II. GENERAL OVERVIEW

II.1. FINANCIAL CRISES

Clear identification of financial crisis is a crucial step in order to define and measure contagion (Pericoli & Sbracia, 2003). A generalized definition of financial crisis is turmoil in financial markets which spreads across the financial system, worsening typical problems in the system such as adverse selection and moral hazard and ultimately interfering with the capacity of the market to efficiently allocate capital (Mishkin, 1992). Typically, such market turmoil can be identified by falling asset prices and insolvency among debtors and financial intermediaries (Eichengreen & Portes, 1987).

Specifically, there are three different types of crises – currency crisis, stock market crisis, and banking crisis – and they can be identified by distinct indicators which are summarized as follows (Pericoli & Sbracia, 2003):

- Currency crisis is typically indicated by devaluation of a specific currency against its peg or by an extreme value of an exchange rate pressure indicator such as a weighted average of changes in the exchange rate, short-term interest rates and international reserves.
- A sharp fall in the stock market index and/or an upsurge in the volatility of asset prices are indicators of stock market crisis
- Banking crisis is associated with collapse in the ratio of non-performing assets to total assets, the closure or failure of important banking institutions, the occurrence of major bailouts, and large-scale nationalization of banks or widespread bank runs.

The incidence of crisis can be identified by some quantifiable measures. According to Rose & Spiegel (2009), two variables that can be applied as a proxy of crisis incidence are percentage changes in GDP per capita and in stock market. Therefore natural logarithm of changes in GDP (PPP) per capita for countries during the periods considered are calculated and presented in the following figures:

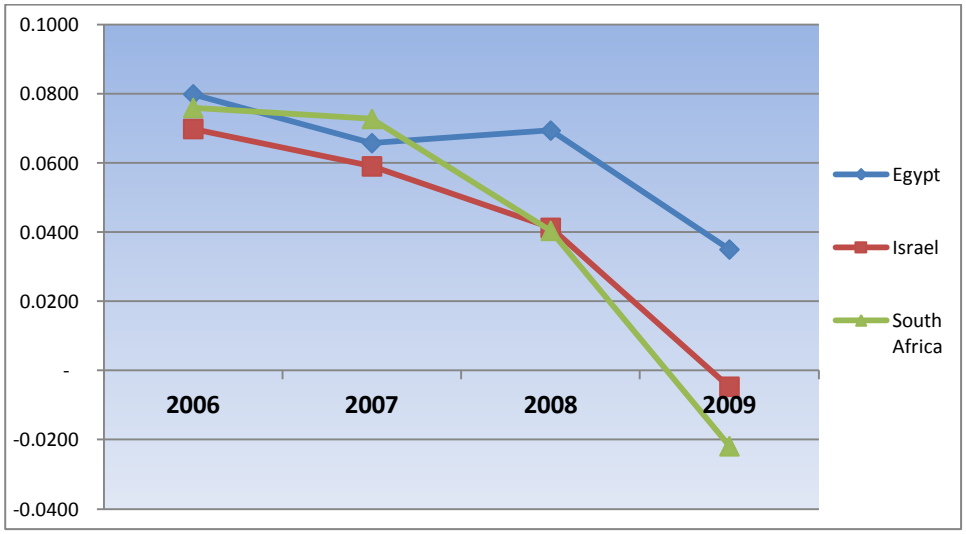

Figure 1. Changes in GDP (PPP) per Capita 2006-2009 – Africa Region (Own Calculation, (IMFb, 2010)

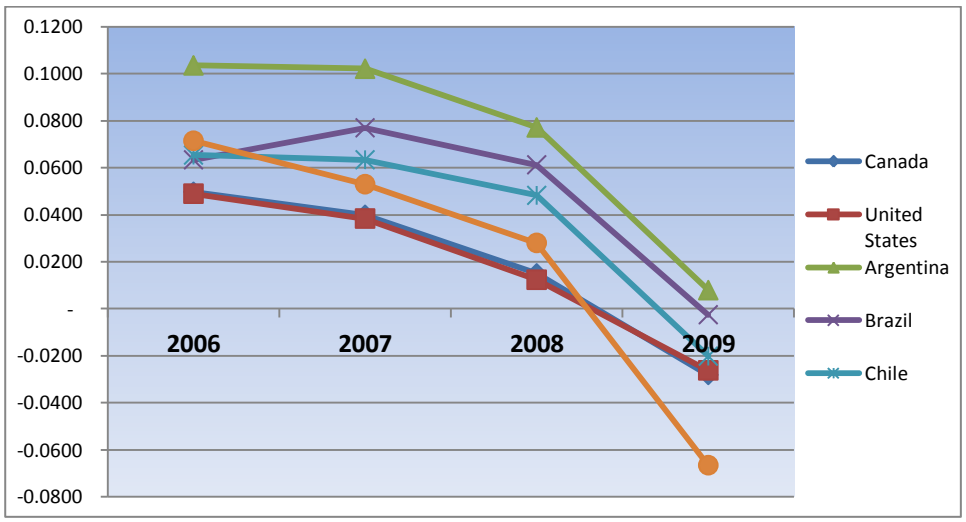

Figure 2. Changes in GDP (PPP) per Capita 2006-2009 – America Region ((Own Calculation, (IMFb, 2010)

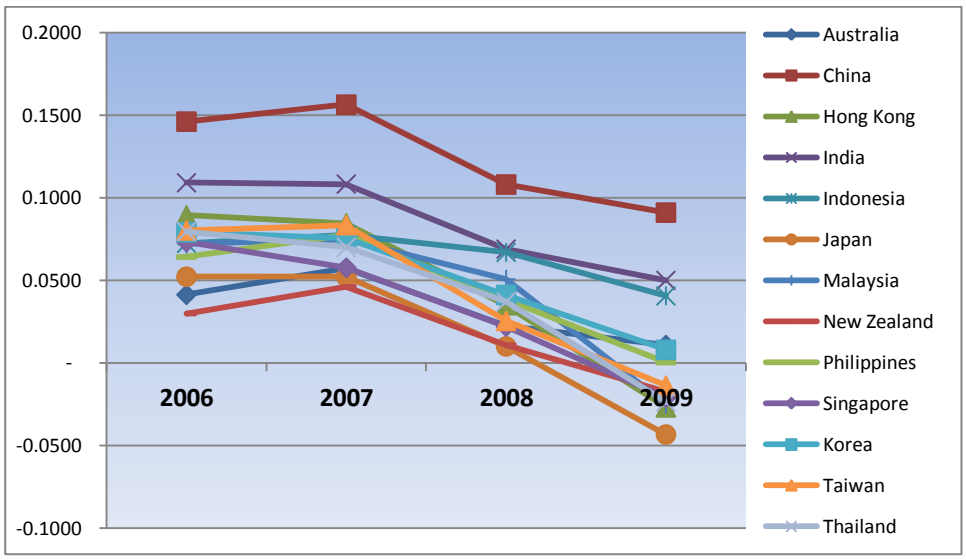

Figure 3. Changes in GDP (PPP) per Capita 2006-2009 – Asia Region ((Own Calculation, (IMFb, 2010)

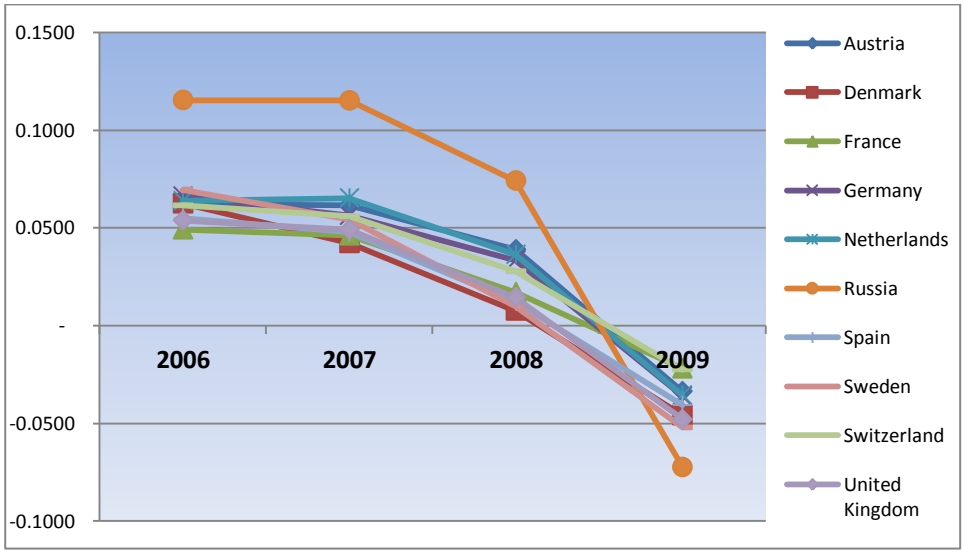

Figure 4. Changes in GDP (PPP) per Capita 2006-2009 – Europe Region (Own Calculation, (IMFb, 2010)

According to Eichengreen & Portes (1987), financial crisis does not stem from one type of crisis alone; rather it results from the linkages among financial markets. Regarding the recent crisis, shock originated in subprime market spread to financial markets through exposures of financial institutions to the derivatives. In order to understand how this relatively small shock magnified into fully fledged global recession requires rigorous cross-

asset analysis which is beyond the scope of this study. However, we can begin to analyse how a shock into USA equity market transmitted worldwide. From the four figures above, it can be seen that the economies included in this study experienced sharp decline in their output almost uniformly in 2008. Therefore, it is deemed reasonable to focus the analysis on this year.

II.2. INTERNATIONAL STOCK MARKETS IN 2008

A closer look at international stock markets in 2008 reveals that the sharp decline appears to occur around early October 2008 for most markets, when or right after the market crashed in the United States. The substantial heightened volatilities and subsequent crash on 06 October 2008 in the United States are deemed to be worse than previous episodes of crashes, e.g. dotcom bubble, Black Monday in 1987 and even the Asian crisis of 1997 (Jackson, 2008). The Dow Jones Industrial Average fell below 10,000 points for the first time since October 2004, (Giles, Mackenzie, & Parker, 2008). Stock market in Indonesia plunged by 10 per cent, its biggest one-day fall (Aglionby, 2008). The FTSE 100 in the UK suffered its biggest its biggest points fall ever and its largest one-day percentage fall since Black Monday, wiping 93 Bn pounds sterling worth of the companies' shares (Giles, Mackenzie, & Parker, 2008). Other markets also saw dramatic falls; trading was halted in several markets, including in Brazil where Bovespa dropped more than 5 per cent and in Russia where shares fell by more than 19 per cent (Giles, Mackenzie, & Parker, 2008)

To illustrate the magnitude of the stock market crisis in 2008, below are the natural logarithm annual returns of the international markets (in local currency) during the periods considered:

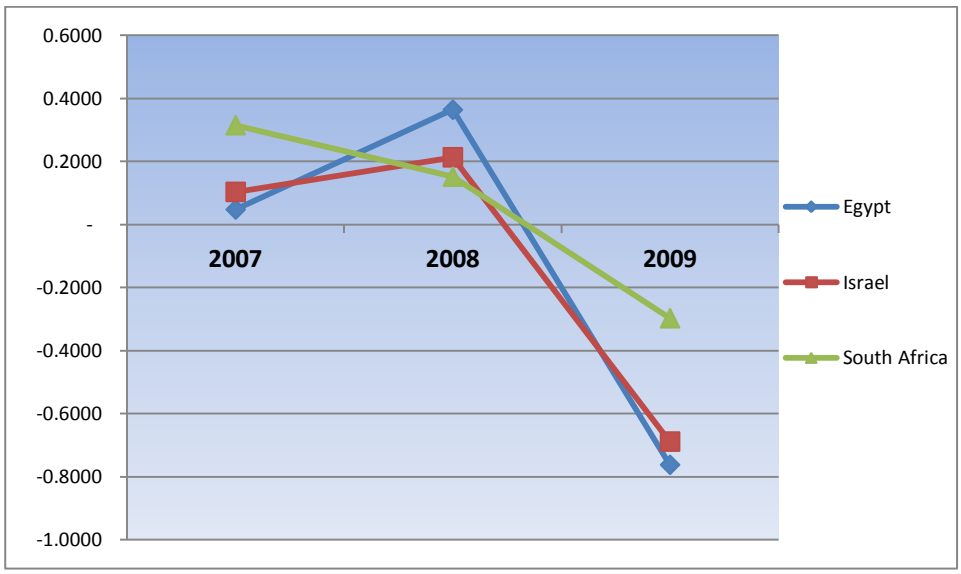

Figure 5. Annual Returns 2007-2009 – Africa Region (Own Calculation, (Thomson One Banker, 2010))

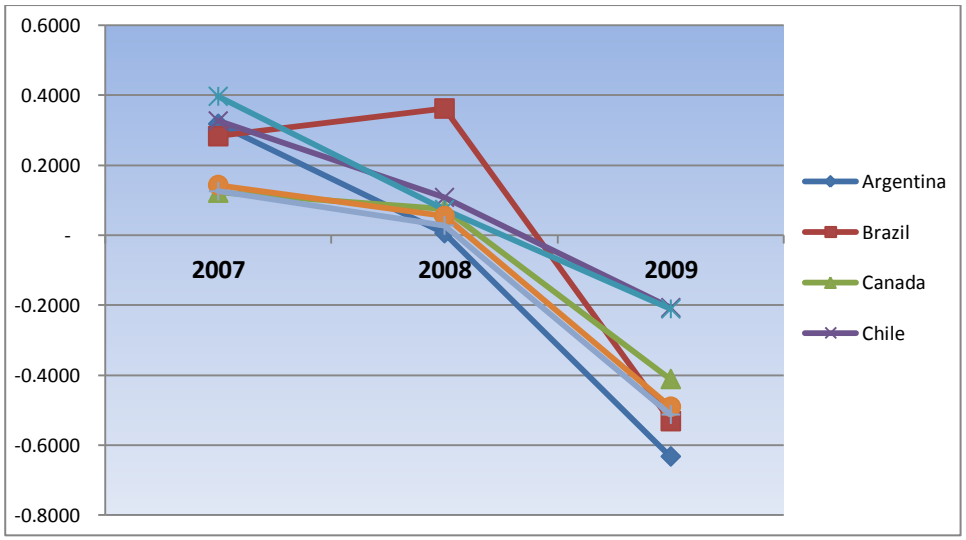

Figure 6. Annual Returns 2007-2009 – America Region (Own Calculation, (Thomson One Banker, 2010))

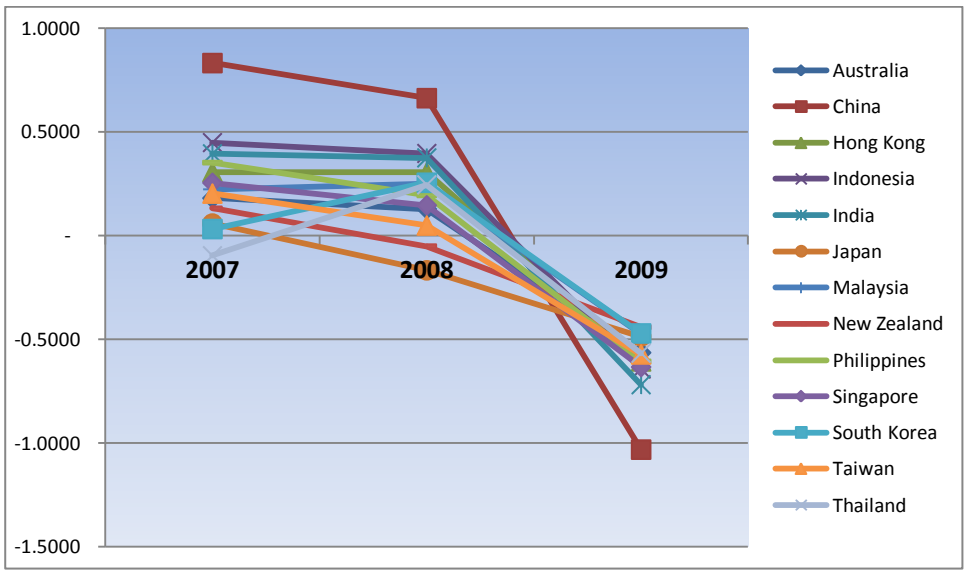

Figure 7. Annual Returns 2007-2009 – Asia Region (Own Calculation, (Thomson One Banker, 2010))

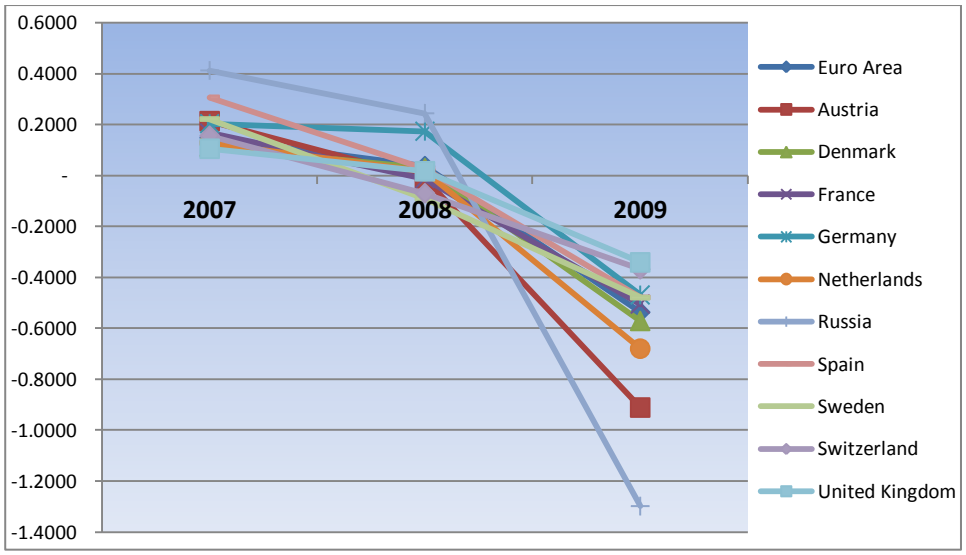

Figure 8. Annual Returns 2007-2009 – Europe Region (Own Calculation, (Thomson One Banker, 2010))

The price declines in 2008 can be observed almost consistently in international stock markets, some are more severe than others. It does not appear to be a surprise that a shock originated in the United States, a large economy which is highly integrated to the rest of the world through trade and financial linkages can be far-reaching (Kaminsky, Reinhart, & Vegh, 2003). Almost intuitively, we assume that the crisis in equity market of

2008 was contagious. The severe loss of confidence by investors following the failure of Lehman Brothers is arguably a significant unexpected effect that has been suggested as one of elements that present in contagious crisis (Kaminsky, Reinhart, & Vegh, 2003; Rigobon & Wei, 2003; Didier, Mauro, & Schmukler, 2006).

II.3. DEFINITION OF CONTAGION

In order to empirically measure contagion, it is necessary to establish the exact definition of contagion to be applied. There are different opinions and perspectives of what constitutes as crisis contagion. A generalized view of contagion is the spillover effect from one or a group of markets, countries or institutions, to another (Pritsker, 2001). International contagion, i.e. spill-over from one country to another is applied in this study. Based on the classification of World Bank, this type of contagion can be divided into (Billio, Duca, & Pelizzon, 2003; Cheung, Tam, & Szeto, 2009): broad, restrictive, and very restrictive definition.

II.3.1. BROAD DEFINITION

Contagion is the general propagation of shock, negative or positive, from one economy to another as a consequence of fundamental linkages between them; this mechanism works both in calm and crisis periods (Billio, Duca, & Pelizzon, 2003). This type of contagion is often cited as fundamental-based contagion or interdependence (Calvo & Reinhart, 1996; Dornbusch, Park, & Claessens, 2000; Forbes & Rigobon, 2001). Fundamental linkages here typically refer to real and financial links that transmit common shocks across markets (Cheung, Tam, & Szeto, 2009).

II.3.2. RESTRICTIVE DEFINITION

A more restrictive definition of contagion refers to the transmission of shock to other economies beyond any fundamental links among the economies and beyond common shocks and are sometimes coined excess comovement (Cheung, Tam, & Szeto, 2009). The problem with this definition is defining what comprise the fundamentals, which often latent factors, as a benchmark to effectively determine whether excess comovements have occurred (Billio, Duca, & Pelizzon, 2003).

II.3.3. VERY RESTRICTIVE DEFINITION

The evidence of contagion in this perspective is limited into a significant increase in the comovement of asset prices, covariance and/or correlation of asset returns, financial flows and volatility between markets after a shock to an individual country (or group of countries) compared to that in tranquil times (Dornbusch, Park, & Claessens, 2000; Billio & Pelizzo, 2003). In various studies, this type of contagion is often referred to as “shift-contagion” (Forbes & Rigobon, 2001). Some also define this type of contagion as the change in the transmission mechanism, instead of the asset prices, in a turmoil period (Billio, Duca, & Pelizzon, 2003). Studies on shift-contagion usually consider shock transmission across countries for a particular asset market, such as the stock market (Cheung, Tam, & Szeto, 2009).

Shift-contagion assumes a structural break in the data-generating process of asset prices (Pericoli & Sbracia, 2003), i.e. the discontinuity in transmission mechanism(s), and can be tested by checking the stability of parameters (Billio, Duca, & Pelizzon, 2003). Frequently, it is also associated with herding behaviour of investors (Kaminsky & Reinhart, 2000). If a crisis in one market produces a significant change in investment strategies of

investors, this change may have influence in the pricing of asset in other markets with different fundamentals from the epicentre (Pericoli & Sbracia, 2003).

II.4. CHANNELS OF TRANSMISSION

Financial markets and financial intermediaries are crucial factors in international shock transmission. The degree of global economic integration is often cited as the determining factor of the channels of transmission between the economies concerned (Cheung, Tam, & Szeto, 2009). Additionally, some studies also define macroeconomic policies and circumstances as another channel of transmission (Eichengreen, Rose, & Wyplosz, 1996; Collins & Gavron, 2004), i.e. country with weak macroeconomic fundamentals is prone to crisis contagion in turmoil period. The transmission of shocks also can be influenced by the decisions of domestic and international policy makers as well as by the reactions of those in other countries (Pericoli & Sbracia, 2003). These linkages may have different signs: some spillover may amplify, while others may dampen or offset the initial shock (Pericoli & Sbracia, 2003).

II.4.1. REAL LINKAGES

Real linkages are the inter-connectedness of economies through their real sectors which generally are divided into two: macroeconomic fundamentals and international trade. Contagion as a result of macroeconomic fundamentals is related to common shocks that lead to comovement in asset prices or capital flows in an international context (Dornbusch, Park, & Claessens, 2000).

In literatures on contagion, real linkages are also referred to patterns of international trade and applied in explaining the regional effect of contagion, i.e. countries affected by crisis are sometimes found to be clustered in geographical proximity (Glick &

Rose, 1999). Trade integration can be quantified by the sum of the exports and imports to and from the crisis epicenter relative to total exports and imports (Collins & Gavron, 2004). This parameter can also be applied to appraise the trade account deterioration of the exporting economy due to crisis in its market(s) (Cheung, Tam, & Szeto, 2009).

Some studies suggest common trade bloc as another real channel of transmission which make a country especially prone to contagion from another member country (Kaminsky & Reinhart, 2000; Collins & Gavron, 2004). Trade integration also exacerbates the shock transmission to a particular economy via currency devaluation in another economy, undermining the competitiveness of the former and making it more prone to contagion (Cheung, Tam, & Szeto, 2009).

II.4.2. FINANCIAL LINKAGES

Sometimes crisis among economies cannot be explained by substantial trade links. Financial linkages among countries are utilized to explain adverse effect in capital flows, e.g. reductions in trade credit and foreign direct investments (Cheung, Tam, & Szeto, 2009). Generally, transmission of shock through financial channels can be explained by the following factors:

II.4.2.1. Common Creditor

It is a spillover effect of a shock originated in an international bank because of the decreased lending by the bank (Cheung, Tam, & Szeto, 2009). This channel is typically associated with financial crises in emerging markets (Kaminsky & Reinhart, 2002).

II.4.2.2. Interconnected Lenders

This link can be illustrated by a simple domino model of financial contagion originated by default of a crucial lender (Adrian & Shin, 2008). Examples of channels identified in bank linkages are: direct or indirect equity exposures to overseas institutions through shareholding or funding, payment and settlement systems and, as observed in the current crisis, holdings of credit risk transfer instruments with underlying assets held by either local or overseas financial institutions (Chan-Lau, Mitra, & Ong, 2007; Rose & Spiegel, 2009).

II.4.2.3. Interactions under Market-Based Financial System

The transmission of contagion in this linkage is a consequence of changes in asset prices and the measured risks. (Adrian & Shin, 2008; Cheung, Tam, & Szeto, 2009). Marked-to-market capital of financial institutions causes their balance sheet to immediately reflect the changes in their asset prices. By assuming an efficient market, this in turn will induce immediate response from the market. The probable impact of a shock and the speed of its propagation can be multiplied through changes in market prices, even if exposures to said shock are widely dispersed around the financial system (Adrian & Shin, 2008).

II.4.3. INVESTORS BEHAVIOR

This study classifies the proceeding hypotheses of investors' behavior in one group for clarity purpose; however, rational behavior of investors belongs to the fundamental financial linkages and evidence of spillover caused by it will not be considered shift-contagion.

Sometimes the spread of contagion cannot be explained by both real and financial linkages; rather it is simply the results of investors' behavior, whether they are rational or

irrational. It is suggested that investors rebalance their portfolio in response to liquidity constraints, information asymmetry, multiple equilibriums, and changes in the rules of the game (Dornbusch, Park, & Claessens, 2000). However, by readjusting their investment strategies and their exposures to common macroeconomic risks, investors transmit idiosyncratic shock from one market to another (Kodres & Pritsker, 2002).

II.4.3.1. Liquidity Shocks

This channel of contagion spread crisis to other economies as a consequence of the action of investors in rebalancing their portfolio due to liquidity constraints. This type of transmission mechanism depends on different motivations of investors in readjusting their investment strategies across markets. The first hypothesis is that an idiosyncratic liquidity shock in one economy may force an investor to sell its asset in other economies to raise capital (Cheung, Tam, & Szeto, 2009). If there is high correlation of liquidity shocks among investors, this mass-selling may instigate a falling in asset price and transmit what originally a country-specific shock across markets and/economies.

Another hypothesis is the leveraged investors (Cheung, Tam, & Szeto, 2009). A shock in one economy reduces the value of collaterals held by leveraged investors. Leveraged investors facing margin calls are compelled to sell part of their holdings in non-crisis economies (Dornbusch, Park, & Claessens, 2000). Study shows that there is evidence for interconnection between the leverage ratio of financial intermediaries and economic cycle, i.e. high leverage during booms and low leverage during busts (Adrian & Shin, 2008). This procyclical feature of leverage ratio makes the capitalisation of financial intermediaries more sensitive to price changes and the associated measured risks.

The last hypothesis of liquidity shock is called cross-market hedging (Kodres & Pritsker, 2002; Cheung, Tam, & Szeto, 2009). This approach postulates that investors respond to country-specific shock by re-adjusting their cross-market hedging to offset this loss. In turn this action exposes other economies to the initial shock.

II.4.3.2. Information Asymmetry

As mentioned previously, herding behavior among investors can be rational or irrational and occurs due to the existence of informational disequilibrium between informed and less-informed investors (Cheung, Tam, & Szeto, 2009). The action of less-informed investors in readjusting their portfolio tends to follow those they consider to be more informed, disregarding the fact that they do not own perfect information that reflect the actual situation. However, this type of behavior is not always irrational. Rational less-informed investors may decide to sell their holdings in economies with similar situations as the epicenter of the crisis (Dornbusch, Park, & Claessens, 2000).

II.4.3.3. Multiple Equilibria

According to this framework, a country-specific shock is transmitted through the sudden shift of expectations and confidence of investors (Dornbusch, Park, & Claessens, 2000; Forbes & Rigobon, 2001). In other words, investors are considered to move from one state of equilibrium to another. The contagion of crisis is therefore seen as self-fulfilling. An example of this multiple equilibrium hypothesis is the difference state of confidence investors have toward the Euro before and after the debt crisis in Greece. Due to the crisis in Greece, investors adjust their confidence and expectation in other Euro-zone economies even though there are no fundamental changes in those economies. In this case, problems in Greece are viewed as “sunspots”, i.e. a signal of problems in other countries given

similarities to the crisis' epicentre (Masson, 1998). However there is a possibility of irrationality in terms of investors' over-reacting to bad news (Cheung, Tam, & Szeto, 2009).

II.4.3.4. Changes in the Rules of the Game

According to this hypothesis, crisis is propagated to other economies because investors re-assess their risks based on their expectations for changes in international financial transactions (Dornbusch, Park, & Claessens, 2000). The debt crisis in Greece can also be used to exemplify this postulation: a positive development in bailout funds to Greece by other Euro-zone economies rallied the markets and upsurge the exchange rate of the Euro.