	-3.492	-4.131	-	-	-
M1	-3.175	-3.492	-4.131	-	-	-
M2	-2.595	-2.915	-3.553	-1.613	-1.947	-2.608
M3	-3.175	-3.492	-4.131	-	-2.916	-3.555
Market rate	-3.175	-3.492	-4.131	-2.596	-2.916	-3.555
Trade	-3.175	-3.492	-4.131	-	-	-
Domestic	-2.595	-2.915	-3.553	-1.613	-1.947	-2.608
Reserves	-2.595	-2.915	-3.553	-1.613	-1.947	-2.608
Stock	-3.175	-3.492	-4.131	-	-	-
Corn	-3.175	-3.492	-4.131	-2.596	-2.916	-3.555
Sugar	-2.595	-2.915	-3.553	-1.613	-1.947	-2.608
Soybean	-3.175	-3.492	-4.131	-2.596	-2.916	-3.555
Wheat	-3.175	-3.492	-4.131	-2.596	-2.916	-3.555

Notes: All variables are transformed to natural logs. Asterisks (*), (**) and (***) indicate statistically significant at the 1%, 5% and 10% levels, respectively. The optimum lag length for PP test was automatically selected based on Newey-West using Barlett Kernel.

Table 4.1 presents the aftereffects of Phillips-Perron unit root test with 17 variables. The null hypothesis states that the variables have a unit root. The tables shows the in the upper part and the critical value given in the table below the results. The result from the table demonstrates that all the series are integrated either I (0) or I (1) however none of them are intergrated at I (2), recommending their qualification to be inspected in the ARDL bounds test method.

4.1.2 ARDL Cointegration Test

As specified prior, the variables considered in this study are mix of I(0) and I(1) series. Because of this, the cointegration test routines focused around Johansen (1995) and the Johansen-Juselius (1990) oblige that all the variables be of equivalent degree of intergration. Accordingly, these techniques for cointergration are not fitting and can't be utilized. Subsequently, we receive the ARDL displaying methodology for cointegration investigation in this study. The cointegration relationship between the financial variables and agricultural commodity prices are inspected utilizing the ARDL bound testing method. Before we directing the ARDL bound test, as a first step, the order of lags ought to be gotten from either utilizing the Akaike Information Criterion (AIC) or Schwartz-Bayesian Criterion (SBC)[5].

Since this study is utilizing quarterly data, 8 lags are chosen as the maximum lag (k) following (Abdelhak et al., (2011), Ozturk and Acavavci (2012), and Nathan and Liew (2013). The aftereffect of statistics for selecting the optimum lag order for the ARDL Bound Cointegration Test is given in appendix.

[5] The model selection criteria are a function of the residual sums of squares and are asymptotically equivalent (Shrestha & Khorshed, 2005).

Taking after on Pesaran & Pesaran (1997), in this study have choose the ideal model by utilizing Schwartz-Bayesian Criteria (SBC) by selecting minimum lag length due this study give little size of observation which is 57 (Shrestha & Khorshed, 2005).

Table 4.2 speaks to the F-statistics of estimation using SBC. We had performed the test using each of the variables with dependent variables. Table 4.2 demonstrates that result. The ascertained F statitics are contrasted and the critical values got from Pesaran, Shin and Smith (2001) and Pesaran and Pesaran (2009). Two sorts of critical values are given. The upper level critical are classified for the suspicion that all the series are intergrated of order one, I(1), while the lower level critical values are organized for the supposition that all the series are incorporated of order zero, I(0). On the off chance that the orders of the series are mixed, then the ascertained F-statistics are contrasted and the relating upper and lower level critical values. In the event that the statistics lies between the lower and upper limits, the test results are uncertain (Pesaran & Pesaran, 1997).

The results propose that there are cointegrating vectors which are in the middle of corn and cpi, corn and M2, and corn and domestic which are significant at 1%, other than that, corn and market, corn and M1, and wheat and export are significant at 5% ultimately, variables that cointegrated at significant level of 10% are corn and M3, soybean and M3, wheat and import, and wheat and domestic. Besides that, likewise give the aftereffect of Serial Correlation, Functional Form, Normality and Heteroscedasticity for every combination of financial variables and agricultural commodity prices.

This study then moved ahead to infer the long-run estimates by method for the ARDL approach. In picking the short-run dynamics of the ARDL-ECM, the lag structure was defined on the premise of the SBC model selection criteria utilized throughout the OLS estimation of the bound tests. The results are presented in Table 4.3. Table 4.3 gives the long-run coefficients, and short-run error-correction model between financial variables and agricultural commodity prices for Malaysia speak to of the chose ARDL models. Panel A shows estimated long-run coefficients. Panel B of the table demonstrates the error-correction representation for the chose ARDL model.

From Panel A can gauge the relationship and long-run effect between variables. Negative evaluated coefficient between corn and market state that negative relationship between corn and market, when the market rate expands, the price of corn abatements. While other nine long run coefficients gives positive hint which demonstrates positive relationship between those financial variables and the agricultural commodity prices. At the point when the financial variables expand, the agricultural commodity prices additionally will be builds. For example, from the Table 4.3, can see that CPI has significant relationship with the corn. This state that CPI having long-run effect on corn.

ECM gives the criticism or the speed of adjustment whereby short-run dynamics focalize to the long-run equilibrium way in model. Microfit(4.0) gives assessments of the ECM intimated by the chose ARDL model. The negative sign of the ECM term affirms the normal joining process in the long-run dynamics of commodity price and financial variables (Monir et al., 2013). Banerjee et al., (1998) stated that a very important error-correction term is the further proof of the

being of a steady long-term association. The ECM qualities are all negative and significant, as needed for stability. The coefficient of EC_t (-1) is discovered to be little in magnitude and is statistically significant. It demonstrates that there is a long run relationship between the variables. From the above table, the negative sign of the ECM term confirms the expected convergence process in the long-run dynamics of corn price and CPI. We also have run diagnostic test and the results have been provided in the appendix.

Table 4.2: Bound Testing Result for Malaysia

Dependent Variable	independent Variable	Lag	F-Statistic	Serial Correlation	Functional Form	Normality	Heteroscedasticity
CORN	CPI	7	11.994[0.000]*	2.902[0.574]	0.442[0.506]	5.986[0.050]	0.685[0.408]
CORN	INFLA	4	2.689[0.080]	3.182[0.528]	2.487[0.115]	0.466[0.792]	0.243[0.622]
CORN	MARKET	4	5.915[0.006]**	6.863[0.143]	1.475[0.225]	1.109[0.574]	0.0125[0.911]
CORN	EXPORT	8	1.714[0.198]	8.630[0.071]	1.733[0.188]	0.961[0.618]	0.012[0.912]
CORN	IMPORT	8	1.638[0.212]	5.934[0.204]	1.471[0.225]	0.265[0.875]	1.072[0.300]
CORN	M0	8	3.104[0.060]	2.368[0.668]	0.595[0.440]	0.616[0.735]	0.043[0.835]
CORN	M1	1	6.850[0.002]**	8.992[0.061]	0.404[0.525]	3.642[0.162]	0.164[0.685]
CORN	M2	7	10.034[0.000]*	6.474[0.166]	1.061[0.303]	0.619[0.734]	0.005[0.941]
CORN	M3	8	5.496[0.009]***	3.626[0.459]	3.736[0.053]	1.052[0.591]	0.092[0.762]
CORN	TRADE	8	1.572[0.225]	4.631[0.327]	3.582[0.058]	0.645[0.724]	2.088[0.148]
CORN	DOMESTIC	7	9.013[0.001]*	9.400[0.052]	2.357[0.125]	5.856[0.053]	0.001[0.974]
CORN	RESERVES	8	1.883[0.170]	8.960[0.062]	1.372[0.241]	0.108[0.947]	0.004[0.945]
CORN	STOCK	8	0.266[0.768]	6.780[0.148]	0.045[0.830]	0.763[0.683]	0.023[0.878]
SUGAR	CPI	8	3.610[0.040]	6.912[0.141]	2.982[0.084]	0.370[0.831]	0.743[0.389]
SUGAR	INFLA	7	1.963[0.157]	7.972[0.093]	0.187[0.665]	0.783[0.676]	0.103[0.747]
SUGAR	MARKET	7	1.541[0.230]	4.643[0.326]	0.122[0.726]	0.763[0.683]	0.402[0.526]
SUGAR	EXPORT	8	2.094[0.141]	4.019[0.403]	1.263[0.261]	0.775[0.678]	1.954[0.162]
SUGAR	IMPORT	8	1.437[0.254]	5.243[0.263]	0.169[0.681]	1.159[0.560]	1.021[0.312]
SUGAR	M0	8	2.323[0.116]	7.325[0.120]	0.807[0.369]	2.298[0.317]	0.053[0.817]
SUGAR	M1	8	3.113[0.060]	7.266[0.122]	0.318[0.573]	0.217[0.897]	0.358[0.549]
SUGAR	M2	8	2.839[0.075]	2.657[0.617]	0.201[0.654]	2.730[0.255]	0.301[0.583]
SUGAR	M3	7	2.291[0.117]	6.516[0.164]	0.001[0.972]	1.925[0.382]	0.001[0.967]
SUGAR	TRADE	7	1.765[0.187]	8.488[0.075]	0.163[0.686]	1.293[0.524]	0.116[0.732]
SUGAR	DOMESTIC	8	3.799[0.034]	4.234[0.375]	0.071[0.790]	1.326[0.515]	0.338[0.561]
SUGAR	RESERVES	8	3.433[0.046]	3.408[0.492]	1.782[0.182]	2.434[0.296]	0.643[0.422]
SUGAR	STOCK	8	2.335[0.115]	4.033[0.401]	2.681[0.102]	0.025[0.987]	0.008[0.926]

Notes: (*) (**) (***) indicate that the variables are co-integration at 1%, 5% and 10% level. The optimum lag selected using Schwarz Bayesian Criterion (SBC). The maximum lag is fixed at eight. [a] Lagrange multiplier test of residual serial correlation. [b] Ramsey's RESET test using the square of the fitted values. [c] Based on a test of skewness and kurtosis of residuals and [d] Based on the regression of squared residuals on squared fitted values . the critical values are obtained from Table CI(iii) Case III: Unrestricted intercept and no trend reported in Pesaran et all. (2001).

Table 4.2: F-statistic by using ARDL approach (continued)

Dependent Variable	independent Variable	Lag	F-Statistic	Serial Correlation	Functional Form	Normality	Heteroscedasticity
SOYBEAN	CPI	3	3.768[0.031]	3.972[0.410]	0.36640.985]	18.107[0.000]	0.815[0.366]
SOYBEAN	INFLA	8	2.086[0.142]	6.613[0.158]	2.258[0.133]	0.892[0.640]	1.004[0.316]
SOYBEAN	MARKET	8	3.770[0.035]	3.730[0.444]	0.963[0.326]	5.566[0.062]	0.010[0.917]
SOYBEAN	EXPORT	3	1.922[0.158]	4.475[0.345]	2.866[0.090]	4.660[0.097]	0.022[0.882]
SOYBEAN	IMPORT	8	2.085[0.143]	5.903[0.206]	3.286[0.070]	1.715[0.424]	0.128[0.720]
SOYBEAN	M0	4	4.052[0.025]	6.954[0.138]	0.982[0.322]	7.221[0.027]	0.402[0.998]
SOYBEAN	M1	5	2.379[0.106]	3.982[0.408]	3.292[0.070]	4.997[0.082]	0.072[0.788]
SOYBEAN	M2	8	4.637[0.018]	2.932[0.569]	2.009[0.156]	5.080[0.079]	0.014[0.904]
SOYBEAN	M3	6	5.037[0.012]***	2.601[0.627]	0.852[0.356]	4.928[0.085]	0.548[0.459]
SOYBEAN	TRADE	8	0.687[0.511]	2.673[0.614]	1.876[0.171]	1.748[0.417]	0.375[0.540]
SOYBEAN	DOMESTIC	8	2.910[0.070]	0.187[0.996]	2.252[0.133]	1.044[0.593]	0.403[0.525]
SOYBEAN	RESERVES	8	2.244[0.124]	8.558[0.073]	2.772[0.096]	1.428[0.490]	0.327[0.567]
SOYBEAN	STOCK	8	0.517[0.601]	6.588[0.159]	0.490[0.484]	7.474[0.024]	0.626[0.429]
WHEAT	CPI	8	3.532[0.042]	6.605[0.158]	0.432[.511]	1.3431[0.511]	1.094[0.295]
WHEAT	INFLA	7	3.765[0.034]	6.969[0.138]	3.085[0.079]	0.521[0.771]	0.435[0.509]
WHEAT	MARKET	8	3.580[0.041]	3.481[0.481]	1.099[0.294]	1.016[0.602]	0.023[0.878]
WHEAT	EXPORT	8	6.892[0.004]**	6.106[0.191]	0.143[0.705]	2.266[0.322]	2.073[0.150]
WHEAT	IMPORT	8	5.157[0.012]***	0.772[0.942]	0.936[0.333]	2.548[0.280]	0.977[0.975]
WHEAT	M0	3	4.309[0.020]	7.260[0.123]	0.023[0.878]	11.376[0.003]	0.107[0.743]
WHEAT	M1	8	2.108[0.140]	8.795[0.066]	1.837[0.175]	2.023[0.364]	0.002[0.959]
WHEAT	M2	2	4.745[0.013]	5.773[0.217]	0.469[0.493]	11.243[0.004]	1.593[0.207]
WHEAT	M3	6	3.942[0.029]	1.593[0.810]	8.010[0.005]	1.605[0.448]	3.696[0.055]
WHEAT	TRADE	4	0.678[0.513]	4.782[0.310]	3.710[0.054]	5.468[0.065]	1.368[0.242]
WHEAT	DOMESTIC	8	4.930[0.014]***	8.121[0.087]	2.808[0.094]	0.003[0.998]	4.914[0.027]
WHEAT	RESERVES	6	3.916[0.029]	3.514[0.476]	1.421[0.233]	4.173[0.124]	1.748[0.186]
WHEAT	STOCK	5	1.660[0.203]	2.907[0.573]	0.011[0.915]	0.517[0.772]	12.155[0.000]

Notes: (*) (**) (***) indicate that the variables are co-integration at 1%, 5% and 10% level. The optimum lag selected using Schwarz Bayesian Criterion (SBC). The maximum lag is fixed at eight. [a] Lagrange multiplier test of residual serial correlation. [b] Ramsey's RESET test using the square of the fitted values. [c] Based on a test of skewness and kurtosis of residuals and [d] Based on the regression of squared residuals on squared fitted values . the critical values are obtained from Table CI(iii) Case III: Unrestricted intercept and no trend reported in Pesaran et all. (2001).

Table 4.3: Long-run Coefficients, and Short-run Error-Correction Model for Malaysia				
Dependent variable	Regressor	Coefficient	Standard Error	t-ratio [Prob]
Panel A: Estimated long-run coefficients				
LNCORN {2,0}	LNCPI	0.035	0.005	7.457[0.000]
	C	3.045	0.445	6.846[0.000]
LNCORN {1,0}	LNMARKET	-1.207	0.114	-10.563[0.000]
	C	10.536	0.402	26.234[0.000]
LNCORN {1,0}	LNM1	0.682	0.112	6.086[0.000]
	C	-1.819	1.336	-1.361[0.179]
LNCORN {2,0}	LNM2	0.660	0.105	6.270[0.000]
	C	-2.597	1.428	-1.819[0.075]
LNCORN {2,1}	LNM3	0.844	0.111	7.615[0.000]
	C	-5.340	1.515	-3.524[0.001]
LNCORN {2,0}	LNDOMESTIC	0.981	0.156	6.291[0.000]
	C	-6.965	2.118	-3.289[0.002]
LNSOYBEAN {1,0}	LNM3	0.718	0.141	5.084[0.000]
	C	-2.839	1.923	-1.473[0.147]
LNWHEAT {1,0}	LNEXPORT	0.810	0.306	2.644[0.011]
	C	-2.031	3.298	-0.616[0.541]
LNWHEAT {1,0}	LNIMPORT	0.890	0.286	3.112[0.003]
	C	-2.728	3.023	-0.902[0.372]
LNWHEAT {1,0}	LNDOMESTIC	0.603	0.246	2.452[0.018]
	C	-1.493	3.337	-0.447[0.657]
Panel B: Error-correction representation for the selected ARDL model				
ΔLNCORN {2,0}	ΔLNCPI	0.014	0.004	3.216[0.002]
	ΔC	1.244	0.359	3.461[0.001]
	EC_t *(-1)*	-0.481	0.109	-3.741[0.001]
ΔLNCORN {1,0}	ΔLNMARKET	-0.521	0.096	-5.402[0.000]
	ΔC	4.545	0.799	5.686[0.000]
	EC_t *(-1)*	-0.431	0.078	-5.543[0.000]
ΔLNCORN {1,0}	ΔLNM1	0.205	0.075	2.716[0.009]
	ΔC	-0.546	0.444	-1.231[0.224]
	EC_t *(-1)*	-0.300	0.098	-3.065[0.003]
ΔLNCORN {2,0}	ΔLNM2	0.233	0.077	3.015[0.004]
	ΔC	-0.916	0.582	-1.574[0.122]
	EC_t *(-1)*	-0.353	0.099	-3.570[0.001]
ΔLNCORN {2,1}	ΔLNM3	3.216	1.179	2.729[0.009]
	ΔC	-2.175	0.844	-2.576[0.013]
	EC_t *(-1)*	-0.407	0.102	-3.995[0.000]
ΔLNCORN {2,0}	ΔLNDOMESTIC	0.357	0.127	2.816[0.007]
	ΔC	-2.534	1.150	-2.204[0.033]
	EC_t *(-1)*	-0.364	0.108	-3.370[0.002]
ΔLNSOYBEAN {1,0}	ΔLNM3	0.270	0.092	2.940[0.005]
	ΔC	-1.065	0.763	-1.395[0.169]
	EC_t *(-1)*	-0.376	0.112	-3.369[0.001]
ΔLNWHEAT {1,0}	ΔLNEXPORT	0.238	0.129	1.838[0.072]

	ΔC	-0.597	1.014	-0.588[0.559]

Table 4.3: Long-run Coefficients, and Short-run Error-Correction Model for Malaysia (continued)

	EC_t *(-1)*	-0.294	0.104	-2.831[0.007]
ΔLNWHEAT {1,0}	ΔLNIMPORT	0.273	0.120	2.266[0.028]
	ΔC	-0.836	0.955	-0.876[0.386]
	EC_t *(-1)*	-0.307	0.097	-3.165[0.003]
ΔLNWHEAT {1,0}	ΔLNDOMESTIC	0.169	0.096	1.755[0.086]
	ΔC	-0.419	0.964	-0.435[0.666]
	EC_t *(-1)*	-0.281	0.101	-2.776[0.008]

Notes: [Prob] indicate the Probability. { } represent the lag selected based on Schwarz Bayesian Criterion (SBC). EC_t (-1) represent the error-correction term.

4.1.3 Non-Granger causality Test (Toda Yamamoto approach)

The being of a long-run relationship among the variables indicates that at that place must be at least one way of causality to check the existence of long-run equilibrium relationship (Engle & Granger, 1987). Nevertheless, it should be mentioned that it does not suggest the direction of temporal causality between variables. Having determined that a cointegrating relationship exists between agricultural commodity costs and financial variables, the second aim of this work is to verify if the financial variable Granger cause agricultural prices or inversely using Toda Yamamoto causality test in Eviews. If hence, then can state that it is agricultural commodity prices that respond to campaigns in financial variables. The empirical results of Granger Causality test based on Toda and Yamamoto (1995) methodology is estimated through MWALD test and reported in Table 4.4. The estimates of MWALD test show that the test result follows the chi-square distribution with the appropriate lag length along with their associated probability.

Table 4.4: Toda-Yamamoto Causality (modified WALD) Test Result

Null Hypothesis	Chiq value	Prob value	Ect	Directions
CPI granger cause corn	12.089	0.098	-0.481	CPI → corn
Corn does not granger cause CPI	5.816	0.561		
Inflation does not granger cause corn	6.803	0.147		No causality
Corn does not granger cause inflation	4.025	0.403		
Market granger cause corn	23.995	0.000	-0.431	Market → corn
Corn does not granger cause market	4.551	0.337		
Export does not granger cause corn	13.201	0.105		No causality
Corn does not granger cause export	6.804	0.558		
Import does not granger cause corn	9.106	0.333		Import ← corn
Corn granger cause import	17.748	0.023		
M0 does not granger cause corn	9.204	0.325		No causality
Corn does not granger cause m0	7.146	0.521		
M1 granger cause corn	11.158	0.001	-0.300	M1 → corn
Corn does not granger cause m1	0.212	0.645		
M2 granger cause corn	16.355	0.022	-0.353	M2 → corn
Corn does not granger cause m2	1.809	0.970		
M3 granger cause corn	13.676	0.091	-0.407	M3 → corn
Corn does not granger cause m3	7.299	0.505		
Trade does not granger cause corn	4.842	0.774		No causality
Corn does not granger cause trade	5.629	0.689		
Domestic granger cause corn	22.408	0.002	-0.364	Domestic →corn
Corn granger cause domestic	18.017	0.012		Corn ← domestic
Reserves does not granger cause corn	5.120	0.745		No causality
Corn does not granger cause reserves	7.045	0.532		
Stock does not granger cause corn	5.184	0.738		No causality
Corn does not granger cause stock	12.907	0.115		
Cpi granger cause sugar	13.927	0.084		Cpi →sugar
Sugar does not granger cause cpi	3.909	0.865		
Inflation does not granger cause sugar	4.428	0.729		Inflation ←sugar
Sugar granger cause inflation	21.607	0.003		
Market does not granger cause sugar	5.150	0.642		Market ←sugar
Sugar granger cause market	15.886	0.026		
Export does not granger cause sugar	12.199	0.143		No causality
Sugar does not granger cause export	3.457	0.903		
Import does not granger cause sugar	5.854	0.664		No causality
Sugar does not granger import	4.687	0.790		

Null Hypothesis	Chiq value	Prob value	Ect	Directions
M0 granger cause sugar	24.088	0.002		M0 → sugar
Sugar does not granger cause m0	2.367	0.968		
M1 granger cause sugar	15.209	0.055		M1 → sugar
Sugar does not granger cause m1	2.695	0.952		
M2 does not granger cause sugar	10.614	0.225		No causality
Sugar does not granger cause m2	6.606	0.580		
M3 granger cause sugar	13.471	0.061		M3 → sugar
Sugar does not granger cause m3	4.691	0.698		
Trade does not granger cause sugar	9.765	0.202		Trade ← sugar
Sugar granger cause trade	14.729	0.040		
Domestic does not granger cause sugar	8.501	0.386		No causality
Sugar does not granger cause domestic	9.630	0.292		
Reserves does not granger cause sugar	7.824	0.451		No causality
Sugar does not granger cause reserves	3.369	0.909		
Stock granger cause sugar	14.795	0.063		Stock → sugar
Sugar does not granger cause stock	2.539	0.960		
Cpi does not granger cause soybean	3.518	0.318		No causality
Soybean does not granger cause cpi	0.533	0.912		
Inflation does not granger cause soybean	10.246	0.248		No causality
Soybean does not granger cause inflation	5.922	0.656		
Market granger cause soybean	17.646	0.024		Market →
Soybean does not granger cause market	5.725	0.678		soybean
Export granger cause soybean	7.964	0.047		Export →
Soybean does not granger cause export	1.540	0.673		soybean
Import does not granger cause soybean	7.299	0.505		No causality
Soybean does not granger cause import	6.734	0.566		
M0 granger cause soybean	9.171	0.057		M0 → soybean
Soybean does not granger cause m0	3.611	0.461		
M1 granger cause soybean	9.615	0.087		M1 → soybean
Soybean does not granger cause m1	6.993	0.221		
M2 does not granger cause soybean	8.164	0.418		No causality
Soybean does not granger cause m2	6.531	0.588		
M3 granger cause soybean	14.320	0.026	-0.376	M3 → soybean
Soybean does not granger cause m3	2.902	0.821		
Trade does not granger cause soybean	1.340	0.995		No causality

Soybean does not granger cause trade	7.232	0.512		
Null Hypothesis	Chiq value	Prob value	Ect	Directions
Domestic does not granger cause soybean Soybean does not granger cause domestic	9.550 3.161	0.298 0.924		No causality
Reserves does not granger cause soybean Soybean does not granger cause reserves	7.105 4.298	0.525 0.829		No causality
Stock does not granger cause soybean Soybean granger cause stock	2.077 13.378	0.979 0.100		Stock ← soybean
Cpi granger cause wheat Wheat does not granger cause cpi	20.855 12.148	0.008 0.145		Cpi → wheat
Inflation granger cause wheat Wheat does not granger cause inflation	19.309 4.271	0.007 0.748		Inflation → wheat
Market granger cause wheat Wheat granger cause market	19.135 24.034	0.014 0.002		Market ← wheat Wheat → market
Export granger cause wheat Wheat does not granger cause export	23.505 9.858	0.003 0.275	-0.294	Export → wheat
Import granger cause wheat Wheat does not granger cause import	23.762 9.417	0.003 0.308	-0.307	Import → wheat
M0 granger cause wheat Wheat granger cause m0	10.026 8.905	0.018 0.031		M0 ← wheat Wheat → m0
M1 granger cause wheat Wheat granger cause m1	23.748 13.691	0.003 0.090		M1 ← wheat Wheat → m1
M2 does not granger cause wheat Wheat does not granger cause m2	0.467 1.590	0.792 0.452		No causality
M3 does not granger cause wheat Wheat does not granger cause m3	7.650 8.848	0.265 0.182		No causality
Trade does not granger cause wheat Wheat does not granger cause trade	4.050 3.262	0.399 0.515		No causality
Domestic granger cause wheat Wheat does not granger cause domestic	13.588 11.450	0.093 0.178	-0.281	Domestic → wheat
Reserves does not granger cause wheat Wheat does not granger cause reserves	3.373 6.817	0.761 0.338		No causality
Stock granger cause wheat Wheat does not granger cause stock	12.518 1.549	0.028 0.907		Stock → wheat

From the above Table 4.4, as an example, we can clearly say that there is a unidirectional causality between CPI and corn, which is CPI granger cause the

corn price. Yet the residual of the combination also shows the mix of unidirectional, bidirectional, and no causality between the financial variables and the agricultural commodity costs. The result obtains identifying the probability value. If the probability value is less than 10 per cent, then we conclude that the variable having causality relationship while, probability more than ten per cent state there is no causality relationship between both variables.

4.1.4 Impulse response

The result of impulse response has been attached in appendix. It is in graph form estimated both response of dependent variable to independent variable and response of independent variable to dependent variable. This impulse has been estimated using VAR estimation in Eviews for 20 quarters. For an example, the response of corn to cpi stated that there is no stable condition where it is not move along neutral equilibrium. It establishes a non-stabilize effect. While, the response of cpi to corn shows there is a stable movement along the neutral point for 20 quarters forwarded. The rest impulse response of several combinations of variables has been indicated in the graph. According to Jason. R (2011), it leaves us to foresee what the framework's yield will look like in the time space. On the off chance that we can go down the framework's info sign into a whole of a pack of segments, then the output is equivalent to the aggregate of the framework yields for each of those sections. At that level, the production would be tantamount to the aggregate of duplicates of the impulse response, scaled and time-moved in the same direction.

4.2 Concluding Remarks

This study applied unit root tests, cointegration test, ARDL approach, and Granger causality test and impulse response to test the issue of financial variables on agricultural commodity prices in Malaysia. Grounded along the outcomes of the unit root test, we launch that all the variables given mixed results which are stationary at both points and first difference but no any of the variables are integrated at second difference. For cointegration test, it implies that ten combinations of dependent and independent variables. Thither is a long run relationship between the variables in the model and the variables are moving in concert to reach balance in the long run. Moreover, by using Toda Yamamoto granger causality, this study also establish the causality between variables either there is unidirectional, bidirectional and also establish that no causality. Eventually this study also estimated impulse response using VAR estimation with appropriate lags.

CHAPTER 5: CONCLUSION

5.0 Introduction

In this study, have explained whether financial variables have a substantial effect on agricultural commodity prices specifically in Malaysia. This chapter discussed in the summary of the overall outcomes. Commencement is a summary of outcomes. Next is a Policy Recommendation. Besides that, limitations and recommendation for future research also listed down in this chapter.

5.1 Summary of Results

At that place are few researches done in this study regarding financial variables and agricultural commodity prices in the late years. Most of them are focused on developed countries such as United States, United Kingdom, Canada and many others. The present report analyzes the relationship between financial variables and the agricultural commodity costs by focusing on Malaysia. Likewise, as well define the effect of agricultural commodity costs in the long run as the government might as well concentrate on the agricultural sector which has been not given importance in these years.

By using the technique of ARDL, a model to ascertain the result of financial variables on agricultural commodity prices is estimated for Malaysia, with the sample period from 2000Q1 to 2014Q1. As a first step the study had conduct Phillips-Perron unit root test to identify the type of cointegraion. There have been found that the result obtained was a mixed result with combination of

both I(0) and I(1). This study found that totally four variables which are integrated at I (0) and the other thirteen variables are integrated at I (1). So those to run cointegration test, the study proceed the test by using ARDL approach. From the result, have been found that there are ten combinations of financial variables are cointegrated with agricultural commodity costs.

By using ten cointegrated variables study proceeds the analysis by conducting long-run coefficient and also short-run error-correction model. This trial establishes that there is long-run relationship between those selected financial variables and agricultural commodity costs. There also include ARDL diagnostic test to identify econometric problem such as Serial correlation, Functional form, Normality and also Heteroscedasticity. Overall, this study found all the ten cointegrated models having long run relationship between both financial variables and agricultural commodity prices.

Follows by Toda Yamamoto approach to test Granger causality effect between financial variables and agricultural commodity costs. The results show some of combinations having a unidirectional causality effect, some are bidirectional causality effect and others are having no causal force. Finally, by using the VAR estimates we had run impulse response for all the financial variables with each agricultural variable of corn, sugar, soybean and also wheat. The solutions are presented in the graph form which shows for 20 quarters. Overall this study found that about 26 combinations of variables giving unidirectional relationship, 4 variables are bidirectional relationship and 22 are showing no causality relationship between financial variables and agricultural commodity prices.

In conclusion, this study concludes that the financial variables have an impact on Malaysian agricultural commodity prices in the given period through their impacts on CPI, market rate, export, import, M1, M2, M3, and domestic. Although our research delivers a few restrictions, it will be a benchmark to future researchers if they are setting about to move to a research based on this subject.

5.2 Policy Recommendations

5.2.1 Corn price and financial variables

Since this study establish that there are changes in prices of corn caused by the motion of the CPI with positive relationship, the government can stabilize the CPI rate to not increase or fall too much. This is because reducing the CPI rate will increase the cost of corn and it results in increasing the income of the country, meanwhile increasing the corn price will also lead to increases in inflation rate. The same position applies to the other financial variable such as M1, M2, M3 and Domestic credit. Only there is negative relationship between market rate and monetary value of corn. When the market exchange rate increases the monetary value of corn drop, this will decrease the corn price, where the corn price relatively becomes more cheap and there will be an increase in export for the maize. But investors might be disappointed with the reduction in corn price. They might focus on other agricultural trade goods. As a conclusion, this study recommended the approach made by Good and Irwin, (2007) and Wright, (2009) that a humble physical reserve be considered to help lessen the negative effects of the corn price diminishment and the balancing out the cost.

5.2.2 Sugar price and financial variables

In this study has shown that there is no relationship between selected financial variables. The outcomes from this study are differing from the previous study about sugar price where there is relationship between financial variables and sugar price. This is due to divergences in the selected financial variables utilizing by Sunday et al., 2012 which are inflation rate, GDP, non-oil export, index energy consumption and real FPI.

5.2.3 Soybean price and financial variables

Same as corn price, this study has shown there is positive relationship between M3 and soybean price. Where central bank should stabilize the money supply as the monetary value of soybean move along with the money supply as the rising prices on agricultural commodity costs can be stabilizing and the economic system of Malaysia moves successful agricultural development. This study suggests the policymakers to concentrate on expanding monetary policy to increase the flow of money in economy (Angsar et al., 2012). This is because increase in price of soybean will better-off the soybean exporters, investors and also government as it increases the income of the country. But it will hurt the consumer in form of inflation. To avoid this situation and make both parties beneficial, Central Bank should focus on expand the monetary policy to overcome the inflation problem which cause by the positive relationship between financial variables and price of soybean.

5.2.4 Wheat price and financial variables

Wheat price affected by financial variables such as export rate, import rate and domestic credit with positive relationship. The regime has to rivet on this three financial development to stabilize the wheat price. This is also helping investors by granting them more information near the wheat prices to invest in it. The policy instrument unmistakably is to direct commodity prospects in wheat considerably all the more determinedly (and even to boycott it amid over the top worldwide prices) to drive a superior wedge in the middle of universal and residential prices than does through and through fare bans, which remains a feeble and likely incapable or obtuse instrument. In the interim, to be substantially more compelling as a market balancing out instrument, the confirmation is suggesting that we may require to give careful consideration to the nature of freely secured and put away wheat stocks, and other non-market drivers (Dipak et al., 2011).

5.2.5 Overall Policy Recommendations

It is getting more and more important that farmers and agribusiness understand the linkages between the financial variables and agricultural commodity costs. The results giving that, except market rate, the other financial variables show a confident relationship between financial variables and agricultural commodity costs. So that, this study will help to contribute suggestions to the regime and to policy makers in term to stabilizing the cost of agricultural trade goods by using selected financial variables. Because the price stability will helps to achieve elevated amounts of economic action and job by improving the transparency of the price instrument. This study also generally

informed consumption and investment choices and to apportion resources all more efficiently by reducing inflation risk.

This work also helps investors to distinguish the economic status of Malaysia by giving them a clear picture of the investment while what decision they have to made on financial variables to obtain the best result in alterations in agricultural commodity costs. These discoveries further propose that developments of financial variables have had and will keep on having a more noteworthy impact on the strength and maintainability of the agricultural region in Malaysia as Malaysia depend all the more vigorously on household and universal business powers for benefits and business good fortunes.

5.3 Limitations of the Study

This study has three limitations that would like to be voice out from this research. The first limitation of this study is low frequency of the data; this study only obtain the quarterly data from 2000Q1 to 2014Q1 in which a better data frequency will be monthly or weekly (Gunther & Dramane, 2011). The frequency of the data will affect the accuracy of the results. The larger the frequency of data, the results estimation will become more accurate and precise. Secondly, the sample size is not large enough due to the difficulty of obtain slow updates of data from the Thomson Reuter, DataStream. Finally, this study found that there is missing data for some financial variables for example BOP and inflation rate (Magda & Joshua, 2002 and Jeffrey, 2006). The missing variables lead to error in

prediction of the results to find relationship between financial variables and agricultural commodity prices.

5.4 Recommendation for Future Research

We recommend future researches to focus to a greater extent on the issue of other financial variables by trying to examine by splitting the period into three characters where one before the crisis, during crisis and third is after crisis. Future researches recommended collecting missing variables for other financial variables and trying to analyze the relationship between financial variables and agricultural commodity costs by using monthly data or weekly data to produce more precise outcomes. Future researchers also recommended finding out those missing variables that have been omitted in this study to get more information on the agricultural commodity prices. They are likewise suggested to examine commodities other than corn, sugar, soybean and wheat. Future researchers are recommended to include oil price or energy price as independent variables to detect the changes in agricultural commodity price.

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APPENDICES

APPENDIX 4.1: Optimum Lag Order Selection for ARDL Test

Statistics for Selecting the Optimum Lag Order for the ARDL Bound Co-integration Test

Optimum Lag (*k*)	AIC	SBC	Optimum Lag (*k*)	AIC	SBC
	$f(LNCORN_t \mid LNCPI_t)$			$f(LNCORN_t \mid LNINFLA_t)$	
1	35.914	32.903	1	34.621	31.610
2	36.020	31.048	2	35.916	30.944
3	34.856	27.960	3	33.646	26.750
4	36.528	27.747	4	35.131	26.351
5	33.424	22.799	5	37.500	26.875
6	31.495	19.067	6	35.085	22.657
7	29.989	15.801	7	31.979	17.790
8	30.764	14.858	8	28.862	12.957
	$f(LNCORN_t \mid LNMARKET_t)$			$f(LNCORN_t \mid LNEXPORT_t)$	
1	36.701	33.690	1	36.689	33.678
2	43.617	38.644	2	36.957	31.985
3	41.335	34.439	3	35.113	28.217
4	39.105	30.325	4	36.991	28.211
5	41.535	30.910	5	34.613	23.988
6	39.483	27.055	6	32.280	19.851
7	36.752	22.564	7	28.957	14.769
8	34.371	18.465	8	28.284	12.379
	$f(LNCORN_t \mid LNIMPORT_t)$			$f(LNCORN_t \mid LNM0_t)$	
1	34.593	31.582	1	34.407	31.396
2	36.180	31.207	2	35.360	30.387
3	33.701	26.805	3	33.375	26.479
4	34.896	26.115	4	32.339	23.558
5	35.370	24.745	5	29.301	18.676
6	32.985	20.556	6	27.957	15.529
7	30.550	16.361	7	25.751	11.562
8	28.057	12.151	8	25.227	9.322
	$f(LNCORN_t \mid LNM1_t)$			$f(LNCORN_t \mid LNM2_t)$	
1	34.912	31.901	1	34.425	31.414
2	35.481	30.508	2	35.811	30.839
3	33.652	26.756	3	33.478	26.582
4	34.182	25.401	4	33.338	24.558
5	31.185	20.560	5	30.488	19.863
6	29.815	17.387	6	27.555	15.127
7	27.408	13.219	7	24.628	10.439
8	26.875	10.970	8	24.574	8.669

Notes: AIC and SBC indicate the Akaike Info. Criterion and Schwarz Bayesian Criterion, respectively.

Statistics for Selecting the Optimum Lag Order for the ARDL Bound Co-integration Test

Optimum Lag (*k*)	AIC	SBC	Optimum Lag (*k*)	AIC	SBC
	$f(LNCORN_t \mid LNM3_t)$			$f(LNCORN_t \mid LNTRADE_t)$	
1	34.518	31.507	1	34.525	31.514
2	36.627	31.655	2	35.429	30.457
3	34.225	27.329	3	33.439	26.543
4	33.872	25.091	4	33.706	24.926
5	30.855	20.230	5	31.378	20.753
6	28.577	16.149	6	28.224	15.796
7	25.566	11.378	7	25.821	11.633
8	25.939	10.034	8	24.661	8.756
	$f(LNCORN_t \mid LNDOMESTIC_$			$f(LNCORN_t \mid LNRESERVES_t)$	
1	34.543	31.532	1	34.429	31.418
2	35.120	30.148	2	35.909	30.937
3	33.910	27.014	3	33.991	27.095
4	34.132	25.351	4	33.190	24.409
5	34.919	24.294	5	30.278	19.653
6	34.294	21.866	6	29.031	16.602
7	31.932	17.743	7	26.031	11.842
8	33.708	17.803	8	26.121	10.216
	$f(LNCORN_t \mid LNSTOCK_t)$			$f(LNSUGAR_t \mid LNCPI_t)$	
1	35.575	32.564	1	26.381	23.370
2	36.944	31.971	2	26.238	21.265
3	34.586	27.690	3	25.822	18.926
4	33.179	24.398	4	23.595	14.814
5	29.987	19.362	5	24.076	13.451
6	27.381	14.953	6	22.519	10.091
7	25.083	10.895	7	22.328	8.139
8	26.622	10.716	8	23.819	7.914
	$f(LNSUGAR_t \mid LNINFLA_t)$			$f(LNSUGAR_t \mid LNMARKET_t)$	
1	26.689	23.678	1	26.380	23.369
2	24.816	19.843	2	25.313	20.340
3	23.680	16.784	3	24.360	17.464
4	21.407	12.626	4	21.762	12.981
5	19.187	8.562	5	19.289	8.664
6	17.930	5.502	6	19.196	6.767
7	15.146	0.957	7	16.382	2.194
8	16.868	0.963	8	18.366	2.461

Notes: AIC and SBC indicate the Akaike Info. Criterion and Schwarz Bayesian Criterion, respectively.

Statistics for Selecting the Optimum Lag Order for the ARDL Bound Co-integration Test

Optimum Lag (k)	AIC	SBC	Optimum Lag (k)	AIC	SBC
	$f(LNSUGAR_t \mid LNEXPORT_t)$			$f(LNSUGAR_t \mid LNIMPORT_t)$	
1	26.839	23.828	1	26.525	23.514
2	25.940	20.968	2	24.770	19.797
3	24.802	17.906	3	24.112	17.216
4	22.086	13.305	4	21.683	12.903
5	24.984	14.358	5	20.238	9.613
6	25.335	12.906	6	19.805	7.377
7	23.344	9.155	7	18.343	4.155
8	22.403	6.498	8	18.261	2.356
	$f(LNSUGAR_t \mid LNM0_t)$			$f(LNSUGAR_t \mid LNM1_t)$	
1	30.994	27.983	1	26.534	23.523
2	29.650	24.677	2	25.378	20.405
3	30.121	23.225	3	24.603	17.707
4	30.991	22.210	4	23.435	14.654
5	28.791	18.166	5	21.212	10.587
6	28.551	16.122	6	21.467	9.039
7	25.393	11.204	7	21.421	7.232
8	26.251	10.346	8	20.940	5.035
	$f(LNSUGAR_t \mid LNM2_t)$			$f(LNSUGAR_t \mid LNM3_t)$	
1	27.195	24.184	1	29.312	26.301
2	25.257	20.284	2	27.239	22.267
3	24.979	18.083	3	26.141	19.245
4	24.926	16.145	4	26.345	17.564
5	22.603	11.978	5	23.895	13.270
6	21.276	8.847	6	26.190	13.762
7	19.068	4.879	7	23.519	9.330
8	22.775	6.870	8	26.151	10.245
	$f(LNSUGAR_t \mid LNTRADE_t)$			$f(LNSUGAR_t \mid LNDOMESTIC_t$	
1	27.567	24.556	1	26.715	23.704
2	26.227	21.254	2	24.964	19.991
3	25.193	18.297	3	23.783	16.887
4	22.981	14.201	4	23.507	14.727
5	23.467	12.842	5	21.494	10.869
6	21.204	8.776	6	22.214	9.786
7	21.275	7.086	7	19.336	5.148
8	23.424	7.519	8	18.645	2.740
	$f(LNSUGAR_t \mid LNRESERVE$			$f(LNSUGAR_t \mid LNSTOCK_t)$	
1	26.385	23.374	1	26.475	23.464
2	24.631	19.658	2	24.800	19.828
3	23.676	16.779	3	26.357	19.461
4	21.705	12.925	4	24.890	16.109
5	22.204	11.579	5	22.852	12.227
6	20.240	7.812	6	21.892	9.464
7	19.396	5.207	7	20.379	6.190
8	18.663	2.758	8	21.716	5.811

Notes: AIC and SBC indicate the Akaike Info. Criterion and Schwarz Bayesian Criterion, respectively.

Statistics for Selecting the Optimum Lag Order for the ARDL Bound Co-integration Test

Optimum Lag (*k*)	AIC	SBC	Optimum Lag (*k*)	AIC	SBC
	$f(LNSOYBEAN_t \mid LNCPI_t)$			$f(LNSOYBEAN_t \mid LNINFLA_t)$	
1	26.182	23.171	1	26.431	23.420
2	25.958	20.985	2	25.452	20.479
3	25.346	18.450	3	25.218	18.322
4	24.054	15.274	4	23.844	15.064
5	21.996	11.371	5	24.944	14.319
6	19.863	7.435	6	22.076	9.648
7	20.426	6.237	7	21.348	7.159
8	19.332	3.427	8	19.421	3.516
	$f(LNSOYBEAN_t \mid LNMARKI$			$f(LNSOYBEAN_t \mid LNEXPORT$	
1	25.385	22.374	1	28.777	25.766
2	24.422	19.449	2	28.162	23.190
3	24.003	17.107	3	27.797	20.901
4	22.964	14.183	4	27.881	19.101
5	22.042	11.417	5	26.102	15.477
6	21.558	9.130	6	23.632	11.204
7	20.506	6.318	7	24.444	10.255
8	18.237	2.332	8	24.157	8.252
	$f(LNSOYBEAN_t \mid LNIMPOR$			$f(LNSOYBEAN_t \mid LNM0_t)$	
1	26.625	23.614	1	25.336	22.325
2	25.827	20.855	2	24.144	19.172
3	24.739	17.843	3	23.657	16.761
4	24.293	15.512	4	22.766	13.986
5	23.282	12.657	5	24.842	14.217
6	20.859	8.431	6	21.847	9.419
7	20.058	5.870	7	18.827	4.638
8	18.330	2.425	8	17.562	1.657
	$f(LNSOYBEAN_t \mid LNM1_t)$			$f(LNSOYBEAN_t \mid LNM2_t)$	
1	25.316	22.305	1	25.344	22.333
2	26.417	21.445	2	24.569	19.596
3	25.597	18.701	3	23.485	16.589
4	24.596	15.816	4	22.067	13.286
5	23.538	12.913	5	20.308	9.683
6	21.316	8.888	6	17.522	5.094
7	19.299	5.110	7	16.910	2.721
8	17.888	1.983	8	15.332	-0.572
	$f(LNSOYBEAN_t \mid LNM3_t)$			$f(LNSOYBEAN_t \mid LNTRADE_t)$	
1	26.331	23.320	1	25.486	22.475
2	24.866	19.893	2	24.978	20.006
3	24.549	17.653	3	24.771	17.875
4	23.372	14.592	4	22.839	14.059
5	24.091	13.466	5	20.475	9.850
6	21.498	9.070	6	17.919	5.491
7	19.372	5.183	7	16.150	1.962
8	23.426	7.521	8	14.712	-1.192

Notes: AIC and SBC indicate the Akaike Info. Criterion and Schwarz Bayesian Criterion, respectively.

Statistics for Selecting the Optimum Lag Order for the ARDL Bound Co-integration Test

Optimum Lag (k)	AIC	SBC	Optimum Lag (k)	AIC	SBC
	$f(LNSOYBEAN_t \mid LNDOMES$			$f(LNSOYBEAN_t \mid LNRESERV$	
1	25.495	22.484	1	25.452	22.441
2	24.227	19.255	2	27.020	22.048
3	26.043	19.147	3	26.078	19.182
4	24.938	16.158	4	24.243	15.463
5	24.831	14.206	5	22.574	11.949
6	22.787	10.359	6	19.850	7.422
7	20.786	6.597	7	19.058	4.869
8	19.098	3.193	8	17.449	1.544
	$f(LNSOYBEAN_t \mid LNSTOCK_t$			$f(LNWHEAT_t \mid LNCPI_t)$	
1	25.425	22.414	1	28.092	25.081
2	24.394	19.422	2	26.791	21.819
3	24.672	17.776	3	24.650	17.754
4	22.591	13.810	4	25.537	16.756
5	20.700	10.074	5	22.449	11.824
6	17.688	5.260	6	20.454	8.026
7	16.026	1.837	7	25.380	11.192
8	14.035	-1.870	8	23.370	7.465
	$f(LNWHEAT_t \mid LNINFLA_t)$			$f(LNWHEAT_t \mid LNMARKET_t)$	
1	28.432	25.421	1	27.812	24.801
2	27.164	22.191	2	28.019	23.046
3	26.078	19.182	3	25.598	18.702
4	27.371	18.591	4	26.484	17.703
5	25.887	15.262	5	25.837	15.212
6	24.232	11.804	6	24.678	12.250
7	21.651	7.462	7	21.550	7.361
8	19.174	3.269	8	18.887	2.982
	$f(LNWHEAT_t \mid LNEXPORT_t$			$f(LNWHEAT_t \mid LNIMPORT_t)$	
1	28.828	25.817	1	27.945	24.934
2	26.284	21.311	2	25.711	20.738
3	25.023	18.127	3	23.411	16.514
4	25.720	16.940	4	23.802	15.022
5	25.424	14.799	5	22.458	11.833
6	22.345	9.917	6	20.702	8.274
7	19.637	5.449	7	19.708	5.519
8	16.578	0.673	8	18.245	2.340
	$f(LNWHEAT_t \mid LNM0_t)$			$f(LNWHEAT_t \mid LNM1_t)$	
1	30.706	27.695	1	27.808	24.797
2	28.080	23.108	2	25.697	20.725
3	25.093	18.197	3	23.574	16.678
4	26.015	17.235	4	24.628	15.848
5	23.887	13.262	5	22.386	11.761
6	23.830	11.402	6	23.935	11.507
7	21.159	6.971	7	21.923	7.734
8	18.502	2.597	8	23.093	7.188

Notes: AIC and SBC indicate the Akaike Info. Criterion and Schwarz Bayesian Criterion, respectively.

Statistics for Selecting the Optimum Lag Order for the ARDL Bound Co-integration Test

Optimum Lag (k)	AIC	SBC	Optimum Lag (k)	AIC	SBC
	$f(LNWHEAT_t \mid LNM2_t)$			$f(LNWHEAT_t \mid LNM3_t)$	
1	28.346	25.335	1	29.592	26.581
2	26.258	21.285	2	27.181	22.208
3	24.068	17.172	3	24.243	17.347
4	23.668	14.887	4	24.556	15.775
5	20.881	10.256	5	22.410	11.785
6	18.288	5.860	6	20.041	7.613
7	15.447	1.258	7	17.147	2.958
8	13.514	-2.391	8	15.796	-0.108
	$f(LNWHEAT_t \mid LNTRADE_t)$			$f(LNWHEAT_t \mid LNDOMESTIC$	
1	30.382	27.371	1	27.808	24.797
2	27.909	22.937	2	25.444	20.471
3	25.385	18.489	3	23.095	16.199
4	24.473	15.692	4	22.653	13.873
5	22.907	12.282	5	20.919	10.294
6	20.969	8.541	6	22.263	9.835
7	17.982	3.793	7	20.043	5.854
8	15.191	-0.713	8	16.905	0.999
	$f(LNWHEAT_t \mid LNRESERVE$			$f(LNWHEAT_t \mid LNSTOCK_t)$	
1	27.809	24.798	1	29.240	26.229
2	25.450	20.477	2	31.375	26.403
3	23.801	16.905	3	29.017	22.121
4	23.442	14.661	4	27.266	18.486
5	20.492	9.867	5	24.776	14.151
6	17.984	5.556	6	23.412	10.983
7	16.504	2.315	7	20.690	6.501
8	13.569	-2.336	8	17.900	1.995

Notes: AIC and SBC indicate the Akaike Info. Criterion and Schwarz Bayesian Criterion, respectively.

APPENDIX 4.2: ARDL Diagnostic Test Result for Malaysia

ARDL Diagnostic and Stability Tests Result

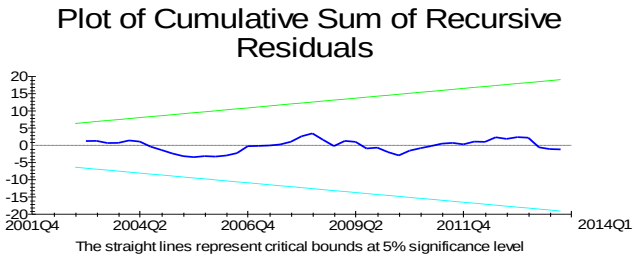
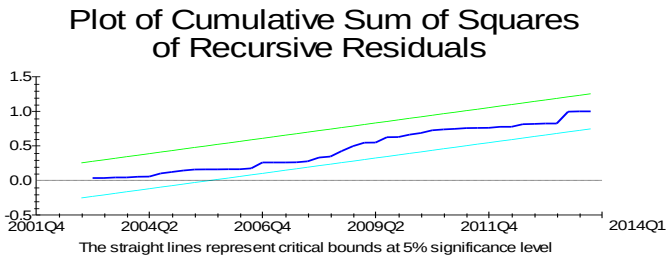
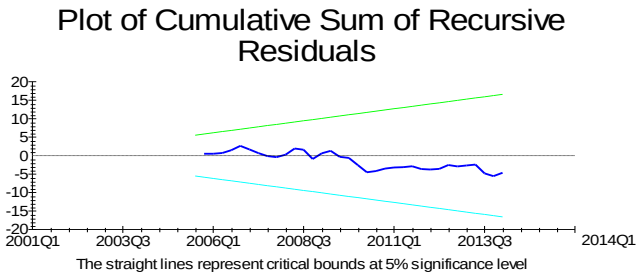
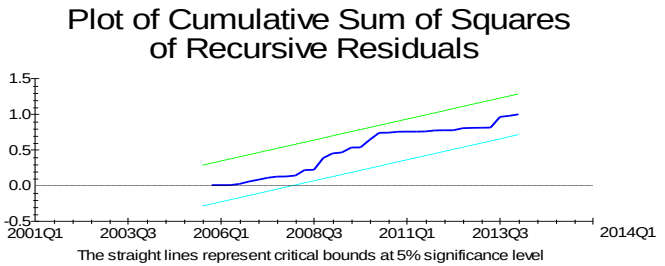
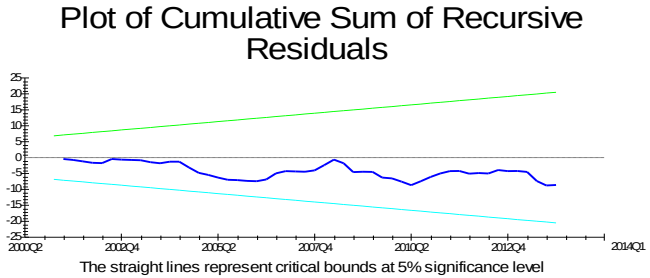
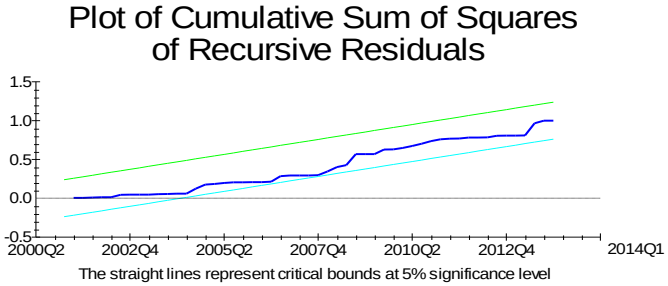
ARDL Diagnostic Tests Result for Malaysia

Dependent Variable	Independent Variable	Serial Correlation [a] [Prob]	Functional Form [b] [Prob]	Normality [c] [Prob]	Heteroscedasticity [d] [Prob]
LNCORN	LNCPI	7.285[0.122]	0.118[0.731]	0.606[0.739]	2.283[0.131]
LNCORN	LNMARKET	11.950[0.018]	0.022[0.881]	0.358[0.836]	0.616[0.433]
LNCORN	LNM1	14.641[0.006]	0.302[0.582]	1.492[0.474]	3.802[0.051]
LNCORN	LNM2	7.663[0.105]	0.021[0.885]	0.614[0.736]	1.679[0.195]
LNCORN	LNM3	4.599[0.331]	0.269[0.604]	0.263[0.877]	0.494[0.482]
LNCORN	LNDOMESTIC	7.030[0.134]	0.764[0.382]	0.268[0.875]	1.802[0.179]
LNSOYBEAN	LNM3	6.334[0.175]	0.002[0.964]	2.250[0.325]	0.029[0.864]
LNWHEAT	LNEXPORT	4.566[0.335]	1.434[0.231]	5.730[0.057]	0.407[0.523]
LNWHEAT	LNIMPORT	4.604[0.330]	1.569[0.210]	6.157[0.046]	0.390[0.532]
LNWHEAT	LNDOMESTIC	3.297[0.510]	0.288[0.592]	6.919[0.031]	0.127[0.722]

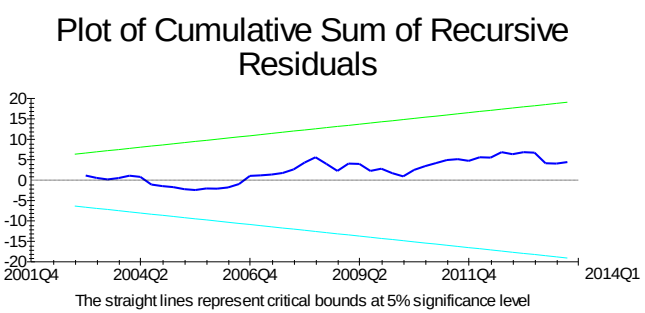
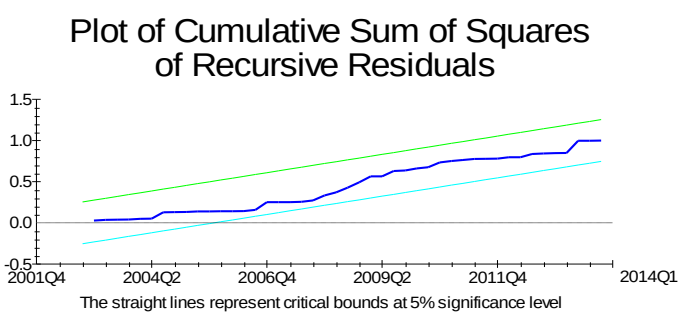
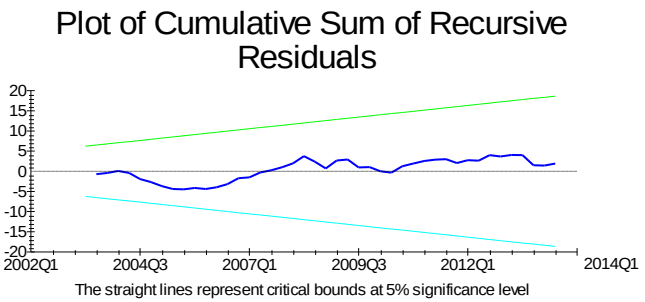
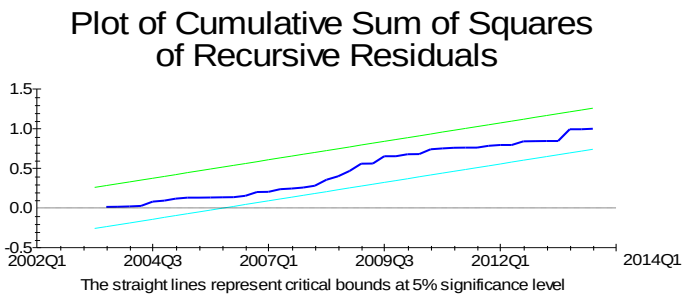
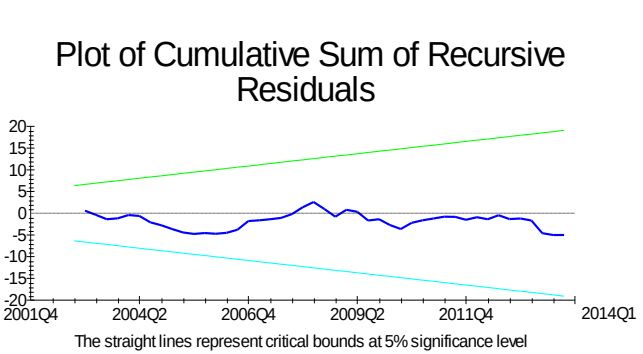
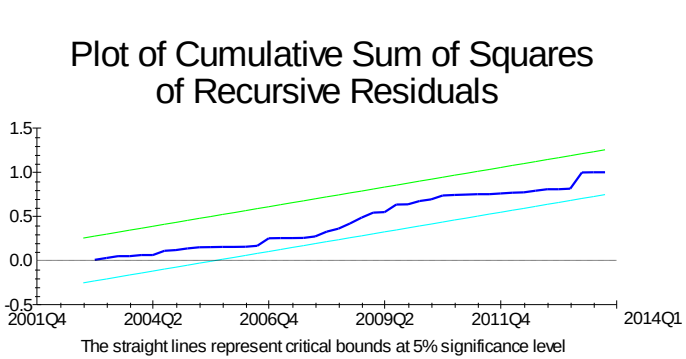
Notes: [a] Lagrange multiplier test of residual serial correlation. [b] Ramsey's RESET test using the square of the fitted values. [c] Based on a test of skewness and kurtosis of residuals and [d] Based on the regression of squared residuals on squared fitted values.

APPENDIX 4.3: ARDL Stability Test Results for Malaysia

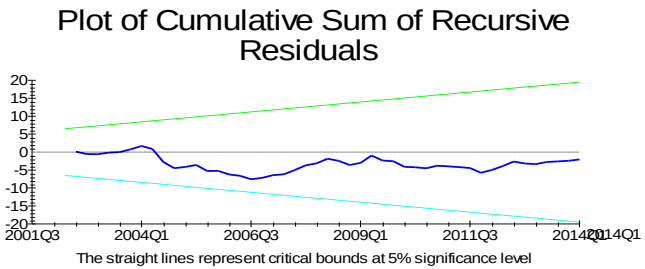
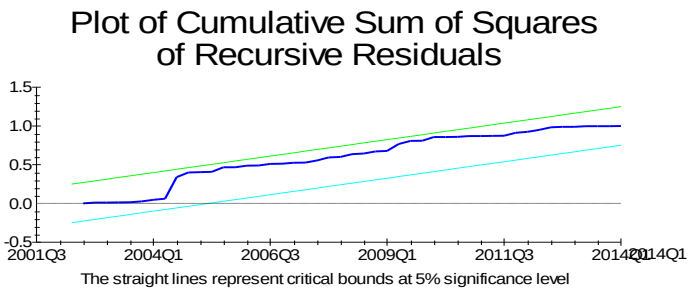
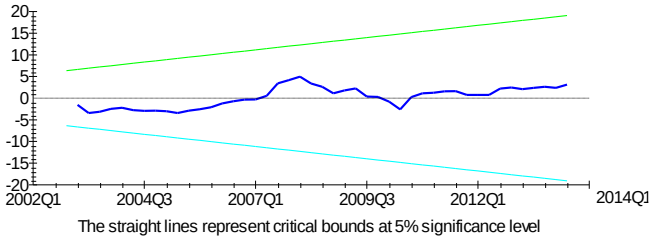
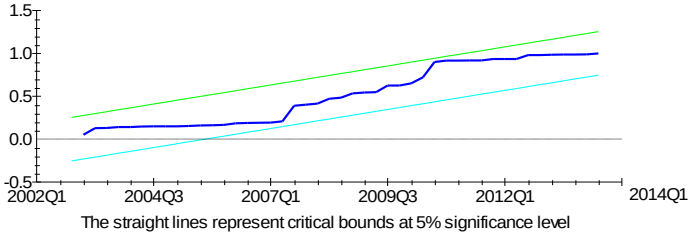
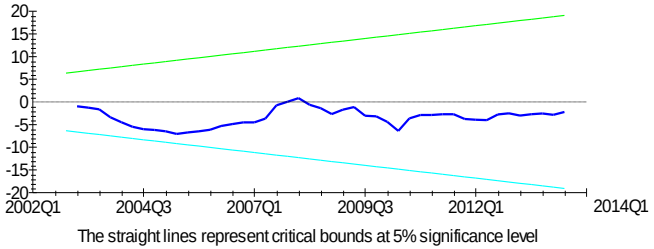
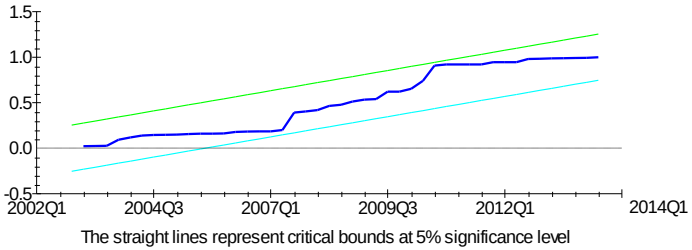
ARDL Stability Tests Result for Malaysia

Dependent Variable	Independent Variable	Cusum Test	Cusum Sq Test
LNCORN	LNCPI		
LNCORN	LNMARKET		
LNCORN	LNM1		

ARDL Stability Tests Result for Malaysia (Con't)

Dependent Variable	Independent Variable	Cusum Test	Cusum Sq Test
LNCORN	LNM2		
LNCORN	LNM3		
LNCORN	LNDOMESTIC		

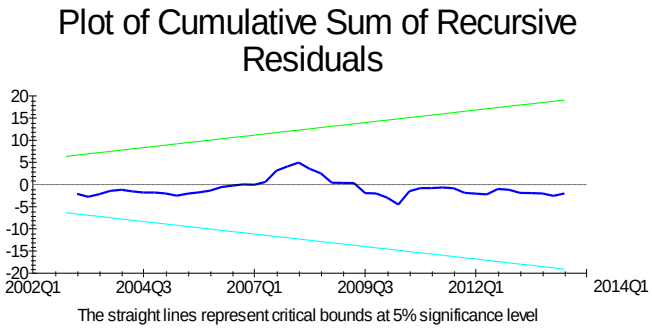
ARDL Stability Tests Result for Malaysia (Con't)

Dependent Variable	Independent Variable	Cusum Test	Cusum Sq Test
LNSOYBEAN	LNM3		
LNWHEAT	LNEXPORT		
LNWHEAT	LNIMPORT		

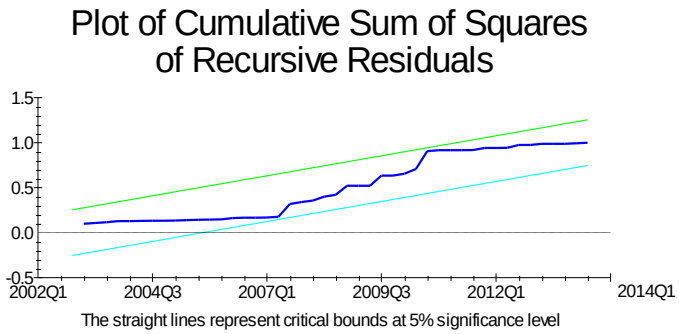
ARDL Stability Tests Result for Malaysia (Con't)

Dependent Variable	Independent Variable
LNWHEAT	LNDOMESTIC

Cusum Test

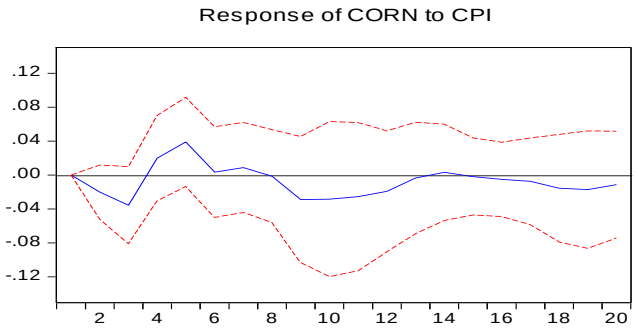
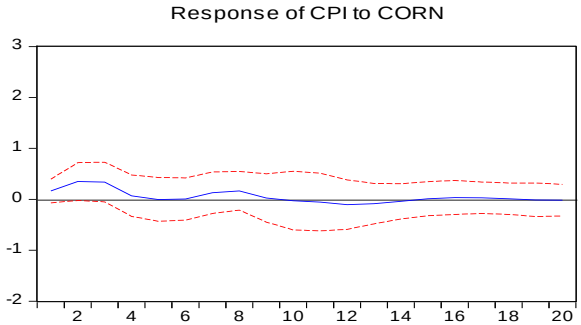
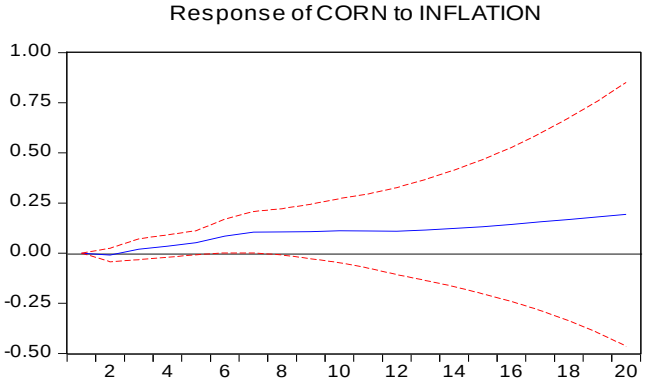
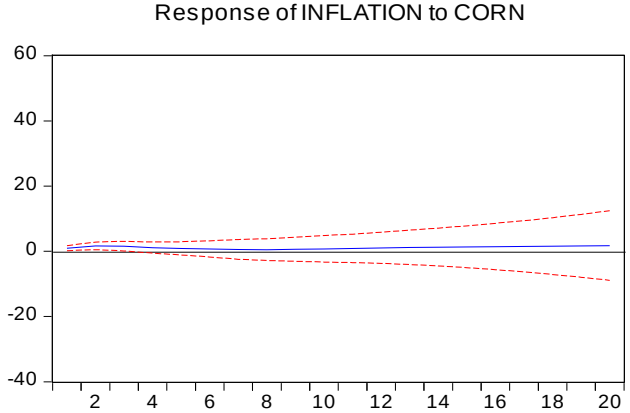


Cusum Sq Test

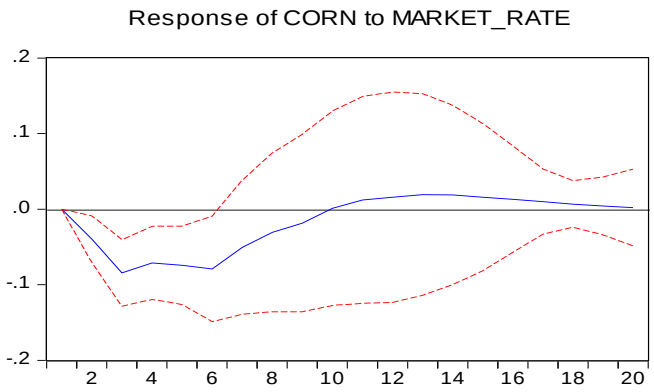
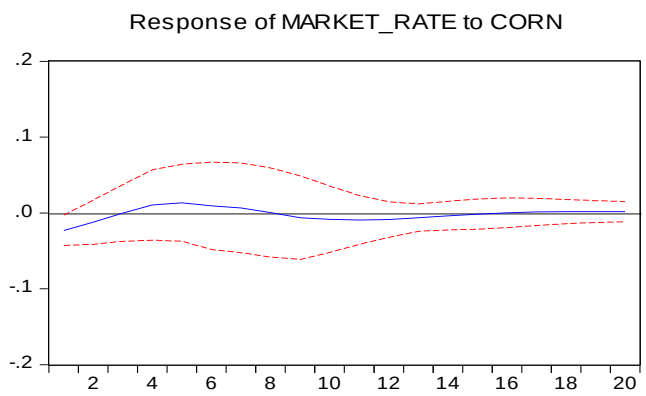
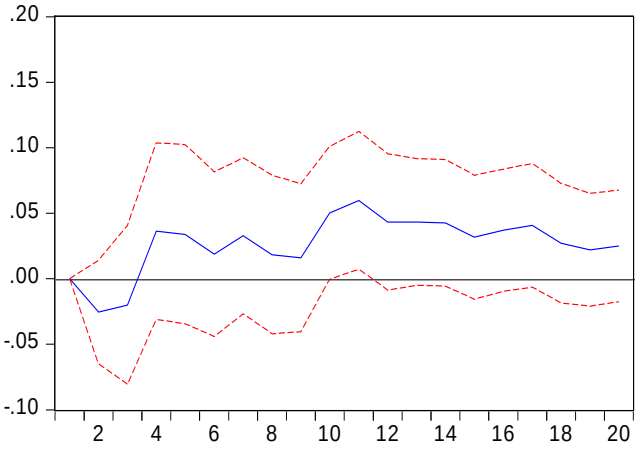
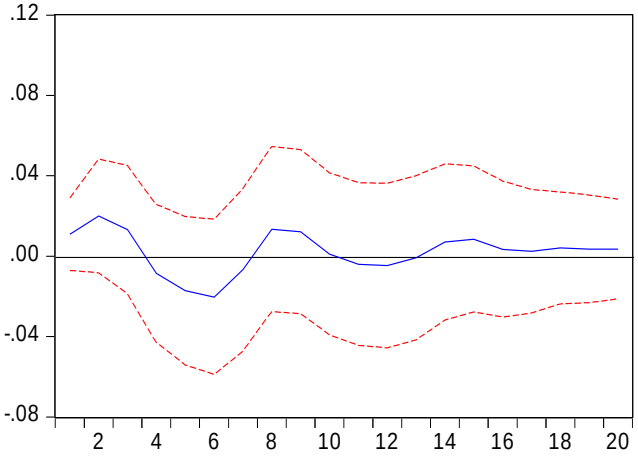


APPENDIX 4.4: Impulse Response Results

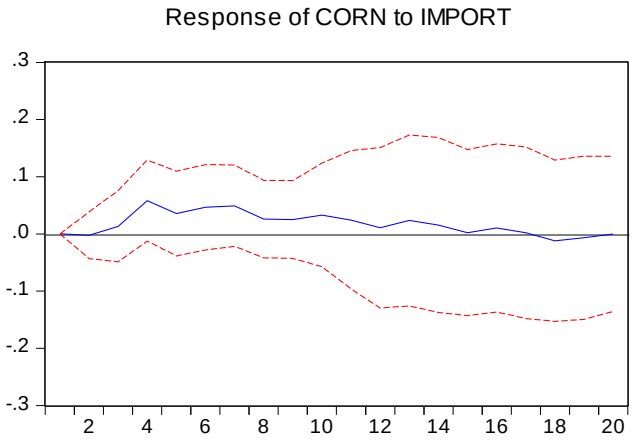
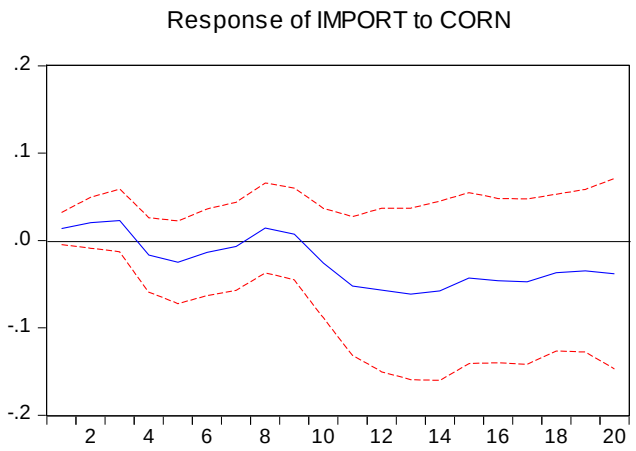
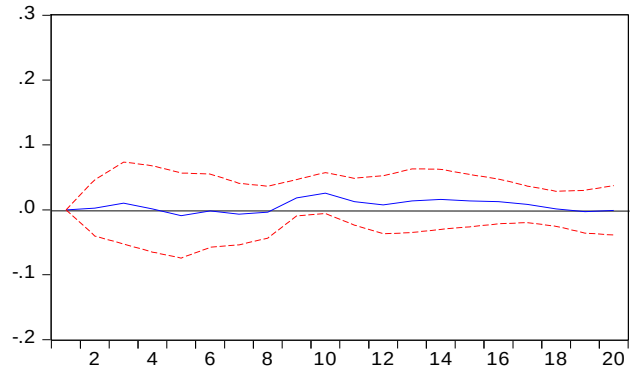
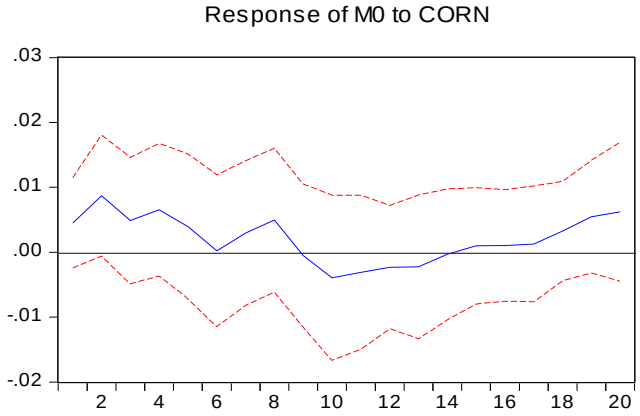
Impulse Response

Dependent Variable	Independent Variable	Dependent variable to dependent variable	Independent variable to dependent variable
CORN	CPI		
CORN	INFLATION		

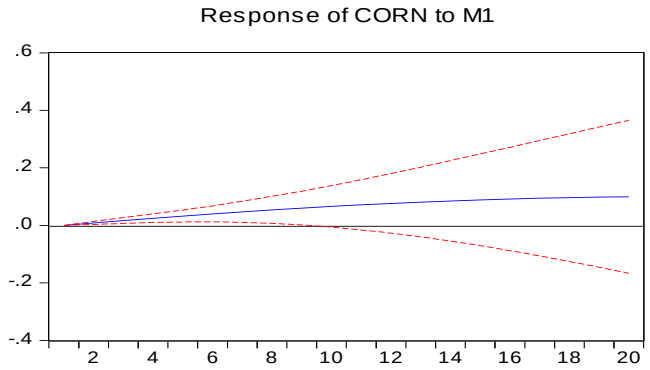
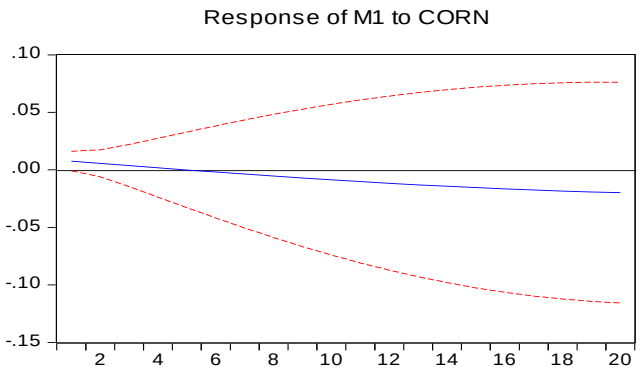
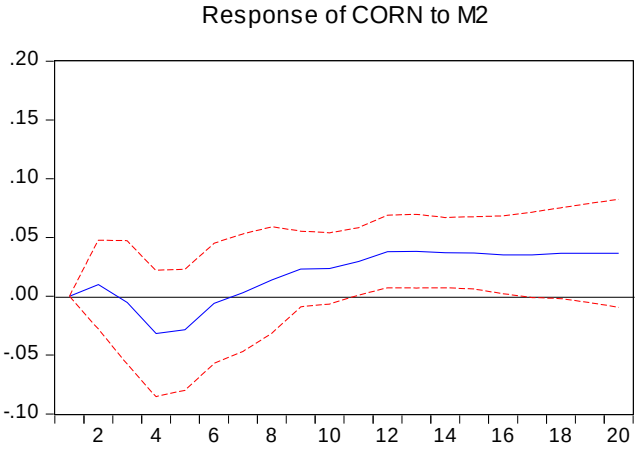
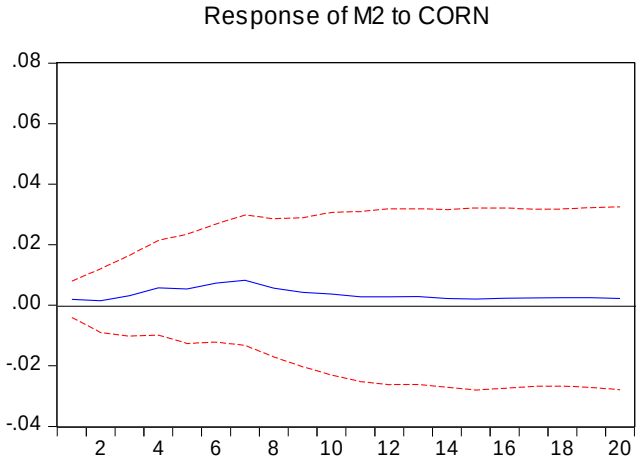
Impulse Response (continued)

Dependent Variable	Independent Variable	Dependent variable to dependent variable	Independent variable to dependent variable
CORN	MARKET		
CORN	EXPORT		

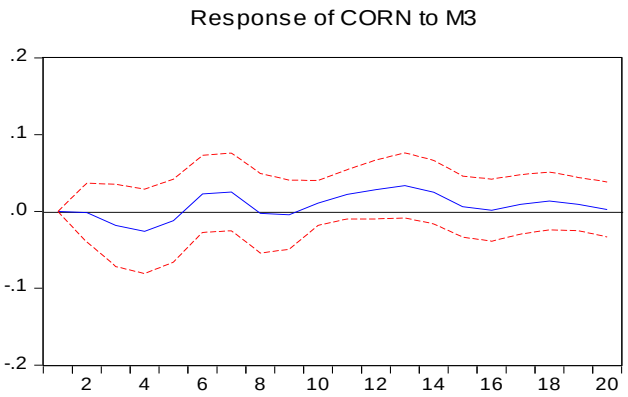
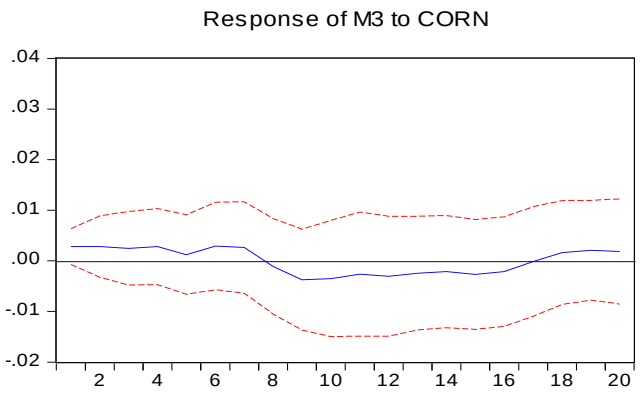
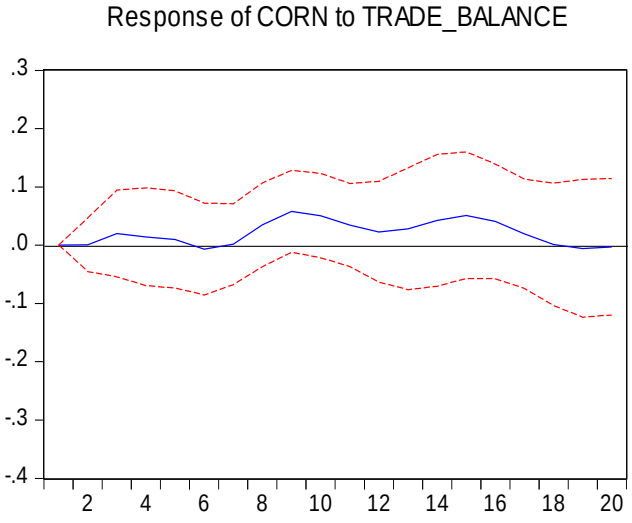
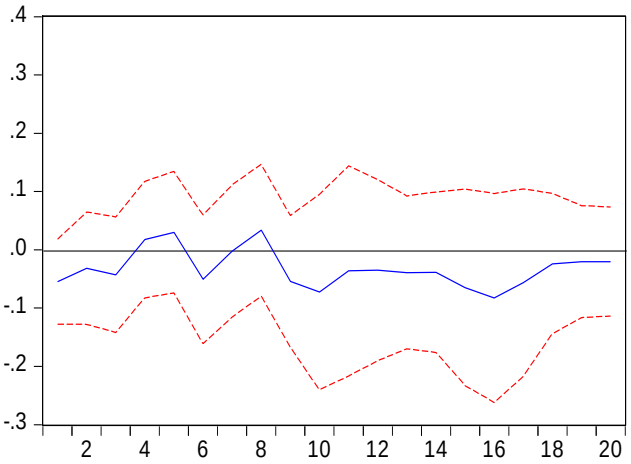
Impulse Response (continued)

Dependent Variable	Independent Variable	Dependent variable to dependent variable	Independent variable to dependent variable
CORN	IMPORT		
CORN	M0		

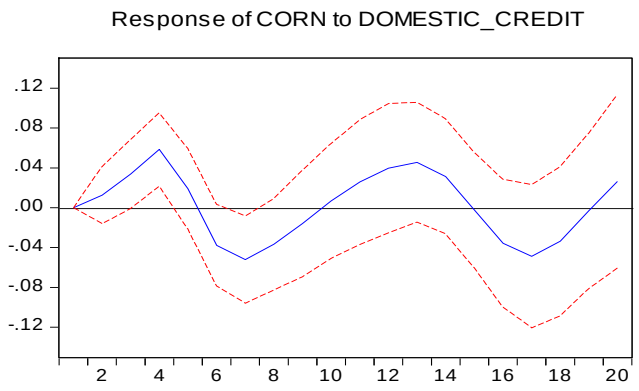
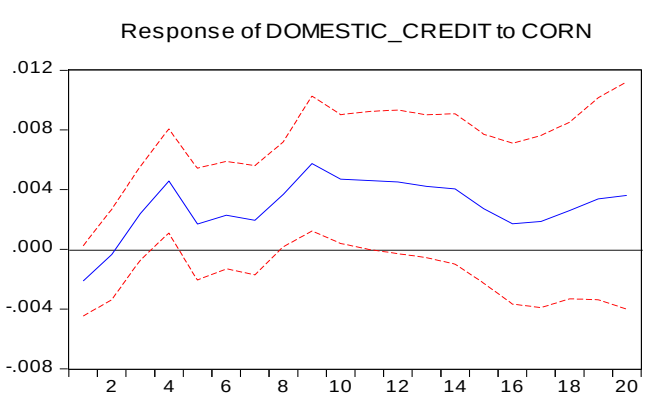
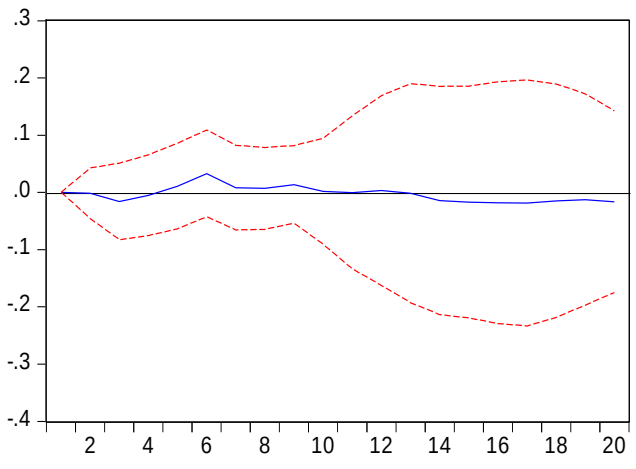
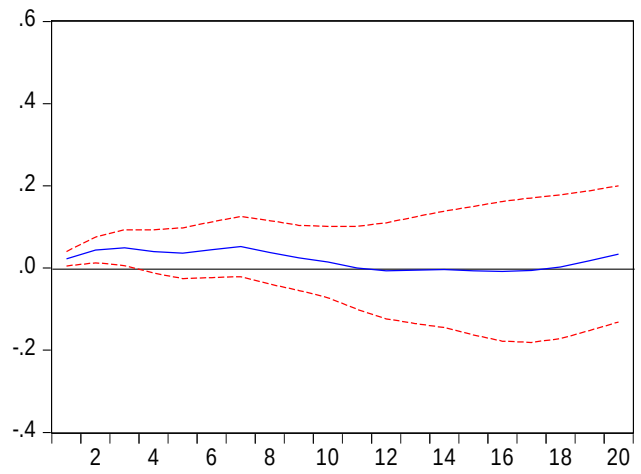
Impulse Response (continue…)

Dependent Variable	Independent Variable	Dependent variable to dependent variable	Independent variable to dependent variable
CORN	M1		
CORN	M2		

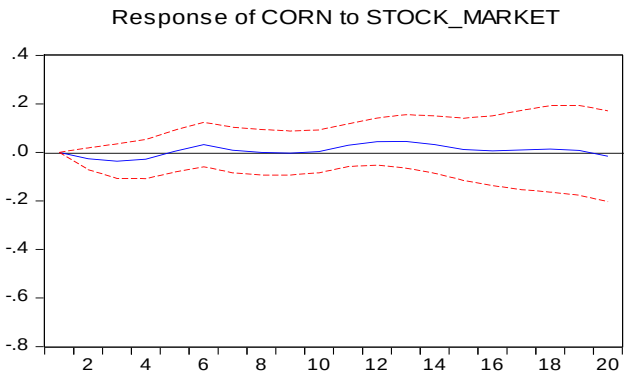
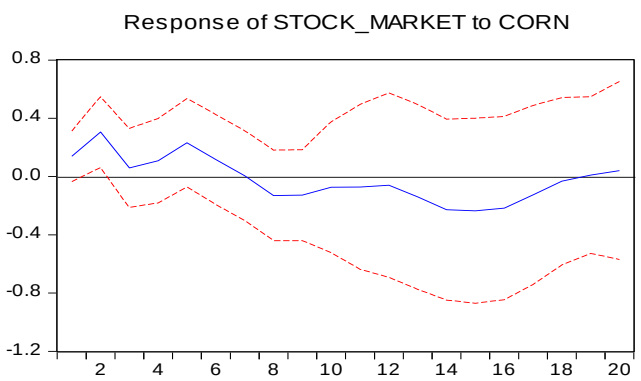
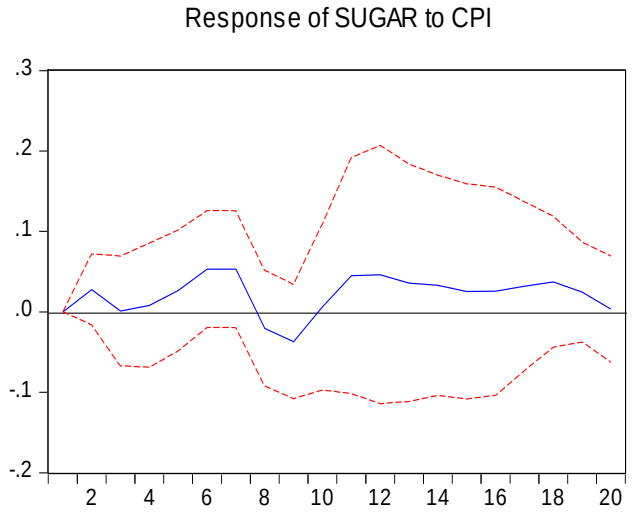
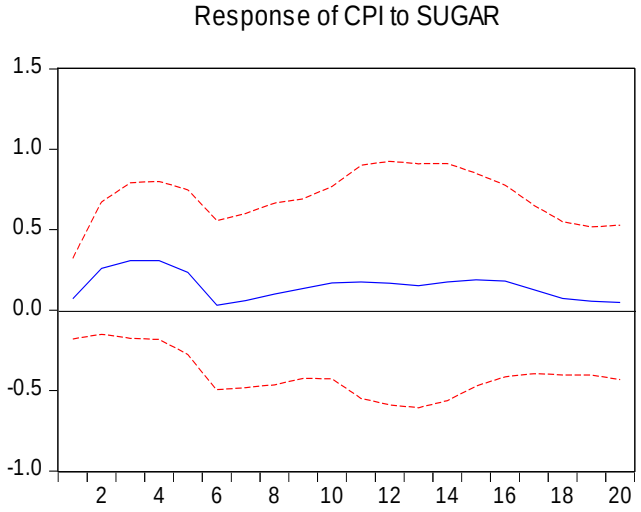
Impulse Response (continued)

Dependent Variable	Independent Variable	Dependent variable to dependent variable	Independent variable to dependent variable
CORN	M3		
CORN	TRADE		

Impulse Response (continued)

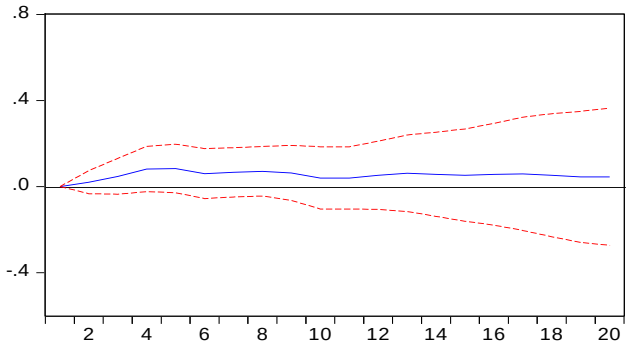
Dependent Variable	Independent Variable	Dependent variable to dependent variable	Independent variable to dependent variable
CORN	DOMESTIC		
CORN	RESERVES		

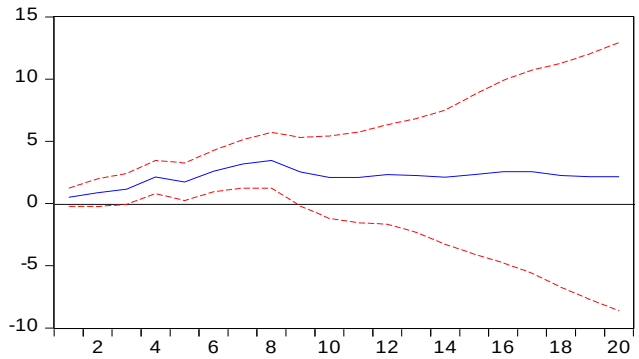
Impulse Response (continued)

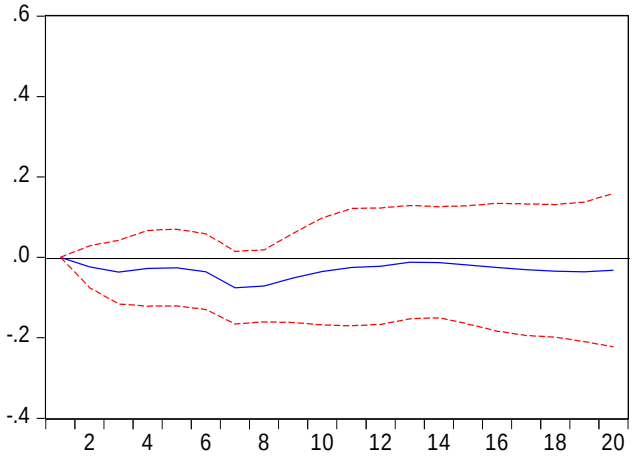
Dependent Variable	Independent Variable	Dependent variable to dependent variable	Independent variable to dependent variable
CORN	STOCK		
SUGAR	CPI		

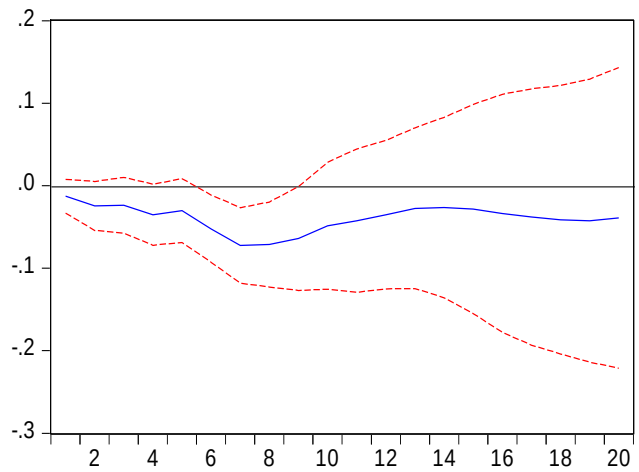
Impulse Response (continued)

Dependent Variable	Independent Variable	Dependent variable to dependent variable	Independent variable to dependent variable
SUGAR	INFLATION	Response of SUGAR to INFLATION	Response of INFLATION to SUGAR
SUGAR	MARKET	Response of SUGAR to MARKET_RATE	Response of MARKET_RATE to SUGAR

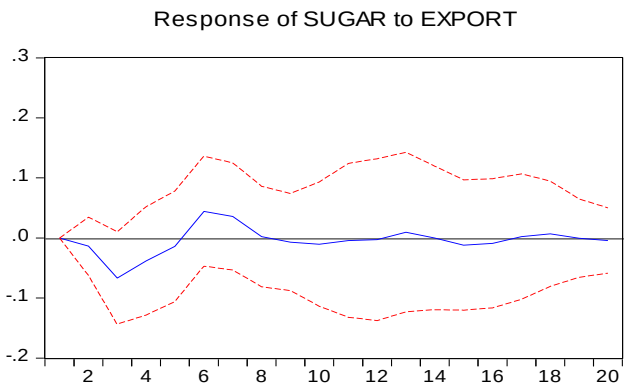
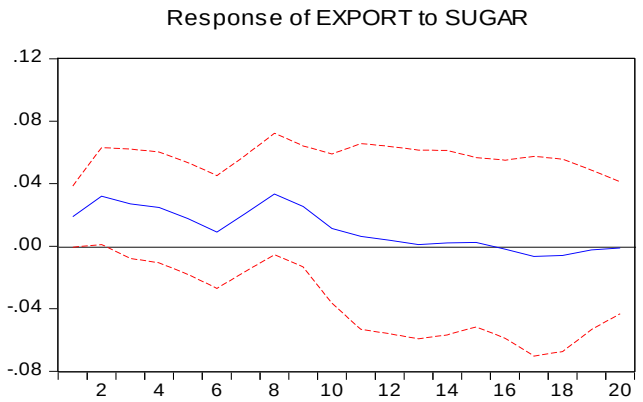
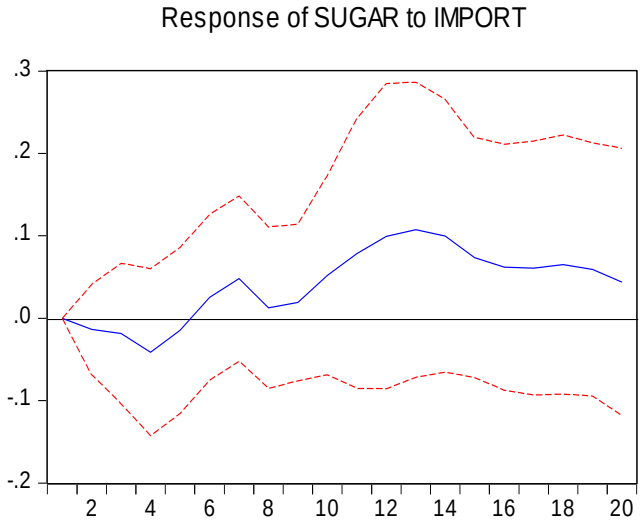
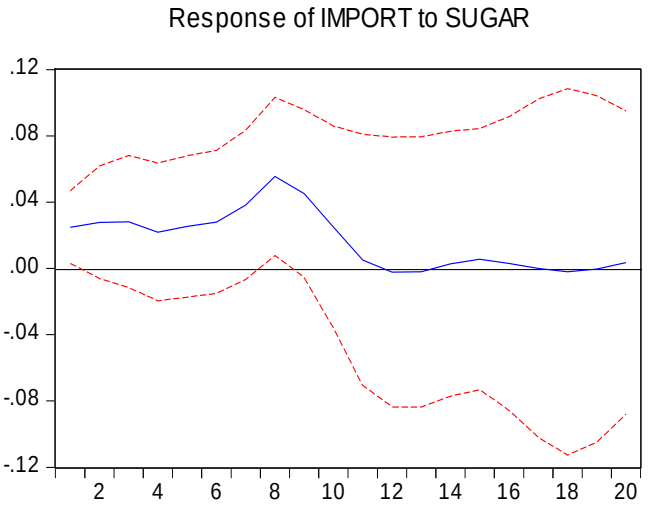




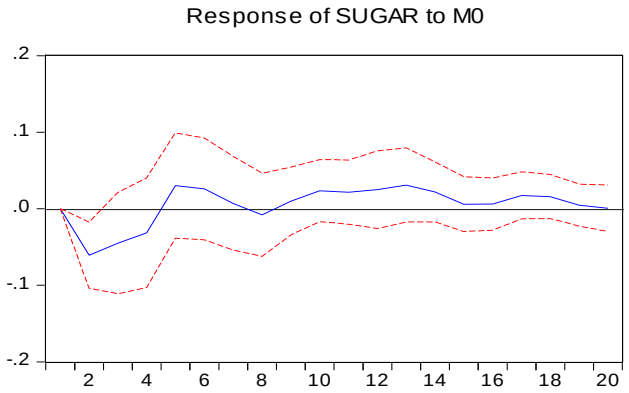
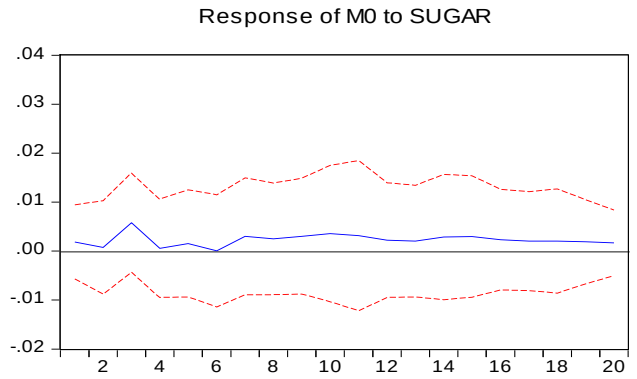
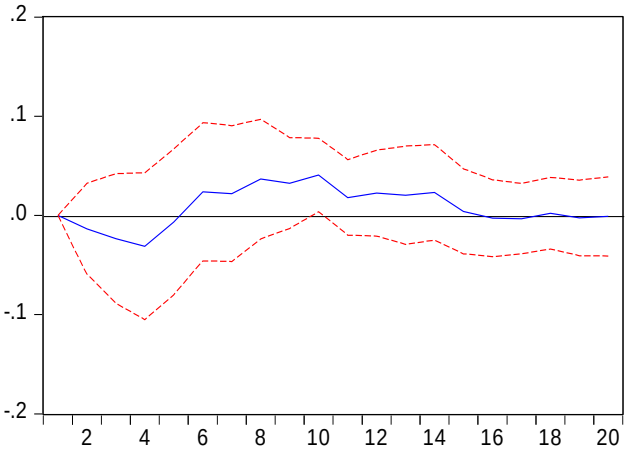
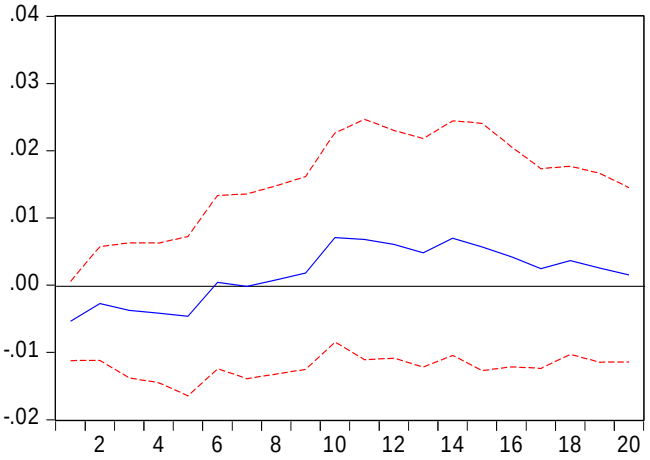




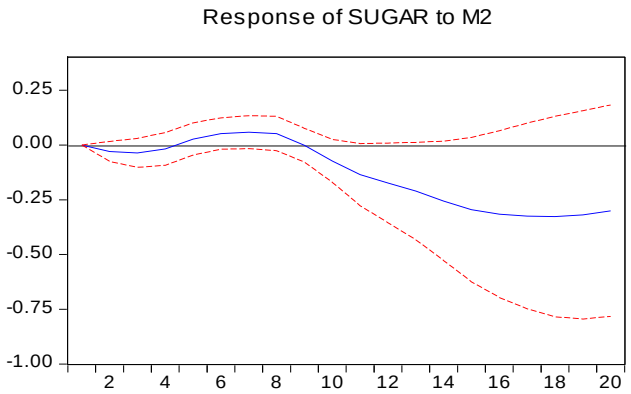
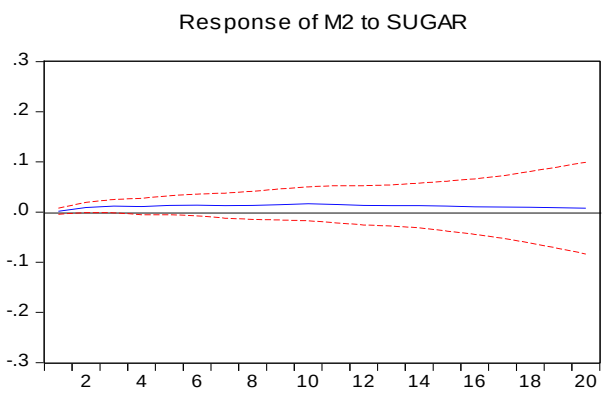
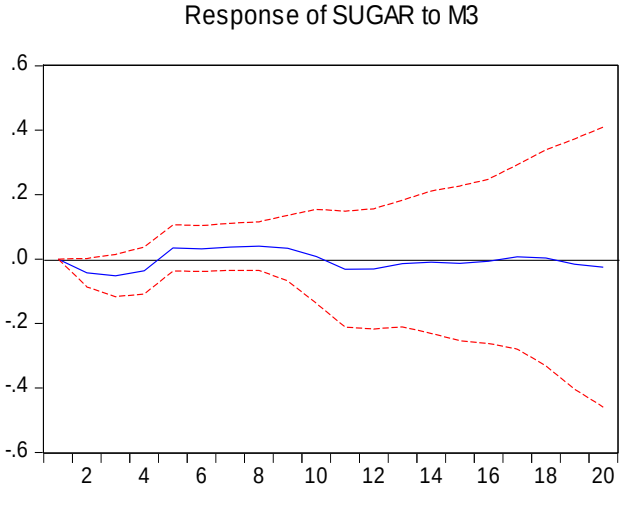
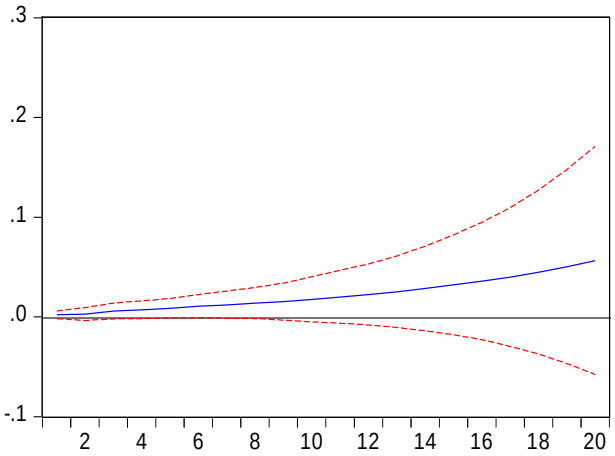
Impulse Response (continued)

Dependent Variable	Independent Variable	Dependent variable to dependent variable	Independent variable to dependent variable
SUGAR	EXPORT		
SUGAR	IMPORT		

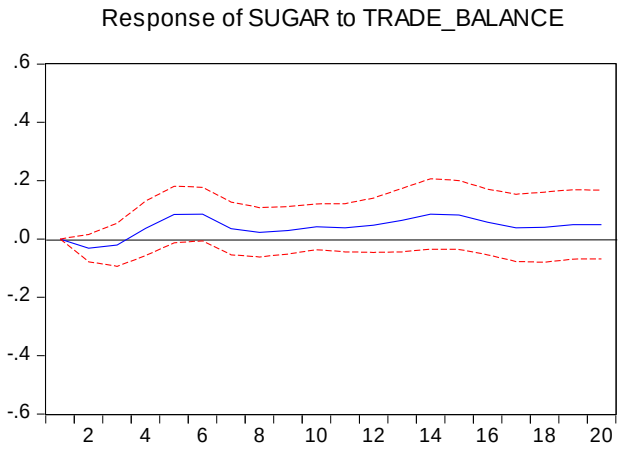
Impulse Response (continued)

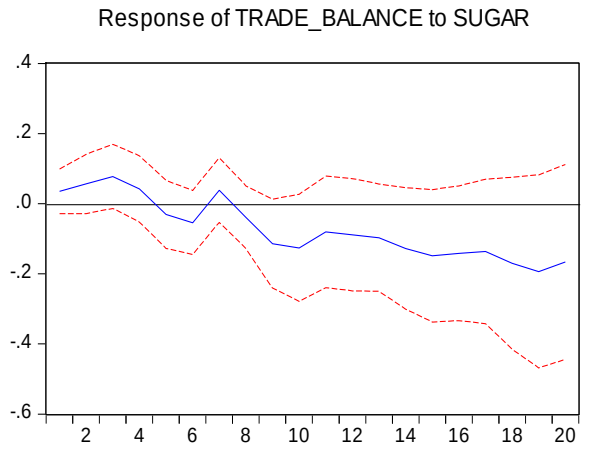
Dependent Variable	Independent Variable	Dependent variable to dependent variable	Independent variable to dependent variable
SUGAR	M0		
SUGAR	M1		

Impulse Response (continue…)

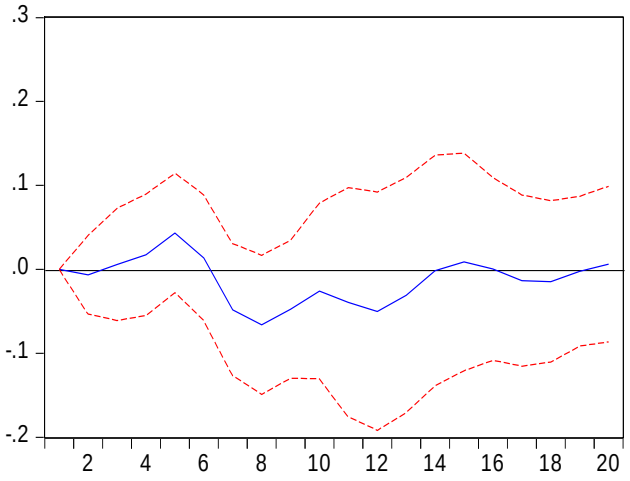
Dependent Variable	Independent Variable	Dependent variable to dependent variable	Independent variable to dependent variable
SUGAR	M2		
SUGAR	M3		

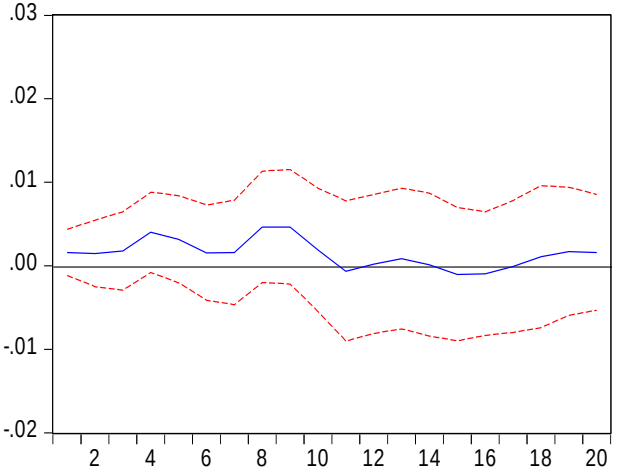
SUGAR TRADE



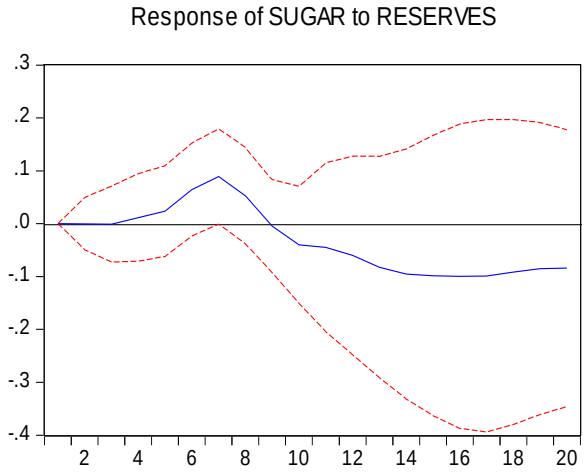


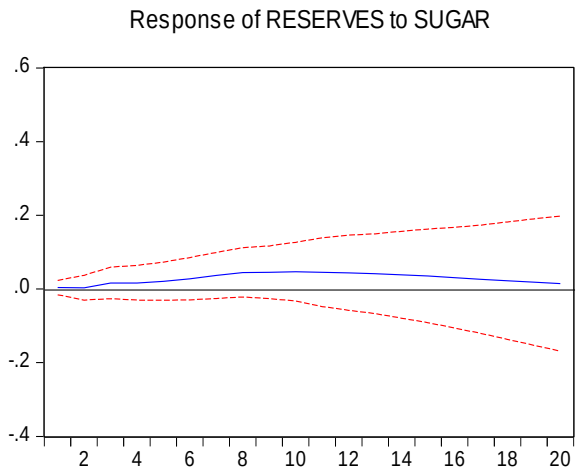
SUGAR DOMESTIC



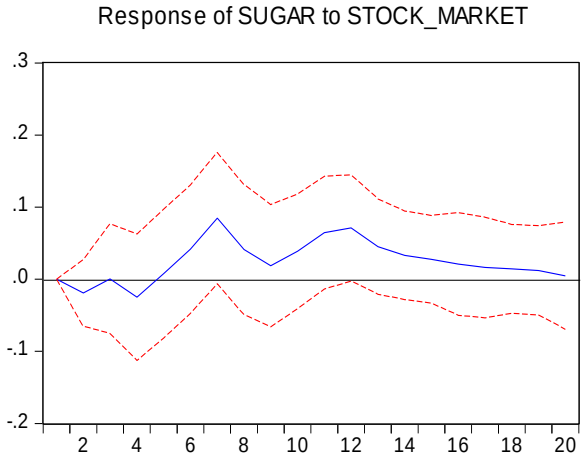


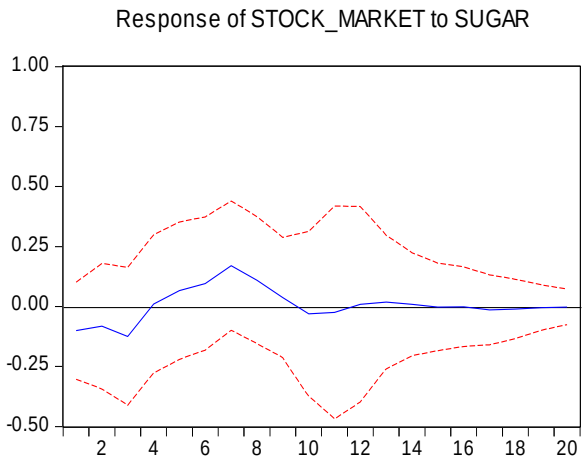
SUGAR RESERVES



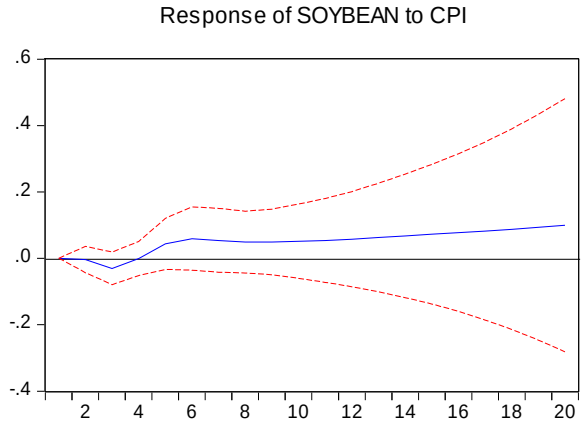


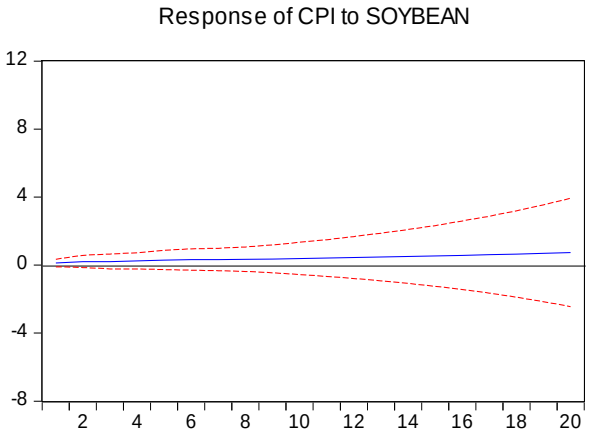
SUGAR STOCK



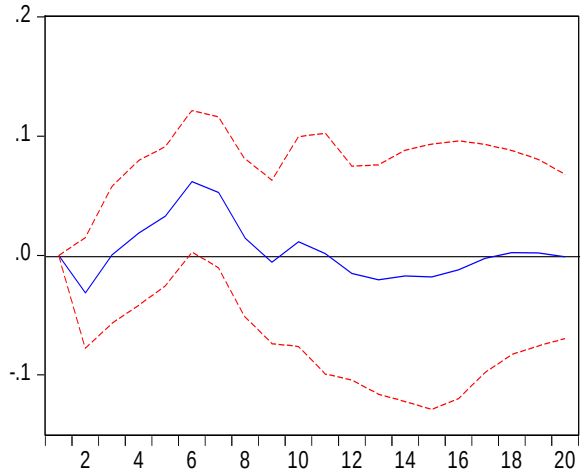


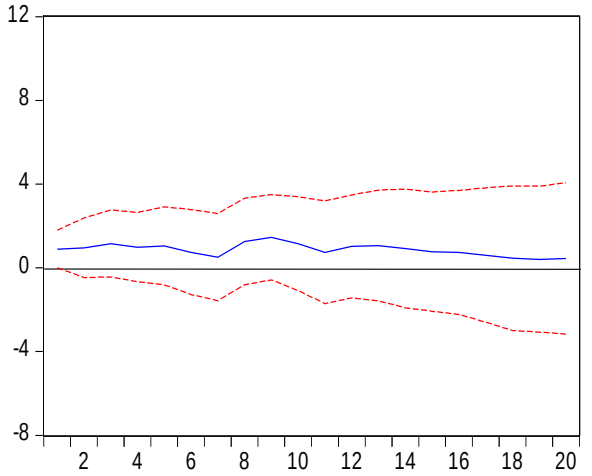
SOYBEAN CPI



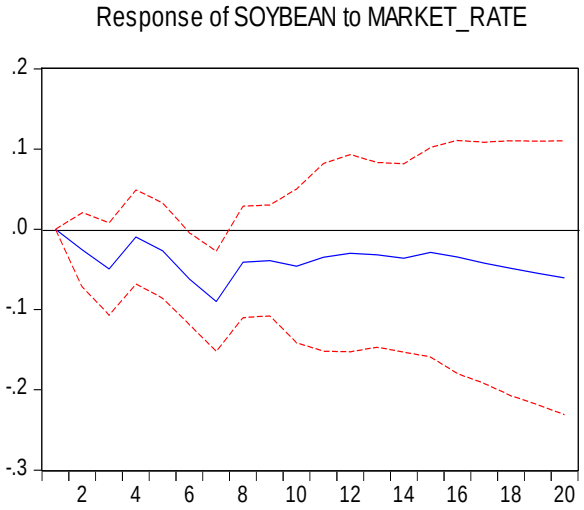


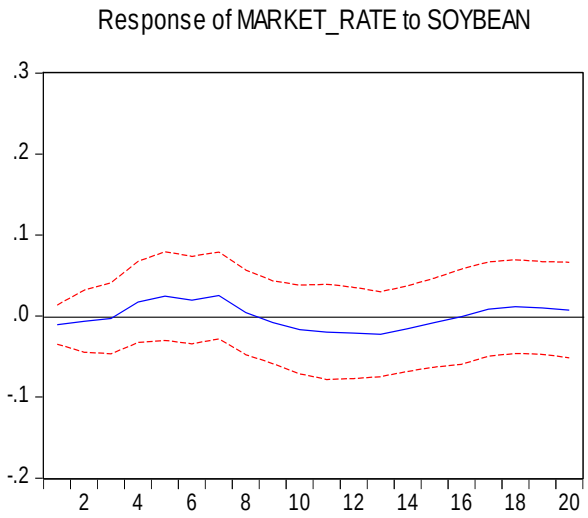
SOYBEAN INFLATION



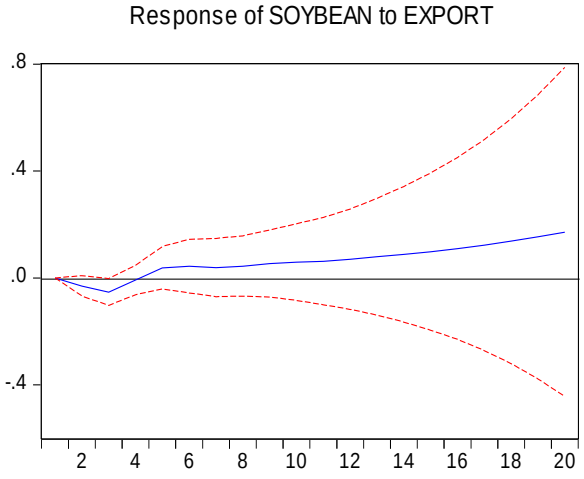


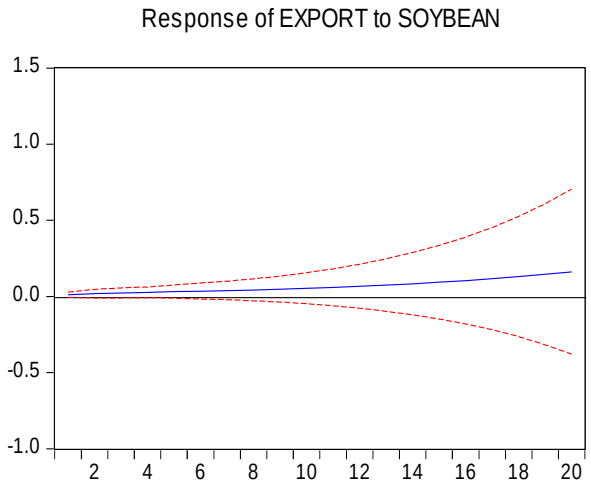
SOYBEAN MARKET



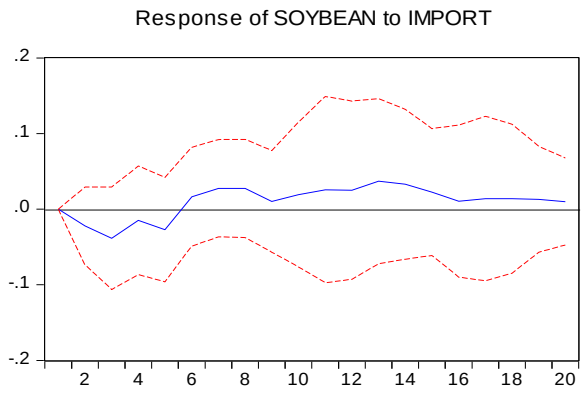
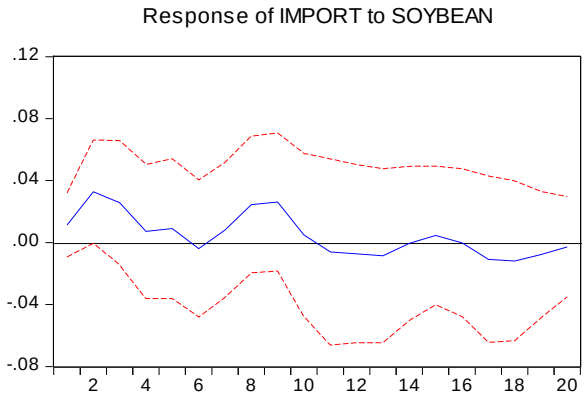
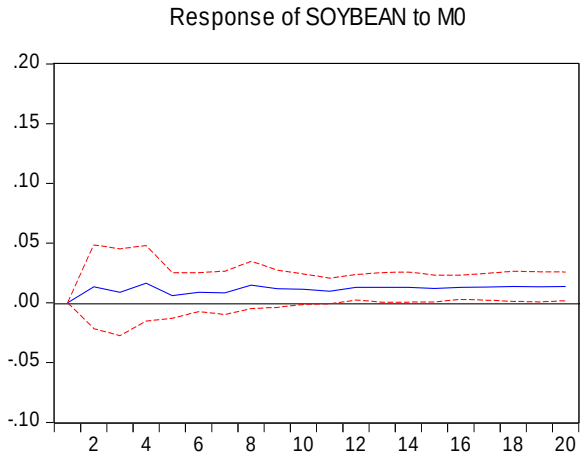
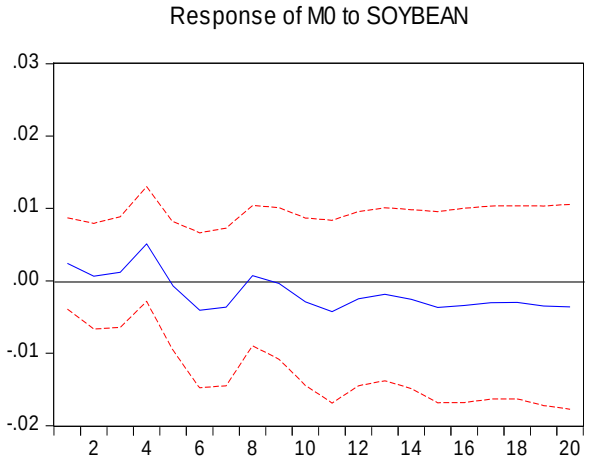


SOYBEAN EXPORT

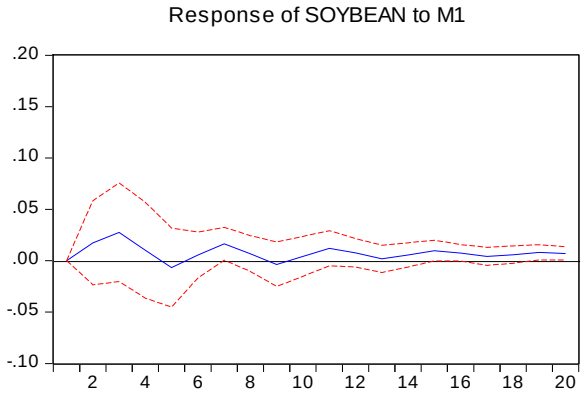


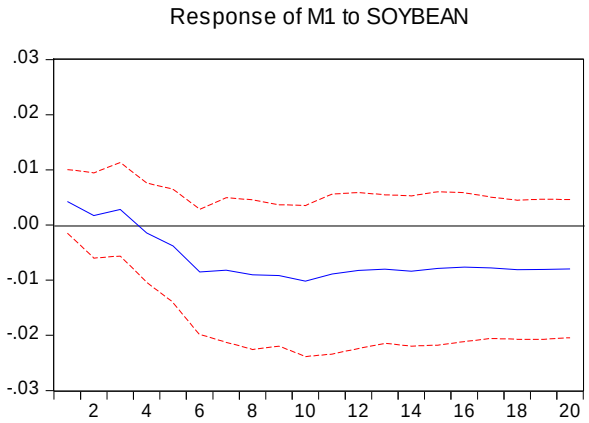


Impulse Response (continue…)

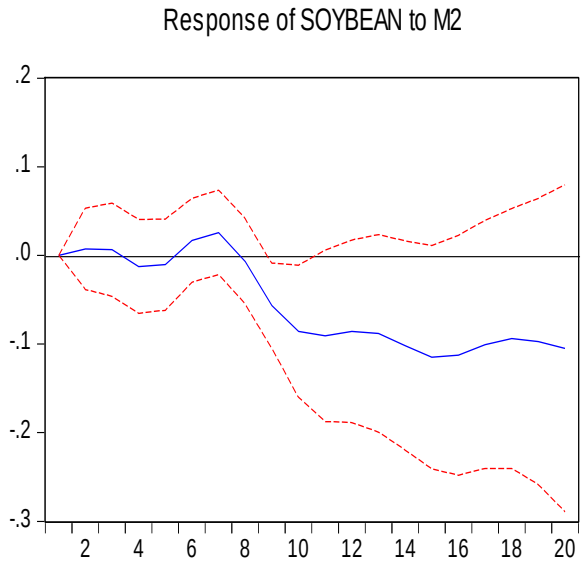
Dependent Variable	Independent Variable	Dependent variable to dependent variable	Independent variable to dependent variable
SOYBEAN	IMPORT		
SOYBEAN	M0		

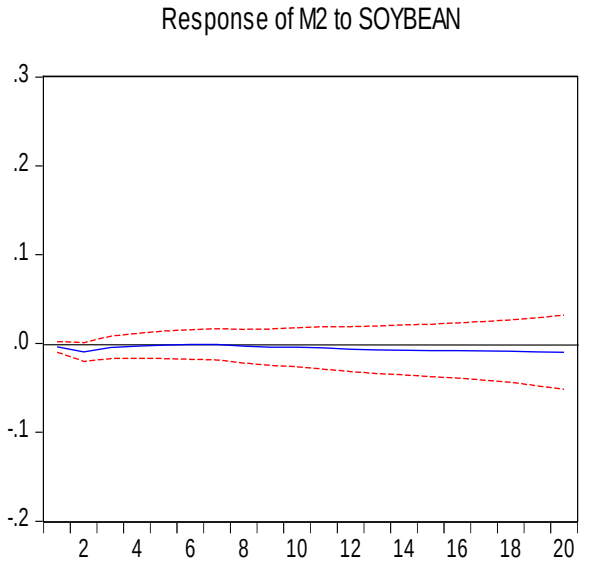
SOYBEAN M1



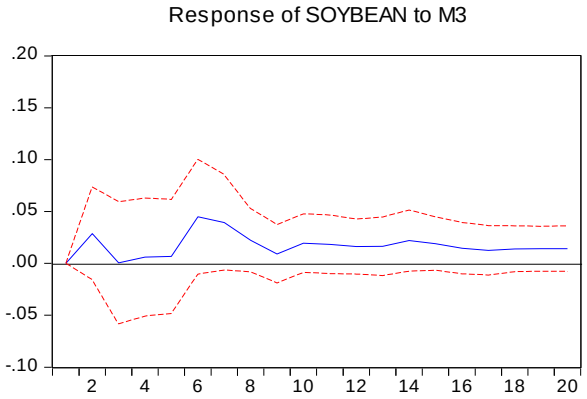


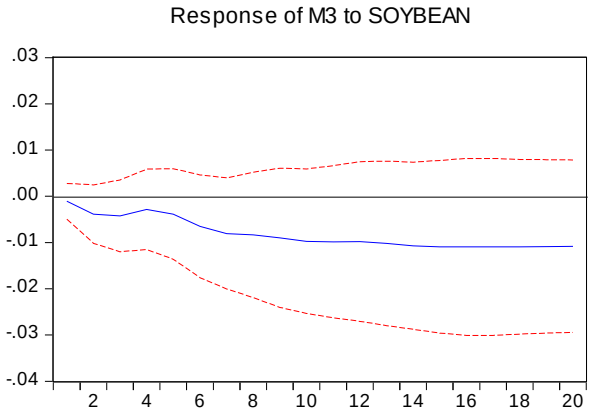
SOYBEAN M2



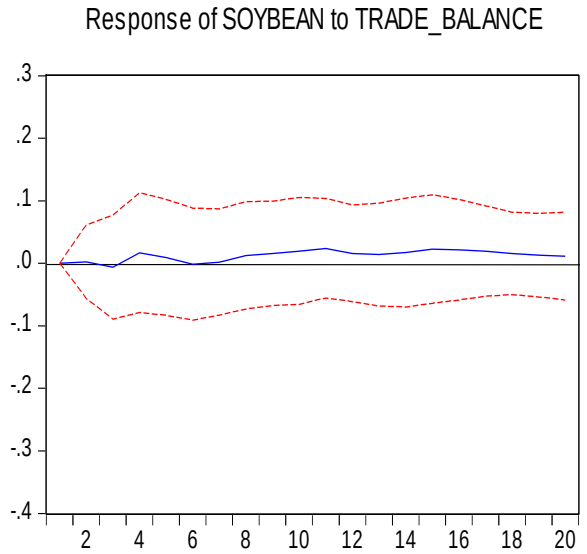


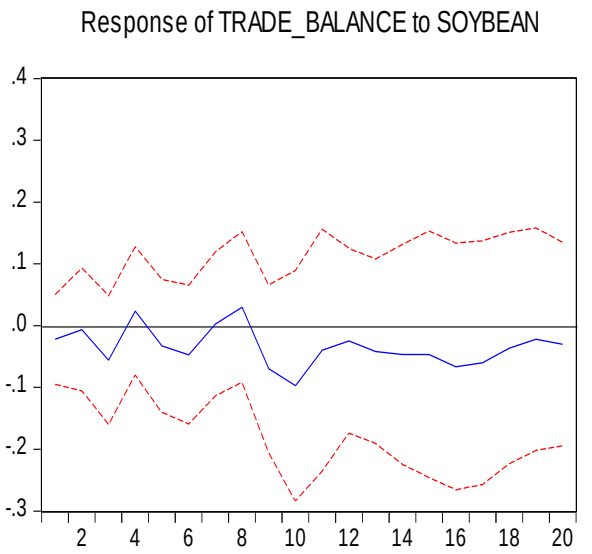
SOYBEAN M3



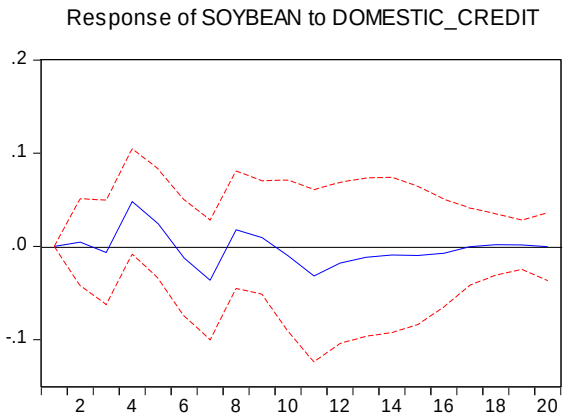


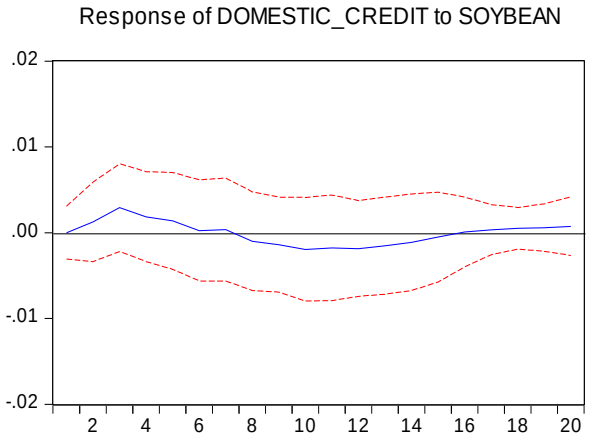
SOYBEAN TRADE



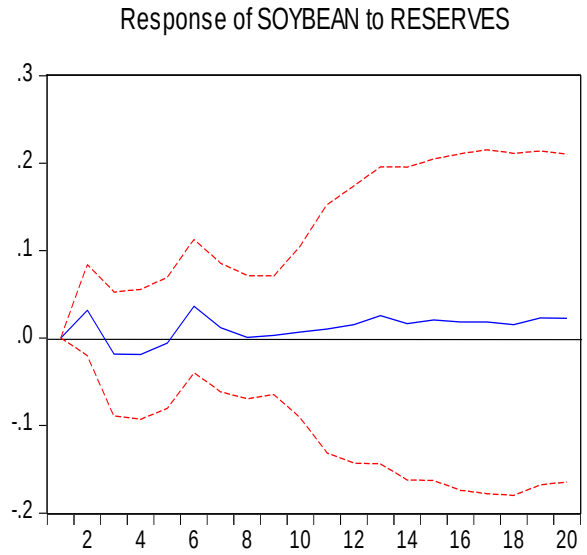


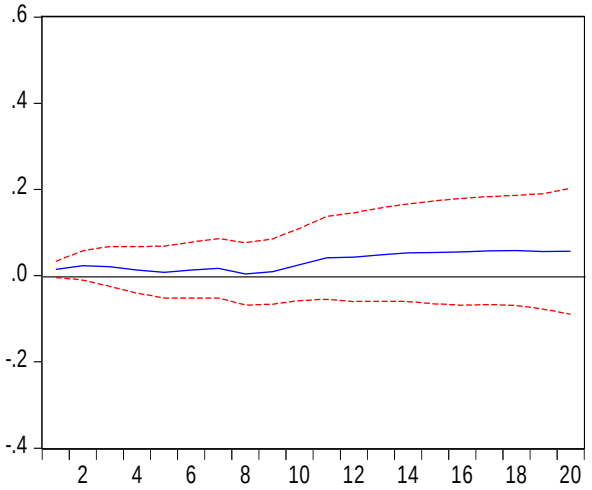
SOYBEAN DOMESTIC



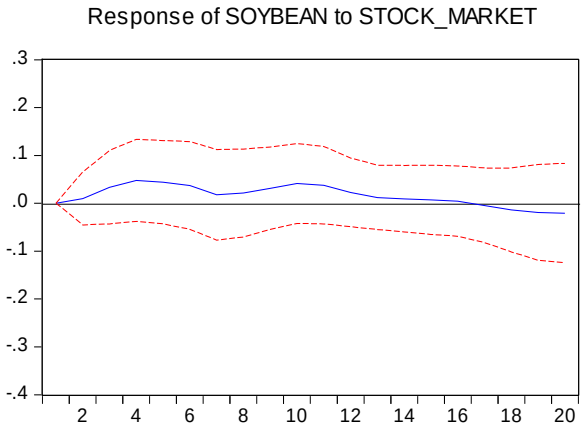


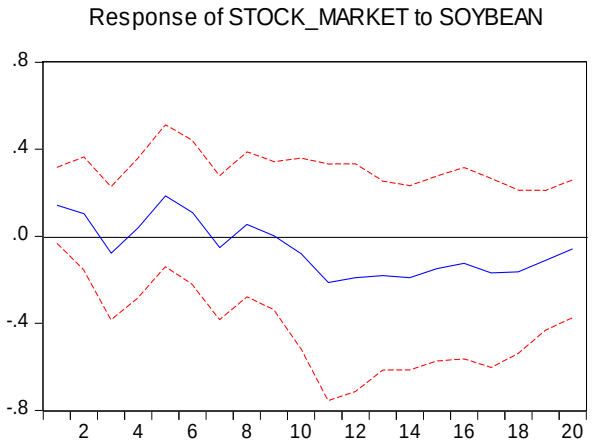
SOYBEAN RESERVES



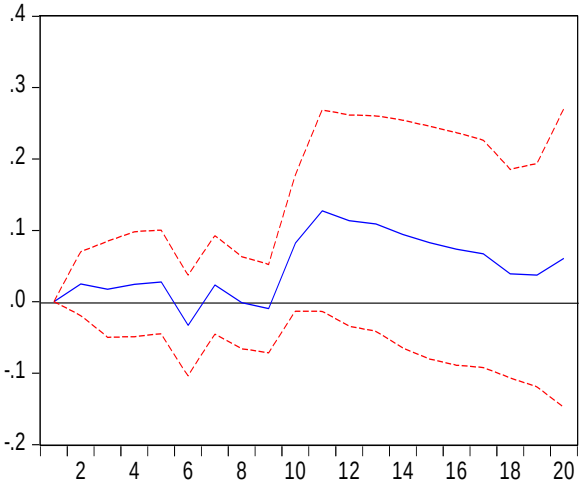


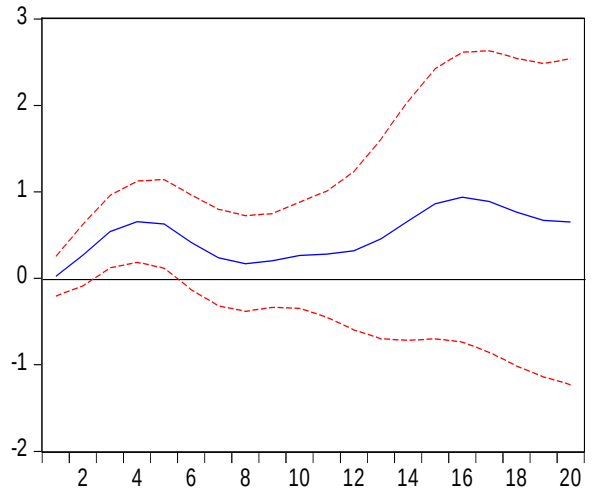
SOYBEAN STOCK



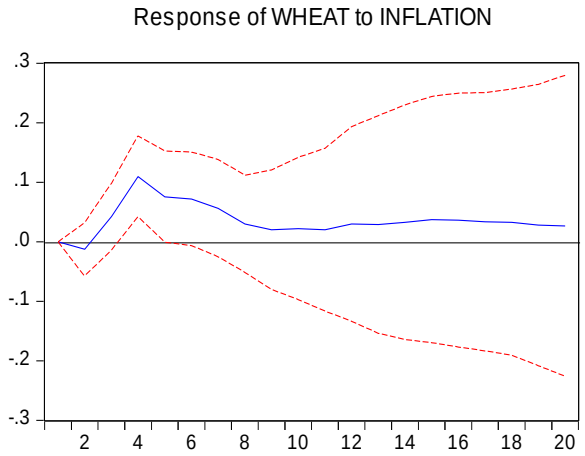


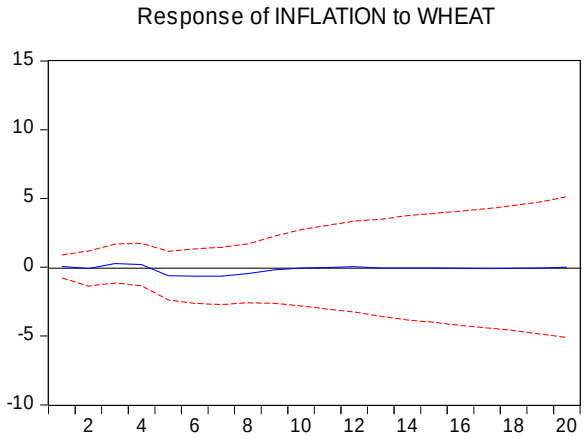
WHEAT CPI



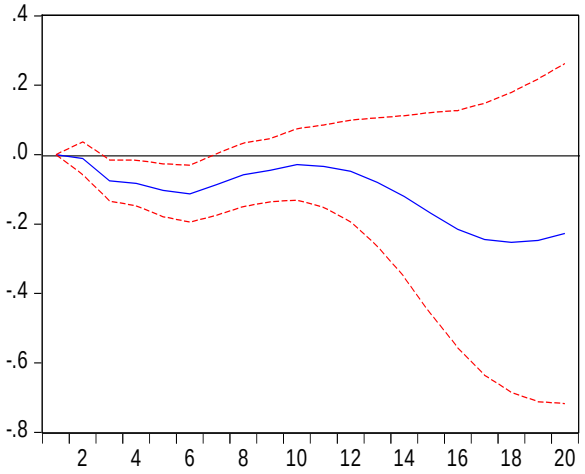


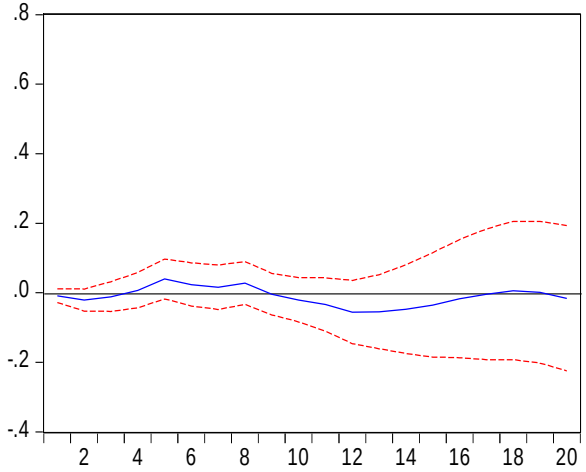
WHEAT INFLATION



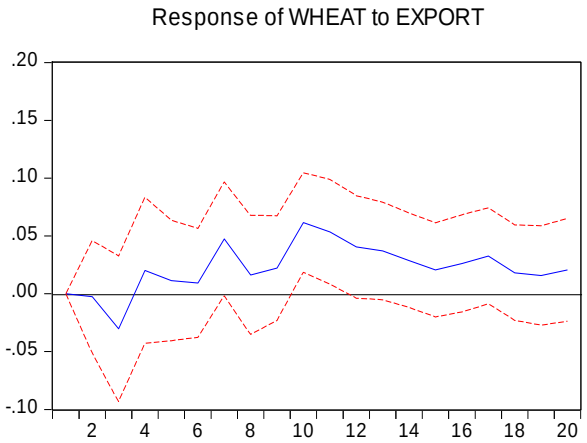


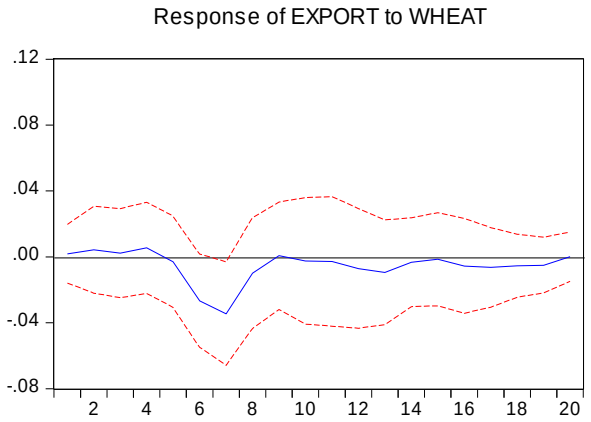
WHEAT MARKET



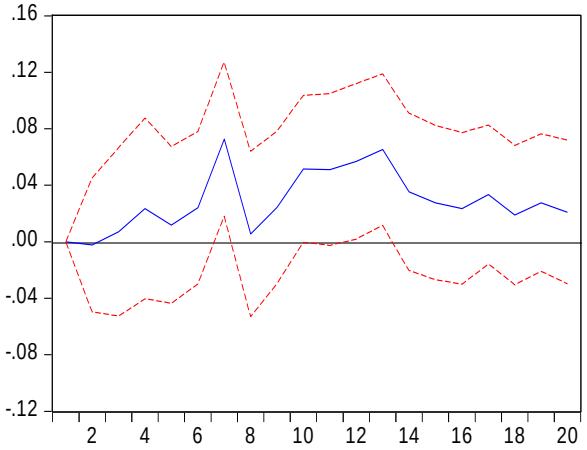


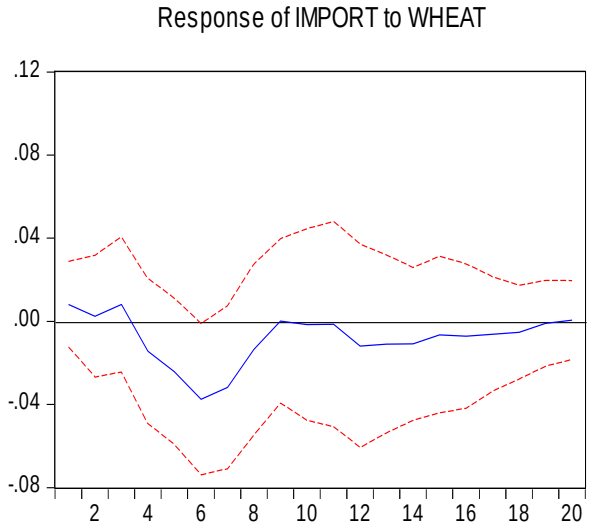
WHEAT EXPORT



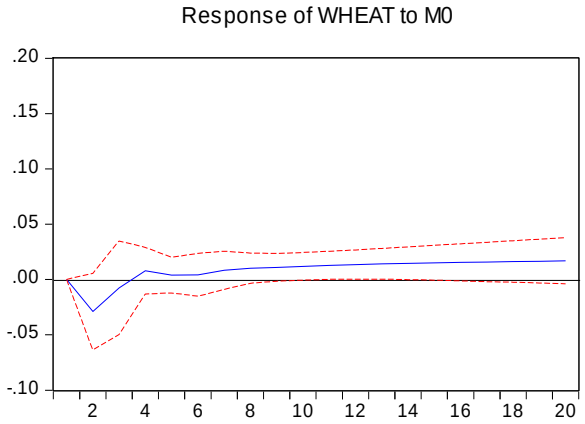


WHEAT IMPORT

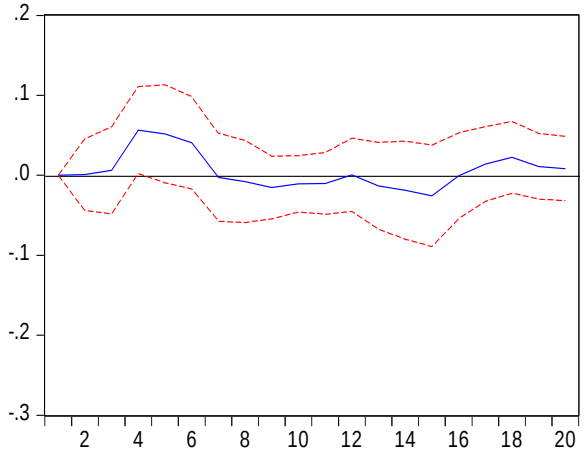


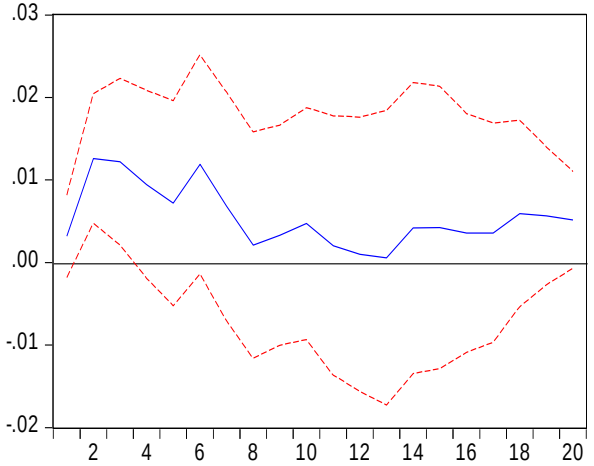


WHEAT M0

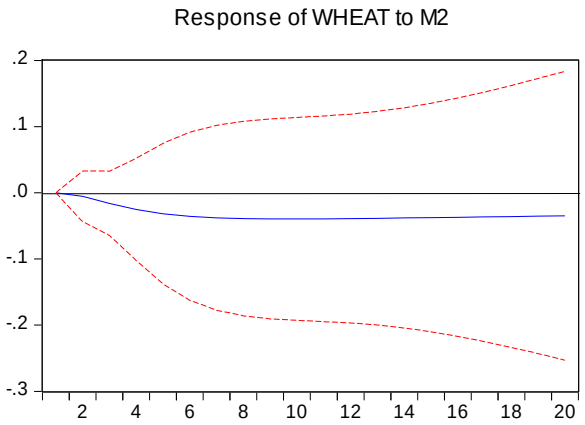


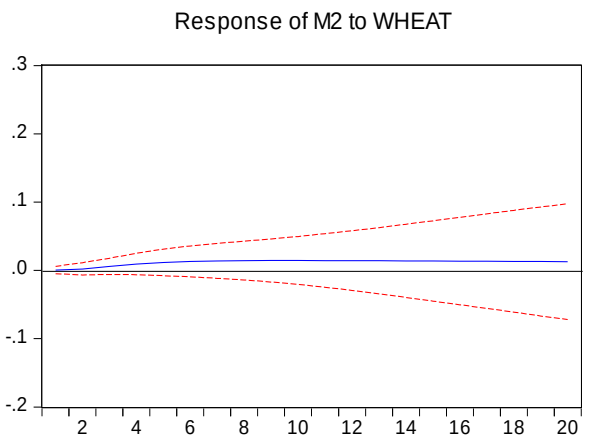
WHEAT M1



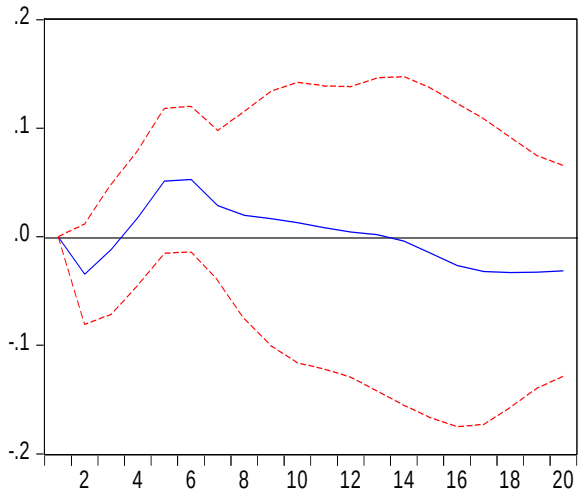


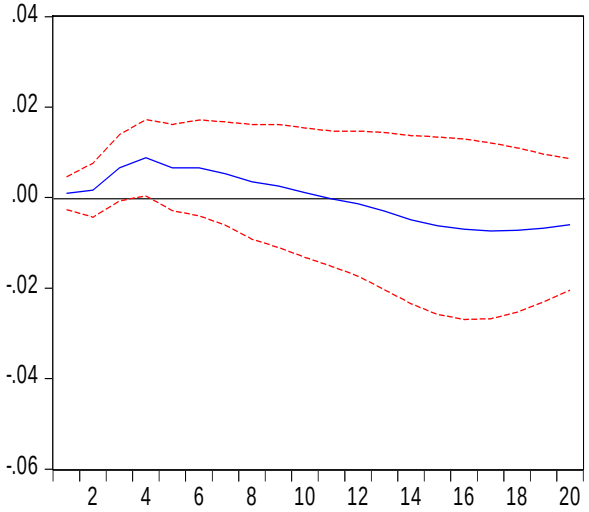
WHEAT M2



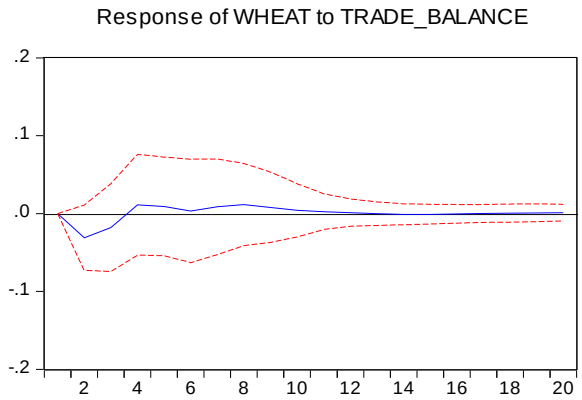


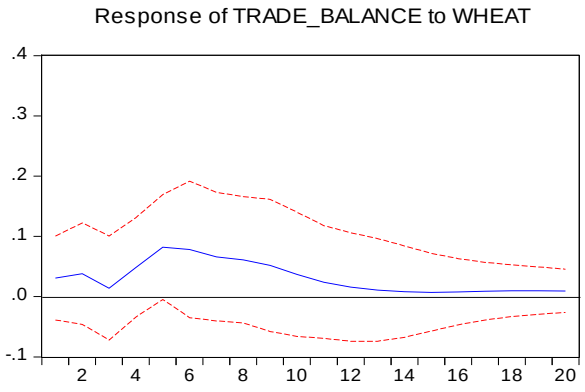
WHEAT M3



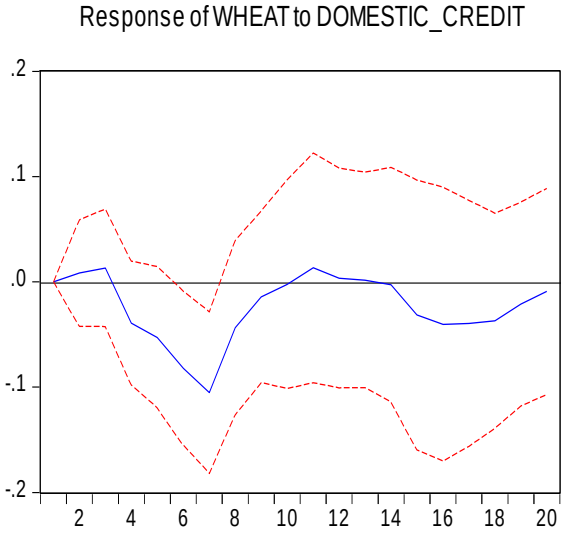


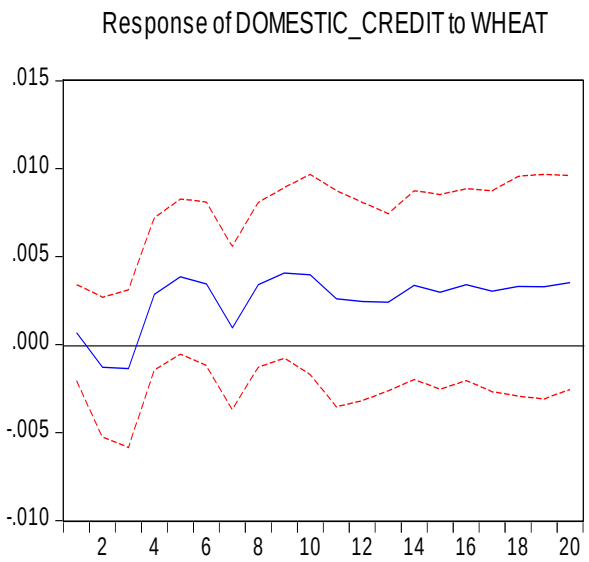
WHEAT TRADE



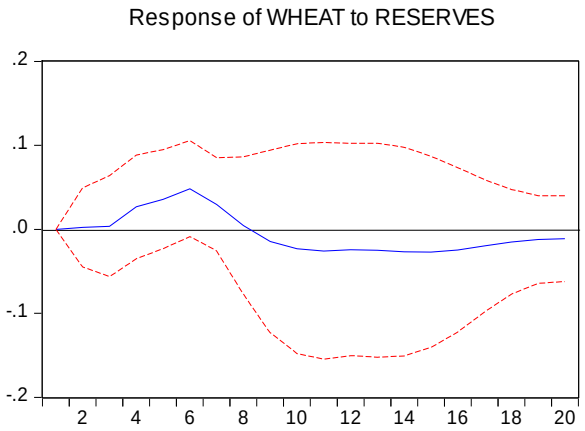


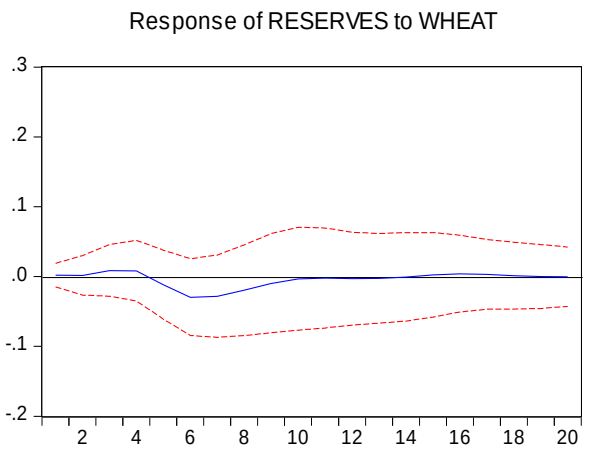
WHEAT DOMESTIC





WHEAT RESERVES





WHEAT STOCK