

ISTANBUL TECHNICAL UNIVERSITY ★ GRADUATE SCHOOL OF SCIENCE
ENGINEERING AND TECHNOLOGY

**MARKET INTEGRATION AND FORECAST PERFORMANCES OF STOCK
MARKET AND MACROECONOMIC VOLATILITIES IN GLOBAL
FINANCIAL CRISES**

Ph.D. THESIS

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Department of Management Engineering

Management Engineering Programme

MAY 2012

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**KÜRESEL FİNANSAL KRİZLERDE PİYASA BÜTÜNLEŞMESİ VE HİSSE
SENEDİ PİYASASI İLE MAKROEKONOMİK OYNAKLIKLARIN TAHMİN
PERFORMANSLARI**

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In remembrance of my grandmother,

FOREWORD

Polonius:

Neither a borrower nor a lender be,
For loan oft loses both itself and friend,
And borrowing dulls the edge of husbandry.

Hamlet Act 1, Scene 3, 75–77

First of all, I am grateful to Assoc. Prof. Dr. Oktay Taş for his never-ending patience, for his contribution in my thesis and for sharing his vast academic experience with me. I also thank Prof. Dr. Burç Ülengin for his remarks and corrections on the statistical tests and Prof. Dr. Sudi Apak, Prof. Dr. Suat Teker and Prof. Dr. Suat Küçükçifçi for his contribution to my work. Finally, I am also thankful to TÜBİTAK for its scholarship during the period of my doctoral studentship.

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ABBREVIATIONS

AIC	: Akaike Information Criterion
ARCH	: Autoregressive Conditional Heteroskedasticity
ARMA	: Autoregressive Moving Average
ARIMA	: Autoregressive Integrated Moving Average
ASEAN	: Association of Southeast Asian Nations
BRIC	: Brazil, Russia, India, China
CEE	: Central and Eastern Europe
DAX	: Deutscher Aktien Index
EBIT	: Earnings Before Interest and Taxes
EGARCH	: Exponential Generalized Autoregressive Conditional Heteroskedasticity
EMU	: Economic and Monetary Union
EU	: European Union
FTSE	: Financial Times and the London Stock Exchange
GARCH	: Generalized Autoregressive Conditional Heteroskedasticity
GDP	: Gross Domestic Product
GMM	: Generalized Method of Moments
ICSS	: Iterated Cumulative Sums of Squares
LAC	: Latin American Countries
LIBOR	: London Interbank Offered Rate
LTCM	: Long Term Capital Management
MENA	: Middle-Eastern North African
NAFTA	: North American Free Trade Agreement
NIE	: Newly Industrialized Economies
NYSE	: New York Stock Exchange
OECD	: Organization for Economic Co-operation and Development
ROI	: Return on Investment
SIC	: Schwarz Information Criterion
UK	: United Kingdom
US	: United States
USA	: United States of America
VAR	: Vector Autoregressive

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MARKET INTEGRATION AND FORECAST PERFORMANCES OF STOCK MARKET AND MACROECONOMIC VOLATILITIES IN GLOBAL FINANCIAL CRISES

SUMMARY

In 2007, as the US subprime mortgage market began to fall down, which reached its peak with the catastrophic collapse of the Lehman Brothers, no one was aware of that this was going to be the worst financial crisis since the Great Depression. Evaluating the advantages and disadvantages connected with financial globalization demands a pure understanding of the influence of international market integration and financial volatility.

This thesis focuses on the analysis of the integration of 17 important stock markets and forecast performances of stock market and macroeconomic volatility for the period of last global, financial crisis. The results of the first section generally support the findings of previous literature on market integration. In order to examine the linkages of 17 national stock markets, cointegration, impulse response and variance decomposition analysis are performed, before and during the period of the global financial crisis of 2007. According to the results, it has been found that the cointegrational relationship had improved globally during the period of global crisis.

This work also has explored the effects of financial volatility during the last global crisis. According to the literature, volatility in financial markets increases severely during the crises. This thesis, which underlines the importance of stock market volatility during financial crises, introduces another important tool to assess the volatility clustering behavior, namely macroeconomic volatility. Thus, the key finding of this work is that the forecast performance of stock market volatility surpasses the forecast performance of macroeconomic volatility. The leading motive behind this result can be the nature of the data used in the macroeconomic volatility calculations. Although such problems are likely to be less severe at shorter time spans, the analyzed volatility of quarterly macroeconomic data could still be damaged by inadequate estimation, which would tend to influence the outcomes towards not finding any informative results regarding macroeconomic volatility.

KÜRESEL FİNANSAL KRİZLERDE PİYASA BÜTÜNLEŞMESİ VE HİSSE SENEDİ PİYASASI İLE MAKROEKONOMİK OYNAKLIKLARIN TAHMİN PERFORMANSLARI

ÖZET

Son küresel finansal kriz özellikle 2000’li yılların sonunda uluslararası finansal piyasaların etkileşimini tekrar arttırmıştır. Finansal küreselleşmenin getirdiği avantaj ve dezavantajları değerlendirmek bu bağlamda uluslararası piyasa bütünleşmesi ve finansal oynaklığın daha detaylı bir biçimde kavranmasını gerektirmektedir. Bu yüzden bu tez 17 hisse senedi piyasasının bütünleşmesine ve bu ekonomilerin hisse senedi piyasası oynaklığı ile makroekonomik oynaklıklarının son küresel finansal kriz süresince çözümlenmesine odaklanmıştır. İlk bölümün sonuçları genel olarak piyasa bütünleşmesi hakkındaki literatürü destekler niteliktedir. 17 ulusal hisse senedi piyasası arasındaki bağlantıyı incelemek için 2007 küresel krizi öncesinde kriz süresi boyunca sırasıyla eşbütünleşme, dürtü yanıtı ve varyans ayrıştırma analizleri gerçekleştirilmiştir. Sonuçlara göre kriz dönemi boyunca küresel olarak eşbütünleşme ilişkisi artmıştır. Eşbütünleşme vektörlerinin varlığı çalışmadaki 17 hisse senedi piyasasının uzun dönem denge durumu paylaştıklarına işaret etmektedir. Bununla birlikte eşbütünleşme vektörlerinin sayısındaki artış çalışmadaki piyasaların kriz döneminde, kriz öncesi döneme göre birbirlerine daha yakın hareket etmeye eğilim gösterdiklerini belirtmektedir. Dürtü yanıtı analizi de ABD hisse senedi piyasasından diğer piyasalara şok aktarımının benzer örüntüler sergilediğini göstermektedir. Buna rağmen gelişmekte olan tüm piyasalar için güçlü bir ilişkiden bahsetmek mümkün değildir. Bunlara ek olarak tüm piyasaların “dışsalılık düzeyi” kriz süresince anlamlı bir biçimde azalmıştır ve hiçbir ülkenin finansal krize “dışsal” kalmadığını vurgulamaktadır. İlginç bir biçimde Fransa krizden önce en az etkilenen piyasa olarak öne çıkmakta ve çoğu Latin Amerika ülkesi Fransız piyasası tarafından etkileniyor gözükmektedir. Bunun olası nedenlerinden birini Fransa’nın AB bölgesindeki güçlü finansal konumuna bağlamak mümkündür. Ayrıca Büyük Britanya gibi gelişmiş bir ülkenin hisse senedi piyasası kriz öncesi ve süresinde gelişmekte olan piyasaları fazla etkilemiyor gözükmektedir. Kriz boyunca Hong Kong hisse senedi piyasasının Hindistan, Endonezya, Japonya, Malezya, Filipinler, Singapur ve Güney Kore piyasaları üzerinde etkili bir role sahip olması, bu ülkenin Japonya’ya ek olarak bölgesel bir liderliğe adım attığına işaret etmektedir. Tüm bu sonuçlar, hisse senedi piyasalarının bütünleşmesinin yoğun bir şekilde ülkelerin finansal serbestleşme düzeyleri, hisse senedi piyasasının büyüklüğü ve coğrafi konumu gibi etkenlere bağlı olduğunu ifade etmektedir.

Finansal aktörler (analizciler, uzmanlar, spekülâtörler vd.) son iki onyıldır oynaklığa büyük önem vermektedirler. Finans kuramında oynaklık, basitçe riski işaret eder ve yüksek oynaklık, piyasanın aksamamasının bir yansıması olarak ele alınır. Piyasa oynaklığının gözle görülür olduğu durumlarda, sermaye piyasalarının iyi işlemediği ve finansal varlıkların doğru bir biçimde fiyatlanmadığı kabul edilir. Bu yüzden,

oynaklığı çözümlmek, tahmin etmek ve ondan kaynaklanan sorunları yönetmek büyük önem taşımaktadır. Dolayısıyla bu çalışmada diğer taraftan son küresel krizde finansal oynaklığın etkileri de incelenmiştir. Literatüre göre finansal piyasalardaki oynaklık kriz dönemlerinde ciddi bir biçimde artmaktadır. Hatta hisse senedi piyasalarındaki oynaklık genellikle finansal piyasaların farklı bölümlerindeki kırılganlığın bir göstergesi sayılmaktadır. Finansal kriz dönemlerinde hisse senedi piyasası oynaklığının önemini tekrar vurgulayan bu tez, makroekonomik oynaklığı da göz önünde bulundurarak oynaklık kümelenmesi davranışını çözümlmeye yönelik yeni bir adım atmıştır.

Getirilerin standart sapması, varlık getirilerinin oynaklığının ölçülmesinin en önemli yöntemlerinden biridir. Geçmişte oynaklığın sabit olduğu varsayılmış ve verili bir dönem için getirilerin standart sapması olarak hesaplanıp adına tarihsel oynaklık denmiştir. Günümüzde çoğu araştırmacı, varlık getirilerinin oynaklık kümelenmesinin fazla olması durumunda bunun yüksek oynaklığa yol açtığını düşünmektedir. Doğrudan ölçümlerle elde edilen gerçekleşmiş oynaklık, opsiyon bazlı zımnı oynaklık ve parametrik zaman serisi modelleriyle elde edilen stokastik oynaklık, varlık getirilerinin oynaklığının çözümlenmesi ve tahmininde kullanılmaktadır. Bunlar arasında zamana bağlı, koşullu oynaklığı en uygun modelleyen yöntem, zamana bağlı varyansı gecikmeli kalıntıların karesinin ve koşullu varyansın bir fonksiyonu olarak tanımlayan GARCH (General Autoregressive Conditional Heteroscedasticity - Otoregresif Koşullu Değişken Varyans) modelidir. Diğer modellerle karşılaştırıldığında, oynaklık dinamiğini etkin bir biçimde değerlendirmesi ve basit hesaplanması sayesinde GARCH oldukça üstün bir yöntemdir. Bu bağlamda 17 ulusal ekonominin yatırım getirisi serilerini oluşturabilmek için ulusal ödemeler bilançosundan yararlanılmıştır. Ardından zaman serisi çözümlenmesi aracılığıyla uygun oynaklık tahmin modelleri belirlenmiştir. Daha sonra hisse senedi piyasaları getirisine ve ulusal ekonominin yatırım getirisine dayanarak iki tür oynaklık tahmin edilmiştir. GARCH modelleri, koşullu varyansın geçmiş kalıntıların karelerine bağlı olarak değiştiğini varsaymaktadır. Dolayısıyla oynaklıkların tahmin performansları, kalıntıların kareleriyle koşullu varyans arasındaki korelasyon katsayısı yardımıyla karşılaştırılmıştır. Sonuç olarak bu tezin önemli bulgularından biri, hisse senedi piyasası oynaklık tahmin performansının makroekonomik oynaklık tahmin performansından üstün olduğudur. Buna yol açan temel gerekçenin makroekonomik oynaklık hesaplamalarında kullanılan veriden kaynaklandığı düşünülmektedir. Koşullu varyansın en çok günlük, haftalık ya da aylık veride etkili olduğu ve daha düşük veri sıklıklarında daha az etkili olduğu genel kabul görmektedir. Her ne kadar çok uzun olmayan zaman süreçlerinde bu tür sorunların ortaya çıkması çözümlmelerde büyük hata payları yaratmasa da, üç aylık makroekonomik verilerle hesaplanan oynaklık yeterli olmayan tahmin sonuçları ortaya çıkarmış ve bu da sonuçların finansal olarak yorumlanmasını zorlaştırmıştır.

Ayrıntılı olarak; Meksika, Güney Kore ve ABD hisse senedi piyasaları etkin oynaklık tahminlerine sahiptir. ABD, Meksika ve Güney Kore piyasalarında, 2007'deki yüksek faizli ipotek piyasalarında ortaya çıkan krizle birlikte oynaklık kümelenmesindeki bu artış, ABD piyasalarındaki altüst oluşun diğer iki piyasaya hızlıca aktarıldığı anlamına gelmektedir. ABD ile yüklü miktarda ticaret ilişkisinde bulunan Meksika, mali ve para politikaları sıkılaştıran Güney Kore ve kriz sürecindeki tüm piyasalarının tepetaklak olduğu ABD, bu ülkelerin hisse senedi piyasalarında oynaklık üzerinde neden dikkate değer bir etki olduğunu açıklamaktadır.

Diğer taraftan makroekonomik getiriler bağlamında kalıntıların karesiyle koşullu varyans arasındaki korelasyon katsayısının, hisse senedi piyasalarındakini aşan sadece üç örnek bulunmaktadır. Endonezya, Kolombiya ve Japonya ulusal ekonomileri makroekonomik oynaklık kümelenmesini daha etkili bir biçimde yansıtabilmektedir. Özellikle korelasyon katsayısının 0,91 olmasıyla Endonezya ekonomisi tahmin performansında başı çekmektedir. Dış sermaye hareketlerindeki kontrolün düzeyi, ulusal ekonomisinin kuralsızlaştırılması ve iki yönlü ticaret bağımlılıkları Endonezya'nın özgün durumunu açıklayabilir. Buna ek olarak, Kolombiya'nın ulusal parasının devalüasyonu ile ve Japonya'daki serbest sermayenin kısıtsız dolaşımı, bu ülkelerin makroekonomik oynaklıklarının tahmin performanslarında neden daha iyi sonuçlar elde edildiğini açıklamada önemli göstergelerdir. Son olarak krizin kaynağı olarak ABD ekonomisinin makroekonomik oynaklık kümelenmelerinin etkilerini yakalayamamasını, bu ülkenin hisse senedi piyasasının yüksek piyasa değerine ve evrenselliğine bağlamak mümkündür.

Bu tezin elde ettiği farklı sonuçlara bakılacak olursa, alternatif bir veri setiyle çalışmanın daha detaylı ve farklı sonuçlara yol açacağını var saymak mümkündür. Hatta çalışmanın sadece gelişmekte olan ülkelere odaklanması, bu türdeki ülkelerin gelişmiş olan ülkelerle aralarındaki düşük korelasyonları yüzünden bağımsız bir veri olarak ele alınabilmesi sayesinde daha homojen sonuçlara yol açması olasıdır. Bunlara ek olarak eğer mümkünse makroekonomik oynaklığın tahmin performansının geliştirilmesi daha yüksek sıklıkta (örneğin aylık) veriler kullanılarak gerçekleştirilmelidir. Aksi halde makroekonomik verinin daha etkin bir şekilde tahmin edilebilmesi için yeni bir model geliştirilmelidir.

1. INTRODUCTION

The acceleration of information transfer and the globalization of financial systems have enhanced the risk of economic crises, for a danger in one country can disseminate to other geographies and give rise to global crises. In 2007, as the US subprime mortgage market began to fall down, which reached its peak with the catastrophic collapse of the Lehman Brothers, no one was aware of that this was going to be the worst financial crisis since the Great Depression. The crisis has brought forth the largest financial impact, imposing serious harm on markets and institutions at the heart of the international financial system. The financial turmoil has not only been acting on the financial markets and the economic system of the USA, but it has also been dispersing around other countries' international markets, without the exception of emerging financial markets. As the global financial crisis have expanded in different stages, international financial markets experienced hazardous instabilities, with volatility disseminating across markets at an unprecedented rapidity.

The current global financial crisis has again given rise to the interactions of international financial markets, which is an important research field. Generally, issues of global significance tend to have an important effect on the world's stock markets. Financial crises can cause spectacular changes in investment behavior and so it is important to examine the dynamic interdependence of stock markets before and after any important financial shock (Edwards, 2000). Empirical researches indicate that the comovement patterns of national stock markets alter importantly after greater economic turmoil like crises. Some academicians have reported that comovement or cointegration among stock markets of other countries grows severely during the crisis (Grubel, 1968; Granger and Morgenstern, 1970; Milliaris and Urrutia, 1992; Arshanapalli et al., 1995; Hon et al., 2006; Khalid and Rajaguru, 2007; Huyghebaert and Wang, 2010). In addition, financial literature has exhibited a strong importance in the interdependency of international stock markets on a market integration basis (Stansell, 1993; Kim and Rogers, 1995; Tai, 2000; Bekaert and

Harvey, 2002; Phylaktis and Ravazzolo, 2002; Bessler and Yang, 2003; Yang et al., 2003).

Nowadays, rational international financial agents, in diversifying their portfolios toward developing markets, should take into account that the market integration might reduce the expected returns and increase correlations between world market and emerging market returns. Hence, market integration is a principal topic. In finance, markets are seen as integrated when assets with the same risk level demand the exact expected return regardless of their origin. Furthermore, theory of finance asserts that there are possible profits from international portfolio diversification if returns on investment in divergent national stock markets are not completely correlated, and the correlation character is steady. This has influenced economists and finance specialists to consider the interdependencies among international stock markets and correlation structure in some noticeable detail. Unfortunately, prior empirical studies about the interdependency of the major world stock markets have not yielded to consistent results. Most study has centered on fully developed stock markets and there are relatively not many studies of interdependencies among emerging markets. Due to the different results from the studies in this area, additional insights should be procurable through an exploration of an alternative set of financial markets, particularly, a set of developing markets.

With respect to these financial issues mentioned above, the first part of this thesis also focuses on market integration of emerging and developed markets during the last global, financial crisis. Firstly, in order to analyze the relationship a cointegration analysis among the markets is carried out which assesses the long run common movements between the markets before and during the crisis. Secondly, an impulse response analysis is implemented to evaluate the pace of shock transmission in U.S. market, which is the main source of the crisis, to the other markets which reflects the degree of capital market integration. Finally, in order to give a more detailed insight of the market integration a variance decomposition analysis is performed which examines the amount of information each market contributes to the other markets before and during the crisis period.

The ongoing financial crisis is not a unique one. Chasing the globalization pattern of the early 1990's, international financial market breakdowns have become more often experienced phenomena, remarkably in the economies of emerging markets. In the

course of these crises, volatility in financial markets has grown drastically as the stock returns shifted towards an unfavorable area. As the primary fluctuations of each of these crises are not limited to the country of origin but spread to other countries as well, it is critical to get a scale of return and volatility spillovers across international markets during financial crises.

The incremental attention and motivation on exploring volatility can be accounted for numerous reasons, but the most appropriate of all comprise the fact of international portfolio diversification and the return of financial crises that took place in both developed and emerging countries during the 1990's decade (Arouri et al., 2008). Kyle (1985) has remarked that financial information is displayed in the volatility of stock returns, more than in the price itself. The volatility of equity and stock market prices is generally considered as a pointer of financial fragility for the diverse parts of financial markets and more than two decades, an essential indicator for describing the risk-taking behaviors of agents, particularly the replacement of different sorts of securities in their portfolios, has been the volatility of financial markets (Dufrenot et al., 2011). Several theoretical researches and empirical analyses have applied a broad variety of methods and data frequencies to display the integration of international stock markets and scrutinized for the causes behind this financial fact. The core of the studies has been largely on the correlations between the stock returns and volatility spillovers between stock markets worldwide (Arouri et al., 2008). In spite of a huge amount of literature on international market interdependence, the existent empirical results continue to be indistinct and have yielded contravening outcomes concerning the nature of the dynamic interdependence among developed and/or emerging markets (Awokuse et al., 2009).

This work too hypothesizes the significant role of stock market volatility in case of financial crises. Furthermore, in this thesis an alternative approach for volatility modeling is being introduced. There are two types of volatility forecasted in the thesis, namely stock market and macroeconomic. The former one is calculated and forecasted by means of stock market returns whereas the latter is calculated via macroeconomic data which is the main contribution of this work. Moreover, in order to capture macroeconomic volatility spillover effects the period of financial liberalization of national economies is added in the forecast analysis.

Throughout the late 1980's and early 1990's many Asian and Latin American economies experienced a number of economic recoveries, global integration processes and financial liberalization which have been moderated by international financial crises. The crises and other examples of extreme financial vulnerability exemplify potential risks of financial liberalization. An important problem is whether national economies have undergone substantial increases in volatility in the post-financial liberalization period. Indeed, the liberalization of national economies can support market integration, which has significant policy and investment implications. The number of advantages emanating from international diversification would be dissimilar under internationally separated markets than under incorporated markets. It cannot be deducted from the fact that growing integration and openness must cause a more volatile environment and expose to an international market economic or financial disturbance. Moreover, the transmission of market upheaval is probably to be larger if international financial markets are integrated. Furthermore, the asset pricing in segmented markets is contrary to that in integrated financial markets. Considering these contrasting point of views on the advantages/disadvantages of financial market integration, it seems more crucial to decide whether international financial markets have become more integrated.

Based on these financial discussions the second part of this thesis centers on the forecast performances of stock market and macroeconomic volatilities. With the help of time series analysis the appropriate model is determined. Subsequently, the relevant ARCH-type model for stock market and macroeconomic volatility is implemented. In order to analyze the effects of the last financial crisis, the stock market and macroeconomic volatilities of the crisis period are forecasted and compared, which makes this work an alternative point of view in financial literature.

The rest of the thesis is organized as follows: Section two contains the relevant literature review on financial liberalization and crisis, market integration and stock market and macroeconomic volatility. Section three introduces the data and describes the methodology with related literature review used in the thesis. Section four presents the empirical findings and Section five evaluates the results and gives suggestions for further research.

2. LITERATURE REVIEW

2.1 Financial Liberalization and Crisis

As the economy starts to integrate into a world of capital market, effective equity market liberalizations enable crucial changes in the financial and real sectors. There are many countries to evaluate and many ways to liberalize so the process is quite complicated for a study. A set of more systematic methods should be used to pin the liberalization of emerging markets if one wants to study the effectiveness of liberalization policies, the sequencing of liberalizations, and the effect of them on the real economy.

Grabel (1995) has debated the significance of calculating stock market volatility after financial liberalization in the developing countries. She has come up with three kinds of alternative indices for calculating volatility that has been used in examining the situation when financial liberalization induces increased asset price volatility. Huang and Yang (2000), by making use of the daily returns of the ten emerging markets with a world index, have come up with the result that South Korea, Turkey, and Mexico were agonized by greater volatility whereas, Argentina, Chile, Malaysia and the Philippines undergo through diminished volatility. They could find no distinctive pattern for those other countries post-market liberalization.

Henry (2000) discovered the fact that growth of the investment rate and a substantial revaluation of equity prices in a large number of countries are due to liberalization. He investigated into the outcomes of this liberalization over the emerging stock markets and had come up with the statement that it decreases the cost of capital, enabling the risk sharing to be divided between domestic and foreign agents.

Kassimatis (2002) examined through trial and error if stock market volatility developed in the aftermath of financial liberalization in six developing markets. The findings show that the implemented important liberalization policies are followed by volatility.

Bekaert et al. (2003) wanted to show the effect of liberalization on the real sector, emphasizing the synthesis of current methods. Bae et al. (2003) examined the links between availability to foreign equity investment as a security cross-listings and aggregate portfolio flows.

Edwards et al. (2003) focused on the pattern of behavior of stock markets in six rising countries by comparing the bull and bear cycles of four Latin American and two Asian countries in their degree of concordance. The result of their study showed that those cycles in these rising countries have tendency to have a shorter duration and larger amplitude and volatility than in highly-developed countries.

Kose et al. (2003) studied the changes in macroeconomic volatility over a major group of industrial and emerging economies between the years 1960-1999 in a large scale of examination. The results of the examination show several issues: the volatility based on output growth has shown decline during the 1990s and the input growth has increased in relation with the former situation. In addition to this result, another impact from the study was that growing financial openness is closely linked with emerging conditional volatility of consumption up to a certain number. In their extensive study, Prasad et al. (2004) underlined some of the outstanding traits of world-wide financial integration from the point of view of the under-developed countries. The proof of the impacts of financial globalization on growth and volatility has been analyzed.

Füss (2005) executed some tests of the random walk hypothesis and market efficiency on the seven Asian emerging markets due to the effect of financial market integration. He found out, through trial and error, that the return of predictability is affected in such a way that trading strategies, which enables the domestic investors to earn abnormal returns, might not be able to be developed.

Aizenman (2005) examined the case of Latin American financial liberalization. Jayasuriya (2005) studied the impact of stock market liberalization on the eighteen rising markets and on their stock return volatility and came up with the result that volatility may decrease, increase or stay the same after liberalization. He tried to bring post-liberalization volatility and market characteristics together. He showed that favorable market characteristics such as higher market transparency and investor

protection are the most common characteristics of countries undergoing a lower post-liberalization volatility.

Cuñado et al. (2006) assessed whether or not the potent conduct of stock market volatility in six rising economies underwent a change during the period between January 1976 and December 2004. Their assessment showed the variations in volatility behavior might have been exaggerated in the previous years.

Jermann and Quadrini (2006) focused on the previous two decades and showed that in the course of two decades financial flows of the companies became more volatile. They demonstrated a pattern in which the distinct roles for debt and equity financing were present. The conclusion was that innovations enable an easier way to use equity financing which can be considered for a significant decrease in macroeconomic volatility.

Daniel and Jones (2007) worked on a potent definition which models itself on the evolution of the just-liberalized bank possibilities and motives to take on a risk. The pattern that they have created relies on the fact that even though the banking system is well-planned and well-developed, most of the countries will go through an initial period of growth which has less risks, then a period of banking crisis.

Feridun (2007) defined the particulars of currency crisis in the period between the years January 1980 and June 2006 in Turkey. The results of his examination showed that the regular crisis determinants failed to explain the pattern of crisis in Turkey. When he examined the years between September 1989 and June 2006, he found out that the US federal funds rate, banking sector fragility index, US GDP, and US three-month T-bill rate are very important in the post-capital account liberalization. His findings are considered as evidence to point out the fact that Turkish economy is fragile to currency crisis.

Diamandis (2008) studied whether or not the potent behavior of Latin American stock market and mature stock markets has changed over the course of past two decades. He pinpointed an important growth in volatility during the period of crisis over the examined markets.

Diebold and Yilmaz (2008) focused on the obvious and open association between the macroeconomic fundamentals and stock market volatilities while examining the global cross section of stock markets of forty countries.

Nguyen and Bellalah (2008), by trial and error, retested the potent variations in emerging market volatility over stock market liberalization. The structural fractures in emerging market volatility series did not occur during the actual official liberalization time. They occurred in accordance with the alternative events of the process. The findings show that when the US investors became effective in the emerging markets, the stock return volatility was decreased.

Kaminsky and Schmukler (2008) developed a brand new extensive chronology of financial liberalization, which pointed out that the impact of financial liberalization is time-varying. The conclusion of the study was that in the aftermath of the financial liberalization, there are booms and busts in the short run, whereas in the long run, there is a return to stability.

Tong and Wei (2008) constructed a way to investigate the possibility of a financial-sector crisis being spread to the real economy. They used it in to assess the current mortgage crisis.

Crouhy et al. (2008) studied the varied elements of the subprime mortgage credit crisis, for which they have suggested several solutions.

Sanders (2008) pointed out the link between the subprime mortgage defaults and housing prices by examining some of the key factors of the US subprime mortgage crisis. He had explained that the financial institutions have misunderstood the decline of the house prices and increasing subprime default.

Mian and Sufi (2009) carried on a within-county analysis via ZIP code-level data for the documentation of the reasons for the biggest financial crisis since the Great Depression. The results indicated the large amount of increase in mortgage credit to subprime ZIP codes which separated from the income growth. This situation is also associated with the increase in securitization of subprime mortgages.

Cajueiro et al. (2009) evaluated the financial market liberalization in Greece in 1990s which modified the extent of market development. They used a time-varying global Hurst exponents which resulted in the statement that the shifts in financial market liberalization affect positively on the extent of development of stock markets.

Eizaguirre et al. (2009) conducted a test in which they assessed the changes in the pattern of the rising market volatility and its relation with the financial liberalization events. They concluded that those changes are indeed due to the liberalization of

emerging markets. They also found out that the changes are not always toward the same direction; Latin American countries have lower volatility where the Asian countries have tendency towards high increases in market instability. In addition to this fact, they also found that occasional shocks have deep impact on almost all countries.

Ahmed and Suardi (2009) studied the varied impacts of financial and trade liberalization over growth volatility of real output and consumption in Africa. The conclusion underlines the fact that trade liberalization is closely linked with a major output and consumption growth volatility. Furthermore, in order to decrease volatility in output and consumption growth, financial market depth and institutional quality carry on together.

Neumann et al. (2009) investigated the volatility of capital flows after the liberalization of financial markets. The study was based on the response of foreign direct investment, portfolio flows, and debt flows to the financial liberalization using a panel data over a set of overlapping data from 1973-2000. The results show the difference between the portfolio flows and foreign investment flows; the former shows little response to capital liberalization, the latter show important rises in volatility.

Majid and Kassim (2009) examined the stock markets of Indonesia and Malaysia in order to conduct the results of the current financial crisis. The findings of the study were parallel to those of the general view that stock markets have tendency to display greater extent of integration or increased co-movements in the crisis period which result in decline in the benefits of diversification.

Bartram and Bodnar (2009) conducted a wide examination on the impact of the last financial crisis over the international equity markets and their dominant components. The study also included the analysis of the magnitude of the crisis in the form of value destruction. They also suggested that the global side of the crisis is obvious in the high correlations between the investment and market styles.

Acharya et al. (2009) and Wade (2008) had a short scaled study on the reasons and solutions of the financial crisis of 2007-2009.

Fidrmuc and Korhonen (2010) focused on the link between global financial crisis and business cycles in China and India. The link was based on the trade ties and dynamic correlations of GDP growth in rising Asian countries and OECD countries.

Broner and Ventura (2010) provided a basic model which is based on the observed effects of financial liberalization. The model underlined the link between domestic and global financial transactions along with the effect of imperfect enforcement.

Umutlu et al. (2010) debated whether or not the degree of financial liberalization influences the aggregated total volatility of stock returns through taking into account the time-varying structure of financial liberalization. They have shown the ways in which financial liberalization affected aggregated total volatility. They found out a negative relation to the degree of financial liberalization for small or medium sized markets in terms of controlling for size, liquidity, country, and crisis effects.

Pesaran and Pesaran (2010) debated in their study how suitable the multivariate volatility models are for modeling market risk in the time of financial crisis.

Gklezakau and Mylonakis (2010) examined the global stock markets and their behavior under the duress of economic crisis through the interdependence among the price indices of ten markets. Their trial by error outcomes pointed out the recent deep crisis had shown increase in their correlation.

Simpson (2010) showed that there are crucial costs linked with global banking financial integration. He also went on to show that these costs were pointed out in a period before the 2008 global financial crisis since the analysis of the daily country banking index data from December 1999 to September 2008 provides.

Assidenau (2011) studied the cointegration traits of dominant capital markets indices during the September, 2008/August, 2009 part of the financial and banking crisis started in US markets. His study shows three sets of economic indices (OECD, Pacific group and Asia group) have at least one cointegrating vector. As opposed to the previous studies, his paper suggests and shows that during the time of the financial crisis, Asian markets indices had been cointegrated.

Johansson (2011) studied the active structure of local financial market integration within Europe and East Asia while focusing on the recent financial crisis. He concluded his study by saying that Europe is much more affected by the financial crisis with higher volatility and covariance.

Beine and Candelon (2011) analyzed the effects of trade and financial liberalization on the extent of stock market co-movement in the emerging economies in which they had studied an example of 25 developing countries observed over fifteen years. They assumed an impact of reforms targeted the opening of these countries via trade and finance to the rest of the world. The outcome of the study underlines the crucial backing of the positive impact of trade and financial liberalization reforms on the degree of cross-country stock market linkages.

Dufrenot et al. (2011) based their study on a time-varying transition probability Markov-switching model while using a set of daily data from January 2004 to April 2009. The result they had come up did not validate the financial decoupling hypothesis, due to the financial stress in the US markets being transferred to the LAC's stock market volatility, mainly in Mexico.

Demyanyk and van Hemert (2011) studied the quality of subprime mortgage loans using loan-level data, for which they modified their performance for variations in borrower characteristics, loan characteristics and macroeconomic conditions. The evidence they have shown was that the emergence and decline of the subprime mortgage market leads to a typical lending boom-bust pattern after which unsustainable growth causes market to collapse.

2.2 Market Integration

Integration of financial markets has been the main topic of discussion in both the academic and financial spheres. There have been many researches made under varied titles such as interdependence, contagion, spillovers... all of which point out the market integration. Hence, this part of the paper presents the glimpse of the background of a market structure before a financial crisis.

Eichengreen et al. (1995) focused on the methods of testing the turbulence in foreign exchange markets. They used a data from 1959 to 1993 of twenty OECD countries. They also examined the antecedents and aftermath of devaluations and revaluations, flotation, fixings and speculative attacks. The conclusion that they have drawn from this study was that no obvious warning could be traced for speculative attacks.

Frankel and Rose (1996) used a panel of annual data for a hundred developing countries between 1971-1992. There are three ways in which the crashed do happen:

first, when output growth is low; secondly, when the foreign rates are high and last, when the domestic credit was low.

Glick and Rose (1998), in their paper, showed that in order to comprehend the spread of currency crisis, one needs to understand the patterns of international trade. In the paper, they emphasized the fact that international trade tied the countries that were affected by the currency crisis together. Furthermore, there was an explanation as to how cross-country correlations in exchange market pressure in the crisis were made clear by the trade linkages.

Baig and Goldfajn (1999) examined the contagion among the financial markets of Thailand, Malaysia, Indonesia, the Philippines and Korea. The result was that the equity market correlations suggested varied evidence, however correlations in currency and sovereign got higher rapidly. They also presented the fact that cross-border contagion in the currency and equity markets exists following own-country news and other fundamentals.

Dornbusch et al. (2000) mainly examined the issue that enabled to distinguish the countries that are at risk of contagion as well as offered some solutions to reduce the risks. They wanted to underline the significance of macroeconomic considerations and institutional factors in propagating shocks.

Claessens and Forbes (2001) made it clear that any research in the future should mainly focus on the examination of the financial channels for contagion, case studies, and research on the financial system.

Dungey and Martin (2001) underlined the significant aspect of transfer of information between financial markets in the crisis. They used a latent factor model of returns to present spillovers and contagion in the currency and equity markets in the East Asian crisis of 1997-8. They also showed that the spillovers and contagion were responsible for equity market volatility.

Forbes and Rigobon (2001) re-defined contagion and renamed it “shift-contagion”. In their 2002 paper, they came up with the evidence that correlation coefficients were conditional on market volatility, which under certain assumptions, adjustment for bias was possible. The outcome of the paper showed that there was virtually no increase in unconditional correlation coefficients (i.e., no contagion) during the 1997

Asian crisis, 1994 Mexican devaluation, and 1987 US market crash. The market co-movement was found which was called interdependence.

Aside from that outcome, Dungey et al. studied the phase of turbulence in the global financial markets in 1998. The study underlined the market assessment of credit risk by daily movements in bond spreads for twelve countries. They have used a dynamic latent factor, which presented the substantial global contagion impacts arising from the Russian and LTCM crises. In another paper, Dungey et al. (2004) focused on the transmission of volatility in East-Asian currency markets. They figured out that the transmission of volatility in that region is not because of the contagion but because of the common world factors. Especially, spillovers do not have a major role in Japanese market and even non-existent in Australian.

In their updated work, Dungey et al. (2005) focused on how the presence and characteristics of contagion in financial markets adopted in recent literature. They showed the varied testing methodologies to be related using a framework of a latent factor.

Bekaert et al. (2005) studied the link between market integration and contagion. Two factor asset pricing model was introduced to explain contagion as correlation within the model residuals. The outline they have used enabled the time-varying expected returns along with time-varying risk loadings for the tested countries. The result of the study was that no evidence was present on additional contagion due to the Mexican crisis. What they found was the economical increases in residual correlation in Asia during the Asian crisis.

Hoque (2007) analyzed the dynamics of Bangladesh stock market price movements along with USA, Japan, and India.

Iwatsubo and Inagaki (2007) explored stock market contagion between US and Asian markets. The difference between contagion and fundamentals-based stock price co-movement was the presence of significant bilateral contagion effects in returns and return volatility. In addition to this, the flow of contagion effects from US market to Asian markets was stronger than the reverse direction. Eventually, they showed that the intensity of contagion was crucially greater during rather than after the Asian crisis.

Pan et al. (2007) studied the dynamic relation between exchange rates and stock prices for seven East-Asian countries between years January 1988 and October 1988. Their study resulted in the presence of causal relation from exchange rates to stock prices and from equity market to the foreign exchange market.

Glezakos et al. (2007) analyzed the relationships among dominant global financial markets in the short and long run, especially focusing on the Greek stock exchange during the years 2000 to 2006. The results of the study included the dominance of the USA financial market and the dominant effect of DAX and FTSE.

Yunus and Swanson (2007) studied the long-run relationships and short-run causal relations within the public property markets of the Asian-Pacific area and the US starting in January 2000 ending in March 2006.

Nielsson (2007) investigated the interdependence between the Nordic and Baltic stock indices within the light of increased merger activity during 1996-2006. The result of the study showed that there is only a glimpse of interdependence.

Segot and Lucey (2008) examined an area of seven rising MENA stock markets for informational efficiency in relation to its theoretical undertones. The conclusion of the study stated that the effect of general economic liberalization is not important based on the heterogeneous levels of efficiency in those markets.

Majid et al. (2008) examined five chosen ASEAN emerging markets with their interdependencies from the US and Japan on market integration. They based their study on a two-step estimation, cointegration and GMM. The results showed that ASEAN stock markets move towards a bigger integration both among themselves and with the US and Japan, given the post-1997 financial turmoil.

Yu and Hassan (2008) examined financial integration of MENA area to utilize a greater in-depth analysis of the structure of interdependence and transmission device of stock returns and volatility between MENA and global stock markets.

Elyasiani and Zhao (2008) used VAR, generalized impulse response function and generalized variance decomposition techniques, which is introduced by Pesaran and Shin (1998), to study the interdependence between Iran, its dominant trading partners and US.

Morana (2008) suggested that both economic and financial integration have a major role in explaining global stock markets comovement for the G-7 countries.

Patra and Poshakwale (2008) focused on the Athens stock exchange to present evidence on the long-run and short-run relationship between the major stock indexes.

Siddiqui (2009) took into account the period 19/10/1999 to 25/04/2008 to assess the relationship between the selected Asian and the US stock markets while using daily closing data of twelve stock markets. The findings showed that the stock markets were integrated among each other. Moreover, they stated that stock markets have no major role in influencing other markets.

Awokuse et al. (2009) examined the developed model of the interdependence within the chosen Asian emerging markets and stock markets of Japan, UK and US. The result was that the time-varying cointegration links exist within the mentioned stock markets.

Atmadja (2009) analyzed the five ASEAN stock market indices on the existence of cointegration relationship and the short-run dynamic interaction before and after the 2007 crisis. Using accounting innovation analysis, he found a rise in the explanatory power of an endogenous variable to another during the crisis, which meant that the contagious effect of the 2007 US financial crisis could also be found in the ASEAN capital market.

Bley (2009) focused on the dynamics and contemporaneous interactions of stock markets of the Euro region on the country and economic sector levels. The result of the study showed the time-varying aspect of the financial market integration process. Moreover, the evidence that return behavior has been changing was found along with the fact that stock market in the Euro zone are separating from each other.

The study by Diebold and Yilmaz (2009) showed a basic and visceral capacity of interdependence of asset returns and/or volatilities. To be more specific, they defined and analyzed precise and separate measures of return spillovers and volatility spillovers. They analyzed 19 global equity markets within the period of 1990s to the present and came up with the result that there is an evidence of divergent behavior in the dynamics of return spillovers vs. volatility spillovers.

Majid et al. (2009) investigated market integration between five ASEAN rising markets before and after the 1997 financial crisis. They found out that the ASEAN stock markets were cointegrated during the time of the crisis.

Bhaduri and Samuel (2009) used a logistic smooth transition regression method to determine the degree of correlation between the returns as well as the pace of integration. The findings of the study showed that there is a very small degree of correlation between the Indian markets and the other global markets.

Hasan and Javed (2009) focused on the short and long-term causal relationships amid the macroeconomic variables and equity market returns in the rising equity market between the period of 6/1998 to 6/2008 using the VAR outline on monthly data.

Diamandis (2009) analyzed the long-run relationships between four Latin American stock markets and a grown stock market of US. He underlined the fact that despite the existence of cointegration, there are small long-term benefits due to international portfolio diversification caused by the slow adjustment of the stock prices.

Raju and Khanapuri (2009) centered on the stock market integration in Asia. They directed their study towards the effect of the important economies such as China and India on the other Asian markets explaining the transmission mechanisms of innovations.

Jawadi et al. (2010) examined the problem of long and short-term stock market integration in Mexico and Argentina – the two biggest rising economies of Latin America. The results of the study showed that there was no long-run linkages between the markets examined, which meant that their fundamentals rule over the Mexican and Argentinian markets.

Yılmaz (2010) studied the degree of contagion and interdependence among East Asian equity markets starting from 1990s to the present time using the forecast error variance decomposition from a VAR. What he had drawn from the examination was the return and volatility spillover indices over the rolling sub-sample windows. The results indicated that there was an apparent difference between the behavior of the East Asian return and volatility spillover indices over time.

Poshakwale and Thapa (2010) studied the effect of foreign investors to make a statement on the short-run dynamics and long-run relationship of the rising Indian equity market with the global equity markets. They used daily return series and

equity portfolio investments created by foreign institutional investors. The conclusion was that the close-knit integration of the Indian equity market with the global markets was formed by the rapid growth in the flow of foreign equity portfolio investments.

Syllignakis and Kouretas (2010) focused on the long-term linkages between seven CEE rising markets and the German and US markets. The outcome of the study showed that these linkages between CEE and the world markets led to the beginning of the EU accession process.

Bunn and Gianfreda (2010) showed new outcomes in relation with the integration of the French, German, British, Dutch and Spanish power markets at their lead times. Overall, there was a less influence of the size and the proximity of neighboring markets.

Cheng et al. (2010) examined the excess market returns within the nine much-ignored MENA countries. The result of the examination indicated the investment in the sample-study would have presented the returns uncorrelated with the world market. This would, in turn, have enabled portfolio diversification to be improved.

Tudor (2011) examined six CEE stock markets in relation with the US stock exchange in terms of causal relationships and short-term interaction. He made it clear in his study that relationships within CEE stock markets are time-varying along with the fact that while in financial chaos, investing in varied CEE markets to increase the potential for diversifying risk is quite limited.

Ali et al. (2011) used cointegration test on monthly stock prices between July 1998 and June 2008 to study the comovement of Pakistan's equity market in relation with the other markets such as India, China, Indonesia, Singapore, Taiwan, Malaysia, Japan, USA and the UK.

Muhammed et al. (2012) assessed financial integration by referring to the financial market of Pakistan through using Johansen cointegration technique. It resulted in the evidence of a long-run correlation within local foreign exchange market and LIBOR.

2.3 Stock Market and Macroeconomic Volatility

Even for spectators in the financial markets, the most significant topic is volatility. It is being the symptom of disruption makes it synonymous with high risk. For many people, it means that the prices are not given fair amounts and capital market is dysfunctional. However, if it is dealt with derivative securities, the most crucial aspect is to understand volatility, to forecast it correctly, and in addition to these, to organize the investment portfolios' exposure.

Among the various ways to measure speculative asset return volatility, the standard deviation of returns is the most widely used. Volatility was conventionally considered as constant volatility that has been estimated as the sample standard deviation of returns for a period called historical volatility. On the other hand, it had become a well-known fact that volatility clustering has been the outcome of many asset return time series whereas volatility becomes high or low in accordance with its recent stats. These findings have been discovered in three ways: the parametric time series models such as GARCH and stochastic volatility have been estimated; secondly from estimating option price implied volatilities; lastly from estimating realized volatility which is a direct measure. GARCH model is the most commonly used method for modeling the time-varied conditional volatility among all of them. GARCH is used for modeling the time varying variance as a lagged squared residuals' and lagged conditional variance function. GARCH is a strong method for its flexible adaptation of the dynamics of volatilities and for its easy estimation when compared to the other methods.

Gay (2008) has investigated the time series relationship between stock market index prices and the macroeconomic variables of exchange rate and oil price for BRIC through using Box-Jenkins ARIMA model. No important relationship between present and past stock market returns was found, which in turn suggests that the markets of Brazil, Russia, India and China have the weak form of market efficiency. Moreover, there was no important relationship between respective exchange rate and oil price on the stock market index prices of any BRIC country. Abugri (2008) made an in-depth analysis of whether or not dynamics in key macroeconomic indicators such as exchange rates, interest rates, industrial production and money supply in four Latin American countries do explain the market returns efficiently. In order to proxy

the effects of global variables, MSCI world index and the US 3-month T-bill yield are also included. The result of Abugri's study was that the global factors are crucially important when explaining returns in all the markets using a six-variable VAR model. Pierdzioch et al. (2008) had made a comparison between the forecasts of stock market volatility based on real-time and revised economic data. They had made a use of a brand new data set on monthly real-time macroeconomic variables for Germany that covered the period 1994-2005. Furthermore, statistical criteria have been used, which is based on utility-based criterion, and an options-based criterion to assess volatility forecasts. Rivas et al. (2008) has analyzed the effects of volatile spillover of equity markets of Europe on the equity markets of Mexico, Brazil and Chile. The outcomes of the E-GARCH models suggested that the Spanish and German stock markets tend to have stronger volatility spillover effects on Latin American markets than Italy, the UK, and France. They also came up with the fact that Mexico and Brazil have been much more affected by the German and Spanish spillover effect. In addition to this, the positive innovations have less effect in increasing volatility than the negative innovations in all cases. Teresiene (2009) investigated into the major factors which influence the stock price volatility. He suggested for a three-stage system to explain a set of stock price volatility factors in which the main point is to take an investor's psychology into consideration. Teresiene also considered the returns of the OMXV index and stock prices of the Lithuanian stock market by stressing the leverage effect. Sarkar et al. (2009) underlined the volatility of the Indian stock markets. They analyzed the link between the Indian market index (SENSEX) and domestic sectoral indices. One of the findings was that the volatility in the developed markets indicates that Granger causes SENSEX volatility; which shows a powerful evidence of a global contagion. Furthermore, the most prominent participants in the volatility of the SENSEX are capital goods and consumer durables. Wang and Moore (2009) examined how the new EU stock markets are affected by the abrupt changes in volatility through using the iterated cumulative sums of squares (ICSS) algorithm. They also have discovered the persistence of volatility has been decreased crucially in each series when the sudden shift are taken into consideration in the GARCH models – this also meant that the extent of volatility persistence present in the financial time series has been mostly ignored in the previous studies.

Chinzara and Aziakpono (2009) focused on the comparison between the equity markets of South Africa and the world major equity markets making use of daily data for the period 1995-2007. Another thing they have focused on was the nature of volatility, the long term trend of volatility and the risk premium hypothesis by using univariate GARCH and multivariate VAR models. The results they had come up with show that both returns and volatility linkages are present in the relationship between the South African and the major world stock markets. The results also show that Australia, China, and the US have the most influence on South African returns and volatility. The inherently asymmetric volatility is logically stable over time among all the stock markets in the study, for which there was no crucial proof for the risk premium hypothesis. Vrugt (2009) has made use of a brand new comprehensive dataset to examine the effect of ten US and six macroeconomic announcements from Japan, Hong Kong, South Korea and Australia. GARCH model was used in his study which enabled multiplicative announcement effects and asymmetries. Vrugt's results show that overnight conditional variances have been significantly higher on announcement days and crucially lower on days before and after announcements. Weber (2010) focused on the shock and volatility transmission between the foreign exchange, money and stock markets in Asian Pacific countries between 1999 and 2006. The most crucial findings of his study were the issues of monetary policy reactions to financial shocks and the potential of exchange rate stabilization strategies. Moreover, he analyzed the regional coherence of the structural financial innovations. Cassola and Morana (2010) evaluated the sources of volatility persistence in Euro-based money market interest rates and the presence of linkages of volatility dynamics. The stationary long memory was found in all data. They underlined the non-significant forward transmission of liquidity shocks. Barba and Ceretta (2011) examined if the US subprime financial turmoil has affected on the conditional volatility of stock prices in Latin America. They focused on the four emerging capital markets of Latin America (Argentina, Brazil, Chile, and Mexico) and the US considering the recent financial crisis of 2007-2008. The result of the study was that pre-crisis, there had been no evidence of volatility spillovers from North America towards Latin American stock markets. However, during the crisis, US volatility has been affected by Brazil and Chile and the US volatility affected Argentina, Chile and Mexico. In the post-economic crisis, the US stock market, which showed an increase in spillover effects due to the crisis, affected and was

affected by the Latin American volatility. Wang (2011) focused on the time-series relationship between stock market volatility and macroeconomic variable volatility for China. He used EGARCH and lag-augmented VAR (LA-VAR) models. One of his findings was the presence of a bilateral relationship between inflation and stock markets in the existence of a unidirectional relationship between the interest rate and stock prices. The conclusion was that Chinese stock market is way less efficient than that of the US and it is separated from the Chinese real economy.

3. DATA AND METHODOLOGY

Theory of finance asserts that there are possible profits from international portfolio diversification if returns on investment in divergent national stock markets are not completely correlated, and the correlation character is steady. This has influenced economists and finance specialists to consider the interdependencies among international stock markets and correlation structure in some noticeable detail. Unfortunately, prior empirical studies about the interdependency of the major world stock markets have not yielded to consistent results. Most study has centered on fully developed stock markets and there are relatively not many studies of interdependencies among emerging markets. Within the framework of this work, two main financial research areas are analyzed with respect to 2007 global financial crisis. The first research is focused on market integration whereas the second one is about two different types of volatility, namely stock market and macroeconomic. In order to conduct this research, 17 different countries are evaluated.

3.1 Data

The complete data consists of 17 countries in six different regions such as, Developed Asia, Developing Asia, East Europe, West Europe, Latin America, North America, where the number of countries to be evaluated are tried to be as homogenous as possible. For some regions such as Ex-Soviet Union Countries and Africa, neither stock nor macroeconomic data are available or data structures are not appropriate for handling. The source for all the stock and macroeconomic data is Datastream.

3.1.1 Stock market data

The data consist of weekly stock index closing prices of four Latin American, nine Asian, three European and one North American, i.e., Chile, Colombia, Mexico, Venezuela, Hong Kong, India, Indonesia, Japan, Malaysia, Philippines, Singapore,

South Korea, Thailand, Poland, France, Great Britain and USA. All the indexes are collected for the period from July 13, 2001 to January 1, 2010 due to availability. All weekly index prices are taken a natural logarithm ($\ln$) in front and are expressed in national currency terms. Furthermore, to investigate the possible differences of market integration among the 17 stock market indices before and during the global financial crisis, the data are divided into two groups:

1. July 7, 2001–July 28, 2007: the period before the global financial crisis.
2. August 4, 2007–January 1, 2010: the period during the global financial crisis.

A range of descriptive statistics for 17 stock market indices is presented in Table 3.1 for the period before and during the crisis.

Table 3.1: Descriptive statistics of 17 stock market indices.

Country	Sample period	# obs.	mean	max.	min.	stand. dev.	skewness	curtosis
Chile	before	317	8152.848	15118.35	4621.860	2729.070	0.634489	2.696971
	during	127	13846.89	16630.91	10411.65	1447.196	-0.248659	2.140122
Colombia	before	317	4792.073	11433.26	778.8700	3677.992	0.604439	1.773339
	during	127	9525.112	11614.81	6671.420	1275.917	-0.331813	2.091955
France	before	317	4214.820	6168.150	2574.910	877.1492	0.297817	2.185627
	during	127	4146.330	5843.950	2534.450	957.9475	0.273226	1.769189
Great Britain	before	317	5032.399	6732.400	3491.590	801.7805	0.234036	2.078059
	during	127	5209.414	6730.710	3530.730	868.9657	-0.054848	1.743059
Hong Kong	before	317	13562.28	23291.90	8409.010	3428.640	0.756204	2.844565
	during	127	20711.02	30468.34	11921.52	4763.374	-0.120166	2.162715
India	before	317	3498.811	8056.020	1216.370	1940.937	0.697843	2.198625
	during	127	7686.693	11461.71	4242.160	1846.400	-0.302117	2.241459

Table 3.1 (continued): Descriptive statistics of 17 stock market indices.

Indonesia	before	317	0.100817	0.261000	0.036000	0.054895	0.896118	3.009002
	during	127	0.219583	0.300000	0.094000	0.061668	-0.680254	2.112435
Japan	before	317	106.1774	154.8300	63.94000	25.06199	0.282932	1.903553
	during	127	114.1325	147.5900	73.36000	19.85542	-0.122709	1.896390
Malaysia	before	317	1205.910	2371.750	669.7000	411.8746	1.046767	3.419920
	during	127	1850.313	2605.270	978.2600	456.0606	-0.419694	1.943589
Mexico	before	317	13031.49	32411.84	5087.940	7450.681	1.015297	2.970359
	during	127	26784.15	32548.53	16978.84	4286.102	-0.673021	2.186098
Philippines	before	317	1793.769	3786.020	993.3500	687.5823	1.047930	3.411434
	during	127	2721.193	3824.200	1765.900	559.6659	0.049426	2.134721
Poland	before	317	27803.67	67568.50	11654.30	14416.58	0.972419	2.991060
	during	127	40328.19	63813.86	21690.75	11628.05	0.352656	2.135393
Singapore	before	317	2001.362	3584.080	1184.960	568.2004	0.936791	3.331222

Table 3.1 (continued): Descriptive statistics of 17 stock market indices.

	during	127	2654.485	3814.380	1513.120	621.4918	-0.232652	2.018640
South Korea	before	317	970.4577	1983.540	472.3100	329.6638	0.712860	2.611549
	during	127	1555.568	2028.060	938.7500	274.7373	-0.352373	2.198139
Thailand	before	317	575.3265	863.5800	268.1100	164.5471	-0.519812	1.674515
	during	127	671.3072	894.5700	392.8700	154.9135	-0.399400	1.793794
USA	before	317	1463.677	2035.880	815.4000	257.1472	-0.446216	2.698402
	during	127	1677.586	2213.860	1064.700	308.1989	-0.346237	1.952391
Venezuela	before	317	22220.91	59413.31	6070.090	12715.48	0.399222	2.352384
	during	127	40900.97	55075.68	34211.89	5849.830	0.990041	2.848847

3.1.2 Macroeconomic data

In order to calculate the international macroeconomic market value of a national economy, its ROI and consequently the macroeconomic volatility, net fixed capital formation, balance of payments of national accounts and national currency/\$ exchange rate are required. The data is quarterly and is collected for the period from 1989 to the end of 2009, which marks the beginning of financial liberalization in most emerging economies and includes the period of last global financial crisis. Thus, it is expected to analyze the effect of financial liberalization in recent financial crisis. For saving space, macroeconomic data is given in the Appendix.

3.2 Methodology

In order to analyze the long-run and short-run dynamics of stock market behavior, cointegration, and impulse response and variance decomposition analysis are used. However, return-based calculations are not satisfying to evaluate the nature of shock transmissions during financial crises. Therefore, researches should also center upon the concept of volatility. Subsequent to the details of the calculation of volatility, this section concludes with the calculation of the international macroeconomic market value.

3.2.1 Cointegration analysis

Cointegration is an approach developed to evaluate the link between the non-stationary time series. Exceptionally, there is a risk of the misestimating of the non-existent association between the variables which does not mean that there is no association between the variables. Contrawise, long-term common movement can be discovered between the non-stationary time series. As a consequence, a common equilibrium of the variables can be mentioned.

A large sum of empirical researches has been conducted for the last two decades in the area of cointegration. Jeon and Chiang (1991) investigated the behavior of stock prices in New York, London, Tokyo and Frankfurt based on univariate and multivariate cointegration approaches. Kasa (1992), Richards (1995) and Francis and Leachman (1998) examined the presence of cointegrational relationships between the

developed European markets and US market, while Arshanapalli and Doukas (1996), Phylaktis (1999) and Manning (2002) made the same research for the Asian markets. Moreover, Choudhry (1997), Arbeláez et al. (2001) and Chen et al. (2002) studied the Latin American markets. Implementing cointegration analysis, Corhay et al. (1993) also scrutinized the price indices of five European stock markets and concluded that they revealed a common long-run trending behavior over the period 1975–1991. Choudhry (1997) analyzed the long-run relationship between the stock indices of six Latin American countries and USA, and obtained cointegrational relationship with significant causality among the six Latin American indices with and without the US index.

To the contrary, the developing markets of CEE have been investigated to a smaller scale. Linne (1998) reported cointegrational relationship between the CEE markets, however according to his research no cointegrational relationship was found with developed markets. Jochum et al. (1999) scrutinized the impact of the 1997–1998 Russian crisis on the long-run relations between the Vyshegrad countries (the Czech Republic, Hungary, and Poland), Russia, and US. MacDonald (2001) analyzed the stock market indices of CEE countries, as a block, against each of three developed markets (Britain, Germany, and US). He recorded significant long-run relations for each of the groups. Contrarily to this, however, Gilmore and McManus (2002) did not obtain long-run bonds between the three CEE markets and US. These authors solely centered on the interactions with the US market, excluding any associations with the substantial European stock markets. Arshanapalli et al. (1995) noticed a growth in stock market interdependence after the 1987 crisis for the emerging markets of Malaysia, the Philippines, Thailand and the developed markets of Hong Kong, Singapore, US and Japan for the years from 1986 to 1992. They specified the pre-crash period as January 1986 to September 1987 and the post-crash period as November 1987 to December 1992. They obtained cointegrational relationship in the post-crash period, but not in the pre-crash period and concluded that stock market cointegration had enhanced after the October 1987 crash. Liu et al. (1998) investigated the soundness of the relationships among the developed and emerging Asian markets, namely Thailand, Taiwan, Japan, Singapore, Hong Kong, and US by separating the sample into two sub-samples: 2 January 1985 to 16 October 1987, and 19 October 1987 to 31 December 1990. They obtained a growth in the general stock

market interdependence as well as an increase in the interdependence within the Asian-Pacific regional markets after the 1987 crisis. As an alternative of the 1987 stock market crash, Sheng and Tu (2000) researched the stock market relationships of the following emerging and developed Asian-Pacific countries before and during the period of the 1998 Asian financial crisis: Taiwan, Malaysia, Thailand, South Korea, the Philippines, Indonesia, China, US, Australia, Singapore, Japan and Hong Kong. They utilized daily data for the period from 1 July 1996 to 30 June 1998, and split it on 30 June 1997 to make pre- and post-crisis samples. They concluded that stock market interdependence has been enhanced since the crisis. The results of Sheng and Tu (2000) on the effect of the 1998 crisis are in harmony with those obtained by Arshanapalli et al. (1995) and Liu et al. (1998) for the 1987 crash. Palac-McMiken (1997) found monthly cointegrational relationship in the ASEAN markets (Indonesia, Malaysia, Philippines, Singapore and Thailand) for the period from 1987 to 1995. Ghosh et al. (1999) investigated the debacle of the Asian-Pacific stock markets by using the theory of cointegration to explore which developing markets are triggered by the markets of Japan and US. Their empirical results suggested that some countries are dominated by US whereas some are controlled by Japan, and the remaining countries are governed by neither during the time span of the study. Moreover, they contrasted two forecast models, namely an error correction and a naïve model, and suggested that the error correction model outperformed the naïve model through out-of-sample forecast. Yang et al. (2003) scrutinized long-run relationships and short-run dynamic causal associations among US, Japanese, and ten Asian emerging stock markets, with the peculiar attention to the 1997–1998 Asian financial crisis. They found that both long-run cointegrational relationships and short-run causal associations among these markets were reinforced during the crisis and that these markets have generally been more integrated after the crisis than before the crisis. Furthermore, they offered that the degree of integration among countries tends to change over time, particularly around periods marked by financial crises. Syriopoulos (2007) analyzed the short- and long-run behavior of major emerging CEE (Poland, Czech Republic, Hungary, Slovakia), and developed (Germany, US) stock markets and foregrounded the effect of the EMU on stock market linkages. He got one cointegration vector in both pre- and post-EMU sub-period which points out the market comovements towards a stationary long-run equilibrium. Furthermore, he continued that CEE markets are inclined to exhibit

stronger linkages with their developed counterparts, whereas US market maintains a world leading dominant role. Al-Fayoumi et al. (2009) analyzed the dynamic linkages among the daily returns of the Amman Stock Exchange indices for the period from September 3, 2000 to August 30, 2007 and they concluded that these indices are associated via one cointegrating vector in the long-run.

As opposed to Engle and Granger (1987) cointegration test, Johansen (1988), Stock and Watson (1988) used the maximum likelihood forecast method to test the existence of all the cointegrated vectors. In this way, Engle and Granger (1987) method has been rectified of its errors and risks. The starting point of Johansen cointegration test is that Y_t is a non-stationary stochastic variable and μ is a $n \times 1$ constant vector and the equation would be shown as VAR(k) equation:

$$Y_t = \mu + \Pi_1 Y_{t-1} + \Pi_2 Y_{t-2} + \dots + \Pi_k Y_{t-k} + e_t \quad (3.1)$$

If the first differences of the variables are thrown in the equation, error correction model can be shown as in the second equation:

$$\Delta Y_t = \mu + \Gamma_1 \Delta Y_{t-1} + \dots + \Gamma_{k-1} \Delta Y_{t-k+1} - \Pi Y_{t-k} + e_t \quad (3.2)$$

Here,

$$\Gamma = -I + \Pi_1 + \dots + \Pi_i \quad (3.2a)$$

$$i = 1, \dots, k - 1 \quad (3.2b)$$

$$\Pi = I - \Pi_1 - \dots - \Pi_k \quad (3.2c)$$

and I is the unit vector.

Π matrix gives information on the long term relations between the variables. The degree of the Π matrix is the number for the linear and stationary combinations of the variables. The result can be in three ways:

If the degree of Π matrix is $r = n$ (number of variables) all Y_t 's are stationary; if the degree of Π matrix is zero ($r = 0$) there is no long-term relationship between the variables in the model and if the degree of Π matrix is $0 < r < n$ there is r amount of cointegrated vectors.

When the third possibility happens, Π matrix can be divided into two $n \times r$ matrix. Π matrix can be divided into its factors as in $\alpha\beta'$. β shows the cointegration vectors in long term and α shows the adaptation coefficients that calculates the power of the cointegration in the error correction model. In other words, it shows the error correction parameters.

In Johansen cointegration test, calculation of the number of cointegrated vectors in Π matrix can be obtained by testing the unit roots (λ_i). These tests can be conducted in two statistical ways which are Trace statistic and Eigenvalue.

Trace statistic can be calculated as follows:

$$\lambda_{trace} = -T \sum_{i=r+1}^n \ln(1 - \lambda_i) \quad (3.3)$$

H_0 : Rank (Π_y) = r null hypothesis

H_1 : Rank (Π_y) = n alternate hypothesis

Eigenvalue statistic can be calculated by the equation below:

$$\lambda_{eig}(r, r+1) = -T \ln(1 - \lambda_{r+1}) \quad (3.4)$$

H_0 : Rank (Π_y) = r null hypothesis is tested against

H_1 : Rank (Π_y) = $r+1$ alternate hypothesis

A crucial factor in the determination of VAR models is the specification of the lag length of the VAR model. Lütkepohl (1991) points out that overfitting (selecting a higher order lag length than the true lag length) results in an increase in the mean-square forecast errors of the VAR model and that underfitting the lag length frequently creates autocorrelated errors. Most VAR models are determined utilizing symmetric lags, i.e. the same lag length is used for all variables in all equations of the model. Additionally, this lag length is repeatedly chosen using an explicit statistical criterion such as the AIC or SIC. VAR models with symmetric lags can be smoothly determined; since the identification of all equations of the model is the same, calculation by ordinary least squares results in efficient parameter forecasts. However, according to financial theory there are no convincing arguments that lag lengths should be the same for all variables in all equations. According to Johansen

method, the choice of lag length is more critical, but models specify that moderate deviations (which could not be discovered in the initial statistical analysis) do not seem to change the assumptions.

3.2.2 Impulse response analysis

An impulse response analysis is carried in order to how rapidly a shock in one market is transmitted to the other markets. Thus, it is an indicator of the degree of capital market integration. As suggested by Lütkepohl and Reimers (1992), (3.5) given below can be used to examine the interactions between n non-stationary stochastic variables:

$$Y_t = \mu + \sum_{i=0}^{\infty} \phi_i \varepsilon_{t-i} \quad (3.5)$$

where the coefficients of ϕ_i can be used to generate the effects of error term shocks on the entire time paths of the non-stationary stochastic variable Y_t . The accumulated effects of the impulses in error terms can be obtained by the appropriate summation of the coefficients of the impulse response function.

According to Sims' original paper (1980), dynamic studies of VAR models are habitually implemented utilizing the 'orthogonalized' impulse responses, where the underlying shocks to the VAR model are orthogonalized using the Cholesky decomposition before impulse responses, or forecast error variance decompositions are calculated. This method is not, however, unvarying to the order of the variables in the VAR model. Alternatively, Koop et al. (1996) and Pesaran and Shin (1998) offered the 'generalized' impulse response analysis for unrestricted VAR and cointegrated VAR models. Different from the traditional impulse response analysis, their approach does not demand orthogonalization of shocks and is constant to the order of the variables in the VAR model. The method is also employed in the building of order-invariant forecast error variance decompositions. Moreover, Chowdhury (1994) utilized variance decomposition and impulse response functions to scrutinize the relationships among the Asian NIE's, Japan and US where he used daily data for the period from January 1986 to December 1990. He drew the conclusion that US influenced the NIE's and that there were significant relationships between the markets. An impulse response analysis for a German money demand

system was documented by Lütkepohl and Reimers (1992). The authors used the broader money variable M2, domestic demand as income variable and a long-term bond rate in addition to a 3-months interest rate. The sample period in that study was 1960.I-1987.IV.

3.2.3 Variance decomposition analysis

Variance decomposition or forecast error variance decomposition indicates the amount of information each variable contributes to the other variables in a VAR model. It is also related to impulse responses and may be used for interpreting dynamic models. The h -step forecast error for the y_t variables in terms of structural innovations $\varepsilon_t = (\varepsilon_{1t}, \dots, \varepsilon_{Kt}) = B^{-1}\mu_t$ can be shown to be

$$\psi_0 \varepsilon_{T+h} + \psi_1 \varepsilon_{T+h-1} + \dots + \psi_{h-1} \varepsilon_{T+1} \quad (3.6)$$

so that the k^{th} element of the forecast error vector is

$$\sum_{n=0}^{h-1} (\psi_{k1,n} \varepsilon_{1,T+h-n} + \dots + \psi_{kK,n} \varepsilon_{K,T+h-n}) \quad (3.7)$$

where $\psi_{ij,n}$ denotes the ij^{th} element of Ψ_n (Lütkepohl, 1991). Due to the ε_{Kt} are contemporaneously and serially uncorrelated and have unit variances, the corresponding forecast error variance is

$$\sigma_k^2(h) = \sum_{n=0}^{h-1} (\psi_{k1,n}^2 + \dots + \psi_{kK,n}^2) = \sum_{j=1}^K (\psi_{kj,0}^2 + \dots + \psi_{kj,h-1}^2) \quad (3.8)$$

Furthermore, the quantity

$$(\psi_{kj,0}^2 + \dots + \psi_{kj,h-1}^2) \quad (3.8a)$$

is interpreted as the contribution of variable j to the h -step forecast error variance of variable k . This interpretation is justified if the ε_{it} can be viewed as shocks in variable i . The percentage contribution of variable j to the h -step forecast error variance of variable k is obtained by dividing the above terms by $\sigma_k^2(h)$.

$$\omega_{kj}(h) = (\omega_{kj,0}^2 + \dots + \omega_{kj,h-1}^2) / \sigma_k^2(h). \quad (3.9)$$

3.2.4 Volatility

A major topic in the field of financial economics and econometrics has been the modeling of volatilities for risky asset prices. The most simple assumption to build a model for daily returns is to define a zero-mean normal random variable. While the zero mean is a reasonable assumption that is usually supported by financial data, many empirical results display that the asset returns are negatively skewed and have a leptokurtic distribution. The leptokurtosis can be handled by incorporating conditional heteroscedasticity into a Gaussian process. A model commonly adopted for returns is defined by

$$r_t = \sigma_t \varepsilon_t \quad (3.10)$$

$$\varepsilon_t \sim i.i.d.(0,1) \quad (3.10a)$$

In (3.10), ε_t is a zero-mean white noise often assumed to be normal and σ_t is the time-varying volatility. This model handles the dynamics in the variance, while ignoring the possible dynamics in the mean, which is a common choice when dealing with daily returns. Assuming that ε_t is a normal white noise, the returns conditional on σ_t are normal. While the normality is often assumed for the conditional distribution, by modeling σ_t as being time varying the unconditional distribution is leptokurtic.

ARCH-type models have been thoroughly used to evaluate conditional heteroskedasticity and assumed to nearly correspond to the representative behavior of uncertain markets. The ARCH model was first introduced by Engle. Many ARCH-type models have been developed, among which one of the most popular is the GARCH(1,1), originally proposed by Bollerslev.

$$r_t = \sigma_t \varepsilon_t \quad (3.11)$$

$$\varepsilon_t \sim i.i.d.(0,1) \quad (3.11a)$$

$$\sigma_t^2 = \gamma + \alpha \varepsilon_{t-1}^2 + \beta \sigma_{t-1}^2 \quad (3.11b)$$

Since ε_t is assumed to be normal, the returns are normally distributed conditionally on the variance which depends on the information up to the previous period. The

value of the parameters $\alpha + \beta < 1$ defines the stationarity condition. While returns are modeled as being serially uncorrelated, the squared returns can be expressed as an AR process (specifically an ARMA (1,1)). The unconditional distribution is symmetric around a zero mean, with variance $\gamma/(1-\alpha-\beta)$ and kurtosis greater than 3 (i.e. leptokurtic distribution). Similar features apply to the generic ARCH(p) and GARCH(p,q) models. Within several adjustments to the standard GARCH model, Nelson (1991) promoted a very prospering asymmetric GARCH model, which is called EGARCH that explains asymmetric effects of returns on conditional variance. For an EGARCH(1,1) the (3.11b) is modified to

$$\ln \sigma_t^2 = \gamma + \beta \ln \sigma_{t-1}^2 + \alpha \left| \frac{r_{t-1}}{\sigma_{t-1}} \right| + \omega \frac{r_{t-1}}{\sigma_{t-1}} \quad (3.12)$$

The parameter ω measures the asymmetry. The logarithmic expression guarantees a positive conditional variance. Moreover, forecasting an ARCH-type model by maximum likelihood method is very simple because of the normality assumption. The estimation becomes more complicated if the normality assumption is loosened: Usually, a Student-t distribution is accepted, which enhances the ability of the model to detect the fat tails of the actual distribution of the returns (Baillie and Bollerslev, 1989). Furthermore, the forecast of the variance is established with the conditional variance equation. Compared to other qualified models, the fact that the one step ahead forecast is totally definite is one of the main features concerning GARCH model.

3.2.5 Calculation of the international macroeconomic market value

Up to the present, few researches focused on determining market value of national economies. Most of the models dealt with the contagion by using macroeconomic models with multiple criteria (Masson, 1999) whereas a few of them (Marshall, 1998) stressed the relation between fundamental value of a firm and the unique fundamental value of a national economy which is the present value of the cash flow generated by the total economic activity of the country.

The theoretical background of the methodology used in this section can be found in Clark (1991), Clark & Marois (1996), Clark (2002) and Clark & Kassimatis (2004). Modern financial theory defines the value of a project or financial asset as the net

present value of future cash flows discounted at the appropriate rate. The appropriate rate is determined as a function of the risk of the project or financial asset under consideration. Therefore, the analytical framework described in this section uses the discounted cash flow model to establish the relationship between macroeconomic cash flows from period to period and the macroeconomic balance sheet. Generally, valuation models of discounted cash flows have the form:

$$V_t = (b_t - a_t) + (b_{t+1} - a_{t+1})R^{-1} + \dots + (b_n - a_n)R^{-(n-t)} \quad (3.13)$$

where “V” represents the net present value, “b” represents the cash income, “a” represents expenditure and “R” represents the discount factor with $R=1+r$ where r is the appropriate discount rate.

The techniques and definitions of the previous paragraph can be applied to determine market values and rates of return for a national economy. To start with the model, balance of payments accounting discipline can be represented by the equation:

$$BP_t = X_t - M_t + FS_t + F_t \quad (3.14)$$

This accounting equation defines the variation of official foreign reserves as the difference between the foreign exchange value of exports and imports of all goods and services, where private and official unrequited transfers are included in X and M , plus (minus) the net inflow (outflow) of foreign capital. With this condition, the market value of a national economy can be determined.

According to Equation 3.13 V_t represents the market value of a national economy at the beginning of period t when all transactions are effected at the beginning of each period. The next step is to determine the macroeconomic cash flows relevant to the international investor. The “b”s are composed of the foreign exchange value of the economy’s sales of its final output. Thus, “b”s are equal to the foreign exchange value of internal sales of domestically produced final goods and services. Domestically produced final goods and services are equal to total consumption less imports of consumption goods ($C_T - M_{CT}$) and can be written as follows:

$$b_T = X_T + (C_T - M_{CT}) \quad (3.15)$$

Similarly, “a”s are composed of the foreign exchange value of the economy’s final expenditure and stand for the cost of production of all consumption and investment goods. Hence, “a”s are composed of the foreign exchange value imports plus the foreign exchange value of internal expenditure for domestically produced final goods and services. The equation can be written as follows:

$$a_T = M_T + (C_T - M_{cT}) \quad (3.16)$$

Since the foreign exchange value of internal expenditure on domestically produced final goods and services is exactly equal to the foreign exchange value of internal sales of domestically produced final goods and services, $(b_T - a_T)$ will always be equal to X_T (the foreign exchange value of exports) minus M_T (the foreign exchange value of imports).

Bearing those associations in mind, the cash flows of income and expenditure can be utilized to calculate the foreign exchange value the economy at the time T . Accordingly, the foreign exchange value of the economy at time T is:

$$V_T = E[(b_T - a_T) + (b_{T+1} - a_{T+1})R^{-1} + \dots + (b_n - a_n)R^{-(n-T)}] \quad (3.17)$$

where V_T stands for the capital value of the economy at the beginning of period T , $R=1+r$, and E is the expectations operator. Arranging the formula for V_{T+1} gives:

$$V_{T+1} = E[(b_{T+1} - a_{T+1}) + (b_{T+2} - a_{T+2})R^{-1} + \dots + (b_n - a_n)R^{-(n-(T+1))}] \quad (3.18)$$

Putting (3.18) into (3.17), multiplying by $1+r$ to obtain the value of the economy at the end of the period T and rearranging yields the national accounting equation for period T . Here it should be noted that b_T and a_T are known because they take place on the first day of the period.

$$r(V_T + a_T - b_T) + a_T = b_T + (V_{T+1} - V_T) \quad (3.19)$$

where $r(V_T + a_T - b_T)$ represents profits before interest and dividends paid abroad, a_T stands for cost, b_T corresponds to income and $(V_{T+1} - V_T)$ represents net investment. It can be more easily recognized if (3.15) and (3.16) are substituted into (3.19):

$$r(V_T + M_T - X_T) + C_T = X_T - M_T + C_T + (V_{T+1} - V_T) \quad (3.20)$$

The right-hand side of (3.20) is instantly perceived as a derivative description of net domestic product. The left-hand side of the equation stands for the economy's earnings before interest and dividends paid abroad plus consumption. Displaying the model with the help of national accounts has several practical advantages. First of all, net national product is well known to researchers and macroeconomic data is usually given in this format. On the other hand, the left-hand side of the equation presents net national product in a new format that is relevant for international investor and more useful for financial analysis – earnings and consumption broken down to demonstrate international criteria for income distribution.

In literature there are several studies which pay attention and refer to Clark's estimation of international macroeconomic market value. Coccia (2007), Davey (2007), Simpson (2008), Mullins et al. (2008), Ortiz et al. (2006), Yapraklı and Güngör (2007) mention papers on sovereignty, political risk etc. all of which use the estimation of balance sheet approach as a tool of calculating market value of national economies. Karmann and Maltritz (2002), in their discussion paper on sovereign risk, underlined the importance of computation of market value of a national economy by using the cash flows of future net exports discounted at the economy's rate of return. They also indicated that the economy's annual rates of return are calculated as $(\Delta V + NX)/V$ where V is the market value of a national economy and NX are cash flows of future net exports. Miller (2006) put an emphasis on the model adopted by Clark (2002) which supposes that all asset returns are denominated in a single currency and thus makes it possible to separate currency from systematic risk and makes the econometric analysis easy, since the world market proxy portfolio is calculated in a single currency. Oshiro and Saruwatari (2005) laid stress on the estimation of the probability of default by using the accumulated fixed capital formulation as the underlying asset in the option-pricing model which was introduced by Clark (1991). Furthermore, they underlined the concept of macroeconomic balance sheet proposed by Clark (1991) and calculated the equity values of Thailand and Argentina in their paper. Finally, Asteriou (2008) used the Clark (2002) and Clark and Kassimatis (2004) methodology to calculate the market value of three Asian Countries (Indonesia, Malaysia and Philippines) for each year

over the period from 1990 to 2004 and to estimate the macroeconomic financial risk premium for the same time span. He noticed the correspondence of earnings on the country's entire stock of assets (before considering whether the assets were financed by domestic or foreign capital) to the concept of earning before interest and taxes in corporate finance which was featured by Clark and Marois (1996).

3.2.5.1 Application of the model

The individual V_T 's in the aforementioned accounting format cannot be obtained directly for two reasons. First of all, the model concerns expected future cash flows and, secondly, a country's national accounts are given in national currency rather than in foreign currency. The domestic currency equivalent of (3.17) is:

$$V'_T = E\left[(b'_T - a'_T) + (b'_{T+1} - a'_{T+1})R'^{-1} + \dots + (b'_n - a'_n)R'^{-(n-T)}\right] \quad (3.21)$$

where the primes indicate domestic currency values and $R' = 1 + r'$. r' is the economy's internal rate of return in domestic currency. Since $b - a$ equals $X - M$, using the exchange rate (3.21) can be described as follows:

$$X'_T = S_T X_T \quad (3.22)$$

$$M'_T = S_T M_T \quad (3.23)$$

where S_T is the spot exchange rate at time T demonstrated as the number of units of domestic currency for one unit of foreign currency. Then

$$V'_T = E\left[S_T(X_T - M_T) + S_{T+1}(X_{T+1} - M_{T+1})R'^{-1} + \dots + S_n(X_n - M_n)R'^{-(n-T)}\right] \quad (3.24)$$

Using the forward rate parity and interest rate parity hypotheses, it is known that:

$$V'_T = S_T V_T \quad (3.25)$$

so that:

$$V_T = \frac{V'_T}{S_T} \quad (3.26)$$

and at the end of the period

$$V_{T+1} = \frac{V'_{T+1}}{S_{T+1}} \quad (3.27)$$

V' can be determined directly from available statistical data. The domestic currency value of net investment at market prices is a constituent of the traditional presentation of the national accounts or it can be calculated from gross fixed capital formation, which is also presented therein. The domestic currency value of what has been invested in the economy from time 0 to the end of time $T-1$ is:

$$V'_T = \sum_{t=0}^{T-1} (V'_{t+1} - V'_t) \quad (3.28)$$

and

$$V'_{T+1} = \sum_{t=0}^T (V'_{t+1} - V'_t) \quad (3.29)$$

Thus, the right-hand side of (3.20) can be captured by implementing the spot exchange rate to X' , M' and C' and using (3.26-3.29) to estimate V_T and V_{T+1} .

3.2.5.2 Macroeconomic profits

Subtracting C_T from both sides of (3.20) yields to a valuation of the economy's annual profits based on international criteria for resource allocation and income distribution:

$$r(V_T + M_T - X_T) = X_T - M_T + (V_{T+1} - V_T) \quad (3.30)$$

The definitions of exports and imports are as follows:

X = merchandise exports plus exports of all services except investment income plus unrequited transfers and other income (credit);

M = merchandise imports plus imports of all services except investment income plus unrequited transfers and other income (debit).

Investment income is not comprised in exports and imports. In this way profits demonstrate earnings on the country's entire stock assets before considering whether

the assets were financed by domestic or foreign capital which corresponds to the concept of EBIT in corporate finance.

3.2.5.3 ROI

A more relevant measure of economic performance from the perspective of the international investor is the rate of growth of the country's capacity to produce net foreign exchange value. Basic discounted dividend models utilize ROI and rate of reinvestment out of profits to calculate the growth rate. According to financial theory, ROI is the ratio of money gained or lost (whether realized or unrealized) on an investment relative to the amount of money invested. Following this approach, the country's ROI can be calculated from current profits and the balance sheet:

$$ROI = \frac{X_T - M_T + (V_{T+1} - V_T)}{\sum_{t=0}^T V_{t+1} - V_t} \quad (3.31)$$

4. EMPIRICAL FINDINGS

As mentioned earlier, the results of this work covers two parts. In the first part, results for cointegration, impulse response and variance decomposition analysis are given. The second part focuses on stock market and macroeconomic volatility calculations, and presents findings based on the international macroeconomic market value of a national economy.

4.1 Stock Market Integration

In this section; cointegration, impulse response and variance decomposition analysis are used to examine the linkages among one North American, nine Asian, four Latin American and three European stock markets before and during the period of the global financial crisis of 2007.

4.1.1 Results from cointegration analysis

As it has been asserted before if two or more non-stationary time series have a linear stationary equation, they can be called cointegrated. Therefore, in order to apply a cointegration analysis it has to be checked whether the time series have a unit root or not. In other words, all the time series have to be non-stationary so that they can be added to the cointegration analysis. The empirical results of unit root tests are summarized in Table 4.1.

Table 4.1: Summary results of unit root tests¹.

	Chile	Colombia	France	Great Britain	Hong Kong	India	Indonesia
before the crisis	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
during the crisis	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
	Japan	Malaysia	Mexico	Philippines	Poland	Singapore	South Korea
before the crisis	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
during the crisis	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
	Thailand	USA	Venezuela				
before the crisis	I(1)	I(1)	I(1)				
during the crisis	I(1)	I(1)	I(1)				

¹ I(n) denotes integration of order n.

Before the crisis, the calculated values of test statistics are all smaller than their corresponding critical values at 5% significance level. We do not reject the null hypothesis that the 17 indices contain a unit root. Similarly, during the period of the crisis, the calculated values of test statistics of all 17 indices are smaller than their corresponding critical values at 5% significance level. We do not reject the null hypothesis that the 17 indices all contain a unit root. According to the results of unit root tests a, cointegration analysis could be implemented for these two different sub-periods.

According to Johansen method, the choice of lag length is important. The choice of lag length was based on AIC and the optimal lag length was 8 for the period before the crisis and 3 during the crisis period. The results of cointegrational relationship among 17 countries are presented in Table 4.2. During the period of the crisis, it has been found that the cointegrational relationship had improved globally. At 95% confidence interval, results show that there are 9 cointegrating vectors during the period of the crisis and 7 before the period of the global crisis.

Table 4.2: Test for the number of cointegrating vectors.

Null hypothesis	Alternative hypothesis	Test statistic	Test statistic	Critical value
		Before the crisis	During the crisis	95%
λ_{trace} test				
$r \leq 0$	$r > 1$	11,317	13,311	9,24
$r \leq 2$	$r > 2$	27,598	29,062	19.96
$r \leq 3$	$r > 3$	45,707	46,812	34,91
$r \leq 4$	$r > 4$	66,984	68,651	53,12
$r \leq 5$	$r > 5$	94,470	104,748	76,07
$r \leq 6$	$r > 6$	122,667	118,607	102,14
$r \leq 7$	$r > 7$	125,196	135,573	131,70
$r \leq 8$	$r > 8$	160,608	171,969	165,58
$r \leq 9$	$r > 9$	199,584	200,337	202,92
$r \leq 10$	$r > 10$	225,589	238,049	244,15
$r \leq 11$	$r > 11$	269,964	285,442	291,40

λ_{max} statistic suggests no more than 7 cointegrating vectors, since H_0 of $r \leq 7$ can't be rejected, as $\lambda_{max(7)}$ is less than the critical value at the 5% significance level before the crisis. Similarly, during the period of crisis, there exist 9 cointegrating vectors since H_0 of $r \leq 9$ can't be rejected, as $\lambda_{max(9)}$ is less than the critical value at the 5% significance level during the crisis. The presence of cointegrating vectors indicates that the stock indices of the 17 market under study share long-run equilibriums. Moreover, the increase in number of cointegrating vectors indicates that markets under study tend to move more closely during the period of global crisis than before they did.

A closer look at the results will provide more detailed information about the cointegrational relationship between stock markets. As it has been mentioned above, according to Johansen procedure the model assumes at most 7 long-run cointegration

relationships before crisis period. The first five cointegration vectors before the crisis period can be seen at Table 4.3.

Table 4.3: Restricted cointegration estimation: long-run equations and speed-of adjustment coefficients (before the crisis period).

β -coefficients	Equation 1	Equation 2	Equation 3	Equation 4	Equation 5
Chile	1,000	0,000	0,000	0,000	0,000
Colombia	0,000	1,000	0,000	0,000	0,000
France	0,000	0,000	1,000	0,000	0,000
Great Britain	0,000	0,000	0,000	1,000	0,000
Hong Kong	0,000	0,000	0,000	0,000	1,000
India	0,156	-0,761	2,807	-2,841	0,291
Indonesia	46723,62	1513148	-130200,200	217160,6	-17433,120
Japan	1,394	-187,474	44,473	-76,151	5,287
Malaysia	-1,927	-494,790	5,751	-59,798	0,934
Mexico	-0,242	-9,934	0,977	-1,181	0,004
Philippines	-0,288	13,485	-5,051	4,003	0,190
Poland	0,081	5,281	-0,763	0,846	-0,088
Singapore	11,422	272,987	3,235	26,195	-0,496
South Korea	2,078	52,611	-11,092	11,751	-1,335
Thailand	-4,803	-102,890	9,102	-11,334	0,152
USA	0,484	3,246	-3,095	0,554	-0,271
Venezuela	0,031	0,396	-0,044	0,071	-0,009
α -coefficients	Equation 1	Equation 2	Equation 3	Equation 4	Equation 5
Chile	-0,047	-0,001	0,047	0,037	-0,056
Colombia	1,737	-0,065	0,548	0,408	0,245
France	0,091	-0,003	-0,009	0,020	0,062
Great Britain	0,135	0,001	0,087	- 0,043	0,130
Hong Kong	-0,003	-0,001	0,009	0,009	- 0,066
India	0,014	-0,008	0,141	0,096	-0,421
Indonesia	1,87E-06	0,000	1,03E-06	2,98E-07	1,15E-05
Japan	0,005	0,000	0,002	0,001	0,003
Malaysia	0,104	-0,001	-0,013	-0,007	0,173
Mexico	0,858	-0,019	0,203	0,192	1,134
Philippines	0,148	-0,003	0,038	-0,001	-0,252
Poland	2,654	-0,061	0,157	0,024	2,091
Singapore	0,132	-0,001	-0,016	-0,012	0,245
South Korea	0,006	0,003	0,005	-0,008	0,150
Thailand	-0,001	0,002	-0,003	-0,005	0,109
USA	-0,023	0,004	0,041	0,010	0,044
Venezuela	-4,140	0,021	1,165	0,956	-3,981

The signs of all parameters of the long-run cointegration vectors are as expected and their sizes are significant except Indonesia. Therefore, Indonesian stock market will not be seen as a cointegrated emerging stock market for further analysis. The reason behind that could be to some degree the independence of the Indonesian market from other ASEAN markets and the rest of the world which may have been driven by the chronic political and economic uncertainties faced by the country before the crisis. Moreover, due to these precariousness, international investors may regard the Indonesian market as a unique market among the ASEAN countries.

Countries like Japan, Malaysia, Singapore and Thailand report also high β -coefficients in some equations. An alternative notation for Equation 1, 2, 3, 4 and 5 can be seen below:

$$\begin{aligned} \text{chile} = & (0.156*\text{india}) + (1.394*\text{japan}) - (1.927*\text{malaysia}) - \\ & (0.242*\text{mexico}) - (0.288*\text{philippines}) + (0.081*\text{poland}) + \\ & (11.422*\text{singapore}) + (2.078*\text{south korea}) - (4.803*\text{thailand}) + \\ & (0.484*\text{usa}) + (0.031*\text{venezuela}) \end{aligned} \quad (4.1)$$

$$\begin{aligned} \text{colombia} = & - (0.761*\text{india}) - (187.474*\text{japan}) - (494.790*\text{malaysia}) - \\ & (9.934*\text{mexico}) + (13.485*\text{philippines}) + (5.281*\text{poland}) + \\ & (272.987*\text{singapore}) + (52.611*\text{south korea}) - (102.890*\text{thailand}) + \\ & (3.246*\text{usa}) + (0.396*\text{venezuela}) \end{aligned} \quad (4.2)$$

$$\begin{aligned} \text{france} = & (2.807*\text{india}) + (44.473*\text{japan}) + (5.751*\text{malaysia}) + \\ & (0.977*\text{mexico}) - (5.051*\text{philippines}) - (0.763*\text{poland}) + \\ & (3.235*\text{singapore}) - (11.092*\text{south korea}) + (9.102*\text{thailand}) - \\ & (3.095*\text{usa}) - (0.044*\text{venezuela}) \end{aligned} \quad (4.3)$$

$$\begin{aligned} \text{great britain} = & - (2.841*\text{india}) - (76.151*\text{japan}) - (59.798*\text{malaysia}) - \\ & (1.181*\text{mexico}) + (4.003*\text{philippines}) + (0.846*\text{poland}) + \\ & (26.195*\text{singapore}) + (11.751*\text{south korea}) - (11.334*\text{thailand}) + \\ & (0.554*\text{usa}) + (0.071*\text{venezuela}) \end{aligned} \quad (4.4)$$

$$\begin{aligned}
\text{hong kong} = & (0.291*\text{india}) + (5.287*\text{japan}) + (0.934*\text{malaysia}) + \\
& (0.004*\text{mexico}) + (0.190*\text{philippines}) - (0.088*\text{poland}) - \\
& (0.496*\text{singapore}) - (1.335*\text{south korea}) + (0.152*\text{thailand}) - \\
& (0.271*\text{usa}) - (0.009*\text{venezuela})
\end{aligned} \tag{4.5}$$

Regarding Chilean stock market, the first cointegration vector indicates a stationary long-run relationship in which its stock market depends heavily on Singaporean and Thai markets. According to **(4.1)**, a 1% permanent increase in the Thai stock index causes the Chilean stock index to increase by 4.8%. Contrarily, a permanent 1% increase in Singaporean stock market is associated with a 11.4% reduction in Chilean stock index.

Regarding Colombian stock market, the second cointegration vector indicates a stationary long-run relationship in which its stock market depends heavily on Singaporean and Malaysian markets. According to **(4.2)**, a 1% permanent increase in the Singaporean stock index causes the Colombian stock index to decrease by 272.9%. Contrarily, a permanent 1% increase in Malaysian stock market is associated with a 494.8% increase in Colombian stock index.

Regarding French stock market, the third cointegration vector indicates a stationary long-run relationship in which its stock market depends heavily on Japanese and South Korean markets. According to **(4.3)**, a 1% permanent increase in the South Korean stock index causes the French stock index to increase by 11.09%. Contrarily, a permanent 1% increase in Japanese stock market is associated with a 44.47% reduction in French stock index.

Regarding British stock market, the fourth cointegration vector indicates a stationary long-run relationship in which its stock market depends heavily on Singaporean and Japanese markets. According **(4.4)**, a 1% permanent increase in the Japanese stock index causes the British stock index to increase by 76.15%. Contrarily, a permanent 1% increase in Singaporean stock market is associated with a 26.20% reduction in British stock index.

Regarding Hong Kongese stock market, the fifth cointegration vector indicates a stationary long-run relationship in which its stock market depends heavily on

Japanese and South Korean markets. According to **(4.5)**, a 1% permanent increase in the South Korean stock index causes the Hong Kongese stock index to increase by 1.34%. Contrarily, a permanent 1% increase in Japanese stock market is associated with a 5.29% reduction in Hong Kongese stock index.

These results suggest that generally, Singaporean and Japanese markets play a dominant role for the long-run stock market equilibrium before the crisis. Currently, Japan and Singapore seem to offer regional leadership, as they both employ the most important influence on the other Asian financial markets. In the long-run, the findings imply that the influence of Singapore and Japan on the emerging markets has enhanced since the Asian financial crisis of 1997.

Furthermore, according to Johansen procedure the model assumes at most 9 long-run cointegration relationships during the crisis period. The first five cointegration vectors during the crisis period can be seen at Table 4.4.

Table 4.4: Restricted cointegration estimation: long-run equations and speed-of-adjustment coefficients (during the crisis period).

β -coefficients	Equation 1	Equation 2	Equation 3	Equation 4	Equation 5
Chile	1,000	0,000	0,000	0,000	0,000
Colombia	0,000	1,000	0,000	0,000	0,000
France	0,000	0,000	1,000	0,000	0,000
Great Britain	0,000	0,000	0,000	1,000	0,000
Hong Kong	0,000	0,000	0,000	0,000	1,000
India	-0,126	-10,451	-1,606	-0,114	-0,013
Indonesia	-2555,392	-28356,200	27439,10	3182,735	39,614
Japan	2,283	439,018	-71,437	-478,174	7,599
Malaysia	-1,396	28,032	-8,494	-5,623	-1,328
Mexico	0,109	3,813	1,113	0,747	-0,023
Philippines	-1,432	8,197	-5,639	5,236	0,187
Poland	-0,010	-3,442	-0,363	-0,154	-0,023
Singapore	0,008	-27,423	-7,433	-0,643	0,155
South Korea	0,485	10,035	-5,882	-5,459	-0,417
Thailand	0,295	-198,783	25,840	18,910	1,966
USA	3,280	95,628	27,711	3,448	-0,971
Venezuela	-0,066	-1,861	-0,419	-0,366	0,018
α -coefficients	Equation 1	Equation 2	Equation 3	Equation 4	Equation 5
Chile	-0,078	0,023	-0,138	-0,026	-0,991
Colombia	-11,266	-0,018	0,338	-0,411	1,879
France	0,901	0,100	-0,626	-0,013	-1,804
Great Britain	-1,178	-0,023	0,142	- 0,016	-1,339
Hong Kong	0,246	0,007	-0,092	-0,002	-0,141
India	0,691	0,026	-0,157	0,003	0,116
Indonesia	1,69E-05	9,81E-07	3,30E-06	0,000	0,000
Japan	1,769	0,491	-2,261	0,121	-21,034
Malaysia	-3,056	0,002	0,124	0,021	-1,833
Mexico	0,021	0,001	-0,005	0,002	-0,040
Philippines	0,239	0,003	0,036	-0,033	0,241
Poland	1,481	0,175	-1,045	0,160	-5,615
Singapore	0,080	-0,032	0,141	0,014	0,330
South Korea	3,543	0,619	-2,698	-0,253	-13,027
Thailand	-0,026	0,040	-0,152	0,012	-2,444
USA	-0,099	0,004	0,013	0,028	0,156
Venezuela	-0,014	0,001	0,006	-0,004	0,008

The signs of all parameters of the long-run cointegration vectors are as expected and their sizes are reasonable again except Indonesia. Therefore, Indonesian stock market will not be seen as a cointegrated emerging stock market for further analysis. It could again be asserted that among the markets, Indonesia was found to be relatively independent of other ASEAN markets. However, it should be underscored that due to the substantial participation and growing attention of international investors in investing in developing markets, the developments in the other markets will become more crucial for Indonesia.

Countries like Japan, Thailand and USA report also high β -coefficients in some equations. An alternative notation for Equation 1, 2, 3, 4 and 5 can be seen below:

$$\begin{aligned} \text{chile} = & - (0.126*\text{india}) + (2.283*\text{japan}) - (1.396*\text{malaysia}) + \\ & (0.109*\text{mexico}) - (1.432*\text{philippines}) - (0.010*\text{poland}) + \\ & (0.008*\text{singapore}) + (0.485*\text{south korea}) + (0.295*\text{thailand}) + \\ & (3.280*\text{usa}) - (0.066*\text{venezuela}) \end{aligned} \quad (4.6)$$

$$\begin{aligned} \text{colombia} = & - (10.451*\text{india}) + (439.018*\text{japan}) + (28.032*\text{malaysia}) \\ & + (3.813*\text{mexico}) + (8.197*\text{philippines}) - (3.442*\text{poland}) - \\ & (27.423*\text{singapore}) + (10.035*\text{south korea}) - (198,783*\text{thailand}) + \\ & (95.628*\text{usa}) - (1.861*\text{venezuela}) \end{aligned} \quad (4.7)$$

$$\begin{aligned} \text{france} = & - (1.606*\text{india}) - (71.437*\text{japan}) - (8.494*\text{malaysia}) + \\ & (1.113*\text{mexico}) - (5.639*\text{philippines}) - (0.363*\text{poland}) - \\ & (7.433*\text{singapore}) - (5.882*\text{south korea}) + (25.840*\text{thailand}) + \\ & (27.711*\text{usa}) - (0.419*\text{venezuela}) \end{aligned} \quad (4.8)$$

$$\begin{aligned} \text{great britain} = & - (0.114*\text{india}) - (478.174*\text{japan}) - (5.623*\text{malaysia}) + \\ & (0.747*\text{mexico}) + (5.236*\text{philippines}) - (0.154*\text{poland}) - \\ & (0.643*\text{singapore}) - (5.459*\text{south korea}) + (18.910*\text{thailand}) + \\ & (3.448*\text{usa}) - (0.366*\text{venezuela}) \end{aligned} \quad (4.9)$$

$$\begin{aligned} \text{hong kong} = & - (0.013*\text{india}) + (7.599*\text{japan}) - (1.328*\text{malaysia}) - \\ & (0.023*\text{mexico}) + (0.187*\text{philippines}) - (0.023*\text{poland}) + \\ & (0.155*\text{singapore}) - (0.417*\text{south korea}) + (1.966*\text{thailand}) - \\ & (0.971*\text{usa}) + (0.018*\text{venezuela}) \end{aligned} \quad (4.10)$$

Regarding Chilean stock market, the first cointegration vector indicates a stationary long-run relationship in which its stock market depends mostly on US and Philippine markets. According to **(4.6)**, a 1% permanent increase in the Philippine stock index causes the Chilean stock index to increase by 1.4%, i.e. a one-step increase of output to a new higher sustained level. Contrarily, a permanent 1% increase in US stock market is associated with a 3.3 % reduction in Chilean stock index. It can be claimed that the close and strong relation between Chilean - Singaporean and Chilean - Thai markets diminished significantly with respect to the period before the crisis.

Regarding Colombian stock market, the second cointegration vector indicates a stationary long-run relationship in which its stock market depends heavily on Japanese and Thai markets. According to **(4.7)**, a 1% permanent increase in the Thai stock index causes the Colombian stock index to increase by 198.78%. Contrarily, a permanent 1% increase in Japanese stock market is associated with a 439.02% decrease in Colombian stock index. It can be claimed that the relation between Colombian - Singaporean and Colombian - Malaysian markets shifted significantly to the relation between Colombian - Japanese and Colombian - Thai markets during the crisis.

Regarding French stock market, the third cointegration vector indicates a stationary long-run relationship in which its stock market depends heavily on Japanese and US markets. According to **(4.8)**, a 1% permanent increase in the Japanese stock index causes the French stock index to increase by 71.44%. Contrarily, a permanent 1% increase in US stock market is associated with a 27.71% reduction in French stock index. France still has a relation with Japan but its relation with South Korea diminished and changed to a relation with US market during the crisis.

Regarding British stock market, the fourth cointegration vector indicates a stationary long-run relationship in which its stock market depends heavily on Thai and Japanese markets. According **(4.9)**, a 1% permanent increase in the Japanese stock index causes the British stock index to increase by 478.17%. Contrarily, a permanent 1% increase in Thai stock market is associated with a 18.91% reduction in British stock index. Great Britain still has a relation with Japan but its relation with Singaporean market diminished and changed to a relation with Thai market during the crisis.

Regarding Hong Kongese stock market, the fifth cointegration vector indicates a stationary long-run relationship in which its stock market depends heavily on Japanese and Malaysian markets. According to **(4.10)**, a 1% permanent increase in the Malaysian stock index causes the Hong Kongese stock index to increase by 1.33%. Contrarily, a permanent 1% increase in Japanese stock market is associated with a 7.60% reduction in Hong Kongese stock index. Hong Kongese market still has a relation with Japanese market but its relation with South Korean market diminished and changed to a relation with Malaysian market during the crisis.

The results during the crisis period reveal that generally, US, Japanese and somewhat Thai markets have a negative impact on other markets. Given the crucial trade and financial interrelatedness between the US economy and Latin American, Asian economies it is suitable to argue that the US stock market has an important impact on these markets over the last years and therefore, during the period of the subprime mortgage crisis countries are inclined to move more closer in the long-run because of the US market. Moreover, it could be asserted that the Japanese financial market is subject to numerous asymmetric impacts. The negative effect of this market during the crisis might be assigned to the background of its long-lasting deflation and recession period that began in the 1990's. Additionally, the negative impact of Thai market could be accounted for the dependence of its economy to US and Japanese markets. Specially, since July 1997 when Thailand left its exchange rate peg against the US dollar and agreed the baht to float, its currency began to depreciate vis-à-vis the US dollar. Moreover, its stock market is heavily dependent on Japanese commercial bank lending.

As expected, the speed-of-adjustment coefficients, denoted α -parameters or feedback coefficients, of Chilean, Colombian, French, British and Hong Kongese stock indexes in **(4.1)** - **(4.10)** both have negative signs, which indicates the adjustment of these variables to their own long-run equilibrium condition.

4.1.2 Results from impulse response analysis

The results of impulse response analysis among 17 countries are presented in Table 4.5 and visually in Appendix. The estimated impulse responses offer an additional way of examining how each of the 16 markets responds to innovations from US

market where the subprime mortgage crisis emerged and spread to other markets. The transmitted shocks in US stock market are given in Table 4.5.

Table 4.5: Impulse responses to unit shock in the US market before and during the global crisis (data multiplied by 100).

i th week after shock	Chile	Colombia	France	Great Britain	Hong Kong	India	Indonesia	Japan
Pre-crisis								
1	0,000000	0,000000	0,000000	0,000000	0,000000	0,000000	0,000000	0,000000
2	0,01	-0,02	-0,02	-0,01	-0,02	-0,06	-0,00019	0,000419
3	0,06	-0,06	-0,02	0,02	-0,02	-0,09	0,000112	0,0000828
4	0,10	-0,06	-0,01	0,03	-0,01	-0,09	0,0000830	-0,0000184
5	0,01	-0,01	-0,00	0,03	-0,01	-0,09	0,00000730	-0,0000135
6	0,01	-0,02	0,00	0,03	-0,01	-0,10	0,000000690	-0,000000424
7	0,10	-0,02	0,00	0,03	-0,01	-0,10	-0,0000000411	0,000000170
8	0,08	-0,03	0,02	0,03	-0,01	-0,10	0,000000124	0,000000189
9	0,06	-0,03	0,02	0,04	-0,01	-0,01	0,00000000503	0,0000000337
10	0,04	-0,03	0,02	0,04	-0,01	-0,01	0,0000000108	0,0000000124
i th week after shock	Malaysia	Mexico	Philippines	Poland	Singapore	South Korea	Thailand	Venezuela
Pre-crisis								
1	0,000000	0,000000	0,000000	0,000000	0,000000	0,000000	0,000000	-0,03
2	-0,02	-0,04	-0,04	0,01	-0,03	-0,02	0,01	-0,02
3	-0,02	-0,03	-0,02	-0,04	-0,04	-0,03	0,01	-0,02
4	-0,02	-0,04	-0,02	-0,02	-0,02	-0,03	0,02	-0,02
5	-0,02	-0,05	-0,02	-0,06	-0,02	-0,03	0,02	-0,02
6	-0,02	-0,05	-0,03	-0,08	-0,01	-0,03	0,02	-0,01
7	-0,02	-0,06	-0,03	-0,09	-0,01	-0,03	0,03	-0,01
8	-0,02	-0,06	-0,04	-0,09	-0,01	-0,02	0,03	-0,01
9	-0,02	-0,07	-0,04	-0,10	-0,01	-0,02	0,03	-0,01
10	-0,02	-0,07	-0,04	-0,10	-0,01	-0,01	0,04	-0,10

Table 4.5 (continued): Impulse responses to unit shock in the US market before and during the global crisis (data multiplied by 100).

i th week after shock	Chile	Colombia	France	Great Britain	Hong Kong	India	Indonesia	Japan
During the crisis								
1	0,000000	0,000000	0,000000	0,000000	0,000000	0,000000	0,008832	0,000000
2	0,10	0,05	0,14	0,04	0,02	0,05	-0,0000669	-0,000146
3	0,09	0,05	0,07	0,03	0,01	0,03	-0,0000143	0,0000362
4	0,06	0,03	0,01	-0,03	0,05	0,04	0,00000446	-0,0000348
5	0,04	0,04	-0,00	-0,05	0,04	0,04	0,000000446	-0,000000266
6	0,02	0,03	-0,03	-0,12	0,03	0,03	0,000000216	-0,000000150
7	-0,04	0,02	-0,07	-0,02	-0,07	0,02	-0,0000000720	-0,0000000787
8	-0,02	0,09	-0,09	-0,03	-0,03	0,02	0,00000000741	0,00000101
9	-0,02	0,02	-0,11	-0,04	-0,04	0,02	0,00000000441	0,0000000108
10	-0,03	0,09	-0,12	-0,04	-0,06	0,02	0,00000000334	0,0000000798
i th week after shock	Malaysia	Mexico	Philippines	Poland	Singapore	South Korea	Thailand	Venezuela
During the crisis								
1	0,00	0,000000	0,000000	0,000000	0,000000	0,000000	0,000000	0,02
2	0,02	0,05	0,02	0,03	0,03	0,09	0,05	0,07
3	0,10	0,04	0,02	0,02	0,02	0,08	0,01	0,02
4	0,03	-0,06	0,01	0,01	0,08	0,06	0,01	0,01
5	0,02	-0,07	0,07	0,02	0,06	0,02	-0,01	0,01
6	-0,01	-0,01	0,06	-0,05	0,01	-0,01	-0,01	0,02
7	-0,04	-0,02	0,04	-0,09	-0,03	-0,03	-0,03	0,01
8	-0,07	-0,02	0,03	-0,08	-0,06	-0,04	-0,03	0,10
9	-0,08	-0,01	0,04	-0,07	-0,07	-0,05	-0,04	0,07
10	-0,10	-0,02	0,03	-0,09	-0,10	-0,06	-0,04	0,06

Impulse responses trace out the responsiveness of the dependent variable in the VAR model to shocks to each of the explanatory variables. If the effect of a shock is permanent, it shifts the system to a new equilibrium in the long-run. If the effect is transitory, the system returns to its previous equilibrium, and the impact dies out soon. In case of strong market linkages, deviations from the equilibrium are short lived. The pattern of the impulse response of each stock market to a shock in the US stock market is examined in the pre-crisis period and during the crisis. Table 4.5 shows that neither the Indonesian nor the Japanese stock market responds to shocks in US market before the crisis and during the crisis. A one-standard deviation shock to US stock market is rapidly transmitted to all other stock indices before and during the crisis except Japanese and Indonesian stock markets. Generally, the responses of emerging stock markets to a US shock before the crisis tapers off rapidly, except for Poland and Venezuela. In that time period, the impulse responses of Poland and Venezuela to a US shock remain as high as -0,10 at the end of 10 weeks. For that reason, it appears that a shock in the US has a persistent impact on the Polish and Venezuelan markets. Furthermore, a shock in US has a significant impact on the Chilean and Indian market before the crisis, given that the impulse response coefficient remains at 0,10 even at the end of a 7-week and a 8-week horizon, respectively. Besides, the responses of emerging stock markets to a US shock during the crisis tapers off rapidly, except for France, Malaysia and Singapore whose impulse response coefficients remain as high as -0,12; -0,10 and -0,10, respectively. It could be asserted that a shock in the US has a persistent impact on the French, Malaysian and Singaporean markets. In addition to this, a shock in US has a significant impact on the British and Venezuelan market during the crisis, given that the impulse response coefficient remains at -0,12 and 0,10 even at the end of a 6-week and a 8-week horizon, respectively. Results of impulse response analysis can be seen graphically in the Appendix.

When interpreting these results, it should be noted that Latin American equity markets seem to respond differently to shocks originating from US stock market. As an example, a shock originating from US stock market has a persistent impact on Venezuela whereas its effect for Chile lasts only for the period before the crisis. This can be explained by the different degree of financial liberalization of these countries. Venezuela has a bilateral trade treaty with USA on oil and its market is heavily

dependent upon the US market. In the case of Chile, its imports and exports comprising European countries are much less compared with those of Mexico and Brazil. This result is consistent with the view that capital flows were comparatively tighter in Chile. In the past, the Chilean government asked for foreign investors to provide a fixed percentage of their investment as collateral with the Central Bank of Chile. This would make it more difficult for foreign capital to escape out of Chile, thereby making its financial market more isolated against foreign shocks, like that of US. Similarly, the effect of US market on the Polish market is due to the degree of financial liberalization of the latter. As a former Iron Curtain country, Poland experienced its financial liberalization with the fall of Berlin Wall. However, the size of its stock market is not large enough which points at the partial but strong impact of US shocks before the period of crisis. Similarly, effects of shocks on the Indian market tend to last relatively long before the period of crisis. India, like Japan, is subject to numerous asymmetric impacts. Similarly, the recession and long-lasting deflation period in the 1990's might affect the Indian market comparatively for a shorter period of time. It could be asserted that positive equity shocks might play the role for growth signals, giving grounds to turn away from its lasting zero interest rate policy. In turn, such levels of interest rate increases to reassure Indian foreign exchange market, reducing its variance. Interestingly but significantly, Indonesian and Japanese markets don't respond to US shocks neither before nor during the crisis. It should be added that the Japanese economy and banking industry are less open and less integrated than other Asian banking systems. While the Japanese economy is broad and overseas trade and investment is significant, the economy is also less open than the other developed economies. Therefore, it is not surprising that Japanese market does not respond to US shocks before the crisis. Additionally, the Indonesian stock market also does not respond to shocks originating from US stock market. It could be asserted that the stronger the bilateral trade linkages between the economies, the greater the transmission of shocks between them. Since Indonesia is a country that has weaker bilateral trade relations with USA, its stock market does not react to shocks arising from US market before and during the current global crisis. Additionally, it is not surprising that shocks originating from US stock market have a relatively long-term effect on British market because of its historical and financial partnership in the Anglo-Saxon world. In addition to these, during the crisis US shocks are influential so that they reflect similar patterns for Malaysian, Singaporean

and French markets. Because of the similar results of variance decomposition analysis, financial reasons behind that similar pattern is discussed in the next section.

4.1.3 Results from variance decomposition analysis

The proportion of market movements that can be explained by its own shocks, or the ‘degree of exogeneity’, before and during the period of the crisis can be seen in Table 4.6. It indicates that the ‘degree of exogeneity’ for all countries has been significantly reduced, implying no countries are exogenous to the financial crisis. It can be asserted that prior to the crisis, some of the markets, like France, Chile and Colombia, are pretty exogenous in the sense that a very high percentage of the error variance is accounted for by their own innovations. It should be added that the banking system and economy of Colombia are small and less developed which makes it more closed to international impacts. Similarly, with its strict capital flows and isolated financial market, error variances of Chilean market can be explained by its own innovations. Furthermore, the degree of exogeneity in two markets, Malaysia and Singapore, was reduced less (7,76 and 3,07, respectively). This also suggests that these markets passively responded to other country’s innovations during the period of the global financial crisis. Furthermore, it should be underlined that as a small open economy, Singapore is very responsive to innovations in major stock markets. Although a few other markets (particularly the UK) also have some influence on Singapore, historically the US and Japan have the strongest and more consistent influence on Singapore. Moreover, the results indicate that the Malaysian market may also be a responsive Asian market to external influence. However, inspite of the acceptance of capital controls by the Malaysian government during the period from 1998 to 2005, Singapore seems to have close causal associations with Malaysian market. Thus, not surprisingly, Malaysian market is highly connected with Singaporean market across all the periods.

Table 4.6: The comparison of ‘degree of exogeneity’ before and during the period of the crisis.

	Before the crisis (1)	During the crisis (2)	Difference (1) - (2)
Chile	78,02	33,97	44,05
Colombia	73,15	35,24	37,91
France	85,51	54,54	30,97
Great Britain	61,31	36,77	24,54
Hong Kong	44,35	29,77	14,58
India	48,8	22,55	26,25
Indonesia	50,26	11,84	38,42
Japan	56,61	16,68	39,93
Malaysia	22,83	15,07	7,76
Mexico	30,63	15,16	15,47
Philippines	44,26	14,54	29,72
Poland	33,97	12,08	21,89
Singapore	5,63	2,56	3,07
South Korea	39,54	15,36	24,18
Thailand	57,44	18,99	38,45
USA	62,58	33,11	29,47
Venezuela	74,53	57,47	17,06

Based on these results, a quantitative measure of the short-run dynamic interdependences of 17 stock markets is provided.

Table E.1 and E.2 in the Appendix section document the decomposition of innovations; in other words, it reflects the percentage of forecast error variance of one stock market explained by innovations in other markets. According to this, stronger interactions are documented during the period of crisis. Specifically, across the markets, Singapore is the least exogenous market. Furthermore, France appears to be the least interactive market before the period of crisis and most of the Asian countries are somewhat affected more by it. As an example, for Hong Kong, Malaysia, Singapore and South Korea about 13, 13, 22 and 11 percent of the forecast error variance of their stock markets is accounted for by French innovations, respectively. This may be due to the strong financial position of France in the EU region. As an example, in 1999, before the implementation of the Euro as the single monetary in the EU, France had low inflation, large stock market capitalization and comparatively high growth. Perhaps, entering the Euro enhanced the opportunities of international diversification of portfolios and the regulation of French Franc more effectively which made France a leading country together with Germany in the Euro zone. Therefore, it is not surprising that French innovations could have an effect in Southeast Asia. Moreover, according to the results, developed markets like that of Great Britain have a minor role in effecting the emerging markets before and during the period of crisis. Furthermore, during the period of crisis Hong Kongese market has an influential role in explaining the error variances of Indian, Indonesian, Japanese, Malaysian, Philippine, Singaporean and South Korean markets, given that the explained error variances are at 14,04; 10,48; 7,22; 16,79; 7,23; 14,55 and 10,63 percent, respectively. This suggests that in addition to Japan, Hong Kong plays a regional leadership in Asia. Nevertheless, Hong Kong's influence became weakened during and after the Asian financial crisis of 1997. Although Hong Kong's market is a leader to some Asian markets, in the case of this financial crisis, its leadership could be seen as indirect and secondary to that of Japan and other major markets such as the US. Additionally, error variances of Singaporean market are explained by Malaysian market in both periods. Since Malaysia and Singapore are recognized as the two markets in the region that are geographically and economically attached to each other, the highest interdependency is expected to be observed between them. The higher interrelatedness of Malaysia and Singapore could be partly due to their higher level of financial liberalization such as capital control, exchange rate, and interest rate liberalization. Interestingly, South Korean innovations account for

forecast error variances in Japanese and incidentally in Polish markets during the period of crisis.

4.2 International Market Value and Volatility Calculations

With respect to the theoretical background discussed in the Methodology section, the international macroeconomic market value of a national economy and its return on investment can be calculated step by step as follows:

First, the net fixed capital formation for all countries is gathered for all countries prior to the global financial liberalization which indicates the last quarter of 1988. Gross fixed capital formation statistically measures the value of acquisitions of new or existing fixed assets by the business sector, governments and "pure" households (excluding their unincorporated enterprises) less disposals of fixed assets. Thus, net fixed capital formation can be found by subtracting the depreciation of existing assets from gross capital formation. The net fixed capital formation is given in the Appendix section of this work. With the help of balance of payments of national accounts, net capital value for each period is calculated by adding the net investment (gross investment minus depreciation) to the value of the economy for the last time period. At this point, net investment refers to an activity of spending which increases the availability of fixed capital goods or means of production. It is the total spending on new fixed investment minus replacement investment, which simply replaces depreciated capital goods. Then, dividing by the national currency/\$ exchange rate, it gives the economy's market value in dollars at the end of each period. Table F.1 in the Appendix section depicts the macroeconomic international market values of 17 economies.

Furthermore, using **(3.31)** given in the methodology section, the return series for all national economies are generated.

According to this work, two different types of volatility are calculated and forecasted, namely stock market and macroeconomic. In order to compare the forecast performance of ARCH-type models in volatility modeling firstly the appropriate model is determined via time series analysis. Secondly, the relevant ARCH-type model is implemented. As mentioned before, the time span for stock market returns is between July 2001 and January 2010 whereas the quarterly data for

macroeconomic returns begins at the first quarter of 1989 and ends at the end of last quarter of 2009 which marks the era of financial liberalization. In order to save space, calculated macroeconomic and stock market returns are given in the supplementary CD.

After organizing the data, appropriate volatility models for stock market and macroeconomic returns are calculated by adding (if necessary) a moving average and/or an autoregressive term to the mean and variance equation, respectively. The relevant equations for mean and variance are given in the additional CD. Furthermore, conditional variance forecast performance of models is presented. Particularly, one-step ahead forecast is carried on using static forecast. In order to contrast the weekly and quarterly volatility results, last three years of the time span is forecasted due to data availability. Moreover, coefficient of correlation between squared residuals and conditional variance is given for further analysis. The forecast performance of volatility models for 17 stock market and macroeconomic returns is given in the figures presented in the Appendix section of this work.

In general, it can be asserted that the forecast performance of stock market volatility outperforms the forecast performance of macroeconomic volatility. From the literature of financial time series it is clear that any ARCH-type process accepts that the conditional variance is subject to all previous squared residuals. In other terms, the lagged volatility or squared error of a financial asset may have a substantial effect on the current volatility of itself. With respect to this theoretical background, it can be proposed that stock markets reflect the volatile behavior of periods with global financial turmoil better than national economies where the related return, thus volatility, is calculated with the help of balance of payments. One reason for these different results can be the nature of the data used in the macroeconomic volatility calculations. The data and model propose that expected variation in excess returns is an crucial source of volatility. ARCH models and other econometric approaches display that the conditional variance of returns is highly varying and because of the nature of financial environment forecast problems can take place. It is known that variations in conditional variance are most drastic in daily, weekly or monthly data and are much weaker at lower frequencies. Generally, for financial markets research high-frequency data is more favorable to lower frequency data as it detects the dynamic interdependencies that take place within a shorter period of time, a

characteristic that cannot be observed by low frequency data. Financial markets in general, and the stock market in particular, react promptly to new information. Thus, lower frequency data distorts such reactions. Moreover, there is some business-cycle fluctuation in volatility, but it does not appear powerful enough to analyze large movements in aggregate returns (Bollerslev et al., 1992; Schwert 1989). Although such problems are likely to be less severe at shorter time spans, the analyzed volatility of quarterly macroeconomic data could still be damaged by inadequate estimation which would tend to influence the outcomes towards not finding any informative results regarding macroeconomic volatility. In detail, Mexican, South Korean and US stock markets have efficient volatility forecasts. On the other hand, Indonesian, Colombian and Japanese national economies reflect macroeconomic volatility clustering in a prominent way.

A more precise indicator which reflects the forecast performance of volatility models is the coefficient of correlation between squared residuals and conditional variance which is given for stock market and macroeconomic returns in Table 4.7 and 4.8, respectively.

Table 4.7: Coefficient of correlation between squared residuals and conditional variance for 17 stock market returns.

Chile	0.258933	Mexico	0.553951
Colombia	0.143919	Philippines	0.184379
France	0.391599	Poland	0.338140
Great Britain	0.352519	Singapore	0.380642
Hong Kong	0.430795	South Korea	0.473411
India	0.287346	Thailand	0.324004
Indonesia	0.259025	USA	0.451143
Japan	0.171582	Venezuela	0.319888
Malaysia	0.381708		

Table 4.8: Coefficient of correlation between squared residuals and conditional variance for 17 macroeconomic returns.

Chile	0.203143	Mexico	0.252007
Colombia	0.516953	Philippines	0.165204
France	0.065309	Poland	0.329637
Great Britain	0.280172	Singapore	0.021364
Hong Kong	0.144879	South Korea	0.338397
India	0.031496	Thailand	0.280226
Indonesia	0.910118	USA	0.011922
Japan	0.500395	Venezuela	0.268888
Malaysia	0.379356		

According to the finance literature, GARCH models are employed to perceive different sorts of volatility clustering behavior where volatility clustering signifies the empirical fact that if after a market shock volatility increases then it tends to remain high for a while, even without additional bad news in the market. As far as any ARCH-type process accepts that the conditional variance is subject to all previous squared residuals, clustering is also apparent in coefficient of correlation between squared residuals and conditional variance. Specially, during times of crisis these correlations too are likely to increase (Alexander, 2008). According to the results, weekly stock market returns exhibit more persistent conditional volatility than that of quarterly macroeconomic returns with some exceptions and because of the nature of the model, correlations become more persistent as common shocks should last for longer periods. In depth, the correlation coefficient between squared residuals and conditional variance for 17 stock market returns range from 0,14 up to 0,55. The highest correlation is obtained for Mexican stock market which is followed by that of South Korean and US markets, respectively. On the other hand, the correlation coefficient between squared residuals and conditional variance for 17 macroeconomic returns range from 0,01 up to 0,91 which indicates a wide range. Interestingly, correlation between squared residuals and conditional variance for

Indonesian national economy is the highest which is followed by that of Colombian and Japanese economies, respectively. Moreover, it can be asserted that forecast performances of macroeconomic volatilities for US, Singaporean, Indian and French economies are very poor considering the coefficient of correlation. The dependency of lagged volatility of macroeconomic returns does not have any significant impact on the current volatility of itself for those economies.

In particular, relatively high correlation coefficient for Mexican, South Korean and US stock markets indicates an increase in volatility spillovers from a shock to US stock market after the 2007 global financial crisis. This finding is supported by the literature which confirms that financial crisis increase volatility spillovers. This increase in the spillover effect between the US, Mexican and South Korean stock markets after the 2007 subprime mortgage crisis could mean that equity market disturbances in US market are rapidly transmitted to these countries. For policy makers, these results suggest that these stock markets could be more susceptible to risk transmission from the US stock market. In case of Mexico, it is clear that Mexico has the biggest trade relationships with US among all the Latin American countries and the closest bonds given its membership to NAFTA and crossborder capital flows. Furthermore, because of the impacts of synchronization, liberalization and deregulation of the Mexican fiscal system and the dependence of its economy and infrastructure on US economy is particularly discernible. In case of South Korea, after having consented to strengthen its monetary and fiscal policies, the developing country, which is an important economic partner for the US economy, adhered in wide-ranging, market-oriented reforms of its financial and corporate segments and of its labor market policies which may cause to a higher degree of volatility spillovers. Furthermore, a relatively high correlation for US stock market indicates that the past volatility of US stock market returns may have a significant impact on the current volatility of themselves during the subprime mortgage crisis. US stock market, as the source of the global crisis, reflects a relatively high degree of volatility clustering.

As mentioned above, the forecast performance for macroeconomic returns are relatively efficient for Indonesian, Colombian and Japanese economies with respect to the correlation coefficient between squared residuals and conditional variance. In case of Indonesia, the correlation coefficient is 0,91 which outperforms the one for the Indonesian stock market whose magnitude is 0,26. This high difference may be

attributed to relatively low degree of development of its stock market. Moreover, level of its foreign capital controls, deregulating its national economy and bilateral trade connections may lead to a better forecast performance for macroeconomic volatility. The second economy whose forecast performance of macroeconomic volatility precedes that one for stock market volatility is Colombia. The reason for that can be the declaration of Colombian government to depreciate its national currency at a faster pace since the onset of the new millennium which obliges Colombian government to accept capital controls during the years preceding the 2007 crisis, leading to a crucial distortion in its national accounts. The third best forecast performance with respect to the correlation coefficient belongs to Japanese economy. A possible reason for the relatively high correlation between squared residuals and conditional variance can be the disclosure of Japanese economy towards untrammelled free capital flows. Since the Southeast Asian currency crisis in the late 1990's, the Japanese economy has been weakened. The Japanese banking industry was less effective with its banks enclosed with bad and doubtful debts. Therefore, Japanese government regulated its capital flows which causes the country be responsive to any financial shocks and make its national accounts more volatile. Apart from these three forecast performances, macroeconomic volatility forecast yields to poorer results for the other 14 economies. In case of four countries, namely US, Indian, Singaporean and French economies, the correlation coefficient between squared residuals and conditional variance is close to zero indicating that there is no significant impact for past macroeconomic volatilities of these economies on their current volatilities during the subprime mortgage crisis. Particularly, the macroeconomic data cannot capture the effects of the crisis which is totally absorbed by the stock markets. For the Singaporean economy, international capital flows may lie at the heart of an economic explanation. In particular, the impact could be rationalized by the function of the city-state as an Asian financial center, transmitting the exchange rate to the stock market through international portfolio shifts. France with its large stock market capitalization and India with its asymmetric impacts on the stock market may be the reason why volatility clustering can be explained with the help of stock market volatility. Finally, it can be asserted that US macroeconomic indicators cannot capture the spillover effects. The reason can be that US stock market is responsible for all the volatility clustering and spillover because of its large capitalization and universality.

5. CONCLUSION

The current global financial crisis has again given rise to the interactions of international financial markets, peculiarly during the last years of 2000's. Evaluating the advantages and disadvantages connected with financial globalization demands a pure understanding of the influence of international market integration and financial volatility. Therefore this work focuses on the analysis of the integration of 17 important stock markets and forecast performances of stock market and macroeconomic volatility for the period of last global, financial crisis. The results of the first section generally support the findings of previous literature on market integration. In order to examine the linkages of 17 national stock markets, cointegration, impulse response and variance decomposition analysis are performed, before and during the period of the global financial crisis of 2007. According to the results, it has been found that the cointegrational relationship had improved globally during the period of global crisis. The presence of cointegrating vectors indicates that the stock indices of the 17 market under study share long-run equilibriums. Moreover, the increase in number of cointegrating vectors indicates that markets under study tend to move more closely during the period of global crisis than before they did. Impulse response analysis shows similar patterns of shock transmission from U.S. market to other stock markets. However, there is no strong relationship for all emerging markets. Furthermore, the 'degree of exogeneity' for all countries has been significantly reduced during the period of global crisis, implying no countries are exogenous to the financial crisis. Interestingly, France appears to be the least interactive market before the period of crisis and most of the Latin American countries are somewhat affected more by it which may be due to its strong financial position in the E.U. region. Moreover, developed markets like that of Great Britain have a minor role in effecting the emerging markets before and during the period of crisis. Additionally, during the period of crisis Hong Kongese market has an influential role in explaining Indian, Indonesian, Japanese, Malaysian, Philippine, Singaporean and South Korean stock markets which may suggest that in addition to

Japan, Hong Kong plays a regional leadership in Asia. All these results imply that the stock market integration heavily depends on the financial issues like degree of financial liberalization of the country, size and geographical position of the stock market.

This work also has explored the effects of financial volatility during the last global crisis. According to the literature, volatility in financial markets increases severely during the crises. Moreover, the volatility of equity and stock market prices is generally considered as a pointer of financial fragility for the diverse parts of financial markets. This thesis, which underlines the importance of stock market volatility during financial crises, introduces another important tool to assess the volatility clustering behavior, namely macroeconomic volatility. To generate the ROI series of 17 national economies, national balance of payments are employed. Subsequently, via time series analysis the appropriate volatility model is determined. Additionally, volatility based on stock market returns and ROI is forecasted. It is known that any ARCH-type process assumes that the conditional variance depends on all previous squared residuals. Therefore, the forecast performance is compared with respect to the correlation coefficient between squared residuals and conditional variance. Thus, the key finding of this work is that the forecast performance of stock market volatility surpasses the forecast performance of macroeconomic volatility. The leading motive behind this result can be the nature of the data used in the macroeconomic volatility calculations. It is clear that changes in conditional variance are most dramatic in daily, weekly or monthly data and are much weaker at lower frequencies. Although such problems are likely to be less severe at shorter time spans, the analyzed volatility of quarterly macroeconomic data could still be damaged by inadequate estimation which would tend to influence the outcomes towards not finding any informative results regarding macroeconomic volatility.

Particularly, Mexican, South Korean and U.S. stock markets have efficient volatility forecasts. This increase in the spillover effect between the U.S., Mexican and South Korean stock markets after the 2007 subprime mortgage crisis could mean that equity market disturbances in U.S. market are rapidly transmitted to these countries. Mexico with its highest trade links with the U.S.A. and South Korea with its tightened fiscal and monetary policies and U.S.A. with its financial turmoil in the

global, financial crisis can explain why significant impact on the current volatility is evident in these stock markets.

On the other hand, there are only three economies in which the correlation coefficient between squared residuals and conditional variance for macroeconomic returns exceeds that one for stock market returns. Namely, Indonesian, Colombian and Japanese national economies reflect macroeconomic volatility clustering in a more effective way. Especially, Indonesian economy with 0,91 correlation coefficient takes the lead in forecast performance. This can be ascribed to its degree of its external capital controls, deregulation of its national economy and trade bilateral dependencies. Moreover, Colombian economy with its devaluation of its national currency and Japanese economy with its unrestricted free capital flows can lead to a better forecast performance of macroeconomic volatility. Finally, it should be noted that US economy, as the origin of the crisis, cannot capture the macroeconomic spillover effects which can be because of its large capitalization and universality of its stock market.

Given the divergent conclusions of this work, additional insights should be procurable through an exploration of an alternative set of financial markets. Moreover, it should be noted that emerging markets demonstrate an independent data source because of their low correlations with developed markets so that an increasing amount of research should be conducted in this field. Further research should also examine whether countries can deregulate financial systems without becoming vulnerable to crises. Additionally, the forecast performance of macroeconomic volatility should be extended, if possible, in higher frequency data, such as monthly returns. Otherwise, another study for a realizable model to efficiently forecast the macroeconomic data should be made. Another avenue for future research should be the detailed study of spillover effects by means of volatility models.

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APPENDICES

APPENDIX A: Balance of payments of national accounts

APPENDIX B: National currency/\$ exchange rate

APPENDIX C: Impulse responses

APPENDIX D: Return series and volatility results (CD-Rom)

APPENDIX E: Decomposition of innovations

APPENDIX F: International macroeconomic market value

APPENDIX G: Volatility forecast performances

APPENDIX A: Balance of payments of national accounts

Table A.1: Total GDP of national economies (in thousands of local currency).

	1989	1990	1991	1992	1993	1994	1995
Chile	7353700000	9245500000	12720000000	16123200000	19276500000	23714700000	28309200000
Colombia	20134595616	26924214988	34749381090	44609763883	58690750667	75826025849	94808392123
France	980533700	1033025000	1070021300	1107810800	1114698500	1154733200	1194600300
Great Britain	525274000	570283000	598664000	622080000	654196000	692987000	733266000
Hong Kong	536267000	598952000	690324000	805081000	927996000	1047470000	1115739000
India	4861800000	5686700000	6531200000	7483700000	8592200000	10127700000	11918100000
Indonesia	179608000000	210866000000	249969000000	282395000000	329776000000	382220000000	454514000000
Japan	409602000000	440125000000	468234000000	480492000000	484234000000	486552000000	493588000000
Malaysia	105233000	119081000	135124000	150682000	172194000	195461000	222473000
Mexico	548858000	738898000	949148000	1125330000	1256200000	1420160000	1837020000
Philippines	925444000	1077240000	1248010000	1351560000	1474460000	1692930000	1905950000
Poland	11831900	56027100	80882900	114944000	155780000	225098000	337222000
Singapore	58735700	66778100	74569900	80983900	93971400	107956600	119470000
South Korea	148197000000	178797000000	216511000000	245700000000	290676000000	340208000000	398838000000
Thailand	1857000000	2191100000	2506635000	2830914000	3165222000	3629341000	4186212000
USA	5484350000	5800530000	5992100000	6342300000	6667330000	7085150000	7414630000
Venezuela	1485540	2279260	3037490	4131480	5453900	8675170	13685700
	1996	1997	1998	1999	2000	2001	2002
Chile	31237300000	34722600000	36534900000	37138500000	40575300000	43536800000	46341800000
Colombia	113078939045	136653413517	157734941032	170177475774	196373851000	213582653000	232933484040

Table A.1 (continued): Total GDP of national economies (in thousands of local currency).

France	1227252700	1267425200	1323653000	1367966000	1441406000	1497209000	1548633000
Great Britain	781726000	830094000	879102000	928730000	976533000	1021828000	1075564000
Hong Kong	1229482000	1365026000	1292764000	1266669000	1317650000	1299220000	1277310000
India	13786200000	15271600000	17512000000	19520400000	21023100000	22789500000	24545600000
Indonesia	532568000000	627695000000	955753000000	1099730000000	1389769800000	1646322200000	1821833500000
Japan	504262000000	515249000000	504843000000	497629000000	502989900000	497719700000	491312200000
Malaysia	253732000	281795000	283243000	300764000	356401000	352579000	383213000
Mexico	2525580000	3174280000	3846350000	4594720000	5491710000	5809690000	6263140000
Philippines	2171920000	2426740000	2665060000	2976900000	3354730000	3631470000	3963870000
Poland	422436000	515353000	600902000	665688000	744377900	779563800	808578600
Singapore	130502000	142341300	137902400	140021700	159840400	153469200	158163800
South Korea	448596000000	491135000000	484103000000	529500000000	603235900000	651415300000	720539000000
Thailand	4611041000	4732610000	4626447000	4637079000	4922731000	5133502000	5450640000
USA	7838470000	8332350000	8793480000	9353500000	9951480000	10286200000	10642300000
Venezuela	29437700	41943100	50013000	59344600	79655700	88945600	107840000
	2003	2004	2005	2006	2007	2008	2009
Chile	51156400000	58303200000	66192600000	77830600000	85854526474	89234840517	91608433249
Colombia	263887767000	299066590000	335546938750	383322872000	431839018000	478359984000	493600218000
France	1594804000	1660175000	1726053000	1806426000	1894638000	1949341000	1920867000
Great Britain	1139746000	1202956000	1254058000	1325795000	1398882000	1448392000	1395872000
Hong Kong	1234760000	1291920000	1382590000	1475360000	1615430000	1676930000	1635249279
India	27546200000	31494100000	35867400000	41291700000	47234000000	53217500000	58169039322
Indonesia	2013674600000	2295826200000	2774281100000	3339479600000	3949321300000	4951357000000	5613442000000

Table A.1 (continued): Total GDP of national economies (in thousands of local currency).

Japan	490294000000	498328400000	501734500000	507364700000	515520400000	505114000000	474218700000
Malaysia	418769000	474048000	522445000	574441000	639776000	738677000	674433000
Mexico	7555803383	8557291268	9221553168	10344756970	11175985191	12110555265	11822986250
Philippines	4316400000	4871550000	5444040000	6031160000	6647340000	7423210000	7669139901
Poland	843156200	924537600	983302300	1060031400	1176736700	1272836800	1341880800
Singapore	162382100	185364500	201313300	221142800	251610100	257418500	257640400
South Korea	767113700000	826892700000	865241100000	908743800000	975013000000	1026451800000	1063059100000
Thailand	5928980000	6503490000	7102960000	7850190000	8529840000	9075490000	9047628009
USA	11142200000	11867700000	12638400000	13398900000	14077600000	14441400000	14258700000
Venezuela	134228000	212683000	304087000	396140000	489668000	686802000	725185000

Table A.2: Government Final Consumption Expenditure (in thousands of local currency).

	1989	1990	1991	1992	1993	1994	1995
Chile	741800000	901900000	1267310000	1617510000	2017940000	2420130000	2938540000
Colombia	2101568002	2731906808	3533318776	5217868310	7345128574	9774518415	12622508982
France	212099000	224473000	237803000	252619000	268297000	274220000	282971000
Great Britain	101720000	112483000	123841000	131632000	133781000	138278000	143032000
Hong Kong	36161000	43132000	51285000	63785000	72283000	83148000	93624000
India	579100000	660300000	742900000	839600000	977300000	1086400000	1298210000
Indonesia	16872000000	18953000000	22830000000	26879000000	29757000000	31014000000	35584200000
Japan	55008000000	56889500000	60871600000	64249300000	67014100000	71567800000	74663400000
Malaysia	14798000	16426000	18504000	19604000	21750000	23973000	27527000
Mexico	45382700	61949300	86162600	111752000	138565000	164161000	191981000
Philippines	88186000	108843000	123885000	130524000	149057000	182776000	217045000
Poland	706700	10488200	17690500	23819100	30406500	37853300	63027000
Singapore	6013000	6780000	7351000	7459000	8723200	9007600	10124000
South Korea	15587500000	18701700000	22690800000	26506200000	34413200000	38941500000	44686900000
Thailand	176798000	205354000	231127000	280203000	315982000	354387000	414403000
USA	901386000	964401000	1014140000	1047840000	1072170000	1104110000	1136500000
Venezuela	144370	191820	293210	379420	466020	627000	974820
	1996	1997	1998	1999	2000	2001	2002
Chile	3426050000	3860480000	4197120000	4603830000	5053860000	5480770000	5943920000
Colombia	18122879506	24246180527	28528426567	33588323961	37057829000	40837100000	43585036000
France	293590000	302595000	305720000	316721000	330077000	341214000	362175000
Great Britain	148767000	150652000	156490000	169652000	181972000	194584000	212577000
Hong Kong	103541000	112751000	116550000	119993000	120172000	128866000	131291000

Table A.2 (continued): Government Final Consumption Expenditure (in thousands of local currency).

India	1472040000	1740680000	2155380000	2527440000	2650880000	2817860000	2909780000
Indonesia	40299200000	42952000000	54415900000	72631300000	90779700000	113416000000	132219000000
Japan	77341100000	78963100000	80304000000	82207200000	84941700000	87122400000	88305600000
Malaysia	28178000	30341000	27670000	33044000	36229000	42448000	49656000
Mexico	243706000	314622000	399956000	506459000	612621000	683377000	759866000
Philippines	259501000	319935000	354406000	389238000	438858000	444834000	456904000
Poland	77236000	91578000	103996000	116017000	129831000	139457000	144651000
Singapore	12167400	13129300	13817600	13937000	17338500	18390300	19422800
South Korea	52138500000	56748700000	61980600000	65173600000	72100900000	83010000000	90930300000
Thailand	469516000	476705000	511691000	533041000	557807000	581117000	603891000
USA	1171110000	1216550000	1255970000	1334020000	1417090000	1501640000	1616890000
Venezuela	1475640	5675820	6735600	7309460	9916960	12663400	14027100
	2003	2004	2005	2006	2007	2008	2009
Chile	6146220000	6655430000	7317460000	8200460000	9424350000	10598800000	12318110000
Colombia	48294075000	52726924000	58561680000	64965981000	71474159000	78023646000	79052324022
France	378397000	393772000	408609000	422237000	436927000	451622000	433639346
Great Britain	232819000	251114000	268088000	285187000	294713000	313562000	328774000
Hong Kong	130151000	127327000	121435000	123033000	130398000	139537000	144609500
India	3102970000	3380520000	3755620000	4215460000	4790990000	6164470000	6582069046
Indonesia	163701000000	191056000000	224981000000	288080000000	329760000000	416867000000	517059100000
Japan	88502600000	89468000000	90601800000	90703300000	92417200000	93980200000	93865450000
Malaysia	54306000	59635000	64516000	68609000	78297000	92531000	89187000
Mexico	893844000	920896000	992393000	1080750000	1180740000	1248980000	1347698750

Table A.2 (continued): Government Final Consumption Expenditure (in thousands of local currency).

Philippines	477411000	492110000	527045000	589930000	646676000	713912000	819222000
Poland	152826000	162656000	177785000	193707000	211027000	217821000	239701500
Singapore	19437700	19987900	21422800	23449900	24450000	27525200	26728069
South Korea	100057000000	110128000000	120010000000	131901000000	143262000000	156328000000	168916100000
Thailand	635251000	721314000	838825000	925987000	1038760000	1128230000	1271286000
USA	1736510000	1844020000	1977850000	2093350000	2214970000	2386850000	2418950000
Venezuela	17276200	25428200	33619500	46044000	58067300	77352900	88698117

Table A.3: Private Final Consumption Expenditure (in thousands of local currency).

	1989	1990	1991	1992	1993	1994	1995
Chile	4422000000	5719600000	7941560000	10330300000	12458900000	14648700000	17270300000
Colombia	13660748729	18231734450	23834523681	31705501424	41664328678	53100874850	66164249533
France	560370800	589790000	611226400	632207100	641038700	658883500	676279200
Great Britain	326258000	354764000	375920000	395152000	421010000	442230000	465337000
Hong Kong	288697000	332809000	401412000	467135000	541082000	624409000	691708000
India	3387500000	3871400000	4462600000	5009800000	5747700000	6641600000	7517340000
Indonesia	95414000000	114693000000	137469000000	147709000000	192958000000	228119000000	279876000000
Japan	218442000000	234272000000	247563000000	258052000000	264149000000	267137000000	271656000000
Malaysia	52619000	61687000	70501000	75749000	83144000	94088000	106613000
Mexico	377907000	514117000	669159000	808120000	903174000	1016130000	1232000000
Philippines	649276000	767061000	916384000	1019210000	1122530000	1258750000	1411900000
Poland	6075700	27186700	48643100	71925000	99627300	142746000	203821000
Singapore	27664000	30847000	33536000	36415000	42231900	47183300	49084900
South Korea	77132300000	93504900000	113226000000	130028000000	149686000000	177904000000	208462000000
Thailand	1030560000	1234980000	1378060000	1550500000	1730520000	1958730000	2225740000
USA	3598500000	3835420000	3980070000	4236880000	4483600000	4750800000	4987300000
Venezuela	977280	1415390	2021220	2877610	3977380	6077140	9507720
	1996	1997	1998	1999	2000	2001	2002
Chile	19785000000	21972000000	23703600000	23927900000	25897200000	27772000000	29241800000
Colombia	78693415381	94472973330	110372416648	116469640570	131465686000	146078740000	161680530040
France	698609200	707697400	736511400	758143000	803291000	838226000	866138000
Great Britain	500412000	532082000	567970000	604556000	640089000	672889000	707386000
Hong Kong	755508000	833825000	795948000	765248000	777141000	782984000	748402000

Table A.3 (continued): Private Final Consumption Expenditure (in thousands of local currency).

India	8865590000	9653390000	11215900000	12575400000	13455800000	14703000000	15526200000
Indonesia	332094000000	387171000000	647824000000	813183000000	856798300000	1039655000000	1231964500000
Japan	278564000000	284387000000	282527000000	283880000000	282772300000	284216600000	283253900000
Malaysia	116794000	127783000	117718000	125056000	155941000	162618000	172485000
Mexico	1646260000	2042080000	2593350000	3084140000	3682550000	4044880000	4326510000
Philippines	1595350000	1762010000	1980090000	2161650000	2335540000	2565020000	2750990000
Poland	263060000	323267000	375344000	420878000	477375700	506753500	541341400
Singapore	54311600	58402100	55146600	59048100	67526500	70608400	73985200
South Korea	236194000000	258636000000	238811000000	274934000000	330389600000	364251500000	408715700000
Thailand	2479830000	2586960000	2505310000	2595110000	2762930000	2941010000	3119980000
USA	5273600000	5570620000	5918480000	6342800000	6830380000	7148800000	7439200000
Venezuela	18618000	21610100	28822600	34071600	41220700	48838800	57740100
	2003	2004	2005	2006	2007	2008	2009
Chile	32109200000	34615400000	38546500000	42301900000	46660100000	52481200000	53304411491
Colombia	179677232000	197726389000	217068598750	241156921000	273320799000	299909569000	312524902930
France	900035000	939977000	981500000	1026130000	1073275000	1114138000	1121329000
Great Britain	742276000	779064000	814964000	849475000	892990000	928500000	910568000
Hong Kong	719873000	767923000	804936000	863591000	972027000	1014180000	1015500535
India	17035500000	18481100000	20643000000	23078200000	25960800000	29133900000	33157435912
Indonesia	1372078000000	1532888300000	1785596400000	2092655700000	2510504300000	2999956900000	3290843300000
Japan	281791000000	284428400000	285935700000	289593700000	292523200000	291750600000	282588400000
Malaysia	186674000	208571000	234234000	258280000	292724000	334147000	346832934
Mexico	5042755380	5673796653	6141604273	6714814272	7316008042	7833874082	7972892901

Table A.3 (continued): Private Final Consumption Expenditure (in thousands of local currency).

Philippines	2988240000	3346720000	3772250000	4229500000	4611880000	5279480000	5581831367
Poland	554988900	598074200	623360300	662312500	711871800	785203700	824513700
Singapore	74732700	78570200	81778200	87264600	97003600	105548000	105344992
South Korea	420098500000	435060400000	465430500000	494917600000	530264200000	561627500000	577404700000
Thailand	3388460000	3687550000	4043730000	4379070000	4556990000	4997730000	4912425257
USA	7804000000	8285080000	8818980000	9322680000	9826450000	10129900000	10092600000
Venezuela	73532700	104675000	142161000	189548000	263668000	362590000	459635488

Table A.4: Exports of Goods and Services (in thousands of local currency).

	1989	1990	1991	1992	1993	1994	1995
Chile	2638730000	3200900000	4120840000	4806630000	5132010000	6544050000	8295390000
Colombia	2639349987	4042828486	5435255974	5958476258	7206149508	9195923808	11141854873
France	213748800	219512900	230954300	239135100	234434500	252300200	272074900
Great Britain	124153000	136583000	138662000	145480000	165834000	183215000	207147000
Hong Kong	695472000	779198000	917575000	1101350000	1255830000	1404300000	1597770000
India	346100000	406400000	562500000	673100000	861500000	1016100000	1307330000
Indonesia	45764000000	55852000000	68452000000	83050000000	88231000000	101332000000	119592000000
Japan	42273000000	45863100000	46667900000	47288100000	44109000000	44269700000	45230100000
Malaysia	75112000	88675000	105161000	114494000	135896000	174255000	209323000
Mexico	104266000	137441000	155327000	171476000	191540000	238965000	558798000
Philippines	260161000	296415000	369377000	393706000	462384000	572646000	692952000
Poland	2257010	16050900	19025700	27241800	35732600	53218200	78234000
Singapore	107962903	122326562	129836093	134822354	155851348	184763725	223460304
South Korea	47556200000	52020300000	59225700000	67941900000	77111900000	90623700000	114978000000
Thailand	648490000	745286000	901494000	1046660000	1201510000	1410790000	1751670000
USA	503347000	552356000	596833000	635312000	655838000	720892000	812214000
Venezuela	502980	899170	952350	1088770	1470280	2677450	3709800
	1996	1997	1998	1999	2000	2001	2002
Chile	8520520000	9404200000	9608640000	10992300000	12820200000	14501000000	15773500000
Colombia	13897707772	16399582956	19141024811	25245873973	34142398000	35177505000	36580055000
France	284610000	325756000	347351200	357618000	411730000	421006000	419947000
Great Britain	229047000	237478000	233284000	242691000	269819000	276866000	280536000
Hong Kong	1683300000	1742540000	1609750000	1625390000	1887700000	1801790000	1909960000

Table A.4 (continued): Exports of Goods and Services (in thousands of local currency).

India	1448540000	1652030000	1952800000	2276970000	2781260000	2907570000	3555560000
Indonesia	137533000000	174871000000	506245000000	390560000000	569490000000	642595000000	595514000000
Japan	49560600000	56073600000	55051000000	51143500000	55255900000	52567000000	55829100000
Malaysia	232358000	262885000	327836000	364861000	427003000	389256000	415040000
Mexico	811506000	962221000	1180390000	1414080000	1700950000	1601670000	1681100000
Philippines	879773000	1188050000	1389860000	1532160000	1858580000	1785230000	1991330000
Poland	94239000	120634000	156122000	161040000	201908000	210919000	231535000
Singapore	237038600	249386000	238148000	257439000	312724000	293776800	304680200
South Korea	124988000000	159091000000	223482000000	206842000000	232633000000	232820000000	238684000000
Thailand	1809910000	2272110000	2723950000	2703310000	3287280000	3380750000	3499000000
USA	868561000	955334000	955937000	991230000	1096280000	1032810000	1005920000
Venezuela	10748900	12272100	10463000	13596900	23693000	20222300	32819600
	2003	2004	2005	2006	2007	2008	2009
Chile	18684500000	23763700000	27355100000	35619400000	40399400000	39969700000	34400865000
Colombia	45143030000	52177956000	57954758000	68328456000	72869097000	87102191000	91173210469
France	407727000	426811000	449763000	483041000	502296000	515591000	442823170
Great Britain	290677000	303796000	330794000	377879000	371503000	422401000	381858500
Hong Kong	2111510000	2456620000	2747140000	3032410000	3359580000	3562830000	3188666000
India	4078030000	5690510000	7251240000	9168040000	9994410000	12066000000	10535395000
Indonesia	613721000000	739639000000	945122000000	1036320000000	1162970000000	1474510000000	1331668000000
Japan	58882400000	66286300000	71912700000	81756300000	90830400000	88473800000	57721425000
Malaysia	447846000	546925000	613694000	669505000	707156000	765370000	639009500
Mexico	1915770000	2281360000	2507350000	2902870000	3163020000	3424220000	3198747500

Table A.4 (continued): Exports of Goods and Services (in thousands of local currency).

Philippines	2142040000	2480970000	2589740000	2851390000	2833630000	2845380000	2479822000
Poland	280888000	346631000	364658000	427776000	479565000	500511000	532319337
Singapore	344936900	416050300	475996100	538341900	579123500	603236700	583618019
South Korea	271320000000	338059000000	339757000000	360625000000	408754000000	541266000000	533772000000
Thailand	3886570000	4587860000	5232930000	5777550000	6259580000	6941530000	6167640000
USA	1040770000	1182400000	1305100000	1471050000	1655950000	1831100000	1545712500
Venezuela	45440700	76987800	120597000	143250000	151930000	218289000	185242111

Table A.5: Imports of Goods and Services (in thousands of local currency).

	1989	1990	1991	1992	1993	1994	1995
Chile	2298170000	2898500000	3532400000	4541750000	5516710000	6158500000	7672550000
Colombia	2961377440	4197430633	5139921192	7416813576	11984278461	15428761834	19332077540
France	225368500	233387800	242185700	236908600	224181800	242301600	258454800
Great Britain	143011000	148647000	142573000	152177000	170726000	186180000	208005000
Hong Kong	634815000	729405000	877932000	1066780000	1192940000	1391400000	1647380000
India	402100000	487000000	562500000	730000000	860000000	1047100000	1449530000
Indonesia	41564000000	54827000000	67453000000	76438000000	78383000000	96952600000	125657000000
Japan	36036000000	41689900000	39120900000	36890500000	33343500000	34386700000	38272400000
Malaysia	68730000	86241000	110107000	112450000	136068000	177389000	218077000
Mexico	104622000	145603000	182924000	228123000	240859000	307494000	509862000
Philippines	280118000	358548000	406698000	459911000	586935000	679439000	842073000
Poland	1760760	12050000	20579100	25478700	34214700	48389400	70975000
Singapore	103094059	117728627	121907848	126934685	148495948	168725147	204840183
South Korea	44294900000	54100600000	65741200000	71600200000	75975300000	93148900000	119336000000
Thailand	696101000	909456000	1065490000	1160170000	1335680000	1586560000	2033890000
USA	591497000	630344000	624303000	668556000	720862000	814491000	903579000
Venezuela	330920	460050	796640	1194360	1482440	1934500	2985670
	1996	1997	1998	1999	2000	2001	2002
Chile	9047940000	10140100000	10801900000	10148400000	12064100000	13833300000	14653500000
Colombia	22926853351	27588139203	32068236472	29468374429	37051610000	44143374000	48872475000
France	266150100	288986200	313543900	328970000	398715000	403814000	393405000
Great Britain	228457000	233019000	240094000	256180000	287793000	300878000	308609000
Hong Kong	1701120000	1788300000	1602560000	1558670000	1829140000	1743400000	1804020000

Table A.5 (continued): Imports of Goods and Services (in thousands of local currency).

India	1610220000	1843330000	2247450000	2657020000	2975230000	3110500000	3799810000
Indonesia	140812000000	176600000000	413058000000	301654000000	423318000000	506426000000	480815000000
Japan	47021800000	50316100000	45607000000	43251100000	47940400000	49392800000	49417200000
Malaysia	228843000	260310000	265536000	289514000	358529000	327765000	348919000
Mexico	759451000	965609000	1262760000	1488560000	1810580000	1730390000	1794950000
Philippines	1070610000	1438910000	1566620000	1527420000	1794720000	1899390000	2010480000
Poland	100284000	140870000	185155000	200396000	249712000	239488000	259537000
Singapore	217229400	231228000	209621000	234347000	290968700	270713700	278164000
South Korea	140574000000	162056000000	161180000000	171437000000	215398000000	218083000000	228054000000
Thailand	2099230000	2205120000	1988910000	2120350000	2862310000	3047570000	3134270000
USA	964805000	1056890000	1115890000	1251740000	1475760000	1399850000	1430310000
Venezuela	6278250	9221630	11342400	11369500	14428000	17260500	19564500
	2003	2004	2005	2006	2007	2008	2009
Chile	16581000000	18415000000	21719200000	23900800000	28527000000	36343600000	27323795000
Colombia	58997035000	63544952000	70575601000	84226732000	90871015000	104089627000	108435535902
France	391583000	425122000	464642000	506546000	537646000	563819000	481685334
Great Britain	316672000	336282000	373641000	419409000	416450000	460640000	413736500
Hong Kong	1997460000	2342050000	2575330000	2864240000	3184760000	3381130000	3077512000
India	4433980000	6259450000	8306780000	10422600000	11677900000	14913700000	11077637500
Indonesia	465941000000	632376000000	830083000000	855588000000	1003270000000	1418110000000	1223722500000
Japan	50906900000	56660300000	64956700000	75407800000	82198000000	87758500000	57773012500
Malaysia	365383000	450350000	494414000	539443000	577110000	594655000	493719750
Mexico	2026190000	2433000000	2641650000	3032340000	3337970000	3689740000	3420665000

Table A.5 (continued): Imports of Goods and Services (in thousands of local currency).

Philippines	2398390000	2659010000	2816240000	2894690000	2802660000	2860270000	2429585500
Poland	303575000	368365000	371946000	446927000	512845000	541094000	583538592
Singapore	300214100	369095700	418472300	471498900	499429400	554139900	542329263
South Korea	253920000000	303678000000	316378000000	348023000000	394026000000	553949000000	480016500000
Thailand	3485270000	4281860000	5338560000	5503770000	5544490000	6692920000	5236990000
USA	1540160000	1797780000	2027800000	2240350000	2369700000	2538880000	1929187500
Venezuela	22447800	40769400	62242600	82889000	120930000	134887000	115622611

Table A.6: Net fixed capital formation for 17 economies (in thousands of local currency).

Quarter	Chile	Colombia	France	Great Britain	Hong_Kong	India
Q4 1988	3663716,905	7266308,084	8042968,224	547475,2647	560263,1087	4142192,577
Q1 1989	4040226,21	7833315,947	8232908,58	565999,796	585386,1208	4286051,295
Q2 1989	4410904,442	8391253,151	8419573,21	584209,4648	610088,6552	4486936,948
Q3 1989	4775841,908	8940264,802	8603018,608	602109,6228	634377,7493	4684480,123
Q4 1989	5135127,518	9480493,687	8783300,292	619705,5308	658260,3227	4878736,436
Q1 1990	5593948,437	10168979,72	8979392,217	637641,5278	686206,4585	5068603,407
Q2 1990	6045538,385	10846371,82	9172096,061	655270,5433	713683,3076	5310400,382
Q3 1990	6490011,323	11512848,77	9361470,363	672597,8313	740698,7506	5548180,465
Q4 1990	6927479,413	12168586,44	9547572,652	689628,5559	767260,5357	5782010,386
Q1 1991	7469105,18	12922155,51	9761272,995	703956,5759	799621,2859	6010516,279
Q2 1991	8002068,097	13663405,31	9971281,321	718036,4842	831438,4062	6269658,999
Q3 1991	8526506,718	14392537,23	10177661,42	731872,5772	862721,029	6524468,36
Q4 1991	9042557,383	15109749,37	10380475,96	745469,077	893478,1334	6775016,823
Q1 1992	9835358,716	16168441,5	10572890,75	757626,6099	933011,8232	7019885,577
Q2 1992	10615638,06	17210015,75	10761962,8	769572,2543	971883,2994	7322387,917
Q3 1992	11383593,2	18234748,9	10947750,19	781309,7032	1010103,654	7619830,255
Q4 1992	12139418,79	19242913,26	11130309,98	792842,5849	1047683,795	7912297,232
Q1 1993	13197986,93	21003242,11	11285200,13	804235,5634	1092344,788	8198170,987
Q2 1993	14239824,98	22735905,67	11437381,37	815429,4195	1136255,993	8521027,151
Q3 1993	15265197,36	24441338,73	11586901,1	826427,6334	1179429,995	8838453,834
Q4 1993	16274364,28	26119969,25	11733805,85	837233,6243	1221879,172	9150542,346
Q1 1994	17423722,97	29663668,84	11885393,6	849719,7977	1277958,855	9455626,018
Q2 1994	18554511,71	33154721,57	12034326,36	861987,9144	1333101,323	9852775,202
Q3 1994	19667030,55	36593909,6	12180650,64	874041,7825	1387322,237	10243269,24
Q4 1994	20761574,67	39982003,45	12324412,11	885885,1436	1440636,999	10627219,64
Q1 1995	22205115,16	44090538,47	12472984,03	899763,5478	1499900,453	11002565,91
Q2 1995	23625298,32	48135443,21	12618950,51	913399,846	1558166,889	11543634,46
Q3 1995	25022502,07	52117703,12	12762357,23	926798,2615	1615453,08	12075730,43

Table A.6 (continued): Net fixed capital formation for 17 economies (in thousands of local currency).

Q4 1995	26397098,24	56038288,4	12903249,09	939962,9443	1671775,517	12599002,62
Q1 1996	28025597,93	60582711,62	13044196,52	955108,5853	1738092,527	13110406,33
Q2 1996	29627466,54	65054731,08	13182668,13	969990,1845	1803291,556	13670699,93
Q3 1996	31203139,58	69455500,35	13318707,42	984612,3451	1867391,452	14221620,05
Q4 1996	32753045,43	73786154,61	13452357,1	998979,5901	1930410,745	14763323,53
Q1 1997	34566327,87	78736313,46	13583862,76	1014999,425	2010961,284	15292730,84
Q2 1997	36349699,88	83606111,66	13713054,57	1030739,948	2090157,799	15860761,59
Q3 1997	38103654,84	88396853,76	13839973,26	1046206,027	2168023,051	16419208,52
Q4 1997	39828677,98	93109823,17	13964658,8	1061402,447	2244579,418	16968233,32
Q1 1998	41546918,52	98223682,89	14113799,81	1080798,716	2303189,733	17504972,21
Q2 1998	43236333,05	103253137,7	14260320,14	1099857,894	2360792,854	18145138,19
Q3 1998	44897405,17	108199580,6	14404265,84	1118585,841	2417406,088	18774490,86
Q4 1998	46530610,38	113064381,8	14545682,17	1136988,313	2473046,448	19393212,85
Q1 1999	47664018,12	116144318,3	14711312,46	1156117,001	2511222,794	19998200,95
Q2 1999	48777899,81	119171412,5	14874035,34	1174912,551	2548732,94	20805334,39
Q3 1999	49872591,84	122146571	15033901,83	1193380,767	2585588,512	21598908,11
Q4 1999	50948424,8	125070684,9	15190962,08	1211527,347	2621800,931	22379149,93
Q1 2000	52174118,76	128414394,6	15385290,7	1230869,672	2662941,546	23143018
Q2 2000	53378714,6	131700781	15576216,69	1249874,967	2703364,979	23948736,07
Q3 2000	54562575,48	134930826,8	15763799,62	1268549,107	2743083,733	24740849,17
Q4 2000	55726058,3	138105497,9	15948098,03	1286897,86	2782110,092	25519587,03
Q1 2001	57112307,99	142167162,8	16146779,6	1305934,723	2816605,827	26279835,59
Q2 2001	58474693,43	146159356,9	16341979,02	1324639,071	2850496,927	27151834,79
Q3 2001	59813625,43	150083268,5	16533757,32	1343016,712	2883793,991	28009030,12
Q4 2001	61129507,74	153940065,3	16722174,45	1361073,352	2916507,431	28851672,91
Q1 2002	62544333,99	158844149,6	16904997,24	1380473,48	2936475,848	29675747,93
Q2 2002	63934743,56	163664645,1	17084608,69	1399534,481	2956091,411	30645559,7
Q3 2002	65301157,83	168402976,7	17261065,22	1418262,285	2975360,353	31598893,64
Q4 2002	66643990,89	173060544,6	17434422,23	1436662,715	2994288,801	32536029,72

Table A.6 (continued): Imports of Goods and Services (in thousands of local currency).

Q1 2003	68071962,44	179572599,9	17621756,35	1458301,466	3006700,846	33456105,78
Q2 2003	69473773,04	185967760,3	17805661,27	1479545,732	3018880,897	34609258,96
Q3 2003	70849898,81	192247984,8	17986199,51	1500402,626	3030833,33	35741536,96
Q4 2003	72200807,46	198415214,6	18163432,45	1520879,142	3042562,438	36853301,23
Q1 2004	73767674,9	210189960,1	18369257,62	1544499,255	3057414,235	38477773,52
Q2 2004	75305979,54	221760022,6	18571326,2	1567688,376	3071995,387	40073240,45
Q3 2004	76816235,41	233128312,4	18769706,38	1590454,306	3086310,815	41640174,59
Q4 2004	78298947,89	244297775,8	18964465,13	1612804,711	3100365,353	43179046,17
Q1 2005	80463590,29	258482218,3	19196402,98	1637144,816	3117756,622	45239907,25
Q2 2005	82589318,31	272411290,8	19424112,53	1661039,554	3134830,827	47263767,56
Q3 2005	84676802,77	286089156,4	19647670,32	1684497,038	3151593,731	49251236,33
Q4 2005	86726705,48	299519979	19867151,53	1707525,238	3168050,992	51202920,08
Q1 2006	88943466,01	317976800,2	20132787,98	1734651,408	3192935,856	53720272,34
Q2 2006	91119649,52	336104326,9	20393586,01	1761283,115	3217369,958	56192293,14
Q3 2006	93255993,47	353907654	20649632,97	1787429,287	3241361,406	58619736,73
Q4 2006	95353222,52	371391918,9	20901014,72	1813098,699	3264918,162	61003353,42
Q1 2007	97991221,65	391618153,3	21207226,96	1843790,473	3288555,619	64014709,41
Q2 2007	100581405,1	411476265,8	21507864,63	1873923,273	3311759,092	66971735,19
Q3 2007	103124615,2	430972677,6	21803028,19	1903507,165	3334536,549	69875342,5
Q4 2007	105621681,6	450113743	22092816,36	1932552,042	3356895,812	72726437,49
Q1 2008	109144844,9	472675587,9	22407424,2	1959616,847	3380128,152	76158489,91
Q2 2008	112604695,3	494827582,8	22716274,49	1986182,43	3402934,518	79528317,24
Q3 2008	116002310,9	516576841,3	23019472,18	2012258,071	3425322,716	82836991,57
Q4 2008	119338757,5	537930403,3	23317120,34	2037852,871	3447300,411	86085574,42
Quarter	Indonesia	Japan	Malaysia	Mexico	Philippines	Poland
Q4 1988	200248340,1	947465290,8	176241,7173	139236,4655	779260,2918	1963,506055
Q1 1989	211660313,7	964346308,5	180725,9311	160261,4469	814525,4986	2421,228444
Q2 1989	222884464	980933755,4	185133,0119	180979,8915	849200,8196	2872,88341
Q3 1989	233923882,1	997232736,7	189464,2864	201396,2685	883296,1217	3318,551383

Table A.6 (continued): Net fixed capital formation for 17 economies (in thousands of local currency).

Q4 1989	244781608,6	1013248269	193721,0587	221514,9819	916821,107	3758,311722
Q1 1990	258422151,3	1032600621	199789,1402	250129,3769	962763,2062	6667,426671
Q2 1990	271837802,7	1051617047	205753,7147	278315,2174	1007941,981	9552,441585
Q3 1990	285032270,7	1070303377	211616,5479	306078,9217	1052370,115	12413,55612
Q4 1990	298009201,8	1088665343	217379,3751	333426,8122	1096060,08	15250,96827
Q1 1991	310552319	1106707713	225996,1166	370438,7615	1140121,312	18995,29289
Q2 1991	322884698,1	1124435750	234467,59	406883,5266	1183440,308	22690,65582
Q3 1991	335009879,7	1141854931	242796,2445	442769,7992	1226029,569	26337,69727
Q4 1991	346931344,8	1158970637	250984,4877	478106,1378	1267901,39	29937,04913
Q1 1992	360315025,1	1174868088	260541,6616	523628,7814	1317203,449	34322,41875
Q2 1992	373472736,1	1190487425	269937,3596	568439,4722	1365673,453	38643,49838
Q3 1992	386408293,1	1205833513	279174,3101	612549,3448	1413325,445	42901,23051
Q4 1992	399125446,8	1220911134	288255,1953	655969,3595	1460173,231	47096,54382
Q1 1993	414041973,4	1233645472	300140,377	703650,3371	1523304,929	52566,77874
Q2 1993	428706223,7	1246155964	311825,6348	750563,0755	1585377,641	57953,73279
Q3 1993	443122464,4	1258446545	323314,3318	796719,9527	1646409,13	63258,67388
Q4 1993	457294889,9	1270521079	334609,7743	842133,1473	1706416,862	68482,85059
Q1 1994	475942990	1282779334	348652,7576	897180,1251	1777760,945	77557,69439
Q2 1994	494277206,8	1294821865	362459,7632	951331,3896	1847905,898	86497,18895
Q3 1994	512302823,6	1306652469	376034,7566	1004601,515	1916871,878	95303,35298
Q4 1994	530025034,7	1318274874	389381,6364	1057004,841	1984678,698	103978,1751
Q1 1995	553450673,3	1329563387	407112,6983	1113779,807	2056865,438	116759,9162
Q2 1995	576483890,7	1340652925	424547,2864	1169616,135	2127829,595	129348,7221
Q3 1995	599131260,8	1351546997	441690,3581	1224529,344	2197591,877	141747,5051
Q4 1995	621399247,2	1362249048	458546,7876	1278534,695	2266172,639	153959,1334
Q1 1996	650439609,4	1374508541	477797,7943	1370667,537	2355121,848	171710,1663
Q2 1996	678995206,9	1386552084	496725,3144	1461314,681	2442570,662	189190,6586
Q3 1996	707074131,8	1398383480	515334,7839	1550500,084	2528544,39	206404,7334
Q4 1996	734684341	1410006466	533631,547	1638247,318	2613067,913	223356,4512

Table A.6 (continued): Net fixed capital formation for 17 economies (in thousands of local currency).

Q1 1997	766790041,8	1421683342	554985,6585	1766804,95	2717356,426	247636,8389
Q2 1997	798357542,2	1433154314	575979,9554	1893307,198	2819887,426	271544,0507
Q3 1997	829395864,4	1444423012	596620,5005	2017786,922	2920690,533	295083,8221
Q4 1997	859913879	1455493004	616913,2545	2140276,459	3019794,864	318261,8006
Q1 1998	906466286,5	1464350226	625184,7325	2307032,131	3108927,002	348075,3434
Q2 1998	952249509,4	1473050760	633311,4423	2471119,719	3196534,852	377421,6803
Q3 1998	997276256,8	1481597379	641295,9177	2632581,914	3282644,481	406308,1329
Q4 1998	1041559028	1489992804	649140,6481	2791460,72	3367281,511	434741,9081
Q1 1999	1079282987	1497004168	654347,1404	2989887,559	3451371,849	466922,3251
Q2 1999	1116367902	1503891246	659461,7887	3185110,44	3534014,774	498585,1749
Q3 1999	1152824596	1510656241	664486,2134	3377181,096	3615235,2	529738,7817
Q4 1999	1188663713	1517301317	669422,0059	3566150,425	3695057,611	560391,3358
Q1 2000	1237689821	1524112903	679524,4265	3802042,905	3809719,889	593865,0002
Q2 2000	1285893338	1530803723	689450,5272	4034124,784	3922428,432	626793,0763
Q3 2000	1333288066	1537375919	699203,3854	4262457,616	4033216,53	659184,4567
Q4 2000	1379887576	1543831593	708786,0247	4487101,965	4142116,905	691047,889
Q1 2001	1437665628	1549016458	717189,2291	4702839,37	4233340,757	718706,1666
Q2 2001	1494472649	1554109231	725445,0273	4914982,231	4322987,757	745898,4096
Q3 2001	1550324959	1559111548	733556,005	5123590,438	4411085,163	772632,4706
Q4 2001	1605238603	1564025017	741524,7025	5328722,885	4497659,758	798916,0698
Q1 2002	1666614555	1566311794	749435,5702	5540382,168	4593082,6	822333,989
Q2 2002	1726953740	1568557841	757207,4275	5748473,533	4686854,094	845351,3119
Q3 2002	1786273671	1570763882	764842,7171	5953057,124	4779002,817	867974,8912
Q4 2002	1844591567	1572930631	772343,8387	6154192,071	4869556,851	890211,4624
Q1 2003	1911798694	1573339565	780560,8704	6377044,132	4966781,302	913429,8742
Q2 2003	1977781841	1573740091	788627,5721	6595824,258	5062225,646	936222,282
Q3 2003	2042562626	1574132382	796546,6815	6810605,345	5155922,238	958596,4666
Q4 2003	2106162364	1574516606	804320,887	7021459,16	5247902,868	980560,0695

Table A.6 (continued): Net fixed capital formation for 17 economies (in thousands of local currency).

Q1 2004	2200047026	1574724032	815096,5848	7326966,422	5353236,268	1005559,357
Q2 2004	2292256884	1574927560	825677,0287	7627014,135	5456647,859	1030102,559
Q3 2004	2382819122	1575127264	836065,7116	7921691,691	5558172,341	1054197,884
Q4 2004	2471760799	1575323216	846266,0666	8211087,984	5657843,815	1077853,405
Q1 2005	2595104389	1576526543	858294,1852	8541156,897	5755501,072	1104159,792
Q2 2005	2716241430	1577708312	870103,0103	8865209,039	5851360,928	1129985,516
Q3 2005	2835207548	1578868909	881696,5059	9183351,267	5945456,639	1155339,274
Q4 2005	2952038301	1580008715	893078,5669	9495688,911	6037820,828	1180229,611
Q1 2006	3105181495	1581897956	907339,5065	9878909,184	6144532,972	1212139,048
Q2 2006	3255572747	1583752925	921341,2161	10255187,28	6249298,557	1243470,668
Q3 2006	3403257160	1585574243	935088,3483	10624643,4	6352152,765	1274234,629
Q4 2006	3548279719	1587362519	948585,4762	10987396,37	6453130,167	1304440,937
Q1 2007	3736916932	1588567894	966838,0133	11401744,54	6588088,709	1345749,234
Q2 2007	3922162817	1589750839	984760,1809	11808539,86	6720604,522	1386313,374
Q3 2007	4104072957	1590911771	1002357,835	12207916,79	6850720,818	1426146,152
Q4 2007	4282702807	1592051101	1019636,736	12600007,81	6978480,126	1465260,209
Q1 2008	4556361759	1591357487	1038225,046	13057772,05	7135979,442	1510637,641
Q2 2008	4825193906	1590675698	1056473,031	13507206,41	7290617,719	1555188,634
Q3 2008	5089269441	1590005536	1074386,894	13948458,33	7442445,898	1598927,912
Q4 2008	5348659732	1589346804	1091972,726	14381673,16	7591514,104	1641869,974
Quarter	Singapore	South_Korea	Thailand	USA	Venezuela	
Q4 1988	122808,8444	51597912,58	2423260,986	5988755,641	876788,6131	
Q1 1989	125409,955	54277009,63	2543700,975	6096432,121	926093,0819	
Q2 1989	127966,0494	56911704,93	2662138,734	6202236,484	974585,2348	
Q3 1989	130477,9069	59502734,36	2778607,549	6306201,278	1022278,455	
Q4 1989	132946,2929	62050821,62	2893140,151	6408358,489	1069185,906	
Q1 1990	136047,0295	65917964,93	3066156,258	6508150,684	1132159,659	
Q2 1990	139094,2681	69721922,47	3236335,715	6606201,787	1194099,664	

Table A.6 (continued): Net fixed capital formation for 17 economies (in thousands of local currency).

Q3 1990	142088,9318	73463726,63	3403725,028	6702542,174	1255022,892
Q4 1990	145031,9276	77144392,96	3568369,944	6797201,693	1314946,032
Q1 1991	148813,2213	97279159,91	3770512,721	6878818,724	1432218,117
Q2 1991	152529,5312	117155018,3	3969326,99	6959004,372	1547641,604
Q3 1991	156181,9743	136775297,2	4164867,558	7037783,74	1661245,633
Q4 1991	159771,648	156143283,3	4357188,33	7115181,492	1773058,886
Q1 1992	164234,6626	176510677,8	4562314,393	7202546,138	1967440,155
Q2 1992	168621,1812	196573512,8	4764017,962	7288379,205	2158837,423
Q3 1992	172932,5149	216336342,5	4962356,142	7372707,544	2347296,496
Q4 1992	177169,9523	235803652,9	5157385,084	7455557,533	2532862,481
Q1 1993	182326,571	257182305,4	5384188,127	7558264,478	2765857,599
Q2 1993	187394,9525	278224612,2	5607190,646	7659174,798	2995193,411
Q3 1993	192376,6067	298935864,9	5826456,328	7758319,921	3220927,389
Q4 1993	197273,0177	319321272,1	6042047,789	7855730,725	3443116,1
Q1 1994	202946,2257	343301926,1	6303246,209	7976942,03	3771350,516
Q2 1994	208522,3091	366897447,3	6560063,188	8096038,101	4094452,276
Q3 1994	214002,9305	390114021	6812572,223	8213055,852	4412501,639
Q4 1994	219389,7243	412957733,2	7060845,577	8328031,552	4725577,611
Q1 1995	225576,3062	443520909,6	7371531,561	8461039,841	5216395,08
Q2 1995	231656,8903	473592521,9	7677011,582	8591728,852	5699621,904
Q3 1995	237633,2925	503180476,1	7977372,872	8720139,026	6175375,475
Q4 1995	243507,2979	532292551,1	8272701,202	8846310,099	6643771,369
Q1 1996	251712,0587	565638425,7	8606804,157	8994608,052	7709451,956
Q2 1996	259777,3346	598439697,1	8935280,423	9140323,086	8759770,846
Q3 1996	267705,497	630705259,8	9258224,762	9283500,187	9794949,477
Q4 1996	275498,8769	662443862,9	9575730,337	9424183,558	10815206,09
Q1 1997	284515,3612	695166814	9806629,162	9589680,75	12692486,4
Q2 1997	293378,3513	727345540	10033548,72	9752298,782	14543127,78
Q3 1997	302090,4605	758989092,2	10256557,6	9912087,744	16367508,22

Table A.6 (continued): Net fixed capital formation for 17 economies (in thousands of local currency).

Q4 1997	310654,2571	790106371,1	10475723,19	10069096,85	18166000,38
Q1 1998	318185,2475	813320312,1	10549513,93	10253720,43	20389433,35
Q2 1998	325586,4745	836137184,8	10622001,13	10435135,69	22579282,02
Q3 1998	332860,1739	858563781	10693207,79	10613398,4	24736053,68
Q4 1998	340008,5431	880606776,2	10763156,55	10788563,34	26860247,95
Q1 1999	345863,4879	904856403,7	10813841,02	10990872,01	28891827,51
Q2 1999	351616,5237	928690157,9	10863627,05	11189667,16	30890802,97
Q3 1999	357269,4245	952115170,9	10912530,55	11385009,81	32857697,6
Q4 1999	362823,9331	975138452,4	10960567,18	11576959,91	34793026,25
Q1 2000	368380,5385	1003454263	11037029,43	11795874,17	37162468,89
Q2 2000	373840,2322	1031286270	11112141,02	12010990,72	39493753,99
Q3 2000	379204,7043	1058642740	11185925,8	12222375,46	41787496,04
Q4 2000	384475,6158	1085531798	11258407,21	12430093,11	44044299,64
Q1 2001	389127,845	1112798874	11355096,03	12707857	47068964,4
Q2 2001	393698,4955	1139596711	11450080,66	12980821,81	50044631,82
Q3 2001	398188,9976	1165933383	11543391,12	13249070,47	52972095,61
Q4 2001	402600,7568	1191816828	11635056,93	13512684,47	55852136,65
Q1 2002	405538,0253	1221051293	11740922,8	13756389,98	60883841,9
Q2 2002	408423,4245	1249782238	11844924,12	13995858,65	65836324,95
Q3 2002	411257,8704	1278018335	11947093,72	14231164,13	70710833,12
Q4 2002	414042,2628	1305768106	12047463,87	14462378,79	75508594,09
Q1 2003	416449,8229	1337566636	12192474,05	14712756,87	79486313,33
Q2 2003	418812,9233	1368785310	12334859,08	14958552,87	83388157,71
Q3 2003	421132,3871	1399434521	12474665,87	15199850,06	87215893,92
Q4 2003	423409,0223	1429524492	12611940,5	15436730,25	90971184,64
Q1 2004	426684,2467	1465393329	12812826,02	15738648,48	99320422,9
Q2 2004	429900,0595	1500609622	13010082,44	16035087,62	107529528,6
Q3 2004	433057,5319	1535185018	13203774,12	16326145,34	115599910,3
Q4 2004	436157,7158	1569130973	13393964,37	16611917,71	123533100

Table A.6 (continued): Net fixed capital formation for 17 economies (in thousands of local currency).

Q1 2005	439182,4426	1604560980	13675126,46	16953612,99	137133830,8
Q2 2005	442151,575	1639341008	13951222,51	17289088,88	150503152,7
Q3 2005	445066,1359	1673482973	14222341,29	17618456,91	163642927,3
Q4 2005	447927,1288	1706998570	14488570,16	17941826,73	176555416,7
Q1 2006	452243,2254	1742711437	14789489,82	18304946,87	195376175,3
Q2 2006	456481,2015	1777770039	15084915,71	18661434,88	213868345,4
Q3 2006	460642,4583	1812186323	15374947,07	19011410,79	232035445,6
Q4 2006	464728,3725	1845972023	15659681,45	19354992,57	249881449,2
Q1 2007	471728,4772	1883633399	15950960,59	19702110,72	275133655,2
Q2 2007	478602,7259	1920606629	16236891,33	20042850,95	299942048,1
Q3 2007	485353,3377	1956904188	16517571,99	20377330,73	324311900,3
Q4 2007	491982,4954	1992538329	16793099,05	20705665,31	348248973,3
Q1 2008	501808,5599	2033035743	17124918,09	21011652,29	376687993,6
Q2 2008	511457,5172	2072793992	17450698,83	21311994,03	404611100,4
Q3 2008	520932,4764	2111826431	17770549,6	21606795,61	432026869,2
Q4 2008	530236,4979	2150146189	18084576,91	21896160,06	458943902,1

APPENDIX B: National currency/\$ exchange rate

Table B.1: National currency/\$ exchange rate (quarterly data).

	Chile	Colombia	France	Great Britain	Hong Kong	India	Indonesia	Japan
1989q01	254,71	357,72	6,3945	0,592136	7,788	15,6324	1756	132,05
1989q02	269,52	381,79	6,636	0,645078	7,795	16,5308	1773	144,1
1989q03	281,02	405,84	6,3355	0,615309	7,8	16,6749	1783	139,3
1989q04	296,58	433,92	5,788	0,622859	7,807	17,0352	1797	143,45
1990q01	297,64	468,96	5,698	0,608717	7,808	17,2267	1823	157,2
1990q02	297,27	502,39	5,61	0,574119	7,787	17,4532	1844	152,9
1990q03	307,31	534,9	5,2365	0,53376	7,762	18,0678	1864	137,8
1990q04	336,86	568,73	5,129	0,518672	7,801	18,0732	1901	134,4
1991q01	344,38	598,46	5,816	0,576203	7,794	19,6197	1932	141
1991q02	347,76	628,82	6,1445	0,616713	7,76	21,1903	1954	137,9
1991q03	357,15	667,18	5,6665	0,570613	7,745	25,7632	1968	132,85
1991q04	374,87	706,86	5,18	0,534559	7,781	25,8338	1992	125,2
1992q01	349,53	733,34	5,5675	0,574977	7,739	25,89	2017	133,2
1992q02	359,88	758,62	5,1325	0,52687	7,732	25,89	2033	125,5
1992q03	375,92	784,75	4,765	0,560947	7,723	25,89	2038	119,2
1992q04	382,33	811,77	5,5065	0,661376	7,743	26,2	2062	124,75
1993q01	401,06	836,94	5,4789	0,665115	7,732	31,23	2071	116,35
1993q02	404,02	862,91	5,695	0,662822	7,749	31,34	2088	106,75
1993q03	410,13	889,76	5,663	0,661945	7,737	31,37	2108	105,15
1993q04	431,04	917,33	5,8955	0,675128	7,726	31,38	2110	111,85
1994q01	427	820,78	5,71	0,674673	7,728	31,37	2143	103,15
1994q02	418,94	819,64	5,4715	0,649266	7,729	31,37	2160	99,05
1994q03	412,2	842	5,2815	0,633032	7,727	31,37	2181	98,45
1994q04	404,09	831,27	5,346	0,64	7,738	31,38	2200	99,74
1995q01	405,22	880,23	4,849	0,619963	7,733	31,5	2219	89,35
1995q02	374,48	881,23	4,853	0,627353	7,738	31,42	2246	84,6
1995q03	396,74	972,8	4,9145	0,632911	7,732	34,01	2275	98,3
1995q04	407,13	987,65	4,9	0,645161	7,732	35,18	2308	102,83
1996q01	411,64	1048,42	5,0315	0,655566	7,734	34,33	2337	106,28
1996q02	409,68	1069,73	5,1525	0,645786	7,74	35,06	2342	109,42
1996q03	412,98	1025,06	5,1715	0,640123	7,733	35,76	2340	110,97
1996q04	424,97	1005,33	5,237	0,588928	7,736	35,93	2383	116
1997q01	414,79	1059,88	5,6435	0,613761	7,75	35,91	2419	124,05
1997q02	416,47	1090,58	5,8777	0,601214	7,747	35,82	2450	114,4
1997q03	415,2	1246,27	5,9331	0,619886	7,738	36,18	3275	121
1997q04	439,81	1293,58	5,9881	0,604668	7,746	39,28	4650	129,95
1998q01	454,18	1358,03	6,1845	0,595203	7,749	39,5	8325	132,05
1998q02	465,22	1363,04	6,1174	0,601431	7,744	42,47	14900	140,85
1998q03	466,38	1556,15	5,6164	0,589797	7,745	42,49	10700	135,25
1998q04	473,77	1507,52	5,6221	0,601142	7,746	42,48	8025	115,6
1999q01	483,83	1533,51	0,930925	0,62054	7,749	42,43	8685	120,4
1999q02	518,9	1732,1	0,968242	0,634961	7,756	43,36	6726	121,1

Table B.1 (continued): National currency/\$ exchange rate (quarterly data).

1999q03	531,11	2017,27	0,937647	0,607349	7,766	43,61	8386	106,85
1999q04	530,07	1873,77	0,995421	0,618659	7,771	43,49	7085	102,2
2000q01	505,81	1951,56	1,04679	0,62692	7,786	43,62	7590	105,85
2000q02	538,61	2139,11	1,04646	0,661288	7,794	44,68	8735	105,4
2000q03	565,37	2211,94	1,1409	0,680226	7,796	46,07	8780	107,85
2000q04	572,68	2187,02	1,07469	0,670151	7,796	46,75	9595	114,9
2001q01	592,91	2309,83	1,13225	0,701508	7,797	46,64	10400	124,6
2001q02	626,65	2305,33	1,17925	0,7122	7,797	47,04	11440	124,05
2001q03	696,23	2328,49	1,09517	0,68018	7,799	47,86	9675	119,3
2001q04	656,2	2301,33	1,13469	0,689465	7,797	48,18	10400	131,8
2002q01	664,44	2261,37	1,14626	0,702642	7,799	48,8	9655	133,2
2002q02	697,62	2398,14	1,00251	0,650618	7,798	48,87	8730	119,45
2002q03	747,62	2828,08	1,0142	0,639509	7,8	48,38	9015	121,55
2002q04	712,38	2864,79	0,953562	0,620424	7,798	48,03	8940	119,9
2003q01	727,36	2958,25	0,917852	0,633032	7,798	47,55	8908	120,15
2003q02	697,23	2817,32	0,87512	0,606024	7,797	46,47	8285	119,85
2003q03	665,13	2889,39	0,858222	0,597514	7,743	45,85	8389	111,2
2003q04	599,42	2780,82	0,791766	0,560318	7,763	45,605	8465	107,1
2004q01	623,21	2678,16	0,818063	0,545137	7,794	43,445	8587	104,3
2004q02	636,59	2699,58	0,822707	0,551968	7,8	45,975	9415	108,38
2004q03	606,96	2595,17	0,805867	0,555926	7,7985	46,155	9170	111
2004q04	559,83	2412,1	0,73416	0,517759	7,7735	43,585	9290	104,12
2005q01	586,45	2376,48	0,771367	0,53118	7,7995	43,755	9480	107,35
2005q02	578,92	2331,81	0,826993	0,557569	7,7715	43,515	9713	110,4
2005q03	533,69	2289,61	0,830427	0,566155	7,7575	43,99	10310	113,15
2005q04	514,21	2284,22	0,847673	0,580754	7,7525	45,065	9830	117,97
2006q01	527,7	2289,98	0,826173	0,576402	7,7595	44,605	9075	117,4
2006q02	547,31	2633,12	0,786596	0,545137	7,7665	45,085	9300	114,95
2006q03	538,22	2397,07	0,789889	0,534702	7,7875	45,955	9235	117,8
2006q04	534,43	2225,44	0,759301	0,509424	7,7745	44,245	9020	118,95
2007q01	539,37	2155,06	0,750863	0,510699	7,8105	43,595	9118	117,65
2007q02	527,46	1958,09	0,740466	0,498778	7,8125	40,755	9054	123,23
2007q03	511,72	2013,18	0,705268	0,492296	7,7665	39,735	9137	115,05
2007q04	495,82	1987,81	0,679302	0,499151	7,8015	39,415	9419	114
2008q01	439,09	1821,6	0,632431	0,502892	7,7855	39,985	9217	100,1
2008q02	520,14	1832,81	0,634357	0,502084	7,8005	42,95	9225	106,4
2008q03	552,47	2174,62	0,699154	0,555617	7,7655	46,935	9378	104,3
2008q04	629,11	2198,09	0,718546	0,685965	7,7505	48,455	10950	90,75
2009q01	582,1	2561,21	0,751428	0,69735	7,7505	50,945	11575	98,1
2009q02	529,07	2188,5	0,707514	0,603865	7,7505	47,88	10225	95,95
2009q03	546,07	1922	0,68292	0,620617	7,7505	48,04	9681	89,77
2009q04	506,43	2044,23	0,694155	0,617475	7,7555	46,68	9400	92,06
	Malaysia	Mexico	Philippines	Poland	Singapore	South Korea	Thailand	Venezuela
1989q01	2,7545	2,369	21,33	0,057255	1,9589	671,9	25,54	0,0384684
1989q02	2,7055	2,46	21,807	0,08446	1,966	667,2	25,95	0,0387405
1989q03	2,6905	2,551	21,945	0,18	1,9603	670	25,79	0,0399132
1989q04	2,7033	2,641	22,44	0,65	1,8944	679,6	25,69	0,0449268

Table B.1 (continued): National currency/\$ exchange rate (quarterly data).

1990q01	2,7273	2,733	22,75	0,95	1,8843	702,1	25,98	0,0454343
1990q02	2,7105	2,8178	23,27	0,95	1,8396	716	25,79	0,0488034
1990q03	2,701	2,8906	25,75	0,95	1,7632	712,9	25,34	0,0506323
1990q04	2,7015	2,9454	28	0,95	1,7445	716,4	25,29	0,0525412
1991q01	2,772	2,981	28	0,95	1,7931	724,7	25,65	0,0563189
1991q02	2,781	3,0182	27,75	1,1458	1,7655	723,1	25,71	0,057712
1991q03	2,741	3,0558	27	1,1096	1,6895	741,5	25,54	0,0617856
1991q04	2,724	3,071	26,65	1,0957	1,6305	760,8	25,28	0,0641943
1992q01	2,585	3,0835	25,383	1,3497	1,6605	775,1	25,6	0,0678408
1992q02	2,5065	3,12226	25,584	1,3512	1,6173	790,2	25,29	0,0690289
1992q03	2,4985	3,11631	25,12	1,3909	1,5923	786,6	25,09	0,0722952
1992q04	2,612	3,1154	25,096	1,5767	1,6449	788,4	25,52	0,0828584
1993q01	2,5945	3,0976	25,513	1,6626	1,6406	794	25,36	0,0880576
1993q02	2,5805	3,1212	27,272	1,7777	1,6233	803,7	25,25	0,093105
1993q03	2,5508	3,1178	29,813	1,9735	1,5877	808,8	25,2	0,101834
1993q04	2,7015	3,1059	27,699	2,1344	1,608	808,1	25,54	0,110172
1994q01	2,673	3,3598	27,565	2,2119	1,5692	806,5	25,23	0,119643
1994q02	2,6035	3,3918	26,91	2,245	1,5241	805,5	24,99	0,206838
1994q03	2,5655	3,404	26	2,3216	1,4838	798,9	24,97	0,177116
1994q04	2,56	5,325	24,418	2,4372	1,4607	788,7	25,09	0,177293
1995q01	2,5368	6,8175	25,987	2,402	1,4191	771,5	24,74	0,177293
1995q02	2,4395	6,3092	25,575	2,342	1,3965	758,1	24,66	0,177293
1995q03	2,5072	6,4195	26,065	2,433	1,4205	768,4	25,07	0,177293
1995q04	2,542	7,6425	26,214	2,468	1,4143	774,7	25,19	0,302441
1996q01	2,5368	7,5479	26,197	2,5875	1,408	782,7	25,23	0,302441
1996q02	2,4955	7,6108	26,203	2,72	1,4099	810,6	25,36	0,48912
1996q03	2,5085	7,5374	26,257	2,811	1,408	821,2	25,42	0,493552
1996q04	2,529	7,8509	26,288	2,8755	1,3998	844,2	25,61	0,496942
1997q01	2,479	7,8905	26,367	3,076	1,4451	897,1	25,97	0,498506
1997q02	2,5248	7,958	26,384	3,286	1,43	888,1	25,79	0,506588
1997q03	3,1935	7,8199	33,873	3,4205	1,5295	914,8	36,523	0,519103
1997q04	3,8919	8,0833	39,975	3,518	1,6755	1695	47,247	0,525882
1998q01	3,648	8,5165	37,081	3,4485	1,606	1383	38,804	0,545958
1998q02	4,169	9,0407	42,091	3,4825	1,7068	1373	42,313	0,570727
1998q03	3,8	10,1062	43,809	3,579	1,685	1391	39,308	0,601492
1998q04	3,8	9,865	39,059	3,504	1,6605	1204	36,691	0,588717
1999q01	3,8	9,5158	38,766	4,01	1,7322	1227	37,644	0,608532
1999q02	3,8	9,4875	38,019	3,9297	1,7013	1157,6	36,84	0,631997
1999q03	3,8	9,3582	41,112	4,1141	1,7026	1216,4	40,9779	0,654941
1999q04	3,8	9,5143	40,313	4,1483	1,666	1138	37,47	0,67606
2000q01	3,8	9,2331	41,063	4,1428	1,7189	1106	37,8066	0,698221
2000q02	3,8	9,9538	43,154	4,3907	1,7294	1115	39,1223	0,711257
2000q03	3,8	9,4088	46,283	4,5404	1,741	1115	42,2143	0,720383
2000q04	3,8	9,5722	49,998	4,1432	1,7315	1264,5	43,2676	0,729769
2001q01	3,8	9,538	49,378	4,1	1,8005	1327,5	44,7726	0,738112
2001q02	3,8	9,0608	52,366	3,9871	1,8207	1297,5	45,2052	0,749584
2001q03	3,8	9,5258	51,355	4,2367	1,7651	1309,6	44,3813	0,774874
2001q04	3,8	9,1423	51,404	3,9863	1,851	1313,5	44,2217	0,795732

Table B.1 (continued): National currency/\$ exchange rate (quarterly data).

2002q01	3,8	9,0298	51,148	4,1323	1,8425	1325,9	43,4787	0,930006
2002q02	3,8	9,9998	50,418	4,0416	1,7645	1201,3	41,527	1,37324
2002q03	3,8	10,1667	52,447	4,1482	1,777	1227,8	43,3409	1,53828
2002q04	3,8	10,3125	53,096	3,8388	1,7365	1186,2	43,1516	1,46136
2003q01	3,8	10,7889	53,532	4,0512	1,7656	1254,6	42,8534	1,66655
2003q02	3,8	10,4808	53,706	3,8966	1,7567	1193,1	41,9776	1,66655
2003q03	3,8	10,9272	54,942	3,9799	1,7285	1150,1	39,9483	1,66655
2003q04	3,8	11,236	55,569	3,7408	1,7008	1192,6	39,5907	1,66655
2004q01	3,8	11,154	56,357	3,8813	1,679	1146,6	39,4081	2,00028
2004q02	3,8	11,4116	56,181	3,747	1,7163	1155,5	40,8854	2,00028
2004q03	3,8	11,4106	56,336	3,5569	1,6908	1151,8	41,4467	2,00028
2004q04	3,8	11,2648	56,267	2,9904	1,6338	1035,1	39,0612	2,00028
2005q01	3,8	11,2942	54,793	3,1518	1,6498	1015,5	39,1123	2,00028
2005q02	3,8	10,8428	55,919	3,3461	1,6832	1025,4	41,269	2,23911
2005q03	3,7692	10,8495	56,055	3,2575	1,6891	1041,1	40,9633	2,23911
2005q04	3,78	10,7777	53,067	3,2613	1,6642	1011,6	41,0299	2,23911
2006q01	3,686	10,951	51,284	3,2491	1,6183	971,6	38,7958	2,23911
2006q02	3,675	11,3973	53,587	3,1816	1,5894	960,3	38,1859	2,23911
2006q03	3,6845	11,0152	50,387	3,1425	1,5869	946,2	37,4931	2,23911
2006q04	3,5315	10,881	49,132	2,9105	1,5336	929,8	36,0455	2,23911
2007q01	3,456	11,0813	48,262	2,9058	1,5172	940,9	34,9669	2,23911
2007q02	3,4545	10,8661	46,329	2,7989	1,5326	926,8	34,4965	2,23911
2007q03	3,417	10,9243	45,063	2,6647	1,4909	915,1	34,3851	2,23911
2007q04	3,3065	10,8662	41,401	2,435	1,4412	936,1	33,7184	2,23911
2008q01	3,1875	10,6962	41,868	2,2305	1,3799	990,4	31,4603	2,23911
2008q02	3,2665	10,2841	44,756	2,1194	1,3616	1046	33,4837	2,23911
2008q03	3,4575	10,7919	45,685	2,3708	1,4314	1207	34,0018	2,23911
2008q04	3,464	13,5383	47,485	2,9618	1,4392	1259,5	34,8977	2,23911
2009q01	3,647	14,3317	48,419	3,5416	1,5194	1383,5	35,4797	2,1446
2009q02	3,5225	13,2023	48,308	3,1733	1,4498	1273,9	33,9796	2,1446
2009q03	3,4745	13,5042	47,393	2,8852	1,4141	1178,1	33,5102	2,1446
2009q04	3,4245	13,0587	46,356	2,8503	1,4034	1164,5	33,3197	2,1446

APPENDIX C: Impulse responses

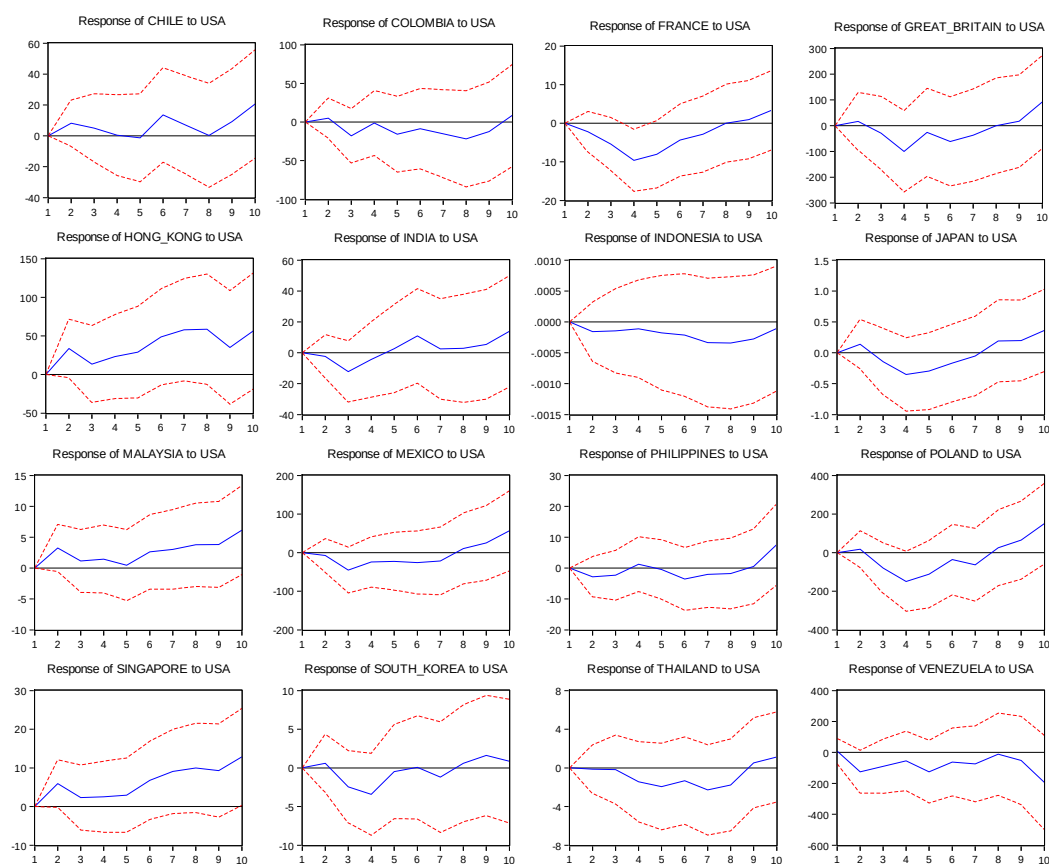


Figure C.1: Impulse response to unit stock in the US market before the crisis period.

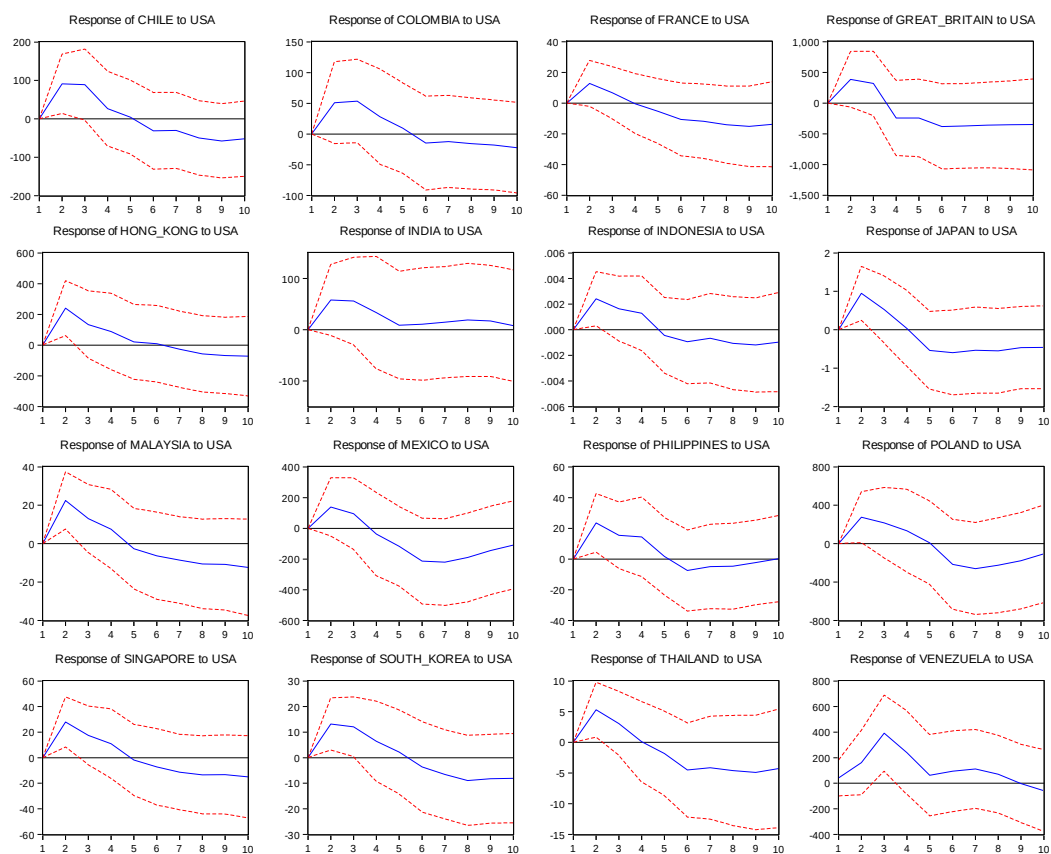


Figure C.2: Impulse response to unit shock in the US market during the crisis period.

APPENDIX E: Decomposition of innovations

Table E.1: Decomposition of innovations before the crisis (percentage of forecast error variances).

	Horizon (weeks)	Chile	Colombia	France	Great Britain	Hong Kong	India	Indonesia	Japan	Malaysia
Pre-crisis										
Chile	1	86,18	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	83,66	0,04	0,01	0,19	0,01	0,32	0,06	2,01	0,18
	3	78,02	0,07	0,01	0,48	0,18	0,23	0,07	4,13	0,20
Colombia	1	0,38	85,06	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,29	79,24	0,01	0,32	0,28	0,30	0,12	0,05	1,00
	3	0,34	73,15	0,08	0,38	0,51	0,61	0,10	0,63	1,66
France	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,57	0,17	0,05	0,61	0,05	0,04	0,22	0,09	0,66
	3	1,01	0,59	0,10	1,44	0,08	0,08	0,38	1,45	0,54
Great Britain	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,65	0,00	0,01	0,40	0,00	0,11	1,61	0,00	1,71
	3	0,64	0,07	0,12	0,82	0,02	0,09	1,59	0,50	1,67
Hong Kong	1	2,96	0,99	9,94	0,33	61,06	0,00	0,00	0,00	0,00
	2	4,73	1,15	12,74	0,51	47,95	0,00	0,84	0,48	0,42
	3	6,28	1,15	12,89	1,41	44,35	0,00	0,75	1,37	1,99
India	1	2,58	3,76	1,32	0,95	1,64	62,40	0,00	0,00	0,00
	2	3,39	5,54	1,21	1,72	3,30	55,45	0,05	0,15	0,45
	3	3,36	8,09	1,89	3,06	4,35	48,80	0,04	1,15	0,88
Indonesia	1	2,47	1,87	0,01	0,20	2,77	2,27	67,25	0,00	0,00
	2	1,95	2,35	0,02	1,05	2,39	5,90	53,68	0,01	0,04
	3	1,79	2,30	0,11	2,27	2,27	5,99	50,26	0,11	0,11

Table E.1 (continued): Decomposition of innovations before the crisis (percentage of forecast error variances).

Japan	1	1,61	1,19	2,21	0,75	3,15	0,30	0,55	68,54	0,00
	2	1,38	0,69	4,95	0,55	1,91	0,57	0,31	61,31	0,80
	3	1,40	0,68	5,39	0,50	1,67	0,53	0,25	56,61	2,84
Malaysia	1	3,54	1,47	6,53	0,10	11,60	0,14	2,66	0,48	37,81
	2	4,57	0,92	11,48	0,32	9,54	0,41	1,72	0,30	27,95
	3	5,28	0,89	12,64	1,06	9,57	0,34	1,71	0,61	22,83
Mexico	1	0,39	1,98	1,76	0,05	0,49	0,28	0,43	0,14	0,06
	2	0,53	2,28	1,73	0,61	0,51	0,69	0,42	0,08	0,92
	3	0,47	3,19	2,14	1,54	1,03	0,82	0,30	0,49	0,84
Philippines	1	0,02	1,04	0,00	0,01	1,67	0,18	3,61	0,89	2,23
	2	0,85	0,78	0,02	0,54	1,02	1,83	2,10	0,52	1,44
	3	1,47	0,64	0,17	1,28	0,80	2,91	1,86	0,45	2,13
Poland	1	1,44	0,79	0,81	0,01	1,45	0,37	0,05	0,22	0,72
	2	2,26	1,72	0,45	0,28	0,81	1,43	0,58	0,17	0,65
	3	2,35	2,05	0,51	1,12	0,66	1,91	0,69	0,34	0,58
Singapore	1	3,06	0,76	13,13	0,19	10,72	0,09	0,78	0,01	37,63
	2	4,08	0,43	20,14	0,68	8,23	0,29	0,43	0,02	26,55
	3	4,81	0,37	21,63	1,56	7,79	0,27	0,33	0,64	21,32
South Korea	1	0,38	0,65	4,62	0,16	6,44	0,59	0,57	4,22	1,16
	2	0,24	0,58	9,36	0,92	5,70	1,28	0,43	2,62	0,71
	3	0,24	0,43	10,88	2,60	5,27	1,38	0,38	1,95	0,52
Thailand	1	0,43	0,22	0,08	0,06	1,41	2,88	1,68	0,64	0,58
	2	0,43	0,21	0,13	0,10	0,80	4,93	0,91	1,14	0,31
	3	0,77	0,17	0,10	0,45	1,15	5,28	0,67	1,25	0,21
Venezuela	1	0,00	0,01	0,32	0,01	1,51	0,28	4,73	0,03	0,01
	2	0,00	0,09	0,38	0,03	2,29	0,32	3,37	0,04	0,00
	3	0,05	0,22	0,69	0,54	2,47	0,27	2,75	0,17	0,08

Table E.1 (continued): Decomposition of innovations before the crisis (percentage of forecast error variances).

	Horizon (weeks)	Mexico	Philippines	Poland	Singapore	South Korea	Thailand	U.S.	Venezuela
Pre-crisis									
Chile	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,19	0,21	0,04	0,16	0,24	0,00	0,00	0,12
	3	0,43	0,18	0,22	0,70	0,69	0,09	0,08	0,08
Colombia	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,38	0,40	0,64	0,00	0,00	0,39	0,30	0,00
	3	0,28	0,81	2,40	0,30	0,03	0,39	0,23	0,01
France	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,79	0,21	0,14	0,00	0,11	0,27	0,12	0,03
	3	0,74	0,99	0,10	0,00	0,15	0,90	0,23	0,03
Great Britain	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,11	1,16	0,01	0,18	0,28	0,66	0,00	0,01
	3	0,19	1,63	0,86	0,42	0,70	0,86	0,04	0,00
Hong Kong	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,00	0,10	0,52	0,31	0,30	0,59	0,15	0,11
	3	0,02	0,11	0,41	0,26	0,43	0,51	0,30	0,10
India	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,79	0,01	0,50	0,07	0,07	0,34	0,18	0,00
	3	0,63	0,18	0,37	0,50	0,12	0,52	0,38	0,04
Indonesia	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,02	0,00	0,38	0,25	0,20	0,37	0,04	0,87
	3	0,07	0,09	0,27	0,20	0,15	0,64	0,12	0,80
Japan	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,33	0,17	0,04	0,00	0,36	0,88	0,22	0,02
	3	0,41	0,24	0,09	0,12	0,38	0,94	0,57	0,02

Table E.1 (continued): Decomposition of innovations before the crisis (percentage of forecast error variances).

Malaysia	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,43	0,15	0,82	0,02	0,07	0,25	0,35	0,02
	3	0,65	0,12	0,73	0,37	0,22	0,21	0,57	0,05
Mexico	1	35,71	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	33,82	0,21	0,00	0,01	0,00	0,05	0,67	0,01
	3	30,63	0,21	0,38	0,80	0,14	0,31	0,85	0,03
Philippines	1	1,47	60,69	0,00	0,00	0,00	0,00	0,00	0,00
	2	4,29	53,05	0,02	0,10	0,18	0,35	0,35	0,03
	3	6,00	44,26	0,05	0,49	1,06	0,25	0,36	0,04
Poland	1	1,31	0,27	41,21	0,00	0,00	0,00	0,00	0,00
	2	1,40	0,54	35,72	0,54	0,00	0,01	0,01	0,00
	3	1,71	1,21	33,97	2,30	0,01	0,04	0,01	0,24
Singapore	1	0,02	0,02	0,03	3,79	0,00	0,00	0,00	0,00
	2	0,36	0,38	0,91	4,48	0,08	0,18	0,34	0,01
	3	0,46	0,27	0,92	5,63	0,17	0,15	0,52	0,17
South Korea	1	0,41	0,05	0,00	1,64	55,86	0,00	0,00	0,00
	2	0,74	0,05	0,07	1,32	46,56	0,41	0,18	0,11
	3	0,77	0,14	0,07	3,16	39,54	0,54	0,61	0,22
Thailand	1	0,51	0,09	1,43	0,08	1,55	65,94	0,00	0,00
	2	1,24	0,05	2,17	0,04	0,84	59,79	0,12	0,04
	3	1,33	0,04	2,52	0,33	0,64	57,44	0,28	0,04
Venezuela	1	0,07	0,01	0,79	0,13	0,23	1,22	0,06	87,53
	2	2,80	0,15	1,41	0,07	0,12	0,88	1,08	81,02
	3	5,02	0,20	1,01	0,16	0,52	0,63	2,01	74,53

Table E.2: Decomposition of innovations during the crisis (percentage of forecast error variances).

	Horizon (weeks)	Chile	Colombia	France	Great Britain	Hong Kong	India	Indonesia	Japan	Malaysia
During crisis										
Chile	1	45,31	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	40,26	1,63	0,36	0,01	0,96	0,36	0,38	0,74	1,13
	3	33,97	1,38	0,47	0,19	1,70	1,07	0,31	1,77	1,33
Colombia	1	2,91	53,60	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	4,48	42,89	0,31	0,04	0,01	0,16	3,42	1,26	0,16
	3	5,75	35,24	0,29	0,95	0,12	0,15	3,01	1,53	0,27
France	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,13	5,86	0,01	1,34	2,12	0,00	0,01	0,16	1,11
	3	0,09	4,14	0,39	2,81	2,78	0,03	0,01	0,76	1,02
Great Britain	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,01	0,63	0,01	1,42	3,95	0,00	0,18	0,07	0,73
	3	0,09	0,69	0,11	4,24	3,90	0,04	0,12	0,60	0,67
Hong Kong	1	0,00	0,17	0,59	0,61	41,71	0,00	0,00	0,00	0,00
	2	0,07	0,74	1,94	1,16	32,52	0,07	0,00	0,06	1,85
	3	0,05	0,53	1,87	1,55	29,77	0,08	0,15	0,19	3,67
India	1	0,02	1,16	0,91	0,60	9,54	43,06	0,00	0,00	0,00
	2	3,49	0,81	0,87	1,20	11,03	29,39	0,02	0,15	1,00
	3	3,42	1,18	0,72	1,35	14,04	22,55	0,10	0,18	1,53
Indonesia	1	0,10	0,25	3,52	0,87	2,66	2,93	31,38	0,00	0,00
	2	0,05	1,82	2,24	0,87	7,95	3,40	17,63	0,09	0,75
	3	0,13	1,90	1,44	0,61	10,48	4,34	11,84	0,06	2,56
Japan	1	2,84	1,24	0,74	0,77	11,28	0,34	0,02	34,09	0,00
	2	2,48	0,61	0,68	0,38	7,05	0,30	0,89	20,29	1,28
	3	1,59	1,35	0,44	0,42	7,22	0,20	0,77	16,68	2,19

Table E.2 (continued): Decomposition of innovations during the crisis (percentage of forecast error variances).

Malaysia	1	0,01	0,24	0,00	0,80	21,81	0,01	0,41	1,07	16,59
	2	0,10	0,68	1,28	1,50	18,07	0,10	0,23	0,57	17,28
	3	0,11	0,55	1,37	1,35	16,79	0,11	0,18	0,79	15,07
Mexico	1	0,24	1,39	0,82	0,71	0,00	0,36	0,04	1,10	2,07
	2	0,16	0,74	0,49	1,15	1,70	1,30	0,04	3,50	7,83
	3	0,28	2,03	0,36	2,13	1,88	1,21	0,04	4,63	7,18
Philippines	1	4,67	1,70	0,16	0,44	2,68	0,30	5,94	0,00	0,67
	2	3,20	1,06	0,41	0,29	5,26	0,19	4,22	0,45	1,04
	3	2,26	0,68	1,27	0,48	7,23	0,17	2,65	0,55	1,41
Poland	1	0,10	7,00	1,58	0,26	0,27	0,24	1,35	0,12	0,05
	2	0,22	3,24	2,62	0,19	1,42	1,30	0,75	0,05	1,52
	3	0,21	2,38	2,63	0,16	2,31	2,83	0,50	1,12	1,34
Singapore	1	0,03	0,64	0,00	0,15	21,04	0,00	0,58	1,11	16,27
	2	0,02	0,47	1,57	0,59	16,46	0,02	0,34	0,60	15,95
	3	0,04	0,64	1,77	0,46	14,55	0,02	0,22	1,02	13,27
South Korea	1	0,08	0,23	0,00	0,00	8,89	0,00	2,27	0,19	0,04
	2	0,08	0,14	3,23	0,06	9,90	0,37	1,61	0,13	0,45
	3	0,06	2,26	2,17	0,59	10,63	0,56	1,11	1,44	0,66
Thailand	1	3,91	2,53	0,56	0,02	0,32	1,41	4,12	1,80	0,19
	2	3,41	1,87	0,42	0,91	2,36	1,51	3,73	1,11	1,25
	3	2,17	1,74	1,12	1,27	5,50	1,16	2,83	1,86	1,54
Venezuela	1	0,01	1,00	0,95	7,03	1,45	0,54	0,68	0,77	1,30
	2	0,38	0,54	2,75	4,24	1,20	0,39	2,34	0,54	1,97
	3	0,71	0,44	4,02	3,23	1,58	0,67	2,06	0,41	1,90

Table E.2 (continued): Decomposition of innovations during the crisis (percentage of forecast error variances).

	Horizon (weeks)	Mexico	Philippines	Poland	Singapore	South Korea	Thailand	U.S.	Venezuela
During crisis									
Chile	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,06	2,53	1,75	0,02	1,75	1,14	4,48	0,00
	3	0,05	2,63	1,31	0,86	2,77	1,54	5,80	0,06
Colombia	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,07	0,31	0,40	0,01	2,97	0,40	1,80	0,19
	3	0,06	0,31	0,33	0,79	5,37	1,30	2,77	0,95
France	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,18	0,71	1,99	1,63	1,09	0,17	2,58	0,19
	3	0,15	0,50	2,76	1,39	2,71	2,30	2,25	0,96
Great Britain	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,15	0,53	3,47	1,23	1,49	1,23	3,28	0,43
	3	0,13	0,35	3,43	1,90	2,06	3,80	3,08	0,94
Hong Kong	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,32	0,83	3,60	0,18	2,81	0,03	3,10	0,12
	3	0,47	0,60	3,54	0,50	4,52	1,17	2,90	0,13
India	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,03	0,22	0,92	0,05	1,22	0,00	1,37	0,63
	3	0,11	0,40	0,86	0,66	4,02	0,81	1,18	2,05
Indonesia	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,01	1,57	3,95	0,02	0,03	0,15	2,62	0,48
	3	0,19	1,23	3,14	2,33	1,49	1,18	2,74	0,96
Japan	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	2,12	6,61	0,89	0,01	4,28	0,93	2,93	0,21
	3	1,78	4,96	1,02	0,48	8,05	2,32	2,35	0,32

Table E.2 (continued): Decomposition of innovations during the crisis (percentage of forecast error variances).

Malaysia	1	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,37	0,55	1,99	0,02	1,25	0,30	4,05	0,06
	3	0,65	0,41	1,98	0,92	4,31	1,71	3,38	0,30
Mexico	1	24,14	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	2	17,69	0,02	1,81	3,24	3,69	1,43	0,18	0,92
	3	15,16	0,04	1,48	2,29	5,64	2,34	0,20	1,10
Philippines	1	0,70	37,01	0,00	0,00	0,00	0,00	0,00	0,00
	2	0,43	23,10	5,45	0,44	2,52	0,00	1,97	0,10
	3	0,31	14,54	5,98	2,35	5,86	0,21	3,88	0,06
Poland	1	0,20	0,54	25,70	0,00	0,00	0,00	0,00	0,00
	2	0,42	0,27	17,55	0,70	5,85	0,65	1,70	0,05
	3	0,47	0,52	12,08	1,62	10,74	1,75	2,02	0,14
Singapore	1	0,13	0,03	0,01	1,72	0,00	0,00	0,00	0,00
	2	0,09	0,38	3,11	1,09	1,53	0,14	4,04	0,09
	3	0,19	0,28	3,00	2,56	5,04	1,03	3,53	0,27
South Korea	1	0,85	0,13	0,07	1,95	38,18	0,00	0,00	0,00
	2	0,55	0,36	4,73	1,34	23,09	1,60	2,06	0,84
	3	0,33	0,23	4,56	2,47	15,36	4,88	2,20	1,10
Thailand	1	1,51	1,08	0,38	0,40	3,10	27,19	0,00	0,00
	2	1,52	0,83	2,13	0,50	1,67	20,91	3,59	0,62
	3	1,08	0,63	2,37	1,19	1,71	18,99	2,32	1,20
Venezuela	1	0,09	0,93	0,64	3,37	1,57	1,31	0,03	67,35
	2	0,43	1,03	0,84	2,48	0,88	3,35	0,35	63,26
	3	2,08	2,10	0,89	2,40	0,66	4,42	2,14	57,47

APPENDIX F: International macroeconomic market value

Table F.1: International macroeconomic market value of national economies (millions of US \$).

	chile	colombia	france	great britain	hong kong	india	indonesia	japan	malaysia
Q4 1988	16207,57	35543,60	471472,16	1006953,66	80370,71	287084,60	118833,14	7504047,05	65956,09
Q1 1989	17282,19	36056,59	447349,99	972052,31	83978,04	284843,91	124036,97	7270017,50	66709,86
Q2 1989	17782,28	36299,15	431662,03	921892,33	87300,52	279114,67	129677,20	6770487,86	69641,12
Q3 1989	18445,01	36514,74	452756,52	997543,94	90640,26	286369,56	135741,13	7115928,14	71762,04
Q4 1989	18794,76	36365,30	496262,72	1016125,74	93951,65	289775,22	141421,91	7018963,26	73146,71
Q1 1990	20343,54	36307,48	505309,95	1068445,17	97808,97	299370,42	147365,67	6520961,96	74741,10
Q2 1990	21986,59	36373,90	514464,09	1163275,25	101952,52	308135,47	153557,51	6823545,85	77456,29
Q3 1990	22833,15	36494,69	552474,17	1283978,01	106173,17	309873,68	159695,54	7703520,33	79988,59
Q4 1990	22257,78	36516,69	565396,46	1355025,49	109515,19	321997,29	164221,42	8034003,29	82233,22
Q1 1991	23504,83	37043,38	499692,35	1242569,12	114007,48	308214,08	170176,07	7791200,33	83316,69
Q2 1991	24992,61	37482,62	474001,62	1182284,68	118920,17	296107,86	176753,03	8102599,36	86211,68
Q3 1991	26006,63	37427,17	515096,67	1300861,71	123572,21	252381,73	183928,19	8552033,55	90680,59
Q4 1991	26369,43	37307,95	564688,72	1413215,15	127401,75	260500,10	190043,13	9224655,44	94477,36
Q1 1992	30573,30	38436,40	525920,84	1334767,13	133546,43	271625,42	196880,15	8793240,93	102933,76
Q2 1992	31920,26	39548,66	571074,72	1479442,60	139125,53	283316,22	204450,87	9462888,62	109639,42
Q3 1992	32689,51	40545,21	615743,50	1410984,37	144752,23	295007,02	213047,09	10100044,91	113483,55
Q4 1992	34236,97	41432,06	533368,65	1214892,85	149828,78	303068,95	219559,32	9781628,72	111893,60
Q1 1993	35287,13	43787,85	535389,71	1225701,91	155503,27	264652,42	226438,10	10606385,26	117139,00
Q2 1993	37658,27	45963,43	514433,51	1247641,88	160611,47	274083,72	232363,65	11689439,50	122289,55
Q3 1993	39687,73	47964,40	516696,28	1267018,02	166318,39	284171,90	237854,51	11998501,26	128281,02
Q4 1993	40227,28	49809,02	495700,65	1259654,47	172020,76	294428,34	245317,20	11403103,70	125437,83
Q1 1994	43548,33	60517,54	511934,51	1280781,74	179485,30	308636,19	251076,39	12478542,37	132044,50
Q2 1994	47383,17	65457,84	534385,26	1351972,42	186970,17	322750,19	258562,08	13113439,10	140979,30
Q3 1994	51203,96	68446,73	553750,23	1408255,16	194528,59	336864,18	265443,14	13312449,36	148557,51
Q4 1994	55338,77	74118,42	547208,14	1414299,13	201751,42	350866,32	272440,40	13257821,70	154378,50
Q1 1995	58812,65	75622,97	603957,37	1484658,34	210563,84	369042,57	281635,80	14927914,71	162577,35

Table F.1 (continued): International macroeconomic market value of national economies (millions of US \$).

Q2 1995	67566,45	81157,91	604121,95	1491528,75	219104,14	389544,77	289639,72	15901692,93	176119,49
Q3 1995	67481,24	78610,16	597216,07	1502575,93	227957,26	377952,14	297191,99	13802210,22	178231,00
Q4 1995	69370,29	82443,33	599639,38	1497732,55	236640,35	382854,12	304026,32	13305760,07	182564,13
Q1 1996	72580,44	82309,24	584305,65	1497972,45	244906,42	411621,10	312379,54	12987042,75	190044,74
Q2 1996	76916,85	85221,66	570914,09	1545033,47	253037,37	421936,58	323812,64	12724314,57	200413,92
Q3 1996	80259,53	93685,91	569145,47	1583292,83	261594,77	432193,54	336199,76	12655006,73	206561,85
Q4 1996	81840,76	100368,22	562351,86	1747655,63	269818,43	448577,38	342025,05	12209980,11	212015,76
Q1 1997	88154,37	100372,46	522292,65	1705218,47	279497,97	469142,23	351518,13	11508351,94	224643,37
Q2 1997	92086,43	102571,43	501910,68	1769669,12	289777,10	490687,03	361469,00	12577486,21	228768,20
Q3 1997	96668,88	94154,50	497649,16	1744358,00	300296,86	505967,98	281183,43	11984444,53	187348,36
Q4 1997	95319,80	94946,98	493499,46	1816958,00	310158,93	484608,80	205624,18	11245641,81	159048,29
Q1 1998	96065,76	94673,52	479307,74	1880716,91	316540,92	501379,59	117617,61	11120239,89	171831,04
Q2 1998	97458,59	98542,55	486061,61	1895745,86	323251,57	484425,57	67260,46	10475571,20	152237,77
Q3 1998	100879,60	90007,65	531049,77	1968325,23	329715,26	502297,34	95812,62	10961484,13	169083,91
Q4 1998	102912,32	96724,00	532139,69	1965699,11	336177,28	520519,63	130617,97	12885789,38	171146,96
Q1 1999	102984,89	97355,80	3227385,05	1937948,14	340201,87	540098,59	122136,00	12407975,85	172520,74
Q2 1999	98087,47	88204,40	3116126,26	1926865,40	344045,82	547073,16	159573,75	12371951,54	173894,51
Q3 1999	97847,90	77461,90	3231360,22	2048895,16	347748,45	562389,39	129481,86	14062389,99	175268,29
Q4 1999	100059,25	85252,89	3056582,21	2045237,31	351667,68	582444,48	155028,48	14744514,77	176642,07
Q1 2000	107369,77	84333,95	2925163,31	2051027,69	356341,27	599632,24	151880,86	14284190,20	179788,81
Q2 2000	103189,70	79201,73	2944668,02	1975472,26	361321,11	603881,07	138199,73	14393488,21	182935,55
Q3 2000	100552,39	78781,37	2717962,03	1950648,63	366572,64	603578,34	143687,19	14113730,01	186082,29
Q4 2000	101487,05	81891,39	2903505,63	2010603,17	371916,87	612455,66	137151,90	13292061,84	189229,03
Q1 2001	100329,31	80009,95	2773074,98	1950010,90	375779,59	632270,75	132860,86	12285698,05	191510,64
Q2 2001	97108,27	82643,55	2679041,61	1949577,04	379690,02	645108,71	126532,64	12368706,55	193792,24
Q3 2001	89366,37	84274,32	2902476,77	2071553,55	383502,07	651958,20	156414,86	12890847,61	196073,84
Q4 2001	96900,63	87750,64	2818524,14	2073447,99	387510,86	665411,49	151835,99	11695130,43	198355,45
Q1 2002	97766,84	92124,94	2804345,14	2063597,81	389846,01	677781,36	169512,71	11578371,44	201061,58
Q2 2002	95086,45	89533,55	3222776,99	2259960,80	392330,84	697604,57	194065,99	12918040,70	203767,71

Table F.1 (continued): International macroeconomic market value of national economies (millions of US \$).

Q3 2002	90565,01	78180,03	3201758,69	2331119,42	394664,46	725674,67	194314,70	12701611,24	206473,84
Q4 2002	96973,83	79407,14	3422515,96	2435709,34	397200,52	752120,45	202382,32	12883250,48	209179,97
Q1 2003	96992,51	79731,87	3573978,42	2419877,04	398788,55	786970,47	208748,41	12860050,20	211717,56
Q2 2003	103286,90	86695,44	3767695,08	2561856,74	400427,93	833151,42	230508,61	12895855,90	214255,14
Q3 2003	110476,11	87433,96	3861457,05	2632965,49	404819,84	872685,86	233638,90	13902892,35	216792,73
Q4 2003	125032,91	93861,82	4206785,18	2844671,80	405372,08	905794,26	237475,45	14439168,33	219330,31
Q1 2004	122800,24	101319,12	4098118,52	2965833,04	405601,26	992559,35	243449,61	14837320,85	222603,89
Q2 2004	122706,06	104343,94	4101397,93	2970552,35	407129,36	977373,24	230565,47	14288892,80	225877,46
Q3 2004	131304,46	112524,73	4214068,13	2990531,75	409048,12	1012842,14	245479,39	13961512,05	229151,03
Q4 2004	145186,34	125350,02	4655263,30	3255141,61	412210,01	1114161,35	250949,21	14894597,33	232424,60
Q1 2005	142385,56	132588,57	4465329,43	3216909,72	412618,73	1161581,39	258636,11	14463935,63	235145,23
Q2 2005	148076,34	140590,96	4197263,37	3106588,32	415894,62	1220022,17	264843,25	14081354,21	237865,86
Q3 2005	164789,85	148745,29	4212058,48	3100770,24	418437,67	1258320,89	261200,25	13755718,25	242552,44
Q4 2005	175354,50	154672,50	4157861,28	3063079,75	420501,19	1278548,92	286218,39	13209608,68	244594,46
Q1 2006	175216,85	161693,14	4305375,87	3132029,86	422950,85	1354163,86	325929,29	13293875,73	254323,39
Q2 2006	173128,25	147065,88	4563287,70	3360110,82	425396,10	1401511,62	333558,04	13597777,17	258586,40
Q3 2006	180312,36	168626,77	4585381,50	3475081,81	427067,79	1435574,44	351529,11	13288862,14	261412,40
Q4 2006	185881,42	189256,15	4812875,21	3699365,66	430605,45	1553994,70	375903,86	13180255,87	276381,98
Q1 2007	189187,01	204134,31	4919853,62	3749641,21	431794,53	1653185,39	391255,64	13347159,02	287412,57
Q2 2007	198579,96	234241,09	5042569,32	3900192,82	434856,99	1849705,28	413550,37	12763085,95	292532,27
Q3 2007	209966,73	237141,54	5350542,23	4013282,12	440624,38	1980592,93	429145,36	13692280,78	300792,39
Q4 2007	222147,89	249597,33	5613528,75	4019054,54	441825,07	2080755,60	435069,25	13840339,71	316063,06
Q1 2008	259198,47	283623,90	6092627,47	4039531,73	445796,60	2144323,06	476760,62	15777242,70	333091,49
Q2 2008	225857,55	293072,68	6137004,34	4096488,41	447996,99	2083085,76	508475,68	14857192,32	330138,00
Q3 2008	219276,41	256432,75	5625279,76	3747391,42	453087,59	1985646,30	531784,34	15170743,34	316720,87
Q4 2008	198390,95	263019,72	5528973,82	3072237,62	457041,84	2000290,68	482507,67	17452471,60	320937,94
Q1 2009	218706,55	233343,82	5327319,92	3035680,13	460624,34	1961663,25	484971,73	16105961,94	305776,12
Q2 2009	245352,11	281994,08	5700767,31	3521342,69	464206,85	2150162,56	581284,75	16427075,93	317559,11
Q3 2009	242290,91	331241,18	5950401,24	3441574,54	467789,35	2205716,75	648045,18	17515439,50	322935,22

Table F.1 (continued): International macroeconomic market value of national economies (millions of US \$).

Q4 2009	266191,09	320975,17	5897707,78	3474446,30	471067,96	2334521,90	702533,42	17038280,18	328653,79
	mexico	philippines	poland	singapore	south korea	thailand	usa	venezuela	
Q4 1988	70008,66	42332,25	767393,43	67037,88	256363,83	97398,90	7118248,54	62147,38	
Q1 1989	79493,61	44023,53	1096560,67	67991,07	275788,01	101361,78	7259341,30	25240,84	
Q2 1989	88191,46	44705,15	1425727,91	69128,33	292604,07	104786,57	7400434,06	25868,46	
Q3 1989	96268,76	46058,26	1754895,15	70716,16	306192,39	110494,12	7541526,83	25889,66	
Q4 1989	103828,93	46640,46	2084062,38	74611,21	316469,06	116001,36	7682619,59	23694,58	
Q1 1990	114184,39	48079,00	3127532,05	76929,78	325311,22	121463,23	7815159,08	24067,22	
Q2 1990	124181,87	49032,33	4171001,72	80764,35	337611,23	129164,57	7947698,57	22999,08	
Q3 1990	134149,80	46142,43	5214471,39	86314,32	357775,67	138385,72	8080238,06	22740,21	
Q4 1990	144505,72	44119,75	6257941,05	89311,96	374632,75	145600,38	8212777,55	22465,13	
Q1 1991	158800,93	45520,26	7358789,52	88931,05	393781,74	151339,84	8322519,47	23102,60	
Q2 1991	172667,14	47343,49	8459637,98	92392,99	418144,58	158751,46	8432261,39	24637,53	
Q3 1991	186171,34	50110,97	9560486,44	98714,04	430677,09	167624,63	8542003,31	24967,79	
Q4 1991	200801,30	52240,55	10661334,90	104529,23	442079,10	177245,50	8651745,24	25912,24	
Q1 1992	217668,12	56508,98	11784042,13	105208,20	456116,95	182781,83	8770017,58	27693,31	
Q2 1992	232427,31	57712,80	12906749,35	110654,49	469170,73	192869,25	8888289,93	30335,90	
Q3 1992	250365,77	60457,05	14029456,57	115069,27	493187,36	202316,14	9006562,28	31943,64	
Q4 1992	267938,69	62194,69	15152163,79	113981,45	513880,83	206683,41	9124834,63	30469,93	
Q1 1993	285957,24	63294,51	16706117,84	117674,42	534347,46	216625,87	9256102,33	31062,50	
Q2 1993	300149,34	61191,99	18260071,90	122358,91	551698,54	226245,69	9387370,03	31640,50	
Q3 1993	316848,76	57787,64	19814025,96	128609,80	571869,88	235387,91	9518637,73	30996,40	
Q4 1993	334497,58	64147,37	21367980,01	130449,22	596035,88	240831,91	9649905,43	30562,10	
Q1 1994	326647,68	66557,27	23973752,84	136980,54	625580,84	254223,26	9808614,37	30206,57	
Q2 1994	340829,57	70326,43	26579525,66	144437,63	654755,18	267197,23	9967323,31	18666,41	
Q3 1994	356809,81	75012,20	29185298,48	151856,66	688796,67	277952,12	10126032,25	23192,93	
Q4 1994	239086,47	82240,57	31791071,30	157809,57	726707,25	287113,21	10284741,19	24562,49	
Q1 1995	196763,58	79995,24	35976236,22	166871,98	778269,59	304452,59	10446707,31	27619,72	
Q2 1995	223441,32	84047,79	40161401,14	174080,65	828012,09	318760,90	10608673,43	30676,94	

Table F.1 (continued): International macroeconomic market value of national economies (millions of US \$).

Q3 1995	230241,65	85179,68	44346566,06	175571,44	852416,63	326650,60	10770639,54	33734,17
Q4 1995	202333,86	87392,01	48531730,98	180792,50	880699,52	338134,87	10932605,66	21567,37
Q1 1996	220541,37	90734,75	54305876,33	186210,32	912305,65	350904,94	11109959,65	25210,79
Q2 1996	234260,77	93999,25	60080021,68	190562,04	920115,15	362344,08	11287313,64	17841,63
Q3 1996	252235,45	97084,45	65854167,03	195428,07	946942,35	374695,52	11464667,63	19914,04
Q4 1996	257230,02	100244,61	71628312,38	201208,76	958792,67	385024,38	11642021,62	21995,60
Q1 1997	277381,76	103807,99	79441915,67	200531,11	935953,16	388330,91	11845895,53	27355,95
Q2 1997	296289,83	107602,34	87255518,97	208337,75	979477,97	399745,37	12049769,45	32262,25
Q3 1997	323158,62	86820,04	95069122,27	200103,61	983936,59	288418,59	12253643,36	36698,38
Q4 1997	333559,53	76115,82	102882725,57	187522,51	548870,80	227705,28	12457517,28	41372,03
Q1 1998	338400,40	84011,98	112386253,86	198436,11	682560,99	277934,13	12679896,34	46161,05
Q2 1998	339322,42	75735,11	121889782,15	189350,15	697471,02	255512,96	12902275,41	50194,20
Q3 1998	321924,90	74420,43	131393310,44	194467,23	698255,61	275722,10	13124654,48	53354,62
Q4 1998	348622,67	85327,40	140896838,72	200043,19	818039,38	296112,08	13347033,54	60364,44
Q1 1999	383301,86	87154,48	151043652,44	194682,25	819751,79	289613,39	13593086,49	63821,23
Q2 1999	406396,32	90072,28	161190466,16	201190,55	886965,69	296953,43	13839139,45	66672,70
Q3 1999	434265,80	84410,52	171337279,88	204007,03	861285,37	267883,97	14085192,40	69375,16
Q4 1999	449030,14	87220,32	181484093,60	211524,16	939001,37	293965,32	14331245,35	72088,76
Q1 2000	489812,82	87243,22	192173457,95	209095,32	990404,11	293930,71	14596305,12	75448,38
Q2 2000	479492,67	84553,55	202862822,30	211881,95	1006448,73	286541,47	14861364,89	79609,71
Q3 2000	533868,03	80270,92	213552186,65	214499,34	1030487,64	267866,62	15126424,66	84075,11
Q4 2000	550901,66	75633,71	224241551,00	219727,43	929851,40	263602,37	15391484,43	88397,28
Q1 2001	574727,40	78941,59	232431783,59	213284,49	905584,42	257331,58	15617446,43	94130,02
Q2 2001	627997,42	76660,84	240622016,18	212873,84	946843,58	257434,22	15843408,44	99318,29
Q3 2001	619220,24	80437,45	248812248,77	221596,55	958228,29	264826,11	16069370,44	102489,31
Q4 2001	667991,35	82626,04	257002481,37	213236,49	975456,40	268404,17	16295332,44	106047,27
Q1 2002	699973,56	85345,97	263754459,97	215584,93	988730,08	275949,64	16507110,76	95250,31
Q2 2002	653439,59	88921,48	270506438,56	226539,94	1116001,36	292016,63	16718889,07	67563,94
Q3 2002	663726,59	87730,66	277258417,16	226361,41	1116100,06	282763,33	16930667,39	63044,22

Table F.1 (continued): International macroeconomic market value of national economies (millions of US \$).

Q4 2002	675059,70	88880,09	284010395,76	233088,80	1180275,57	286984,96	17142445,71	69235,37
Q1 2003	673812,47	91752,87	290840531,58	228480,96	1141751,68	292597,57	17361723,05	62691,39
Q2 2003	723020,92	95040,63	297670667,41	228868,49	1227759,99	302393,20	17581000,39	64671,84
Q3 2003	721683,50	96406,93	304500803,23	231819,82	1301833,96	321632,74	17800277,74	66652,30
Q4 2003	729273,96	98783,98	311330939,05	234800,00	1282607,76	328451,42	18019555,08	68632,75
Q1 2004	768909,52	101035,05	319745172,75	239536,88	1364176,52	335430,12	18286401,02	61955,62
Q2 2004	785053,05	104995,24	328159406,45	235982,65	1383549,62	328569,74	18553246,97	66729,28
Q3 2004	818625,31	108340,02	336573640,15	241218,13	1417970,46	329308,42	18820092,91	71502,95
Q4 2004	863157,85	112110,99	344987873,86	251368,71	1611192,31	354924,81	19086938,85	76276,61
Q1 2005	894725,04	119328,38	353095277,05	250638,00	1676101,73	363001,64	19387304,49	83657,86
Q2 2005	967195,43	121042,41	361202680,25	247337,78	1693404,97	352125,55	19687670,13	81328,62
Q3 2005	1001798,21	124855,61	369310083,45	248141,22	1700848,73	362908,00	19988035,77	87922,56
Q4 2005	1043906,65	136223,87	377417486,65	253546,27	1784390,82	370460,31	20288401,42	94516,51
Q1 2006	1070199,04	144561,89	387485019,75	262816,66	1893988,99	399436,76	20614295,95	104015,42
Q2 2006	1069427,54	141796,18	397552552,86	269712,27	1952837,29	413581,66	20940190,48	113514,33
Q3 2006	1149087,03	154467,46	407620085,96	272257,34	2019044,18	429132,48	21266085,02	123013,24
Q4 2006	1206346,87	162172,76	417687619,07	283913,44	2092417,24	454592,84	21591979,55	132512,15
Q1 2007	1227789,46	169182,77	431852218,86	290174,79	2107016,20	476115,57	21894045,22	145435,55
Q2 2007	1296209,90	180498,74	446016818,66	290419,37	2178952,90	490210,46	22196110,88	158358,95
Q3 2007	1333173,70	189946,36	460181418,45	301791,04	2247203,08	499425,75	22498176,55	171282,35
Q4 2007	1384406,00	211511,31	474346018,25	315559,12	2236275,55	517078,62	22800242,21	184205,75
Q1 2008	1458276,40	214045,30	489252066,82	337327,37	2157012,90	565763,14	23051365,39	199167,91
Q2 2008	1570657,58	204810,91	504158115,39	349715,24	2083397,33	542445,79	23302488,57	214130,06
Q3 2008	1548159,57	205130,47	519064163,97	340133,09	1841061,85	544886,04	23553611,74	229092,22
Q4 2008	1275076,40	201669,03	533970212,54	345720,36	1798403,88	541328,52	23804734,92	244054,38
Q1 2009	1230510,80	200536,57	549204270,05	335493,57	1655513,94	536566,84	23912476,65	262761,44
Q2 2009	1364024,18	203761,42	564438327,55	360006,29	1817817,24	564554,64	24020218,38	270713,31
Q3 2009	1361146,99	210512,80	579672385,06	377713,95	1987124,38	576822,90	24127960,12	278665,18
Q4 2009	1436141,88	218102,50	594906442,56	389278,53	2032069,63	584505,90	24235701,85	286617,05

APPENDIX G: Volatility forecast performances

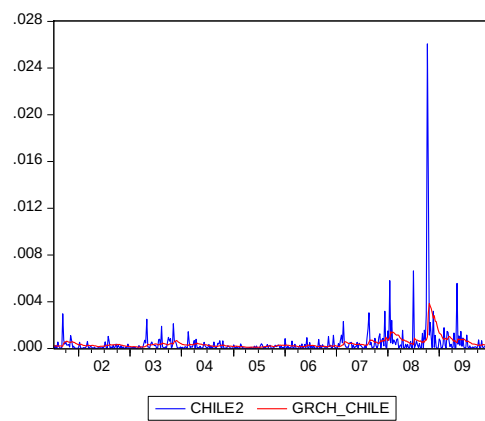


Figure G.1: Forecast performance of Chilean stock market.

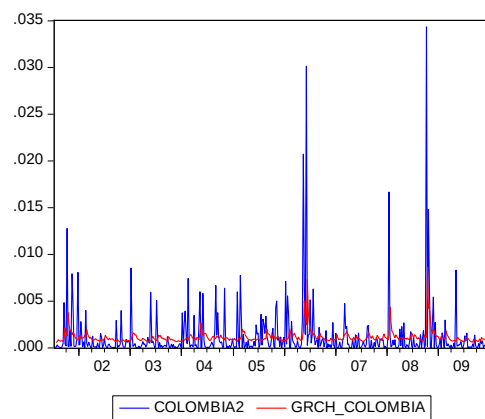


Figure G.2: Forecast performance of Colombian stock market.

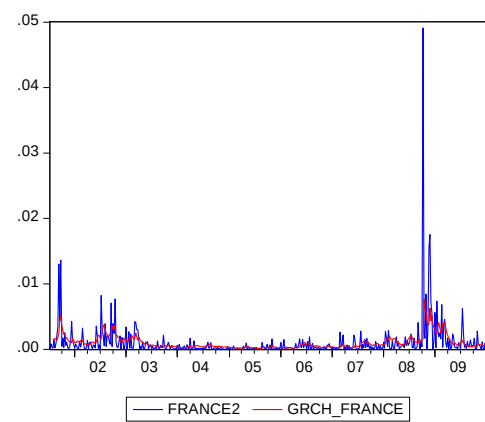


Figure G.3: Forecast performance of French stock market.

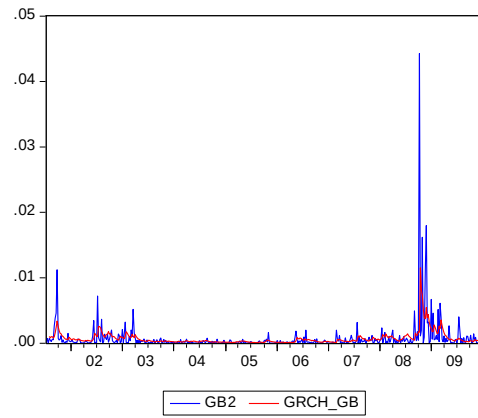


Figure G.4: Forecast performance of British stock market.

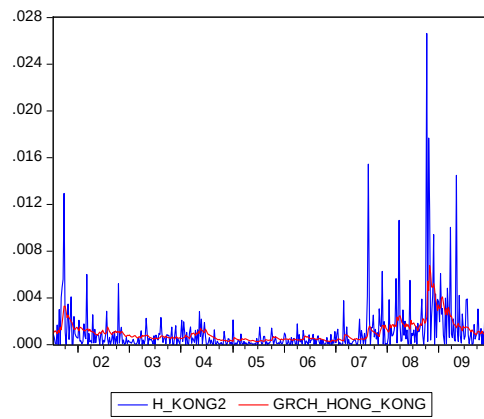


Figure G.5: Forecast performance of Hong Kongese stock market.

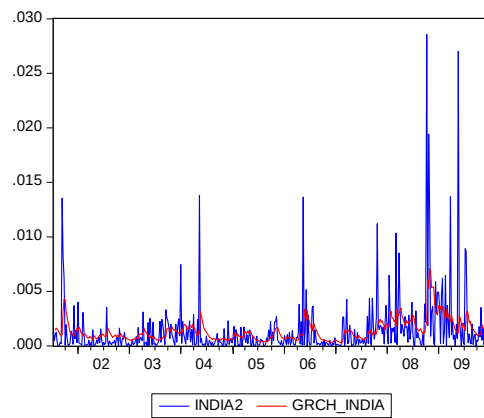


Figure G.6: Forecast performance of Indian stock market.

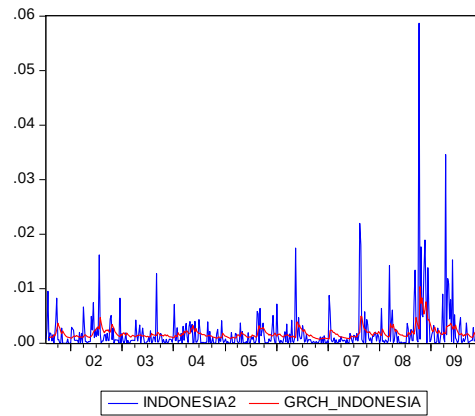


Figure G.7: Forecast performance of Indonesian stock market.

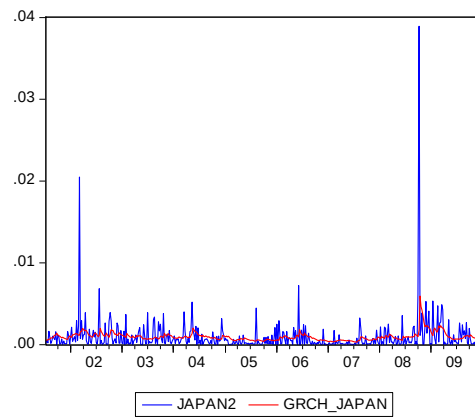


Figure G.8: Forecast performance of Japanese stock market.

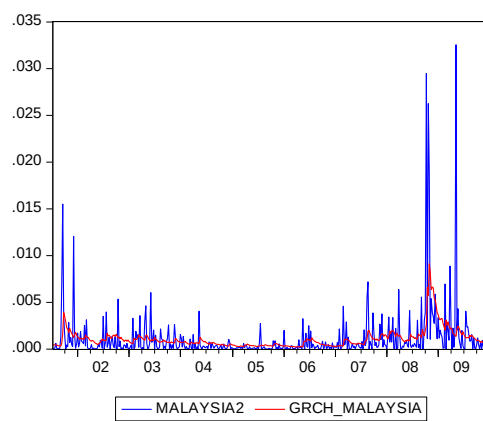


Figure G.9: Forecast performance of Malaysian stock market.

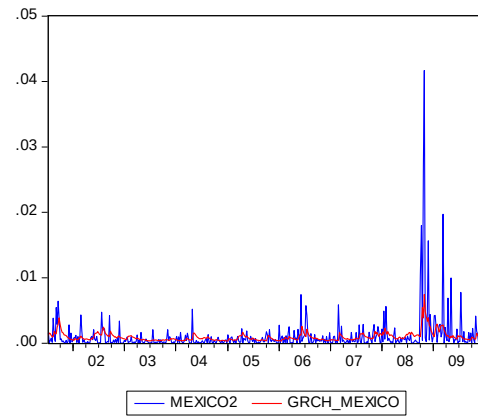


Figure G.10: Forecast performance of Mexican stock market.

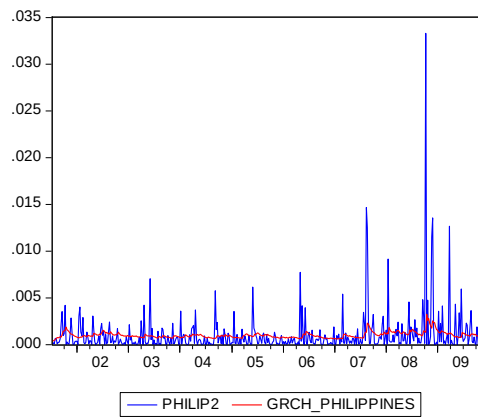


Figure G.11: Forecast performance of Philippine stock market.

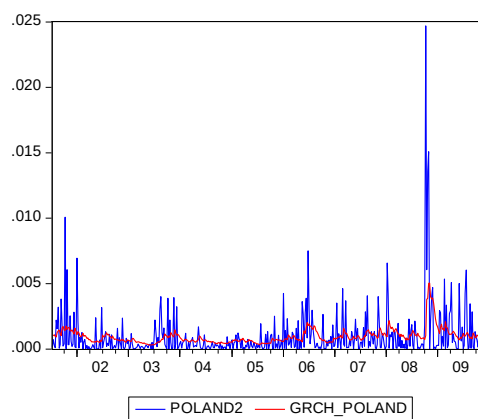


Figure G.12: Forecast performance of Polish stock market.

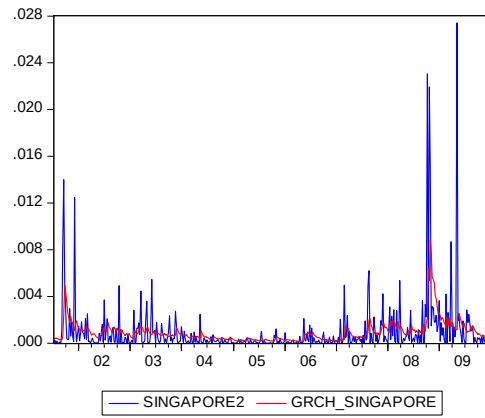


Figure G.13: Forecast performance of Singaporean stock market.

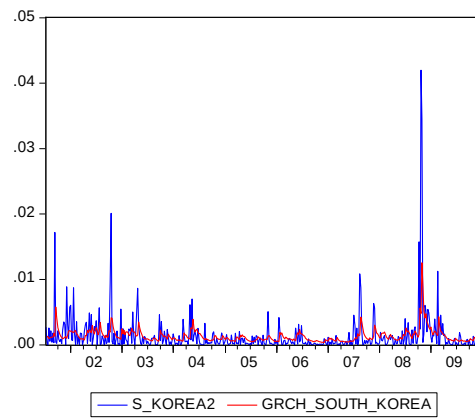


Figure G.14: Forecast performance of South Korean stock market.

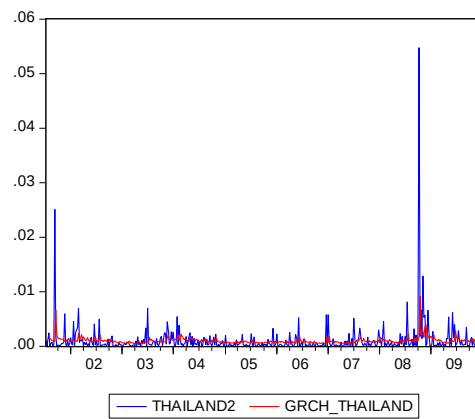


Figure G.15: Forecast performance of Thai stock market.

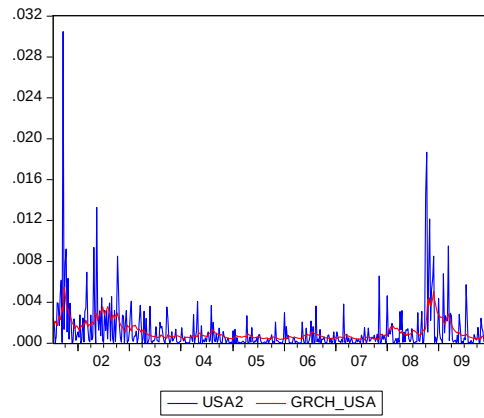


Figure G.16: Forecast performance of US stock market.

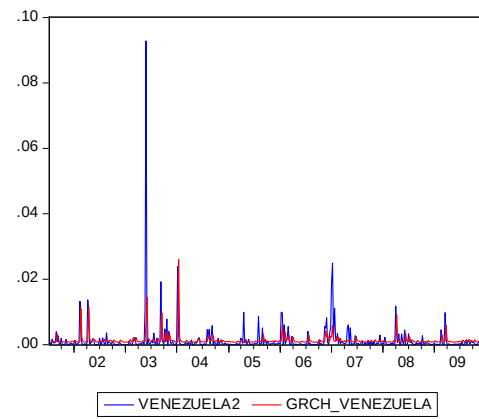


Figure G.17: Forecast performance of Venezuelan stock market.

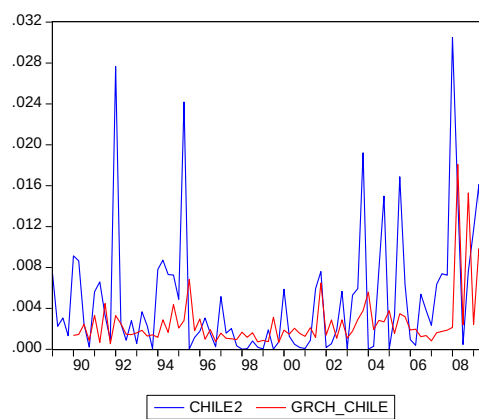


Figure G.18: Forecast performance of Chilean national economy.

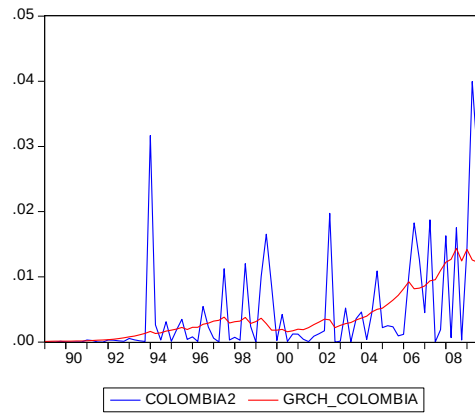


Figure G.19: Forecast performance of Colombian national economy.

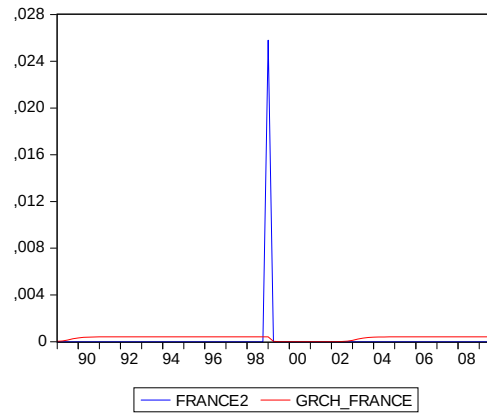


Figure G.20: Forecast performance of French national economy.

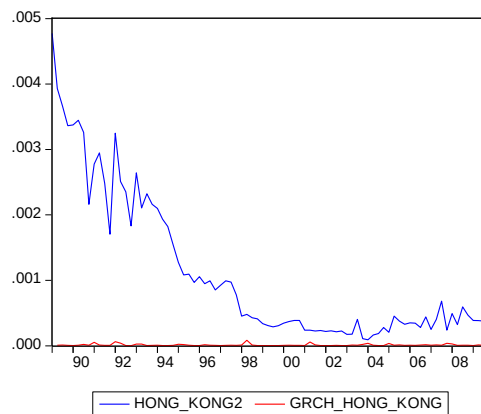


Figure G.21: Forecast performance of Hong Kongese national economy.

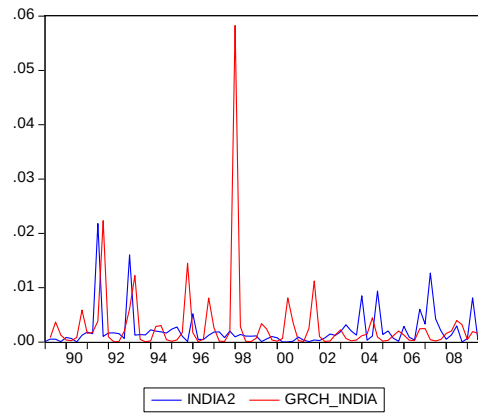


Figure G.22: Forecast performance of Indian national economy.

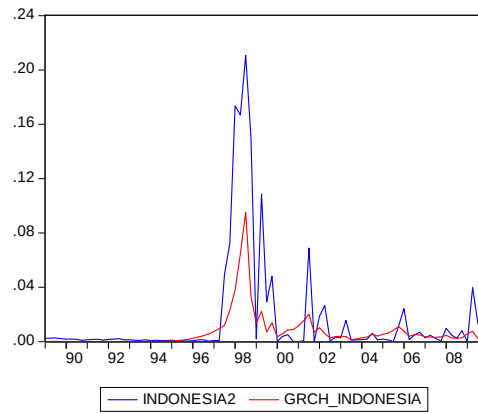


Figure G.23: Forecast performance of Indonesian national economy.

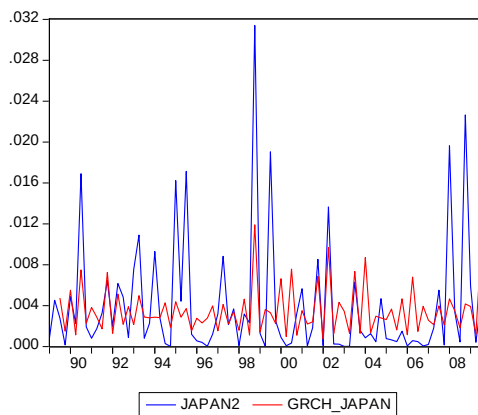


Figure G.24: Forecast performance of Japanese national economy.

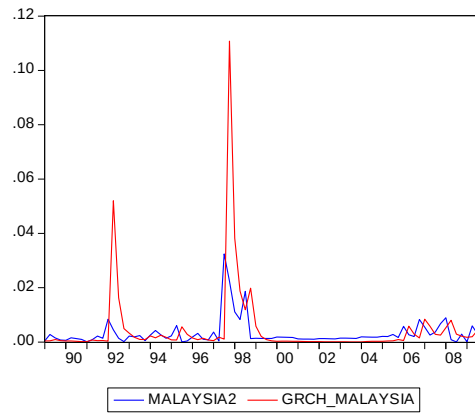


Figure G.25: Forecast performance of Malaysian national economy.

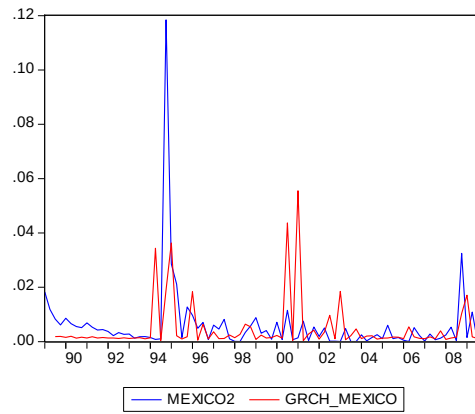


Figure G.26: Forecast performance of Mexican national economy.

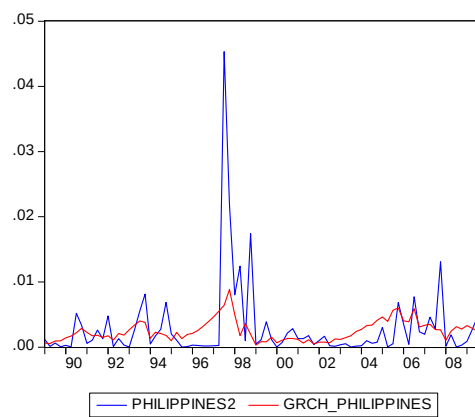


Figure G.27: Forecast performance of Philippine national economy.

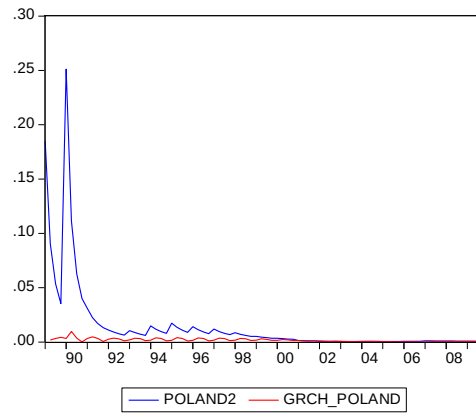


Figure G.28: Forecast performance of Polish national economy.

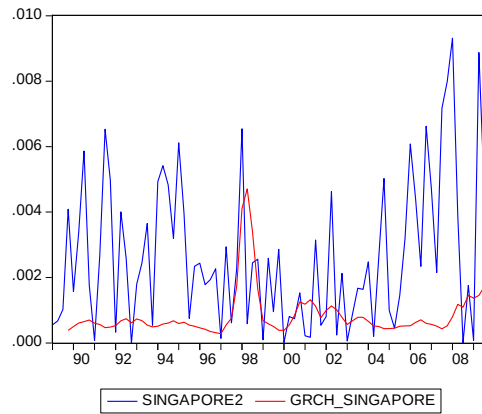


Figure G.29: Forecast performance of Singaporean national economy.

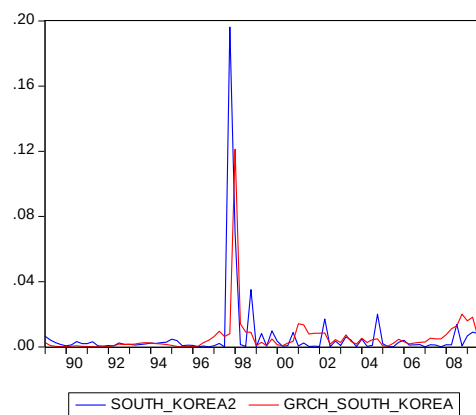


Figure G.30: Forecast performance of South Korean national economy.

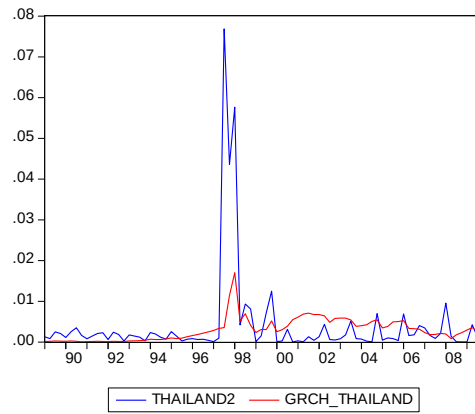


Figure G.31: Forecast performance of Thai national economy.

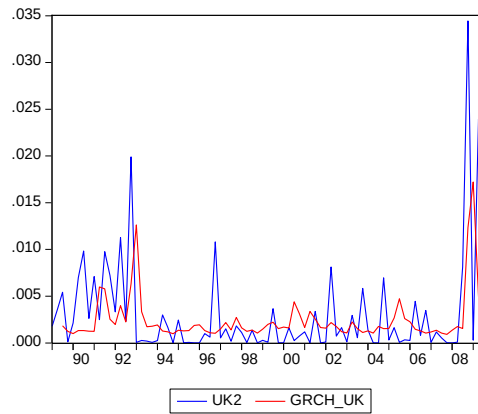


Figure G.32: Forecast performance of UK national economy.

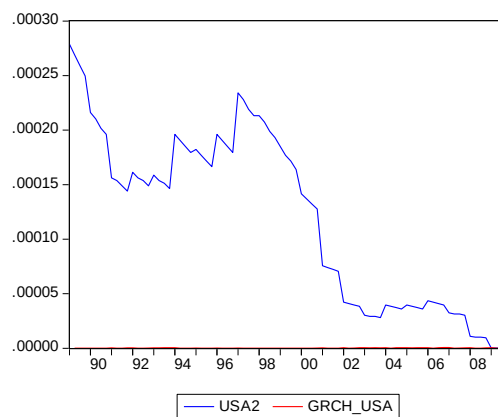


Figure G.33: Forecast performance of US national economy.

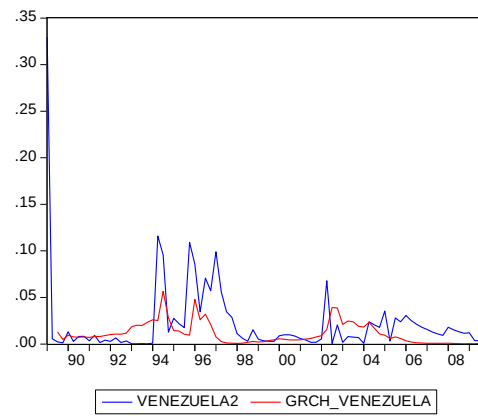


Figure G.34: Forecast performance of Venezuelan national economy.

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