The Real Determinants of Financial Crisis and How to Resolve it in Islamic Economics Perspective

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Abstract: The ongoing global financial crisis, which was triggered by US subprime mortgage crisis since 2007 and has spread to some EU countries, is just a repeat of previous financial crises. The new financial crisis usually has wider, deeper and more devastating impacts on the economy and the people. In the history of capitalism, there have actually been crises almost continuously for the past 200 years except for during one short period, 1945-1971, under Bretton Woods Agreement. Failing to learn the lessons from history will assure that the crises will continue to hobble the financial system. This study applies Vector Error Correction Model (VECM) to determine and compare conventional and Islamic quantitative variables of the financial crisis, as well as to analyze the impact of the real determinants of financial crisis to output and inflation.

The results show that the real determinants of financial crisis are structural in unstable monetary system (interest system and fiat money system), poor governance (administered price), and unsustainable fiscal system (volatile food), as well as misbehavior of economic actors (expectation). Interest system (Monetary) is the number one determinant of financial crisis with 43.66% share in inducing inflation and 24.85% share in curbing economic growth, followed by administered price (Governance) with 14.41% share in inducing inflation and 5.33% share in curbing economic growth, fiat money (Monetary) with 5.54% share in inducing inflation and 13.49% share in curbing economic growth, and volatile food (Fiscal) with 5.79% share in inducing inflation and 9.11% share in curbing economic growth. Meanwhile, the best cure of financial crisis is single global currency (External) and just money (Monetary) using gold standard with 8.03% share in curbing inflation and 3.50% share in inducing economic growth, followed by profit-and-loss sharing (Monetary) with 0.02% share in curbing inflation and 0.09% share in inducing economic growth.

Keywords: Financial crisis, Islamic economic perspective, VECM.

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1. INTRODUCTION

The ongoing global financial crisis, which was triggered by US subprime mortgage crisis since 2007 and has spread to some EU countries, is just a repeat of previous financial crises. The new financial crisis usually has wider, deeper and more devastating impacts on the economy and the people than those of previous ones. In the history of capitalism, there have actually been crises almost continuously for the past 200 years except for during one short period, 1945-1971, under Bretton Woods Agreement. Failing to learn the lessons from history will assure that the crises will continue to hobble the financial system. One aphorism says that those who cannot remember the past are condemned to repeat it (Financial Crisis Inquiry Commission-FCIC, 2011; pp.444). Under Islamic tradition, Muslims should not make the same mistake twice, as mentioned in Al Qur'an at the end of surah Al Baqarah [2]:275.

The first financial crisis has been recorded in England 1825 and 1837. In the past century, financial crises started to erupt in 1915 and the world entered into great depression in 1929 as well as two world wars. After World War II, the world entered into new international monetary arrangement under Bretton Woods Agreement (BWA) in 1945. Unfortunately, BWA collapsed in 1971 and financial crises have spread wider all over the world. There is no one country that could escaped from financial crisis, even for some countries that have generally followed some sound fiscal and monetary policies (Chapra 2008). Moreover, financial crises have happened not because of cyclical or managerial failures, but because of structural failures in various countries under very different regulatory systems as well as at different stages of economic development (Lietaer, *et al.*, 2009).

A new database of financial crises in the period of 1970-2011 can be read in Laeven and Valencia (2012) which covers 147 banking crises, 218 currency crises (10 episodes in 2008-2011), and 66 sovereign debt crisis, including 68 twin crises and 8 triplet crises.

Indonesia is no exception. Multi-dimensional crisis has hit Indonesia in 1997-1998, inflation has jumped up to 64% and Rupiah value has plummeted from Rp2600/US$ to Rp11000/US$, while economic growth has contracted to 13.1% (Ascarya, 2011). All sectors in the economy have contracted significantly. Moreover, rapid currency depreciation had made public debt to reach US$60 billion in November 1997,
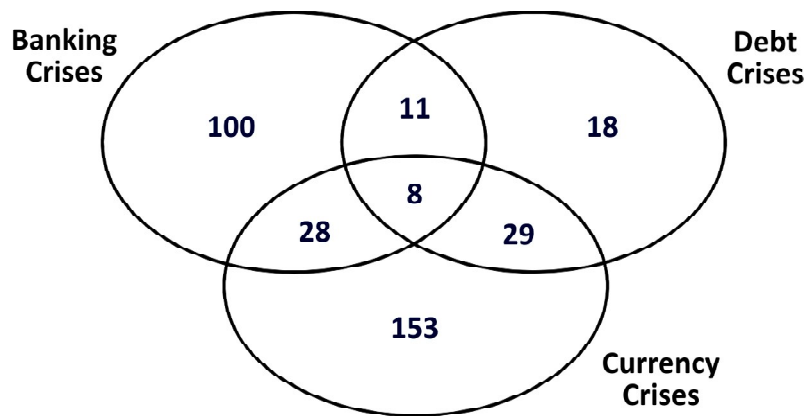

Figure 1: Simultaneous Crises in the Period of 1970 – 2011

Source: Laeven and Valencia (2012), with correction.

which imposed severe strains on the government's budget. Indonesia has suffered the most with fiscal cost reached 56.8% of GDP, while output loss reached 67.9% of GDP (Laeven and Valencia, 2008).

It seems that they have not learned the lessons yet on how to eradicate and/or control the financial crisis. Even though financial crisis has been repeated again and again, none of those affected countries has become economically stronger and more stable. Lipson (2010) argues that the current financial crisis is just a rerun of previous crises from which we have failed to learn our lessons.

Clearly, the current financial system has fundamental flaws which make it unstable and susceptible to financial crisis. This study aims to determine root causes of financial crisis from Conventional and Islamic perspectives using Vector Error Correction Model (VECM) using Indonesian data and propose real remedies to cure the financial crisis permanently and to avoid the similar mistakes in the future, so that financial crisis will not repeated again and again.

2. LITERATURE REVIEW

2.1. Theory of Financial Crisis

The development of financial crisis theory under conventional economic perspective was inspired by currency crises which initially occurred in England in 1825 and 1837. The theory mostly views the crisis from macro perspective, which has been developed from first-generation model, second-generation model, and third-generation model. Other alternative theories include Austrian business cycle theory, Minsky's theory, world system theory, coordination game, herding model and learning model. On the other hand, viewed from Islamic economic perspective, financial crisis is a result of the transgressions of God's laws by economic actors which cause disruption in the balance of economic system, especially in the form of $rib\beta$ (usury or interest), *maysir* (gambling and game of chance or speculation) and *gharar* (excessive uncertainty) in their many forms.

2.1.1. First-Generation Model

First-generation model views financial crisis is originated from currency crisis or balance of payments crisis, which is caused by macroeconomic imbalances due to weak economic fundamentals. Under this model, the collapse of fixed exchange regime is due to unsustainable fiscal policy. The classic first-generation model was first proposed by Krugman (1979) and later by Flood and Garber (1984). These classic models have been extended, among others, by Obstfeld (1986), Calvo (1987), Drazen and Helpman (1987) and van Wijnbergen (1991), which incorporate consumer optimization and government's intertemporal budget constraint. Under fixed exchange rate regime the government should set the amount of money supply fixed in accordance with fixed exchange rate. This requirement would severely limit the ability of the government to raise *seigniorage* revenue from printing fiat money. Therefore, when the government runs persistent primary deficits (this is the hallmark of first-generation model), it has to use foreign reserves or borrow continuously. In the long run, this is not feasible, so that the government would have to print more money, which would lead to the collapse of fixed exchange regime (Flood and Marion, 1999).

Viewed from Islamic economic perspective, the root causes of first-generation financial crisis are international monetary system based on multiple fiat currency system, interest system, excessive fiat money

supply, excessive fiscal deficits, excessive debt, expectation and speculation. The emphasize of first-generation model is currency crisis due to the debasement of currency, where fiat currency does not have any back up assets, to create the *seigniorage* necessary for a rational system of government money. The issuance of fiat money creates a new purchasing power out of nothing. Therefore, fiat money gives unfair benefit, usually known as *seigniorage*, to the money issuer authority. The creation of benefits without any counter value ('*iwad*) in terms of ownership risk (*ghurmi*), value added (*ikhtiyar*), or liability (*daman*) are categorized as *rib*β by Ibnu Arabi.

2.1.2. Second-Generation Model

The second generation model is developed based on the drawbacks of the first generation model and suggests the central role of expectations and coordination failure among creditors, so the crisis could occur independent of soundness of economic fundamentals. This model was first proposed by Obstfeld and Rogoff (1986). When investors have doubts about whether the government is willing to maintain its exchange rate peg, this model generally will exhibit multiple equilibriums, so speculative attacks due to self-fulfilling prophecies may be possible. This means the reason investors attack the currency is that they expect other investors to attack the currency. One example is the model proposed by Obstfeld (1994 and 1996), where the central bank minimizes a quadratic loss function that depends on inflation and on the deviation of output from its natural rate (the detailed discussion of this type of loss function can be seen in Barro and Gordon, 1983). Ali (2006 and 2007) mentioned that in the context of a banking crisis it means that irrespective of solvent position of a bank (or of the banking sector as a whole) if a random event can adversely change the collective expectations of the depositors (*i.e.*, its creditors) then it can precipitate a run on the bank and on the banking system. Thus there can be a range of economic fundamentals over which this type of a pure liquidity crisis can occur. Blanchard (2009) adds that there also exists modern version of bank runs. In traditional bank runs, it was the depositors that took their money out of the banks. In modern bank runs, troubled financial institutions can no longer finance themselves on money market (short-term wholesale funding). The result is however the same as in the old bank runs: Faced with a decrease in their ability to borrow, institutions have to sell their assets at 'fire sale prices'.

Viewed from Islamic economic perspective, the root causes of second-generation financial crisis are expectation, speculation, fractional reserve banking system, leverage system, non-performing loan, troubled financial institutions, and interest system. The emphasize of second-generation model is banking crisis due to fractional reserve banking system (in commercial banking) and leverage system (in investment banking and shadow banking), which create bank money similar to fiat money creation. For illustration, the leverage ratios of Lehman Brothers and Goldman Sachs before they went bankrupt were 30 and 26, respectively. Some European banks had even a higher leverage: BNP Paribas at 32; Dexia and Barclays' leverage ratios are both estimated at about 40; UBS' at 47; and Deutsche Bank's a whopping 83 (Lietaer, *et al.*, 2009). Similar to fiat money creation, bank money creation through fractional reserve or leveraging is considered *rib*β.

2.1.3. Third-Generation Model

The third-generation model is built on the shortcomings of the second-generation model by redefining the fundamentals more broadly to include micro incentives and policies. This model emphasizes the role of the financial sector in causing currency crises and propagating their effects, since many currency crises

coincide with crises in the financial sector (see Diaz-Alejandro, 1985; Kaminsky and Reinhart, 1999). Some other models allow interaction between fundamentals and beliefs so that a crisis is triggered by both factors working together not by any one in isolation (Ali, 2006&2007). Keywords of third-generation model of financial crisis are mismatches in currency and in the characteristics of financial institutions, such as liquidity and maturity mismatches, so that Eichengreen and Hausmann (1999) argue that currency mismatches are an inherent feature of emerging markets. However, when there exist government guarantees, it is optimal for banks and firms to expose themselves to currency risk (McKinnon and Pill, 1996; and Burnside, *et al.*, 2001). Therefore, different third-generation models explore various mechanisms through which balance-sheet exposures may lead to a currency and banking crisis. Burnside, *et al.* (2004) argue that government guarantees lead to the possibility of self-fulfilling speculative attacks, while Chang and Velasco (2001) state that liquidity exposure leads to the possibility of a Diamond and Dybvig (1983) style bank run. Moreover, Caballero and Krishnamurthy (2001) find that firms face a liquidity problem because they finance risky long-term projects with foreign loans but have access to limited amounts of internationally accepted collateral.

Viewed from Islamic economic perspective, the root causes of third-generation financial crisis are international monetary system based on multiple fiat currency system, fractional reserve banking system, leverage system, currency, liquidity and maturity mismatches, interest system, expectation and speculation. The emphasize of third-generation model is currency mismatch due to multiple fiat currency system, as well as liquidity and maturity mismatches due to fractional reserve banking system (in commercial banking) and leverage system (in investment banking and shadow banking), where both of them have been categorized previously as *rib*β.

2.1.4. *Austrian Business Cycle Theory*

Austrian business cycle theory (ABCT) emerges from Austrian school of thought, which assumes that money is not neutral and financial flows are a mere mirror of what is happening in the real economy (Zelmanovitz, 2011). The main proponents of the Austrian business cycle theory historically were Ludwig von Mises and Friedrich Hayek followed by Murray Rothbard, James Keeler and Roger Garrison to name a few. Hayek won a Nobel Prize in economics in 1974 (shared with Gunnar Myrdal) in part for his work on this theory. Austrian business cycle theory, or preferably called credit cycle by Austrian economists, can be divided into four stages, namely, expansion, crisis, recession and recovery. *Expansion* stage starts when low interest rates or expansionary monetary policy tend to stimulate borrowing or credit expansion from the banking system to businesses and individual borrowers, which causes an expansion of the money supply through the money creation process in a fractional reserve banking system. In this stage production and prices increase. Subsequently, this leads to unsustainable credit-sourced boom during which the artificially stimulated borrowing seeks out diminishing investment opportunities, which results in widespread mal-investments causing capital resources to be misallocated into areas that would not attract investment if the money supply remained stable. *Crisis* stage starts with a correction (or credit crunch or recession or bust) that occurs when exponential credit creation cannot be sustained. The money supply suddenly and sharply contracts. In this stage stock exchanges crash and multiple bankruptcies occur. *Recession* stage follows after the crisis when output and prices drop and interest rates increase. Recovery stage start when markets finally "clear" and causing resources to be reallocated back towards more efficient uses. In this stage stocks recover due to the fall in prices and incomes. Recovery and prosperity are associated with increases in productivity, consumer confidence, aggregate demand and prices.

Viewed from Islamic economic perspective, the root causes of ABCT financial crisis are fiat money system, fractional reserve banking system, leverage system, interest system, excessive credit creation, adverse selection, moral hazard, mal-investments, expectation and speculation. The emphasize of ABCT is excessive credit creation due to fractional reserve banking system, which is considered as *rib*β, as well as expectation and adverse selection leading to mal-investments and finally causes stock market crash, due to expectation and speculation, which are considered as *maysir* and are prohibited in Islamic perspective.

2.1.5. *Minsky's Theory*

Hyman Minsky hypothesizes that the capitalistic economy has an inherent tendency to develop instability/fragility (also known as Financial Instability Hypothesis). High fragility leads to a higher risk of a financial crisis, which culminates in severe economic crises. The key mechanism that pushes the economy towards a crisis is the accumulation of debt. To facilitate his theory, Minsky makes a distinction between three types of firms as borrowers. The first type he labels *hedge borrowers* who can meet all debt payments from their cash flows. The second type is *speculative borrowers* who can meet interest payments but must constantly roll over their debt to be able to repay the original loan. The third group of borrowers Minsky labeled *Ponzi borrowers*; they can repay neither the interest nor the original loan. These borrowers rely on the appreciation of the value of their assets to refinance their debt. Ponzi borrowers lead to the most fragility.

The level of financial fragility moves together with the business cycle. In time of recession, firms only borrow as much as they can payback from their cash flows (in other words, they can only act as hedge borrower). As economic condition getting better and businesses grow, expected profits increase and firms tend to raise their level of debt beyond their ability to repay. However, they believe that profits will rise and the debt will eventually be repaid without much trouble. The rising profit attracts other firms or entrepreneurs to join in and encourages them to raise their level of debt. More debt leads to more investment, borrowers' financial health show visible improvement, the economy grows further, and this makes lenders more eager to lend to firms even without full guarantees of success.

As time goes by, the pace of debt accumulation starts to rise much faster than borrowers' ability to repay and serve the debt. This is Ponzi financing. In this way, the economy has taken on much risky credit. At this stage, the foundation for an economic bust is set in motion, started with the default of some big firms, which make lenders realize the actual risks in the economy and stop giving credit. Refinancing becomes impossible for many, and more firms default. If no new money comes into the economy to allow the refinancing process, a real economic crisis begins. During the recession, firms start to hedge again, and the cycle is closed. Many economists, such as Wray (2009a and 2009b) and Prychitko (2010), argue that current global financial crisis could be called the 'Minsky Moment' or 'Minsky Crisis'.

Viewed from Islamic economic perspective, the root causes of Minsky crisis are fiat money system, fractional reserve banking system, leverage system, interest system, excessive debt, expectation, speculation, moral hazard, adverse selection, and fraud. The emphasize of Minsky's theory is expectation and speculation in relation to *speculative borrowers*, as well as fraud in relation to *Ponzi borrowers*. All of these could lead to banking crisis due to credit defaults and stock market crash due to firms' bankruptcies. Therefore, Minsky's crisis is caused by the intertwined among *rib*β, *maysir* and fraud, which are all prohibited in Islamic perspective.

2.2. Previous Studies

Studies on current global financial crisis from conventional economic perspective are plenty, covering several school of thoughts, such as, mainstream (neo classic and new Keynesian), Austrian, binary economics and other minor views. There is an official report from Financial Crisis Inquiry Commission - FCIC (2011) which comprises of 22 chapters divided into five parts, as well as two dissenting views. There is an edited book by Kolb (2011) which comprises of 78 papers grouped in 11 parts. There is one special volume of Cambridge Journal of Economy, volume 33 (2009) which comprises of 15 papers. There is a CEPR (Centre for Economic Policy Research) publication edited by Felton and Reinhart (2008) which includes 38 papers divided into three parts. Since 2008, there have been more than 100 working papers of IMF and more than 25 working papers of NBER which study global financial crisis and its impacts from many different perspectives.

Meanwhile, studies on current global financial crisis from Islamic economic perspective are also plenty but not as many as those of conventional economic perspective. The Task Force on Islamic Finance and Global Financial Stability, organized by Islamic Development Bank – IDB, published a report on Islamic finance and global financial stability (2010), which discusses the resilience of Islamic finance against global financial crisis. There is one special volume of International Journal of Islamic and Middle Eastern Finance and Management, volume 3 number 4 (2010) which comprises of 8 papers. There is a compilation book by Islamic Economic Research Center, King Abdulaziz University - IERC-KAU (2009), which includes 18 papers of prominent Islamic economic and finance scholars. There are also many studies from various journals which discuss financial crisis. The summary of conventional and Islamic literatures which relate financial crisis with several root causes mentioned in the theory of financial crisis can be read in table 1.

Table 1
Root Causes of Financial Crisis in Conventional and Islamic Literatures

Variable	Conventional	Islamic
Behavior		
– *Maysir* (speculation)	Marthinsen (2010:p. 59), Bardhan (2010: p.19), Burnside, *et al.* (1998: 3), Crotty (2009:p.577), Pereira (2010:p.4), Prychitko (2010:p.205)	Trabelsi (2011: p.17), Almoharby (2011: p.106), Ghoul (2011: p.58-59), Ahmed (2010: p.307), Hassan and Kayed (2009: p.36), Farooq (2009: p.8), Siddiqi (2009: p. 8), Seidu (2009: p.29), Al-Masri (2009: p.290), Chapra (2008: p.16), Chapra (2007: p.164&166), Meera and Larbani (2004: p.10-11), Ahmed (2001: p.30), Oguz and Tabakoglu (1991: p.66), Zarqa (2009: p.247)
– Criminal Acts	Marthinsen (2010:p.59), Jalilvand and Malliaris (2010: p.139), Pereira (2010:p.12 and 18), Soral, *et al.* (2006:p.179-180)	Hassan and Kayed (2009: p.36), Mirakhor and Krichene (2009: p.29), Seidu (2009: p.30), Ali (2006 and 2007: p.26), Garcia, *et al.* (2004: p.1), Bashar (1997: p.48), Sabzwari (1984: p.3)
– Expectation	Harvey (2010: p.2 and 27), Corsetti, *et al.* (1999: p.306)	Siddiqi (2009: p.8)

Contd. table 1

Variable	Conventional	Islamic
External		
– Intl. Multiple Fiat Currency System	Corsetti, *et al.* (1999: p.306), Eichengreen and Hausmann (1999: p.2)	Trabelsi (2011: p.17), Meera and Larbani (2004: p.12), Ahmed (2001: p.10)
Governance		
– Price Control	Rothbard (2009: p.1075-1076) , Rothbard (1995: p.124)	Khan and Thaut (2008: p.11), Azid, *et al.* (2008: p.61), Iqbal and Khan (2004: p.2), Kahf (2000: p.9), Oguz and Tabakoglu (1991: p. 64)
Monetary		
– *Rib*β (interest or usury)	Lietaer and Dunne (2013:p.41-42), Bragues (2010: p.4-5), Kremer (2008:p.27-28), Shakespeare (2007:p.91-101), Shakespeare and Challen (2002:p.215-217)	Othman, *et al.* (2012: p.10), Trabelsi (2011: p.17), Ghoul (2011: p.58-59), Ahmed (2010: p.307), Smolo and Mirakhor (2010: p.375), Hassan and Kayed (2009: p.50), Mirakhor and Krichene (2009: p.9), Siddiqi (2009: p.6), Seidu (2009: p.29), Al-Masri (2009: p.289), Thaker and Azam (2009: p.10), IAIE (2009: p.267), Chapra (2008: p.3), Chapra (2007: p.162), Iqbal and Khan (2004: p.2), Ahmed (2001: p.30), Oguz and Tabakoglu (1991: p.66), Zarqa (2009: p.251)
– Fiat Money	Lietaer and Dunne (2013:p.23-36), Shakespeare (2007:p.79-90), Shakespeare and Challen (2002: p.213), Hoppe (1994: p.74), Rothbard (1990: 43-45)	Trabelsi (2011: p.17), Thaker and Azam (2009: p.10), Hassan and Kayed (2009: p.37), Meera and Larbani (2004: p.10)
– Fractional Reserve Banking	Lietaer and Dunne (2013:p.25 and 39), Bragues (2010: p.6) , Shakespeare (2007:p.79-90), Nuri (2002:p.31-46), Shakespeare and Challen (2002: p.213-214), Hoppe (1994: p.74), Rothbard (1990: 26), Bagus and Howden (2010:p.33&36)	Othman, *et al.* (2012: p.12), Trabelsi (2011: p.17), Farooq (2009: p.8), Mirakhor and Krichene (2009: p.14-15), Thaker and Azam (2009: p.10), Meera and Larbani (2004: p.10), Garcia, *et al.* (2004: p.1)
– Leverage	Gorton and Metrick (2012:p.21), Bragues (2010: p.4), Marthinsen (2010:p.59), Demiyanyk (2010: p.92), Bardhan (2010: p. 19), Georgiou (2009: p.3), Shakespeare (2007:p.79-90), Pereira (2010: p.12)	Trabelsi (2011: p.17), Ahmed (2010: p.318), Smolo and Mirakhor (2010: p.372), Hassan and Kayed (2009: p.36), Mirakhor and Krichene (2009: p.26), Siddiqi (2009: p.3), Seidu (2009: p.28), Ahmed (2009: p.15), Chapra (2008: p.2), Chapra (2007: p.165 and 166)
Fiscal		
– Excessive Government Debt	Reinhart and Rogoff (2010: p.2), Reinhart and Rogoff (2009: p.1 and 3), Corsetti, *et al.* (1999: p.306); Burnside, *et al.* (1998: p.3), Park (2009: p.125)	Othman, *et al.* (2012: p.9), Chapra (2007: p.163), Ali (2006 and 2007: p.9), Iqbal and Khan (2004: p.34 and 95), Khan (2001: p.253)
– Poor Mgt. of Strategic Commodities	Rothbard (2009: p.137-142)	Chapra (2007: p.163), Oguz and Tabakoglu (1991: p. 64)

3. METHODOLOGY

3.1. Data

This study will apply quantitative method, namely, Vector Error Correction Model (VECM), which needs time series quantitative data. This quantitative data needed by VECM method will be monthly time series secondary data of March 2004 to June 2012 obtained from several resources, such as Biro Pusat Statistik (BPS), Indonesian Economic and Finance Statistics of Bank Indonesia (SEKI-BI), Syariah Banking Statistics of Bank Indonesia (SPS-BI), Banking Statistics of Bank Indonesia (SPI-BI), Jakarta Stock Exchange (JSX) and Ministry of Energy and Mineral Resources (KESDM).

3.2. Vector Error Correction Model (VECM)

3.2.1. VECM Overview

The methodology to be used is Vector Auto Regression (VAR), followed by Vector Error Correction Model (VECM), if cointegration occurred. VAR is an *n*-equation with *n*-endogenous variable, where each variable is explained by its own lag, as well as current and past values of other endogenous variables in the model. Therefore, in the context of modern econometrics, VAR is considered as multivariate time series that treats all variables endogenous, since there is no confidence that a variable is actually exogenous, and VAR allows the data to tell what actually happen. Sims (1980) argue that if there is true simultaneity among a set of variables, they should all be treated on an equal footing and there should not be any a priori distinction between endogenous and exogenous variables. Enders (2004) formulates a simple first-order bivariate primitive system that can be written as follows.

$$y_t = b_{10} - b_{12}z_t + \gamma_{11}y_{t-1} + \gamma_{12}z_{t-1} + \varepsilon_{yt} \tag{3.1}$$

$$z_t = b_{20} - b_{21}y_t + \gamma_{21}y_{t-1} + \gamma_{22}z_{t-1} + \varepsilon_{zt} \tag{3.2}$$

With assumptions that both y_t and z_t are stationary, ε_{yt} and ε_{zt} are white noise disturbances with standard deviations of $\acute{o}_y$ and $\acute{o}_z$, respectively, and ε_{yt} and ε_{zt} are uncorrelated white-noise disturbances. Meanwhile, the standard form of the above primitive form can be written as follows.

$$y_t = a_{10} + a_{11}y_{t-1} + a_{12}z_{t-1} + e_{yt} \tag{3.3}$$

$$x_t = \mu_t + \sum_{i=1}^{k} A_i + X_{t-1} + \varepsilon_t \tag{3.4}$$

Where, e_{yt} and e_{zt} are composites of ε_{yt} and ε_{zt}. The primitive form is called structural VAR, while the standard form is called VAR. The detailed transformation from primitive form to standard form can be read in Enders (2004). In short, according to Achsani *et al.*, 2005, the general VAR model mathematically can be represented as follows.

$$x_t = \mu_t + \sum_{i=1}^{k} A_i + X_{t-1} + \varepsilon_t \tag{3.5}$$

Where x_t is a vector of endogenous variables with ($n \times 1$) dimension, μ_t is a vector of exogenous variables, including constant (intercept) and trend, A_i is coefficient matrix with ($n \times n$) dimension, and ε_t is a vector of residuals. In a simple bivariate system y_t and z_t, y_t is affected by current and past value of z_t, while z_t is affected by current and past value of y_t.

VAR provides systematic ways to capture dynamic changes in multiple time series, and possess credible and easy to understand approach for describing data, forecasting, structural inference, and policy analysis (Stock and Watson, 2001). VAR provides four tools of analysis, namely, forecasting, impulse response function (IRF), forecast error variance decomposition (FEVD) and Granger causality test. Forecasting can be used to extrapolate current and future values of all variables by utilizing all past information of the variables. IRF can be used to trace current and future responses of each variable to the shock of certain variable. FEVD can be used to predict the contribution of each variable to the shock or changes of certain variable. Meanwhile, Granger causality can be used to determine the causal relationship among variables.

Like any other econometric models, VAR also comprises a series of process of model specification and identification. Model specification includes the selection of variables and their lag length to be used in the model. While, model identification is to identify the equation before it can be used for estimation. There are several possible conditions encountered in the identification process. *Overidentified* condition will be obtained if the number of information exceeds the number of parameter to be estimated. *Exactly identified* or *just identified* condition will be obtained if the number of information and the number of parameter to be estimated is equal. Meanwhile, *underidentified* condition will be obtained if the number of information is less than the number of parameter to be estimated. Estimation process can only be carried out under *overidentified* and *exactly identified* or *just identified* conditions.

The advantages of VAR method compared to other econometric methods, among others, are (Gujarati, 2004 and Enders, 2004):

1. VAR method is freed from various economic theory restrictions that often exists, such as spurious variable endogeneity and exogeneity;

2. VAR develops model simultaneously within complex multivariate system, so that it can capture all relationships among variables in the equation;

3. Multivariate VAR test can avoid biased parameters due to exclusion of relevant variables;

4. VAR test can detect the relationships among variables within equation system by treating all variables endogenous;

5. VAR method is simple where one does not have to worry about determining which variables are endogenous and which ones exogenous, since VAR treats all variables endogenous;

6. VAR estimation is simple where the usual OLS method can be applied to each equation separately; and

7. The estimate forecasts obtained are in many cases better than those obtained from other more complex simultaneous-equation models.

Meanwhile, the disadvantages and problems of VAR model, according to Gujarati (2004), are:

1. VAR model is a-theoretic, since it uses less prior information, unlike simultaneous-equation model where exclusion and inclusion of certain variables plays a crucial role in the identification of the model;

2. VAR model is less suited for policy analysis, due to its emphasis on forecasting;

3. Choosing the appropriate lag length is the biggest practical challenge in VAR modelling, especially when there are too many variables with long lag-length, so that there will be too many parameters that will consume a lot of degree of freedom and require a large sample size;

4. All variables should be (jointly) stationary. If not, all data should be transformed appropriately, *e.g.* by first-differencing. Long-term relationships will be lost in the transformation of data level needed in the analysis; and

5. Impulse Response function (IRF) is the centrepiece of VAR analysis, which has been questioned by researchers.

To overcome the drawback of first difference VAR and to regain the long-term relationships among variables, vector error correction model (VECM) can be applied, provided that there are cointegrations among variables. The trick is to reincorporate original equation in level into the new equation as follows.

$$\Delta y_t = b_{10} + b_{11}\Delta y_{t-1} + b_{12}\Delta z_{t-1} - \lambda\left(y_{t-1} - a_{10} - a_{11}y_{t-2} - a_{12}z_{t-1}\right) + \varepsilon_{yt} \tag{3.6}$$

$$\Delta z_t = b_{20} + b_{21}\Delta y_{t-1} + b_{22}\Delta z_{t-1} - \lambda\left(z_{t-1} - a_{20} - a_{21}y_{t-1} - a_{22}z_{t-2}\right) + \varepsilon_{zt} \tag{3.7}$$

Where *a* is long-term regression coefficient, *b* is short-term regression coefficient, λ is an error correction parameter, and the phrase in the bracket shows the cointegration between variables *y* and *z*. The general VECM model mathematically can be represented as follows (Achsani *et al*, 2005).

$$\Delta x_t = \mu_t + \Pi x_{t-1} + \sum_{i=1}^{k-1}\Gamma_i\Delta x_{t-i} + \varepsilon_t \tag{3.8}$$

Where, Π and Λ are functions of A_i. The matrix Π can be decomposed into two matrices λ and β with $(n \times r)$ dimension. $\Pi = \lambda\beta^T$, where λ is called an adjustment matrix and β is a cointegration vector. Moreover, *r* is a cointegration rank.

3.2.2 VECM Procedure

VAR/VECM analysis process can be read on figure 2. After basic data is ready, data is transformed into natural logarithm form (*ln*), except for interest rates and the PLS return, to obtain consistent and valid results. The first test conducted was the unit root test, to find out whether data is stationary or still contain trends. If the data are stationary at levels, then VAR can be conducted at level. VAR level can estimate the long-term relationship between variables. If data are not stationary at level, then the data should be reduced at the first level (first difference), which reflects the difference or changes in data. If the data are stationary at first difference, then the data will be tested whether there is cointegration between variables. If there is no cointegration between variables, then VAR can only be done at the first difference, and it can only estimate the short-term relationship between variables. Innovation accounting would not be meaningful for the long-term relationship between variables. If there is cointegration between variables, then VECM can be done using data level to obtain long-term relationship between variables. VECM can estimate the short-term and long term relationship between variables. Innovation accounting for the level VAR and VECM will be meaningful for the long-term relationships.
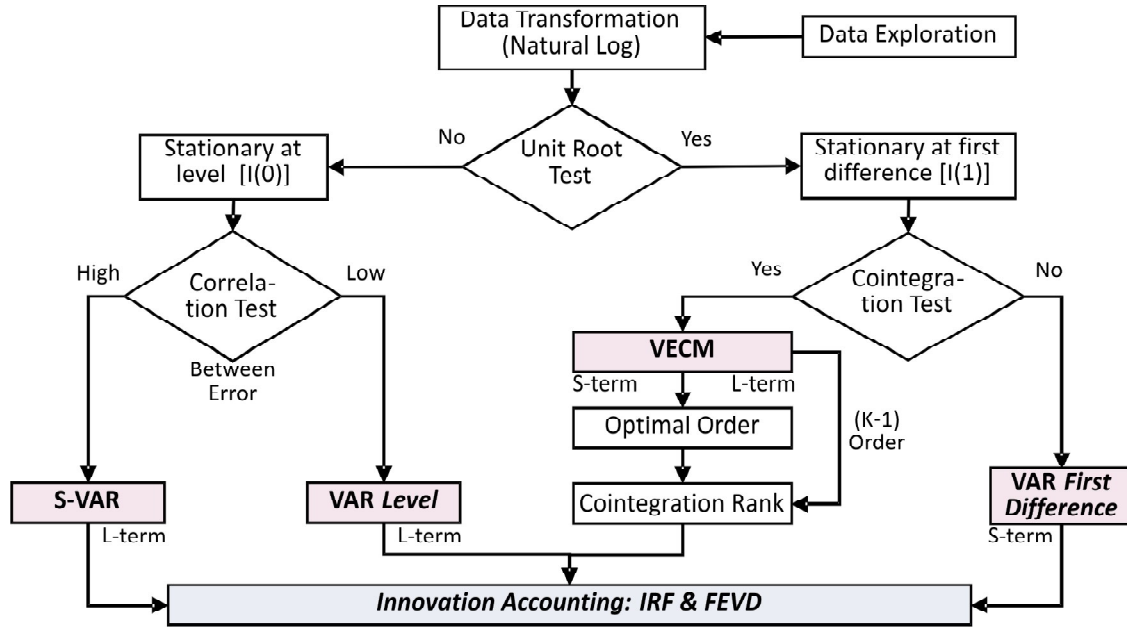
Figure 2: VAR Analysis Process

3.2.3 VECM Model

The general model of VECM can be expressed as equation (3.8).

$$\Delta x_t = \mu_t + \Pi x_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta x_{t-i} + \varepsilon_t$$

Where:

x_k is k selected endogenous variables, specific for each model;

ε_k is disturbance or error term with zero means and constant variance-covariance.

Inflation model:

x_k = [Crisis (Inflation), Behavior, External, Governance, Monetary, Fiscal]

Growth model:

x_k = [Crisis (Growth), Behavior, External, Governance, Monetary, Fiscal]

Proxies for selected endogenous variables (conventional and Islamic) can be seen in table 2 as follows:

The focus of differentiation between conventional and Islamic crisis variables will be in the area of *rib*β monetary/financial system and international multiple fiat currency system, so that the crisis models (inflation and growth) under dual financial system are as follows:

$$\text{INFL} = f\,(\text{INT, PLS, FM, FRB, NB, EXCH, GOLD, VF, ADM, XINFL}) \qquad (3.9)$$

$$\text{GRO} = f\,(\text{INT, PLS, FM, FRB, NB, EXCH, GOLD, VF, ADM, XINFL}) \qquad (3.10)$$

Where:

- *INFL:* the index of monthly CPI (consumer price index) inflation obtained from table "Indeks Harga Konsumen dan Inflasi Bulanan Indonesia", BPS.

Table 2
Proxies of Endogenous Variables

Variable	Crisis	Behavior	External	Governance	Monetary	Fiscal
Conventional	– Inflation (INFL); – Growth (GRO);	– Expectation (XINFL)	– Intl. Mult. Fiat Currency System (EXCH)	– Price Control; Administered Price (ADM)	– Interest Rate (INT) – Fiat Money (FM) – Fractional Reserve Banking (FRB)	– Poor Strategic Comm. Mgt.; Volatile Food (VF)
Islamic		– No Expectation	– Single Global Currency System/Gold Standard (GOLD)	– No Price Control	– Profit and loss Sharing (PLS) – Just Money (GOLD) – Narrow Banking (NB)	– Good Strategic Comm. Mgt.

- *GRO:* the index of monthly IPI (industrial production index) obtained from table "Indeks Produksi Bulanan Industri Besar dan Sedang, 2003-2011", BPS.

- *INT:* the rate of one-month conventional time deposits, obtained from table I.28 "Suku bunga simpanan berjangka rupiah menurut kelompok bank": Bank Umum 1/3/6/12/24 bulan, SEKI-BI.

- *PLS:* the rate of one-month Islamic time deposits (deposito iB), obtained from table 36 "Ekuivalen Tingkat Imbalan bagi hasil/fee/bonus – Bank Umum Syariah dan Unit Usaha Syariah": Time Deposits – 1 month, SPS-BI.

- *FM:* money creation originally issued by the central bank or money in circulation (M0), obtained from table I.2 "Neraca analitis otoritas moneter": Uang Kartal yang diedarkan, SEKI-BI.

- *FRB:* credit creation or fractional reserve banking, is the difference between broad money M2 and M0 monthly. Broad money M2, obtained from table I.1 "Uang Beredar dan Faktor-Faktor yang Mempengaruhinya": M2, SEKI-BI.

- *NB:* Narrow banking with no credit creation, is similar to just money supply or money needed in the economy in Islamic perspective, which is an equilibrium intrinsic M0 proximate by the monthly M1 and GDP data obtained from SEKI BI and BPS.

- *EXCH:* International multiple fiat currency system or exchange rate, is the nominal Rupiah exchange rate to the US Dollar obtained from SEKI BI.

- *GOLD:* Single global currency system and just money using gold standard or gold price, is international gold price index obtained from "Indeks Harga Energi", SEKI BI.

- *VF:* Volatile food inflation, is monthly food price index for rice obtained from SEKI BI.

- *ADM:* Administered price, is monthly gasoline (premium) price obtained from Ministry of Energy and Mineral Resources (KESDM).

- *XINFL:* Expected inflation, is the rate of monthly inflation, CPI index, of previous period obtained from table "Indeks Harga Konsumen dan Inflasi Bulanan Indonesia", BPS.

4. RESULTS AND ANALYSIS

Several procedures of data testing should be followed as a standard procedures for using VAR/VECM method, such as unit root test, stability test, optimum lag test, and cointegration test (see figure 2). After all requirements have been met, results can be generated. The complete results of all VECM procedures can be obtained from the authors.

4.1. Test Results

(a) Unit Root Test

Unit root test results show that most variables are not stationary in level, but all variables are stationary in first difference (see table 3).

Table 3
ADF Test Summary

	ADF Value			McKinnon Critical Value	
Variable	Level	1st Difference		Level	1st Difference
GRO	−5.586035	−15.88780		−3.455376	−3.455842
PLS	−3.947138	−10.59308		−3.455376	−3.456319
NB	−6.498920	−9.960527		−3.455842	−3.461094
GOLD	−2.404773	−9.657199		−3.455376	−3.455842
JII	−2.178969	−7.624593		−3.455842	−3.455842
VF	−1.858362	−7.660940		−3.456319	−3.456319
ADM	−1.625228	−10.13098		−3.455376	−3.455842
XINFL	−0.736651	−6.786609		−3.457301	−3.457301
INFL	−1.187897	−10.16923		−3.455376	−3.455842
INT	−3.380070	−3.587209		−3.455842	−3.455842
FM	−5.676494	−14.85347		−3.455376	−3.455842
FRB	−4.845790	−5.242070		−3.455376	−3.459397
EXCH	−3.123738	−4.577799		−3.456805	−3.4568605
IHSG	−2.293074	−7.682988		−3.455842	−3.455842

(b) Stability Test

Stability test results show that both inflation model and growth model are stable up to 7 (seven) maximum lag (see table 4).

Table 4
Stability Test Summary

No	Model	Modulus	Max Lag
1	INFL	0.339403 – 0.985622	7
2	GRO	0.501793 – 0.993559	7

(c) Optimum Lag Test

Optimum lag test results for inflation model show that lag optimum varies for every criteria from 0 to 6, namely, 0 (zero) for Schwarz information criterion SC, 1 (one) for Hannan-Quinn information criterion HQ, 2 (two) for Final prediction error FPE, 5 (five) for sequential modified LR test statistic LR, and 6 (six) for Akaike information criterion AIC (see table 5).

Table 5
Optimum Lag Test Summary of Inflation Model

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1201.244	NA	2.78e-25	–25.32435	–25.02673*	–25.20413
1	1466.753	463.2274	1.31e-26	–28.39900	–24.82756	–26.95640*
2	1625.753	240.1912	6.41e-27*	–29.20750	–22.36225	–26.44252
3	1726.841	129.0488	1.28e-26	–28.78385	–18.66478	–24.69649
4	1846.860	125.1263	2.28e-26	–28.76298	–15.37010	–23.35324
5	2037.297	153.9706*	1.50e-26	–30.24037	–13.57367	–23.50824
6	2270.353	133.8829	9.87e-27	–32.62453*	–12.68401	–24.57002

Meanwhile, optimum lag test results for growth model show that lag optimum varies for every criteria from 0 to 6, namely, 0 (zero) for Schwarz information criterion SC, 1 (one) for Hannan-Quinn information criterion HQ, 2 (two) for sequential modified LR test statistic LR and Final prediction error FPE, and 6 (six) for Akaike information criterion AIC (see table 4.4).

Table 4
Optimum Lag Test Summary of Growth Model

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1062.597	NA	5.32e-24	–22.37441	–22.07679*	–22.25419
1	1291.046	398.5700	5.49e-25	–24.66055	–21.08912	–23.21795*
2	1453.518	245.4360*	2.50e-25*	–25.54293	–18.69768	–22.77795
3	1540.746	111.3551	6.69e-25	–24.82438	–14.70531	–20.73702
4	1659.571	123.8814	1.23e-24	–24.77810	–11.38522	–19.36836
5	1834.556	141.4775	1.12e-24	–25.92673	–9.260028	–19.19460
6	2078.606	140.1988	5.83e-25	–28.54481*	–8.604292	–20.49030

(d)   Cointegration Test

Johansen cointegration test results for inflation model (INFL) show that there exist 2 (two) cointegrating equations at the 0.05 level and 3 (three) cointegrating equations at the 0.10 level. Moreover, cointegration summary results show that the optimal inflation model under AIC is linear with intercept and trend (assumption 4) model with 3 (three) cointegrating equations (see Appendix).

Meanwhile, Johansen cointegration test results for growth model (GRO) show that there exist 2 (two) cointegrating equations at the 0.05 level and 3 (three) cointegrating equations at the 0.10 level. Moreover, cointegration summary results show that the optimal inflation model under AIC is linear with intercept and no trend (assumption 3) model with 3 (three) cointegrating equations (see Appendix).

4.2.   Inflation Model

Impulse Response Function (IRF) results of Inflation model can be seen in figure 3. The results show that all conventional variables (see figure 3, left) induce inflation or financial crisis, especially, interest rate 'INT' and administered price 'ADM'. Meanwhile, two Islamic variables curb inflation or financial crisis, namely, single global currency or just money 'GOLD' (gold or gold-backed money) and profit-and-loss sharing 'PLS' (prohibition of *rib*β or interest), while one Islamic variable still induces inflation or financial crisis, namely, narrow banking 'NB' (see figure 3, right).
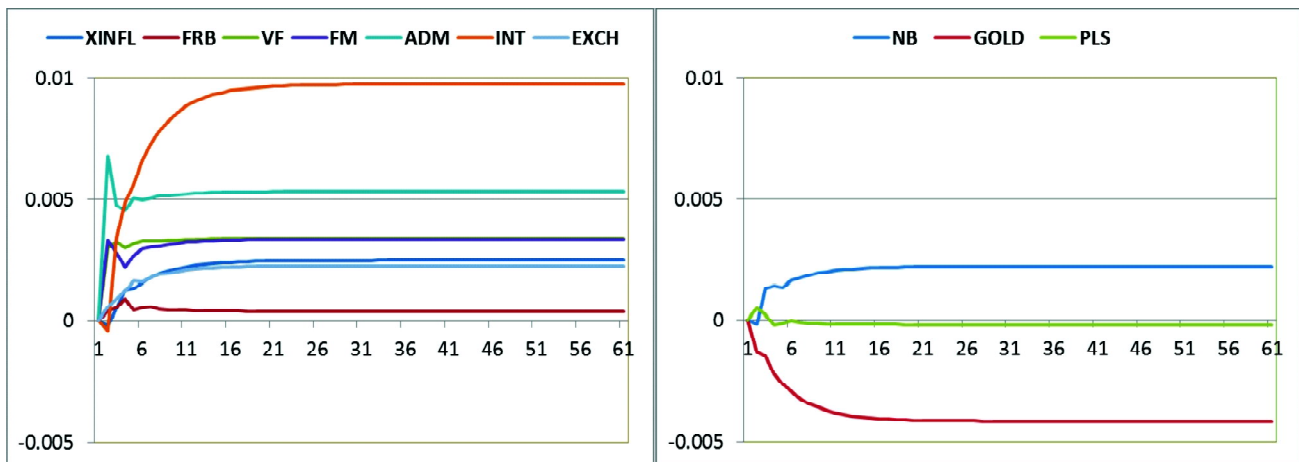

Figure 3: IRF Results of INFLATION Model

Forecast Error Variance Decomposition (FEVD) results of Inflation model can be seen in figure 4. The results show that interest rate 'INT' gives the highest share (43.66%) to induce inflation or financial crisis, followed by administered price 'ADM' with 14.41% share, while single global currency or just money 'GOLD' gives the highest share (8.03%) to reduce inflation or curb the financial crisis.

VECM summary results of Inflation model can be seen in table 5. All conventional variables (see table 5, center), including expected inflation 'XINFL' (Behavior), multiple currency 'EXCH' (External), administered price 'ADM' (Governance), interest rate 'INT', fiat money 'FM' and fractional reserve banking 'FRB' (Monetary), as well as volatile food 'VF' (Fiscal), induce inflation or financial crisis. Meanwhile, some Islamic variables, including 'GOLD' as single global currency (External) and just money (Monetary), as
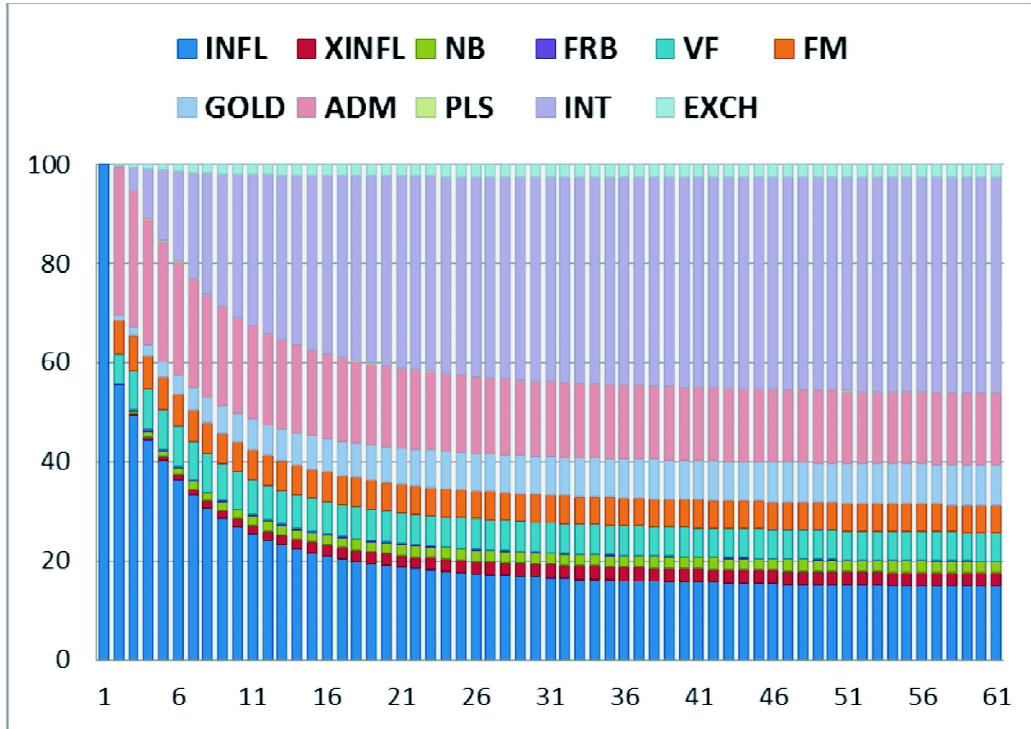
Figure 4: FEVD Results of INFLATION Model

well as profit-and-loss sharing 'PLS' (Monetary), reduce inflation or curb the financial crisis, while one Islamic variable, narrow banking 'NB' (Monetary), still induces inflation or financial crisis (see table 5, right), since narrow banking is being proxied by using M1, where M1 comprises of M0 (fiat currency) and Demand Deposits (part of fractional reserve banking) which are considered *rib*β in Islamic perspective.

Table 5
VECM Summary Results of Inflation Model

Variables	*Conventional*	*Islamic*
Behavior	– XINFL: (+), 2.82%	– N/A
External	– Exch: (+), 2.40%	– Gold: (–), 8.03%
Governance	– Adm: (+), 14.41%	– N/A
	– INT: (+), 43.66%	– PLS: (–), 0.02%
Monetary	– FM: (+), 5.54%	– Nb: (+), 2.32%
	– FRB: (+), 0.08%	– Gold: (–), 8.03%
Fiscal	– VF: (+), 5.79%	– n/a

4.3. Growth Model

Impulse Response Function (IRF) results of Growth model can be seen in figure 5. The results show that almost all conventional variables reduce economic growth or induce financial crisis, especially, interest rate 'INT', fiat money 'FM' and volatile food 'VF'. Fractional reserve banking 'FRB' and international multiple

fiat currency system 'EXCH' still promote economic growth or curb financial crisis. Meanwhile, all Islamic variables promote economic growth or curb financial crisis, especially narrow banking 'NB' and single global currency/gold standard or just money 'GOLD'.
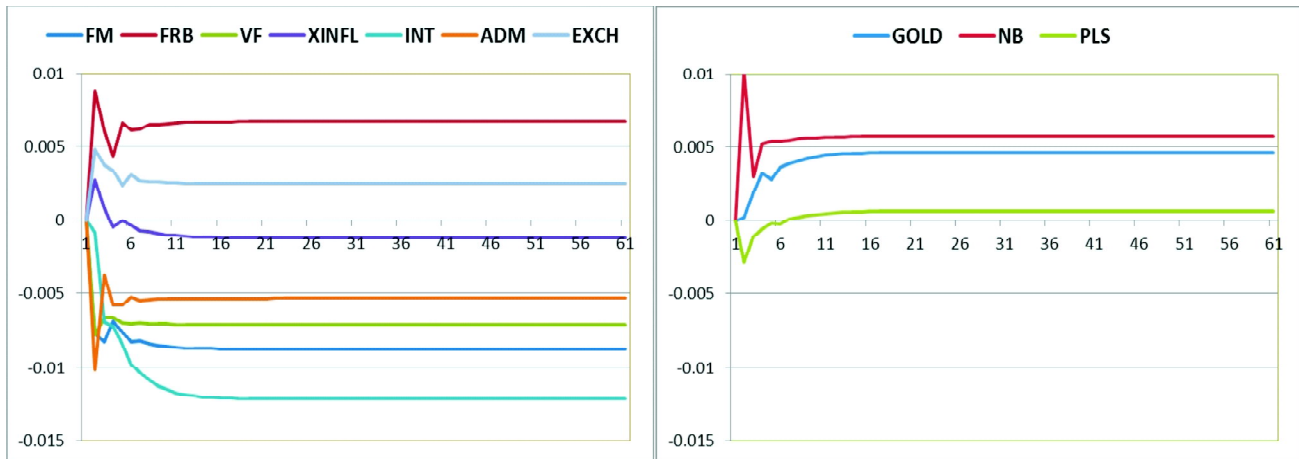

Figure 5: IRF Results of GROWTH Model

Forecast Error Variance Decomposition (FEVD) results of Growth model can be seen in figure 6. The results show that interest rate 'INT' gives the highest share (24.85%) to reduce growth or induce financial crisis, followed by fiat money 'FM' with 13.49% share, while fractional reserve banking 'FRB' (8.02%), narrow banking 'NB' (5,98%) and single global currency/gold standard or just money 'GOLD' give the highest share to improve growth or curb financial crisis. The results consistent with the tight money condition in Indonesia (with M2/GDP less than 0.4), where loosening monetary policy will improve growth.

VECM summary results of Growth model can be seen in table 4.6. Most conventional variables (see table 6, center), including expected inflation 'XINFL' (Behavior), administered price 'ADM' (Governance), interest rate 'INT' and fiat money 'FM' (Monetary), as well as volatile food 'VF' (Fiscal), reduce growth or induce financial crisis, while multiple currency 'EXCH' (External) and fractional reserve banking 'FRB' (Monetary) improve growth or curb financial crisis. Meanwhile, all Islamic variables (see table 6, right), including 'GOLD' as single global currency (External) and just money (Monetary), as well as profit-and-loss sharing 'PLS' and narrow banking 'NB' (Monetary), improve growth or curb financial crisis.

4.4. Analysis

Overall VECM summary results of Inflation and Growth models can be re written as seen in table 7. Five conventional variables, including expected inflation 'XINFL' (Behavior), administered price 'ADM' (Governance), interest rate 'INT' and fiat money 'FM' (Monetary), as well as volatile food 'VF' (Fiscal), induce financial crisis through increased inflation and reduced growth (see table 7, left). Meanwhile, two Islamic variables, including 'GOLD' as single global currency (External) and just money (Monetary), as well as profit-and-loss sharing 'PLS' (Monetary), curb financial crisis through reduced inflation and improved growth. Moreover, two conventional variables, multiple currency 'EXCH' (External) and fractional reserve banking 'FRB' (Monetary), as well as one Islamic variable, narrow banking 'NB' (Monetary), on one hand induce financial crisis through increased inflation, on the other hand curb financial crisis through improved growth.
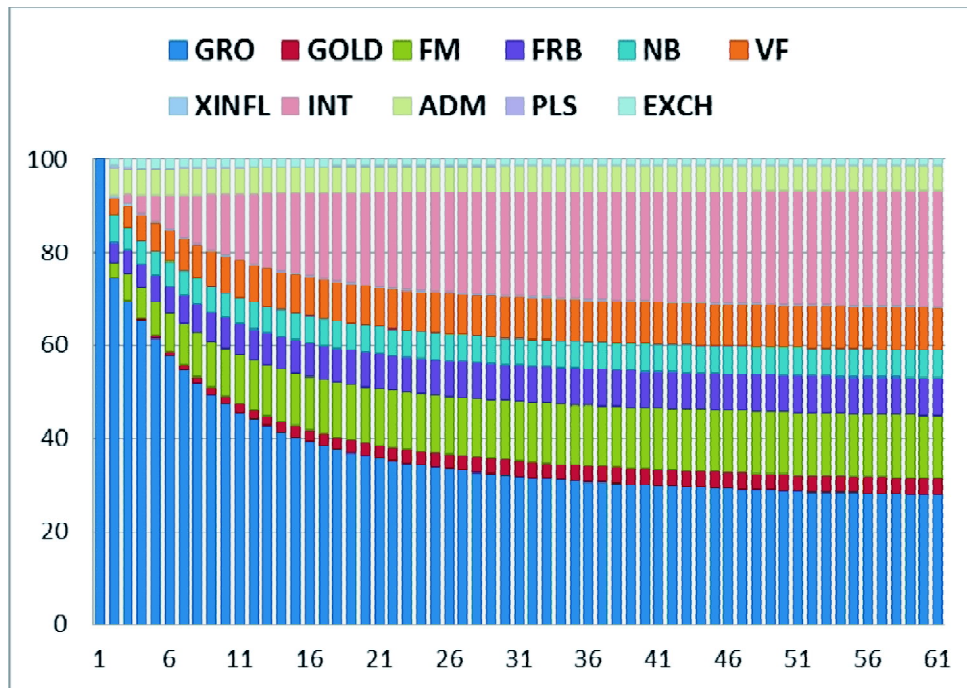
Figure 6: FEVD Results of GROWTH Model

Table 6
VECM Summary Results of Growth Model

Variables	Conventional	Islamic
Behavior	– XINFL: (–), 0.24%	– N/A
External	– Exch: (+), 1.21%	– Gold: (+), 3.50%
Governance	– Adm: (–), 5.33%	– N/A
	– INT: (–), 24.85%	– PLS: (+), 0.09%
Monetary	– FM: (–), 13.49%	– Gold: (+), 3.50%
	– FRB: (+), 8.02%	– NB: (+), 5.98%
Fiscal	– VF: (–), 9.11%	– n/a

In summary, interest rate 'INT' (Monetary) is the number one root cause of financial crisis with 43.66% share in inducing inflation and 24.85% share in curbing economic growth, followed by administered price 'ADM' (Governance) with 14.41% share in inducing inflation and 5.33% share in curbing economic growth, fiat money 'FM' (Monetary) with 5.54% share in inducing inflation and 13.49% share in curbing economic growth, and volatile food 'VF' (Fiscal) with 5.79% share in inducing inflation and 9.11% share in curbing economic growth. Meanwhile, 'Gold' as single global gold currency (External) and just money (Monetary) is the number one cure of financial crisis with 8.03% share in curbing inflation and 3.50% share in inducing economic growth, followed by profit-and-loss sharing 'PLS' (Monetary) with 0.02% share in curbing inflation and 0.09% share in inducing economic growth. Narrow banking 'NB' will be more effective if it is combined by gold or gold backed currency.

Table 7
Overall VECM Summary Results

↑*Inflation and* ↓*Growth*	↑*Inflation and* ↓*Growth*	↓*Inflation and* ↑*Growth*
	Conventional	
Xinfl; Adm; Int and Fm; VF	Exch; FRB	–
	Islamic	
–	NB	Gold; PLS

Gold or gold-backed currency is proven to be the most effective means of stabilizing currency as mentioned by US Congressman Ron Paul in his April 2002 letters to US Treasury Department and the Federal Reserve Bank asking why IMF prohibits gold-backed currencies for its member states (Hosein, 2007). The letter is as follows.

Dear Sirs: I am writing regarding Article 4, Section 2b of the International Monetary Fund (IMF)'s Articles of Agreement. As you may be aware, this language prohibits countries who are members of the IMF from linking their currency to gold. Thus, the IMF is forbidding countries suffering from an erratic monetary policy from adopting the most effective means of stabilizing their currency. This policy could delay a country's recovery from an economic crisis and retard economic growth, thus furthering economic and political instability.I would greatly appreciate an explanation from both the Treasury and the Federal Reserve of the reasons the United States has continued to acquiesce in this misguided policy. Please contact Mr. Norman Singleton, my legislative director, if you require any further information regarding this request.Thank you for your cooperation in this matter.*Ron PaulU.S. House of Representatives*Note: Neither the Federal Reserve Bank nor the US Treasury Department has so far responded to this request for an explanation.

Source: Hosein (2007).

In other words, to prevent financial crisis, in monetary side, interest system should be replaced by profit-and-loss sharing system, while international multiple fiat currency system should be replaced by single global currency based on gold or gold standard. Meanwhile, in government/fiscal side, there should be no price control on goods and services, but there should be good regulation, supervision and management of goods and services, especially for strategic commodities to stabilize their demands and supplies. Moreover, misbehavior of economic actors, especially speculation should be prohibited.

In Indonesia case, there is an anomaly of broad money supply (M2) which always significantly lowers than GDP (see figure 4.5), where M2/GDP in 2012 only reached 0.40. India has the closest M2/GDP figure, which reached 0.80 in 2012, or twice as much as that of Indonesia, while Thailand and Malaysia have very high M2/GDP of 1.32 (in 2012) and 1.42 (in 2011), respectively. That is why the increase of FRB (which uses M2 as its proxy) will give only 0.08% share in increased inflation, but it will give 8.02% share in increased economic growth. Note that M2/GDP of countries affected by 1998 Asian crisis (such as Thailand, Malaysia and South Korea) has reached their pre-crisis level or higher. This means that there is still plenty of room for Indonesia to stimulate economic growth without inducing inflation (or triggering financial crisis) by gradually increases M2/GDP to its optimal level. FRB will become a problem by inducing inflation and triggering financial crisis when M2 becomes excessive (money supply greater than the money needed by the economy), which is usually when M2/GDP becomes greater than its optimal level.
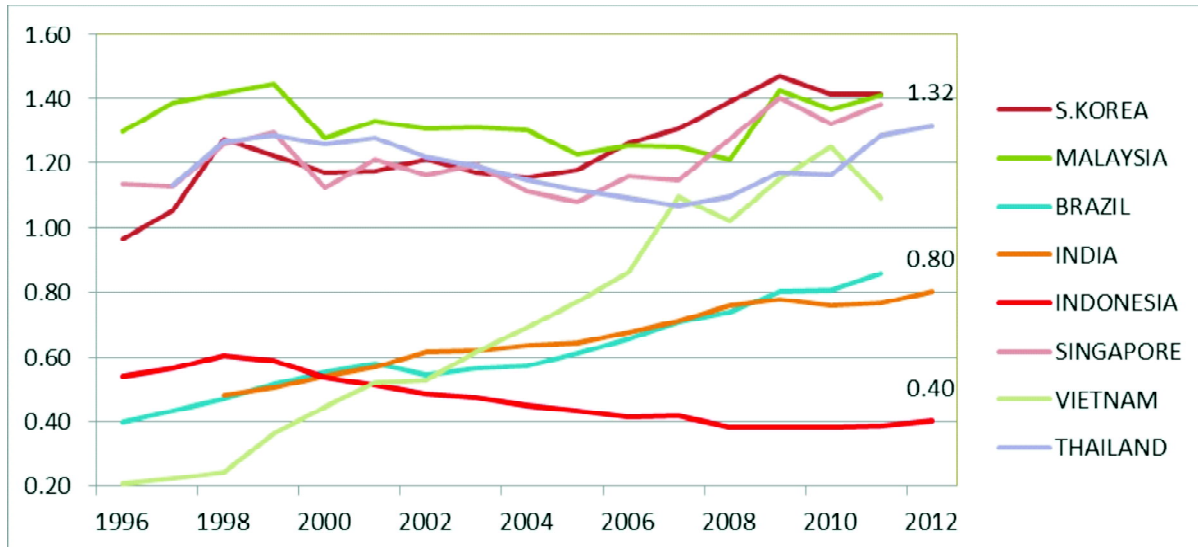
Figure 7: M2/GDP of Indonesia and Other Selected Countries

5. CONCLUSION AND RECOMMENDATION

5.1. Conclusion

- Under Inflation model, all variables induce inflation or cause financial crisis except two Islamic variables, 'PLS' as profit-and-loss sharing (Monetary) and 'GOLD' as single global currency (External) and just money (Monetary), which curb inflation or prevent financial crisis. It means that all conventional variables, namely, interest system 'INT', fiat money system 'FM' and fractional reserve banking system 'FRB' (Monetary), administered price 'ADM' (Governance) that should not be controlled, volatile food 'VF' (Fiscal) due to minimum control, expected inflation 'XINF' (Behavior), and international monetary system with multiple fiat currency 'EXCH' (External), contribute to financial crisis.

- The highest contributor to cause financial crisis through inducing inflation is interest system 'INT' (43.66%), followed by administered price 'ADM' (14.41%), volatile food 'VF' (5.79%) and fiat money system 'FM' (5.54%). The highest contributor to prevent financial crisis through curbing inflation is single global currency and just money 'GOLD' (-8.03%), followed by profit-and-loss sharing 'PLS' (–0.02%).

- Under Growth model, most conventional variables hinder growth or cause financial crisis, including (from the highest to the lowest contributor) interest system 'INT' -28.85% and fiat money system 'FM'-13.49% (Monetary), volatile food 'VF' -9.11% (Fiscal), administered price 'ADM' -5.33% (Governance), and expected inflation 'XINF' -0.24% (Behavior). Meanwhile, all Islamic variables prevent financial crisis through stimulating economic growth, namely, narrow banking 'NB' +5.98% and profit-and-loss sharing 'PLS' +0.09% (Monetary), as well as single global currency and just money 'GOLD' +3.50% (External and Monetary).

- Therefore, the real determinants or root causes of financial crisis are structural in unstable monetary system, poor governance, unsustainable fiscal system, misbehavior of economic actors,

as well as in external factor. Interest system and fiat money system (Monetary), administered price (Governance), volatile food (Fiscal), as well as expectation (Behavior) are the most dominant variables to cause financial crisis through Inflation and Growth.

- Under Inflation and Growth models, interest system is the prime real determinant or root cause of financial crisis through inducing inflation and curbing economic growth, so that lowering the interest rate will decrease inflation and will induce economic growth, thus it will prevent financial crisis most effectively.

- Under Inflation model, narrow banking system 'NB' still induce inflation (thus, financial crisis), since the proxy used for NB is money use for transaction-M1, which is still represents fiat money and money creation of conventional system. When narrow banking system is combined with gold or gold backed currency, it will be most effective.

- Under Growth model, fractional reserve banking system 'FRB' still stimulates growth (or hinders financial crisis), since money supply needed in the economy-M2 is in shortage with the ratio of M2/GDP is less than 40% and in decreasing trend. Therefore the expansion of money supply will stimulate growth.

- Under Growth model, multiple international currency system 'EXCH' still also stimulates growth (or hinders financial crisis), since under multiple currency system, the depreciation of one country's currency will improve the competitiveness of that country in international trade and finance.

5.2. Recommendation

- Structural reforms are needed in monetary system, fiscal system and governance, as well as in international system, which are more fair, just, stable and sustainable. Moreover, behavior of economic actors should be controlled by market conduct regulation and improved by education.

- The share of Islamic finance should be increased, while the share of PLS system in Islamic finance should be increased to improve the stability of financial system in a country adopting dual financial system.

- International monetary system should move towards a just single currency system, which is not a currency of certain country. Gold standard is the most just and stable monetary system.

- In Indonesia case, to lower inflation, and at the same time prevent the CRISIS, interest rate should be lowered up to its optimal level.

- In Indonesia case, to stimulate growth, and at the same time prevent the CRISIS, M2/GDP should be gradually increased up to its optimal level.

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APPENDIX

1.   Inflation Model (INFL)

(a)   Johansen Cointegration Test

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	*Eigen value*	*Trace Statistic*	*0.05 Critical Value*	*Prob.***
None*	0.539129	329.5569	285.1425	0.0002
At most 1*	0.463229	253.6426	239.2354	0.0095
At most 2	0.383796	192.6685	197.3709	0.0833
At most 3	0.341524	145.2192	159.5297	0.2290
At most 4	0.291278	104.2722	125.6154	0.4662
At most 5	0.204191	70.53161	95.75366	0.7047
At most 6	0.180942	48.14882	69.81889	0.7158
At most 7	0.114425	28.58794	47.85613	0.7876
At most 8	0.081687	16.67915	29.79707	0.6636
At most 9	0.079682	8.327887	15.49471	0.4310
At most 10	0.001941	0.190388	3.841466	0.6626

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

* denotes rejection of the hypothesis at the 0.05 level

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

(b)   Cointegration Summary

Date: 12/10/12 Time: 13:30

Sample: 2004M01 2012M05

Included observations: 99

Series: INFL XINFL IM FRB VF FM GOLD ADM PLS INT EXCH

Lags interval: 1 to 1

Selected (0.05 level*) Number of Cointegrating Relations by Model

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	3	4	2	2	2
Max-Eig	3	2	1	1	1

*Critical values based on MacKinnon-Haug-Michelis (1999).

Information Criteria by Rank and Model

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or No. of CEs	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Log Likelihood by Rank (rows) and Model (columns)					
0	1517.742	1517.742	1553.662	1553.662	1557.615
1	1560.250	1564.073	1598.212	1599.433	1603.377
2	1598.974	1605.027	1626.966	1632.218	1635.328
3	1626.922	1633.176	1654.220	1660.769	1663.755
4	1646.031	1660.370	1673.743	1680.870	1683.046
5	1663.506	1677.892	1689.908	1697.059	1699.218
6	1675.128	1691.341	1700.724	1711.238	1712.667
7	1685.152	1701.514	1708.397	1721.584	1722.953
8	1692.618	1709.185	1712.815	1729.169	1730.536
9	1695.434	1713.597	1715.763	1733.452	1734.578
10	1697.653	1716.403	1718.569	1736.323	1737.444
11	1698.424	1718.616	1718.616	1738.602	1738.602
Akaike Information Criteria by Rank (rows) and Model (columns)					
0	−28.21701	−28.21701	−28.72045	−28.72045	−28.57808
1	−28.63132	−28.68834	−29.17599	−29.18047	−29.05812
2	−28.96917	−29.05105	−29.31244	−29.37815	−29.25916
3	−29.08934	−29.15508	−29.41858	−29.49028*	−29.38900
4	−29.03093	−29.23980	−29.36855	−29.43171	−29.33426
5	−28.93951	−29.12912	−29.25067	−29.29413	−29.21652
6	−28.72985	−28.93618	−29.02473	−29.11592	−29.04377
7	−28.48793	−28.67705	−28.73529	−28.86027	−28.80713
8	−28.19430	−28.36736	−28.38010	−28.54887	−28.51588
9	−27.80674	−27.99186	−27.99521	−28.17076	−28.15309
10	−27.40713	−27.58391	−27.60746	−27.76410	−27.76655
11	−26.97827	−27.16396	−27.16396	−27.34550	−27.34550

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or No. of CEs	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend

Schwarz Criteria by Rank (rows) and Model (columns)

0	–25.04520	–25.04520	–25.26029*	–25.26029*	–24.82958
1	–24.88281	–24.91362	–25.13914	–25.11740	–24.73292
2	–24.64397	–24.67342	–24.69889	–24.71217	–24.35727
3	–24.18744	–24.17454	–24.22835	–24.22140	–23.91041
4	–23.55234	–23.65636	–23.60162	–23.55993	–23.27898
5	–22.88423	–22.94278	–22.90704	–22.81943	–22.58455
6	–22.09788	–22.14693	–22.10441	–22.03832	–21.83510
7	–21.27926	–21.28489	–21.23828	–21.17977	–21.02177
8	–20.40894	–20.37230	–20.30639	–20.26546	–20.15383
9	–19.44469	–19.39389	–19.34481	–19.28444	–19.21434
10	–18.46838	–18.38303	–18.38036	–18.27487	–18.25111
11	–17.46283	–17.36018	–17.36018	–17.25336	–17.25336

2. Growth Model (GRO)

(a) Johansen Cointegration Test

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.604103	349.8794	285.1425	0.0000
At most 1 *	0.478326	258.1459	239.2354	0.0052
At most 2	0.436010	193.7254	197.3709	0.0747
At most 3	0.327820	137.0263	159.5297	0.4238
At most 4	0.291920	97.70057	125.6154	0.6729
At most 5	0.206646	63.52595	95.75366	0.8959
At most 6	0.160746	40.60884	69.81889	0.9379
At most 7	0.110090	23.25991	47.85613	0.9567
At most 8	0.059663	11.71303	29.79707	0.9414
At most 9	0.049332	5.622807	15.49471	0.7396
At most 10	0.006186	0.614348	3.841466	0.4332

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

*denotes rejection of the hypothesis at the 0.05 level

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

(b)   *Cointegration Summary*

Date: 12/10/12 Time: 09:42

Sample: 2004M01 2012M05

Included observations: 99

Series: GRO GOLD FM FRB IM VF XINFL INT ADM PLS EXCH

Lags interval: 1 to 1

Selected (0.05 level*) Number of Cointegrating Relations by Model

Data Trend:	*None*	*None*	*Linear*	*Linear*	*Quadratic*
Test Type	*No Intercept No Trend*	*Intercept No Trend*	*Intercept No Trend*	*Intercept Trend*	*Intercept Trend*
Trace	4	4	2	3	3
Max-Eig	4	4	1	1	1

*Critical values based on MacKinnon-Haug-Michelis (1999).

Information Criteria by Rank and Model

Data Trend:	*None*	*None*	*Linear*	*Linear*	*Quadratic*
Rank or No. of CEs	*No Intercept No Trend*	*Intercept No Trend*	*Intercept No Trend*	*Intercept Trend*	*Intercept Trend*
Log Likelihood by Rank (rows) and Model (columns)					
0	1338.785	1338.785	1369.874	1369.874	1373.166
1	1376.547	1384.776	1415.741	1417.705	1420.984
2	1409.489	1420.058	1447.951	1450.819	1454.097
3	1441.097	1452.262	1476.301	1479.258	1482.373
4	1468.510	1480.328	1495.964	1501.689	1503.944
5	1485.108	1499.108	1513.051	1520.015	1522.014
6	1499.281	1514.801	1524.510	1535.828	1537.785
7	1509.650	1525.682	1533.184	1546.564	1548.072
8	1517.909	1534.348	1538.957	1555.236	1556.715
9	1520.830	1540.011	1542.003	1560.735	1561.662
10	1522.966	1542.707	1544.507	1563.711	1564.638
11	1523.380	1544.814	1544.814	1565.985	1565.985
Akaike Information Criteria by Rank (rows) and Model (columns)					
0	–24.60172	–24.60172	–25.00756	–25.00756	–24.85185
1	–24.92013	–25.06619	–25.48972	–25.50918	–25.37341
2	–25.14120	–25.31430	–25.69599	–25.71352	–25.59791

Contd. table

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or No. of CEs	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
3	–25.33530	–25.50025	–25.82426*	–25.82339	–25.72471
4	–25.44465	–25.60259	–25.77704	–25.81189	–25.71603
5	–25.33551	–25.51734	–25.67780	–25.71748	–25.63665
6	–25.17739	–25.36971	–25.46484	–25.57228	–25.51080
7	–24.94243	–25.12490	–25.19564	–25.32452	–25.27417
8	–24.66484	–24.83532	–24.86783	–25.03508	–25.00434
9	–24.27939	–24.48508	–24.48490	–24.68151	–24.65985
10	–23.87810	–24.07489	–24.09105	–24.27699	–24.27551
11	–23.44202	–23.65281	–23.65281	–23.85828	–23.85828

Schwarz Criteria by Rank (rows) and Model (columns)

0	–21.42990	–21.42990	–21.54740*	–21.54740*	–21.10334
1	–21.17163	–21.29147	–21.45287	–21.44612	–21.04821
2	–20.81600	–20.93668	–21.08244	–21.04754	–20.69602
3	–20.43340	–20.51972	–20.63402	–20.55451	–20.24613
4	–19.96607	–20.01915	–20.01011	–19.94011	–19.66075
5	–19.28023	–19.33100	–19.33417	–19.24279	–19.00468
6	–18.54542	–18.58046	–18.54452	–18.49468	–18.30214
7	–17.73376	–17.73274	–17.69862	–17.64401	–17.48881
8	–16.87948	–16.84026	–16.79412	–16.75167	–16.64228
9	–15.91734	–15.88711	–15.83450	–15.79519	–15.72110
10	–14.93935	–14.87401	–14.86395	–14.78776	–14.76007
11	–13.92658	–13.84902	–13.84902	–13.76614	–13.76614