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BANK INDONESIA

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Quarter 2, 2009
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QUARTERLY ANALYSIS:
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Developments in the global economy suggest a gathering momentum in the recovery process, although still daunted by risks. In developed nations, various indicators of macroeconomic recovery have shown an improving trend. Government-sponsored stimulus packages and financial sector stabilisation programmes have successfully bolstered public confidence, and in turn strengthened consumption. Conditions on credit markets have also begun to improve in an added development encouraging greater private consumption. Despite this, stubbornly high levels of unemployment pose risks daunting the economic recovery process in these nations. On the other hand, economic recovery is gaining momentum in emerging market countries, led by China, India and Korea. Investment activity in China, under way since the beginning of the year, is supported by a fiscal stimulus through infrastructure spending and brisk credit expansion Resurgent domestic demand in these Asian economies has stimulated improved economic performance in other countries in the region. Despite this, the economic improvement in some emerging market countries is not yet regarded sufficient to compensate for the slowdown in advanced economies. In response to these developments, further contraction is predicted in the global economy, although at a lesser pace.

Expectations of world economic recovery have fuelled positive developments on global financial markets. Global financial sector performance showed steady gains throughout Q2/2009. Stock markets in developed economies recorded index gains on the back of positive sentiment linked to improvement in bank performance in the wake of the stress tests, optimism for stabilisation of the financial sector and economic conditions and positive performance reported in financial statements published by some world financial institutions. Banking sector conditions have shown improvement, as reflected in a relaxation of lending standards. These financial market developments in advanced nations have in turn impacted financial markets in the region. Despite this, financial market developments took a downturn near the end of the period, triggered by negative sentiment related to stubbornly high levels of unemployment in the United States and Europe.

The improving trend in the global economy has had a positive impact on Indonesia's economic performance. The impact of strengthening demand in trading partners, led by China and India, has boosted Indonesian exports of commodities such as CPO, coal and copper,. Despite the steady improvement, the lack of recovery in the global economy means that exports continue to suffer contraction. Concerning domestic demand, the flagging pace of private consumption has been mitigated by the presidential election and the payout of the 13th month salary to civil servants. Investment activity remains limited under the present conditions of continued weak demand and low levels of capacity utilisation. In view of these developments, economic growth in Q2/2009 is estimated at 3.7%-4.0%.

In regard to prices, the declining inflation trend is set to continue. During June 2009, consumer goods prices recorded 0.11% inflation (mtm), considerably below the historical level and earlier projections. Increases in some international food commodity prices were again offset by appreciation in the rupiah, thus keeping a lid on increases in domestic prices. Besides the appreciation in the rupiah, improving expectations of inflation bolstered by the accelerated pace of disinflation brought down the rate of core inflation. Measures to safeguard adequate supplies of food staples also helped maintain low inflation in Q2/2009. Taken together, cumulative inflation in the CPI measured 0.21% (ytd) or 3.65% (yoy).

Rising commodity prices and strengthening demand in emerging market countries also bolstered the balance of payments, which is performing ahead of earlier predictions. Balance of payments performance has strengthened on the back of a larger than expected surplus in the current account. Non-oil and gas exports have received a boost from rising global market commodity prices, led by mining commodities and crude palm oil, and also from resurgent demand in emerging market nations and especially China and India. In the capital and financial account, portfolio investments again recorded a surplus. Improving conditions on global financial markets and sustained positive perceptions of the domestic economy have prompted renewed growth in portfolio capital inflows. However, following the capital reversal that hit domestic financial markets in mid-June 2009, portfolio investment levels for Q2/2009 were not as high as predicted. Inflows for direct investment are also estimated to have climbed in response to growing exploration activity by oil and natural gas companies. Furthermore, the confidence that has been maintained in the domestic economic outlook and the freeing up of global financial markets has led to higher than forecasted disbursements on private foreign debt. As a result, international reserves reached US$57.58 billion at end-June/2009, equivalent to 5.6 months of imports and servicing of official debt.

Improvement in the balance of payments and positive sentiment on the global market have brought about exchange rate appreciation. Compared to other countries in the region,

the rupiah maintained the second highest rate of appreciation after the Korean won. Averaged over Q2/2009, the rupiah gained 9.99% on the back of increased supply of foreign currency in response to foreign capital inflows. Optimism for global economic recovery alongside carefully managed domestic economic fundamentals, reflected in the balance of payments surplus and attractive yields on rupiah instruments, has stimulated risk appetite for financial assets in emerging markets, including Indonesia. Despite this, negative sentiment over global economic developments prompted a slight drop in the value of the rupiah at end-Q2/2009 compared to early June 2009.

In the financial sector, global developments and conducive domestic macroeconomic indicators have had a positive effect on the domestic financial sector. The stock market charted overall index gains during Q2/2009 despite temporary capital reversal near the end of the quarter that prompted a dip in the stock index. Improvement in domestic fundamentals and rising global commodity prices have paved the way for brisk share buying activity by foreign and domestic investors. On the bond market, yield on Indonesian government securities eased in line with the downward movement in the monetary policy rate and resurgent interest among foreign investors. Despite this, Government Securities yield in longer tenors (above 15 years) remains high, reflecting strong risk perceptions.

In the banking sector, the national banking system is in comparatively stable condition despite the limited banking response to monetary easing. At the micro level, conditions in the Indonesian banking system were again stable, as indicated by the safe level of the capital adequacy ratio (CAR) at a high 17.3% in May 2009. Alongside this, the gross non-performing loans (NPLs) ratio has been held below 5% with net NPLs less than 2%. Banking liquidity, including liquidity on the interbank money market, is steadily improving alongside growth in depositor funds. Despite this, bank interest rates again showed only limited response. The base lending rate response to the 250 bps reduction in the BI Rate from December 2008 to June 2009 measured no more than about 45 bps in figures for May 2009. In a related development, bank loan disbursements for the position at May 2009 saw further contraction at 1.1% (ytd). Even so, liquidity in the economy was adequate. Although the expansion in monetary aggregates (cash outside banks and M1) remains very thin, calculations based on fundamentals indicate that the trend in monetary aggregates is still commensurate to the needs of the economy. With loan interest rates declining at a slower pace and the very limited rate of credit expansion, indications are emerging of a more intensive shift under way in business towards non-bank financing alternatives, such as bond issues.

Looking forward, the economic growth outlook is better than originally predicted. In the short-term, economic projections will be strongly influenced by global developments. The

predicted contraction in exports for the year as a whole is expected to be offset by a surge in private consumption from the national elections. Given the bigger than expected impact from the election of parliamentary and local assembly candidates in Q1/2009, the 2009 presidential polls are predicted to contribute significantly to private consumption. While purchasing power has yet to show significant improvement, private consumption is forecasted to maintain brisk growth in 2009 from the knock-on effects of the national elections. Against this background, the economy has potential to chart higher than projected growth for 2009 as a whole. Indonesia's GDP is forecasted at 3.5%-4.0% growth by end-2009, with a bias towards the upper limit of this band.

Indonesia's balance of payments is predicted to chart a surplus for 2009 overall, strengthened by improvement in global economic conditions, rising commodity prices and ongoing stabilisation of global financial markets. Exports are predicted to improve in response to the more evenly distributed improvement in the global economy across the world's regions since Q3/2008 and the ongoing rise in world commodity prices. In the capital and financial account, foreign capital inflows in portfolio and direct investments are set to continue in line with optimism for world economic recovery alongside more conducive conditions on global financial markets. In addition, capital inflows in the public sector are expected to shore up performance in the capital and financial account.

After factoring in these developments, the Bank Indonesia Board of Governors Meeting on 03 July 2009 decided to lower the BI Rate by 25 bps from 7.0% to 6.75%. This decision is expected to bolster measures for sustaining optimism in domestic economic growth.

Looking ahead, monetary policy will seek to maintain a balance between bolstering the domestic economy amid the persistent sluggishness of the global economy and maintaining macroeconomic stability over the medium-term with the looming increase in inflationary pressure in 2010. **Accordingly, future monetary policy will pursue a more prudent course in view of the progressively limited room for monetary relaxation.**

FINANCIAL CRISIS IN THE DEVELOPING WORLD – POST THE US "ASSET PRICE BUBBLE DEBACLE" – A NEW WAY FORWARD

Ms. Sagarika Chakraborty
Mr. Soumya Banerjee[1]

Abstract

This paper analyze how we should respond to possible asset price bubbles, especially in view of the various conceptual frameworks proposed based on a core set of scientific principles for monetary policy. Further, efforts have also been made at my end to establish as to how Monetary policy should not react to asset price bubbles per se, but rather to changes in the outlook for inflation and aggregate demand resulting from asset price movements. However, regulatory policies and supervisory practices should respond to possible asset price bubbles and help prevent feedback loops between asset price bubbles and credit provision, thereby minimizing the damaging effects of bubbles on the economy.

The general massage of this paper is that credit conditions influence economies enormously and emergency steps to restructure balance sheets through policy revamping are crucial for fixing problems of excessive leverage. This stands in sharp contrast to the view from conventional models - that 'the effects of a worsening of financial intermediation are likely to be limited' and can be handled by interest rate cuts alone.

In the alternative regulatory policy approach, we have strived to examine three possible regulatory responses to managing bubbles: portfolio restrictions; adjustments in capital requirements; and adjustments in provisioning requirements.

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I. INTRODUCTION

Economic development has been a subject of great debate especially with reference to asset price bubbles. With the hindsight of documented experience, the bursting of asset bubbles in the housing market has often been associated with severe economic crises, especially, in the aftermath of the recessions caused by sharp diminution in spending propensity as a result of loss in the consumers' power to leverage against capital gains.

Much before the present financial fiasco engulfed the world the International Monetary Fund (IMF) research reported in the World Economic Outlook in 2003 indicated that output losses after house-price crashes in developed countries have, on average, been twice as large as those after stock market crashes, usually resulting in lasting recessions.[2]

In view of the above scenario, this article mainly seeks to analyze how the existing loopholes in the laws of various countries poise a greater threat in the coming years for a severe economic downturn and as to how such a Diaspora would affect developing countries and their economic stability on the world map. According to Mr. R. Kannan of the Reserve Bank of India, stock prices seem to be a leading indicator of inflation, though they seem to lack predictive power when it comes to the output gap, and therefore, taking example from such case studies it is important to analyze the "bubble trends" of individual economies to chalk out proper bail out plans and to effectuate a stable economy to evade the future set backs.

To achieve this end, we would suggest anti-bubble laws in various developing economies, similar to ours, India which when analyzed fits the template and maps onto microeconomic and macroeconomic research on bubble formation and essentially proposes a regulatory frame work in comparison to the traditional "monetary policy" for all approaches.

The article also ascertains the why asset price bubbles can arise from market failures that lead to credit booms and regulation which can help prevent feedback loops between asset price bubbles and credit provision with the aid of regulatory policies that are to govern the Banks.

II. HISTORICAL MONOLOGUE

The long bull market and the exuberance associated with the new economy boom of the 1990s came to a halt in 2000. Since then, broad equity price indices in industrial countries have fallen sharply and persistently and thus, in order to appreciate the very nature of working of

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2 International Monetary Fund's report in World Economic Outlook, titled, "Growth and Institutions", published in April 2003, available at http://www.imf.org/external/pubs/ft/weo/2003/01/index.htm

these bubbles it is important to analyze them in light of their historical backdrop and the underlying reason that gives rise to such debacles.

The very concept of asset price bubble being a new and emerging predicament across economies is a misnomer. Price bubbles have existed since the mid 17th century and although the sectors which have been affected differed but the underlying causes have more-a-less remained the same. Clubbed together within the term of "economic bubble", (which can be said to include **speculative bubble**, a **market bubble**, a **price bubble**, a **financial bubble**, or a **speculative mania**) it refers to in simple terms "trade in high volumes at prices that are considerably at variance with intrinsic values.[3]

A brief outline of the history of asset price bubble can be summarized in the following table:

Year	Commonly referred to as	Brief description
1637	TULIP MANIA or TULIPOMANIA	It was essentially the first recorded speculative bubble the Dutch Golden Age during which contract prices for bulbs of the recently introduced tulip reached extraordinarily high levels and then suddenly collapsed At the peak of tulip mania in February 1637, tulip contracts sold for more than 10 times the annual income of a skilled craftsman.[4]
1720	SOUTH SEA BUBBLE	The South Sea Company was a British joint stock company that traded in South America during the 18th century. Speculation in the company's stock led to a great economic bubble known as the South Sea Bubble in 1720, which caused financial ruin for many.[5]
1840s	RAILWAY MANIA	One of the most discussed speculative bubbles of Britain that followed a common pattern: as the price of railway shares increased, more and more money was poured in by speculators, until the inevitable collapse. It reached its zenith in 1846, when no fewer than 272 Acts of Parliament were passed, setting up new railway companies, and the proposed routes totalled 9,500 miles (15,300 km) of new railway. Around a third of the railways authorised were never built for reasons of the company either collapsing due to poor financial planning, or for being bought out by a larger competitor before it could build its line, or because it turned out to be a fraudulent enterprise to channel investors' money into another business.[6]

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3 King, Ronald R.; Smith, Vernon L.; Williams, Arlington W. and van Boening, Mark V. (1993). "The Robustness of Bubbles and Crashes in Experimental Stock Markets". in R. H. Day and P. Chen. *Nonlinear Dynamics and Evolutionary Economics.* New York: Oxford University Press. ISBN 0195078594. Also see, Lahart, Justin (2008-05-16). "Bernanke's Bubble Laboratory, Princeton Protégés of Fed Chief Study the Economics of Manias". *The Wall Street Journal*: p. A1. avaialbe at http://online.wsj.com/article/SB121089412378097011.html.

4 Tulipomania: The Story of the World's Most Coveted Flower & the Extraordinary Passions It Aroused." Mike Dash (2001).

5 John O'Farrell, An Utterly Impartial History of Britain - Or 2000 Years of Upper Class Idiots In Charge (October 22 2007) (2007, Doubleday, ISBN 9780385611985). Also, see Charles Mackay, Extraordinary Popular Delusions and the Madness of Crowds (Harriman House Classics 2003), p. 65 & 71.

6 Wolmar, C, 2007, Fire & Steam: A History of the Railways in Britain, Atlantic Book (London) ISBN 978-1-84354-629-0.

8   *Bulletin of Monetary Economics and Banking, July 2009*

Year	Commonly referred to as	Brief description
1920s	FLORIDA LAND BOOM	The Florida land boom of the 1920s was first reported real estate bubble, which burst in 1925, leaving behind entire new cities and the remains of failed development projects. What started with a frenzy report proclaiming "It's June In Miami", resulted in property prices rising rapidly on speculation and a land and development boom was ensued.[7]
1970s	POISEDON Bubble	It was the first so called stock market bubble in which the price of Australian mining shares soared in late 1969, only to crash in the early 1970s. It was triggered by the Poseidon NL company's discovery of a promising site for nickel mining in September 1969.[8]
1980s	JAPANESE ASSET PRICE Bubble	In the decades following World War II, Japan implemented stringent tariffs and policies to encourage people to save their income. With more money in banks, loans and credit became easier to obtain, and with Japan running large trade surpluses, the yen appreciated against foreign currencies. This allowed local companies to invest in capital resources much more easily than their competitors overseas, which reduced the price of Japanese-made goods and widened the trade surplus further.[9] And, with the yen appreciating, financial assets became very lucrative, giving rise to an economic bubble in Japan from 1986 to 1990, in which real estate and stock prices greatly inflated.[10] The bubble's collapse lasted for more than a decade with stock prices bottoming in 2003, until hitting an even lower low amidst the current global crisis in 2008.
1997	ASIAN FINANCIAL CRISIS	Periods of financial crisis followed post 1997 that not only gripped Asia but also raised fears of a worldwide economic meltdown due to financial contagion. The crisis started in Thailand with the financial collapse of the Thai baht caused by the decision of the Thai government to float the baht, cutting its peg to the USD, after exhaustive efforts to support it in the face of a severe financial overextension that was in part real estate driven. At the time, Thailand had acquired a burden of foreign debt that made the country effectively bankrupt even before the collapse of its currency. As the crisis spread, most of Southeast Asia and Japan saw slumping currencies, devalued stock markets and other asset prices, and a precipitous rise in private debt.[11]

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7   Kenneth Ballinger: *Miami Millions*, Miami: (self published), 1936. p. 139.

8   Three Australian Asset-price Bubbles", The Reserve Bank of Australia, 2003. Available at http://www.rba.gov.au/PublicationsAndResearch/2003/Simon.pdf.

9   Bank of Japan, "Asset Price Bubble in Japan in the 1980s: Lessons for Financial and Macroeconomic Stability" http://www.imes.boj.or.jp/english/publication/edps/2003/03-E-15.pdf.

10   "Japan's Bubble Economy".http://www.sjsu.edu/faculty/watkins/bubble.htm.

11   Kaufman, GG., Krueger, TH., Hunter, WC. (1999). The Asian Financial Crisis: Origins, Implications and Solutions. Springer. ISBN 0792384725.

Year	Commonly referred to as	Brief description
2006 to till date	REAL ESTATE BUBBLE	Since 2006, the existence of real estate bubbles or the sub-prime mortgage crisis across the world, has led economists to wonder about the similar patterns in real estate markets of a wide variety of countries, which essentially include similar patterns of overvaluation and excessive borrowing based on those overvaluations. These Real estate bubbles are invariably followed by severe price decreases (also known as a house price crash) that can result in many owners holding negative equity and in the present context that is exactly what has happened leading countries like India, United States, United Kingdom, Japan, China to witness rapid increases in valuations of real property such as housing until they reach unsustainable levels relative to incomes and other economic elements.

A deeper examination and insight into the above models of asset price bubbles would indicate that the output losses after house-price crashed in developed countries have, on an average, been twice as large as those after the stock market crashes, usually resulting in a enduring recessions.[12] Further, the prickly surge in value of the housing stock supported by an equally strong upturn in prices has led analysts to wonder if this boom is really sustainable or is merely a large financial bubble ready to burst. The recent surge in housing prices globally has gone hand-in-hand with a much larger jump in household debt than in previous booms.[13] It is understood that not only that new buyers engaged bigger mortgages, but even existing owners have increased their size of mortgages to turn capital gains into cash resulting in a rally in housing prices.

Seeing the recent trends, the strong upsurge in the housing market in the US is a source of concern, especially, the global financial stability. And while all round development of the housing sector is a welcome boon, it is also important to take note of the pace of such cyclical intensification in lieu of the magnanimous risks of budding asset price bubbles. Of the several factors that contribute to the occurrence of bubbles are high credit growth coupled with low interest rates. The historical cases of asset price debacles are therefore, useful to have some empirical analysis devoted to the assessment of the current conditions in the housing market from the point of view of developing economies, their policy choices in regard to the housing market.

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12 International Monetary Fund's report in World Economic Outlook, titled, "Growth and Institutions", published in April 2003, available at: http://www.imf.org/external/pubs/ft/weo/2003/01/index.htm

13 Identifying Asset Price Bubbles in the Housing Market in India - Preliminary Evidence, Reserve Bank of India Occasional Papers, Vol. 27, No. 1 and 2, Summer and Monsoon 2006.

With reference to developing countries like India, it is to be understood that in such countries empirical research on housing market is scarce due to the paucity of information. With the objective of filling this void, the following few chapters of this article attempts to theoretically analyze the housing price bubbles in India – particularly aiming at separating the real from speculative price elements and focusing on the relevant monetary aggregates that have a bearing on the growth of the housing market.

III. THE CONCERNS BEHIND THE "ASSET PRICE BUBBLE DEBACLE"

There are numerous factors, which emerge to be important towards the growth of the housing market primarily comprising of income growth, monetary policy, tax and regulatory incentives and procedural ease of loan disbursals, *etc.* The speculative factors, on the other hand, may depend on the propaganda built around advertising, asymmetric information and speculative or herd behavior-causing prices to rise to unsustainable levels beyond which it is determined by the above-mentioned factors. Although it is difficult to categorize a housing price bubble, which occurs due to a deviation of market price from the fundamental value of the house, a number of eclectic approaches for identification have been an effective tool.

One of the other concerns arises out of the model proposed by Ball (1999), wherein he suggested the existence of an asset price bubble is not evident till a particular cycle has elapsed. For the purpose of his matrix, Ball had presumed a time frame of 2 years for the existence of the prince bubble could be ascertained with confidence. He went on to analyze that any curbing of monetary policy before this entire cycle was over, would definitely curb the growth of the bubble initially but leading investors to believe that the crisis was over. However, Ball suggested that this rose tinted picture was merely an illusion, as the moment monetary policy was regularized; the economy would slump down again and thereby igniting the vicious cycle all over again. It is evident that Ball like Posen was also belonged to the school of thought who suggested that the old idea of "monetary policy" being the out an out savior needed a revamp and newer approaches were to be suggested, if asset price bubbles were to be deal in a complete way.

Out of the various approaches preferred, index of housing prices and interest rates provided by the Banks of the home country are taken to be useful indices for studying such occurrences of bubbles. It may, however, be pointed out that among all other sectors the movement in the interest rates on housing loans whether fixed or floating have been by and large synchronous with the short term money market rate in the recent years, as evidenced by the reduction of interest rate on housing loans.[14]

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14 Identifying Asset Price Bubbles in the Housing Market in India - Preliminary Evidence, Reserve Bank of India Occasional Papers, Vol. 27, No. 1 and 2, Summer and Monsoon 2006.

a. *Areas of Concern*

With regard to the looming concerns on GDP, interest rates and its co-relation with asset price bubbles, few observations have been noted after a deeper insight into the previous bubble debacle cases, which point out arenas that are required to be understood and deliberated upon, before chalking the future economic pathway:[15]

(1) Policy interest rate shock is the only shock that can itself have a long run effect on the interest rate.

(2) In the long run credit conditions will be determined by supply conditions, i.e. aggregate credit supply and interest rate.

(3) GDP growth is affected by permanent shocks attributed to itself, interest rate and credit growth, presuming in the monetarist tradition, that easy credit availability at a low interest rate environment plays a crucial role in stimulating economic activity.

(4) Finally, housing prices are affected in the long run by permanent shocks in interest rate, credit and GDP shocks and own innovations in housing prices.

b. *Monetary Policy*

The above discovery has in turn led us to another great concern of housing price bubbles - Monetary policy and the role of central banks' in effective curbing of the same. The IMF's Report in 2003[16] suggested that that housing price bursts during the late 1970s and early 1980s was actually followed by tightening of monetary policies to reduce inflation. However, the reliance on monetary policy has also met with substantial criticism over the past few years, and it has been noted that other factors are equally responsible in the interplay of asset price bubble and mere tightening of the monetary policy may not always be the viable solution. This view has also been supported by OECD,[17] when it held that, while monetary authorities can have many choices to respond to asset price developments including housing prices, the policy response to housing prices should be related only to the extent that they contain information about future output growth and inflation, and that, if desired, would be more appropriate to use an alternative policy instruments.

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15 An In-Depth Analysis of the East Asian Crisis: Special Implications for India, Subhajit Sr., Indira Gandhi Institute of Development Research (IGIDR), 2008, accessible at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1152131.

16 International Monetary Fund's report in World Economic Outlook, titled, "Growth and Institutions", published in April 2003, available at http://www.imf.org/external/pubs/ft/weo/2003/01/index.htm.

17 Asset Price Booms and Monetary Policy", Carsten Detken and Frank Smets, European Central Bank (ECB), 2004, accessible at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=533122.

c. *Excessive Risk Taking Trends*

While the role of monetary policy has been in great deliberation some observers see the meltdown threatening Western financial markets as the cost paid due to warped enticements in the financial system, which has encouraged excessive risk-propensity. It is thought that the growing concern arise out of Banks and financial institutions succeeding in compelling their creditors against high returns due to lower tail risks and pay out of excess returns as bonuses, and thereby edging towards omnibus financial crisis. While this is a one dimensional view taken on a micro spectrum, others trace the problem to industry-wide externalities, and claim that if bank's equity rises with asset prices, the size of the balance sheet consistent with the value at risk also rises, and financial intermediary demand will act pro-cyclically, with periods.[18]

d. *Low Interest Rates and Sub Prime Loans*

Like other countries across the world, India, before the present economic debacle witnessed an era of low interest rates and steady economic growth, which although fancied the consumers, assured stable future for investors, encouraged rapid expansion in the balance sheets of highly leveraged institutions (HLIs) but also gave rise to the concern of "shadow banking system". It has been noted that in countries like US, where such a phenomena was strongly witnessed, the 'shadow banking system' expanded so swiftly that by 2006 "the combined balance sheets of investment banks and hedge funds was over 50% of commercial banks' balance sheets".[19] Experts blamed this expansion to infused increase in the equity base of the HLIs and also warned of severe de-leveraging if and when asset prices were to fall, which happened exactly in 2008, the bubble would burst.

Among the predominant assets acquired in this lending boom were securitised sub-prime mortgages designed to ensure that poorer families could get cheaper and affordable housing. The basic idea of a sub-prime loan discovered that the dominant form of wealth of low-income households is potentially their home equity. If borrowers can lend to these households for a short span of time, say two to three years, at a high, but affordable interest rate, equity shall be accumulated in form of their homes. Subsequently the mortgage can be refinanced with a lower loan-to-value ratio, reflecting the embedded price appreciation. So, the mortgages were structured in such a fashion that sub-prime *lenders* effectively have an (implicit) option on house prices. After the initial period of two to three years, there is a step-up interest rate, such that the borrowers basically are induced to get a refinance and the lender had the option to provide a new mortgage depending on the appreciation in the value of such house.

18 Rethinking Capital Regulation", Kashyap, A.K., R. Rajan and J.C Stein, 2008.
19 Liquidity and financial cycles", Adrian, Tobias and Hyun Song Shin, 2007, Mimeo Princeton University.

However, the basic defect that lurked in and was egregiously overlooked that buying securities backed by sub-prime loans (so-called ABSs), shadow banks were acquiring assets with substantial 'tail risk'. Moreover house prices being substantially above the equilibrium a process of correction in housing prices would wipe out the option values embedded in the trenches of ABSs - leading to the fear of insolvency of such banks. This was again supplemented with a view that bursting of the house price bubble could create a systemic crisis.[20] The US housing capital market ruined by such sub prime mortgages and loans was basically a victim of a speculative bubble, where assets are held largely for capital gain and of how the programmes written for pricing mortgage-backed assets failed account for the possibility of house prices falling.

IV. SEEKING TO REDRESS THE "BUBBLE TROUBLE"

Post September 2008, the world saw the collapse of several key market players like Merrill Lynch and Lehman Brothers, like Government's incessantly strived to save major Banks with their popular bail out plans. While most of the bail out plans, aimed at injecting huge amount of money into their financial system, the national emergency plan essentially covered three aspects: First, lowering national gearing, essentially because leveraging adds risks, especially if this is leveraged from external borrowing, as the more you borrow from abroad the more you become vulnerable to external shocks; Secondly, the higher the level of domestic savings, reflected in higher bank capital and lower credit/GDP ratio, the greater shall be the resilience to the pain of adjustment to external or internal shocks and Thirdly, irrespective of the exchange rate regime, there must be a commitment to a stable currency, which meant strong external reserves, low inflation and a sound banking system.

The above points essentially arise out of the guidelines prescribed after the Asian Financial Crisis, to include:[21]

- Credible policies, with monetary and fiscal policies consistent with each other, both in policy and its application.
- Appropriately phased Capital account liberalization
- Sound fundamentals incorporating a high domestic savings rate, sustainable fiscal and balance of payments positions, high foreign exchange reserves and prudent debt management system.
- Good supervision involving the maintenance of solid capital adequacy and liquidity requirements for the financial sector, as well as regular examination and monitoring of financial institutions and markets. A healthy banking system having the capacity to avoid excessive credit concentrations and risks and to manage market risks.

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20 The Panic of 2007", Gary Gorton, 2008, Yale School of Management and NBER, Prepared for the Federal Reserve Bank of Kansas City, Jackson Hole Conference, August 2008, accessible at'http://www.kc.frb.org/publicat/sympos/2008/gorton.08.04.08.pdf.

21 Bank Restructuring: Lessons from the 1980s",Sheng, Andrew, Washington, D.C.: World Bank, 1996.

- A robust financial infrastructure encompassing an efficient payments and settlements system for domestic and international transactions. In essence, to reduce payment risks and allow central bank to monitor flows in domestic currency as well as exposure of banks on real time basis.
- A non-warped incentive structure, such as taxation or regulatory restrictions that does not encourage risk concentrations or excessive leverage in any economic sectors.

While the world debated on ways to avoid the bubble trap, a few other alternatives were suggested for rectifying the present global doom syndrome.

a. *Debt Equity Swap*

Capital restructuring frequently involves a debt-equity swap, where lenders become owners and relieving the borrowers of collateral requirements and interest payment obligations.[22] In simple terms, the old equity holders are wiped out and the old debt claims are altered into equity claims in the new entity which continues to operate with a new capital structure. Alternatively, the debt-holders can also agree to cut down the face value of debt, in exchange for some warrants. This has also been witnessed in the model credit cycle developed by Kiyotaki and Moore, which was originally designed to show that real shocks would have much more persistent effects on the economy than what is usually foreseen and deliberated on how debts must be collateralized due to moral hazard, and dumping collateral generates significant negative externalities.[23]

b. *Capital Injection*

A key feature of the UK rescue plan has been the provision of (voluntary) capital injections in form of preference shares or unsecured debt. This is primarily aimed to curb financial meltdown by checking the de-leveraging process that follows a shock to net worth, and so limiting the negative externality of asset sales, while at the same time ensuring avoidance of the threat to solvency posed by massive fire-sales of collateral assets.

c. *Loan Write Downs*

A loan write-down is another way of avoiding the negative externalities caused by loan enforcement programs. Governments can come up with policies for their Banks or Financial Institutions whereby the bankruptcy reform so proposed would allow for homeowners to write

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22 Why Paulson is wrong": Economists Voice, Zingales, Luigi, 2008, The Berkeley Electronic Press.
23 Credit Cycles", Kiyotaki, Nobuhiro, and John Moore, Journal of Political Economy, 105, 1997.

down the value of their homes and stay in their houses. [Furthermore], the government could assume part of the mortgage, taking advantage of the lower interest rate at which it has access to funds and its greater ability to demand repayment. In return for the lower interest rate – which would make housing more affordable – it could demand from the homeowner the conversion of the loan into a recourse loan (reducing the likelihood of default), and from the original holders of the mortgage, a write down of the value of the mortgage to say 90% of the current market price.[24]

V. THE GREAT DEBATE ON MONETARY POLICY

While various alternatives have been provided to curb the great "bubble debacle", the main debate still hovers on whether Monetary Policy plays the most essential role in determining/ curbing the volatility and formation of the asset price bubble? It is to be understood that, it is not merely legal restructuring that can ameliorate the conditions of those who have borrowed heavily against overvalued assets whose prices are being 'corrected'. Timely adjustment of interest rates can also help. The idea is simple enough– to stabilise the prices of those assets whose collapsing values are threatening the system. A cut in real interest rates at the time the bubble bursts and thereafter will generate a transfer from lenders to borrowers, and help to limit the fire-sales at the root of the crisis.

However, the present analysis is much complex than it appears to be as economists divide themselves on the role of Monetary Policy in determining asset price bubbles.

It is argued that the role of Central Banks is to manage inflation and the former does it via their Monetary Policy. While the economies around the world benefited immensely from this Central Bank focus on inflation, certain eyebrows were raised as the Philips Curve, strived a trade-off between inflation and unemployment that again undermined the role of inflation. However, these arguments were put to rest by Milton Friedman in 1970 at American Economic Association where he displayed that there was no trade-off between inflation and unemployment. Inflation is always and everywhere a monetary phenomenon" and monetary economics didn't look back since then.

Despite separate regulators, Central banks continue to be an essential part of financial markets. Central banks regulate money supply via Banks who in turn are an integral part of financial system. Hence, monitoring financial system becomes an automatic responsibility of the Central Bank, which also acts as regulators of various types of financial markets- debt

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24 We aren't done yet: Comments on the financial crises and Bailout", Stiglitz, Joseph E, 2008, Economists' Voice: The Berkeley Electronic Press, (October).

markets, currency markets etc. Most Central Banks release their outlook on financial markets along with that of the economy. It provides financial market participants a number of cues on the developments in financial markets.

Further, in countries like India, with the Central Bank (Reserve Bank of India) raising the cash reserve ratio of Banks, in apprehension and fretting about the ever-growing inflation, especially about the high prices of assets like stocks and land, has led economists to wonder whether it is apt for central banks to assume that there is a bubble and proceed to prick it? This in turn has again led to re-opening of the great debate of the role of Central Banks in determining the financial statistics of the country.

Economists all over the world, stand divided on this issue and this has been evident from the research works of Nouriel Roubini of Roubini Economics,[25] who said that Central banks should – indeed must – prick bubbles, in comparison to the views of Adam S Posen, a senior fellow at the Institute for International Economics, who was of the opinion that they should not, since bubbles can be caused by many factors and not just monetary ones.

Roubini's (several) arguments are based on the notion that central banks should prevent bubbles from bursting rather than merely react after they burst to limit the damage. He says that economic theory "supports the idea of targeting the asset prices and asset bubbles", and no one really knows whether there is a bubble or not. This uncertainty by itself is not enough reason for central banks not to act. The real issue is whether an optimal monetary policy rule should depend on the degree of uncertainty. So "even if monetary authorities cannot separate with certainty the two components of an asset price – the one based on fundamentals and the other not – the optimal policy response implies reacting to the overall asset price (as opposed to reacting separately to its two fundamental and non-fundamental components)." – Essentially the view taken by Reserve Bank of India.

Posen, on the other hand, takes the diametrically opposite view, by saying that "Central banks should not be in the business of trying to prick asset price bubbles because the connection between monetary conditions and the rise of bubbles is rather tenuous". Thus, if central banks get up to their usual tactics, like raising interest rates or reducing the amount available to the banks for lending, they will only cause a recession. "The cost-benefit analysis", says Posen, "hardly justifies such preemptive action".

However while ascertaining that there is no monetary substitute for financial stability and no market substitute for monetary ease during severe credit crunch, the underlying assumption that is taken by Posen is that there exists a good banking supervision system, as if

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25 Why Central Banks Should Burst Bubbles", Roubini, Nouriel, 2006, International Finance Journal.

the financial system is fragile, the central bank can land the economy in trouble by not acting in time. It appears that in India, the Reserve Bank has taken this very caveat to defend its stand and by emphasizing on the fact that the present banking system is not robust, its intervention is much required. However, we feel that such a defense is not sufficient to justify the intervention of Central Banks in determining a monetary policy that seeks to curb asset price bubble at the very outset, i.e., as a pre-emptive action.

The recent sub prime crisis and the oil/ commodity price has lead to opinions that easy monetary policy also contributes to rising asset prices. The higher demand for houses leads to higher prices leading to higher wealth. This leads to higher consumption and it has been observed that a part of the proceedings are invested in equity/commodity markets as well. This leads to rise in equity prices as well. Alternatively, people can invest directly in equity and commodities markets by taking loans at low rates fueling the rise in asset prices and then invest the proceeds in housing markets. As the interest rate cycle reverses, the corrections are felt across asset markets. However, till the recent crisis the Central Banks have not really been concerned, as the magnitude has been small but the sub-prime crisis is the time to reassess the policies. The "need to target asset prices" theory also suggest it is not important to be precise about the size of the bubble as long as the price bubbles can be identified. Most Central Bankers in their speeches do express concern about rising housing prices while research has shown that Central Banks do target asset prices implicitly. Moreover, Central Banks are the best placed in an economy to gauge the development of irrational rise in asset prices.

There exists another school of thought who feel that Posen was indeed correct in pointing out that the central bank should not take asset prices directly into account in monetary policy making but laissez-faire in its approach while responding to sharp movements in inflation and output even if asset price swings are their source. In this context it is also to be understood that, price bubbles also arise out of other fundamental factors which the Central Bank and its policies may fail to consider. One of such fundamentals as pointed out by Marcus Brunnermeier, is that there exists a behavioral perspective to developments of asset bubbles, which the monetary policy may fail to appreciate and thus, not resolve the problem of price bubbles in the realistic sense of the term.[26] Further, there also exists a fear that, Central Bank's identification of a bubble could lead to far more damage than expected and thus, if the Central bank raises its policy rates to counter asset bubbles it dampens the entire economic activity, thereby deeming monetary policy to be a bunt tool to target asset price bubbles.

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26 Synchronization risk and delayed arbitrage", Abreu, Dilip and Markus K. Brunnermeier,2002,Journal of Financial Economics, Vol. 66(2-3), pp. 341–360.; Also See "Bubbles and Crashes",Abreu, Dilip and Markus K. Brunnermeier, 2003, Econometrica, Vol. 71(1), pp. 173-204.

The above analysis shows that linkages between asset prices and monetary policy are well understood but there are no identifiable ways to manage it. This does not imply that Central banks can ignore this problem as both financial deepening and financial innovation are only going to exacerbate the problem. Till the sub-prime the leading institutions in their research papers suggested that Central Banks shouldn't target asset prices as most of the crisis happened in developing economies. The problems identified were - weak financial systems, poor macroeconomic policies etc. Now, with the crisis beginning in US and engulfing other developed economies these reasons are not valid. IMF in its World Economic Outlook (April 2008) released a report analyzing Housing markets and Monetary Policy.[27]

> *This main idea of this chapter was to examine how innovations in housing finance systems in advanced economies over the past two decades have altered the role of the housing sector in the business cycle and the monetary policy transmission mechanism. It concludes that these changes have broadened the spillovers from the housing sector to the rest of the economy and have amplified their impact by strengthening the role of housing as collateral. This analysis suggests that in economies with more developed mortgage markets, monetary policymakers may need to respond more aggressively to developments in the housing sector, within a risk-management approach that treats house price dynamics as one of the key factors to be considered in assessing the balance of risks to output and inflation.*

This has stirred an inevitable controversy as people felt that IMF was advocating the theory that Central banks should target Asset prices. An IMF Chief Economist clarified:[28]

> *"Monetary policy may need to respond to house price inflation especially in economies where it is easier for households to access mortgage credit. This would fit within a broad "risk management" approach to monetary policy that recognizes all the uncertainty surrounding the various shocks hitting the economy. The logic is that monetary policy may need to respond to house price inflation particularly when house prices move rapidly or out of line with normal valuation ranges.*

But unfortunately the report fails to offer any constructive idea of how Central Banks should target asset prices, but is a change of stance nevertheless. However, we feel that while such suggestions may prima facie seem to be lucratively alluring, a deeper analysis would bring out the inherent defects that would mar its implementation:

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27 Review of Annual Statement on Monetary Policy for the Year 2006-07, Reserve Bank of India, 2006.

28 Housing and Business Cycle", World Economic Outlook, 2008 International Monetary Fund, accesible at http://www.imf.org/external/pubs/ft/weo/2008/01/index.htm.

a) *Including Asset Prices in Inflation indices:* This is the most radical proposal but has severe limitations. Firstly, it is difficult to identify assets, which would be included. Secondly, asset prices move randomly which could make the task of gauging inflation even difficult.

b) *Pricking the Bubble*: Central bank should aggressively increase interest rates to counter the asset price rise. However, Firstly it is difficult to identify a bubble and some assets may actually be adequately priced. Secondly, there is not a very precise relation between interest rates and asset prices and large interest rate increases may be needed to calm asset prices which would put entire economy under stress.

c) *Leaning against the Wind Act:* This approach is increasingly becoming the most accepted in the policy arena. It simpliciter means that Central bank adopts a hawkish stance against rising asset prices early on. This would dispel the notion that Central banks would only act in times of distress. But there are not many ideas on how this approach can be made workable. Some economists suggest that more restrictive credit conditions (Higher capital requirements etc) in booms and reducing them in recessions. Some have suggested that higher margin requirement should be placed during booms. Another idea is just like Central Banks manage inflationary expectations by communicating to the public they can manage asset price expectations as well.

As the Central Banks across the world, strive to move beyond the inherent defects and try and make implementation of the above Guidelines possible, the Reserve Bank of India in its Annual monetary policy statement for the year 2006-07 stated that:[29]

> *It appears that globally as well as in India, underlying inflation conditions are perhaps not being appropriately reflected in prices facing consumers and financing imbalances are growing in the presence of abundant liquidity, rising asset prices and a marked increase in risk appetite. It is in this context, and consistent with the multiple indicator approach adopted by the Reserve Bank, that monetary policy in India has consistently emphasized the need to be watchful about indications of rising aggregate demand embedded in consumer and business confidence, asset prices, corporate performance, the sizeable growth of reserve money and money supply, the rising trade and current account deficits and, in particular, the quality of credit growth.*
>
> *In retrospect, this risk sensitive approach has served us well in reining in aggregate demand pressures and second round effects to an extent. It has also ensured that constant vigil is maintained on threats to financial stability through a period when inflation was on the upturn and asset prices, especially in housing and real estate, are emerging as a challenge to monetary authorities worldwide.*

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29 Housing and Business Cycle", World Economic Outlook, 2008 International Monetary Fund, accesible at http://www.imf.org/external/pubs/ft/weo/2008/01/index.htm.

Apart from raising concerns over asset prices, RBI has also asked banks to raise provision requirements on loans to specific sectors like capital market exposures, housing loans and commercial real estate. It has increased the risk weight on exposures of Banks to commercial real estate. While, some economists feel that it was this guarded approach of RBI that prevented India from being severely affected during the financial crisis but the opponents feel that it is a false analogy used by RBI to substantiate its intervention which in the long run would not prove to be fruitful.

However, with the present crisis at hand, there appears to be a general consensus in India, with regard to the need of timely intervention of the Reserve Bank to prevent any further debacles. However, the question which stills remains debatable is – what is the appropriate role of monetary policy in presence of asset-price bubbles? What methods are to be adopted to achieve the objectives of the monetary policy? One view is that monetary policy should do no more than follow the standard precepts of inflation targeting. Proponents of this view would acknowledge that rising asset prices often have expansionary effects on the economy, and might sometimes also provide a signal for incipient inflationary pressures, so that some tightening of monetary policy might be appropriate. According to this view, however, policy should only respond to observed changes in asset prices to the extent that they signal current or future changes to inflation or the output gap. However the fact remains that "One should not attempt to use policy either too gently against a suspected asset-price bubbles while it is growing or, more aggressively, try to burst it."[30]

However, the growing alternative views, challenging the above notions and believing that monetary policy should aim to do more than respond to actual and expected developments in inflation and the output gap, have led the authors to ponder on the arguments that: "*Raising interest rates modestly as asset prices rise above what are estimated to be warranted levels, and lowering interest rates modestly when asset prices fall below warranted levels, will tend to offset the impact on output and inflation of [asset-price] bubbles, thereby enhancing overall macroeconomic stability.*"[31]

This, has led the conclusion that while the present debate on the role of monetary policy in assessing the asset price bubble is an eternal question, the present world conditions demands a change in outlook, wherein we need to break out from the shackles of orthodox perspective and seek to contemplate new grounds that may prove to effectively redress the issue.

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30 Monetary Policy and Asset Price Volatility, Bernanke, Ben, and Mark Gertler, 1999, In New Challenges for Monetary Policy: A Symposium Sponsored by the Federal Reserve Bank of Kansas City: 77–128. Federal Reserve Bank of Kansas City.

31 Asset Prices and Central Bank Policy", Cecchetti, Stephen G., Hans Genberg, John Lipsky, and Sushil Wadhwani,2003, Journal of Money, Credit and Banking.

The we feel, that the anti bubble laws of developing countries like India, need to be put onto a template, which maps onto microeconomic (including behavioral finance) and macroeconomic research on bubble formation and seeks to include:

(1) laws that aim to provide information to investors on fundamental value of assets, essentially capturing laws requiring enhanced disclosure or investor education either to focus investor attention on information on fundamental value rather than noise or to remedy information asymmetries that lead to wrong asset pricing;

(2) laws that attempt to short circuit positive feedback loops, and thereby attempt to dampen the positive feedback created when investors chase rising asset prices and include transaction taxes, circuit breakers and laws that attempt to restrict access of investors to certain markets or channel less sophisticated investors to less risky assets;

(3) removal of legal restrictions on arbitrage;

(4) laws that restrict credit to investors to curb speculation (e.g., margin regulations).

VI. THE WAY FORWARD – THE REGULATORY APPROACH

As suggested hereinabove, we feel that adapting to either view regarding the relevance of monetary policy in curbing asset price bubbles may actually prove to be a misnomer. The present hype has failed to appreciate that there can exist other approaches which might provide to be an effective tool to resolve the instant problem at hand.

While the ways suggested above are essentially alternatives, which we feel could provide respite in the present scenario but we must also appreciate that such changes cannot be brought about without a major change in the policy of the Banks/ Financial Institutions. While a considerable amount of research has been devoted to the question of whether or not pre-emptive monetary policy should be used to influence asset prices, there has been comparatively much less discussion of the effectiveness, desirability and nature of pre-emptive regulatory policy in this context.[32]

We base our view points on the following three main propositions, namely:

(i) Monetary policy is either inappropriate or relatively ineffective in bursting bubbles;

(ii) Pro-cyclicality of the financial system can be reduced with appropriate regulatory policies; and

(iii) A strong banking system that correctly measures and prices risk can reduce the likelihood of asset price bubbles developing.

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32 Asset Price Bubbles and Prudential Regulation", Working Paper 3, September 2001, Australian Prudential Regulation Authority, accessible at http://www.apra.gov.au/Policy/upload/Asset-Price-Bubbles-and-Prudential-Regulation-Sep2001.pdf.

It is understandable that asset prices can and do fall sharply from time to time and that these falls cause severe economic disruption; irrespective of whether these falls are simply excessive price swings or genuine bubbles. But the focus is primarily on the relationship between these price movements and the behaviour of banks in which prudential regulation might affect that relationship. Following are certain evidences to supplement such theory:

- Bubbles actually cause damage to the real economy;
- A reliable relationship exists between the formation/bursting of bubbles and the behaviour of banks; and
- Regulation can influence the behaviour without material side effects, either for the economy or for the other objectives of prudential regulation.

It had been argued by Kindleberger,[33] way back in 1989 that asset price bubbles are often, although not always, related to banking crises and are typically fuelled by some form of monetary expansion and his findings were supported by empirical evidence that bank failures are inversely correlated with the business cycle. This view was later strengthened by Allen and Gale[34] who argued that the existence of agency costs in the banking sector, combined with uncertainty about future credit expansion, determines the extent of asset price bubbles and subsequent effects on the real economy.

In view of the above, economists based their opinions against the use of monetary policy to control or burst bubbles, and economists like Bernanke and Gertler (1999), through their Dynamic New Keynesian" model, showed that monetary policy should not respond to changes in asset prices, except when asset prices signal changes in inflationary expectations.[35] The bursting of an asset price bubble that does not have implications for expected inflation is strongly rejected by the Bernanke and Gertler model. Using collateral constrained "Dynamic New Keynesian" model, Bordo and Jeanne (2001) showed that, in the event of a sudden decline in asset prices, monetary policy may be ineffective in increasing output and, further, that the pre-emptive use of monetary policy is likely to be ineffective in avoiding a market crash.[36] In addition, Kaufman (1998) also argues against the use of monetary policy to burst bubbles and Schwartz (2001) argues that monetary policy is not only ineffective, it is inappropriate for bursting bubbles, on the grounds that, unless the bubble has been caused

33 Anatomy of a Typical Financial Crisis", Charles Kindleberger, 1989, accessible athttp://delong.typepad.com/egregious_moderation/2009/01/charles-kindleberger-anatomy-of-a-typical-financial-crisis.html.

34 Financial Contagion", Franklin Allen and Douglas Gale, The Journal of Political Economy, Vol. 108, No. 1. (Feb., 2000), accessible at http://links.jstor.org/sici?sici=0022-3808%28200002%29108%3A1%3C1%3AFC%3E2.0.CO%3B2-D.

35 Monetary Policy and Asset Price Volatility, Bernanke, Ben, and Mark Gertler, 1999, In New Challenges for Monetary Policy: A Symposium Sponsored by the Federal Reserve Bank of Kansas City: 77–128. Federal Reserve Bank of Kansas City.

36 Asset Price, Reversals, Economic Instability, and Monetary Policy", Bordo, M.D. and O. Jeanne, (2001), Paper presented at the Annual Meeting of the American Financial Association, New Orleans, January 7, 2001.

by lax monetary conditions, market prices should correct themselves based on projections of earnings growth.[37]

While a dissenting voice came from economists like Kent and Lowe (1997), later theories (including that of Kent and Lowe) have affirmed the usage of prudential regulation to respond to bubbles,[38] namely:

- Borio *et al* suggest that one benefit of using prudential regulation to respond to asset price bubbles is that the costs of poor regulatory policy choices are likely to be smaller than the cost of poor monetary policy choices; they also argue that the effects of regulatory policy changes are more predictable.

- Bordo and Jeanne suggest capital requirements and risk-based deposit insurance should be used to account for capital losses from a sudden fall in asset prices, although their arguments is in favour of regulations (and fiscal policy) which are based more on demonstrating the ineffectiveness of monetary policy, rather than demonstrating the effectiveness of regulation.

- Kent and Lowe suggest that prudential regulation may support monetary policy by minimizing the adverse impact of asset price bubbles on the financial system which, in turn, ensures that the banking system is healthy and not overexposed to the risks associated with the bursting of a bubble.

However, how prudential tools might be used to deal with bubbles is a question still unanswered. Supervisors assess and influence risk taking in financial institutions through a range of qualitative and quantitative methods. These techniques include restrictions on portfolio composition, risk-based capital requirements, loan loss provisioning, and stress testing of market risk exposures. Although, proponents across the world feel that regulatory policies are the most effective ways of curbing asset price bubbles, we feel that there are certain latent defects which might seek to weaken the very root of these proposals and thereby render them ineffective, especially in developing countries like India. Therefore, if such policies are to be effectively implemented, the following defects are to be appropriately addressed within a reasonable time frame.

(i) *Restrictions on Portfolio Composition:* Portfolio restrictions have historically been used as a tool for both bank supervision and monetary policy. To limit the risk of asset price bubbles, Schwartz (2001) suggested that regulations should be particularly concerned with bank portfolio composition and give financial institutions an incentive for self regulation by linking deposit insurance premiums to a benchmark asset portfolio, where the weights for loans secured by

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37 Asset Price Inflation and Monetary Policy",Schwartz, A. J.,(2001),Paper presented at the Annual Meeting of the American Financial Association, New Orleans, 7 January.
38 Asset Price Bubbles and Monetary Policy',Kent, C. and P. Lowe, 1997, Reserve Bank of Australia, Research Discussion Paper 9709.

each class are set by the regulator. The argument for influencing portfolio composition in a way is based on the US experience of the 1920s and more recently the Japanese experience of the 1980s. In both periods, shifts in bank lending towards the funding of speculative investment in equity and property markets facilitated the asset price booms and left their respective financial systems in critically weakened positions when the magical boom period finished.

Defects:
- The construction of a suitable set of weights for the benchmark portfolio is problematic.
- Substituting the judgment of regulators with the judgment of the bank management – something that runs counter to the risk-based philosophy that has been emerging in banking regulation over recent decades.
- High-growth industries, by definition, tend to make greater demands on new credit in comparison to stable or declining industries. A decision to effectively limit the amount of new credit supplied to a particular sector may inhibit growth in areas of the economy in which the country has a genuine comparative advantage.

(ii) *Capital Adequacy:* Minimum capital ratios have been a mainstay of banking regulation for many years and many proponents like Kaufman (1999) have pointed out that high leverage of banks are the source of bank failures and suggested that increasing the required minimum capital ratio is a relatively costless but effective way of insulating banks from the bubble ruptures. The assertion that additional capital is effectively costless is based on the proposition that regulated banks are able to exploit lower capital ratios than unregulated institutions because of their implicit government guarantee through deposit insurance and brings along with itself the recommendation of a wider application of structured early intervention, with higher trigger capital ratios as a fundamental element of this strategy.

Defects:
- While Kaufman may be correct that alteration to the capital ratio of banks is largely a pricing issue from the perspective of the markets, the cost of credit is not independent of the debt/equity combination of the bank. Raising the required capital ratio is likely to result in either a rise in the price or a reduction in the availability of credit.
- There is no guidance in the present framework to show as to how much capital would be sufficient.
- It is also to be remembered that the proposal of structured early intervention is not universally accepted. There is a strong case for its application in countries where regulatory forbearance has resulted in repeated losses, or in which banks are particularly uncooperative in working through problems with their regulators. Although, India stands at a good platform when it

comes to its relationship with its regulators, the benefits of structured early intervention are very much situation specific.

• While higher capital requirements and structured early intervention may reduce the cost of bursting bubbles, they do not address the questions of why bubbles form and how these might be prevented.

(iii) *Loan Loss Provisioning:* During an economic expansion, bank credit increases, while loan losses and provisions for loan losses typically fall. This counter-cyclical tendency for provisions arises because traditional provisioning methodology, based on fixed and specific provisions, tends to be backward looking, rather than based on future expected losses. The traditional approach towards provisioning for loan is based on the view that provisions should reduce the value of loan assets to the lower cost and net realizable value. Under this approach provisions are not generally established until a loan is recognized as impaired. The behaviour of reserves under the traditional approach accentuates the boom and the bust cycle and can therefore contribute both to creating price bubbles and to bursting them. In recent years, however, banks have begun adopting variations of what is known as "Dynamic Provisioning". The philosophy underlying dynamic provisioning is that provisions should cover expected losses, while capital should be available to cover the unexpected losses. Dynamic provisioning recognizes expected losses as a cost of being in the business of making loans. Under this line of thought, for a bank not recognize expected losses, "is equivalent to an insurance company writing premiums and then hoping that no one will claim".[39]

Defects:
• The counter-cyclical nature of the traditional provisioning methodology has raised concerns for the regulators;
• Despite the Basel Committee recommendations on the concept of expected loss, provisioning tends to remain generally reactive rather than anticipative, for reasons largely related to tax and accounting rules in various jurisdictions;
• The concept of dynamic provisioning has not met with a lot of takers and hence not accepted as genuine alternative.

VII. CONCLUDING THOUGHTS

The framework used here is very much an iconic 'reduced form': it would be more satisfactory to model the process of intermediation explicitly, for example - to take international

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[39] Managing Bank Capital',Matten, C, 2000, John Wiley & Sons Ltd.,West Sussex.

dimensions into account. But the message is clear enough - that credit conditions influence economies enormously and emergency steps to restructure balance sheets through policy revamping are crucial for fixing problems of excessive leverage. This stands in sharp contrast to the view from conventional models - that 'the effects of a worsening of financial intermediation are likely to be limited' and can be handled by interest rate cuts alone.

Paul de Grauwe's warning[40] - conventional models fail to connect with the issues at hand - carries another message. It is not only the bank balance sheets that have to be restructured: the micro-foundations of macroeconomics needs similar treatment along with policy overhaul; and acknowledging the fact that regulatory frameworks have a much deeper effect in affecting asset price bubbles than monetary policies.

In the alternative regulatory policy approach, we have strived to examine three possible regulatory responses to managing bubbles: portfolio restrictions; adjustments in capital requirements; and adjustments in provisioning requirements, to conclude that:

- The first approach, of setting portfolio composition restrictions, is contrary to the principles of modern risk-based banking supervision and potentially costly in terms of its impact on economic efficiency.

- While there is a case for using adjustments in capital adequacy as a counter-cyclical tool, the efficiency costs arising from imprecision militate against it.

- A stronger case exists for introducing a counter-cyclical provisioning regime along the lines pioneered largely on the pro-cyclical tendencies of the traditional approach towards provisioning and also on the fact that the counter-cyclical provisioning approach is compatible with the sort of outcomes that should be produced by a cyclically adjusted dynamic provisioning model.

- Finally we found that that the role for financial regulation in controlling the emergence of, and damage from, assets price bubbles remains relatively limited.

Although the regulatory model suggested, does not promise to be a definitive coverage of the role of prudential regulations, in controlling the emergence of asset price bubbles and the financial damage from their aftermath, it mainly strives to throw light on 3 moot points, namely, (1) bubbles impose a cost on the economy; (2) there is a vibrant relationship between bubbles and the behaviour of banks; and (3) this relationship could be managed without undue cost through appropriate regulation. And this, we feel would go a long way in chalking out an effective alternative for curbing the asset bubble debacle especially in developing countries like India.

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40 As cited in "Asset Price Bubbles and Prudential Regulation", Working Paper 3, September 2001, Australian Prudential Regulation Authority, accessible at http://www.apra.gov.au/Policy/upload/Asset-Price-Bubbles-and-Prudential-Regulation-Sep2001.pdf.

LESSONS LEARNED FROM REPEATED FINANCIAL CRISES: AN ISLAMIC ECONOMIC PERSPECTIVE

A s c a r y a[1]

Abstract

Financial crises have been repeated again and again over a long period of time since the demise of gold regime in 1915, have been temporarily subsided in the period under Bretton Woods Agreement with gold standard in 1950-1972, and have been reemerged after the collapse of Bretton Woods Agreement with higher frequency and magnitude. The recent subprime mortgage crisis in the US has spread out throughout the world threatening global meltdown. It seems that the conventional world have not really learned the lessons and have handled the crisis only partially in the symptoms without touching the root cause of the crisis. This study tries to determine the anatomy and root causes of the crisis and layout strategies to cure it using analytic descriptive and quantitative approaches under Islamic perspectives.

The study concludes that the root causes of the crisis from Islamic economic perspective can be human error and natural phenomenon uncontrollable by human. Human error can be divided into three groups, namely (1) moral decadences that trigger (2) system or conceptual flaws and (3) internal weaknesses. Conceptual system flaws include 1) excess money supply from seigniorage, fractional reserve banking system, credit card and derivatives; 2) Speculation; 3) interest system; 4) international monetary system; and 5) real and monetary sectors decoupling.

Empirical results show that riba rooted causes of financial crises (excess money supply 2.8%, interest rate 45.2%, and exchange rate 18.6%) give 66.6% share to financial crises in Indonesia, while if we substitute these three systems according to Islamic perspective (just money supply 0.7%, PLS return 2.5%, and single global currency 0.2%) will give only 3.4% share to financial crises in Indonesia, or a massive reduction of 63.2%.

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I. INTRODUCTION

I.1. Background

Financial crises have occurred one after another since the demise of gold standard regime in 1915. The crises started with depression in Japan (1920), hyper inflation in Germany (1922-1923), and finally manifested into the great depression in 1929-1930 (Davies and Davies, 1996). Subsequently, financial crisis have hit Austria (banking crisis in 1931), France (hyper inflation in 1944-1966), Hungary (hyper inflation and monetary crisis in 1944-1946), German (hyper inflation in 1945-1946), and Nigeria (banking crisis in 1945-1955).

The crises have subsided in the period under Bretton Woods Agreements in 1950-1972, with strict fixed exchange rate international monetary arrangements where US Dollar as world currency is pegged to gold (one troy ounce of gold is equal to 35 US Dollar) while other currencies are pegged to US Dollar, with the guarantee that US Dollar is exchangeable to gold in any time. The Bretton Woods era is known as a golden age, where personal income increases, the volume of world trade increases, investment increases, and international economic stability maintained. David Felix stated that there is no long period of time, in the past or present which is comparable or closely resemble to the achievement (the high production, high productivity, low unemployment, and just distributive income) of Bretton Woods era.

The Bretton Woods agreements finally collapsed in 1971, when the US unilaterally terminated the convertibility of US Dollar to gold. The US enjoyed huge seigniorage profits from printing fiat currency without gold back up. Other countries finally followed the US to use fiat money and adopted floating exchange rate. Following the collapse of Bretton Woods Agreements, financial crises have resurfaced more frequently started in England (banking crisis
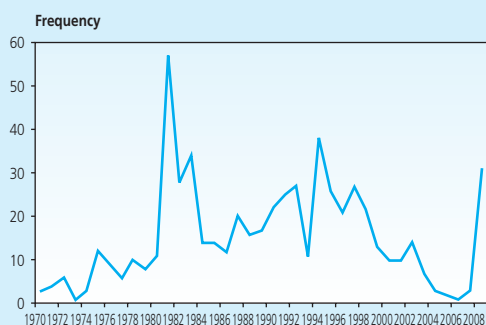
Figure III.1
Frequency of World Crisis

in 1973-74), industrial countries (deep recession in 1978-1980), developing countries (debt crises in 1980-1982), US and UK (great crash of stock exchange in 1987), Mexico (financial crisis in 1994), Asian countries, Russia, Brazil and Argentina (financial crisis and hyper inflation in 1997-1999), and finally the current subprime mortgage crisis in the US that has spread out all over the world.

Since the collapse of Bretton Woods Agreements there have already been more than 96 financial crises and 176 monetary crises (Caprio and Klingebiel, 1996) that 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., 2008). However, the conventional solutions taken only deal with the symptoms, not the root systemic causes of the crisis. A new database of financial crises in the period of 1970-2007 can be read in Laeven and Valencia (2008) that covers 395 episodes of financial crises (banking crisis, currency crisis and sovereign debt crisis), including 42 twin crises and 10 triple crises.

It seems that they have not learned the lessons yet on how to eradicate and/or control the financial crisis. Even though the crisis has been repeated again and again, none of those countries that has become economically stronger and more stable. In Indonesian multi-dimensional crisis in 1997-1998, inflation has jumped up to 77.6%, while economic growth has slumped to -13.2% (Hatta, 2008). All sectors in the economy have contracted significantly. Construction sector has contracted 36.4%, while financial sector has contracted 26.6%. Therefore, there should be a comprehensive and holistic study to determine the detailed anatomy and the root causes of the crisis to be able to cure the crisis permanently and to avoid the similar mistakes in the future, so that crisis will not be repeated again.

I.2. Objectives

This study will determine descriptively the detailed anatomy and the root causes of the crisis based on conventional and Islamic perspectives, and propose systemic steps to eradicate and control financial crisis. Subsequently, to provide some empirical evidences, this study will test empirically some root causes of the crisis in Indonesia.

I.3. Data and Methodology

The data used in this study is secondary time series quarterly data collected from various institutions, especially Bank Indonesia and Biro Pusat Statistik, for the period of January of 2002 to September of 2008. The methodology applied will be Vector Auto Regression (VAR),

followed by Vector Error Correction Model (VECM), if cointegration occurred. In the qualitative part of the study, analytic descriptive method will be applied based on data and literatures.

II. LITERATURE REVIEW

II.1. The Origin of Financial Crisis

The financial crisis was originated from the debasement of metallic currencies that caused hyper inflation. Roman gold coins Aureus (7 grams of gold alloyed with silver) and Solidus (4.4 grams, of which 4.2 grams was gold) and Byzantine gold coins were frequently alloyed with other metals of much lower value to create the *seigniorage* necessary for a rational system of government money.

During the Prophet Muhammad's (SAW) time, debasement of currency in all forms was strictly forbidden. The Umayyad ruler Caliph Marwan ibn al-Hakam (65-66 H/684-685 M) had a man's hand cut off for cutting up a *Dirham* or silver currency (Sanusi, 2002).

Meanwhile, English pound that comprised 240 silver pennies in 11th century, by 1666 was being minted into more than 700 pennies at the Royal Mint (El-Diwany, 2002). Later in 14th century, hyper inflation in Egypt occurred due to overly minted Fulus (copper or bronze) currency by the government. In the time of Sultan Al-Dzahir Burquq (Utsmaniah Empire 781 H), the use of alloyed silver minted by Sultan al-Dzahir Baibras was cancelled and replaced with copper Fulus.

Meanwhile, following its foundation in 1694, Bank of England (BoE) issued 'paper receipts/money' backed by 100 percent gold or silver and fully convertible upon demand. Later on, BoE issued paper money or bank notes on certain reserve ratio, so that paper money supply far exceeded the underlying gold or silver. Consequently, the first two crises of the century in 1825 and 1837 in England were due to over issue of bank notes. In 1254 H Utsmaniah Empire, paper money "al-Qa'imah" was issued and lasted for 23 years. In 1278 H, the circulation of al-Qa'imah was suspended due to too much al-Qa'imah in circulation. Meanwhile in 1934, the US Dollar was devalued from 23.22 grains of gold to 13.714 grains of gold by order of President Roosevelt (El-Diwani, 2002).

Inspired by the crises in England, David Hume (1711-1766 M) proposed a theory of 'beneficial inflation' with the hypothesis that increasing the money supply would raise production in the short run and may not raise the price at all in the long run. But, John Maynard Keynes (1883-1946 M) was 'the father of inflation' who in 1936 (in his *magnum opus*, The general Theory of Employment, Interest, and Money)£successfully developed Hume's idea into formalized

model of what the Austrian school called 'inflation economics'. His 'inflation economics', although severely criticized by Austrian school, has been adopted by most today's government all over the world, and has caused repeated financial crises.

Therefore, inflationary and crisis prone economic development paradigm is a deliberate ideological and political choice of 'economic regime' adopted by the government to profit from *seigniorage* income obtained by merely minting undervalued metallic currency or printing valueless paper currency that function as 'legal' tender or money.

II.2. The Theory of Financial Crisis

In general, contemporary economic crisis occurs due to one or a combination of several types of crises, such as banking crisis, exchange rate crisis, sovereign debt crisis, balance of payment crisis, financial crisis, monetary crisis, stock market crash, bubble economy, and hyper inflation. Economic crisis can trigger or triggered by political and social crises. Economic crisis will cause economic contraction that subsequently will lead to stagnation, recession, depression, unemployment, deprivation, starvation, death, as well as other economic, social and political problems and instability.

The most frequently occurred crises are various types of financial crisis, such as banking crisis, exchange rate crisis, and sovereign debt crisis. The underlying theory of financial crisis has been widely discussed in conventional economic literatures, but has not been discussed much in Islamic economic literatures. The next sub-section will discuss the theory of financial crisis under conventional and Islamic economic perspectives.

II.2.1. Financial Crisis under Conventional Economic Perspective

The financial crisis can happen in various conditions where several financial institutions or assets loss most of their values. The crisis event can be in the form of financial distress, banking panic or systemic banking crisis, stock market crash, bursting of financial bubble, currency crash, balance of payments distress, sovereign debt default, or a combination of two or more events.

a. Types of Financial Crisis

Types of financial crisis in conventional economic literatures include currency crisis or balance of payments/BOP crisis, banking crisis, sovereign debt crisis, and stock/asset market crash. In reality, financial crisis in a country comprises of two or more types that occur simultaneously or successively.

1. *Currency Crisis* or *BOP Crisis*

   Currency crisis or BOP crisis occurs when the value of a currency depreciates quickly[2], so that undermines its ability to serve as a medium of exchange or a store of value, due to excess demand of foreign currencies (usually in US Dollar or Euro) that cannot be satisfied by foreign reserves of the country. If the country adopts fixed exchange regime, the government is forced to devalue its currency and/or to adopt floating exchange regime. The buyers of foreign currency are usually foreign investors who try to flee their assets or capital to safety, which makes country's balance of payments excessively run a deficit. Examples of currency crisis are 1994 Peso crisis in Mexico, 1997 Asian financial crisis (Thailand, Malaysia, Indonesia and Korea), 1998 financial crisis in Russia, and 1999 financial crisis in Brazil and Argentina.

2. *Banking Crisis*

   Banking crisis occurs when a commercial bank suffers a sudden rush of withdrawals (or a bank runs) by many of its depositors. Bank runs can happen since commercial bank operates under fractional reserve banking system, in which bank can make loan more than the deposits received and bank extends loan in long term but receives deposits in short term, so that there is always a mismatch in maturity. Systemic banking crisis happens when bank runs become widespread. If bank runs are not widespread, but the banks are reluctant to extend loan, this situation is called credit crunch. Moreover, in most cases systemic banking crisis is a general realization that systemically important financial institutions are in distress (Laeven and Valencia, 2008). Examples of banking crisis are 1931 banking crisis in the US, 1945-1955 banking crisis in Nigeria, 1973-1974 banking crisis in the UK, 1997-1998 Asian financial crisis, 2007 run on Northern Rock, and 2008 collapse of Bear Stearns.

3. *Sovereign Debt Default*

   Sovereign debt default happens when a country fails to repay its debt to other countries (bilateral debt) or to international institutions (multilateral debt). Sovereign debt default usually follows by debt relief and/or debt restructuring and/or debt rescheduling. Examples of this type of crisis includes 1980 LDCs debt crises, 1980 debt crisis in Poland, and 1982 debt crisis in Mexico (followed by Argentina, Brazil and Venezuela).

4. *Stock/Asset Market Crash*

   Stock/asset market crash happens when overvalued prices of stocks or other financial assets are drop drastically in a short period of time. Overvalued price means that the price of the asset exceeds the values of its future income. Assets are traded with inflated values. In other

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2   Laeven and Valencia (2008) define currency crisis as a nominal depreciation of the currency of at least 30 percent that is also at least a 10 percent increase in the rate of depreciation compared to the year before.

words there exist price bubbles of assets that inevitably burst. This situation happens when market players choose to seek capital gains rather than dividends, which means that market players are not real investors, but merely speculators. Some examples of this type of crisis are 1929 Wall Street Crash, 1987 stock market crash in the US and the UK, 2008 global stock market crashes in many countries.

Financial crisis is called twin crises when banking crisis and currency crisis happen simultaneously or consecutively, while financial crisis is called triple crisis when banking crisis, currency crisis and sovereign debt crisis happen simultaneously or consecutively (Laeven and Valencia, 2008). Indonesian financial crisis in 1997-1998 was an example of triple crises, which was a combination of currency crisis, banking crisis, stock market crash, followed by sovereign debt default in 1999.

When a financial crisis of one country spreads to other neighboring country (contagion effect), it is called regional financial crisis. When a financial crisis of one country spreads widely to other countries in other part of the world, it is called global financial crisis. This can happen due to integrated and borderless global financial system, so that financial assets movements from one country to another can be done without any barrier. Asian financial crisis in 1997-1998 was an example of regional financial crisis started by the collapse of Thailand Baht followed by the collapse of Malaysian Ringgit, Indonesian Rupiah, the Philippines Peso, and Korean Won. Meanwhile, 2007 subprime mortgage crisis in the US, which has spread out to many developed and developing countries all over the world until today, has been the example of global financial crisis.

Financial crisis erupted in financial sector can be isolated in financial sector and not affected other sector of the economy, such as 1987 stock market crash in the US. However, in many instances, financial crisis is believed to have impact on the decline of economic growth of the country, which means that financial crisis has spread to other sectors, especially the real sector, since banks are unable to extend loan or financing to productive activities. Moreover, aggregate demand declines due to the decline in buying power, unemployment increases due to bankruptcy of businesses, and so on, which at the end financial crisis leads to a wider economic crisis. Prolonged financial crisis not only will slow the economic growth down, but also will cause the economic growth to halt (stagnation). Furthermore, financial crisis can cause recession and even depression. Global financial crisis in 1929-1930 is called the Great Depression since it caused economic depression in many countries in different part of the world. Meanwhile, current on going global financial crisis has caused recession in many countries.

b. Theories

The theory of financial crisis under conventional economic perspective mostly views the crisis from macro perspective, which is developed from first generation model, second generation model, and third generation model. Other alternative theories include world system theory, Minsky's theory, coordination game, herding model and learning 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. This model was first proposed by Krugman (1979) and later by Flood and Garber (1984), 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, 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. This model could not explain Asian financial crisis where despite sound economic fundamentals, these countries still experienced crises.

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 can 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 equilibria, 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. Ali (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. These models are deficient from policy perspective in two ways. First, they do not predict why and when crisis may strike because it is based on some random event generating a sudden coordination of expectations. Second, they do not inform us what to do to contain the crisis.

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. 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, 2007). The third-generation model emphasizes the balance-sheet effects associated with devaluations. The basic idea is that banks and firms in emerging market countries have explicit currency mismatches on their balance sheets because they borrow in foreign currency and lend in local currency. Banks and firms face credit risk because their income is related to the production of non-traded goods whose price, evaluated in foreign currency, falls after devaluations. Banks and firms are also exposed to liquidity shocks because they finance long-term projects with short-term borrowing (Craig, et al., 2007).

II.2.2. Financial Crisis under Islamic Economic Perspective

Under Islamic economic perspective, economic crisis could happen when the balance in economic sector and its stakeholders are disrupted due to the transgressions of God's law, especially in the form of riba (interest), maysir (gambling and game of chance or speculation), gharar (excessive uncertainty), price control, manipulation, asymmetric information, distributive justice, fairness, greed, maslahah, etc. in their many forms. Financial sector is a part of economy that supports real sector so that economic activities (especially in production and trade) can run and excel smoothly without any hindrance.

a. Financial Crisis in Previous Era

Financial crises were rarely happened in Islamic era during the time of the Prophet Muhammad (peace and blessing be upon him), the Four Guided Caliphs, Umayyad Empires, Abbasid Empires, and Ottoman Empires. Nonetheless, there have been a few episodes of financial crises during those eras. The most notorious financial crisis was recorded by Al-Maqrizi (766-845 H/1364-1442 M) in 14th century Egypt. The crisis was triggered by overly minted copper currency called *Fulus* by the government of the time. The results were prices of commodities hike to the level of what we called 'hyper inflation'. This financial crisis has been closely related to the debasement of metallic currency that caused price increase.

Based on this and other events, Al-Maqrizi formulated the causes of the crisis as natural and human error. Natural causes include natural disasters like earthquake, landslide, volcano, typhoon, tornado, floods, tsunami, etc. that would make shortage in the supply of commodities, and subsequently would cause price hike. Economic activities and transactions would be slowed

or even halted, which would eventually lead to famine, plague, and death. Moreover, even after the disaster has passed, prices could continue to increase due to previous production halt. As a result, the prices of other products and services would also increase, including salaries and wages.

Human error causes of crisis include corruption and poor management, excessive tax, and too much money in circulation. Note that at this time, there was no interest and no fiat money. However, the most notable cause of crisis was excess money supply due to overly minted metallic currency.

Al-Maqrizi went further to analyze the impact of the crisis to seven groups of society. The first group is power holders or bureaucrats who receive higher nominal income. They are not really affected by the crisis much although their real income and purchasing power drop significantly. The second group is conglomerates or the haves who have high nominal income. They are only affected by the crisis a little due to drop in their assets. The third group is middle entrepreneurs or professionals who have middle to high income. They are almost not impacted by the crisis since their salaries have also increase in line with the price increase. The fourth group is farmers, which can be divided into two groups, i.e., farm owners and farm workers. Farm owners are positively affected by the crisis since their assets increase in value. Farm workers are highly impacted and suffered so much by the crisis since the increase of their income are not in par with the price increase. The fifth group includes Fuqaha (academicians), teachers, students and soldiers who have fixed income. This group is most impacted and suffered by the crisis. The sixth group includes blue collars and servants, while the seventh group includes unfortunates and beggars. These two groups, who have lowest income, are the most suffered by the crisis, so that many of them starve to death.

Another example of financial crisis has happened during the Ottoman Empire in 1839 M. At this time, paper money "al-Qa'imah" was issued as official currency. Later on, the government printed more and more paper money to finance its spending, so that price of commodities increased inevitably which lead to crisis. After 23 years of application, al-Qa'imah finally suspended in 1862 M due to too much al-Qa'imah in circulation to recover from the crisis. The solution taken by the government was right on the root cause of the crisis, so that crisis would not be repeated again in the future.

b. Theories

Under Islamic economic perspective, financial crisis could happen when the balance in financial sector and its stakeholders are disrupted due to the transgressions of Allah's laws in their many forms. Allah's Laws (cardinal principles) in economic and finance can be summarized as follows (Zabswari, 1984, modified).

- Sovereignty belongs to Allah (*Al-Malikal Mulk*) and He is the Absolute (*Ash-Shamad*). Owner of all that exist (*Al-Maalik*) (QS Ali Imran [3]:26, QS Ibrahim [14]:2, QS Al-Mulk [67]:1);
- Man is His viceroy on the earth but not the real owner (QS Al-Baqarah [2]:30, QS Faathir [35]:39);
- Worldly things that man possesses or acquires are Allah's blessings, therefore his less fortunate brothers have a due share in his brother's wealth, such as the obligation of *zakah*;
- Abstain from wasteful and luxurious living;
- Wealth should not be accumulated;
- Wealth should always remain in circulation;
- Economic exploitation of every kind has been eliminated, such as *riba* and *maysir*;
- Removal of grave disparities in the economic conditions of individuals, thus eliminating class conflicts, by dividing one's possessions after his death among his heirs;
- Laying out certain compulsory and voluntary obligations on the individuals having substantial means for the poor members of the community (*zakah*, *infaq*, *shadaqah*, *waqf*, etc.).

Meanwhile, Obaidullah (2005) lays out the details of Islamic financial system ethics to be conformed as follows.

- Freedom to contract, which means no contract is valid if it involves an element of coercion for either of the parties;
- Freedom from *Riba* (interest), which means there is no reward for time preference alone. Reward, returns or benefits must always accompany liability or risk;
- Freedom from *Gharar* (excessive uncertainty), which means contracting under conditions of excessive uncertainty is not permissible;
- Freedom from *Al-Qimar* (gambling) and *Al-Maysir* (speculation or unearned income), which means Contracting under excessive uncertainty *(gharar)* is akin to gambling *(al-qimar)*, and uninformed speculation in its worst form is also akin to gambling *(al-qimar)*. Islam explicitly prohibits gains made from games of chance, which involve unearned income *(al-maysir)*;
- Freedom from price control and manipulation, which means prices are determined by forces of demand and supply. There should be no interference in the price formation process even by the regulators. It is a requirement that the forces of demand and supply should be genuine and free from any artificial manipulation.
- Entitlement to transact at fair prices, which means prices are an outcome of free play of forces of demand and supply without any intervention or manipulation.
- Entitlement to equal, adequate and accurate information, which means there should be no asymmetric information, no concealment, and no informational disadvantage to either party;
- Freedom from *darar* (detriment), which means there is no third party which is adversely affected by a contract of two parties;

- Mutual cooperation and solidarity, which means every person should assist one another in the doing of good and righteousness, and should not assist one another in sin and transgression (QS Al-Maidah [5];2);
- *Maslahah Mursalah* (unrestricted public interest), which means concerns about conformity to norms of Islamic ethics dominate all other concerns. Individual interests should not dominate or be above public interests.

Iqbal (undated) adds money as potential capital, which means money becomes actual capital only when it joins hands with other resources to undertake a productive activity.

Riba (Interest)

Riba is the central tenet of the system, which literally means "an excess" and interpreted as "any unjustifiable increase of capital whether in loans or sales". More precisely, any positive, fixed, predetermined rate tied to the maturity and the amount of principal (i.e., guaranteed regardless of the performance of the investment) is considered riba and is prohibited. The general consensus among Islamic scholars is that riba covers not only usury but also the charging of "interest" as widely practiced (Iqbal, undated).

Some scholars, like Bernard Lietaer and Tareq el-Diwany, have identified some negative impacts of interest (Meera, 2004), namely: 1) Interest requires endless economic growth even when actual standards of living remain constant; 2) Interest encourages competition among participants in the economy; and 3) Interest concentrates wealth in the hands of small minority by taxing the majority. Comprehensively, Meera (2004) describes the impact of conventional monetary system that can cause banking crises, economic problems, and political turmoil because money gets destroyed.

Figure III.2
The Implication of Interest in the Economy
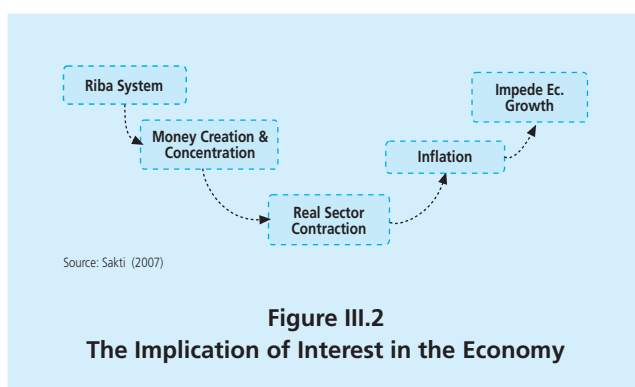
In conventional economy, interest (*riba*) system, fiat money, fractional reserve banking system, money as commodity, and the permissibility of speculation cause the creation of money

(paper money and bank money) and concentration of money in monetary sector to seek higher return with less or no risk. Consequently, money or investment that should be channeled to the real sector for productive purposes mostly flows to the monetary sector and impedes growth, and even reduces the size of real sector. The creation of money without value addition will cause inflation. In the end, the goal of economic growth will be impeded (read figure III.2).

The alternative of interest system in Islamic economic and finance is profit-and-lost sharing (PLS) system. The *zakah* system, PLS system and the prohibition of speculation will accelerate investment activities to the real sector for productive purposes. This will ensure the distribution of wealth and income as well as the growth in the real sector. The improvement in productivity and opportunity to work and to do business finally will accelerate economic growth, and therefore, social wellbeing will be achieved (read figure III.3).

Figure III.3
The Implication of PLS in the Economy
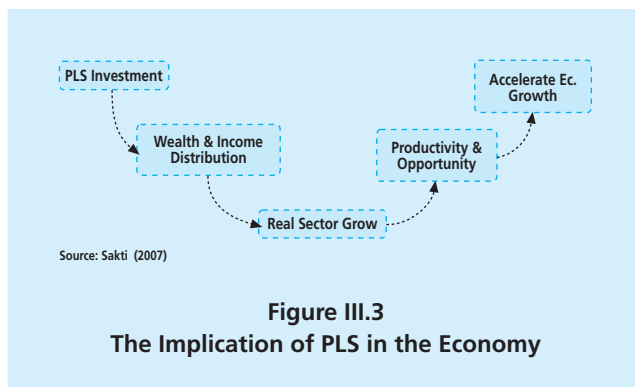
In modern era, *riba* is not only present in interest, but also present in many other sophisticated forms, such as fiat money, fractional reserve banking, credit card, derivatives, etc.

- *Fiat Money*

Fiat money is something (usually in the form of paper or coin) that is acknowledged as a legal medium of exchange in a certain jurisdiction or state, even though it does not carry a value or back up equivalent to its nominal value. 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 *riba* by Ibnu Arabi.

Within economic system where fiat money is used, the institution given the authority to issue money (usually central bank, monetary authority, treasury department, or other appointed institution) gains this *seigniorage* benefit. Consequently, aggregate purchasing power of money

will decrease (in the form of inflation) equivalent to the percentage of new money added (issued) in the economy. The party who suffer a loss is the whole population who holds this money. For example, if the cost of printing Rp100,000 bill is Rp2,000, then the *seigniorage* benefit is Rp98,000.

Meanwhile, money in Islam is either full bodied money (money, in the form of gold or silver, which has intrinsic value equivalent to its nominal value) or fully backed money (money, usually in the form of paper or coin, which its nominal value is backed by 100 percent gold equivalent stored by the issuing authority. In this new money issuance, there is no new purchasing power created (no *seigniorage*), so that there is no *riba* involved. Furthermore, in the printing process of new money, the cost of printing is the government responsibility, so that there is no party suffers financial loss.

In the Islamic economic system where Islamic money is used, the institution given the authority to issue money does not gain *seigniorage* benefit; even it has to take the responsibility of printing costs. The amount of money added (issued) to the economy is aligned with the growth of value added of the economy, so that Islamic economic in general does not have inflationary nature and tends to be stable. Therefore, the value of dinar (in gold) and dirham (in silver) have always been relatively stable. For example, the price of sheep has always been around 1-2 dinar, and the price of chicken has always been around one dirham. With this kind of money people do not have to suffer the loss due to a decrease of purchasing power (inflation) like that of fiat money.

The use of fiat money will only benefits big and developed countries, like United States with its dollars and European Union with its Euros, where their currencies are used widely all over the world. With their fiat money, they can suck the wealth of other small and less developed countries that have abundance natural resources and exchange them with paper which has no intrinsic value. For example, with only US$1 expenses to print US$100 bill, the *seigniorage* profit earned by the US from the use of its currency by the world community would be enormous. Whereas, the use of Islamic money would make fair transactions, and all countries are in the same rank. Moreover, Mahmud Abu Saud in his book "Interest Free Banking" (1976) stated that unless we standardized our money and stabilized its value, the sound and healthy economy could not be achieved. Only with the gold (dinar) and silver (dirham) standards that money can be stabilized.

- *Fractional Reserve Banking*

Fractional reserve banking system means that a bank is required to hold reserve in only a certain percentage of deposits mobilized. The minimum reserve requirement of bank varies

around 5% - 20%. With this system, bank has the ability to create another kind of fiat money, i.e. bank money (demand deposits, electronic money), through multiple deposit creation. In this case, money is created when a bank extends loan. For example, if the required minimum reserve is 10%, Rp1 million deposit, first, will be recorded as 'Deposit' in liability side and cash 'Reserve' in asset side. Second, since reserve requirement is only 10%, the bank can extend loan as much as Rp9 million, so that the total deposit becomes Rp10 million. This transaction illustrated below.

Balance Sheet 1			
Reserve	1 mn	Deposit	1 mn
Balance Sheet 2			
Reserve	1 mn	Deposit	1 mn
Loan	9 mn	Deposit (loan)	9 mn

The formula of multiple deposit creation can be written as follows (Meera, 2004):

$D = 1/r \times R$,

Where, D = change in total deposit; r = minimum reserve ratio (e.g., 10%); and R= change in reserve (e.g., new deposit Rp1 million). In this example, deposit of Rp1 million can create new money (deposit) nine times of its original value, Rp9 million, so that the total deposit becomes Rp10 million. Therefore, fractional reserve banking system also gives unfair *seigniorage* profit to the bank which authorized to create new bank money. Remember that the creation of profit without any counter value is considered as *riba* by Ibnu Arabi. Consequently, the creation of bank money will also make the aggregate purchasing power of money to decrease (in the form of inflation) equivalent to the percentage of new bank money created by bank. The party who suffer a loss with the creation of new bank money is, again, the whole population who holds this money.

Meanwhile, the 100 percent reserve banking system does not give the opportunity for bank to create new (bank) money, since 100 percent reserve has to be deposited back to central bank. A bank can only extend loan as much as the original deposit. Therefore, there will be no new purchasing power created (and no *seigniorage*), so that there is no *riba* involved, there is no inflationary effect, and there is no party suffered any loss.

For example, Rp1 million deposits, first, will be recorded as 'Deposit' in liability side and cash 'Reserve' in asset side. Second, since reserve requirement is 100%, the bank can only

extend loan as much as Rp1 million, so that in the asset side, the 'Reserve" becomes 'Loan' of Rp1 million. This transaction can be illustrated below.

Balance Sheet 1			
Reserve	1 mn	Deposit	1 mn
Balance Sheet 2			
Loan	1 mn	Deposit	1 mn

Maysir (game of chance or speculation)

The *Qu_rann*prohibits contracting under conditions of uncertainty and gambling (*qimar*). The two words, uncertainty and gambling are not synonymous, though related. Uncertainty is same as *gharar* and under such conditions, exchange or contracting is reduced to a gamble. It is interesting to note here that a major objection of contemporary scholars against forwards, futures and options contracts is that these are almost always settled in price differences only. Hence, these are used more as tools of gambling than as tools of risk management (Obaidullah, 2005).

Gambling is prohibited not only because it is a game of chance with irrational speculation and baseless. It is also prohibited because it does not give productive impact to the economy, so that it does not increase aggregate supply of products and services in the real sector. This prohibition is similar to the prohibition of hoarding commodities that will reduce aggregate supply. Therefore, the prohibition of *maysir* economically implies that investment activities should correlate to the real sector to increase aggregate supply.

In modern era, *maysir* is not only present in gambling, but also present in many other sophisticated forms, such as stocks/financial assets trading to make capital gain, forwards, future and options contracts, derivatives products (such as Credit Default Swaps), etc.

II.3. Previous Studies under Conventional Economic Perspective

There are so many papers that discuss financial crisis under conventional perspective, especially after the occurrence of crisis, locally, regionally or globally. Conventional literature that discusses chronology of crisis since the Great Depression is written by Davies and Davies (1996), while the newest database on financial crisis in the period of 1970-2007 is written by

Laeven and Valencia (2008), which includes 395 episodes of financial crises (banking crisis, currency crisis and sovereign debt crisis), including 42 twin crises and 10 triple crises. Literatures that discuss Asian financial crisis are plenty, such as Kaminsky and Reinhart (1999), Lindgren *et al.* (1999), McKibbin and Martin (1999), Dooley (2000), Barro (2001), Kawai *et al.* (2001), Caprio and Klingebiel (2002), Allayannis *et al.* (2003), Kaminsky *et al.* (2003), Claessens *et al.* (2004), Eichengreen (2004), Hanson (2005), Goldstein (2005), Caprio (2005), and Caprio *et al.* (2005). There are also several literatures that discuss financial crisis in Indonesia, such as Kenward (2002) and Batunanggar (2002). Moreover, literatures that discuss current global financial crisis triggered by subprime mortgage crisis in the US has also been written by many authors, such as Caprio *et al.* (2008), Chailloux *et al.* (2008), and Reinhart and Rogoff (2008). Other than those, conventional discussion of the crisis that offers new paradigm is proposed by Lietaer *et al.* (2008).

Table III.1 Summary of Important Financial Crises						
Country	**Year of Crisis**	**Type of Crisis**	**NPL (%)**	**Cost (% GDP)**	**Loss (% GDP)**	**Growth Min (%)**
South America:						
Argentina	2001	Syst. Banking, Debt, Currency	20.1	9.6	42.7	-10.9
Bolivia	1994	Syst. Banking	6.2	6.0	0.0	4.4
Brazil	1994	Syst. Banking, Debt R.	16.0	13.2	0.0	2.1
Chile	1981	Syst. Banking, Currency, Debt	35.6	42.9	92.4	-13.6
Colombia	1998	Syst. Banking	4.1	5.0	15.1	0.9
Dominican Rep.	2003	Syst. Banking, Currency, Debt	9.0	22.0	15.5	-1.9
Ecuador	1998	Syst. Banking, Currency, Debt	40.0	21.7	6.5	-6.3
Mexico	1994	Syst. Banking, Currency	18.9	19.3	4.2	-6.2
Nicaragua	2000	Syst. Banking	12.7	13.6	0.0	0.8
Paraguay	1995	Syst. Banking	8.1	12.9	0.0	0.4
Uruguay	2002	Syst. Banking, Currency, Debt	36.3	20.0	28.8	-11.0
Venezuela	1994	Syst. Banking, Currency	24.0	15.0	9.6	-2.3
Asia:						
Indonesia	1997	Syst. Banking, Currency, Debt	32.5	56.8	67.9	-13.1
Korea	1997	Syst. Banking, Currency	35.0	31.2	50.1	-6.9
Malaysia	1997	Syst. Banking, Currency	30.0	16.4	50.0	-7.4
Philippines	1997	Syst. Banking, Currency	20.0	13.2	0.0	-0.6
Thailand	1997	Syst. Banking, Currency	33.0	43.8	97.7	-10.5
Vietnam	1997	Syst. Banking, Debt R.	35.0	10.0	19.7	4.8
Others:						
China	1998	Syst. Banking	20.0	18.0	36.8	7.6
Japan	1997	Syst. Banking	35.0	14.0	17.6	-2.0
Russia	1998	Syst. Banking, Currency, Debt	40.0	6.0	0.0	-5.3
Turkey	2000	Syst. Banking, Currency	27.6	32.0	5.4	-5.7
Ukraine	1998	Syst. Banking, Currency, Debt	62.4	0.0	0.0	-1.9

Source: Laeven dan Valencia (2008)

Summary on important crises of South America, Asia, and other countries can be read in table III.1. In general, triple crises are more severe than twin crises or single crisis. It is recorded that triple crises of Chile in 1981 has caused the most output loss. Meanwhile, Ukraine is a country that managed to minimize the loss of triple crises in 1998. Moreover, countries that never hit by the crisis include Australia, Austria, Barbados, Belgium, Belize, Bhutan, Brunei, Canada, Denmark, France, Germany, Hong Kong, Luxemburg, Mauritius, Netherlands, Singapore, dan Switzerland.

Meanwhile, the ongoing global financial crisis, started from US subprime mortgage crisis in August 2007 which has spread out to more than 25 countries in various parts o the globe since September 2008, is basically similar to previous financial crises (Reinhart and Rogoff, 2008). At this time of crisis, countries that have never been hit by financial crisis are unable to avoid the contagion, such as the Netherland, France, Germany, and Singapore.

According to Caprio *et al.* (2008), the principal source of the crisis has been the contradictory political and bureaucratic incentives which undermine the effectiveness of financial regulation and supervision in every country in the world. One of them is financial instrument innovations that lead to more complicated risk shifting behavior, yet less transparent. In fact, there are lessons learned from repeated previous crises. However, they fail to learn from past mistakes. Azis (2008) argues that the root causes of the crisis are global imbalances in current account, investment-savings and export-import. Capital inflow in surplus countries causes asset price bubble which inevitably results in systemic banking crisis.

The current measures to cope with the crisis are still limited to crisis containment and fundamentally have not changed much, such as: a) inject liquidity or bailout; b) lower interest rates; c) fiscal expansion; d) establish asset management institution to buy toxic assets; e) buy share of good asset with cash or securities paper; f) take over ownership and nationalization; g) guarantee interbank loans; h) blanket guarantee or increase deposit insurance; i) temporarily close the bourse; j) prohibit short-selling; k) rely on domestic demand; l) offer incentive to exporter (Azis, 2008; Chailloux et al., 2008; Depkominfo, 2008). Whereas, the program reform to end the crisis are proposed by Caprio et al. (2008): 1) lender reform, where compensation for loan officers must be linked to long-term performance rather than to short-term profits; 2) Credit Rating Organization (CRO) Reform, that incorporates its agency and accountability; 3) Securitization Reform; 4) Accounting Reform; 5) Improve Government Accountability; 6) Basel II revision to new Basel III since risk management has changed so much.

In the mean time, Lietaer *et al*. (2008) observe the on-going global financial crisis results not from a cyclical or managerial failure, but from a structural one, especially in money and monetary systems. Part of the evidence is repeated financial crises since the breakdown of Bretton Woods agreement with increasing frequency as well as magnitude, and such crashes have happened even under very different regulatory systems as well as at different stages of economic development. Laeven dan Valencia (2008) have recorder 395 crises during 1970-2007, including 42 twin crises and 10 triple crises. However, so far the conventional solutions being applied only deal with the symptoms, not the systemic cause, such as bailout, nationalization etc. Similarly, the financial reregulation that will be on everybody's political agenda will, at best, reduce the frequency of such crises, but not avoid their re-occurrence. Their recommendation is the implementation of complementary currency as partial payment of taxes and business-to-business (B2B) which runs in parallel with national currency to increase the availability of money in its prime function as a medium of exchange, rather than for savings or speculation. Additionally, these currencies are expressly designed to link what would remain otherwise unused resources with unmet needs within a community, region or country.

II.4. Previous Studies under Islamic Economic Perspective

On the other hand, literatures of financial crisis under Islamic perspective are not as many as that of conventional perspective. Some literatures on Asian financial crisis include Hasan (2002) and Hasan (2003) that discuss financial crisis in Malaysia,£as well as Garcia *et al.* (2004) that discusses financial crisis in Asia. Meanwhile, Al-Jarhi (2004) analyses banking crisis in Turkey, while Ali (2007) discusses banking crisis in general. Moreover, literatures that discuss current global financial are limited, such as study by Siddiqi (2008). However, literatures in the form of article and short paper are many, such as Harahap (2008), Idris (2008), Iqbal (2008), Izhar (2008), Sakti (2008), Sanrego and Ali (2008), Thomas (2008), and Shodiq (2008).

Summary of literatures on the root causes of financial crises and their alternative solutions under Islamic economic perspective can be read in table III.2. It can be concluded from Islamic economic literatures that the root causes of financial crises are human error and natural phenomenon uncontrollable by human. Human error can be divided into three groups, namely (1) moral decadences that trigger (2) system or conceptual flaws and (3) internal weaknesses.

Table III.2 Root Causes of Financial Crises And Alternative Solutions			
Author	**Root Causes**	**Root Causes**	
		Author	**Root Causes**
Hasan (2002, 2003)	Interest System Speculation Fractional Reserve Banking Fiat Monetary System	Interest-Free System Restricted	Narrow Banking + Liquidity Gold Monetary System
Garcia et al. (2004)	Fractional Reserve Banking Interest-Based Credit	Equity-Based Financing	Narrow Banking
Al-Jarhi (2004)	Fractional Reserve Banking Interest-Based Credit	Commodity and PLS Finances	Narrow Banking
Ali (2006/2007)	Debt-Based Finance Weak Internal Mgt Imprudent Financing Poor Crisis Mgt Small Size Incompetence BODs, Staffs Dual Banking System Liquidity Access Conv. Bank Products Imitation	Equity-Based Finance Crisis Mgt Plan Create Association of Islamic Bank Competence BODs, Staffs Easy Access to Liquidity IB should not imitate CB products	Stability of both banks are required
Ali (2007)	Macroeconomic factors Ext. Microeconomic factors Int. Microeconomic factors		
Siddiqi (2008)	Moral failure (Greed, Hedonism) Interest System Speculation Risk Shifting Money Creation	Interest-free System Restricted Risk Sharing Restricted	

Note: **Narrow Banking** = 100 Percent Reserve (for demand deposits) Banking System. **Macroeconomic factors** include all macro situations. **External microeconomic factors** include supervision problems, inadequate infrastructure, financial liberalization policies, political interference, moral hazard due to deposit insurance, lack of transparency, fraud and corruption. **Internal microeconomic factors** include banking strategy, poor credit assessment, taking interest rate or exchange rate exposure, concentration of lending, entering in new areas of activity, internal control failure, other operational failures.

III. ROOT CAUSES OF FINANCIAL CRISES

Based on literature review in chapter II, recipes to cure financial crises usually only touch the symptoms and never touch their real systemic root causes, so that we never really get rid of the crises. Therefore, the grand strategy to be taken to cure the crises should be gradually removing their systemic root causes, as can be read in figure III.4. This study will focus on system or conceptual flaws.

Figure III.4
The Anatomy of Financial Crises

Economic system flaws can be categorized into five groups, namely 1) excess money supply; 2) speculation; 3) interest system; 4) international monetary system; and 5) decoupling of real and monetary sectors. These five system flaws have led crisis to re-emerge repeatedly, since most economists presume that these systems are not the root causes of the crises, so that solutions never address these issues.

1. Excess Money Supply

Excess money supply is a result of excess money creation and the creation of artificial purchasing power. Excess money creation includes the printing of fiat money (seigniorage) and the creation of bank money through fractional reserve banking (money multiplier), while the creation of artificial purchasing power includes credit card and credit line. Furthermore, money creation also takes place in financial market with multi level derivatives products. Excess money supply has proven to be the primary determinant of inflation in most countries, including Indonesia (Ascarya, 2008).

Fractional reserve banking system can really create new money several fold (money multiplier) without backup assets. For example, Lehman Brothers' and Goldman Sachs' ratio of assets to capital were respectively 30 and 26, before they both disappeared. Some European banks had even a higher leverage: BNP Parisbas 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.*, 2008). Meanwhile, long before that in 1937, Lord Josiah Stamp, former director Bank of England, described the power of a bank with interest as a weapon (Sakti, 2007).

> "*The modern banking system manufactures money out of nothing. The process is perhaps the most astounding piece of sleight of hand that was ever invented. Banking was coinceived in inequity and born in sin. Bankers own the earth; take it away from them, but leave them with the power to create credit, and with the stroke of a pen they will create enough money to buy it back again. If you want to be slaves of the bankers, and pay the cost of your own slavery, then let the banks create money.*"[3]

Credit card essentially is an instant creator of purchasing power for the card holder, which actually does not have the purchasing power yet. The ease to obtain credit card (one person can obtain several credit cards at once) leads to a huge outstanding credit card loan in almost every country. Non-performing credit card loans are expected to be a new threat to countries suffering from financial crises, especially the United States.

Derivatives products are the creator of new money in financial market which are illustrated as the inverted pyramid of debts, standing on a slender base of real wealth, where small original/back up asset at the bottom has grown several fold as derivatives products at the top, so that their collapse are inevitable. The failure of subprime mortgage in the United States is a clear example.

2. Speculation

Today's capitalistic economic system relies heavily on the psychology of speculators, especially in financial market, since this system allows products and transactions which encourage speculation. This limitation is never considered as fundamental flaw, so that there is never a policy to curb speculative activity.

Speculative activity essentially is a zero-sum game which encourages risk shifting behavior that cannot produce real value added. This is different from risk sharing in investment activity which can produce real value added. Speculation activities in capital and money markets take place when capital owner expects instant return from capital gain, short-selling, misuse hedging,

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3 Lord J. Stamp, Public Address in Central Hall, Westminster, 1937.

derivatives etc. Since these are zero-sum game (you lose what I gain), there is no added value in the economy, unlike trade or investment activities based on risk sharing.

Capital market is a place where investors (surplus spending units) meet entrepreneurs (deficit spending units). However, rule and regulation make investment and speculative activities can be done, making it difficult to differentiate between real investor and speculator. Pessimistic estimate states that 95 percent of investors are actually speculators. Advanced products and transactions innovations encourage speculative and risk shifting behaviors.

3. Interest System

Interest system is one of the root causes of financial crises. The fixed and predetermine rate of interest (rate of return) before economic activity is started will dictate the market and lead to mislead market behavior from its natural course. Interest rate should reflect productivity level of the capital in economic process. However, that never happens, so that there is always a gap between predetermined interest rate and actual productivity that leads to market distortion. Interest system is a systematic risk shifting so that there is always unfairness involved. When all market players do not want to share the risk (which is naturally embedded in every business and its return), somehow, someone will become a victim of the system. In the mean time, credit system has dictated the market to behave unnaturally. The predetermination of interest rate is basically provides guaranteed profit for one party against unpredictable future events. Predetermined interest rate (whether it is high or low) will force the market to give positive return (above the cost of fund), while real productivity could be higher or lower than the cost of fund, so that the business may gain profits or suffer losses. When there exists this gap, the market will react negatively (Sakti, 2008). Moreover, different from general conventional economic views, it has been proven that interest rate is one of the major determinants of inflation in Indonesia (Ascarya, 2009). Guarantee

Since long ago, some western economists have criticized interest system with its credit mechanism that has caused debt trap problems for many developing and developed countries. Consequently, there is always a bubble in economic growth realized and it never reflects the real productivity and wellbeing. This bubble economy is like a time bomb that will explode at some point in the future in the form of crisis. Barbeton and Lane (1999) in Sakti (2007) have been predicted the occurrence of the crises that will afflict developed countries.

> *"The credit and capital markets have grown too rapidly, with too little transparency and accountability. Prepare for an explosion that will rock the western financial sistem to its foundations."*

Furthermore, interest system has actually been prohibited since long before in Jewish teachings (Exodus 22:25, Deuteronomy 23: 19, Levicitus 35:7, Lucas 6: 35), Christian teachings (Lucas 6:34-35, the early priests' views of'I-XII decades, the Christian scholars' views of XII-XV decades, the Christian reformists' views of XVI-1836) as well as Greek teachings delivered by Plato (427-347 SM) and Aristoteles (384-322 SM). Finally, interest system (riba or usury) is prohibited in Islamic teaching through Al-Qur'an in stages, started in QS Ar-Rum [30]:39, QS An-Nisaa [4]:161, QS Ali Imran [3]:130-132 and QS Al-Baqarah [2]:275-279 (Ascarya, 2007).

4. International Monetary System

Current international monetary system is based on multiple fiat money of every country in the world with floating value and without any back-up of real assets. Therefore, each country gains seigniorage profits of printing the national currency on the burden of all people as money holders in the form of depleting purchasing power (or inflation). Country like the United States gains a huge seigniorage, since its currency is used internationally. This condition makes persistent inflation and unfairness, especially for small countries with un-convertible currency. The more a currency is used as international payment, the more a country gains seigniorage. In contrast, a country with un-convertible currency (developing countries, small countries and poor countries) can only enjoy seigniorage in national level. Meanwhile, money creation through banking system has made the 20th century one of the highest inflationary centuries on the historical record, inflation is obviously not a problem specific to the process of money issuance by governments (Lietaer et al., 2008). Moreover, exchange rate has proven to be one of major determinants of inflation in several countries, including Indonesia (Yanuarti and Hutabarat, 2006; Ascarya, 2009).

The value of a currency is relatively stable when it is backed by gold. But, when a currency has no more back up from gold, its value depreciates quickly. A research conducted by Prof. Roy Festrem of Berkeley University concluded that in the span of 400 years up to 1976 the price and value of gold has been relatively stable, even has slightly been appreciated (Sanrego and Ali, 2008). In 1800, the price of gold was equivalent to 19.39 US Dollar per troy ounce, while before the breakdown of Bretton Woods Agreement in 1971, the price of gold was equivalent to 35 US Dollar per troy ounce. But in 2004, the price of gold has jumped to 455.75 US Dollar per troy ounce, and at the end of 2008 it has jumped again to 769.40 US Dollar per troy ounce. This means that the value of US Dollar has been stable in a long period of time when it was backed by gold, but it has been depreciated quickly when it was not backed by gold. This condition applies to other fiat moneys.

5. Decoupling of Real and Monetary Sectors

In the history of economy, the main entity of economy has always been the productive activities of goods and services in the real sector with money served as medium of exchange. The emergence and expansion of interest system with money as a commodity and rate of interest as its price, new financial markets emerged in parallel with the main market of goods and services in the real sector, such as capital market, money market, bond market and derivatives market. Since financial markets offer fixed and predetermined rate of return, money/capital that originally is invested in the real sector, flows swiftly to financial sector (which cannot produce real value added), so that the amount of capital concentrated in financial sector has exceed tens of times to that in the real sector (which can produce real value added). Financial sector, which is originally serves as supporting entity to the real sector, has developed as a separate sector that has its own products and prices. Therefore, Sakti (2007) argues that the economy is inevitably dichotomized (consciously or unconsciously) into two main activities, namely real activity and monetary activity (also known as classical dichotomy).[4] The consequent of this misallocation of resources has made lack of capital to grow in the real sector, while it has made financial sector artificially grow with flooded capital in the form of bubble economy, which eventually will be corrected and burst in the form of financial crisis. Furthermore, the dichotomy will increase the gap between the rich and the poor.

The believe that financial sector is a standalone sector in the economy may be wrong, since the dichotomy has resulted in a big gap between real and financial sectors. Financial sector should function as a supporting agent to economic growth through real sector activities. Consequently, all elements and instruments in the financial sector should be maintained and protected to fully support real sector activities. Therefore, the tendency of repeated bubble in the financial sector could be avoided.

IV. EMPIRICAL EVIDENCE

This chapter will present some empirical evidences of the main root causes of financial crises in Indonesia. The three main root causes are interest, excess money, and exchange rate, while the three alternative substitutes are PLS return (as a substitute for interest), just money (as a substitute for excess money), and single global currency or gold (as a substitute for multiple currency or exchange rate), as presented in figure III.5.

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4 This condition is augmented by monetary theories of classical thought, which essentially states that the monetary policy to control money supply will not affect the real sector. The expansion of money supply will only increase the price, while output will not increase.

Figure III.5
Substitutions of Conventional Systems with Islamic Systems
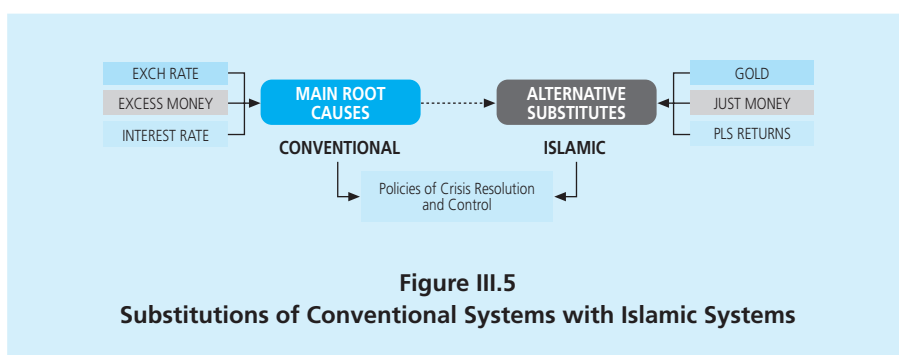
IV.1. Type and Source of Data

The data used in this study is secondary data of monthly time series obtained from Indonesian Economic and Finance Statistics of Bank Indonesia (SEKI-BI), Syariah Banking Statistics of Bank Indonesia (SPS-BI), for the period of January 2002 to November 2008.

IV.2. Variable and Operational Definition

The variables used in this study and their operational definitions are as follows.

a. CPI Inflation (**INF**) is the index of monthly CPI inflation obtained from SEKI-BI.
b. Excess money supply from money and credit creation or fiat money (**FM**) is the monthly M2 - consumption data obtained from SEKI-BI.
c. Interest rate (**IR**) is the monthly 1-month working capital loan rate of conventional banks obtained from SEKI-BI.
d. Multiple currencies system or exchange rate (**EXC**) is the nominal Rupiah exchange rate to the US Dollar obtained from SEKI-BI.
e. Just money supply or money needed in the economy in Islamic perspective (**JM**) is an equilibrium intrinsic M0 proximate by the monthly consumption data obtained from SEKI-BI.
f. PLS Returns (**RS**) is the returns of investment from Islamic bank represented by *equivalent rate* from the actual returns of *Mudharabah* time deposit or investment obtained from full-fledged Islamic banks and Syariah Banking Statistics of Bank Indonesia (SPS-BI).
g. Single global currency or gold price (**GOLD**) is international gold price index obtained from Indeks Harga Energi SEKI-BI.

In this model, only the main root causes of financial crises are included. Conventional model will include excess money supply from money and credit creation (FM), interest rate (IR),

and multiple currency system or exchange rate (EXC). Meanwhile, Islamic model will replace excess money supply (FM) with just money supply (IM), interest rate (IR) with PLS returns (RS), and exchange rate (EXC) with single global currency (GOLD).

The drawback of this model is that not all variables (root causes of financial crises) are included in the model. Another drawback of this model is that the replacement variables for Islamic model (i.e. JM, RS, and GOLD) are not immune from the contamination of conventional model, since JM and GOLD are conventional data to be used as proxies, while RS is still dominated and influenced by interest rate, since the share of Islamic banking in Indonesia is still very small at 2.2%. Moreover, the essence/quality of true JM and FM (intrinsic M0 vs. token M0), where JM is not created from nothing while FM is created from nothing, is not captured by their proxies, M0 and consumption, respectively.

IV.3. Method of Estimation

The empirical exercise can be done using 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.

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

$$z_t = b_{20} - b_{21}y_t + \gamma_{21}y_{t-1} + \gamma_{22}z_{t-1} + \varepsilon_{zt} \tag{III.2}$$

With assumptions that both y_t and z_t are stationary, ε_{yt} and ε_{zt} are white noise disturbances with standard deviations of σ_y and σ_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.

$$y_t = a_{10} + a_{11}y_{t-1} + a_{12}z_{t-1} + e_{yt} \tag{III.3}$$

$$z_t = a_{20} + a_{21}y_{t-1} + a_{22}z_{t-1} + e_{zt} \tag{III.4}$$

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.

$$x_t = \mu_t + \sum_{i=1}^{k} A_i + X_{t-1} + \varepsilon_t \qquad \text{(III.5)}$$

Where x_t is a vector of endogenous variables with (n x 1) dimension, μ_t is a vector of exogenous variables, including constant (intercept) and trend, A_i is coefficient matrix with (n x 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, modified): 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-lenght, 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 centerpiece 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.

$$\Delta y_t = b_{10} + b_{11}\Delta y_{t-1} + b_{12}\Delta z_{t-1} - \lambda\left(y_{t-1} - a_{10} - a_{11}y_{t-2} - a_{12}z_{t-1}\right) + \varepsilon_{yt} \qquad \text{(III.6)}$$

$$\Delta z_t = b_{20} + b_{21}\Delta y_{t-1} + b_{22}\Delta z_{t-1} - \lambda\left(z_{t-1} - a_{20} - a_{21}y_{t-1} - a_{22}z_{t-2}\right) + \varepsilon_{zt} \qquad \text{(III.7)}$$

Where a is long-term regression coefficient, b is short-term regression coefficient, λ is an error correction parameter, and the frase 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).

$$\Delta x_{t-1} = \mu_t + \Pi x_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta x_{t-i} + \varepsilon_t \qquad \text{(III.8)}$$

Where, Π and Γ are functions of A_i. The matrix Π can be decomposed into two matrices λ dan β with (n x 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.

The process of VAR analysis can be read in figure III.6. After the raw data is ready, data is transformed into natural logarithmic (ln) form, except for interest rate and PLS returns data, to get consistent and valid results. The first test to be conducted is unit root test. If the data is

stationary at level, then VAR can be done in level. VAR level can estimate long-term relationship between variables. If not, the data should be differentiated. If the data is stationary at first difference, then it should be checked for the existence of cointegration between variables. If the data is not cointegrated, then VAR can be done in first difference, and it can only estimate short-term relationship between variables. Innovation accounting will not be meaningful for long-term relationship. If the data is cointegrated, then VECM can be done using data in level to incorporate long-term relationship between variables. VECM can estimate short-term and long-term relationship between variables. Innovation accounting for VAR level and VECM will be meaningful for long-term relationship.

Figure III.6
The Process of VAR Analysis
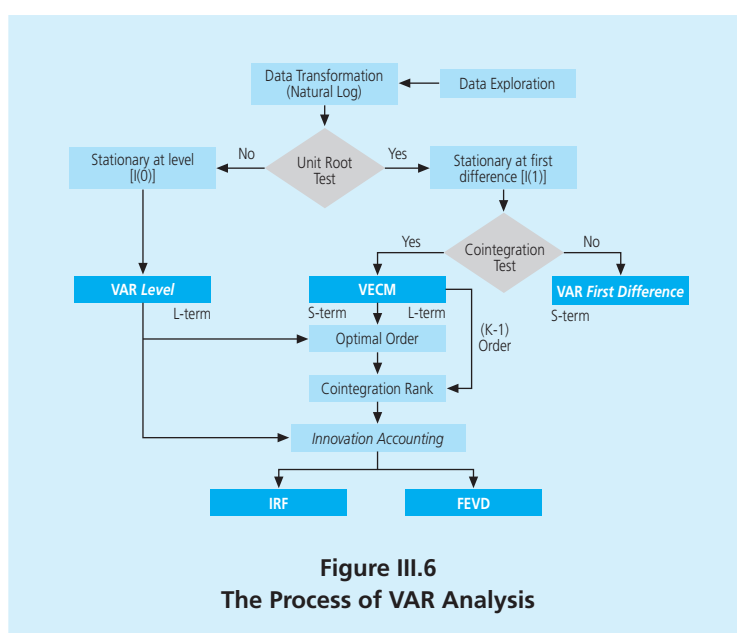
Based on the conceptual framework in figure III.5, the main root causes of financial crises are: 1) fiat money 'FM' excess money supply from money and credit creations; 2) interest rate 'IR'; and 3) exchange rate 'EXC'. This model can be written as follows.

$$\ln INF_t = \alpha_0 + \alpha_1 \ln FM_t + \alpha_2 INT_t + \alpha_3 \ln EXC_t \tag{III.9}$$

To eradicate some of the root causes of financial crises under Islamic perspective, excess money supply will be no more and replaced by just money supply 'JM', since fiat money is replaced by gold backed money with no *seigniorage*, fractional reserve banking is replaced by 100 percent reserve banking or narrow banking that does not create bank money, credit card is replaced by debit card so that there is no purchasing power creation, and derivatives are replaced by asset backed securities and *sukuk* so that there is no leveraging. Moreover,

international multiple currency system will be replaced by single global currency based on gold standard 'GOLD' so that there is no exchange rate inflation, while interest rate is replaced by profit-and-loss sharing returns 'RS' so that there is no credit creation. Therefore, the model of alternative substitutes under Islamic perspective can be written as follows.

$$\ln INF_t = \beta_0 + \beta_1 \ln JM_t + \beta_2 RS_t + \beta_3 \ln GOLD_t \qquad \text{(III.10)}$$

Following the model in equation (III.9), the equation of VAR model in matrix for conventional CPI inflation can be written as follows.

$$\begin{bmatrix} \ln INF_t \\ \ln FM_t \\ INT_t \\ \ln EXC_t \end{bmatrix} = \begin{bmatrix} \alpha_{10} \\ \alpha_{20} \\ \alpha_{30} \\ \alpha_{40} \end{bmatrix} + \begin{bmatrix} \alpha_{11} \alpha_{12} \alpha_{13} \alpha_{14} \\ \alpha_{21} \alpha_{22} \alpha_{23} \alpha_{24} \\ \alpha_{31} \alpha_{32} \alpha_{33} \alpha_{34} \\ \alpha_{41} \alpha_{42} \alpha_{43} \alpha_{44} \end{bmatrix} \begin{bmatrix} \ln INF_{t-1} \\ \ln FM_{t-1} \\ INT_{t-1} \\ \ln EXC_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \end{bmatrix} \qquad \text{(III.11)}$$

$$\downarrow \qquad \downarrow \qquad \downarrow \qquad \downarrow \qquad \downarrow$$
Variable   Constant   Parameter   Lag   Error

Following the model of alternative substitutes under Islamic perspective in equation (III.10), the equation of VAR model in matrix can be written as follows.

$$\begin{bmatrix} \ln INF_t \\ \ln JM_t \\ RS_t \\ \ln GOLD_t \end{bmatrix} = \begin{bmatrix} \beta_{10} \\ \beta_{20} \\ \beta_{30} \\ \beta_{40} \end{bmatrix} + \begin{bmatrix} \beta_{11} \beta_{12} \beta_{13} \beta_{14} \\ \beta_{21} \beta_{22} \beta_{23} \beta_{24} \\ \beta_{31} \beta_{32} \beta_{33} \beta_{34} \\ \beta_{41} \beta_{42} \beta_{43} \beta_{44} \end{bmatrix} \begin{bmatrix} \ln INF_{t-1} \\ \ln JM_{t-1} \\ RS_{t-1} \\ \ln GOLD_{t-1} \end{bmatrix} + \begin{bmatrix} \mu_{1t} \\ \mu_{2t} \\ \mu_{3t} \\ \mu_{4t} \end{bmatrix} \qquad \text{(III.12)}$$

Furthermore, if the data shows stationary in first difference and cointegration between variables, then the VAR model will be combined with correction error model, namely Vector Error Correction Model (VECM). Therefore, equation of the VECM model in matrix for the model in equation (III.11) can be written as follows.

$$\begin{bmatrix} \Delta \ln INF_t \\ \Delta \ln FM_t \\ \Delta INT_t \\ \Delta \ln EXC_t \end{bmatrix} = \begin{bmatrix} \alpha_{10} \\ \alpha_{20} \\ \alpha_{30} \\ \alpha_{40} \end{bmatrix} + \begin{bmatrix} \alpha_{11} \alpha_{12} \alpha_{13} \alpha_{14} \\ \alpha_{21} \alpha_{22} \alpha_{23} \alpha_{24} \\ \alpha_{31} \alpha_{32} \alpha_{33} \alpha_{34} \\ \alpha_{41} \alpha_{42} \alpha_{43} \alpha_{44} \end{bmatrix} \begin{bmatrix} \Delta \ln INF_{t-1} \\ \Delta \ln FM_{t-1} \\ \Delta INT_{t-1} \\ \Delta \ln EXC_{t-1} \end{bmatrix} - \lambda \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \end{bmatrix} \qquad \text{(III.13)}$$

Equation of the VECM model in matrix for equation (III.12) can be written as follows.

$$\begin{bmatrix} \Delta \ln INF_t \\ \Delta \ln JM_t \\ \Delta RS_t \\ \Delta \ln GOLD_t \end{bmatrix} = \begin{bmatrix} \beta_{10} \\ \beta_{20} \\ \beta_{30} \\ \beta_{40} \end{bmatrix} + \begin{bmatrix} \beta_{11} \beta_{12} \beta_{13} \beta_{14} \\ \beta_{21} \beta_{22} \beta_{23} \beta_{24} \\ \beta_{31} \beta_{32} \beta_{33} \beta_{34} \\ \beta_{41} \beta_{42} \beta_{43} \beta_{44} \end{bmatrix} \begin{bmatrix} \Delta \ln INF_{t-1} \\ \Delta \ln JM_{t-1} \\ \Delta RS_{t-1} \\ \Delta \ln GOLD_{t-1} \end{bmatrix} - \lambda \begin{bmatrix} \mu_{1t} \\ \mu_{2t} \\ \mu_{3t} \\ \mu_{4t} \end{bmatrix} \qquad \text{(III.14)}$$

Where, Δ is the change of variable from previous period, λ is an adjustment level from short-term to long-term equilibrium.

To determine the inter-relation among variables under study, innovation accounting of Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD) will be utilized. IRF can be used to determine the response of one endogen variable from the shock of other variables in the model. FEVD can be used to determine the relative contribution of one variable to explain variability of its endogenous variables. All data in this study is transformed into natural logarithmic form (ln), except interest rate, PLS returns, and expected inflation, to obtain valid and consistent results. Software to be used in the data processing is *Microsoft Excel 2007* and *Eviews 4.1*.

IV.4. Results and Analysis

IV.4.1. Stationary Test

Two methods are used simultaneously to test the existence of unit root or the stationary of the data, i.e., Augmented Dickey-Fuller or ADF test and Phillips-Perron or PP test with 5% McKinnon critical value, meaning that if the value of t-ADF or t-PP is less than 5% McKinnon critical value, then the data is stationary or has no unit root. Table appendix III.1 and table appendix III.2 in the appendix show the results of stationary tests of conventional model and Islamic model, respectively. There is no variable that stationary at level, however, all variables are stationary at first difference.

IV.4.2. Selection of Optimal Lag

One problem of the VAR system is autocorrelation. To overcome this problem, optimal lag length should be applied. Therefore, optimal lag length should be obtained using the test of optimal lag. The selection of optimal lag length in this study will be based on the shortest lag of *Schwarz Information Criterion* (SC). Table appendix III.3 and table appendix III.4 in the appendix show the results of optimal lag selection test for conventional model and Islamic model, respectively. Based on SC, the optimal lag for original model is 2 (two) and the optimal lag for alternative Islamic model is also 2 (two).

IV.4.3. Cointegration Test

All variables in original and alternative Islamic models are stationary at first difference, I(1), so that the long-term relationships among variables can only be obtained if they have

satisfied the criteria of integration process. Cointegration test based on trace statistics will be applied to determine the number of equation systems that can explain long-term relationship. Table III.5 and III.6 in the appendix show the results of cointegration test for original model and alternative Islamic model, respectively. Trace test of original model indicates 1 (one) cointegrating equations at the 5% critical value, while trace test of alternative Islamic model also indicates 1 (one) cointegrating equations at the 5% critical value.

IV.4.4. Stability Test

The VAR system at its optimal lag should be stable. Unstable VAR system will make the results of Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD) are not valid. The stability test based on modulus or unit-circle will be applied to determine if the VAR system at its optimal lag is stable within its unit-circle or with modulus less than one. Table appendix III.7 and table appendix III.8 in the appendix show the results of stability test for original VAR system (optimal lag = 2) and alternative Islamic VAR system (optimal lag = 2), respectively. Original VAR system is stable up to lag 10 with modulus $0.184767 - 0.984235$, while alternative Islamic system is stable up to lag 11 with modulus $0.070512 - 0.997073$.

IV.4.5. Results

a. Impulse Response Function

Table III.3 shows the summary of IRF results for CPI inflation shocks by various conventional determinants of inflation.

Table III.3 Impulse Response Function Summary			
SHOCK	**ORIGINAL**	**ISLAMIC**	**SHOCK**
lnFM Fiat Money	**Positive** and permanent at **0.004**, stabilize in 16th period	Positive and permanent at 0.001, stabilize in 10th period	lnJM Just Money
lnIR Interest Rate	**Positive** and permanent at **0.013**, stabilize in 22th period	Negative and permanent at 0.002, stabilize in 16th period	PLS PLS Returns
LnEXC Exchange Rate	**Positive** and permanent at **0.006**, stabilize in 17th period	Positive and permanent at 0.0008, stabilize in 8th period	lnGOLD Single Global Currency

Figure III.1 shows that the responses of financial crisis (CPI inflation) to the shock of root causes of the crisis are varies, where interest rate lnIR and multiple currency system or exchange rate lnEXC give the biggest positive impact, followed by lnFM to the crisis in Indonesia. Whereas, figure III.2 shows that the responses of financial crisis (CPI inflation) to the shock of alternative Islamic substitutes are mostly very small.

Figure III.7
Response of Financial Crisis (CPI Inflation) to Fiat Money and Just Money
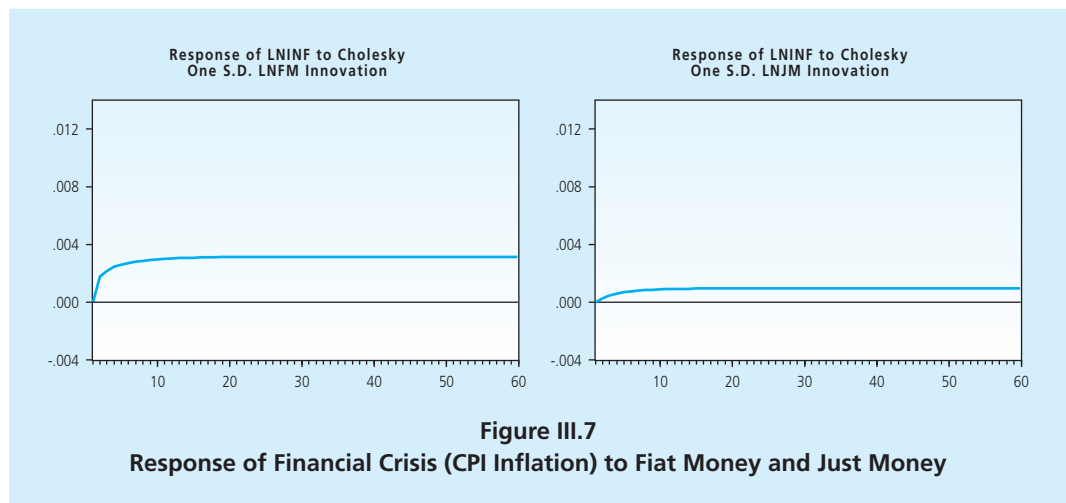
Figure III.7 compares the impact of fiat money lnFM and just money lnJM to financial crisis (CPI inflation). It shows that lnFM gives greater and permanent positive impact to the crisis, while lnJM only gives smaller and permanent positive impact to the crisis. Moreover, estimation results show that lnFM gives statistically significant impact in the long-term, while lnJM gives statistically no significant impact to the crisis.

Figure III.8
Response of Financial Crisis (CPI Inflation) to Interest Rate and PLS Returns
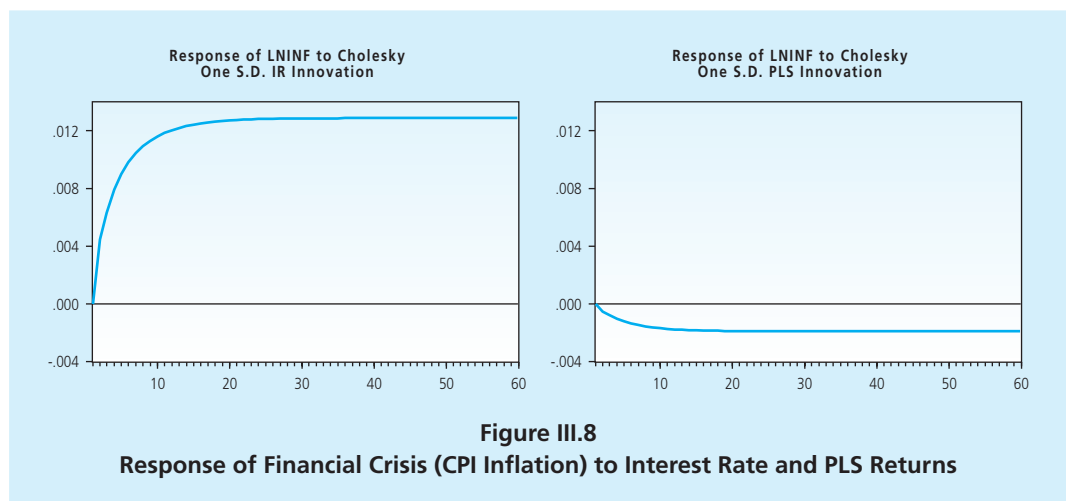
Figure III.8 compares the impact of interest rate IR and PLS returns RS to financial crisis (CPI inflation). It clearly shows that INT gives much greater and permanent impact to the crisis than that of PLS. Moreover, estimation results show that IR is statistically significant in the short-term and long-term, while RS are statistically not significant in short-term but significant (negative) in long-term.

Figure III.9
Response of Financial Crisis (CPI Inflation) to Multiple Currencies and Single Global Currency
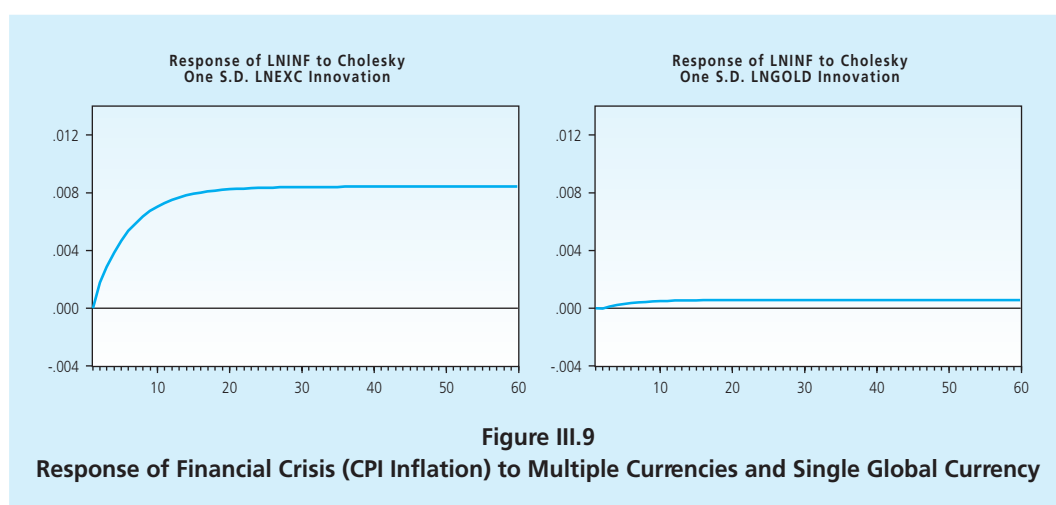
Figure III.9 compares the impact of multiple currency system lnEXC and single global currency system lnGOLD to financial crisis (CPI inflation). It clearly shows that lnEXC gives much greater and permanent impact to the crisis than that of lnGOLD. Moreover, estimation results show that lnEXC is statistically significant to influence the crisis in the long-term, while lnGOLD is also statistically significant to influence the crisis.

b. Forecast Error Variance Decomposition

Figure III.10 compares the results of Forecast Error Variance Decomposition (FEVD) of original and alternative Islamic models. Figure 4.6 (left) shows FEVD of original model, where fiat money (lnFM 2.8%), interest–rate (INT 45.2%), and exchange rate (lnEXC 18.6%) give 66.6% share to the behavior of financial crisis (CPI inflation).
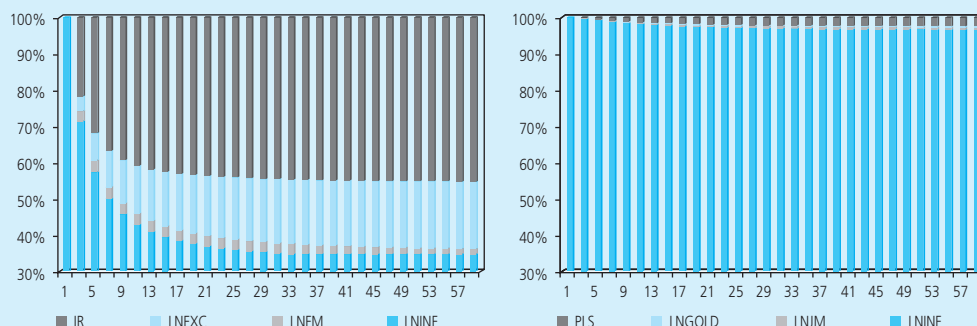
Figure III.10
FEVD of Conventional and Islamic Models of Determinants of Inflation

Meanwhile, figure III.10 (right) shows FEVD of alternative Islamic model, where just money supply (lnJM 0.7%), PLS returns (RS 2.5%), and single global currency (lnGOLD 0.2%) give only 3.4% share to the behavior of financial crisis (CPI inflation).

IV.4.6. Analysis

The phenomena of financial crisis first appeared in the debasement of metallic currency, i.e., when gold or silver coins as currency was diluted with other metals by the government to increase the total number of coins issued without a requirement to increase the amount of gold used to make them. This is essentially the transgression of Allah's law and the natural balance. At that time that was the only option to create money without any counter-value, while the transgression of Allah's law will result in natural imbalance, catastrophe or crisis. In contemporary conventional economics this is called *seigniorage* income from printing fiat money that causes excess money supply. Ibnu Arabi stated that every economic transaction without any '*iwad* or counter-value will amounted to *riba*. Moreover, gold and silver as currency were originally public goods which now can be owned privately, so that piling and hoarding gold/silver become legal, which were previously prohibited.

Nevertheless, in today's sophisticated economic and finance, financial crisis is not solely due to *riba* from money creation or the printing of fiat money. Other sources of financial crisis are many forms of *riba* and many forms of *maysir*. Many forms of *riba* include money creation from paper fiat money, fractional reserve banking system, interest system, credit card, derivatives, etc. Many forms of *maysir* include stocks/assets trading to make capital gain, forwards, future and options contracts, derivatives products (such as Credit Default Swaps), etc.

Financial crisis triggered from inflation is recognized by Austrian school as ideological and political diseases, where the government deliberately runs inflation economics. Therefore, to get rid of inflation triggered financial crisis is just a matter of political will and commitment. Austrian school offers two choices, inflation or gold standard (i.e., replace fiat money with gold standard and replace fractional reserve banking with free banking).

Most root causes of financial crises have been recognized by conventional as well as Islamic perspectives, although there are some differences among different conventional school of thought. However, Islamic perspective has gone further into the detail and some more (such as, interest, credit card, derivatives, corruption, and poor administration).

Massive efforts have been made to get rid of financial crises with more failures than success due to the failure to distinguish natural and artificial (human error, criminal activities) root causes of financial crises. We should understand natural causes, but natural causes should not be used as an excuse/smoke screen to allow artificial causes (criminal activities) to continue. Artificial causes of financial crises can be eradicated.

In the end, economic and financial systems are ideological and political choices of economic regimes taken by the government. With the political will and commitment by the government, financial crises can be gradually and systematically eradicated and controlled.

From the empirical exercise, riba rooted causes of financial crises (lnFM fiat money 2.8%, IR interest rate 45.2%, and lnEXC exchange rate 18.6%) give 66.6% share to financial crises in Indonesia, while if we replace these three systems according to Islamic perspective (lnJM just money supply 0.7%, RS PLS return 2.5%, and lnGOLD single global currency 0.2%) will give only 3.4% share to financial crises in Indonesia, or a massive reduction of 63.2%.

Interest rate IR is the most dominant source of financial crises (45.2%) and exchange rate lnEXC is the second most dominant source of financial crises (18.6%). The replacement of interest rate IR with PLS returns RS alone will reduce 42.7% share of financial crisis in Indonesia. The further replacement of multiple currency system lnEXC with single global currency lnGOLD will reduce further 18.4% share of financial crises in Indonesia.

V. CONCLUSIONS AND RECOMMENDATIONS

V.1. Conclusions

- Financial crisis first occurred as a transgression of Allah's law in one form of *riba*, i.e., deliberate debasement of metallic currencies, by the government which caused natural imbalance and catastrophe manifested in the form of hyperinflation in Egypt (14th century) and first two

crises in the UK (19th century). The transgressions have been expanded and sophisticated in many form of *riba* and many form of *maysir*. Many forms of *riba* include money creation from paper fiat money, fractional reserve banking system, interest system, credit card, derivatives, etc. Many forms of *maysir* include stocks/assets trading to make capital gain, forwards, future and options contracts, derivatives products (such as Credit Default Swaps), etc.

- The root causes of financial crises from Islamic economic literatures can be human error and natural phenomenon uncontrollable by human. Human error can be divided into three groups, namely (1) moral decadences that trigger (2) system or conceptual flaws and (3) internal weaknesses.

- From the empirical exercise, *riba* rooted causes of financial crises (lnFM fiat money 2.8%, IR interest rate 45.2%, and lnEXC exchange rate 18.6%) give 66.6% share to financial crises in Indonesia, while if we replace these three systems according to Islamic perspective (lnJM just money supply 0.7%, RS PLS return 2.5%, and lnGOLD single global currency 0.2%) will give only 3.4% share to financial crises in Indonesia, or a massive reduction of 63.2%.

- Empirical results show that if the main three root causes of financial crises (fiat money, interest, and exchange rate) were substituted by their Islamic alternatives (just money supply, PLS, and single global currency) , three riba rooted causes of financial crises can be eliminated. It leaves to the government to make political will and commitment to eradicate and control financial crises.

- The *maysir* rooted causes of financial crises can also be eliminated with prohibitions or restrictions of speculative transactions, contracts and products.

V.2. Recommendations

- In a country adopting dual monetary system, like Indonesia, root causes of financial crises can be partly eradicated and partly controlled. The extension of eradication can go as far as Austrian school with the elimination of money and credit creations, as well as the restriction of speculative activities gradually and systematically. What essentially required is government will and commitment. Other inflation determinants that cannot be eliminated should be controlled tightly with discipline.

- Under dual monetary system, to minimize the negative impact of financial crisis can be done by increasing the share of PLS-based Islamic finance (banking, capital market, insurance, mutual funds, etc.) and adopting PLS returns as policy rate anchor as well as PLS-based monetary instruments, since PLS returns has no significant share to financial crisis.

- This study can be improved and extended by adding variables of *maysir* rooted causes of financial crisis, by the selection of more proper proxies (especially for lnFM and lnJM), by applying alternative methods, and by comparing with other countries.

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APPENDIX

Table Appendix III.1 The Results of Stationary Tests for Original Model				
Variable	**ADF Value**		**Phillips Perron Value**	
	Level	**1st Difference**	**Level**	**1st Difference**
LNINF	-2.054813	-5.813510	-2.205655	-6.031241
LNFM	-0.451516	-5.129169	-0.539663	-4.935065
LNEXC	-3.353963	-7.634553	-3.433336	-7.634553
IR	-2.299623	-3.148172	-1.535057	-3.085059

Note: Boldface indicates that the data is stationary at 5% McKinnon critical value.

Table Appendix III.2 The Results of Stationary Tests for Alternative Islamic Model				
Variable	**ADF Value**		**Phillips Perron Value**	
	Level	**1st Difference**	**Level**	**1st Difference**
LNINF	-2.054813	-5.813510	-2.205655	-6.031241
LNJM	-2.178651	-7.508594	-1.469565	-4.661710
LNGOLD	-2.777781	-8.408193	-2.875405	-8.429406
PLS	-3.232887	-11.17122	-3.110523	-11.86335

Note: Boldface indicates that the data is stationary at 5% McKinnon critical value.

Table Appendix III.3 The Results of Optimal Lag Selection Tests for Original Model						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	545.3692	NA	5.20E-12	-14.63160	-14.50706	-14.58192
1	597.2678	96.78388	1.97E-12	-15.60183	-14.97911*	-15.35342
2	620.6983	41.16155*	1.62E-12*	-15.80266*	-14.68176	-15.35552*
3	630.0964	15.49426	1.95E-12	-15.62423	-14.00515	-14.97836
4	633.9896	5.997599	2.76E-12	-15.29702	-13.17977	-14.45242
5	641.4880	10.74096	3.58E-12	-15.06724	-12.45182	-14.02392
6	652.4645	14.53645	4.30E-12	-14.93147	-11.81787	-13.68942

Lag	LogL	LR	FPE	AIC	SC	HQ
Table Appendix III.4						
The Results of Optimal Lag Selection Tests for Alternative Islamic Model						
0	-36.95116	NA	3.55E-05	1.106788	1.231332	1.156470
1	329.3795	683.1572	2.75E-09*	-8.361609*	-7.738889*	-8.113198*
2	343.7805	25.29897	2.88E-09	-8.318391	-7.197495	-7.871252
3	357.4346	22.51087	3.10E-09	-8.254990	-6.635917	-7.609122
4	375.1223	27.24859*	3.02E-09	-8.300603	-6.183354	-7.456006
5	388.3613	18.96404	3.35E-09	-8.225982	-5.610557	-7.182657
6	395.6676	9.675790	4.44E-09	-7.991015	-4.877414	-6.748961
7	412.1965	20.10282	4.68E-09	-8.005312	-4.393534	-6.564529

Table Appendix III.5
The Results of Cointegration Tests for Original Model
Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.349216	**53.02090**	**47.21**	**54.46**
At most 1	0.163119	19.08431	29.68	35.65
At most 2	0.058680	5.016495	15.41	20.04
At most 3	0.003023	0.239183	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Trace test indicates 1 cointegrating equation(s) at the 5% level

Table Appendix III.6
The Results of Cointegration Tests for Alternative Islamic Model
Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.297366	**47.08473**	**39.89**	**45.58**
At most 1	0.120815	19.20413	24.31	29.75
At most 2	0.075747	9.032114	12.53	16.31
At most 3	0.034936	2.809291	3.84	6.51

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Trace test indicates 1 cointegrating equation(s) at the 5% level

Table Appendix III.7 The Results of Stability Tests for Original Model				
Model	**Kisaran Modulus**	**Kisaran Modulus**	**Kisaran Modulus**	**Kisaran Modulus**
Lag 10	0.984235	0.942561	0.910376	0.848700
	0.984235	0.942561	0.910376	0.834046
	0.961798	0.939534	0.907208	0.834046
	0.961798	0.939534	0.907208	0.800115
	0.951371	0.937633	0.906425	0.800115
	0.951371	0.937633	0.906425	0.695685
	0.950928	0.932337	0.900471	0.617155
	0.950928	0.932337	0.900471	0.617155
	0.942834	0.925312	0.896148	0.510481
	0.942834	0.925312	0.896148	0.184767

Table Appendix III.8 The Results of Stability Tests for Original Model				
Model	**Kisaran Modulus**	**Kisaran Modulus**	**Kisaran Modulus**	**Kisaran Modulus**
Lag 11	0.997073	0.833917	0.794679	0.694789
	0.925203	0.815483	0.766975	0.687197
	0.914299	0.815483	0.766975	0.687197
	0.914299	0.795255	0.728143	0.647026
	0.903334	0.795255	0.728143	0.647026
	0.833917	0.794679	0.694789	0.070512

Table Appendix III.9 The Estimation Results for Original Model		
Vector Error Correction Model		
Short-term		
CointEq1	0.003345	[1.16654]
D(LNINF(-1))	-0.115715	[-1.12716]
D(LNFM(-1))	0.035004	[1.61484]
D(LNEXC(-1))	0.073466	[1.75436]
D(IR(-1))	0.028526	[5.07153]*
Long-term		
LNFM(-1)	0.840164	[-3.39005]*
LNEXC(-1)	9.629346	[-5.99422]*
IR(-1)	0.078738	[-2.32496]*

Table Appendix III.10 The Estimation Results for Alternative Islamic Model		
Vector Error Correction Model		
Short-term		
CointEq1	-0.001492	[-0.52098]
D(LNINF(-1))	0.094799	[0.81474]
D(LNJM(-1))	0.003005	[0.20150]
D(LNGOLD(-1))	-0.004251	[-0.19132]
D(PLS(-1))	-9.73E-05	[-0.08623]
Long-term		
LNJM(-1)	-0.350296	[0.68344]
LNGOLD(-1)	0.875140	[-2.70461]*
PLS(-1)	-0.309382	[3.84134]*

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MODELING OF INDONESIA CONSUMER PRICE INDEX USING MULTI INPUT INTERVENTION MODEL

P.W. Novianti [1]
Suhartono [2]

Abstract

There are some events which are expected effecting CPI's fluctuation, i.e. financial crisis 1997/1998, fuel price risings, base year changing's, independence of Timor-Timur (October 1999), and Tsunami disaster in Aceh (December 2004). During re-search period, there were eight fuel price risings and four base year changing's. The objective of this research is to obtain multi input intervention model which can des-cribe magnitude and duration of each event effected to CPI. Most of intervention re-searches that have been done are only contain of an intervention with single input, ei-ther step or pulse function. Multi input intervention was used in Indonesia CPI case because there are some events which are expected effecting CPI. Based on the result, those events were affecting CPI. Additionally, other events, such as led on January 1999, events on April 2002, July 2003, December 2005, and September 2008, were affecting CPI too. In general, those events gave positive effect to CPI, except events on April 2002 and July 2003 which gave negative effects.

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I. INTRODUCTION

Consumer Price Index (CPI) is an index to describe the price's fluctuation of some goods or services after base year. Indonesia's CPI is affected by monetary crisis on 1997/1998 (Rupingi, 2001) and fuel price rising (Rosa, 2006). Additionally, there are other events which expected give contribution to CPI's fluctuation, e.g. base year changing, independence of Timor-Timur (October 1999), and Tsunami disaster in Aceh (December 2004). Empirical study about the period and the magnitude of the effect of those events to Indonesia CPI are needed by government and Bank of Indonesia to make appropriate policy for stabilizing the fluctuation of CPI, especially when those events occur again.

A quantitative model that most commonly used for time series forecasting is Autoregressive Integrated Moving Average (ARIMA). However, ARIMA model is not suitable for this CPI case, because there are some events that make the changing of data pattern. As one of the alternatives, intervention modeling is used for this case. Intervention modeling was used by Bhattacharya and Layton (1979) to analyze the effectiveness of seat belt legislation on the Queensland toll-road, Kendall and Ord (1990) to study about the effect of pilots demonstration action at United Kingdom Airlines, Leonard (2001) when analyzing the effect of price rising and promotion to the product demand, Rupingi (2001) to know the effect of monetary crisis in 1997/1998 on Indonesia CPI, and Suhartono (2007) who study the effect of Bali Bomb I to tourism in Bali.

Most of those researches only use an intervention event (single input), either step or pulse function. In this paper, multi input intervention modeling was used because there are many factors that affect Indonesia CPI. Multi input intervention modeling is not widely used and there is no standard procedure like Box-Jenkins method in ARIMA modeling. Therefore, in this research, we developed multi input intervention modeling in Indonesia CPI. As a result, a model which can explain the periods and magnitude effect of those events would be produced.

II. THEORY

Intervention model is a model which could be used to evaluate the impact of an intervention event that is caused by internal or external factor on a time series dataset (Suhartono, 2007). Generally, there are two common types of intervention, i.e., step and pulse functions. More detail explanations and applications of intervention analysis can be found in Wei (1990), Bowerman and O'Connell (1993), Hamilton (1994), Brockwell and Davis (1996), Tsay (2005) and Suhartono (2007). Intervention model can be written as

$$Y_t = \frac{\omega_s(B)B^b}{\delta_r(B)} X_t + \frac{\theta_q(B)}{\phi_p(B)(1-B)^d} a_t,$$

(IV.1)

where Y_t is a response variable at time t and X_t is an intervention variable that show either exist or not the effect of an intervention at time t. X_t can be step function S_t or pulse function P_t. Then, $\omega_s(B)$ and $\delta_r(B)$ are defined as

$$\omega_s(B) = \omega_0 - \omega_1 B - \omega_2 B^2 - \dots - \omega_s B^s,$$

and

$$\delta_s(B) = 1 - \delta_1 B - \delta_2 B^2 - \dots - \delta_r B^r.$$

Equation (IV.1) shows that the magnitude and period of intervention effect is given by b, s, and r. The delay time is shown by b, s gives information about the time which is needed for an effect of intervention to be stable, and r shows the pattern of an intervention effect. The impact of an intervention model on a time series dataset (Y_t^*) is

$$Y_t^* = Y_t - \frac{\theta_q(B)}{\phi_p(B)(1-B)^d} a_t = \frac{\omega_s(B)B^b}{\delta_r(B)} X_t \tag{IV.2}$$

II.1. Step Function Single Input Intervention Model

Step function is an intervention type which occurs in a long term. For example, the analysis of new tax system in Australia since September 2000 (Valadkhani and Platon, 2004) had applied step function intervention. Intervention step function is written below (Wei, 1990)

$$X_t = S_t = \begin{cases} 0, & t < T \\ 1, & t \geq T, \end{cases} \tag{IV.3}$$

where the intervention starts at T. Step function single input intervention model with $b=2$, $s=1$, and $r=1$ can be obtained by substituting Equation (IV.3) into (IV.1),

$$Y_t = \frac{(\omega_0 - \omega_1 B)B^2}{1 - \delta_1} S_t + \frac{\theta_q(B)}{\phi_p(B)(1-B)^d} a_t. \tag{IV.4}$$

Therefore, the effect of step function single input intervention is

$$Y_t^* = \frac{(\omega_0 - \omega_1 B)B^2}{1 - \delta_1} S_t \tag{IV.5}$$

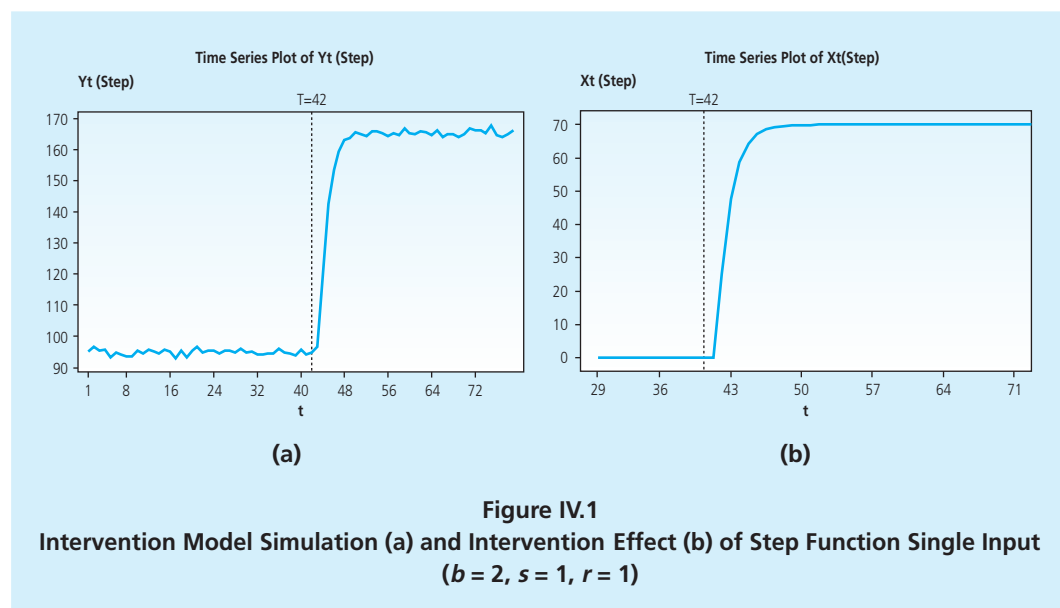If $|\delta_1| < 1$, we have

$$Y_t^* = \omega_0 S_{t-2} + (\omega_0 \delta_1 - \omega_1) S_{t-3} + (\omega_0 \delta_1^2 - \omega_1 \delta_1) S_{t-4} + \dots \tag{IV.6}$$

Intervention's effect in Equation (IV.6) can also be written as

$$Y_t^* = \begin{cases} 0, & t < T+2 \\ \sum_{i=2}^{k} \omega_0 \delta_1^{i-2} - \sum_{j=3}^{k} \omega_1 \delta_1^{j-3}, & t = T+k, \ k \geq 2. \end{cases} \tag{IV.7}$$

Simulation of that intervention, with $\omega_0 = 25$, $\omega_1 = -10$, $\delta_1 = 0.5$ and happen in t = 42 is drawn by Figure IV.1.

Figure IV.1
Intervention Model Simulation (a) and Intervention Effect (b) of Step Function Single Input
($b = 2$, $s = 1$, $r = 1$)

That intervention starts to effect the data on the next two periods after intervention occurred ($b=2$), and the magnitude is 25. Three periods after intervention, the escalation of data is 47.5 and became 64.4 in the fourth period. This increasing becomes permanent effect and goes to 70.

II.2. Pulse Function Single Input Intervention Model

An intervention which occurs only in a certain time (T) is called pulse intervention. The example of this intervention is public election and 11 September attacked in USA which affected to unemployment rate in USA (Dholakia, 2003). Pulse intervention function is

$$X_t = P_t = \begin{cases} 0, & t \neq T \\ 1, & t = T. \end{cases} \tag{IV.8}$$

Explanation of single input intervention effect with pulse function can be done the same with step function intervention in Equation (IV.4) until (IV.7). Simulation of pulse single input intervention model ($b=2$, $s=1$, $r=1$) which the value of and is the same with simulation in Section II.2 is drawn in Figure IV.2. Figure IV.1 and IV.2 show the difference between step and pulse intervention and its effects. The effect of step function is felt in a long term, until $t > T$,

while pulse function has impermanent effect, where in certain t, time series dataset will not affected by intervention event.

Figure IV.2
Intervention Model Simulation (a) and Intervention Effect (b) of Pulse Function Single Input
($b = 2$, $s = 1$, $r = 1$)
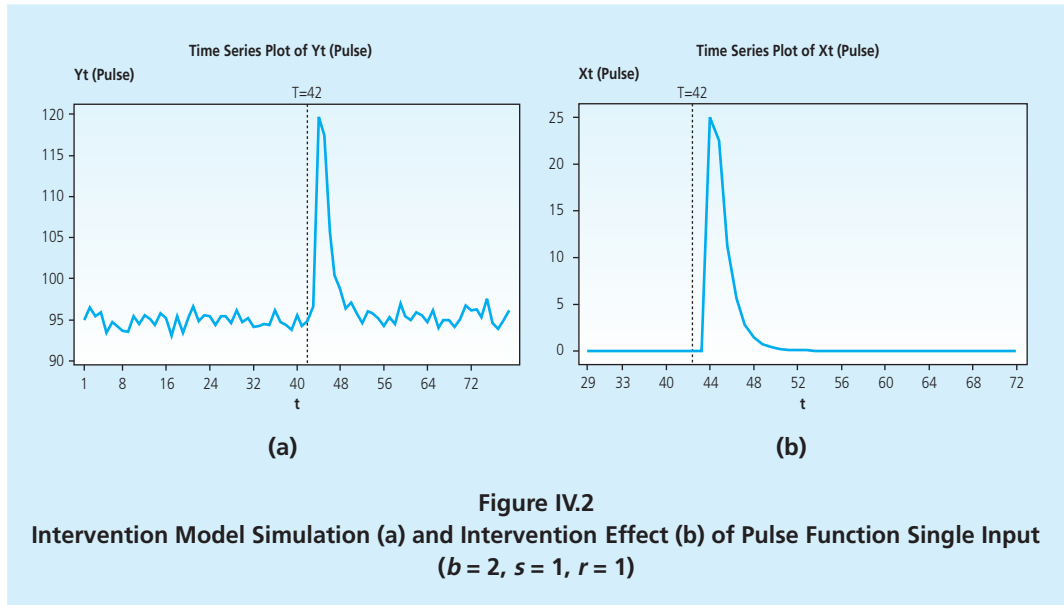
II.3. Multi Input Intervention Model

Multi input intervention model, based on Equation (IV.1), is (Wei, 1990)

$$Y_t = \frac{\omega_{s_1}(B)B^{b_1}}{\delta_{r_1}(B)}X_{1t} + \frac{\omega_{s_2}(B)B^{b_2}}{\delta_{r_2}(B)}X_{2_t} + ... + \frac{\omega_{s_k}(B)B^{b_k}}{\delta_{r_k}(B)}X_{k_t} + \frac{\theta_q(B)}{\phi_p(B)(1-B)^d}a_t$$

Or

$$\sum_{i=1}^{k}\frac{\omega_{s_i}(B)B^{b_i}}{\delta_{r_i}(B)}X_{i_t} + \frac{\theta_q(B)}{\phi_p(B)(1-B)^d}a_t. \tag{IV.9}$$

Equation (IV.9) shows that there are k events on a time series dataset. For illustration, we have multi input intervention with two events, pulse function ($b=1$, $s=2$, $r=0$) which is followed by step function ($b=1$, $s=1$, $r=1$),

$$Y_t = [(\omega_{0_1} - \omega_{1_1}B + \omega_{2_1})B^1]P_t + \frac{(\omega_{0_2} - \omega_{1_2}B)B^1}{1-\delta_1(B)}S_t + \frac{\theta_q(B)}{\phi_p(B)(1-B)^d}a_t. \tag{IV.10}$$
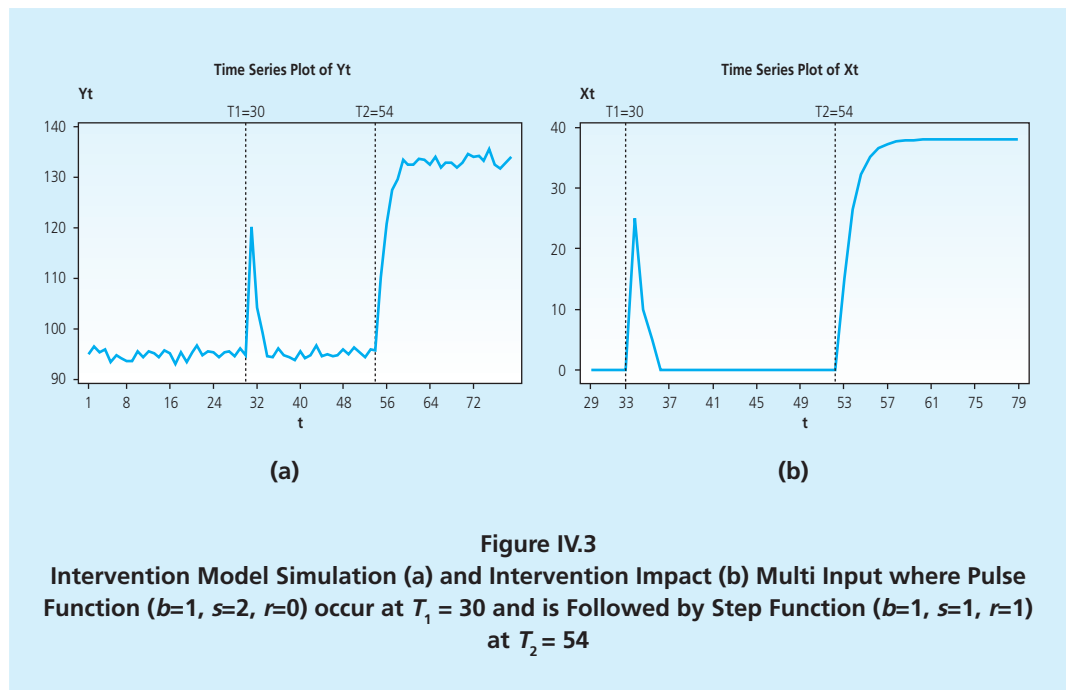
The impact is

$$Y_t^* = \omega_{0_1}P_{t-1} - \omega_{1_1}P_{t-2} - \omega_{2_1}P_{t-3} + \omega_{0_2}S_{t-1} + (\omega_{0_2}\delta_1 - \omega_{1_2})S_{t-2} + (\omega_{0_2}\delta_1 - \omega_{1_2})\delta_1 S_{t-3} + ..., \tag{IV.11}$$

also can be written as

$$Y_t^* = \begin{cases} 0, & t \le T_1 \\ \omega_{0_1}, & t = T_1 + 1 \\ -\omega_{1_1}, & t = T_1 + 2 \\ -\omega_{2_1}, & t = T_1 + 3 \\ 0, & t = T_1 + k, \ \ T_1 + k \le T_2 \\ \omega_{0_2}, & t = T_2 + 1 \\ (\omega_{0_2} - \omega_{1_2}) \left(\sum_{i=2}^{k} \delta_1^{i-2} \right) + \omega_{0_2} \delta_1^{k-1}, & t \ge T_2 + m, m \ge 2. \end{cases}$$

Visualization of Equation (IV.10) and the impact are represented by Figure IV.3, where $\omega_{0_1} = 25$, $\omega_{1_1} = -10$, $\omega_{2_1} = -5$, $\omega_{0_2} = 15$, $\omega_{1_2} = -4$ and $\delta_1 = 0.5$. First intervention is happened at $T_1 = 30$ and the magnitude is 25 on a period ahead. The pulse function intervention is affecting until four periods after T_1 with the magnitude effect are 10 and 5 on the third and fourth period, respectively. The effect of pulse intervention will be equal to zero until $T_2 = 54$, when the second intervention begin. This step intervention is felt one period after T_2 and the impact is 15. On the second until fifth periods, the impacts of this step intervention are 26.5, 32.25, 36.5, and 37.3, respectively. Then, the impact will go to 38.

Figure IV.3
Intervention Model Simulation (a) and Intervention Impact (b) Multi Input where Pulse Function (*b*=1, *s*=2, *r*=0) occur at $T_1 = 30$ and is Followed by Step Function (*b*=1, *s*=1, *r*=1) at $T_2 = 54$

Now, we will show the other multi input intervention model, where step function intervention ($b=1$, $s=2$, $r=0$) as the first intervention and will be followed by pulse function intervention ($b=1$, $s=1$, $r=1$). The model is

$$Y_t = [(\omega_{0_1} - \omega_{1_1}B + \omega_{2_1})B^1]S_t + \frac{(\omega_{0_2} - \omega_{1_2}B)B^1}{1 - \delta_1(B)}P_t + \frac{\theta_q(B)}{\phi_p(B)(1-B)^d}a_t ,$$

and the impact is

$$Y_t^* = \omega_{0_1}S_{t-1} - \omega_{1_1}S_{t-2} - \omega_{2_1}S_{t-3} + \omega_{0_2}P_{t-1} + (\omega_{0_2}\delta_1 - \omega_{1_2})P_{t-2} + (\omega_{0_2}\delta_1 - \omega_{1_2})\delta_1 P_{t-3} + ...$$

First intervention, step function intervention, starts to affect the data at one period after the intervention event occur, and the impact is ω_{0_1}. This impact will be $(\omega_{0_1} - \omega_{1_1})$ in the second period. On the third period until $t = T_2$, the impact is $(\omega_{0_1} - \omega_{1_1} - \omega_{2_1})$. One period after that, the second intervention, i.e. pulse function intervention, give additional impact to the time series dataset, ω_{0_2}. Therefore, the impact will be $(\omega_{0_1} - \omega_{1_1} - \omega_{2_1} + \omega_{0_2})$. The second and third periods after the second intervention, the impacts are $(\omega_{0_1} - \omega_{1_1} - \omega_{2_1} + \omega_{0_2}\delta_1 - \omega_{1_2})$ and $(\omega_{0_1} - \omega_{1_1} - \omega_{2_1} + \omega_{0_2}\delta_1^2 - \omega_{1_2}\delta_1)$. Then, the impact decreases gradually goes to zero. Consequently, the impact will be back to $(\omega_{0_1} - \omega_{1_1} - \omega_{2_1})$.

Figure IV.4
Intervention Model Simulation (a) and Intervention Impact (b) Multi Input where Step Function (b=1, s=2, .r=0) occur at T_1 = 30 and is Followed by Pulse Function (b=1, s=1, r=1) at T_2 = 54
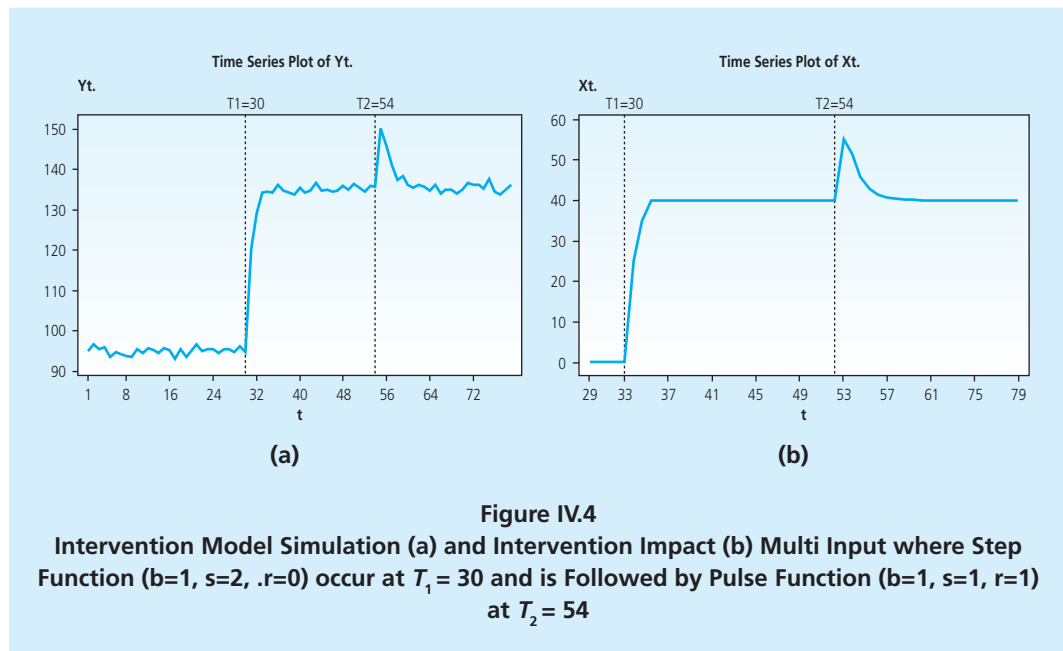
Figure IV.4 shows the simulation of multi input intervention where step function is the first intervention event and the second is pulse function. Here is the initial value for that simulation

$\omega_{0_1} = 25$, $\omega_{1_1} = -10$, $\omega_{2_1} = -5$, $\omega_{0_2} = 15$, $\omega_{1_2} = -4$ and $\delta_1 = 0.5$ First intervention, which happen at $T_1 = 30$, starts to affect the data on $t = 31$, and the impact is 25. There is a rapid increase in intervention effect (see Figure IV.4(b)) during $t = 32$ and $t = 35$, but the effect remain constant between $t = 35$ and $t = 54$. The second intervention happens in $T_2 = 54$ and give effect to the dataset in one period ahead. That effect starts to yield zero effect since the fifth period after $T_2 = 54$.

II.4. Parameters Estimation

Let the intervention model that the parameters will be estimated is defined as

$$Y_t = \frac{\omega_s(B)}{\delta_r(B)} X_{t-b} + \frac{\theta_q(B)}{\phi_p(B)(1-B)^d} a_t. \tag{IV.12}$$

Rewriting Equation (IV.12) as

$$\delta_r(B)\phi_p(B)(1-B)^d Y_t = \omega_s(B)\phi_p(1-B)^d X_{t-b} + \delta_r(B)\theta_q(B)a_t, \tag{IV.13}$$

or

$$c(B)Y_t = d(B)X_{t-b} + e(B)a_t$$

where

$$c(B) = \delta_r(B)\phi_p(B)(1-B)^d = (1 - c_1 B - c_2 B^2 - \ldots - c_{p+r} B^{p+r})(1-B)^d,$$

$$d(B) = \omega_s(B)\phi_p(1-B)^d = (d_0 - d_1 B - d_2 B^2 - \ldots - d_{p+s} B^{p+s})(1-B)^d,$$

$$e(B) = \delta_r(B)\theta_q(B) = 1 - e_1 B - e_2 B^2 - \ldots - e_{r+q} B^{r+q}.$$

Thus, we have

$$a_t = \frac{c(B)Y_t - d(B)X_{t-b}}{e(B)}. \tag{IV.14}$$

The nonlinear least square estimation to estimate those parameters can be found by minimizing

$$S(\delta, \omega, \phi, \theta \mid b) = \sum_{t=t_0}^{n} a_t^2, \tag{IV.15}$$

where $t_0 = $ max $(p + r + 1, b + p + s + 1)$ and   are residuals under white noise assumption and Normal distribution. Parameters of multi input intervention can be obtained by replacing Equation (IV.12) with Equation (IV.9) and follow description in Equation (IV.13) through (IV.15).

III. RESEARCH METHODOLOGY

The Indonesia CPI dataset contains of 239 observations, started from January 1989 until November 2008. All of observations (training data) were used to build that model. Generally, there are five intervention events, which its function is step function, i.e., fuel price rising, base year changing, financial crisis 1997/1998, and Timor-Timur Independence. On the other hand, Tsunami disaster is a pulse function. Those events are showed in Table IV.1.

Table IV.1 Intervention Events in Indonesia's CPI Dataset				
Intervention Events	**Time**	**Percentage of the Risings**	**t**	**Name of Variable**
Fuel Price Rising	Jul-91	22%	31	X_{31},
	Jan-93	27%	49	X_{49},
	May-98	71.43%	113	X_{113},
	Oct -00	12%	142	X_{142},
	Jan-03	21%	169	X_{169},
	Mar-05	30%	195	X_{195},
	Oct-05	125%	202	X_{202},
	May-08	30%	233	X_{233},
Base Year Changing	Jan-96	-	85	X_{85},
	Jan-02	-	157	X_{157},
	Jan-07	-	217	X_{217},
Monetary Crisis	Jul-97	-	103	X_{103},
Timor-Timur Independence	Oct -99	-	130	X_{130},
Tsunami Disaster	Des-04	-	192	X_{192},

Multi input intervention modeling in Indonesia CPI follows this algorithm, i.e.

(1) Dividing dataset into $k+1$ parts,

   a. Data 1, which is the data before first intervention, as many as n_0 series, i.e. $t = 1, 2, ...,$ $T_1 - 1$. Noted as Y_{0_t}.

   b. Data 2, which is the data from first intervention until before second intervention, as many as n_1 series, i.e. $t = T_1, T_1 + 1, T_1 + 2, ..., T_2 - 1$. Noted as Y_{1_t}.

   c. Data $k+1$, which is data from k^{th} intervention until the end of data, as many as n_k *series*, i.e. $t = T_k, T_k + 1, T_k + 2, ..., n$. Noted as Y_{k_t}.

(2) Modeling of first intervention

   a. Step 1

     • ARIMA model's building for time series dataset before first intervention occurs (Y_{0_t}), so we have

$$Y_{0_t} = \frac{\theta_q(B)}{\phi_p(B)(1-B)^d} a_t$$

- Forecasting to Data 2 (Y_{1_t}) using ARIMA model. In this step, we get these forecast data
  $$\hat{Y}_{T_1-1}(1), \hat{Y}_{T_1-1}(2), ..., \hat{Y}_{T_1-1}(n_1).$$

b. Step 2

- Calculate the responses value of first intervention or $Y_{1_t}{}^*$. It is residuals of data on $t = T_1, T_1 + 1, T_1 + 2, ..., T_2 - 1$, based on the forecasting of ARIMA model in the first step. This step produces responses value of first intervention,
  $$Y_{T_1}^*, Y_{T_1+1}^*, ..., Y_{T_2-1}^*.$$

- Identification b_1, s_1, r_1 of first intervention by using the plot of responses value $Y_{T_1}^*$, $Y_{T_1}^* + 1$, ..., $Y_{T_2}^* - 1$ by using the confidence interval, i.e. $\pm 3\hat{\sigma}_{a_0}$ (Root Mean Square Error or MSE of the previous ARIMA model). This interval is based on the determination of control chart bounds at statistical quality control.

c. Step 3

- Parameter estimation and signification test for the first intervention model
- Diagnostic checking, by doing residual assumption checking, i.e. white noise and Normality. In this step, we have first input intervention model

$$Y_t = \frac{\omega_{s_1}(B)B^{b_1}}{\delta_{r_1}(B)} X_{1_t} + \frac{\theta_q(B)}{\phi_p(B)(1-B)^d} a_t. \qquad \text{(IV.16)}$$

(3) Building iteratively of the-m^{th} intervention model, where $m = 2, 3, ..., k$.

a. Step 1

- Forecasting of Data $m+1$ (Y_{m_t}), based on the-m^{th} intervention model. In this step, we have these forecasting value as follows
  $$\hat{Y}_{T_m-1}(1), \hat{Y}_{T_m-1}(2), ..., \hat{Y}_{T_m-1}(n_m).$$

b. Step 2

- Calculate the-m^{th} intervention responses $(Y_{m_t})^*$, i.e. residual on the data of $t = T_m, T_m + 1, T_m + 2, ..., T_{m+1} - 1$, based on the forecasting of the-$(m-1)^{th}$ intervention model. In this step, we have the response values of the-m^{th} intervention,
  $$Y_{T_m}^*, Y_{T_m+1}^*, ..., Y_{T_{m+1}-1}^*.$$

- Identification of b_m, s_m, r_m from m^{th} intervention model, responses' plot of $Y_{T_m}^*$, $Y_{T_m}^* + 1$, ..., $Y_{T_{m+1}}^* - 1$, where the confidence interval is $\pm 3\hat{\sigma}_{a_{m-1}}$

c. Step 3

- Parameter estimation and signification test for the- m^{th} intervention model
- Diagnostic checking, by doing residual assumption test, i.e. white noise and Normality test. In this step, we have

$$\sum_{j=1}^{m} \frac{\omega_{s_j}(B)B^{b_j}}{\delta_{r_j}(B)} X_{j_t} + \frac{\theta_q(B)}{\phi_p(B)(1-B)^d} a_t. \tag{IV.17}$$

This step is done iteratively until the last intervention, i.e. the-m^{th} intervention. Therefore, we get multi input intervention model

$$Y_t = \sum_{j=1}^{m} \frac{\omega_{s_j}(B)B^{b_j}}{\delta_{r_j}(B)} X_{j_t} + \frac{\theta_q(B)}{\phi_p(B)(1-B)^d} a_t.$$

IV. EMPIRICAL RESULT

Indonesia CPI has tendency to be increasing in every month. There are some dramatic rises in Indonesia CPI. It can be seen in Figure IV.5.

Figure IV.5
Time Series Plot of Indonesia CPI during
January 1989-November 2008
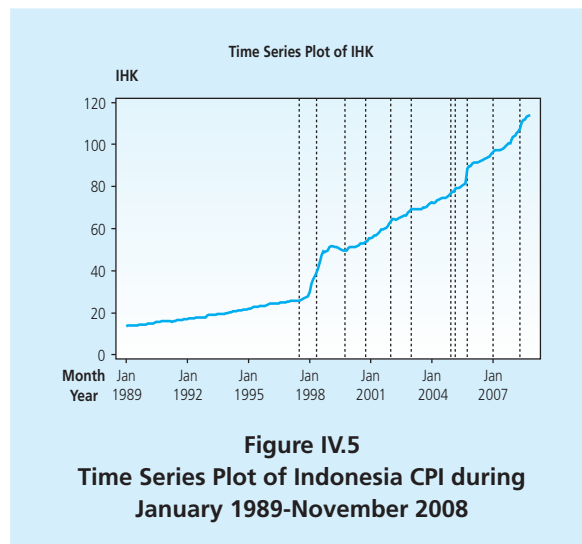
The most significant rising of Indonesia CPI happen on era of monetary crisis in 1997/ 1998 and fuel price rising on October 2005. Based on Info Bank Publishing (2007), there were so many job terminations, closing of some banks, and unstable political condition. Therefore, consumer power parity was decline significantly and effected to Indonesia CPI.

Determination of multi input intervention model in Indonesia CPI follows the algorithm in Section 3. In the next section, we will give brief explanation about how to build the model and its effect of each intervention events. However, we only show an event of each intervention event category. For instance, we use a fuel price rising on May 2008 to represent fuel price risings events.

IV.1. Pre Intervention Modeling

Box-Jenkins procedure is used to determine pre intervention model, i.e. ARIMA. The details of Box-Jenkins procedure can be found in Bowerman and O'Connell (1993). According to Table IV.1, the first intervention event is fuel price rising on July 1991. However, the data that should be used to determine ARIMA model is not enough. To obtain ARIMA model, researcher should have at least fifty observations (Wei, 1990). Therefore, we assumed that monetary crisis is the first intervention event in Indonesia CPI dataset.

Having identified the data by using Box Cox transformation, we conclude that the data is not necessary to be transformed. However, Augmented Dickey Fuller test shows that the dataset have non-constant mean (unstationer). Thus, differencing is applied to get stationery data (Wei, 1990). Based on ACF and PACF plots, there are several possibilities of ARIMA order. However, ARIMA $(0,1,1)(0,0,1)^{12}$ is the best model, because it has the smallest MSE, all parameters are statistically significant, and residual is white noise. Unfortunately, that model doesn't satisfy the Normal distribution. It might be caused by outliers in dataset. After involved the outliers to ARIMA model and re-estimate parameters, we got a model satisfying the residual assumptions, both white noise and Normality, i.e.

$$Y_t = 0.11 + 0.35X_{31_t} + 0.27X_{49_t} + 0.2X_{87_t} + Y_{t-1} + a_t + 0.3a_{t-1} + 0.48a_{t-12} + 0.15a_{t-13}. \quad \text{(IV.18)}$$

MSE of Model (18) is 0.0087. That model shows that the data before intervention is affected by fuel price rising on July 1991 and January 1993, and also an event on March 1996.

IV.2. Intervention Modeling of Indonesia CPI

First intervention event which affected Indonesia CPI is monetary crisis in 1997/ 1998. It is a step function intervention. Based on Figure (IV.6), data pattern of ARIMA model forecasting (green line) is different from data pattern before intervention (red line). It indicates that intervention occurs and has significant effect.£The first step in intervention modeling is identifying the value of *b*, *s*, and *r*. This identification is done by evaluating into residual bar chart of pre intervention model (Figure IV.6(b)).

Based on Figure IV.6(b), we got *b*=2, *s*=[1,4,5,6,7], and *r*=0. The result of parameter estimation and signification test show that all of parameters are significant, so intervention model is written as

$$Y_t = 0.11 + 0.3X_{31_t} + 0.3X_{49_t} - 0.2X_{87_t} + 0.2X_{103_{t-2}} + 0.3X_{103_{t-3}} + 0.2X_{103_{t-6}} + 3.7X_{103_{t-7}} +$$
$$1.8X_{103_{t-8}} + 1.5X_{103_{t-9}} + Y_{t-1} + a_t + 0.59a_{t-1} + 0.44a_{t-12} + 0.26a_{t-13} \quad \text{(IV.19)}$$

Figure IV.6
(a) Time Series Plot (b) Bar Chart Residual of Pre Intervention Model
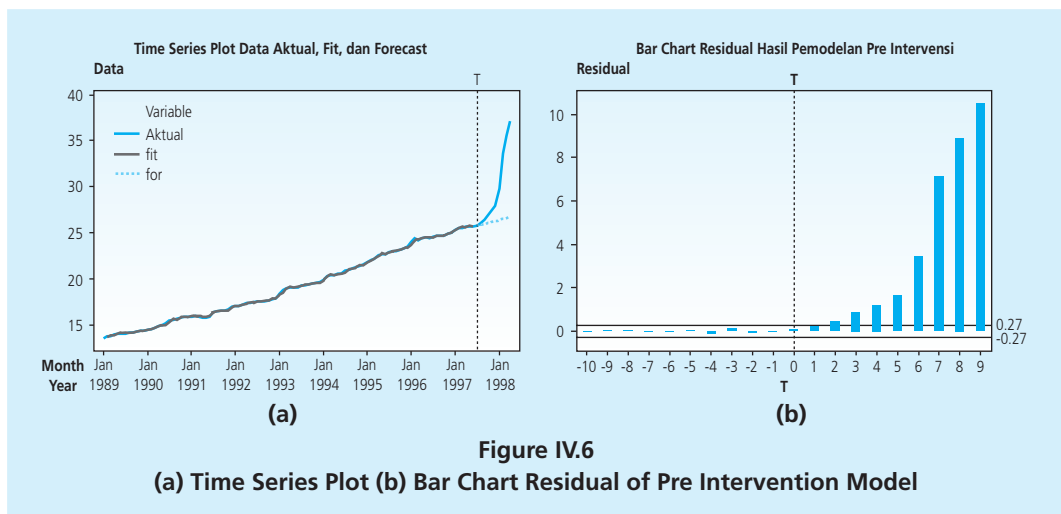
Model (IV.19) shows that monetary crisis gives positive escalation. Two months after intervention occurred, the magnitude of intervention is 0.2. This escalation is become 7.7 in the ninth month after intervention. The detail of monetary crisis effects is shown in Table IV.2.

Table IV.2
Effects of Monetary Crisis to Indonesia CPI

Time (t)	Month	Effect's Magnitude
T+2	September 1997	0.2
T+3 - T+5	October-December 1997	0.2+0.3=0.5
T+6	January 1998	0.2+0.3+0.2=0.7
T+7	February 1998	0.2+0.3+0.2+3.7=4.4
T+8	March 1998	0.2+0.3+0.2+3.7+1.8=6.2
T+9	April 1998	0.2+0.3+0.2+3.7+1.8+1.5=7.7

Figure IV.7
(a) Time Series Plot (b) Residual Bar Chart of Intervention Model because of Monetary Crisis
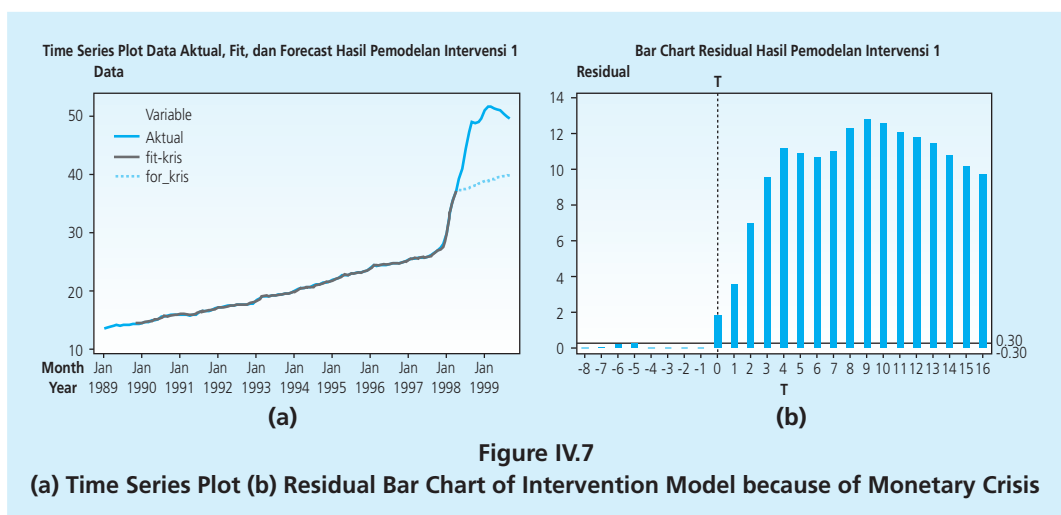
The second intervention is fuel price rising on May 1998 (25-71.43%). It gives additional escalations to Indonesia CPI. Based on the results in Figure 7(b), we got *b*=0, *s*=4, and *r*=0. Intervention model is

$$Y_t = 0.1 + 0.4X_{31_t} + 0.3X_{49_t} - 0.1X_{87_t} + 0.3X_{103_{t-3}} + 0.3X_{103_{t-3}} + 1.2X_{103_{t-6}} + 3.4X_{103_{t-7}} +$$

$$1.8X_{103_{t-8}} + 1.7X_{103_{t-9}} + 1.9X_{113_t} + 1.9X_{113_{t-1}} + 3.8X_{113_{t-2}} + 2.9X_{113_{t-3}} + 1.9X_{113_{t-4}} +$$

$$Y_{t-1} + a_t + 0.8a_{t-1} + 0.95a_{t-12} + 0.7a_{t-13},$$

and the impacts are presented in Table IV.3. These results show that the government policy had direct impact to CPI. In the first month (the same month as this event occurred), CPI rose for almost 2 points and would be 3.8 points in the following month. Furthermore, CPI on September 1998 was 12.4 points higher than a month before this regulation had been applied. It shows that the fuel price rising which happened in the crisis era has quite big effect to CPI.

Table IV.3 Effects of Fuel Price Rising on May 1998 to Indonesia CPI		
Time (t)	**Month**	**Effect's Magnitude**
T	May 1998	1.9
T+1	June 1998	1.9+1.9 =3.8
T+2	July 1998	1.9+1.9+3.8 =7.6
T+3	August 1998	1.9+1.9+3.8+2.9 =10.5
T+4	September 1998	1.9+1.9+3.8+2.9+1.9 =12.4

Modeling of multi input intervention is continued by detecting the order for the next intervention, independence of Timor-Timur. Theoretically, Timor-Timur was not being part of Indonesia in 2002, but BPS has not included Dili (former capital city of Timor–Timur) in CPI's calculating since October 1999. Therefore, we assume that independence of Timor-Timur happened on October 1999. As the previous intervention, order detection is done by evaluating on to residual bar chart of the previous intervention model.

Figure IV.8
(a) Time Series Plot (b) Residual Bar Chart of Intervention Model because of Fuel Price Rising on May 1998

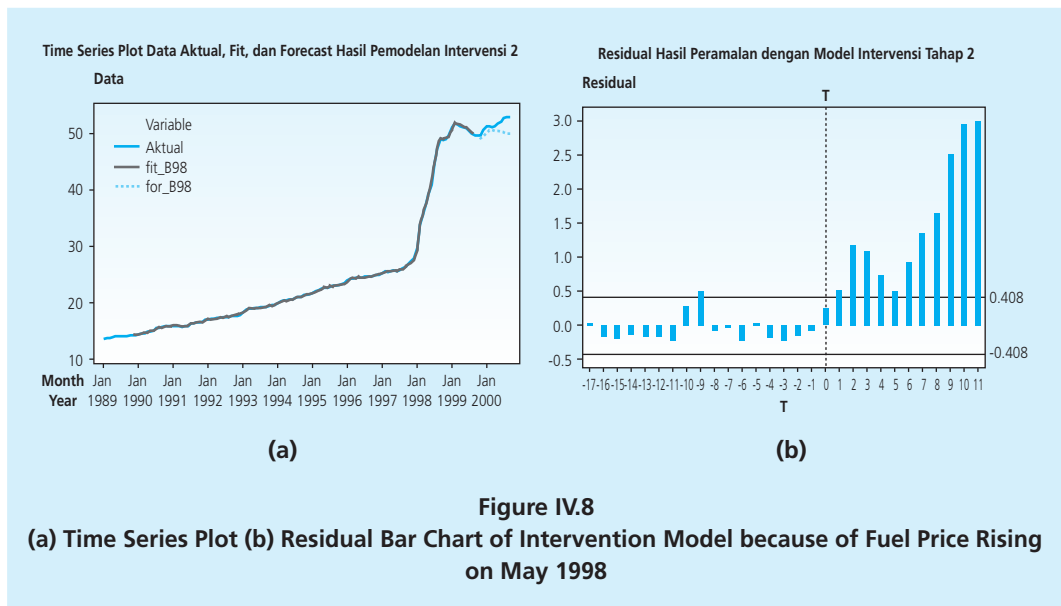Thus, we got the new multi input intervention model as follows

$$Y_t = 0.1 + 0.4X_{31_t} + 0.3X_{49_t} - 0.1X_{87_t} + 0.3X_{103_{t-2}} + 0.3X_{103_{t-3}} + 1.2X_{103_{t-6}} + 3.3X_{103_{t-7}} +$$
$$1.8X_{103_{t-8}} + 1.8X_{103_{t-9}} + 2.1X_{113_t} + 2X_{113_{t-1}} + 3.8X_{113_{t-2}} + 2.9X_{113_{t-3}} + 1.9X_{113_{t-4}} +$$
$$0.6X_{130_{t-2}} + 0.7X_{130_{t-9}} + 0.4X_{130_{t-9}} + 0.4X_{130_{t-10}} + Y_{t-1} + a_t + 0.8a_{t-1} + 0.9a_{t-12} + 0.8a_{t-13}$$

Based on that model, the impact is written as in Table IV.4. The independence of Timor-Timur started to affect CPI dataset in two months after it occurred. The escalation remained stable during December 1999 - June 2000, but there was a slight increase in Indonesia CPI on July and August 2000.

Table IV.4 Effects of Independence of Timor-Timur to Indonesia CPI		
Time (t)	**Month**	**Effect's Magnitude**
T+2 - T+8	December 1999-June 2000	0.6
T+9	July 2000	0.6+0.7 = 1.3
T+10	August 2000	0.6+0.7+0.4 = 1.7
T+11	September 2000	0.6+0.7+0.4 = 1.7

Figure IV.9
(a) Time Series Plot (b) Residual Bar Chart of Intervention Model because of Fuel Price Rising on October 2000
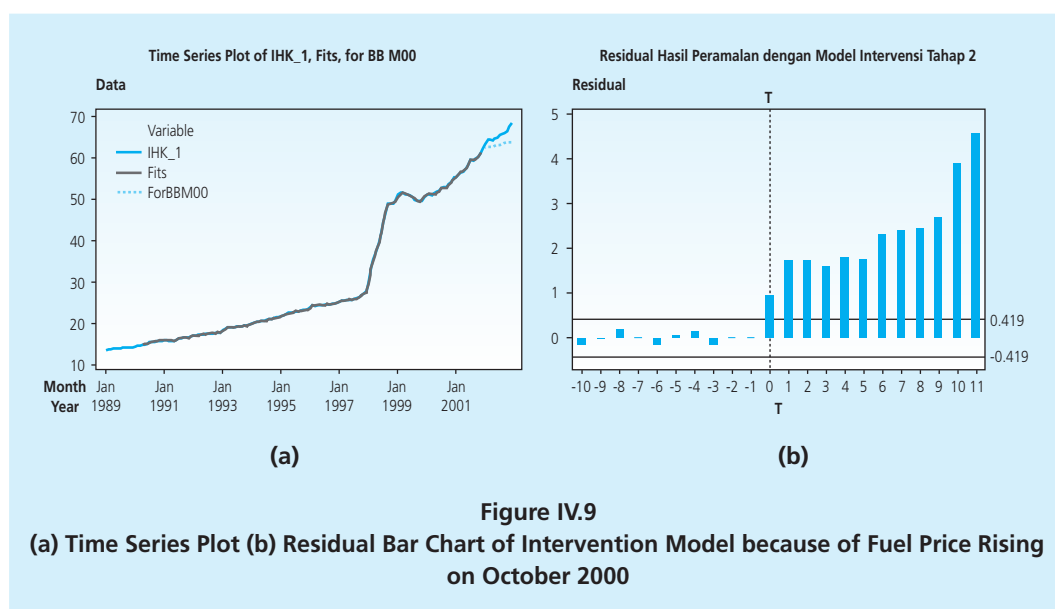
Based on the result at Table IV.1, the next intervention is fuel price rising on October 2000. By using the same step as the previous intervention, we got the new intervention model. Then, we applied that model to identify the order of the next intervention event, base year changing on 2002. In each base year changing, BPS always magnifies the number of commodities and cities. To know the effect of this addition, we consider that it is an intervention event. Figure IV.9 shows that an intervention event effects CPI dataset. Estimation and signification test for parameter yields intervention model as follows
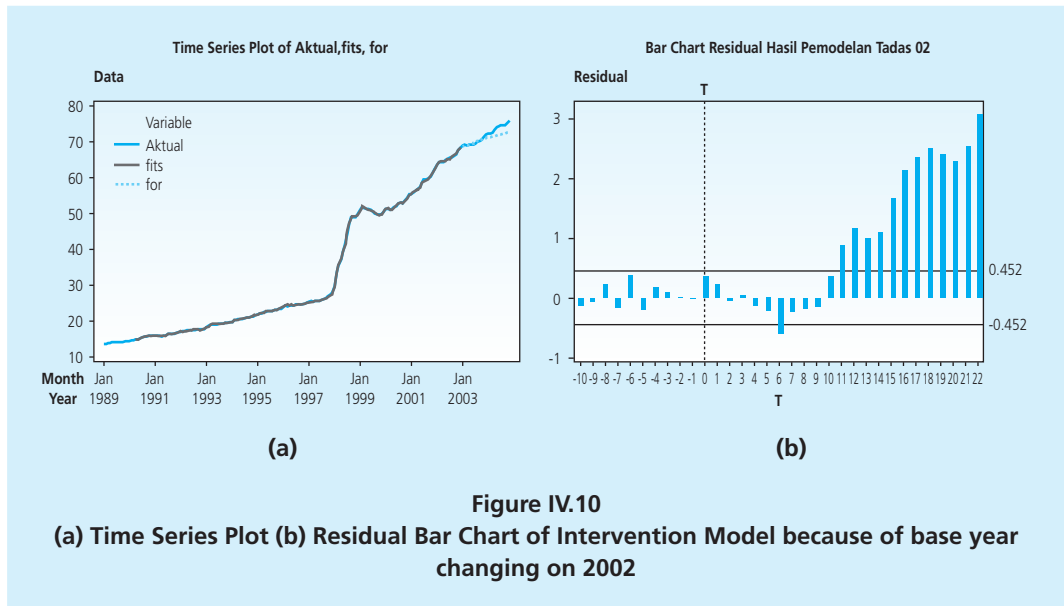
$$Y_t = 0.1 + 0.3X_{31_t} + 0.3X_{49_t} + 0.3X_{103_{t-2}} + 0.3X_{103_{t-3}} + 1.2X_{103_{t-6}} + 3.3X_{103_{t-7}} + 1.7X_{103_{t-8}} +$$

$$1.8X_{103_{t-9}} + 2.1X_{113_t} + 1.9X_{113_{t-1}} + 3.8X_{113_{t-2}} + 2.8X_{113_{t-3}} + 1.8X_{113_{t-4}} + 0.6X_{130_{t-2}} +$$

$$0.9X_{130_{t-9}} + 0.7X_{130_{t-10}} + 0.7X_{142_{t-2}} + 0.5X_{142_{t-4}} + 0.7X_{142_{t-5}} + 0.5X_{142_{t-8}} + 1.03X_{142_{t-9}} +$$

$$0.7X_{142_{t-13}} + 0.7X_{142_{t-14}} + 0.9X_{157_t} + 0.6X_{157_{t-1}} + 1.1X_{157_{t-10}} + 0.7X_{157_{t-11}} + Y_{t-1} + a_t +$$

$$0.7a_{t-1} + 0.9a_{t-12} + 0.7a_{t-13}$$

Government raised the price of fuel on January 2003. The percentage of this rising is 3 until 28 percent. Surprisingly, this government's policy was not affected to CPI. It can be seen in Figure IV.10, where there is no residual which out of the confidence interval. However, residuals on t=175 and t≥180 are out of the limit. It indicates that there are other intervention effects in CPI dataset. Having included those observations and re-estimates parameters coefficients, the model is re-written as

$$Y_t = 0.2 + 0.3X_{31_t} + 0.3X_{49_t} + 0.3X_{103_{t-2}} + 0.3X_{103_{t-3}} + 1.2X_{103_{t-6}} + 3.3X_{103_{t-7}} + 1.7X_{103_{t-8}} +$$

$$1.8X_{103_{t-9}} + 2.1X_{113_t} + 2X_{113_{t-1}} + 3.8X_{113_{t-2}} + 2.8X_{113_{t-3}} + 1.8X_{113_{t-4}} + 0.6X_{130_{t-2}} +$$

$$0.9X_{130_{t-9}} + 0.7X_{130_{t-10}} + 0.7X_{142_{t-2}} + 0.4X_{142_{t-4}} + 0.5X_{142_{t-5}} + 0.5X_{142_{t-8}} + 1.03X_{142_{t-9}} +$$

$$0.6X_{142_{t-13}} + 0.4X_{142_{t-14}} + 0.8X_{157_t} + 0.5X_{157_{t-1}} + 0.7X_{157_{t-10}} - 0.4X_{175_t} + Y_{t-1} + a_t +$$

$$0.7a_{t-1} + 0.9a_{t-12} + 0.7a_{t-13} \tag{IV.20}$$

Figure IV.10
(a) Time Series Plot (b) Residual Bar Chart of Intervention Model because of base year changing on 2002

Model (IV.20) is used to obtain the order of Tsunami disaster, which is the next intervention event. The new model for intervention after included this intervention event is

$$Y_t = 0.2 + 0.3X_{31_t} + 0.3X_{49_t} + 0.2X_{103_{t-2}} + 0.3X_{103_{t-3}} + 1.2X_{103_{t-6}} + 3.3X_{103_{t-7}} + 1.6X_{103_{t-8}} +$$

$$1.8X_{103_{t-9}} + 2.2X_{113_t} + 2X_{113_{t-1}} + 3.8X_{113_{t-2}} + 2.8X_{113_{t-3}} + 1.8X_{113_{t-4}} + 0.6X_{130_{t-2}} +$$

$$0.9X_{130_{t-9}} + 0.8X_{130_{t-10}} + 0.5X_{142_{t-2}} + 0.4X_{142_{t-4}} + 0.5X_{142_{t-5}} + 0.5X_{142_{t-8}} + 0.9X_{142_{t-9}} +$$

$$0.5X_{142_{t-13}} + 0.6X_{157_t} + 0.5X_{157_{t-1}} + 0.7X_{157_{t-10}} - 0.4X_{175_t} + 0.5X_{192_{t-1}} + Y_{t-1} + a_t +$$

$$0.7a_{t-1} + 0.9a_{t-12} + 0.7a_{t-13}$$

That model gives information that Tsunami disaster affected to CPI only in the first month after that event happened. The increasing of CPI is 0.5 on January 2005.

By using the same steps, modeling of intervention with all of intervention events on Table (IV.1) produces multi input intervention model as follows

$$Y_t = 0.1 + 0.3X_{31_t} + 0.3X_{49_t} + 1.2X_{103_{t-6}} + 3.4X_{103_{t-7}} + 1.8X_{103_{t-8}} + 1.7X_{103_{t-9}} +$$

$$1.9X_{113_t} + 1.8X_{113_{t-1}} + 3.5X_{113_{t-2}} + 2.8X_{113_{t-3}} + 1.9X_{113_{t-4}} + 0.4X_{121_t} +$$

$$0.4X_{130_{t-2}} + 0.6X_{130_{t-9}} + 0.5X_{130_{t-10}} + 0.6X_{142_{t-2}} + 0.4X_{142_{t-8}} + 1.1X_{142_{t-9}} +$$

$$0.5X_{142_{t-13}} + 0.7X_{157_t} + 0.8X_{157_{t-1}} + 0.7X_{157_{t-10}} - 0.3X_{160_t} - 0.3X_{175_t} + \qquad \text{(IV.21)}$$

$$0.4X_{192_{t-1}} + 1.2X_{195_t} + 6.3X_{202_t} + 0.7X_{202_{t-1}} + 0.6X_{202_{t-14}} + 0.4X_{204_t} +$$

$$0.7X_{224_{t-4}} + 1.1X_{224_{t-5}} + 0.6X_{224_{t-7}} + 0.5X_{224_{t-8}} + 1.3X_{233_t} + 2.4X_{233_{t-1}} +$$

$$0.9X_{233_{t-2}} + 0.5X_{273_t} + Y_{t-1} + \frac{(1 + 0.7B + 0.1B^7)}{1 - 0.6B^{12}}$$

Multi input intervention Model (IV.21) has high value of kurtosis. It can be caused by a lot of residual which have zero value. RMSE of this multi input intervention model is 0.184.

Besides those events which were written on Table IV.1, Equation (IV.21) shows that led on January 1999 (X_{121}), events on December 2005 and September 2008 (X_{237}) give positive impact in Indonesia CPI. Whereas, events on April 2002 (X_{160}) and July 2003 (X_{175}) yield negative effect to Indonesia CPI. Table IV.2 gives details information about each event's effect. Fuel price risings tend to give direct and positive effect to CPI. During research period, there is only one of fuel price raisings that not affecting CPI which happened on January 2003. Conversely, the highest percentage of fuel price rising happened on October 2005 (125 percent), as a result, CPI rose more than 6 points in that month.

Fuel price risings do not have big impact during Orde Baru era. However, it gives quite big impact in Reformation era. For instance, there was a slight increase in CPI because of fuel price rising on January 1993 (27 percent), but this regulation yields high rising on CPI when the percentage of escalation was only 30 percent (March 2005). It shows that CPI is more sensitive by fuel price rising in Reformation Era than Orde Baru era.

Table IV.5 Interventions' effect to Indonesia CPI					
Interventions	**Time**	**Percentage of the Rising**	**First Effect was Felt**	**Effect's Type**	**First Period's Effect**
Fuel Price Rising	Jul-91	22%	Directly	Positive & Permanent	0.3
	Jan-93	27%	Directly	Positive & Permanent	0.3
	May-98	71 %	Directly	Positive & Permanent	1.9
	Oct-00	12%	Delay 2 months	Positive & Permanent	0.6
	Jan-03	21%	-	-	-
	Mar-05	30%	Directly	Positive & Permanent	1.2
	Oct-05	125%	Directly	Positive & Permanent	6.3
	May-08	30%	Directly	Positive & Permanent	1.3
Base Year Changing	Jan-96	-	-	-	-
	Jan-02	-	Directly	Positive & Permanent	0.7
	Jan-07	-	-	-	-
Monetary Crisis	Jul-97	-	Delay 6 months	Positive & Permanent	1.2
Independence of Timor-Timur	Oct-99	-	Delay 2 months	Positive & Permanent	0.6
Tsunami Disaster	Des-04	-	Delay 1 month	Positive & Temporary	0.4
Ied	Jan-99	-	Directly	Positive & Temporary	0.4
Unknown Events	Apr-02	-	Directly	Negative & Temporary	- 0.3
	Jul-03	-	Directly	Negative & Permanent	- 0.3
	Des-05	-	Directly	Positive & Temporary	0.4
	Sept-08	-	Directly	Positive & Permanent	0.5

Monetary crisis in 1997/1998 gave positive and permanent effect to CPI. Though the effect was felt six months after it started, the CPI increased gradually in that month, 1.2. Other event, independence of Timor-Timur is also give positive and permanent impact.

V. CONCLUSION

In general, we conclude that multi input intervention model which was obtained able to describe precisely the effects of events which affected to Indonesia CPI during January 1989 – November 2008. Based on that model, there are some events that significantly impact to CPI, i.e. fuel price risings, monetary crisis, base year changing on January 2002, independence of Timor-Timur, Tsunami disaster, Ied on January 2002, and unknown events on December 2005 and also September 2008. Those events yield positive impact to CPI. On the contrary, unknown events on April 2002 and July 2003 produce negative effect to CPI. This model has 0.184 of RMSE (standard error) and high kurtosis value that indicate the residual has leptokurtic pattern.

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DETERMINANT OF SUKUK RATINGS

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A b s t r a c t

With the development of sukuk market as the Islamic alternatives of the existing bond market, the issue of how to assign a rating to the sukuk issuance rises. This study tries to provide an empirical foundation for the investors to estimate the ratings assign. Using approach from several rating agencies, past researches on bond ratings, financial distress prediction and bankruptcy prediction models, this study is trying to innovate a new model on determining the sukuk ratings. It used Multinomial Logit regression to create a model of rating probability from several theoretical variables, ie. firm size, leverage, profitability, fixed payment coverage, reputation and existence of guarantor. The result shows 80% of all valid cases are correctly classified into their original rating classes.

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I. INTRODUCTION

A credit rating is an assessment of the credit worthiness of a corporation or security, most often based on the history of borrowing and repayment for the issuer, its underlying assets, its outstanding liabilities and its overall business performance. These credit ratings fulfil a key function of information transmission in capital market. Issuers seek ratings for a number of reasons, including to improve the trust of their business counterparties or because they wish to sell securities to investors with preferences over ratings. Many investors rely on ratings in their investment decisions. For these reasons, ratings are considered important by issuers and investors alike. Money market also plays a vital role for Islamic Economics, not in the least for controlling and regulating money supply in the economy. The main jurist problem with conventional money instruments relates to their pre-dominant debt-based structure. Nonetheless, the recent upsurge in short term Islamic bonds (*sukuk* or certificates), seems to have filled a significant gap in the growing Islamic financial markets. In order to reduce information asymmetries that exist between companies and investors in Islamic capital market, it is also compulsory to study on the credit rating behaviour in Islamic financial instruments specially sukuk. However, until this recent time, there is has not been many studies with regard to this issue. Thus, it is considered that any research effort directed to analyze and investigate the ratings given by the agencies would become great benefit to all users of sukuk-rating information and to the Islamic capital market.

Malaysian corporate sukuk market has continued to expand and mature, affirming the role that Islamic finance plays in mobilising the capital needed by corporate. According to the statistics released by Bank Negara Malaysia ("BNM"), total outstanding sukuk issues as at end-June 2006 stood at RM130.95 billion, some 72% of which stemmed from the corporate sector. Therefore, the main motivation for this research is an attempt to contribute to filling this gap in Malaysia sukuk which is significant in World's capital markets, as well as in literature studies and the academic libraries.

II. LITERATURE REVIEW

There is no previous study on sukuk rating known. However, considering the similar nature of sukuk to conventional corporate bonds, and the fact that most part of assessment towards conventional bonds are also applicable to assess a sukuk issuance, we utilize combination of bond-rating approaches from several rating agencies, as well as bankruptcy and financial distress study approach as literature. The literature review is divided into two main parts. The first part provides a review of rating agency approach on sukuk rating and

selected related past research works on prediction on bond rating, company financial bankruptcy and company financial distress. Second part provides the hypotheses with the theoretical framework and some previous findings that justifies the selection of each variables used in this study.

II.1. Rating Agencies approach

Sukuk, like conventional bonds, are financial instruments that are easily marketable and transferable in the secondary market. Sukuk can also receive credit ratings and allow for credit enhancement through the posting of additional collateral. On the surface, therefore, Sukuk may not appear very different from other credit enhanced trust certificates that are backed by an equipment encumbrance. It is important to note, however, that an asset-based sukuk have different features with an asset-backed Sukuk or asset-backed secured claims.

An asset-based Sukuk represent an ownership interest in a specific asset so as to identify the claimable proportional profit, not the asset itself, generated from that particular asset. While effectively structured asset-backed securities represent a secured claim on some specific underlying equipment, such as airplanes, that can be seized and liquidated in order to service a debt claim. It is for this reason that Fitch would tend to view asset-based Sukuk issues as senior-unsecured obligations deserving of the same issuer default rating (IDR) as the originator of the issue in question. As mentioned earlier, however, Sukuk can be credit enhanced and rated, just like secured debt, if additional asset encumbrances are wrapped into the Sukuk issues. S&P's rating are opinion on the issuer's ability and willingness to meet financial obligations in a timely manner, without commenting on Sharia compliance. The rating on Islamic debt instruments varies, depending on the degree of performance risk of the asset backing transaction and on the type of collateral and transaction structure. At MARC, Sukuk ratings are not fundamentally different from conventional ratings. The Sukuk issuances that MARC has rated to date have all been rated by applying conventional credit rating methodology. For RAM, the assessment of Shariah forms an added assessment factor to its analytical framework of Sukuk. There are two approach being used; first is Asset-backed structure methodology, which is used if the sukuk transaction encompass essential securitization elements which establish that credit risk profile is determined solely by the underlying asset, and that sukuk investors have ownership and reliable security over the assets, while second is if sukuk investor do not possess realizable security over the asset, then the credit risk assessment will be directed towards the entity with the issuer. In this instance, RAM would apply the corporate rating methodology.

II.2. Previous Studies

A pioneering study on bond rating is done by James Horrigan (1966) who attempted the first rating-prediction study in the United States, he used five financial variables; (total asset, working capital/sales, sales/net worth, operating profit/sales, net worth/debt) and was able to predict correctly 58% and 54% of Moody's new and changed ratings and also 52% and 57% of S&P new and changed bond ratings during 1959-1964 period. Then Belkaoui (1980) was putting forward a broad economic rationale for variable selection into a bond rating model using MDA. Belkaoui (1980) identified three main variable characteristics that should be included; they are related to the issuing firm, the issued debt instrument and the variable which represent the market view of firm. He came out with eight variables; (total asset, total debt, long-term leverage, short term leverage, interest coverage, current ratio, total leverage, and bond indenture). The model correctly predicted 62.5% to 65% of 275 S&P new and holdout bond ratings in 1978.

This research is followed by Touray (2004), which is used as main reference for this study. He used eight variables form Belkaoui (1980) to compare modelling using MDA and Multinomial Logit. The result was Multinomial Logit performed better than MDA with 75% correct prediction of the new ratings from Rating Agency Malaysia, using 56 bond rating issued in Malaysia during the period of 1992-2003. Unfortunately, this model cannot be used to predict the holdout sample during crisis period in Malaysia.

Studies on preliminary symptoms of business failures are one of way to assess credit risks. The degree of financial distress of a company is determined by the ability to service its debts. The ability is to be routinely assessed by financing banks which may rate the commercial debts on the basis of their credit rating models, in line with the recent Basel accords. This shows that the nature of financial bankruptcy prediction and financial distress prediction is similar with sukuk ratings whereby financial distress prediction model is in fact also a credit scoring technique. Based on this reasoning, this research also utilizes previous literatures in financial distress and financial bankruptcy as reference in determining sukuk ratings variables.

The research by Zulkarnain et al. (2006) tried to develop bankruptcy prediction model of considerable efficiency for firm listed and traded in small developing economy. He came out with 22 financial ratios consist of liquidity, profitability, leverage, solvency and activity ratio, and found out that total liability, current assets turnover, and cash ratio are the three most relevant variables to predict bankruptcy prediction model. The research is further developed by Chancharat et al. (2007) which tried to investigate the effect of financial ratios, market base variables and company specific variables on corporate financial distress. He used company age, company size, squared size, profitability, liquidity and leverage variables. The result shows that financially distress companies have lower profitability, higher leverage, lower past excess return and larger

size compared to active companies. Similarly, using combination of financial ratios, Lu et.al (2008) tried to come up with financial distress model in Taiwan, Other researches include Hadju and Virag (1996) in Hungaria, Latinen (2007) in Finnish, Merek Gruszczynski (2004) in Poland, Ugurlu and Aksoy (2006) in Turkey, Zulkarnain et al. (2004) in Malaysia, Santiago and Rosillo (2001) in Colombia, and Li and Liu (2009) in China. They found that financial indicators analysis using financial ratios has always been a very useful instrument in evaluating companies' problem in their operation and finances.

Some of the results also suggest that logistic model still produced promising result in bankruptcy prediction. Hadju and Virag (1996), Latinen (2007), Gruszczynski (2004) M. Adnan Aziz and Humayon Dar (2006), Ugurlu and Aksoy (2006), Lu et.al (2008) and Li and Liu (2009) still use binary or trinomial logistic model as their method. These facts support our utilization of multinomial logistic model as the method of this research.

II.3. Hypotheses and Theoretical Framework

Hypothesis One about Total Asset (H1)

Horrigan (1966), Kaplan and Urwitz (1979), Belkaoui (1980), Kamstra (2001), Cho et.al (2002), found total asset to be important element in determining rating. LeClere (2002), Hu and Hansel (2005), Chancharat et.al (2007), and Li (2009) also use this variable in their research for predicting the company financial distress and financial bankruptcy. Horrigan (1966) explained how relative size (expressed in total asset) should make a difference in the eyes of rater or analyst. His logic was that bigger firms are better prepared to absorb the impact of adverse effects of economic and other natural crises than smaller firms. Another view is that larger pools of asset mean more resources are available to the firm for use in potential projects. Touray (2004) mentioned the bigger the asset size of firm relative to other components, the greater is the firm ability to provide secure payment to its lender in the event of crises. This led us to conclude that the bigger the asset size of corporation is, the more likely it will get higher rating. With that the research proposes the following hypothesis:

H1: Other things being equal, the larger the size of total asset of a firm, the greater the likelihood that the sukuk is given a higher rating and vice versa.

Hypothesis Two about Long Term Leverage (H2)

Belkaoui (1980), Kim et.al (2001), Chaveesuk et.al (1999) use long-term leverage ratio as one of variable to determine sukuk rating. Chancharat et.al (2007), Ugurlu (2006), LeClere (2002), Muhammad Sori (2006) also incorporate the same variable in their research for predicting

the company financial distress and financial bankruptcy. There should be a positive relationship between higher leverage and incentive to default on debt. According to them, the transfer of risk to creditors by taking more debt will undoubtedly result in paying a higher premium and consequently lead to lower rating too. Touray (2004) have used the ratio of long-term debt to total invested capital as a proxy measure of leverage and they predict that it is negatively related to rating, since it is the most frequently used ratios in rating studies to represent the degree of leverage. With that the research proposes the following hypothesis:

H2: Other things being equal, the lower the ratio of long term debt to total invested capital, the greater the likelihood that the sukuk gets higher rating than lower rating, vice versa.

Hypothesis Three about Coverage Ratio (H3)

Horrigan (1966), Belkaoui (1980), Kamstra (2001), Touray (2004) argue the interest coverage ratio is a strong indicator of a firm's financial strength. Gibson (1998), observes that firms in the regulated utility enjoy a lower cost of fund and also have more fund raising ability compared to firms in other sectors. This is due to their stable earning and higher coverage ratio record over time. The interest coverage ratio, which is also known at times as the "times interest earned" ratio, is a direct measure of long-term debt paying ability computed from the income statement. It shows how much the interest payments are covered from the direct cash flows of the business operations. The higher the interest coverage ratio of firm, the higher the firm rating is. However, according to Touray (2004), there was conflicting findings about the significance of this variable in explaining bond ratings. This study will also include this variable with the following assumption:

H3: Other things being equal, the higher interest coverage ratio of a firm, the greater the likelihood that the sukuk will be given a higher rating, vice versa.

Hypothesis Four about Return on Asset (ROA) (H4)

Chavesuuk (1999), Kim (2001), Kamstra (2001), Cho et.al (2002), use profitability variable as one of important variable in rating determination. Hadju and Virag (1996), Wen-Ying, et.al (2006) and Li and Liu (2009) utilize ROA as one of important profitability variable in modelling financial distress and financial bankruptcy. Liang et.al (2006) also mentioned profitability variable is used to measure how well a corporation is creating profit. The higher the profitability ration will impact to higher rating. In this study we use Return on Asset (ROA) as a proxy measure of profitability which is also used by Kamstra (2001). The following hypothesis is made regarding the effect of this variable:

H4: Other things being equal, the higher profitability ratio of a firm, the greater the likelihood that the sukuk will be given a higher rating, vice versa.

Hypothesis Five about Beta Company (H5)

According to Kamstra (2001), the actual rating process involves more than just a handful of quantifiable statistical variables. The rating agencies take into account other unquantifiable variables such as leadership quality, management ability, and technology changes. Becker and Milbourn (2008) try to proof the relationship between companies' reputation and rating. All these previous research lead this study to provide a variable which can represent the existence of other qualitative variables. With regard to previous finding by Becker and Milbourn(2008), we decided to use beta company as the proxy of companies' reputation. Ghafar and Saharudin (2003) investigate the relation between betas and return of Islamic Fund, which are invested in sukuk and equity instruments. As we know, reputation of company can be seen from its stability of return, in this case stock return. Impson, Karafiath, and Glasscocl (1992) also look at the impact of bond re-grading on the firms beta.

H5: Other things being equal, the lower beta of a firm, the greater the likelihood that the sukuk will be given a higher rating, vice versa.

Hypothesis Six about Guarantee Status Variable (H6)

According to Touray (2004), the guarantee status should be an important determinant of bond quality rating which assuming has the same nature with sukuk quality rating. In this case, it is a legal right which gives first payment priority to one kind of debtor over the others in the event of liquidation, etc. This agreement provides strong protection to senior sukuk holders at the expense of junior sukuk holders. Consequently, junior sukuk are always lower than senior sukuk in term of ratings. A the same time, the guarantee status of a bond is a promise that comes from a third party who provides a guarantee of principal and interest payment in the event of default. The third party in this case is mostly viewed as having strong financial capability to honour his promises. Therefore, this variable is included into analysis and model as dummy variable. It will be presented in our model as suggested by Gujarati (1995) and Touray (2004) as follows: number 1= represents any sukuk that has a guarantee status and number 0 = will stand for sukuk without guarantee status. The following hypothesis is made regarding the effect of this variable:

H6: It is hypothesized that sukuk with guarantee payment status has a greater likelihood of being given a higher rating than a sukuk without such guarantee.

III. DATA AND SAMPLE SELECTION

This study use the Multinomial Logistic Regression Model (M-Logit) which also known as the Polychotomous Logistic Regression Model. This study use one sample (a synthesized current rating sample) to build the model, predict original cases and test the significance of the variables. The sample of current ratings originally contains 30 observations taken from RAM website. Dependent variable which is Four (4) investment rating classes: AAA, AA, A, BBB are used in this study. Table-1 show the distribution of Sukuk Rating Classes used in this study. RAM assigned and reaffirmed 211 sukuk ratings announced during 2007 to early 2009. Some sukuk issued by same issuer but given different ratings comprise from AAA rating to BBB. Few of them have different ratings because of guarantee status or Junior-Senior sukuk scheme. This condition forces us to drop some sukuk which is issued by the same issuer with same guarantee status. Second, each issuer should have complete financial statement data available publicly before rating announced without any missing variable. This criteria also lead us to omit some sukuk which has non-listed SPV/issuer company or sukuk issued by government. After eliminating all from the sample we ended up with 40 sukuk from total 211 sukuk. The independent variable are taken from RAM website and Bloomberg; Total Asset (X1), Long-Term Leverage Ratio (X2), Interest Coverage Ratio (X3), ROA (X4), Beta Company (X5) Guarantee status (X6) However, the company's financial ratio variables also have some outliers which will be explained later that reduced our sample size to 30 samples. The table below shows the distributions sukuk rating classes used in this study.

Table V.1 Distribution of Sukuk Rating		
RATING	**N**	**Marginal Percentage**
AAA	6	36.7%
AA	13	43.3%
A	11	20%
total	**30**	**100%**

IV. METHODOLOGY

If the categorical dependent variable is ordered or unordered in nature and if the problem involves more than two categories, an extended version of the binary logit model (known as Polychotomous or Multinomial regression model) can still be applies to the problem (Touray, 2004). Here, we also utilize stepwise model that provided in SPSS, to find the best fit model according to its significances. The multinomial logit strategy usually involves allowing one

category to assume specific value, say Y=h0, where h0 = 0. This category is then used as the reference category for the rest of the other categories. This method is also known as the base-line category type which explained by Menard (1995), Agresti (1996), and Touray (2004). The M-Logit coefficients in the base line logit model for the four bonds rating categories (AAA, AA, A, BBB) can be written in general form as suggested by Touray (2004) with reference to Menard (1995) and Argesti (1996) as:

$$\log \frac{p(groupj)}{p(groupJ)} = \alpha_{i0} + \beta_{i1} X_1 + \beta_{i2} X_2 + \beta_{i3} X_3 + \beta_{i4} X_4 + \beta_{i5} X_5 + \beta_{i6} X_6 * (Dp)$$

Where: Category J with capitalized J in the denominator refers to the base-line category; the Category with small j in the numerator refers to any other category.

α_{i0} = constant term,

β = respective coefficient on predictor X.

$X_1 - X_6$ = predictor (independent) variables

Dp = dummy/binary variables

This translates into the following equation in our case:

$$\log \frac{p(AAA)}{p(BBB)} = \alpha_{i0} + \beta_{i1} X_1 + \beta_{i2} X_2 + \beta_{i3} X_3 + \beta_{i4} X_4 + \beta_{i5} X_5 + \beta_{i6} X_6 * (Dp)$$

$$\log \frac{p(AA)}{p(BBB)} = \alpha_{i0} + \beta_{i1} X_1 + \beta_{i2} X_2 + \beta_{i3} X_3 + \beta_{i4} X_4 + \beta_{i5} X_5 + \beta_{i6} X_6 * (Dp)$$

$$\log \frac{p(A)}{p(BBB)} = \alpha_{i0} + \beta_{i1} X_1 + \beta_{i2} X_2 + \beta_{i3} X_3 + \beta_{i4} X_4 + \beta_{i5} X_5 + \beta_{i6} X_6 * (Dp)$$

On the collinearity issue, Touray (2004) with reference to Scott Menard (1995) indicated that collinearity diagnostic test for logistic models can be obtained by running multiple regression analysis. The issue is to assess the inter-relationship between indicator variables. To test the general fit of the model we will use the model fit information measured by -2Log Likelihood, while the Likelihood-Ratio tests method will be used for testing the significance of individual independent variables, base on the recommendation of Touray (2004) with reference to Norusis (1999).

Three Pseudo R-Squares measures are used to examine the strength of relationship between the dependent and independent variables. Two related R-Squares measures that are said to be proxy of the OLS R-Square methods (Cox and Snell R^2 and Nagelkerke R^2) will be referred to for testing the strength of association.

Another common output of the multinomial logistic regression is the classification table, which is useful to further assess the power of the M-logistic regression model in terms of the classificatory power of the model in comparison with the actual ratings observed.

V. EMPIRICAL RESULT AND INTERPRETATIONS

V.1. Screening for Normality, Collinearity, Homoscedasticity, Outliers and Extreme Values

- Outliers and Extreme Values

We use the Steam-and-Leaf Plot graph of SPSS to explore the raw data for individual extreme values and influential outliers' cases. Several extreme values and outliers were identified from the raw data. Touray (2004) with reference to Tabachnick and Fidel (1989) noted that deleting individual influential outlier cases or single variables that contain most of the influential cases is one of several ways of reducing outlier influence. As mentioned earlier, this further reduced our sample size to 30 valid observations.

- Normality

Touray (2004) with reference to Tabachnick and Fidel (1989) indicated that group data distributions are better evaluated using graphical methods; this allow as to see the overall shape distributions and help in deciding on the appropriate transformation type. Since our data distributions has shown considerable level of left-side skewness, the decision to transform the variables was taken, and Logarithmic and Square Root transformations were used, based on Touray (2004) with reference to McLeay and Omar (1999). This finding is supported also by Gujarati (1995). After the transformation, we computed the two normality test again and plotted the graphs as appear in **Error! Reference source not found.** and **Error! Reference source not found.** As can be seen the shape of histogram (**Error! Reference source not found.**) for the transformed variables has improved remarkably to appropriate the normal distributions for all the variables.

- Collinearity and Homoscedasticity

Using Pearson Correlation matrix for the raw and transformed data separately show in Table V.2 and Table V.3. No high significant correlation among variables both raw and transformed data. Gujarati (2003) mentioned in his book if the correlation that high correlation between variables is above 0.8.

Table V.2 Pearson Correlation matrix		ASET	BETA	INTCOV	RATGUAR1	ROA	LTLEV
ASET	Pearson Correlation	1	-.070	-.120	-.129	-.137	-.083
	Sig. (2-tailed)		.674	.486	.441	.413	.620
	N	38	38	36	38	38	38
BETA	Pearson Correlation	-.070	1	-.240	-.050	-.403*	.404*
	Sig. (2-tailed)	.674		.159	.761	.012	.012
	N	38	39	36	39	38	38
INTCOV	Pearson Correlation	-.120	-.240	1	.132	.425**	-.485**
	Sig. (2-tailed)	.486	.159		.442	.010	.003
	N	36	36	36	36	36	36
RATGUAR1	Pearson Correlation	-.129	-.050	.132	1	.217	.159
	Sig. (2-tailed)	.441	.761	.442		.191	.339
	N	38	39	36	39	38	38
ROA	Pearson Correlation	-.137	-.403*	.425**	.217	1	-.311
	Sig. (2-tailed)	.413	.012	.010	.191		.057
	N	38	38	36	38	38	38
LTLEV	Pearson Correlation	-.083	.404*	-.485**	.159	-.311	1
	Sig. (2-tailed)	.620	.012	.003	.339	.057	
	N	38	38	36	38	38	38

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

Table V.3 Pearson Correlation matrix		LNASSET	LNROA	SQBETA	LNCOV	SQLEV	LNREC	RATGUAR1
LNASSET	Pearson Correlation	1	-.440*	.200	-.102	-.018	.571**	-.170
	Sig. (2-tailed)		.012	.229	.573	.915	.000	.308
	N	38	32	38	33	38	38	38
LNROA	Pearson Correlation	-.440*	1	-.334	.451*	-.149	-.152	.438*
	Sig. (2-tailed)	.012		.061	.012	.414	.405	.012
	N	32	32	32	30	32	32	32
SQBETA	Pearson Correlation	.200	-.334	1	-.452**	.354*	.158	-.095
	Sig. (2-tailed)	.229	.061		.008	.025	.342	.561
	N	38	32	40	33	40	38	40
LNCOV	Pearson Correlation	-.102	.451*	-.452**	1	-.654**	.061	.116
	Sig. (2-tailed)	.573	.012	.008		.000	.735	.520
	N	33	30	33	33	33	33	33
SQLEV	Pearson Correlation	-.018	-.149	.354*	-.654**	1	-.104	.026
	Sig. (2-tailed)	.915	.414	.025	.000		.534	.873
	N	38	32	40	33	40	38	40
LNREC	Pearson Correlation	.571**	-.152	.158	.061	-.104	1	.068
	Sig. (2-tailed)	.000	.405	.342	.735	.534		.685
	N	38	32	38	33	38	38	38
RATGUAR1	Pearson Correlation	-.170	.438*	-.095	.116	.026	.068	1
	Sig. (2-tailed)	.308	.012	.561	.520	.873	.685	
	N	38	32	40	33	40	38	40

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

V.2. Assessing the Multinomial Logistic Regression Result (significance tests)

V.2.1. Interpretation of Result (Parameter Estimates)

The result in the parameter estimates is extracted here as shown below:

Equation 1 Predicted logit (AA/A), AA contrasted to A

$$= 4.76 + (1.877)*lnasset + (-13.9)*sqbeta + (-4.96)*ratguar*D$$

Equation 2 Predicted logit (AAA/A), AAA contrasted to A

$$= 12.5 + (4.877)*lnasset + (-49.7)*sqbeta + (-29.3)*ratguar*D$$

According to the signs of coefficients of the M-Logit model here, the log of the odds of getting AAA or AA compared to getting A rating is positively related to total asset and negatively related to beta and bond guarantee status. Only three variables are selected as significant variable in determining bond rating. The negative coefficient associated with dummy independent variable (guarantee status) suggest that, holding all other variables constant, sukuk without guarantee are less likely to get an AAA rating as compared to get A rating. The positive coefficient tells the opposite. The above statistical significance findings are not to be taken seriously because Wald statistic is said to be inaccurate sometimes especially when coefficients are larger as seen in Table V.4. Our final conclusion is base on the model as well as individual independent significance test using Likelihood Ratio.

Table V.4
Parameter Estimates

RATING[a]		B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
2.00	Intercept	4.759	4.781	.991	1	.320			
	SQBETA	-13.918	6.738	4.267	1	.039	9.02E-007	1.66E-012	.490
	LNASSET	1.877	1.086	2.988	1	.084	6.537	.778	54.950
	[RATGUAR1=.00]	-4.963	2.695	3.391	1	.066	.007	3.55E-005	1.377
	[RATGUAR1=1.00]	0[b]	-	-	0	-	-	-	-
3.00	Intercept	12.516	12.435	1.013	1	.314			
	SQBETA	-49.683	47.004	1.117	1	.291	2.65E-022	2.59E-062	2.709E+018
	LNASSET	4.877	5.863	.692	1	.406	131.194	.001	12848646.39
	[RATGUAR1=.00]	-29.304	.000	-	1	-	1.88E-013	1.88E-013	1.88E-013
	[RATGUAR1=1.00]	0[b]	-	-	0	-	-	-	-

a. The reference category is: 1.00.
b. This parameter is set to zero because it is redundant.

V.2.2. Testing overall fit

The 2-log-likelihood value shown below is examined to determine the improvement of the final M-Logit model over the intercept term only and thus it is an overall model test. As can be seen from the table below, the difference between the value of Chi-Square in Table V.5 column 3 is 42.269 with 6 degrees of freedom is highly significant (p<0.000). Therefore, since the observed significance level is very small, we can reject the null hypothesis that the effects of all coefficients in the model are zero and hence conclude that our final model is significantly better than the intercept only model.

Table V.5 2 Log Likelihood				
Model	**Model Fitting Criteria**	**Likelihood Ratio Tests**		
	-2 Log Likelihood	**Chi-Square**	**df**	**Sig.**
Intercept Only	61.742			
Final	19.473	42.269	6	.000

V.2.3. Testing the significance of Individual coefficients.

The Likelihood Ratio test shown in table below presents the test result for the effect of individual independent variables in the final model. The -2-Log-Likelihood is highly significant with (p<0,000) for beta, (p<0.001) for rating guarantor and (p<0.006) for total asset. As mentioned earlier, Norusis (1999) indicated that the Likelihood Test method not only provides an overall significant test for the model, but also it provides the most accurate and reliable test for the effect of individual independent variables in the model. As shown in Table V.6.

Table V.6 Likelihood Ratio Test				
Effect	**Model Fitting Criteria**	**Likelihood Ratio Tests**		
	-2 Log Likelihood of Reduced Model	**Chi-Square**	**df**	**Sig.**
Intercept	19.473(a)	.000	0	.
LNASSET	29.629	10.156	2	.006
SQBETA	43.066	23.593	2	.000
RATGUAR1	34.652	15.179	2	.001

The Pseudo-R^2 test shows the measurement from Cox and Snell, Negelkerke and McFadden's Pseudo-R^2. As seen in the table McFadden's R^2 is about 67%, Negelkerke R^2 is about 86.1% and Cox and Snell is about 75.6%. Thus, we can say that our model has explained on average more than half of the variations observed in the dependent variables based on Pseudo-R^2.

V.2.4. M-Logit Model Classification Result

Table V.7 presents the prediction results of the estimated M-Logit coefficients in the previous section. The columns are the predicted values and the rows are the actual values. The result shows 80% (24/30) of all valid cases are correctly classified into their original rating classes. The highest correct classification rate is in AAA rating category in which 83.3% (5/6) of all cases in that group being correctly classified. Next to that is the A rating category with 81.8% (9/11) of all cases in that group being correctly classified. The lowest hit rate is AA rating category, with few different from other categories 76.9% (10/13) of all cases in that group being correctly classified.

Table V.7 Model Classification Result				
Observed	**Predicted**			
	1.00	**2.00**	**3.00**	**Percent Correct**
1.00	9	2	0	81.8%
2.00	3	10	0	76.9%
3.00	0	1	5	83.3%
Overall Percentage	40.0%	43.3%	16.7%	80.0%

VI. CONCLUSION

To sum up the results of the M-Logit model in this section, we can say that from a set of six independent variables (total asset, long-term leverage, interest coverage, roa, beta and guarantee status) only three variables (total asset, beta and guarantee status) were found to have significant explanatory relationship with sukuk ratings. This particular combination of the above listed variables was also found to be superior to all other combinations in terms of classification rate, model significance level as well as the individual variables significance.

The result shows 80% (24/30) of all valid cases are correctly classified into their original rating classes. However, the poor performance of other variables to predict the current ratings is not surprising at all. We have actually observed these phenomena in our data, that is to say, some of the ratings were downgraded or upgraded by the distribution cash flow performance of its sukuk. Some of sukuk has negative outlook because of having problem in distributing the regular payments to sukuk holders. This indicates this variable is important in determining sukuk rating and lead us to approach special model that can captured these element.

This argument also mentioned in one of rating approach from rating agencies as mentioned earlier in literature review. Sukuk ratings specifically assess the likelihood of full and timely payment of obligations to holders of the instrument issued under the various debt-based Islamic financing contract(s), which can be likened to the concept of probability of default in conventional debt ratings. To overcome this condition further research are needed to combine another significant variables in order to get robust result.

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