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ESSAYS ON STOCK AND FOREIGN EXCHANGE MARKET LINKAGES AND EQUITY CAPITAL FLOWS TO EMERGING ECONOMIES

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Η παρούσα Διδακτορική Διατριβή εκπονήθηκε στο πλαίσιο των σπουδών για απόκτηση Διδακτορικού Διπλώματος στο Τμήμα …… και εγκρίθηκε στις …….. από τα μέλη της Εξεταστικής Επιτροπής

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Abstract

The thesis entitled "Essays on Stock and Foreign Exchange Market Linkages and Equity Capital Flows to Emerging Economies" is comprised of three interrelated chapters in the literature of empirical finance.

In the first chapter we investigate bi-directional linkages between the stock and foreign exchange markets of a number of emerging economies. This is accomplished by estimating a vector autoregressive model with Generalized Autoregressive Conditional Heteroskedasticity (VAR-GARCH) for each of twelve emerging economies. Included in model dynamics are the effects of global and regional stock markets on the stock and foreign exchange markets. We find significant bi-directional spillovers between stock and foreign exchange markets. Moreover, we investigate whether a country's choice of exchange rate regime or the Asian financial crisis had a significant effect on the volatility spillover mechanism.

In the second chapter, we investigate equity capital flows by investment funds to emerging economies during 1998-2013. In particular, we look into whether sovereign credit ratings, global push or domestic pull factors are important determinants of equity flows. We show that credit ratings are not a significant determinant of equity flows to emerging economies. Two economic variables are consistently significant determinants: instability in international financial market as measured by the VIX index and U.S. money growth. Increased instability reduces capital inflows while the growth of the U.S. money base has spilled over (with a lag) into increased equity flows to emerging economies, especially during the period following the collapse of Lehman.

In the last chapter, we investigate what drives asset allocation across emerging markets (EMEs) in three different geographical regions. Using monthly data for fifteen emerging economies during the period 2001-2012, we try to identify the factors explaining why invest in the financial markets of emerging countries. What we are trying to explain are equity shares, shares of country's equity to the sum of all countries equities in the region. This is quite interesting, since these equity shares already take into account country size and are not affected by common external factors, and allows us to examine flows allocations in a different way. Our findings indicate that there is a combination of factors that determine this such as credit ratings, standardized stock market returns, standardized

competitor’s stock market returns, inflation, debt to GDP, political risk rating (PRR) and currency depreciation.

Περίληψη

Η διατριβή με τίτλο «Δοκίμια στις Διασυνδέσεις της Χρηματαγοράς και της Αγοράς Συναλλάγματος και Ροές Μετοχικών Κεφαλαίων στις Αναδυόμενες Οικονομίες» αποτελείται από τρία αλληλένδετα κεφάλαια που σχετίζονται με τη βιβλιογραφία της εμπειρικής χρηματοοικονομικής.

Στο πρώτο κεφάλαιο ερευνούμε αμφίδρομους δεσμούς μεταξύ της χρηματαγοράς και της αγοράς συναλλάγματος ενός αριθμού αναδυόμενων οικονομιών. Αυτό επιταχύνεται με την εκτίμηση ενός διανυσματικού αυτοπαλίνδρομου μοντέλου με δυναμική διακύμανση για την κάθε μια από τις δώδεκα αναδυόμενες οικονομίες. Στα δυναμικά του μοντέλου συμπεριλαμβάνονται και οι επιδράσεις της παγκόσμιας και της περιφερειακής χρηματαγοράς στις χρηματιστηριακές και συναλλαγματικές αγορές. Βρίσκουμε σημαντικές αμφίδρομες διαχύσεις μεταξύ της χρηματαγοράς και της αγοράς συναλλάγματος. Επιπλέον, ερευνούμε κατά πόσο η επιλογή πλαισίου συναλλαγματικής ισοτιμίας της χώρας ή η Ασιατική χρηματοοικονομική κρίση είχαν σημαντική επίδραση στο μηχανισμό διάχυσης μεταβλητότητας.

Στο δεύτερο κεφάλαιο, ερευνούμε τις ροές μετοχικών κεφαλαίων από επενδυτικά κεφάλαια στις αναδυόμενες οικονομίες την περίοδο 1998-2013. Συγκεκριμένα, εξετάζουμε κατά πόσο οι αξιολογήσεις δημόσιου χρέους, οι παγκόσμιοι παράγοντες ώθησης ή οι εγχώριοι παράγοντες έλξης είναι σημαντικοί καθοριστές των ροών μετοχικών κεφαλαίων. Δείχνουμε ότι οι αξιολογήσεις πιστοληπτικής ικανότητας δεν είναι σημαντικός καθοριστής των ροών μετοχικών κεφαλαίων στις αναδυόμενες οικονομίες. Δύο οικονομικές μεταβλητές είναι με συνέπεια σημαντικοί καθοριστές: η αστάθεια στη διεθνή χρηματοπιστωτική αγορά όπως μετριέται από το δείκτη VIX και η αύξηση της προσφοράς χρήματος στις ΗΠΑ. Η αυξημένη αστάθεια μειώνει τις ροές κεφαλαίων ενώ η αύξηση στη νομισματική βάση στις ΗΠΑ έχει διαχυθεί (με υστέρηση) σε αυξημένες ροές μετοχικών κεφαλαίων στις αναδυόμενες οικονομίες, ειδικά κατά την περίοδο που ακολουθεί την κατάρρευση της Lehman.

Στο τελευταίο κεφάλαιο, ερευνούμε τι οδηγεί την κατανομή περιουσιακών στοιχείων στις αναδυόμενες αγορές σε τρεις διαφορετικές γεωγραφικές περιοχές. Χρησιμοποιώντας μηνιαία στοιχεία για δεκαπέντε αναδυόμενες οικονομίες κατά την περίοδο 2001-2012, προσπαθούμε να προσδιορίσουμε τους παράγοντες που εξηγούν γιατί επενδύουν στις

χρηματαγορές των αναδυόμενων χωρών. Αυτό που προσπαθούμε να εξηγήσουμε είναι μερίδια μετοχικών κεφαλαίων, μερίδιο των μετοχικών κεφαλαίων μιας χώρας στο σύνολο των μετοχικών κεφαλαίων όλων των χωρών στην περιφέρεια. Αυτό είναι αρκετά ενδιαφέρον, διότι αυτά τα μερίδια μετοχικών κεφαλαίων λαμβάνουν ήδη υπόψη τους το μέγεθος της χώρας και δεν επηρεάζονται από κοινούς εξωτερικούς παράγοντες, και αυτό μας επιτρέπει να εξετάσουμε τις κατανομές ροών με ένα διαφορετικό τρόπο. Τα ευρήματα μας δείχνουν ότι υπάρχει ένας συνδυασμός παραγόντων που καθορίζει αυτό όπως οι αξιολογήσεις πιστοληπτικής ικανότητας, οι τυποποιημένες αποδόσεις του χρηματιστηρίου, οι τυποποιημένες αποδόσεις των χρηματιστηρίων των ανταγωνιστών, ο πληθωρισμός, το χρέος ως ποσοστό του ΑΕΠ, η αξιολόγηση του πολιτικού κινδύνου και η υποτίμηση του νομίσματος.

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Introduction

This dissertation is concerned with several issues in empirical international finance that concern the measurement of variables relevant to the financial decision-making, econometric analysis of financial data and new econometric methodologies. The dissertation concerns issues of relevance to emerging economies, a significant topic as the role of these economies in the global financial system has increased markedly during the last two decades. It contributes to a better understanding of the special characteristics of emerging economies' financial systems.

Specifically, this dissertation addresses three important questions: (i) stock and foreign exchange market linkages in emerging economies, (ii) what determines equity flows by investment funds to emerging economies, and (iii) which factors affect portfolio allocation by global investment funds across emerging economies. The dissertation uses a large panel dataset that includes the most important among the emerging economies.

Chapter 1 studies bi-directional linkages between the stock market and foreign exchange market of a number of emerging economies. There is an extensive literature on the interlinkage between the stock market and foreign exchange market. Parallel to this literature, another branch examined geographic linkages between stock markets. But, despite extensive research on these interrelated issues, there is not much work on incorporating all these markets in one empirical framework. In addition, the modeling framework used by in previous studies is not unified and is the empirical evidence from these studies is mixed.

There is a large empirical literature regarding the issue of volatility spillovers between stock markets or between the stock and foreign exchange markets. The stock market crisis in the US in 1987 and the Exchange Rate Mechanism (ERM) crisis in Europe in 1992 gave rise to a branch of the literature on cross-border volatility spillovers among mature stock markets. Early studies focused mainly on the G7 economies and later research expanded to include other developed economies. More recently, cross border linkages of emerging stock markets have been the focus of attention because high growth and increasing openness of these economies, along with the speed with which a financial crisis spreads.

The implications of emerging markets stock market integration with global markets, volatility of emerging equity market, and as well market integration and contagion were analyzed by Bekaert and Harvey (1995, 1997, and 2000) and Bekaert *et al.* (2005). The empirical research supports existence of spillovers in mean among foreign exchange market and stock markets. On spillovers in volatility, Yang and Doong (2004) find no evidence in favor of such a link. Other studies on volatility spillovers between the foreign exchange and stock market focus on a specific country or a specific region, mainly Asia, and give mixed results. On the whole, the literature finds a significant link both in terms of return and volatility between emerging stock markets, on the one hand, and regional and global stock markets, on the other. Regarding studies about the link between stock and foreign exchange market returns and volatility, there is a general presumption for bi-directional relationship among them. However, it is difficult to reach general conclusions, since time periods, frequencies of observations and methodologies are different.

Chapter 1 brings together the various strands of the literature within a unified framework in an attempt to provide valuable insights that a specific strand of the literature may leave uncovered. Its purpose is to estimate empirically such a framework in order to examine the link between the stock and foreign exchange market returns and volatilities allowing for geographic linkages across stock markets.

The hypotheses of interest are tests on the spillovers between the stock and foreign exchange market of emerging economies by taking into account any possible interactions between these two markets and the global and regional stock markets. A multivariate VAR(1)-GARCH(1,1) model with the BEKK representation of Engle and Kroner (1995) is used to examine the dynamic feedback relationship in a unifying framework. The stock market returns and the volatilities in emerging stock market and foreign exchange market are modeled together along with the global and regional stock market returns and volatilities. This can provide important insights into the existence of spillovers between these four markets. The mean returns in the local stock market, the foreign exchange market, global stock market and regional stock market are represented by a VAR(1) and this allows for mean return spillovers among these four markets. Of specific interest are mean return spillovers from the global, regional and foreign exchange markets to the emerging stock market and from the global, regional and local stock markets to the foreign exchange market. A variety of hypotheses are tested as regards mean return spillovers (causality-in-mean) and volatility spillovers (causality-in-variance) between these four

markets. Additionally this framework can also draw important insights for the role of the Asian financial crisis and the choice of exchange rate regime may have played on the spillover mechanism between emerging stock market and foreign exchange market.

The data used in this study are weekly and are from the Emerging Markets Database (EMDB) of Standard and Poor's. They cover the time period 06/01/1989-15/08/2008 for twelve emerging economies, six from Latin America (Argentina, Brazil, Chile, Colombia, Mexico and Venezuela) and six from Asia (India, Korea, Malaysia, Pakistan, Philippines and Thailand). The country choice is dictated by data availability in terms of length of coverage. These twelve countries are among the most economically significant countries in the emerging world. Also, this sample period ends one month before the 2008 collapse of Lehman Brothers, a key economic event for which recent research and commentators as well argue that has altered the financial market dynamics fundamentally.

Chapter 2 investigates equity capital flows by investment funds to emerging economies during the time period 4/1998-9/2013. It examines whether global push or domestic pull factors as well as sovereign credit ratings, are important drivers of equity flows. Equity capital inflows to emerging economies over the past two decades have been a major research topic as emerging economies have become more fully integrated into international financial markets following their capital accounts liberalization. This integration raised various questions in the literature on identifying the flows drivers. Many studies have examined the factors behind one or more of the above mentioned categories on capital flows. The data that these studies are based on come from aggregate balance of payments (BoP) statistics which include different flows types that are aggregated into each category. Because each of these categories includes different types of flows, it is not clear which are the important factors for the different types.

The literature on private capital flows to emerging economies determinates can be divided into three broad categories. In the first category, some studies look at aggregate capital flows and they do not make a distinction between the various types such as equity flows, portfolio flows or loans. In the second category, some studies do make a distinction among the various types of capital. In the third category, some studies only focus on one type of capital flow and study its determinants. Lastly, some studies examine aspects of more than one of the above categories. A related issue that has been relatively neglected by the literature on capital flows determinants is the relevance of sovereign credit ratings. This

omission is partly because these studies look at broad categories of capital flows and sovereign credit ratings may not be seen as relevant. But because our study focuses on equity flows by global investment funds, the sovereign credit ratings significance cannot be overlooked. In specific, we study the extent to which sovereign credit ratings are significant for global fund manager's decision on how to allocate equity capital into emerging economies.

The objective of this chapter is to look at the determinants of equity capital flows by private investors to sixteen of the most significant emerging economies. We examine a number of possible economic determinants and other determinants of flows and distinguish between global push and domestic pull factors. The impact of the 2007-2008 global financial crisis on equity capital flows is also assessed as well as the role of quantitative easing (QE) in the US. We have gathered a number of variables of interest from different databases for 16 emerging financial markets. Estimation is based on a monthly panel data and uses country fixed effects and bootstrap standards errors. The sample includes three countries from Latin America, five from Europe Middle East and Africa (EMEA) and eight from Asia. For equity flows, a proprietary data set is used compiled by EPFR Global that tracks equity capital flows by investment funds to emerging economies. EPFR tracks close to 20,000 global funds with just over $20tn in total assets globally. The sixteen countries chosen have complete data on capital flows.

Capital flows to emerging markets can be driven either by internal country specific or by external global factors. Internal or "pull" factors are those which capture the local investment opportunities and risks which influence a pull on overseas funds. External or "push" factors reflect a push on investment to emerging markets, are considered that capture economic activity and alternative investment opportunities. We also examine whether sovereign credit ratings are important factors in international investor's decisions. The principal argument behind liberalization was that emerging economies capital account benefits from attracting equity capital by international investors. This study contributes an understanding of the factors which motivated these investors, an issue that has been rather neglected by the empirical literature.

The dominant economic event during our sample period is the 2007-2008 global financial crisis and its aftermath. The crisis global transmission sparked a lot of interest over which factors drove global capital flows in its aftermath. The collapse in foreign direct investment

and bank loans in 2008 and the surge that followed remain an open and controversial topic. This chapter examines the significance of the factors driving private equity flows to emerging economies after the global financial crisis and the extent to which quantitative easing (QE) in the US spilled over into emerging economies private equity flows. This is an important question but has not been studied systematically within a comprehensive econometric framework which models the various determinants of equity capital flows to emerging economies.

The chapter makes a number of contributions to the empirical literature. It focuses solely on equity capital flows by private investors to sixteen of the most important emerging economies. It looks at various possible economic and other determinants of these flows and distinguishes among external push and domestic pull factors. It investigates the role of sovereign credit ratings in international investor's decisions. It assesses the impact of the 2007-2008 financial crisis on equity capital flows and the effect of the quantitative easing in the US.

Chapter 3 investigates the drivers of asset allocation across emerging markets in three different geographical regions. Using monthly data for fifteen emerging economies from Latin America, EMEA and Asia during the time period 1/2001-12/2012, the objective is to identify which are the factors that affect equity shares (the share of each country's equity to total equity inflows to emerging countries) and investments in emerging financial markets.

The data used to construct the equity share come from equity investments by global funds in emerging economies from a proprietary data set compiled by *EPFR Global*. The funds tracked by EPFR are registered globally and so data track global investor flows to emerging economies. Explanatory factors examined come from three different categories. The first category includes performance factors, the second category risk factors and the third category other variables capturing political risk. Because our data are balanced and our dependent variable is shares, we estimate a pooled Seemingly Unrelated Regression (SUR) Generalized Least Squares (GLS) model, of fifteen cross sections and 144 months.

According to international finance theory, foreign portfolio flows are the outcome of investment decisions across countries in order to diversify and achieve highest returns. Institutional investors recognized long time ago that asset allocation is crucial in achieving

their investment goals. In asset allocation the basic problem is the decision in which asset classes someone to invest and how much to invest in each. Around the world stock markets offer investors many choices, and various rates of return and various types of risks. The theory highlights the positive impact of market segmentation on international portfolio value because spreading the risks among different countries, investors can minimize negative effects of market volatility. There is a large empirical literature on this area.

Another part of empirical literature on portfolio flows has analyzed the determinants of portfolio flows by assessing the significance of domestic (pull) and external (push) factors and also by examining equity market characteristics of a specific country, information, and transaction costs among others in explaining variations in foreign equity portfolio allocation. Some empirical studies have emphasized that significance of global factors in pushing capital towards the developing countries. Work in this area is Calvo *et al.* (1993), Byrne and Fiess (2011), Taylor and Sarno (1997), Fernandez-Arias (1996), Kim (2000) and Broto *et al.* (2011). Some other studies, including Bekaert *et al.* (2002), Bohn and Tesar (1996), Mody *et al.* (2001), Felices and Orskaug (2008) and Montiel and Reinhard (1999), have found instead that it is the domestic pull factors that have attracted the portfolio flows towards developing countries. Some other studies found evidence in favor of both domestic (pull) and global (push) factors (Chuhan *et al.* (1998), Fratzscher (2012), Ghosh *et al.* (2014), Ahmed and Zlate (2014) and Yang *et al.* (2013). The empirical literature has also examined the spillover effects from the global financial crisis and risk, because asset allocation strategy depends on investors' risk profile or risk tolerance (Chiang *et al.* (2013)).

This chapter examines various determinants of equity shares in addition to those examined previously in the empirical literature. The chapter focuses mainly on (local) domestic country specific factors and examines flows allocations from a different perspective. Credit ratings are incorporated within this framework, along with other political and country risk factors, in addition to local and competitors stock standardized returns. Based on the empirical findings we conclude that the local macroeconomic factors (inflation, debt to GDP), political risk and credit ratings as well as financial factors related to local and competitors stock standardized returns and the rate of depreciations affect equity shares among the emerging markets we study.

Chapter 1: Stock and foreign exchange market linkages in emerging economies

1.1 Introduction

It is widely acknowledged that international financial markets have become substantially more integrated in recent years. On the one hand, the collapse of the Bretton Woods system was followed by greater exchange rate fluctuations. On the other, the liberalization of stock markets and capital flows in the 1990s was followed by a huge increase in the volume of cross border transactions in both securities and currencies. The interlinkage between the stock and foreign exchange markets has been a topic of interest of academic researchers and practitioners alike.

There is a lot of interest in the financial press on the linkage between returns in the stock and foreign exchange markets in light of the implications of this issue for international portfolio management. There are contrasting views in the financial press, however, on the direction of linkage. For instance one article ("Asia Currencies Stay Buoyant Amid Storms," *Financial Times*, August 18, 2011) reports that the 'traditional' correlation between higher equity returns and appreciating currencies appears to have broken down recently in Asia while another ("Weakest Currency Areas Give Best Returns," *Financial Times*, March 4, 2012) reports that higher stock returns in emerging economies are correlated with depreciating currencies.

There is a considerable academic literature examining linkages between stock and foreign exchange markets. The flow and portfolio-balance theories of exchange rate determination posit theoretical links between changes in the value of a country's currency and stock prices. This issue has been examined empirically by a number of studies most of which have focused on advanced economies. In view of the increasing significance of the emerging economies in the global financial system, more recent studies have directed emphasis on these economies.

Parallel to the literature on the linkage between the stock and foreign exchange market, another branch of the literature has focused on geographic linkages between stock markets. In particular, the mechanism by which shocks in mature stock markets (stock markets of developed economies) are transmitted to stock markets in emerging economies has been the subject of numerous theoretical and empirical studies. The literature on this issue is

large and we provide a very brief review in the next section by way of motivating our inclusion of geographic (global and regional) spillovers between stock markets.

Despite extensive research on these interrelated issues, there has been very little work incorporating all of them within a unified empirical framework. The purpose of this paper is to estimate empirically such a framework in order to examine the link between the stock and foreign exchange market in emerging economies allowing for geographic linkages across stock markets. Based on this framework, we provide evidence on a number of hypotheses and test various facets of stock and foreign exchange market interaction in emerging economies.

The paper is organized as follows. The following section is a brief summary of the literature. Section 1.3 presents the methodology and Section 1.4 the data. Section 1.5 discusses the evidence from the estimation and tests of the empirical framework and the final section concludes the paper.

1.2 Theoretical considerations and a brief literature review of the empirical evidence

Theory suggests two broad channels that link return in the stock and foreign exchange market. The first approach known as the flow or traditional approach (Dornbusch, 1980) focuses on the current account, or more specifically the trade balance. According to this approach, a depreciation in the value of a country's currency affects its external competitiveness and thus its trade balance, and ultimately real output. This will alter the profitability and (expected) cash flows of firms and thus stock returns. According to this approach, improved stock market returns would be associated with a depreciating domestic currency.

The second approach, known as the portfolio-balance approach (Frankel, 1983), focuses on the choice between holding assets denominated in domestic and foreign currency. Specifically, it postulates that increases in equity returns increase domestic wealth and this, in turn, will lead to appreciation of the domestic currency. This comes about when domestic residents have a higher propensity to hold wealth in the form of domestic bonds than foreign residents. In this case, the increase in domestic wealth increases the net demand for domestic bonds and the domestic currency appreciates to balance relative (domestic and foreign denominated) bond supplies.

When it comes to considerations of volatility spillovers between stock markets or between the stock and foreign exchange markets there is a large empirical literature. The 1987 stock market crisis in the US and the 1992 ERM crisis in Europe gave rise to one branch of the literature on cross-border volatility spillovers among mature (developed economy) stock markets. Early studies covered mostly the G7 economies, e.g. Hamao *et al.* (1990), King and Wadhwani (1990), Schwert (1990) and Karolyi (1995). Later research expanded the sample to other developed economies. For example, Theodossiou and Lee (1993) examined interlinkages between a larger set of countries and Lin *et al.* (1994) examined differences in the transmission of global and local shocks. Most of these studies found weak evidence in favor of significant stock market volatility transmission among advanced economies.

More recently, cross border linkages of emerging stock markets have been the focus of attention because of the high growth and increasing openness of emerging markets, along with the speed with which a financial crisis spreads. The implications of stock market integration of emerging economies with global markets, emerging equity market volatility, and market integration and contagion were analyzed by Bekaert and Harvey (1995, 1997, and 2000) and Bekaert *et al.* (2005). These studies cover individual emerging economies. Other studies have focused on specific emerging market regions (Asia, Europe, Latin America and Middle East). Chen *et al.* (2002) examined regional stock market linkages in Latin American and Yang *et al.* (2006) integration of Central and Eastern European stock markets. Caporale *et al.* (2006), Engle *et al*. (2008), and Li and Rose (2008) examined interlinkages and spillovers across Asian stock markets. Beirne *et al.* (2009, 2010) examined global and regional volatility spillovers among 41 emerging stock markets. On the whole, these studies find some evidence of either stock return transmission or volatility spillovers among emerging stock markets.

Empirical research supports the existence of spillovers in mean between foreign exchange and stock markets. For example, Phylaktis and Ravazzolo (2005) present evidence of bi-directional spillovers between the foreign exchange and stock market returns in emerging markets. More recently, Ehrmann *et al.* (2011) investigate linkages between equity and foreign exchange returns for the US and euro area with the same sample period as our study (1989-2008). They model interaction between these two returns (but not volatilities) within a broader framework that includes also money and bond market returns. They find exchange rate changes have little effect on US equity returns whereas euro area equity

returns respond readily to exchange rate changes. Their study confirms that the US equity market plays a central role in determining stock returns in stock markets globally, a finding we model in the next section. When it comes to spillovers in volatility, Yang and Doong (2004) find no evidence of such a link. Other studies on volatility spillovers between the foreign exchange and stock market focus on a specific country or a specific region (mainly Asia) and yield mixed results. Bodart and Reding (1999) and Karolyi and Stulz (1996) examined return and volatility spillovers indirectly; neither study finds significant transmission effects between foreign exchange and stock market volatility. Francis *et al.* (2002) find a bi-directional relationship and Evans and Lyons (2002) find the spillover from the foreign exchange to the stock market to be much stronger than the other way around.

On the whole, the literature finds a significant link (both in terms of return and volatility) exists between emerging stock markets, on the one hand, and regional and global stock markets, on the other. When it comes to studies on the link between stock and foreign exchange returns and volatility, there is a general presumption for a bi-directional relationship between them. General conclusions, however, are difficult because methodologies, time periods and frequencies of observations are different. For example, Katechos (2011) investigates the underlying relationship between stock markets and exchange rates with currency pairs for seven major currencies and the FTSE All World stock index and finds strong linkages among exchanges rates and global stock market returns. Ülkü and Demirci (2012) study the joint dynamics of emerging stock and foreign exchange markets of eight European countries and the MSCI Europe Index, and find evidence that global developed and emerging stock market returns account for a large part of the comovement between the MSCI Europe stock index and the value of East European currencies and the Turkish lira. Moreover, after controlling for the global index, residual interaction is small, indicating that a significant portion of the stock market and foreign exchange comovements is mainly due to the returns of the global developed market. Walid *et al.* (2011) investigate the dynamic linkage between stock price volatility and exchange rate changes for four emerging countries and find strong evidence that the relationship between stock and foreign exchange markets depends on the regime for the conditional mean and conditional variance of stock returns and stock price volatility responds asymmetrically to events in the foreign exchange market. It should be noted, that none of these studies has looked at the connection between the local stock market, the foreign exchange market and the global and regional stock markets. They conduct pairwise

comparisons, while Beirne *et al.* (2010) look at stock market interactions (local, regional, and global) but do not consider the foreign exchange market.

This paper brings together the various strands of the literature reviewed above within a unified framework. Whereas each strand of the literature focuses on a specific relationship (e.g. between stock and foreign exchange returns or spillovers between global and local stock markets) a framework that brings together these strands can provide valuable insights that a specific strand of the literature may leave uncovered. Specifically, we model returns and volatilities in emerging stock and foreign exchange markets together with global and regional stock market returns and volatilities within a VAR-GARCH framework. This can give important insights into the existence of spillovers between these four markets. In addition, our framework allows us to draw important insights into the role that the Asian financial crisis and the choice of exchange rate regime may have played on the spillover mechanism between emerging stock and foreign exchange markets. The following section describes this framework.

1.3 Empirical Methodology

As outlined in the previous section, the hypotheses of interest are spillovers between the stock and foreign exchange market of emerging economies taking into account possible interactions between these two markets and the global and regional stock markets. In order to test the various hypotheses, we specify and estimate a quarto-variate VAR(1)-GARCH(1,1) model with the BEKK representation of Engle and Kroner (1995).[1]

According to this model, the first moment or mean returns in the emerging stock market, foreign exchange market, global stock market and regional stock market are represented by a VAR(1) (for all countries except Brazil). The choice of order of the VAR is based on the BIC criterion.[2] In its general form it is given by

$$
\begin{aligned}
R_{1,t} &= \alpha_{10} + \delta_{11} R_{1,t-1} + \delta_{12} R_{2,t-1} + \delta_{13} R_{3,t-1} + \delta_{14} R_{4,t-1} + e_{1,t} \\
R_{2,t} &= \alpha_{20} + \delta_{21} R_{1,t-1} + \delta_{22} R_{2,t-1} + \delta_{23} R_{3,t-1} + \delta_{24} R_{4,t-1} + e_{2,t} \\
R_{3,t} &= \alpha_{30} + \delta_{31} R_{1,t-1} + \delta_{32} R_{2,t-1} + \delta_{33} R_{3,t-1} + \delta_{34} R_{4,t-1} + e_{3,t} \\
R_{4,t} &= \alpha_{40} + \delta_{41} R_{1,t-1} + \delta_{42} R_{2,t-1} + \delta_{43} R_{3,t-1} + \delta_{44} R_{4,t-1} + e_{4,t}
\end{aligned} \tag{1.1}
$$

[1] This methodology is reviewed in Bauwens *et al.* (2006). The BEKK representation has been used widely in previous work in financial market linkages by, *inter alia*, Baele (2005), Beirne *et al.* (2010), Bekaert and

[2] For Brazil VAR(2) minimizes the BIC (see Table 1.1).

where $R_{1,t}$ is the emerging (or local) stock market return, $R_{2,t}$ is the rate of appreciation of the emerging (or local) currency vis-à-vis the US dollar, $R_{3,t}$ is the global stock market return and $R_{4,t}$ is the regional stock market return.[3]

The specification in (1.1) allows for mean return spillovers among these four markets. Of specific interest in our work is mean return spillovers from global, regional and foreign exchange markets to the local stock market and from global, regional and local stock markets to the foreign exchange market. In estimating (1.1) we impose the restrictions $\delta_{31} = 0$, $\delta_{32} = 0$, $\delta_{41} = 0$, $\delta_{42} = 0$ because we do not expect returns in emerging stock markets and foreign exchange markets to influence returns in the global or regional stock markets.[4] One may also doubt the validity of including both global and regional stock market returns together in determining stock market returns or foreign exchange returns in (1.1). We have tested the hypothesis $\delta_{14} = \delta_{24} = 0$ (the regional stock market should not be included in the emerging stock market and foreign exchange mean return equations) and found this hypothesis to be rejected in the majority of cases (results in Table 1.2).[5]

The restricted version of (1.1) in matrix form is

$$\mathbf{R}_t = \boldsymbol{\alpha} + \boldsymbol{\delta}\mathbf{R}_{t-1} + \mathbf{e}_t \qquad (1.2)$$

where $\mathbf{R}_t=(R_{1,t},R_{2,t},R_{3,t},R_{4,t})$, $\mathbf{R}_{t-1}=(R_{1,t-1},R_{2,t-1},R_{3,t-1},R_{4,t-1})$, $\boldsymbol{\alpha}=(\alpha_{10},\alpha_{20},\alpha_{30},\alpha_{40})$ is a vector of constants, $\boldsymbol{\delta}=(\delta_{11},\delta_{12},\delta_{13},\delta_{14}|\delta_{21},\delta_{22},\delta_{23},\delta_{24}|0,0,\delta_{33},0|0,0,0,\delta_{44})$ is a vector of parameters to be estimated following the restrictions mentioned in the previous paragraph, and $\mathbf{e}_t=(e_{1t},e_{2t},e_{3t},e_{4t})$ is a tergiversate vector of residuals normally distributed or $\mathbf{e}_t|\boldsymbol{\Omega}_{t-1}\sim(0,\mathbf{H}_t)$. Its conditional variance-covariance matrix, $\mathbf{H}_t$, is

$$H_t = \begin{bmatrix} h_{11} & h_{12} & h_{13} & h_{14} \\ h_{21} & h_{22} & h_{23} & h_{24} \\ h_{31} & h_{32} & h_{33} & h_{34} \\ h_{41} & h_{42} & h_{43} & h_{44} \end{bmatrix} \qquad (1.3)$$

[3] We conducted Augmented Dickey Fuller unit root tests and found the series to be stationary.

[4] While these restrictions make intuitive sense, we conducted formal likelihood ratio and *t*-tests on the validity of these restrictions and found them to be valid.

[5] We have also restricted $\delta_{34}=\delta_{43}=0$ such that the global and regional stock market returns follow AR processes.

The BEKK representation guarantees the positive definiteness of $\mathbf{H}_t$ given by a GARCH-type structure or

$$\mathbf{H}_t = \mathbf{C}'\mathbf{C} + \boldsymbol{\alpha}'\mathbf{e}_{t-1}\mathbf{e}'_{t-1}\boldsymbol{\alpha} + \boldsymbol{\beta}'\mathbf{H}_{t-1}\boldsymbol{\beta} \tag{1.4}$$

The BEKK representation in (1.4) decomposes the conditional variance-covariance matrix $\mathbf{H}_t$ and models it as a function of past values ($\mathbf{H}_{t-1}$) and innovations of past values (e_{1t},e_{2t},e_{3t},e_{4t}). This representation can be used to test volatility spillovers as will be explained below.

Similar to the restrictions imposed on mean return spillovers, we impose restrictions on volatility spillovers. Specifically, volatility in the emerging stock market and foreign exchange market does not affect global or regional stock market volatilities, and the regional stock market volatility does not affect the global market and vice versa.[6] The restricted form of (1.4) is given by

$$\begin{aligned} H_t = C'C &+ \begin{bmatrix} \alpha_{11} & \alpha_{12} & 0 & 0 \\ \alpha_{21} & \alpha_{22} & 0 & 0 \\ \alpha_{31} & \alpha_{32} & \alpha_{33} & 0 \\ \alpha_{41} & \alpha_{42} & 0 & \alpha_{44} \end{bmatrix}' \begin{bmatrix} e_{1,t-1}^2 & e_{1,t-1}e_{2,t-1} & e_{1,t-1}e_{3,t-1} & e_{1,t-1}e_{4,t-1} \\ e_{2,t-1}e_{1,t-1} & e_{2,t-1}^2 & e_{2,t-1}e_{3,t-1} & e_{2,t-1}e_{4,t-1} \\ e_{3,t-1}e_{1,t-1} & e_{3,t-1}e_{2,t-1} & e_{3,t-1}^2 & e_{3,t-1}e_{4,t-1} \\ e_{4,t-1}e_{1,t-1} & e_{4,t-1}e_{2,t-1} & e_{4,t-1}e_{3,t-1} & e_{4,t-1}^2 \end{bmatrix} \begin{bmatrix} \alpha_{11} & \alpha_{12} & 0 & 0 \\ \alpha_{21} & \alpha_{22} & 0 & 0 \\ \alpha_{31} & \alpha_{32} & \alpha_{33} & 0 \\ \alpha_{41} & \alpha_{42} & 0 & \alpha_{44} \end{bmatrix} \\ &+ \begin{bmatrix} \beta_{11} & \beta_{12} & 0 & 0 \\ \beta_{21} & \beta_{22} & 0 & 0 \\ \beta_{31} & \beta_{32} & \beta_{33} & 0 \\ \beta_{41} & \beta_{42} & 0 & \beta_{44} \end{bmatrix}' H_{t-1} \begin{bmatrix} \beta_{11} & \beta_{12} & 0 & 0 \\ \beta_{21} & \beta_{22} & 0 & 0 \\ \beta_{31} & \beta_{32} & \beta_{33} & 0 \\ \beta_{41} & \beta_{42} & 0 & \beta_{44} \end{bmatrix} \end{aligned} \tag{1.5}$$

Estimation of (1.5) focuses on two questions: (i) are there volatility spillovers from the global, regional and foreign exchange market to the emerging stock market and (ii) are there volatility spillovers from the global, regional and local stock markets to the foreign exchange market?

Given a sample of t = 1,….,T observations of the vector $\mathbf{R}_t$, the vector of unknown parameters (θ) is obtained from the conditional density function

[6] Specifically, we restrict the parameters capturing these (α_{13}, α_{14}, α_{23}, α_{24}, α_{34}, α_{43}, β_{13}, β_{14}, β_{23}, β_{24}, β_{34}, and β_{43}) to be jointly equal to zero. A likelihood ratio test for the validity of the joint restrictions supports this hypothesis. Results are available on request.

$$f(R_t \mid \Omega_{t-1}; \theta) = (2\pi)^{-1} \mid H_t \mid^{-1/2} \exp(-[e_t'(H_t^{-1})e_t]/2) \quad (1.6)$$

The log likelihood function is:

$$L = \sum_{t=1}^{T} \log f(R_t \mid \Omega_{t-1}; \theta) \quad (1.7)$$

We obtain Quasi-maximum likelihood estimates of the parameters and standard errors assuming the log likelihood function to be conditional normal (Bollerslev and Wooldridge (1992) and Gouriéroux (1997)). The various hypotheses concerning volatility spillovers are tested by estimating the conditional variances of: (i) local stock market returns ($h_{11,t}$); (ii) foreign exchange market returns ($h_{22,t}$); (iii) global market returns ($h_{33,t}$); and (iv) regional market returns ($h_{44,t}$). The exact form of these conditional variances is in equations (A1), (A2), (A3) and (A4) in Appendix 1.

1.4 Data

In order to compute stock market and exchange rate returns, we use weekly data from the *Emerging Markets Database* (EMDB) of Standard and Poor's that cover the period 06/01/1989-15/08/2008 (1024 observations) for twelve emerging economies in Asia (India, Korea, Malaysia, Pakistan, Philippines and Thailand) and Latin America (Argentina, Brazil, Chile, Colombia, Mexico and Venezuela).[7] The choice of these emerging economies is dictated by data availability in terms of length of coverage: these are the emerging economies for which sufficiently lengthy and continuous weekly data are available to enable estimating long run links between the foreign exchange and stock market. Moreover, these are some of the most economically important countries in the emerging world. Our sample period ends one month before the 2008 collapse of Lehman Brothers, a key event both in advanced but also in emerging economies that recent research as well as commentators argue has altered fundamentally financial market dynamics. For example, Frank and Hesse (2009) provide an overview of the effects of the post-Lehman financial crisis showing that even emerging market countries with sound pre-2008 macroeconomic and financial conditions were strongly affected by contagion which spilled over to financial (stock and bond) markets as well as the real sector (sharply reduced export and GDP growth rates). Similarly, Tsagkanos and Siriopoulos (2013) show that during the recent financial crisis period (2008-2012), the relationship between EU and US

[7] Venezuela and Pakistan have 953 (06/01/1989-06/04/2007) and 907 (05/04/1991-15/08/2008) observations, respectively.

stock and exchange rate markets and other macro indicators is significantly different compared to the pre-2008 period.

Stock market return for country *j* is computed as $R_{j,t}=\ln(P_{j,t}/P_{j,t-1})*100$ where $P_{j,t}$ is the stock market index for country *j* and is denominated in local currency. The global market is approximated by the S&P500 stock index from *Datastream*. The global stock return is calculated the same way. The exchange rate for currency *j*, $S_{j,t}$, is defined in dollars per local currency at time *t* and, therefore exchange rate return or $\ln(S_{j,t}/S_{j,t-1})*100$ is the rate of appreciation of local currency *j* at time *t* relative to the US dollar.

To measure a regional stock market return we construct a weighted average return of each emerging economy's local region (or neighborhood), be it in Latin America or Asia. We refer to this as the Neighborhood Trade Weighted Return or *NTWR*. For each Asian or Latin American economy it is the trade weighted sum of stock returns of the other five countries in the region or

$$NTWR_{j,t} = (\sum_{i=1}^{5} w_{ji,t}\ R_{i,t}) \qquad (1.8)$$

where i =1....5 ($i \neq j$) are all other countries in the region (Asia or Latin America) except *j*, $w_{ji,t}$ are trade weights based on total (exports plus imports) trade between countries *i* and *j* and $\sum_{i}^{5} w_{ij} = 1$. Tables 1.3 and 1.4 provide descriptive statistics.

1.5 Empirical Analysis

1.5.1 Hypothesis Testing

We test a variety of hypotheses concerning mean return spillovers (causality-in-mean) and volatility spillovers (causality-in-variance) between the emerging stock market, the foreign exchange market, and the global and regional stock markets.

First, we test the presence of various conditional mean or return spillovers as follows:

Hypothesis 1: Ho: $\delta_{12}=0$ H_1: $\delta_{12}\neq 0$

existence of mean spillover from the foreign exchange to the emerging stock market.

Hypothesis 2: Ho: $\delta_{13}=0$ H_1: $\delta_{13}\neq 0$

existence of mean spillover from the global to the emerging stock market.

Hypothesis 3: Ho: $\delta_{14}=0$ H_1: $\delta_{14}\neq 0$

existence of mean spillover from the regional to the emerging stock market.

Hypothesis 4: Ho: $\delta_{21}=0$ H_1: $\delta_{21}\neq 0$

existence of mean spillover from the emerging stock market to the foreign exchange market.

Hypothesis 5: Ho: $\delta_{23}=0$ H_1: $\delta_{23}\neq 0$

existence of mean spillover from the global stock market to the foreign exchange market.

Hypothesis 6: Ho: $\delta_{24}=0$ H_1: $\delta_{24}\neq 0$

existence of mean spillover from the regional stock market to the foreign exchange market.

Second, we test the presence of conditional variance or volatility spillover as follows:

Hypothesis 7: Ho: $\alpha_{21}=\beta_{21}=0$ H_1: $\alpha_{21}\neq 0$ or $\beta_{21}\neq 0$

existence of volatility spillovers from the foreign exchange market to the emerging stock market.

Hypothesis 8: Ho: $\alpha_{12}=\beta_{12}=0$ H_1: $\alpha_{12}\neq 0$ or $\beta_{12}\neq 0$

existence of volatility spillovers from the emerging stock market to the foreign exchange market.

Hypothesis 9: Ho: $\alpha_{31}=\beta_{31}=0$ H_1: $\alpha_{31}\neq 0$ or $\beta_{31}\neq 0$

existence of volatility spillovers from the global to the emerging stock market.

Hypothesis 10: Ho: $\alpha_{32}=\beta_{32}=0$ H_1: $\alpha_{32}\neq 0$ or $\beta_{32}\neq 0$

existence of volatility spillovers from the global to the foreign exchange market.

Hypothesis 11: Ho: $\alpha_{41}=\beta_{41}=0$ H_1: $\alpha_{41}\neq 0$ or $\beta_{41}\neq 0$

existence of volatility spillovers from the regional stock market to the emerging stock market.

Hypothesis 12: Ho: $\alpha_{42}=\beta_{42}=0$ H_1: $\alpha_{42}\neq 0$ or $\beta_{42}\neq 0$

existence of volatility spillovers from the regional stock market to the foreign exchange market.

A likelihood ratio test is performed to test each hypothesis of the general form $LR = -2(L_R - L_U) \sim \chi^2(2)$, where L_R and L_U are the values of the restricted and unrestricted (equation 1.7) likelihood function.

1.5.2 Discussion

Regarding hypotheses 1 and 4 we find mixed evidence for conditional mean causality or return spillovers between the foreign exchange and emerging stock markets (see Table 1.5 - Panel A). In five countries there is no evidence of causality in mean, in five countries there is uni-directional spillover and only in two countries there is bi-directional spillover (Brazil and Venezuela). In three countries (Korea, Philippines and Thailand) there is evidence that foreign exchange market returns Granger cause emerging stock market returns while in two cases (Mexico and Pakistan) Granger causality is in the opposite direction. In all (but one) cases of significant Granger causality, stock returns and domestic currency appreciation are inversely related. Regarding the hypothesis of conditional mean spillovers from the global/regional stock market to the emerging stock market and from the global/regional stock market to the foreign exchange market (hypotheses 2-3 and 5-6 respectively) the evidence is also mixed. Relatively more significant effects are found for hypothesis 3, namely positive conditional mean spillovers from regional market returns to local stock markets returns for six emerging countries.

When it comes to volatility spillovers, on the other hand, we find strong evidence in favour of causality-in-variance (hypotheses 7 and 8) between foreign exchange and emerging stock markets volatilities in almost all countries, and especially Asian countries (Table 1.5 - Panel B). Bi-directional volatility spillovers are evident between the emerging stock market and the foreign exchange market for nine of the twelve economies (Argentina, Brazil, Mexico, India, Korea, Malaysia, Pakistan, Philippines and Thailand) and uni-directional volatility spillover for two others (Venezuela and Chile).

Furthermore, there is strong evidence of volatility spillovers from global/regional stock markets to the foreign exchange and emerging stock markets. Table 1.6 summarizes the results from various causality-in-variance tests. Regarding volatility spillovers from the global stock market to the emerging stock market and from the global stock market to the foreign exchange market (hypotheses 9 and 10), there is evidence for nine of twelve countries. Regarding spillovers from the regional stock market to the emerging stock market (hypothesis 11) there is evidence for all countries except Colombia. As far as spillovers from the regional stock market to the foreign exchange market (hypothesis 12) there is evidence for ten countries. Volatility spillovers exist from both global and regional stock markets to both the stock and foreign exchange market in Argentina, Brazil, Korea, Malaysia, Pakistan, Philippines and Thailand; in Chile only regional spillovers are present

while in Mexico only global spillovers. In Colombia there is no evidence of volatility spillovers, either global or regional.[8] In conclusion, there is strong evidence of transmission of volatility from regional stock markets to emerging stock markets. This is also true, but to a somewhat lesser extent, for volatility transmission from the global to the emerging stock markets. Volatility from both global and regional stock markets is transmitted to the stock and foreign exchange markets of emerging Asia. In Latin America, regional volatility transmission predominates: global volatility transmission is significant in only three of six economies. Beirne *et al.* (2010) reach similar conclusions.

Following on these findings, an interesting hypothesis arises: which of the two effects, global or regional, is larger in magnitude? Previous studies have not tested this hypothesis formally. In Table 1.7 we perform a Wald test for the equality of coefficients of the spillover parameters in the volatility equation (1.5) (or equations (A1)-(A2) in Appendix 1). The general conclusions are, first, that the transmission effects from regional and global stock markets to emerging stock markets are significantly different for ten of the twelve countries. Second, for these ten countries, the regional effect is larger in magnitude for seven and the global effect is larger for the other three. Third, the results for the transmission of volatility from regional and global stock markets to foreign exchange markets are mixed. The effects are significantly different for seven countries; of these, the regional effect is larger than the global effect in four cases. In sum, spillovers from regional stock markets to emerging stock and foreign exchange markets are larger in magnitude than global spillovers for the majority of emerging economies considered.

Finally, we test the robustness of the results to a different measure of regional market returns, by computing a more naïve measure namely the Neighborhood Average Returns (*NAR*) index. This is similar to the *NTWR* index but we calculate this as the simple (not the trade weighted) average of returns of markets within a region. Results using the *NAR* as a measure of regional market returns are similar to those presented above.

1.5.3 The effects of the Asian financial crisis on the linkage between the stock and foreign exchange market of emerging economies

The Asian crisis began in early summer of 1997 bringing financial distress as it spread quickly from Thailand to other emerging economies within and outside Asia. The crisis

[8] Colombia's trade is heavily oriented towards Venezuela with a share of around half at the end of the sample period.

resulted in a plunge in asset prices, speculation and capital flight and instability in the whole region. It has been suggested that longer term the crisis brought about loss of investor confidence and likely a shift in their behavior towards portfolio investment.[9]

One way to study the effects of the Asian crisis on return and volatility spillovers is to use a binary variable that is equal to 1 for the post Asian crisis period and 0 otherwise. This is the approach of Chiang *et al*. (2007) who investigate financial contagion following the Asian crisis. We adopt this approach and incorporate such a binary variable in the context of a BEKK model. Our testable hypotheses concerning stock market and foreign exchange spillovers, however, are different compared to the approach in Chiang *et al*. (2007) or Sander and Kleimeier (2003).

To examine whether, following the onset of the Asian financial crisis, there was a change in the volatility spillover mechanism, we modify the model in (1.5) by adding a dummy variable (denoted *AD*) which is equal to 1 after July 4 1997, and is zero otherwise. This allows us to examine shifts in the parameters that capture the transmission mechanism, so that the parameters shift from α_{21}, β_{21}, α_{12} and β_{12} before the crisis to $\alpha_{21}+\alpha_{21\alpha d}$, $\beta_{21}+\beta_{21\alpha d}$, $\alpha_{12}+\alpha_{12\alpha d}$ and $\beta_{12}+\beta_{12\alpha d}$ after the crisis. In this respect, we follow Forbes and Rigobon (2002) and Beirne *et al.* (2009) and examine the 'shift contagion' volatility concept. This is defined as a shift in volatility transmission from the local stock market to the foreign exchange market and vice versa before and after the crisis. The model in (1.5) is modified as follows:

$$\mathbf{H_t = C'C + \alpha' e_{t-1} e'_{t-1} \alpha + \beta' H_{t-1} \beta + \alpha_{\alpha d}' AD e_{t-1} e'_{t-1} AD \alpha_{\alpha d} + \beta_{\alpha d}' AD H_{t-1} AD \beta_{\alpha d}} \quad (1.9)$$

The variable *AD* in (1.9) controls the parameter volatility spillovers before and after the Asian crisis as described above. Before discussing estimation results, we test the significance of including *AD* in (1.9). The likelihood ratio results are in Table 1.8; the null hypothesis (i.e. exclusion of *AD*) is rejected in all cases.

The volatility causality results from the estimation of the model in equation (1.9) are in Table 1.9. Column 1 tests for shift contagion from the foreign exchange to the stock market after the Asian crisis by testing the hypothesis $\alpha_{21\alpha d}=\beta_{21\alpha d}=0$ (see equations (A21)

[9] For a discussion of the crisis and repercussions on portfolio investment sentiment see Edwards (2000).

and (A22) in Appendix 1 for the exact formulation of the conditional variance equation). Column 3 tests for spillovers, in general, from the foreign exchange to the stock market over the complete sample period by testing jointly whether $\alpha_{21\alpha d}=\beta_{21\alpha d}=0$ and $\alpha_{21}=\beta_{21}=0$. Columns 2 and 4 repeat these tests to examine volatility causality in the opposite direction, i.e. from the stock market to the foreign exchange market. Results show evidence of shift contagion from the foreign exchange market to the stock market in all countries (except Colombia) and from the stock market to the foreign exchange market in all countries. Moreover, volatility spillovers from the foreign exchange to the stock market and vice versa are significant before and after the Asian crisis in all emerging markets (except Colombia).

The question then becomes whether following the onset of the Asian crisis volatility spillovers increased or decreased. This can be addressed by comparing and testing the differences in the estimated coefficients on volatility transmission before and after the Asian crisis. The difference in coefficients capturing volatility transmission from the stock market to the foreign exchange market before and after the crisis is $[\alpha_{12}+\alpha_{12\alpha d}]^2 + [\beta_{12}+\beta_{12\alpha d}]^2 - \alpha_{12}^2 - \beta_{12}^2$. The difference in volatility transmission in the opposite direction (from the foreign exchange to the stock market) is $[\alpha_{21}+\alpha_{21\alpha d}]^2+[\beta_{21}+\beta_{21\alpha d}]^2 - \alpha_{21}^2 - \beta_{21}^2$. A positive difference implies that after the Asian crisis the coefficients capturing volatility spillovers are bigger. Specifically, a positive difference means that, following the onset of the Asian crisis, there is an increase in volatility spillovers among the two markets (stock and foreign exchange) and a negative difference implies a decrease in volatility spillovers. Table 1.10 reports differences in the estimated coefficients capturing volatility transmission in both directions. Our general conclusion is that, following the onset of the Asian financial crisis, the experience of the Asian emerging economies is quite different from that of Latin America as regards the volatility transmission mechanism. In most cases, volatility spillovers between the foreign exchange and stock market decreased in Asia (eight of the twelve differences are negative) while the opposite (they increased) is the case for Latin America (nine of the twelve differences are positive). In the years following the Asian financial crisis, the central banks of many Asian nations built up substantial foreign exchange reserves with the aim of cushioning the domestic impact of disturbances in international financial markets. This accumulation of foreign reserves may have served to dampen the volatility transmission mechanism between the foreign exchange and stock markets of Asian emerging economies.

1.5.4 The effects of the choice of exchange rate regime on the linkage between the stock and foreign exchange market of emerging economies

Recently, an important debate has centered on whether a country's official choice of exchange rate regime is meaningful in terms of determining the value of its currency and the performance of the main macroeconomic aggregates. The debate has taken on importance because countries that purport to maintain fixed exchange rate regimes allow substantial variation in the value of their currency and those that claim to maintain flexible exchange rates are frequently reluctant to allow exchange rate fluctuations in practice ("fear of floating"). Klein and Shambaugh (2008) argue that, in practice, a country's choice of exchange regime is important insofar as how exchange rates behave and their macroeconomic implications. Various issues relevant to the choice of exchange rate regime are discussed in Ghosh *et al.* (2003).

Our purpose in this paper is not to contribute directly to this debate. Rather, we focus on how the choice of exchange regime affects the transmission mechanism between the stock and foreign exchange market of emerging economies. Specifically, we address two questions: (i) does the choice of exchange rate regime shift the level (or constant) in the stock market's return and volatility equations? (ii) does the choice of exchange rate regime have an effect on the transmission mechanism or dynamics between foreign exchange and stock market volatilities?

In order to answer these questions, a scheme for classifying exchange rate regimes is necessary. We resort to the large literature on this issue and employ an existing (and widely used) classification scheme by Ilzetzki *et al.* (2011) to the question at hand. This scheme distinguishes between fifteen categories of exchange rate regime. Following much of the literature in this area, we aggregate the fifteen classifications into three categories (fixed, intermediate and flexible exchange rate regimes) and construct a dummy variable (*RD*) that assumes three values: *RD*=1 for a fixed exchange rate regime, *RD*=2 for an intermediate regime and *RD*=3 for a flexible exchange rate regime. The Ilzetzki *et al.* (2011) scheme and aggregation are shown in Table 1.11. The actual exchange regime based on this classification for the emerging economies in our sample is in Table 1.12.

In the first place, the regime variable (*RD)* is inserted as an intercept shift in the stock market return equation (1.1) and the stock market volatility equation (1.4). This is because we want to test whether regime choice has a significant shift effect on average return and

volatility in emerging stock markets. In addition, *RD* is interacted with the parameters that capture volatility (α_{21} and β_{21}) in order to check whether exchange rate regime changes affect the transmission mechanism of volatility. Specifically we estimate the following model

$$R_{1,t} = \alpha_{10} + \delta_{11} R_{1,t-1} + \delta_{12} R_{2,t-1} + \delta_{13} R_{3,t-1} + \delta_{14} R_{4,t-1} + w_1 RD_t + e_{1,t} \quad (1.10)$$

and

$$\mathbf{H_t = C'C + \Xi'\Xi RD + \alpha' e_{t-1} e'_{t-1} \alpha + \beta' H_{t-1} \beta + \alpha_{rd}' RD e_{t-1} e'_{t-1} RD \alpha_{rd} + \beta_{rd}' RD H_{t-1} RD \beta_{rd}} \quad (1.11)$$

where w_1 is a parameter that tests for shift in the constant of the return equation and Ξ is a zero matrix with a single non-zero element ξ_{11} that is the first element of the first row that captures a constant shift in the variance equation of emerging stock market returns, as shown analytically in equation (A31) in Appendix 1.

First, we test whether regime choice has a significant shift effect on the constant of the equations for the mean and volatility of emerging stock market returns, or a test of the null hypothesis $w_1=0$ in (10) and $\xi_{11}=0$ in (1.11), respectively. Table 1.13 reports the estimate of w_1 and ξ_{11} and the corresponding *p*–value for the test of the null.[10] In general, the choice of exchange rate regime does not have a significant effect on the constant (or level shift) of stock market returns. The estimate of w_1 is significant in two of the ten countries: for Brazil greater exchange rate flexibility is associated with a higher level of average stock returns while in Venezuela with lower stock returns. Exchange regime choice has a significant shift level effect on stock market volatility in five of the ten countries. Our general conclusion is that greater exchange rate flexibility is associated with greater volatility of stock market returns: this is the case for four of the five countries (Brazil, India, Pakistan and Philippines), while only for Thailand is greater exchange rate flexibility associated with lower stock volatility.

Next we examine if exchange regime classification has a significant effect on the dynamics of stock market volatility transmission by focusing on the parameters capturing volatility transmission from the foreign exchange to the stock market (α_{21rd} and β_{21rd}) in equation (1.11). Exchange rate regime is significant in the transmission volatility mechanism from

[10] Estimation was not carried out for Chile or Colombia because there was no change in regime classification throughout the sample period: both countries were classified in the intermediate regime category throughout (see Table 1.12).

the foreign exchange market to the local stock market volatility in all cases except India (Likelihood ratio test results are in Table 1.14). The difference in coefficients capturing volatility transmission from the foreign exchange to the stock market including *RD* ($\alpha_{21}+\alpha_{21rd}$, $\beta_{21}+\beta_{21rd}$) and excluding *RD* ($\alpha_{21,}\beta_{21}$), is in Table 1.15. A positive difference, or $[\alpha_{21}+\alpha_{21rd}]^2+[\beta_{21}+\beta_{21rd}]^2 > \alpha_{21}^2+\beta_{21}^2$, implies that higher volatility spillovers are associated with more flexible exchange rate regimes and a negative difference the opposite. For the majority of countries in our sample, more flexible exchange rate regimes are associated with higher volatility spillovers between the foreign exchange and stock market: this is the case for six of ten emerging economies (Brazil, Venezuela, India, Korea, Pakistan and Thailand).

1.6 Conclusion

The aim of this paper is to investigate bi-directional return and volatility spillovers between the stock market and the foreign exchange market of twelve emerging economies. In addition to the emerging stock and foreign exchange markets, the model incorporates spillovers from the global and regional stock market.

Our analysis shows that there is strong evidence of bi-directional causality in variance between the foreign exchange market and stock market in all emerging economies but Colombia. Global and regional stock markets also contribute significantly to volatility spillovers.

Using the notion of shift contagion, the Asian crisis has had a significant effect on the volatility transmission mechanism between the foreign exchange market and the emerging stock market (in both directions). In addition, more flexible exchange rate regimes are associated with higher volatility spillovers between the foreign exchange and stock market for the majority of emerging economies in our sample.

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Table 1.1: Optimal lag order (p*) selection for the quarto VAR(p) model in equation (1.1)

	Minimum values of the BIC	Optimal order p* for VAR(p)
Argentina	22.79033	1
Brazil	21.04861	2
Chile	17.49199	1
Colombia	17.82509	1
Mexico	18.24711	1
Venezuela	20.73464	1
India	16.83782	1
Korea	18.28559	1
Malaysia	17.24406	1
Pakistan	17.14194	1
Philippines	17.70300	1
Thailand	17.74255	1

Note: Similar results apply to the restricted VAR discussed in Section 1.3.

Table 1.2: Likelihood Ratio test for the significance of the regional market in the mean and variance equations of stock and foreign exchange returns

	Mean Equation $\delta_{14}=\delta_{24}=0$	**Variance Equation** $\alpha_{14}=\alpha_{24}=0$ **and** $\beta_{14}=\beta_{24}=0$
Argentina	245.0*	225.3*
Brazil	8.1**	169.6*
Chile	2.6	53.7*
Colombia	6.6**	0.7
Mexico	6.2**	18.0*
Venezuela	78.3*	14.7*
India	3.4	30.7*
Korea	65.7*	88.6*
Malaysia	189.8*	57.6*
Pakistan	163.7*	8.9**
Philippines	2.8	87.3*
Thailand	0.4	23.9*

Note: LR test is reported on the basic quarto-variate model in equations (1.1) and (1.4). Critical values for 1%, 5%, and 10% are 9.210, 5.991 and 4.605 respectively. *, **, and *** denote significance at 1%, 5%, and 10% respectively.

Table 1.3: Descriptive statistics

	Mean	Median	Max	Min	S.D.	Skew.	Kurt.
Stock Market Return							
Argentina	1.0508	0.6798	76.0548	-40.3150	7.4592	2.5150	22.5360
Brazil	1.8844	1.3216	30.0647	-45.7452	6.3842	0.1715	7.8099
Chile	0.4008	0.3444	11.0873	-9.6232	2.6445	0.0075	4.6003
Colombia	0.5335	0.3983	24.3530	-20.1252	3.3248	0.3972	9.8645
Mexico	0.4692	0.6487	15.5995	-16.1141	3.2421	-0.2862	4.8135
Venezuela	0.6809	0.2957	26.7017	-22.2842	4.7410	0.5516	6.7349
India	0.3178	0.4669	16.4980	-15.7825	3.7120	-0.1224	4.9410
Korea	0.1037	0.0847	18.1568	-19.8756	4.2972	-0.0604	5.3928
Malaysia	0.1372	0.2476	28.0922	-19.5575	3.3718	0.1718	11.7761
Pakistan	0.3574	0.5647	14.6091	-18.2677	4.0937	-0.5359	5.1933
Philippines	0.1403	0.1916	15.5985	-24.0543	3.5362	-0.6089	8.1788
Thailand	0.1207	0.2034	23.8841	-26.7491	4.5247	-0.0431	6.8142

Table 1.3 (continued): Descriptive statistics

	Mean	Median	Max	Min	S.D.	Skew.	Kurt.
Foreign Exchange Return							
Argentina	-0.7351	0.0000	19.2609	-81.1227	5.1945	-8.0672	91.0087
Brazil	-1.5192	-0.2305	11.2940	-21.4112	3.5555	-1.6421	7.9803
Chile	-0.0708	-0.0930	4.6821	-5.4964	1.1086	-0.1407	6.9086
Colombia	-0.1685	-0.1515	9.1771	-13.1290	1.2541	-0.8686	21.5563
Mexico	-0.1448	-0.0369	7.0982	-30.0383	1.6163	-7.3145	123.3732
Venezuela	-0.4674	-0.1308	18.4483	-71.3371	3.7359	-9.3613	164.9412
India	-0.1027	0.0000	5.0636	-8.4327	0.7818	-3.7244	44.1789
Korea	-0.0408	0.0000	13.5989	-33.0534	1.6812	-7.2133	158.6227
Malaysia	-0.0206	0.0000	10.0095	-14.9639	1.1856	-1.2202	53.0337
Pakistan	-0.1348	-0.0014	4.6305	-8.3536	0.7964	-4.5922	45.0758
Philippines	-0.0765	0.0000	7.6693	-12.7833	1.2766	-1.7758	23.6151
Thailand	-0.0289	0.0000	9.6774	-11.8821	1.3186	-1.4669	27.9442
Global Stock Market Return							
SP500	0.1506	0.2772	7.4923	-12.3304	2.0770	-0.4834	5.7827

Table 1.4: Descriptive statistics for regional market returns (NTWR)

NTWR	Mean	Median	Max	Min	S.D.	Skew.	Kurt.
Argentina	1.4617	1.1466	22.7112	-28.7426	4.7676	0.1696	6.4020
Brazil	0.7169	0.6518	32.9018	-14.6038	4.1864	1.2170	10.9568
Chile	1.2273	1.1389	25.6183	-22.1666	4.2625	0.4553	7.0868
Colombia	0.8983	0.8195	16.6926	-16.2496	3.1655	0.1700	5.8914
Mexico	1.3009	1.0262	23.6797	-19.9142	3.8799	0.7019	7.4905
Venezuela	1.1041	0.9529	20.8108	-14.3073	3.2177	0.3884	6.9215
India	0.1410	0.1896	11.6961	-12.9359	2.7841	-0.4114	5.7469
Korea	0.1643	0.3044	14.7712	-14.2339	2.5797	-0.6107	7.7179
Malaysia	0.1378	0.1257	13.6257	-13.2886	2.8929	-0.1497	5.6810
Pakistan	0.1360	0.1601	15.3255	-12.4684	2.8118	-0.1828	5.4072
Philippines	0.1354	0.1598	11.8721	-13.9792	3.0017	-0.2844	5.8438
Thailand	0.1329	0.1800	12.9019	-11.7614	2.5343	-0.3609	5.6369

Table 1.5: Causality-in-mean and Causality-in-variance tests

	Panel A: Causality in the mean (spillovers in mean)					
	Local emerging stock market			Foreign Exchange Market (FX)		
	No return spillovers from FX market	No return spillovers from the global market	No return spillovers from the regional market	No return spillovers from local stock market	No return spillovers from global market	No return spillovers from regional market
	$\delta_{12}=0$	$\delta_{13}=0$	$\delta_{14}=0$	$\delta_{21}=0$	$\delta_{23}=0$	$\delta_{24}=0$
ARG	0.08	-0.06	-0.03	-0.19	0.01	0.01
	[0.57]	[0.41]	[0.44]	[0.40]	[0.03]**	[0.28]
BRA	-0.54	0.25	0.08	-0.06	-0.04	0.03
	[0.00]*	[0.04]**	[0.19]	[0.03]**	[0.54]	[0.68]
CHI	0.08	0.02	0.01	0.01	0.01	0.01
	[0.17]	[0.58]	[0.67]	[0.83]	[0.31]	[0.02]**
COL	-0.10	-0.02	0.07	0.05	0.0003	0.01
	[0.11]	[0.55]	[0.01]*	[0.34]	[0.98]	[0.55]
MEX	-0.06	-0.03	0.05	-0.10	-0.004	-0.003
	[0.15]	[0.41]	[0.00]*	[0.02]**	[0.81]	[0.59]
VEN	-0.07	-0.12	0.28	-0.11	-0.02	0.05
	[0.01]*	[0.01]*	[0.00]*	[0.08]***	[0.24]	[0.06]***
IND	-0.21	0.05	0.05	-0.01	-0.0004	-0.003
	[0.33]	[0.32]	[0.26]	[0.86]	[0.95]	[0.72]
KOR	-0.27	0.05	0.15	0.03	0.005	0.002
	[0.00]*	[0.38]	[0.00]*	[0.52]	[0.46]	[0.76]
MAL	0.14	0.04	0.10	0.08	-0.002	0.002
	[0.38]	[0.28]	[0.02]**	[0.28]	[0.00]*	[0.00]*
PAK	-0.18	0.03	0.13	-0.38	-0.04	0.05
	[0.33]	[0.60]	[0.01]*	[0.00]*	[0.02]**	[0.00]*
PHIL	0.25	0.06	0.06	-0.08	-0.002	0.01
	[0.03]**	[0.12]	[0.28]	[0.18]	[0.88]	[0.51]
THAI	-0.31	0.21	-0.02	-0.01	0.02	-0.004
	[0.00]*	[0.00]*	[0.72]	[0.85]	[0.01]*	[0.46]

Note: (Panel A) Robust estimated coefficients and p-values in [ ] of the conditional mean model in equation (1.1). We reject the null at the 1%, 5%, and 10% denoted by * ,**, and *** respectively. The asymptotic normal distribution critical values are 2.54, 1.96 and 1.64. Restrictions related to the δ coefficients refer to single parameter tests for all countries except Brazil, given VAR(2) for this country. For Brazil the sum of the two AR(2) coefficients is reported and the corresponding Wald test for their joint significance is performed.

Table 1.5 (continued): Causality-in-mean and Causality-in-variance tests

	Panel B: Causality in variance (spillovers in volatility)					
	Local emerging stock market			Foreign Exchange Market (FX)		
	No spillovers from FX market	No spillovers from global market	No spillovers from regional market	No spillovers from local stock market	No spillovers from global market	No spillovers from regional market
	$\alpha_{21}=\beta_{21}=0$	$\alpha_{31}=\beta_{31}=0$	$\alpha_{41}=\beta_{41}=0$	$\alpha_{12}=\beta_{12}=0$	$\alpha_{32}=\beta_{32}=0$	$\alpha_{42}=\beta_{42}=0$
ARG	392.6*	74.7*	16.2*	160.7*	286.7*	7.4**
BRA	222.4*	95.3*	42.1*	90.9*	600.1*	249.5*
CHI	0.1	0.7	10.4*	228.9*	0.5	51.1*
COL	3.9	2.4	1.8	2.3	2.0	4.0
MEX	380.9*	5.2***	15.2*	27.4*	0.9	13.5*
VEN	348.4*	19.3*	15.6*	3.2	41.9*	4.0
IND	19.7*	0.1	7.4**	15.3*	136.1*	0.4
KOR	61.0*	29.0*	96.4*	66.9*	26.9*	175.0*
MAL	23.7*	44.0*	118.8*	45.1*	14.2*	18.2*
PAK	90.0*	295.5*	53.0*	28.0*	55.6*	69.1*
PHIL	196.1*	39.2*	65.7*	120.0*	91.3*	152.1*
THAI	17.9*	11.3*	78.1*	6.9**	7.8**	17.8*

Note: (Panel B) The Likelihood Ratio test is performed in the conditional variance model in equation (1.5) and in equations (A1)-(A2) in Appendix 1. The critical values of the chi-square distribution with two degrees of freedom are 9.210, 5.991 and 4.605. We reject the null at the 1%, 5%, and 10% denoted by *,**, and *** respectively.

Table 1.6: Causality-in-variance tests among the foreign exchange market (FX), the local stock market (ESM), global stock market (MM) and regional stock market (NTWR)

From:	FX & ESM	MM	NTWR
To:	FX & ESM	ESM & FX	ESM & FX
Argentina	Bi-directional	MM to ESM & FX	NTWR to ESM & FX
Brazil	Bi-directional	MM to ESM & FX	NTWR to ESM & FX
Chile	ESM to FX	No relationship	NTWR to ESM & FX
Colombia	No relationship	No relationship	No relationship
Mexico	Bi-directional	MM to ESM	NTWR to ESM & FX
Venezuela	FX to ESM	MM to ESM & FX	NTWR to ESM
India	Bi-directional	MM to FX	NTWR to ESM
Korea	Bi-directional	MM to ESM & FX	NTWR to ESM & FX
Malaysia	Bi-directional	MM to ESM & FX	NTWR to ESM & FX
Pakistan	Bi-directional	MM to ESM & FX	NTWR to ESM & FX
Philippines	Bi-directional	MM to ESM & FX	NTWR to ESM & FX
Thailand	Bi-directional	MM to ESM & FX	NTWR to ESM & FX

Note: The Likelihood Ratio tests are performed in models in equation (1.5) and equations (A1)-(A2) in Appendix 1. The direction of causality is reported.

Table 1.7: Global vs. Regional Market volatility effects: comparison of coefficients

	Joint tests	
	Effect of global market to local stock market = Effect of regional market to local stock market	**Effect of global market to FX market = Effect of regional market to FX market**
	$\alpha_{31}=\alpha_{41}=\beta_{31}=\beta_{41}=0$	$\alpha_{32}=\alpha_{42}=\beta_{32}=\beta_{42}=0$
Argentina	+	+
	[0.00]*	[0.00]*
Brazil	-	+
	[0.00]*	[0.00]*
Chile	-	-
	[0.05]**	[0.73]
Colombia	-	+
	[0.83]	[0.26]
Mexico	-	+
	[0.01]**	[0.00]*
Venezuela	-	-
	[0.02]**	[0.17]
India	-	+
	[0.06]***	[0.77]
Korea	+	-
	[0.00]*	[0.11]
Malaysia	-	-
	[0.00]*	[0.02]**
Pakistan	+	-
	[0.02]**	[0.00]*
Philippines	+	-
	[0.27]	[0.00]*
Thailand	-	-
	[0.00]*	[0.00]*

Note: The reported number in [ ] is the p-value of a Wald test for the null of jointly equal coefficients for the model in equation (1.5) and (A1)-(A2) in Appendix 1. "+" means that $\sum((\alpha_{31}-\alpha_{41}) + (\beta_{31}-\beta_{41})) > 0$ i.e. the global effect is larger in magnitude than the regional effect and "-" means that $\sum((\alpha_{31}-\alpha_{41}) + (\beta_{31}-\beta_{41})) < 0$ i.e. the regional effect is larger than the global effect.

Table 1.8: Significance tests for inclusion of the Asian crisis dummy variable (AD) in the conditional variance equation

	LR test statistic
Argentina	733.7*
Brazil	81.8*
Chile	33.9*
Colombia	93.5*
Mexico	171.4*
Venezuela	34.8*
India	115.1*
Korea	86.5*
Malaysia	214.4*
Pakistan	46.3*
Philippines	348.2*
Thailand	190.3*

Note: Significance at 1%, 5%, and 10% levels is denoted by *, **, and *** respectively.

Table 1.9: Causality-in-variance: The Asian crisis model

	No shift contagion from FX market after Asian crisis $\alpha_{21\alpha d}=\beta_{21\alpha d}=0$	No shift contagion from stock market after Asian crisis $\alpha_{12\alpha d}=\beta_{12\alpha d}=0$	No spillover from FX market $\alpha_{21}=\beta_{21}=\alpha_{21\alpha d}=\beta_{21\alpha d}=0$	No spillover from stock market $\alpha_{12}=\beta_{12}=\alpha_{12\alpha d}=\beta_{12\alpha d}=0$
Argentina	678.2*	147.2*	933.1*	87.7*
Brazil	83.3*	70.8*	172.8*	13.3*
Chile	52.0*	94.4*	27.6*	121.6*
Colombia	2.0	23.3*	0.7	79.5*
Mexico	108.5*	49.3*	446.0*	72.7*
Venezuela	79.6*	9.6*	447.6*	271.7*
India	64.1*	95.3*	55.2*	21.6*
Korea	166.5*	120.4*	63.2*	202.3*
Malaysia	16.9*	84.4*	36.8*	41.2*
Pakistan	79.5*	239.6*	122.2*	250.3*
Philippines	205.7*	151.5*	388.8*	198.6*
Thailand	148.5*	13.0*	21.6*	48.2*

Note: Significance at 1%, 5%, and 10% levels is denoted by *, **, and *** respectively.

Table 1.10: What is the sign of the difference in the estimated volatility spillovers pre and post Asian crisis?

	$[\alpha_{12}+\alpha_{12\alpha d}]^2$ $+[\beta_{12}+\beta_{12\alpha d}]^2$ minus $\alpha_{12}^2+\beta_{12}^2$	$[\alpha_{21}+\alpha_{21\alpha d}]^2$ $+[\beta_{21}+\beta_{21\alpha d}]^2$ minus $\alpha_{21}^2+\beta_{21}^2$
Argentina	-	+
Brazil	-	+
Chile	+	+
Colombia	+	+
Mexico	+	+
Venezuela	+	-
India	-	-
Korea	-	+
Malaysia	+	+
Pakistan	-	-
Philippines	-	+
Thailand	-	-

Note: +/- denotes the sign of the difference of the estimated coefficients in equations (A1)-(A2) and (A21)-(A22) in Appendix 1. "+" means that $[\alpha_{12}+\alpha_{12\alpha d}]^2+[\beta_{12}+\beta_{12\alpha d}]^2-\alpha_{12}^2-\beta_{12}^2>0$ or volatility spillovers increased following the onset of the Asian crisis and "-" means $[\alpha_{12}+\alpha_{12\alpha d}]^2+[\beta_{12}+\beta_{12\alpha d}]^2-\alpha_{12}^2-\beta_{12}^2<0$ or volatility spillovers decreased following the onset of the Asian crisis.

Table 1.11: Exchange Regime Classification Scheme: Fixed/Intermediate/Flexible

The different regime classification codes are:		
1	• No separate legal tender	
1	• Pre announced peg or currency board arrangement	Fixed [RD=1]
1	• Pre announced horizontal band that is narrower than or equal to +/-2%	
1	• De facto peg	
2	• Pre announced crawling peg	
2	• Pre announced crawling band that is narrower than or equal to +/-2%	
2	• De factor crawling peg	
2	• De facto crawling band that is narrower than or equal to +/-2%	Intermediate [RD=2]
3	• Pre announced crawling band that is wider than or equal to +/-2%	
3	• De facto crawling band that is narrower than or equal to +/-5%	
3	• Moving band that is narrower than or equal to +/-2% (i.e., allows for both appreciation and depreciation over time)	
3	• Managed floating	
4	• Freely floating	
5	• Freely falling	Flexible [RD=3]
6	• Dual market in which parallel market data is missing	

Source: Ilzetzki, Reinhart and Rogoff (2011).

Table 1.12: Exchange Rate Regime Classification of various emerging economies

Latin America			**Asia**		
Argentina	1/1989-3/1991	3	India	1/1989-7/1991	2
	4/1991-11/2001	1		8/1991-6/1995	1
	12/2001-1/2003	3		7/1995-8/2008	2
	2/2003-8/2008	2	Korea	1/1989-11/1997	2
Brazil	1/1989-3/1989	1		12/1997-6/1998	3
	4/1989-6/1994	3		7/1998-8/2008	2
	7/1994-1/1999	2	Malaysia	1/1989-7/1997	2
	2/1999-8/1999	3		8/1997-9/1998	3
	9/1999- 8/2008	2		10/1998-2/2008	1
Chile	1/1989-8/2008	2		3/2008-8/2008	2
Colombia	1/1989-8/2008	2	Pakistan	4/1991– 2/2008	2
				3/2008-7/2008	3
				8/2008	2
Mexico	1/1989-4/1992	2	Philippines	1/1989-8/1995	2
	5/1992-1/1994	1		9/1995-6/1997	1
	2/1994-12/1994	2		7/1997-11/1997	3
	1/1995-3/1996	3		12/1997-8/2008	2
	4/1996-8/2008	2	Thailand	1/1989-6/1997	1
Venezuela	1/1989-3/1990	3		7/1997-12/1997	3
	4/1990-9/1992	2		1/1998-8/2008	2
	10/1992-6/1996	3			
	7/1996-1/2003	2			
	2/2003-4/2007	1			

Source: The exchange rate regime data are from Ilzetzki, Reinhart and Rogoff (2011).

Table 1.13: Exchange rate regime choice as a shift in the constant of the mean return equation and variance of returns equation

	ARG	BRA	MEX	VEN	IND
Mean					
Returns	0.0691	1.8548	0.4559	-0.9932	0.3283
(w_1)	[0.816]	[0.005]*	[0.137]	[0.000]*	[0.209]
Conditional					
Volatility	0.0421	3.6768	0.0680	0.2525	0.2515
(ξ_{11})	[0.834]	[0.000]*	[0.736]	[0.385]	[0.042]**

Note: Reported values are the estimated coefficients and corresponding *p*-values are in [ ] for the model in equations (1.10)-(1.11).

Table 1.13 (continued): Exchange rate regime choice as a shift in the constant of the mean return equation and variance of returns equation

	KOR	MAL	PAK	PHIL	THAI
Mean					
Returns	0.0090	0.0534	-0.2769	0.2158	0.2279
(w_1)	[0.994]	[0.702]	[0.719]	[0.380]	[0.300]
Conditional					
Volatility	-1.486	0.0645	0.8856	1.0333	-0.6323
(ξ_{11})	[0.161]	[0.698]	[0.000]*	[0.000]*	[0.000]*

Note: Reported values are the estimated coefficients and corresponding *p*-values are in [ ] for the model in equations (1.10)-(1.11).

Table 1.14: Testing volatility causality in the presence of Exchange Regime Classification

	Volatility causality from the FX market to the local stock market volatility $\alpha_{21rd}=\beta_{21rd}=0$
Argentina	1705.1*
Brazil	16.3*
Mexico	273.1*
Venezuela	861.7*
India	1.6
Korea	79.9*
Malaysia	4.7***
Philippines	455.4*
Pakistan	240.3*
Thailand	51.2*

Note: The Likelihood Ratio test examines the null of no causality in variance from foreign exchange to stock market volatility in equation (A31) in Appendix 1. Significance at the 1%, 5%, and 10% level is denoted by *, **, and *** respectively.

Table 1.15: The size of the effect of exchange regime classification on the dynamics of volatility

	$[\alpha_{21}+\alpha_{21rd}]^2+[\beta_{21}+\beta_{21rd}]^2$ minus $\alpha_{21}^2+\beta_{21}^2$
Argentina	-
Brazil	+
Mexico	-
Venezuela	+
India	+
Korea	+
Malaysia	-
Pakistan	+
Philippines	-
Thailand	+

Note: +/- denotes the sign of the difference in estimated coefficients of the model in equation (A31) in Appendix 1. "+" means that $[\alpha_{21}+\alpha_{21rd}]^2+[\beta_{21}+\beta_{21rd}]^2-\alpha_{21}^2-\beta_{21}^2>0$ or more flexible exchange regimes are associated with increased volatility spillovers and "-" means $[\alpha_{21}+\alpha_{21rd}]^2+[\beta_{21}+\beta_{21rd}]^2-\alpha_{21}^2-\beta_{21}^2<0$ i.e. or more flexible exchange regimes are associated with reduced volatility spillovers.

Appendix 1

Conditional Variance Equations

The conditional variance equation of local stock market returns ($h_{11,t}$) is

$$h_{11,t} = c_{11}^2 + a_{11}^2 e_{1,t-1}^2 + a_{21}^2 e_{2,t-1}^2 + a_{31}^2 e_{3,t-1}^2 + a_{41}^2 e_{4,t-1}^2 + 2a_{11}a_{21}e_{1,t-1}e_{2,t-1} + 2a_{11}a_{31}e_{1,t-1}e_{3,t-1} + 2a_{21}a_{31}e_{2,t-1}e_{3,t-1} + 2a_{11}a_{41}e_{1,t-1}e_{4,t-1} + 2a_{21}a_{41}e_{2,t-1}e_{4,t-1} + \beta_{11}^2 h_{11,t-1} + \beta_{21}^2 h_{22,t-1} + \beta_{31}^2 h_{33,t-1} + \beta_{41}^2 h_{44,t-1} + 2\beta_{11}\beta_{21}h_{12,t-1} + 2\beta_{11}\beta_{31}h_{13,t-1} + 2\beta_{21}\beta_{31}h_{23,t-1} + 2\beta_{11}\beta_{41}h_{14,t-1} + 2\beta_{21}\beta_{41}h_{24,t-1}$$

(A1)

The conditional variance equation of foreign exchange market returns ($h_{22,t}$) is

$$h_{22,t} = (c_{12}^2 + c_{22}^2) + a_{22}^2 e_{2,t-1}^2 + a_{12}^2 e_{1,t-1}^2 + a_{32}^2 e_{3,t-1}^2 + a_{42}^2 e_{4,t-1}^2 + 2a_{12}a_{22}e_{1,t-1}e_{2,t-1} + 2a_{22}a_{32}e_{2,t-1}e_{3,t-1} + 2a_{12}a_{32}e_{1,t-1}e_{3,t-1} + 2a_{22}a_{42}e_{2,t-1}e_{4,t-1} + 2a_{12}a_{42}e_{1,t-1}e_{4,t-1} + \beta_{12}^2 h_{11,t-1} + \beta_{22}^2 h_{22,t-1} + \beta_{32}^2 h_{33,t-1} + \beta_{42}^2 h_{44,t-1} + 2\beta_{12}\beta_{22}h_{12,t-1} + 2\beta_{22}\beta_{32}h_{23,t-1} + 2\beta_{12}\beta_{32}h_{13,t-1} + 2\beta_{22}\beta_{42}h_{24,t-1} + 2\beta_{12}\beta_{42}h_{14,t-1}$$

(A2)

The conditional variance equation of global market returns ($h_{33,t}$) is

$$h_{33,t} = (c_{13}^2 + c_{23}^2 + c_{33}^2) + a_{33}^2 e_{3,t-1}^2 + \beta_{33}^2 h_{33,t-1}$$

(A3)

The conditional variance equation of regional market returns ($h_{44,t}$) is

$$h_{44,t} = (c_{14}^2 + c_{24}^2 + c_{34}^2 + c_{44}^2) + a_{44}^2 e_{4,t-1}^2 + \beta_{44}^2 h_{44,t-1}$$

(A4)

In Section 1.5.3, we considered a model that incorporates a dummy variable *AD* to capture possible shifts in the volatility transmission mechanism, following the onset of the Asian financial crisis. In this case, the conditional variance equation of local stock market returns ($h_{11,t}$) changes to

$$h_{11,t} = c_{11}^2 + a_{11}^2 e_{1,t-1}^2 + (a_{21} + a_{21ad}.AD)^2 e_{2,t-1}^2 + a_{31}^2 e_{3,t-1}^2 + a_{41}^2 e_{4,t-1}^2 + 2a_{11}(a_{21} + a_{21ad}.AD)e_{1,t-1}e_{2,t-1} + 2a_{11}a_{31}e_{1,t-1}e_{3,t-1} + 2(a_{21} + a_{21ad}.AD)a_{31}e_{2,t-1}e_{3,t-1} + 2a_{11}a_{41}e_{1,t-1}e_{4,t-1} + 2(a_{21} + a_{21ad}.AD)a_{41}e_{2,t-1}e_{4,t-1} + \beta_{11}^2 h_{11,t-1} + (\beta_{21} + \beta_{21ad}.AD)^2 h_{22,t-1} + \beta_{31}^2 h_{33,t-1} + \beta_{41}^2 h_{44,t-1} + 2\beta_{11}(\beta_{21} + \beta_{21ad}.AD)h_{12,t-1} + 2\beta_{11}\beta_{31}h_{13,t-1} + 2(\beta_{21} + \beta_{21ad}.AD)\beta_{31}h_{23,t-1} + 2\beta_{11}\beta_{41}h_{14,t-1} + 2(\beta_{21} + \beta_{21ad}.AD)\beta_{41}h_{24,t-1}$$

(A21)

The conditional variance equation of foreign exchange market returns ($h_{22,t}$) changes to

$$h_{22,t} = (c_{12}^2 + c_{22}^2) + a_{22}^2 e_{2,t-1}^2 + (a_{12} + a_{12ad}.AD)^2 e_{1,t-1}^2 + a_{32}^2 e_{3,t-1}^2$$
$$+ a_{42}^2 e_{4,t-1}^2 + 2(a_{12} + a_{12ad}.AD)a_{22} e_{1,t-1} e_{2,t-1} + 2a_{22} a_{32} e_{2,t-1} e_{3,t-1}$$
$$+ 2(a_{12} + a_{12ad}.AD)a_{32} e_{1,t-1} e_{3,t-1} + 2a_{22} a_{42} e_{2,t-1} e_{4,t-1}$$
$$+ 2(a_{12} + a_{12ad}.AD)a_{42} e_{1,t-1} e_{4,t-1} + \beta_{22}^2 h_{22,t-1}$$
$$+ (\beta_{12} + \beta_{12ad}.AD)^2 h_{11,t-1} + \beta_{32}^2 h_{33,t-1} + \beta_{42}^2 h_{44,t-1}$$
$$+ 2(\beta_{12} + \beta_{12ad}.AD)\beta_{22} h_{12,t-1} + 2\beta_{22}\beta_{32} h_{23,t-1}$$
$$+ 2(\beta_{12} + \beta_{12ad}.AD)\beta_{32} h_{13,t-1} + 2\beta_{22}\beta_{42} h_{24,t-1}$$
$$+ 2(\beta_{12} + \beta_{12ad}.AD)\beta_{42} h_{14,t-1}$$

(A22)

The conditional variance equations for global and regional stock returns remain the same as (A3) and (A4) above.

In Section 1.5.4, we considered a model that incorporates a dummy variable *RD* to capture possible shifts in the volatility transmission mechanism from the choice of exchange rate regime. In this case, the conditional variance ($h_{11,t}$) equation of emerging stock market returns changes to

$$h_{11,t} = c_{11}^2 + \xi_{11}^2.RD + a_{11}^2 e_{1,t-1}^2 + (a_{21} + a_{21rd}.RD)^2 e_{2,t-1}^2$$
$$+ a_{31}^2 e_{3,t-1}^2 + a_{41}^2 e_{4,t-1}^2 + 2a_{11}(a_{21} + a_{21rd}.RD)e_{1,t-1} e_{2,t-1} + 2a_{11} a_{31} e_{1,t-1} e_{3,t-1}$$
$$+ 2(a_{21} + a_{21rd}.RD)a_{31} e_{2,t-1} e_{3,t-1} + 2a_{11} a_{41} e_{1,t-1} e_{4,t-1}$$
$$+ 2(a_{21} + a_{21rd}.RD)a_{41} e_{2,t-1} e_{4,t-1} + \beta_{11}^2 h_{11,t-1} + (\beta_{21} + \beta_{21rd}.RD)^2 h_{22,t-1}$$
$$+ \beta_{31}^2 h_{33,t-1} + \beta_{41}^2 h_{44,t-1} + 2\beta_{11}(\beta_{21} + \beta_{21rd}.RD)h_{12,t-1} + 2\beta_{11}\beta_{31} h_{13,t-1}$$
$$+ 2(\beta_{21} + \beta_{21rd}.RD)\beta_{31} h_{23,t-1} + 2\beta_{11}\beta_{41} h_{14,t-1}$$
$$+ 2(\beta_{21} + \beta_{21rd}.RD)\beta_{41} h_{24,t-1}$$

(A31)

The return and variance equations for the foreign exchange, global and regional stock returns remain the same as in equation (1.1) and (A2), (A3) and (A4) above.

Chapter 2: What determines equity flows by investment funds to emerging economies?

2.1 Introduction

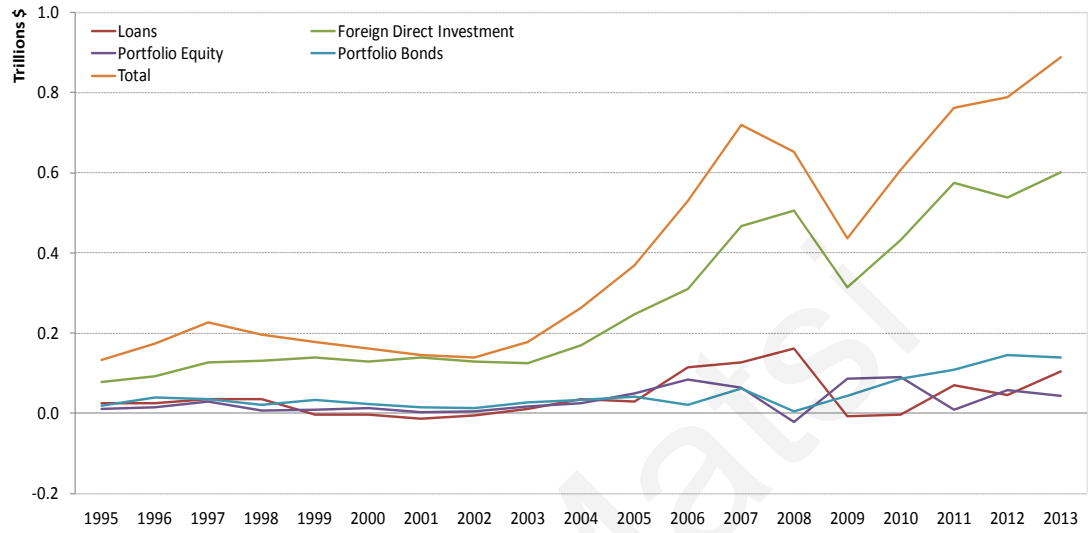
Inflows of equity capital to emerging economies over the past two decades is a major topic of research as these flows have become a major source of financing for emerging economies. Equity capital flows across borders are thought to be beneficial since resources are allocated to projects with greater return opportunities. Large equity flows, however, create challenges for policymakers in emerging economies since they are more volatile than flows to developed economies and their management is an issue surrounded by controversy.

During the past two decades, emerging economies have become more fully integrated into international financial markets following the liberalization of their capital account. Private international capital flows to emerging markets have increased substantially as shown in Figures 2.1 and 2.2. Figure 2.1 shows annual net capital inflows to emerging economies during 1995-2013 for four categories of flows (foreign direct investment, portfolio equity, portfolio bonds and loans) and their sum. Figure 2.2 shows total (cumulative) net capital inflows for the four categories and their sum. As is evident, total net capital flows have increased steadily throughout the period. A dip in foreign direct investment (FDI) and loans in the wake of the global financial crisis was, to some extent, replaced by portfolio equity and bond flows.

This integration of emerging economies has raised several questions in the literature with the aim of trying to identify the drivers behind these flows. Many papers have looked at the factors behind one or more of the above mentioned capital flow categories (or their sum). The data on which many of these studies are based come from aggregate balance of payments statistics data that include different types of flows that are aggregated into each category. Thus each of these categories includes a variety of different types of flows and it is not clear which factors are important determinants for different types. For example, foreign direct investment includes both greenfield investments and acquisitions of existing assets by foreign multinationals or private equity investors, decisions driven by different economic or political motives. Portfolio equity investment flows include both public and publicly guaranteed investments as well as private investments, making disentangling the

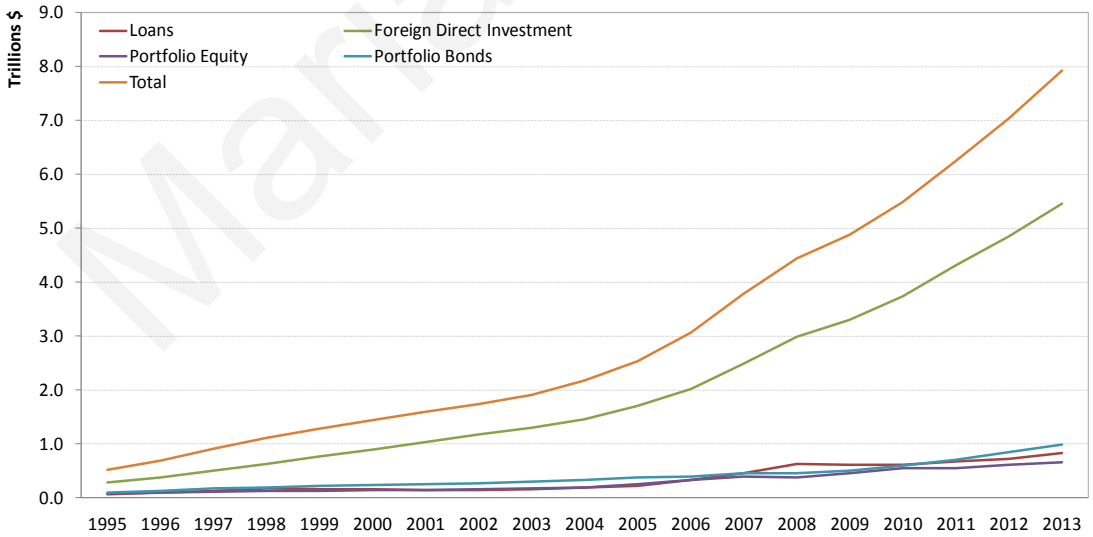
forces behind these flows impossible. The same is true for loans that include both loans from public and private lenders. In sum, with these data it is not possible to identify the factors behind decisions by international investors to allocate capital to these economies.

Figure 2.1: Annual net capital inflows to emerging economies



Source: Authors calculations based on World Bank data

Figure 2.2: Total (cumulative) net capital inflows to emerging economies



Source: Authors calculations based on World Bank data

The aim of this paper is to look at the determinants of decisions by international investors to allocate equity capital to emerging economies. We use a proprietary data set compiled by *EPFR Global* that tracks equity capital flows by investment funds to emerging

economies. EPFR tracks close to 20,000 global funds with just over $20tn in total assets globally. Our data include monthly net equity capital flows to each of 16 emerging economies by investment funds. By looking at equity flows by global investment funds alone we are able to focus on the factors that investors deem important in their global equity capital allocation decisions to emerging economies. Moreover, we look into whether sovereign credit ratings by credit rating agencies are an important factor in the decisions of international investors. One of the principle arguments behind the liberalization of the capital account of emerging economies has been the benefits from attracting equity capital by international investors. Our study contributes to understanding the factors that have motivated these investors, an issue that has been relatively neglected by the literature.

The period under study in this paper is marked by the 2007-2008 global financial crisis and its aftermath. The global transmission of the crisis has sparked a great deal of interest over what factors have played a role in driving global capital flows in its aftermath. The 2008 collapse in FDI and bank loans and the surge (especially in portfolio bond and equity investment) that followed are still an open and controversial topic. In this paper we look at the importance of the factors driving private equity flows to emerging economies following the global financial crisis. In particular, we investigate the extent to which quantitative easing and the growth of the U.S. money base has spilled over into private equity flows to emerging economies. This is an important question that has been raised frequently in the financial press but not been studied systematically within a comprehensive econometric framework that models the various determinants of equity capital flows to emerging economies.

Our paper makes a number of contributions. First, it focuses solely on equity capital flows by private investors to 16 of the most important emerging economies. Second, it looks at a variety of possible economic and other determinants of these flows and distinguishes between global push and domestic pull factors. Third, it investigates the role of sovereign credit ratings in decisions by international investors. Fourth, it looks into the impact of the global financial crisis on equity capital flows and the role played by quantitative easing in the US. Finally, our results are subjected to a variety of robustness checks concerning the choice econometric technique and empirical specification.

The paper is organized as follows. The following section is a brief summary of the literature. Section 2.3 presents the methodology and Section 2.4 the data. Section 2.5 discusses the estimation results and the final section concludes.

2.2 Background Literature

Capital flows to emerging markets can be driven by two types of factors: internal (country specific) or external (global factors). Internal or country specific or "pull" factors are those factors that capture the domestic investment opportunities and risks that influence a pull on funds from overseas. On the other hand the external or global or "push" factors reflect a push on investment to emerging markets. Push factors are considered to capture the economic activity and alternative opportunities for investment.

The literature on the determinants/drivers of private capital flows to emerging economies can be divided into three main categories.[11] First, some papers look at aggregate capital flows to emerging countries and make no distinction between the various forms such as equity flows, portfolio flows or loans.[12] These papers use data mostly from the Balance of Payments (BoP) statistics of various emerging economies. Second, some papers make a distinction between the various forms of capital flows to emerging markets. Some of these papers compare the different types of flows to emerging markets and estimate the determinants of the different types of flows for one or a group of emerging economies. Third, some papers focus on only one type of capital flow to emerging economies and study its determinants. Finally, some papers consider aspects of more than one of the above categories.

Regarding the first category that deals with aggregate capital flows, Calvo *et al.* (1993, 1996), Kim (2000) and Ghosh *et al.* (2014) found evidence on the significance of global/external factors in explaining capital flows. Calvo *et al.* (1993) examined the role of external factors in determining capital inflows to Latin America and argue that these inflows are partly explained by conditions outside the region such as the U.S. recession and lower international interest rates. Calvo *et al.* (1996) examined the issue of capital inflows to developing countries in the 1990s and report that the surge in capital inflows was

[11] Along with other studies (reviewed in this section) we consider only private capital flows not capital flows through the official settlements balance (foreign exchange reserves). The literature on the latter is extensive but is beyond the scope of this paper.

[12] A lot of these papers look at portfolio flows in total and do not distinguish between portfolio equity and portfolio bond flows. This is an important distinction, as was indicated in the introduction, not least because the determinants of these two flows are different.

initially attributed to domestic developments but eventually, since this was a widespread phenomenon and affected countries with different characteristics, this suggested that global factors (movements in interest rates) were especially important. Kim (2000) investigated the causes of capital flows to Mexico, Chile, Korea and Malaysia and found that the resurgence in capital to these countries was mainly due to external reasons such as the decrease in the world interest rate or recession in industrial countries. The study also found that domestic factors are less significant compared to external reasons and the fundamental causes of capital flows are not much different between the four countries. Finally, Ghosh *et al.* (2014) examined the issue of when and why capital sometimes surges to emerging market economies (EMEs). They found that global factors, including U.S. interest rates and investor risk aversion, determine the when surges will occur to EMEs (like "gatekeepers"), but whether a particular EME will receive a surge and its magnitude it depends largely on domestic factors.

The second category that distinguishes various forms capital flows and compares them includes work by Kim and Wu (2008), Broto *et al.* (2011) and Contessi *et al.* (2013). Kim and Wu (2008) distinguish between FDI flows, bank flows and portfolio flows and found strong evidence that their sovereign credit rating measures affect developments in the financial intermediary sector and capital flows. Broto *et al.* distinguish between FDI, portfolio flows (debt securities and equity) and bank inflows and analyze what determines the volatility of different types of capital inflows to emerging countries. They found that since 2000 the significance of global factors has increased at the expense of country specific factors and some domestic macroeconomic and financial factors appear to reduce the volatility of some capital flows without increasing the volatility of others. Contessi *et al.* (2013) also distinguish between various forms and investigate the second-moment properties of the components of international capital flows and their relationship to business cycle variables for thirteen industrial and nine emerging countries. They found that total inward flows are procyclical with respect to output, investment and real interest rate. Disaggregated inward flows comove positively with output in industrial countries and with investment and real interest rate in the G7 countries while inward FDI is the only type of flow that is non-procyclical to output in the emerging economies.

The third category is the most extensive and focuses on only one type of capital flow, mainly portfolio equity, and includes work by Chuhan *et al.* (1998), Fernandez-Arias (1996), Taylor and Sarno (1997), Edison and Warnock (2008), De Santis and Lührmann

(2009), Gande and Parsley (2010), Thapa and Poshakwale (2012), Fratzscher (2012) and Lo Duca (2012). In general, these studies find evidence that global factors are the more significant compared to domestic factors. Chuhan *et al.* (1998) investigated the motives behind the portfolio flows to nine Latin American and nine Asian developing countries. They found that global factors, such as decline in U.S. interest rates and U.S. industrial production slowdown, were significant in explaining capital inflows but also that country-specific developments were at least as important determinants, especially for Asia. Additionally, equity flows are more sensitive to global factors while bond flows are generally more sensitive to credit ratings and the secondary market price of debt. Fernandez-Arias (1996) and Taylor and Sarno (1997) also examined the main drivers behind the early-1990s surge in capital flows to Asia and Latin America looking at the change in net capital flows. Taylor and Sarno (1997) found that U.S. interest rates and domestic creditworthiness were equally important for changes in equity flows, but U.S. interest rates were significantly more important as short-run dynamic drivers of bond flows. Fernandez-Arias (1996) found that the surge of capital inflows appears to be driven more by low returns in industrial countries rather than by domestic factors. Fratzscher (2012) examining high-frequency portfolio capital flows, found that common shocks had a large effect on capital flows in the crisis and in the recovery; however, these effects were highly heterogeneous across countries. Comparing and quantifying these results, he showed that common factors (push factors) were overall the main drivers of capital flows during the crisis while the country-specific determinants (pull factors) have been dominant in the dynamics of global capital flows in 2009 and 2010, especially for emerging markets. Lo Duca (2012) studied how the drivers of portfolio flows change between periods by using a model in which the regression coefficients change endogenously over time in a continuous fashion. The regression coefficients show substantial time variation and big changes in the significance of the drivers of flows coincide with significant market events/shocks.

Also in this category, but by investigating different flows determinants, there is work by Edison and Warnock (2008), De Santis and Lührmann (2009) and Thapa and Poshakwale (2012). Edison and Warnock (2008) for portfolio equity flows, investigated the impact of two types of financial liberalizations (a reduction in capital controls and a cross-border listing) on short- and long-horizon capital flows to emerging markets (Latin America and emerging Asia). In a framework that controls for both push and pull factors, they found that cross-listings results in an immediate short-lived increase in capital flows while a

reduction in capital controls result in increased inflows but only, if at all, on a longer horizon. De Santis and Lührmann (2009) for net equity flows and net debt flows, examined the determinants of net international portfolio flows from a global perspective and showed that population ageing, institutions, money and deviations from uncovered interest parity influence developments in net capital flows. Gande and Parsley (2010) examined the response of equity mutual fund flows to sovereign rating changes in 1996-2002 and found that sovereign downgrades are strongly associated with capital outflows while sovereign improvements are not associated with discernable equity flows changes. Thapa and Poshakwale (2012) found that foreign investors prefer to invest more in more liquid, with a higher degree of market efficiency and lower trading costs countries. Ahmed and Zlate (2014) examined the determinants of both total net capital inflows and portfolio net inflows to emerging economies. They reach several conclusions: growth and interest rate differentials between emerging economies and advanced economies and global risk appetite were significant determinants of net capital flows; there have been significant changes in the behavior of net inflows between the period before the recent global financial crisis and the post-crisis period; recent capital controls appear to have discouraged both total and portfolio net inflows; and that unconventional U.S. monetary policy has had a positive effect on emerging market inflows.

One related issue that has been relatively neglected by the literature on the determinants of capital flows to emerging economies is the relevance of sovereign credit ratings.[13] One reason for this omission is that because these studies look at broad categories of capital flows sovereign ratings may not be seen as relevant. However, because our study focuses on equity flows by global investment funds, the importance of sovereign credit ratings cannot be overlooked. Specifically, we examine the extent to which such credit ratings are significant in the decision by global fund managers to allocate equity capital to emerging economies.

The purpose of sovereign credit ratings is to have forward-looking qualitative measures of the probability to default that are carried out by credit rating agencies (CRAs). The rating of credit is a highly concentrated industry. The two largest CRAs, Moody's Investors

[13] There is a voluminous literature that deals with the impact of sovereign ratings on the spread of emerging market bonds over some safe rate. The subject of our study is the impact of sovereign ratings on capital flows and the literature in this area is sparse.

Service and Standard & Poor's (S&P) control 80% of the global market share. S&P is the largest CRA in terms of number of outstanding ratings and analysts and supervisors. Currently, S&P provides sovereign debt ratings for 21 emerging economies. For most of these countries ratings began during the early 1990s but for four of them (Korea, Malaysia, Taiwan and Thailand) ratings extend back to 1988-1989 (see Table 2.1).

2.2.1 Some stylized facts on capital flows to emerging markets

According to Kaminsky *et al.* (2001), private capital flows have become the main source of external financing for developing countries. The first increase in capital flows occurred in the 1970s. It was triggered by the 1973-1974 oil shock and was amplified by the growth of the Eurodollar market and a spurt in bank lending during 1971-1981. The main recipient was Latin America. The pace of international lending came to an abrupt halt in 1982 with the increase in interest rates to levels not seen since 1930s. There was a revival of international lending by the late 1980s, with the capital flows to Latin America making a comeback. Regarding Asia, capital flows also surged, increasing tenfold from the late 1980s averages.

In the 1990s there was another lending boom, but this boom was quite different in nature from that of the late 1970s. The surge in capital flows to developing countries in the 1990s was remarkable mostly because of the nature rather than the quantities of these flows. Compared to the mid-1980s, lending to developing countries increased but it was no higher than it was in early 1980s. In the 1990s portfolio flows and FDI replaced direct lending and became the dominant source of capital inflows. In the early 1990s, capital flows to Asia were mainly in the form of FDI while in Latin America were mainly short-term portfolio capital flows or as sometimes called `hot money'.

In the 1990s, as in the 1980s, a slowdown in capital inflows followed the boom. The first episode occurred in December 1994, in the immediate aftermath of Mexico’s currency crisis. Capital flows towards the Asian economies were largely not affected. The second and more severe slowdown came in 1997, during the Asian crisis. This slowdown was accentuated by the Russian default in August 1998, as capital flows collapsed.

Table 2.1: Standard and Poor`s emerging economies

Emerging Economy	Date of first rating by S&P
Brazil	12/1/1994
Chile	8/17/1992
China	2/20/1992
Colombia	6/22/1993
Czech Republic	7/28/1993
Egypt	1/15/1997
Hungary	4/20/1992
India	9/13/1990
Indonesia	7/20/1992
Korea	10/1/1988
Malaysia	3/16/1989
Mexico	7/30/1992
Morocco	3/2/1998
Peru	12/18/1997
Philippines	7/2/1993
Poland	6/1/1995
Russia	10/4/1996
South Africa	10/3/1994
Taiwan	4/20/1989
Thailand	6/26/1989
Turkey	5/4/1992

Source: Standard & Poor's

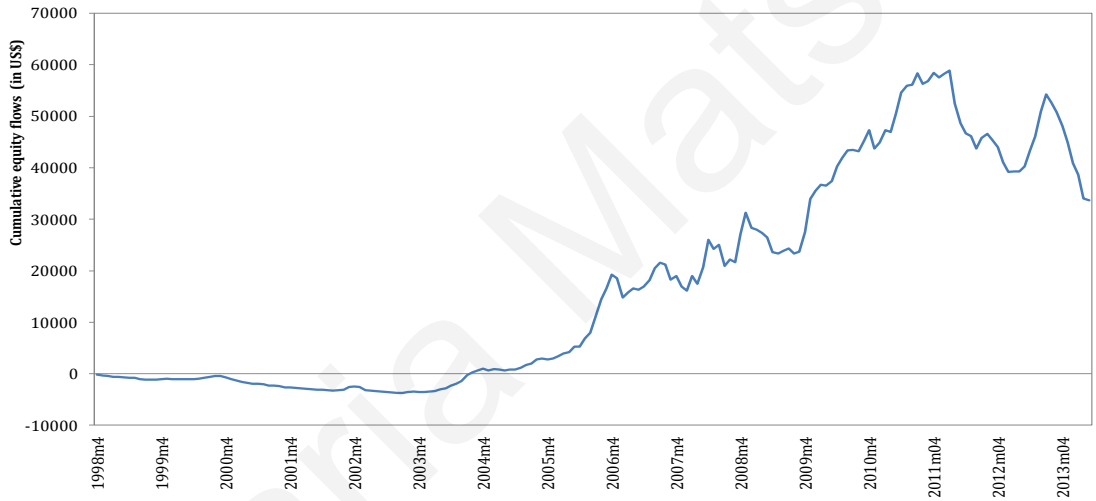
Regarding Central and Eastern Europe, there were dramatic changes during the past two decades. All of these countries have received significant net capital flows and, in several of these, their growth rates during the 1990s were high by emerging markets standards. During the 1990s there was a big accumulation of net external liabilities in several of these economies, unlike the trend observed in other emerging markets.

Since the early 2000s, capital flows to the emerging economies have increased at a rapid pace and have become more volatile. This is evident for the 16 emerging economies considered in this study. Figure 2.3 shows cumulative equity capital flows to all emerging economies. During the first half of the decade these flows are relatively insubstantial.

Beginning, however in mid 2005 they increase rapidly and continue to increase until mid-2011, after the onset of the financial crisis in developed economies. Subsequently they suffer a dip until mid-2013.

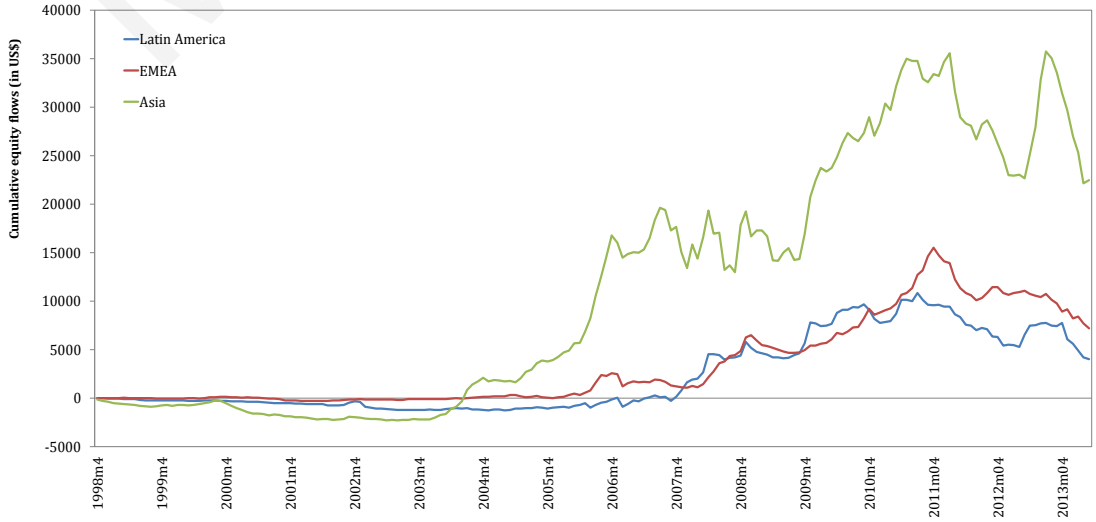
Figure 2.4 shows capital flows to three regions: Asia, Latin America and Europe Middle East and Africa (EMEA). Asia is the first to experience increased capital flows in late 2004 that increase substantially thereafter especially after early 2009. These are followed by flows to Latin America and EMEA beginning in early 2007 that continue until early 2011. While flows to Latin America and EMEA move in tandem after 2007, by mid-2010 flows to EMEA exceed those to Latin America and continue till then end of the period.

Figure 2.3: Total (cumulative) equity capital flows: 16 emerging economies



Source: Authors calculations based on EPFR Global

Figure 2.4: Cumulative equity capital flows by region: 16 emerging economies



Source: Authors calculations based on EPFR Global

Table 2.2: Descriptive statistics of flows by country

Country	Average	STDEV	IQR = Q75-Q25
Brazil	29.4	393.8	105.2
Chile	-2.7	51.3	3.2
Mexico	-5.0	153.0	59.3
Czech	-0.3	11.8	3.2
Egypt	-1.1	6.5	2.6
Russia	36.4	356.7	126.7
S. Africa	-2.8	41.7	16.5
Turkey	6.4	83.5	19.0
China	91.4	901.3	256.8
India	-0.9	344.0	250.7
Indonesia	5.4	82.4	10.6
S. Korea	17.8	246.4	111.8
Malaysia	-2.8	79.7	25.3
Philippines	3.4	27.1	3.9
Taiwan	8.1	277.7	100.4
Thailand	-1.7	101.0	36.6

Table 2.2 presents selected descriptive statistics for the flows variable in each country during 1998-2013. There are four countries (China, Russia, Brazil and S. Korea) with high flows on average during 1998-2013, whilst the remaining countries either had small inflows or small outflows on average. The standard deviation of the flows for half of the countries considered here is relatively higher. The three countries with the highest variability of flows are also the three countries with the highest average flows. The interquartile range (IQR) is the difference between the upper and lower quartiles, and it is another commonly used measure of statistical dispersion. While variance and standard deviation are affected by extreme observations, the IQR is not and thus it is robust. According to IQR, half of the countries examined here have relatively high dispersion and these countries are the same ones that have higher standard deviations.

2.2.2 Waves of capital flows

Historically, capital flows to emerging economies have occurred in cycles of enthusiasm and despair. During the rising period, confidence is high and countries may borrow more

than they should or can and this thereby creates conditions for financial crisis and outflows (Penalver 2003). In the 1980s and 1990s many countries experienced waves of international capital flows and capital flow volatility increased even more during the 2000s. In late 2001 capital flows dried up, surged through the mid 2000s, and contracted sharply in 2008-2009 during the global financial crisis, to rebound quickly again in 2010. Waves in capital flows have generated an extensive academic literature. The waves are divided among "sudden stops" (when foreign capital inflows suddenly slow), "surges" or "bonanzas" (when foreign capital inflows increase rapidly) and capital "flight" (when domestic investors send capital abroad) (Forbes and Warnock, 2012).

A variety of factors, grouped generally as push and pull factors, have been proposed as determinants of capital flows to emerging economies. The pull factors include better macroeconomic management, higher economic growth, macroeconomic stability (macro-financial conditions), lower inflation, and liberalization of the capital account. The push factors include risk aversion, overall risk (or uncertainty) (Lo Duca, 2012), global liquidity, global macro conditions and monetary policies in advanced economies**.** Periods of tighter monetary policy discourage capital outflows from developed to emerging economies while periods of loose monetary policy encourage capital outflows. Thus changes in monetary policies of the advanced economies may have contributed to the cycles and volatility we have observed in capital flows towards emerging economies (Mohan 2009a, Mohan 2009b).

2.3 Empirical Methodology

As a first step, we have checked the data for the presence of a unit root. Testing for unit roots in the variables of this study (capital flows, political variables, domestic macro variables or global variables) we find no support for the unit root hypothesis using the panel unit root tests of (i) Im-Pesaran-Shin and (ii) Fisher for unbalanced panels (results available on request). The credit rating variables are either binary or step type functions and panel unit root tests are not suitable for these variables.

Our first hypothesis is to test the impact of credit ratings on net capital inflows in a benchmark model (2.1) where credit rating is the sole determinant of capital flows

$$Flow_{i,t} = a_i + b_1 * CR_{i,t} + e_{i,t} \quad (2.1)$$

where $Flow_{i,t}$ is net equity inflows into emerging economy i at time t (in US$), $CR_{i,t}$ is country i's comprehensive credit rating and a_i are fixed country effects to be estimated.

Next, we examine various push factors. Specifically, we consider measures of global uncertainly and global liquidity conditions and U.S. monetary growth in model (2.2):

$$Flow_{i,t} = a_i + b_1 * CR_{i,t} + b_2 * VIX_t + b_3 * TED_t + b_4 * MBGR_{t-1} + e_{i,t} \quad (2.2)$$

where *VIX* is a measure of global risk as captured by the implied volatility in S&P500, *TED* is the spread between three-month futures contracts for U.S. Treasuries and three-month contracts for Eurodollars with identical expiration months and is an indicator of perceived credit risk and *MBGR* is the growth rate of the U.S. money base. We hypothesize that global uncertainty and liquidity conditions alter investor perceptions and may influence capital inflows contemporaneously whereas U.S. money growth may spill over into equity inflows to emerging economies with a lag.

In the next step we add several domestic pull factors as measured by macro or political variables in model (2.3):

$$Flow_{i,t} = a_i + b_1 * CR_{i,t} + b_2 * VIX_t + b_3 * TED_t + b_4 * MBGR_{t-1} + b_5 * \boldsymbol{X}_{i,t-1} + b_6 * PR_{i,t-1} + e_{i,t} \quad (2.3)$$

where $\boldsymbol{X}_{i,t-1}$ is a vector of macroeconomic variables defined as $\boldsymbol{X}_{i,t-1}$=[$TB_{i,t-1}$, $RGDP_{i,t-1}$, $INFL_{i,t-1}$, $ERC_{i,t-1}$, $ERV_{i,t-1}$, $SRV_{i,t-1}$] and *TB* is the trade balance or exports minus imports of goods (in US$), *RGDP* is the rate of real GDP growth, *INFL* is the rate of inflation, *ERC* is exchange rate change, *ERV* is exchange rate volatility of domestic currency relative to the U.S. dollar and *SRV* is domestic stock market volatility. Domestic pull factors are hypothesized to influence capital inflows with a lag. We also hypothesize that political uncertainty may have contemporaneous effects on capital inflows. Data on political risk (*PR*) are from the *International Country Risk Guide* (ICGR) compiled by the Political Risk Services Group. The measure we employ here is the ICRG composite political risk index.

We have performed a serial correlation test in all equations (results in Table A2.1 in Appendix 2) and we reject the null for the absence of first-order autocorrelation. Therefore, we estimate a panel model with country Fixed Effects[14] and Bootstrap standards errors[15].

2.4 Data

Estimation is based on a monthly panel data set that covers the time period from April 1998 to September 2013. The sample includes 16 emerging markets: 3 in Latin America, 5 in Europe Middle East and Africa (EMEA) and 8 in Asia. These countries have complete period data on capital flows (for a list see Appendix 2, Table A2.2). Moreover, they include the most important (in terms of domestic output, international trade and capital markets) among the emerging economies.

2.4.1 Global Fund Equity Capital Flow Data

Our work is concerned with equity capital inflows by investment funds to emerging economies. Data for our main variable, equity investments by global funds in emerging economies, is from a proprietary data set compiled by *EPFR Global*. The data are monthly and (as of mid-2014) EPFR tracks 17,732 global funds with over $5tn in equity assets. The funds tracked are registered globally (not just in the US) and thus the data track global investor flows to emerging economies. For each fund, EPFR calculates net flows (investor contributions/redemptions) to each emerging market during each month by excluding portfolio performance and currency fluctuations. To accomplish this it collects three data points: current net asset value, current total net assets (TNA) and any dividends and capital gains distributed during the month.[16] These data points form the basis for the calculation of the net capital inflow to country *i* during month *t* in US dollars as follows:

$$Flow_{i,t} = TNA_{i,t} - (1 + RNVA_{i,t}) \times TNA_{i,t-1} - \Delta FX_{i,t} \qquad (2.4)$$

[14] A panel with Random Effects model was estimated and results are broadly the same. This is further discussed in the robustness section. A dynamic panel mode could not be estimated for our sample, since T is much larger than N in our model and therefore the dynamic panel model estimation method is not suitable for our sample. Moreover, since T is large we do not have any finite sample bias from the fixed effects panel model estimation.

[15] We use the nonparametric bootstrap to obtain the standard error estimators of the model (see also Hall and Wilson (1991)). We use 300 replications for the bootstrap estimates of the standard errors (see Mooney and Duval (1993)) and seed equal to 123. The nonparametric bootstrap procedure is described in detail in Cameron and Trivedi (2010, chap. 13).

[16] According to EPFR Global it has established direct data feeds "by the investment management firms or by their fund administrators that have been given the responsibility for tracking individual security pricing, calculating the net asset value of the fund, and conveying this information on to shareholders, regulatory bodies, securities exchanges, and third-party data vendors".

where $TNA_{i,t}$ measures total net assets of country *i* during month *t*, $RNVA_{i,t}$ is the rate of return (change in net asset value including any dividend distributions) and $\Delta FX_{i,t}$ shows the component of the change in total assets during the month that is due to currency fluctuations.[17]

Flows by all investment funds to each emerging economy are aggregated to arrive at the total capital inflow to each emerging economy during each month. Therefore, capital inflows are net contributions/redemptions of investors globally and changes in portfolio performance and currency fluctuations have been netted out. The data run from the earliest available date (April 1998) until September 2013.

2.4.2 Credit Ratings

Our measure of the sovereign credit rating for each emerging economy is Standard and Poor's (S&P) rating at the end of each month. In contrast to Jaramillo and Tejada (2011) who averaged ratings across the three rating agencies (Standard and Poor`s, Moody's Services and Fitch), we use ratings from Standard and Poor`s. The reason for this is twofold. As Jaramillo and Tejada point out, the ratings do not differ substantially across the three main agencies. Moreover, Gande and Parsley (2010) show that ratings among agencies are highly correlated. As an alternative to using ratings from all the rating agencies, Gande and Parsley (2010) tested whether there exists a leader/follower relationship between the rating agencies. This test is an extension of the one in Cooper, Day, and Lewis (2001) who found that "leaders" consistently have a greater impact on markets. The Gande/Parsley test showed the "leader" rating agency is S&P. Using their result and the fact that ratings do not differ significantly between rating agencies, we focus our analysis on the S&P rating announcements.

Standard and Poor's make announcements on the creditworthiness of countries on an irregular basis, more often for some countries and less often for others, depending on the country's economic and political situation. Countries in distress or countries facing big challenges receive more attention and/or visits. These announcements can either change the country's rating and/or its outlook or reaffirm the existing ones. Standard and Poor's use letter designations to indicate a country's credit rating and to use these in empirical

[17] Fund providers that track funds denominated in currencies other than the US dollar are required, according to EPFR global, "to database currency rates and calculate each fund's base currency fluctuation against the USD".

analysis we transform them in numerical terms.[18] The transformed numerical variable will be the country's Comprehensive Credit Rating (CCR). CCR is calculated by assigning to each letter rating provided by S&P (the letter ratings range from AAA to SD/D) a number from 21 to 0 as shown in Table A2.3 in Appendix 2. So, a rating action or a rating event for a country is defined as a change (negative, positive or neutral) in the country's CCR. Table 2.3 presents a summary of the rating actions that occurred during 4/1998-9/2013 for each country based on the CCR variable in foreign currency. Overall, there were 235 rating actions during this period across the 16 emerging economies. The majority of these (140) reaffirmed previous rating assessments. Upgrades (increases in CCR) dominate downgrades by a factor of 2 to 1: 62 actions represent upgrades compared to 33 that represent downgrades. The countries with the largest number of credit rating actions during this period are Turkey (29), Russia (26) and Indonesia (25).

Figure 2.5 presents a time series of all rating actions by month from April 1998 until September 2013 for all sixteen countries. Figure 2.6 presents upgrades and downgrades over the same time period. There are only a few months without a rating activity during this period. Upgrades dominate downgrades in the period prior to the international financial crisis but in the subsequent period upgrades and downgrades are more evenly split.

[18] S&P provide sovereign ratings both in foreign and local currency. We use the foreign currency ratings in our empirical estimation because we believe it is the more relevant indicator of creditworthiness for investment fund managers. Results with the local currency rating are not substantially different. S&P also provide ratings for a country's long term debt obligations as well as short term obligations. We use the long term rating because it begins at an earlier date (short term ratings were introduced more recently) and we wanted to have as a long a time series as possible.

Table 2.3: Standard and Poor`s credit rating actions

Country	Number of rating actions 4/1998-9/2013			Credit Rating as of September 2013			
				Local Currency		Foreign Currency	
	–	+	†	LT/Outlook	CCR	LT/Outlook	CCR
Brazil	2	6	13	A-/ Negative	15	BBB/ Negative	13
Chile	0	3	4	AA+/Stable	20	AA-/Stable	18
Mexico	1	4	8	A-/Positive	15	BBB/Positive	13
Czech Republic	1	2	5	AA/Stable	19	AA-/Stable	18
Egypt	7	0	9	CCC+/Stable	5	CCC+/Stable	5
Russia	5	9	12	BBB+/Stable	14	BBB/Stable	13
South Africa	1	3	5	A-/Negative	15	BBB/Negative	13
Turkey	2	6	21	BBB/Stable	13	BB+/Stable	11
China	1	5	4	AA-/Stable	18	AA-/Stable	18
India	1	2	12	BBB-/Negative	12	BBB-/Negative	12
Indonesia	5	8	12	BB+/Stable	11	BB+/Stable	11
S. Korea	0	6	1	AA-/Stable	18	A+/Stable	17
Malaysia	3	3	8	A/Stable	16	A-/Stable	15
Philippines	2	3	11	BBB-/Stable	12	BBB-/Stable	12
Taiwan	2	0	7	AA-/Stable	18	AA-/Stable	18
Thailand	0	2	8	A-/Stable	15	BBB+/Stable	14
Sum	**33**	**62**	**140**				

Note: The symbol - denotes a downgrade, + an upgrade, and † denotes no change in rating because the new credit rating reaffirmed the existing one. LT/Outlook refers to the rating for the country's long term obligations and the outlook (positive, negative or stable).

Figure 2.5: Credit rating actions by month (16 countries)

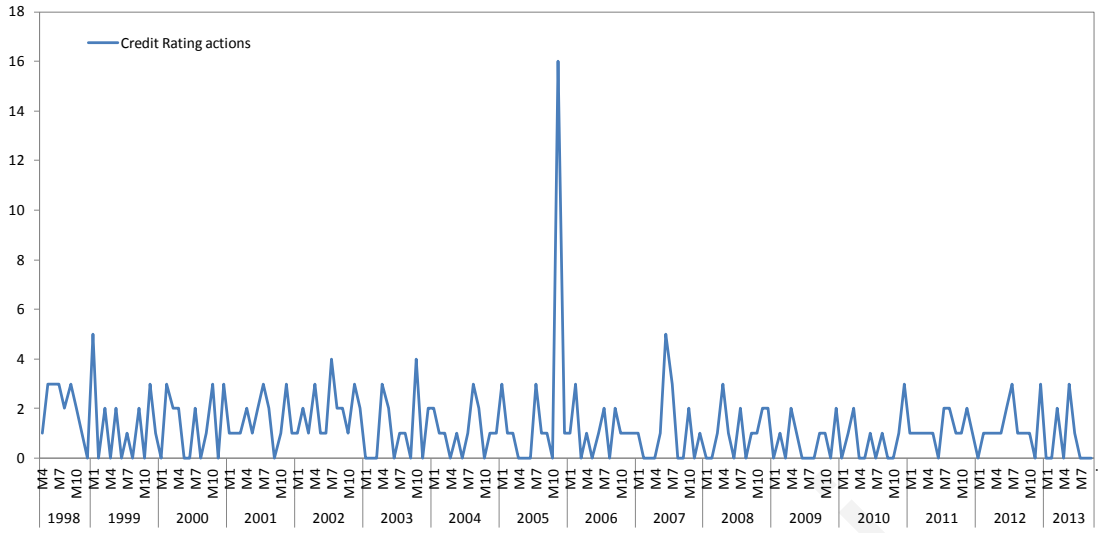
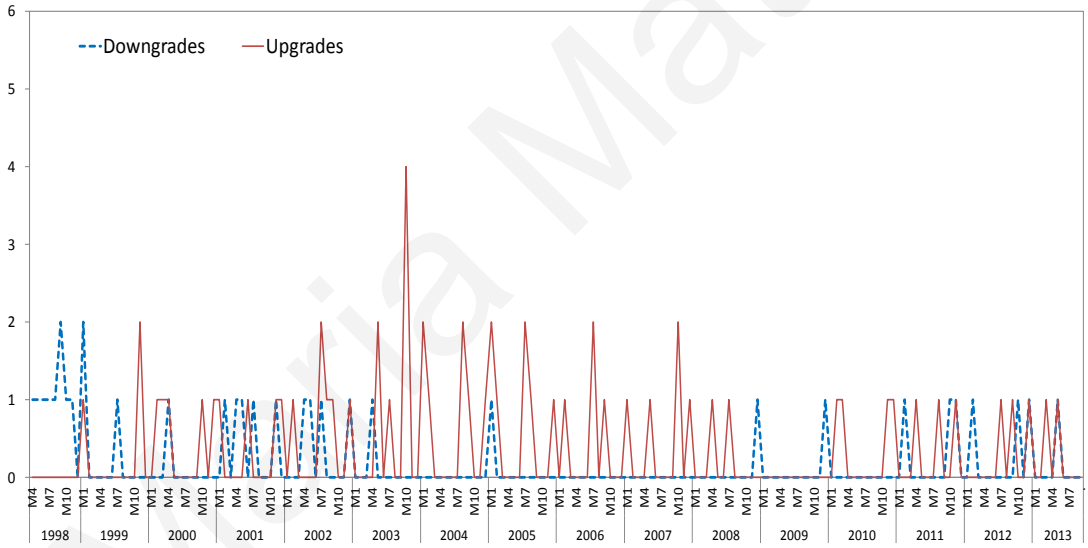


Figure 2.6: Upgrades vs. downgrades by month (16 countries)



2.4.3 Push/Pull Factors

The economic determinants of capital flows to emerging economies are distinguished between push and pull factors. Push factors are general global conditions that capture the general economic climate for investment in emerging economies outside these economies. Variables on global liquidity and global risk as well as the growth of U.S. money base are representative of the push factors we consider in this paper. Global risk is measured by the VIX index (*VIX*), an indicator that captures market expectations of near-term volatility conveyed by S&P 500 stock index option prices. It is considered a barometer of investor sentiment and market volatility. The TED spread (*TED*) is the difference between interest rates on interbank loans and short-term U.S. government debt (T-bills). It is an indicator of

perceived credit risk in the general economy because T-bills are considered risk-free while the interbank rates reflect the credit risk of lending to commercial banks. An increase in the TED spread is a sign that lenders believe the risk of default on interbank loans increases. The TED spread is constructed as the 3-Month U.S. dollar London Interbank Offered Rate (LIBOR) minus the U.S. 3-Month Treasury Bill. The push factor is the growth rate of the U.S. money base (*MBGR*) and is included to capture the extent to which expansionary U.S. monetary policy has spilled over into flows of equity capital to emerging economies.

Macroeconomic pull factors include country-specific variables that measure the economic climate in each emerging market that investment managers evaluate. The pull factors we consider are: real GDP growth[19], domestic inflation and stock market volatility as a means to evaluating a country's domestic sector and the trade balance, trade openness and foreign exchange variability to evaluate the external sector. Stock market volatility and foreign exchange market volatility are estimated from an AR(1)-GARCH(1,1) model of domestic stock market returns and dollar exchange rate returns, respectively. The data source for the pull factors is the IMF's *International Financial Statistics*. Together with the push factors, they give a more complete model of factors affecting equity capital flows into emerging economies.

2.4.4 Political Stability

In addition to the pull/push factors, we test whether perceptions of political stability are significant determinants of capital inflows. The data on perceived political stability are from International Country Risk Guide (ICGR) of the PRS group. Each country's ICRG score takes into account 22 variables which are grouped in three major subcategories of risk: political risk index (*PR*), financial risk index (*FR*), and economic risk index (*ER*). In this paper we use the *PR* index as a measure of a country's perceived political stability. The *PR* index is measured on a scale from 0 to 100 and an increase in the score signifies lower political risk or increased political stability.

Table A2.4 in Appendix 2 presents the data sources.

[19] We use quarterly GDP data because monthly IP data are not available for most of the countries for the long time span of our study.

2.5 Empirical Results

2.5.1 Overview

Results from estimating models (2.1) and (2.2) are in Table 2.4 and from model (2.3) in Table 2.5.

Model (2.1) is a benchmark model with credit rating as the sole explanatory variable. The model examines the effect of credit ratings on equity flows alone or, alternatively, it can be used to examine if there is a significant correlation between the two variables. Results in column (2.1a) indicate that there is not a significant relationship between credit ratings and equity flows. Credit ratings are meant to represent forward-looking opinions about credit risk rating agencies and one can hypothesize that they should influence capital inflows; our results do not support this hypothesis. One yet another possible explanation for this could be the fact that the credit rating variable may not have enough variability to explain flows. Using descriptive statistics we find the variance of the credit rating variable across time for each country and across countries. We observe that half of the countries have relatively lower variance which offers a statistical explanation as to why this variable turns out to be insignificant or yield mixed evidence for a panel of countries. In addition to estimating the contemporaneous relationship between credit ratings and capital flows we tested whether credit ratings represent a lead or lag indicator of capital flows. The results in columns (2.1b)-(2.1d) show that the lead or lag hypothesis can be rejected.

Kim and Wu (2008) found evidence that sovereign credit rating measures affect among others capital flows for 51 emerging markets during 1995-2003. With data from 85 countries during 1996-2002, Gande and Parsley (2010) found that downgrades are strongly associated with equity capital outflows from the country that has been downgraded while upgrades/ improvements in a country´s rating are not related with discernible changes in equity flows. In both cases the sample ends about a decade earlier than ours and does not cover the recent financial crisis era. It might be the case that any significant effect of credit ratings on capital flows may not be present during the more recent period. We investigate this hypothesis in detail below.

Model (2.2) adds the various global (push) factors. Specifically, we consider two measures of global uncertainly and global liquidity (the VIX index and the TED spread) and U.S. monetary growth. Our empirical results indicate global risk and the growth of the U.S. money base have a significant effect on flows while the effect of the TED spread is

insignificant. As anticipated an increase in global risk is strongly and negatively related to reduce capital inflows while U.S. monetary growth has spilled over into increased capital inflows to emerging economies.

Table 2.4: Results from models (2.1) and (2.2)

Model	**(2.1a)**	**(2.1b)**	**(2.1c)**	**(2.1d)**	**(2.2)**
CR_t	3.0863			11.7032	1.8899
	2.5135			20.3710	2.2819
CR_{t-1}		2.6874		-9.2493	
		2.4994		12.8692	
CR_{t+1}			3.1796	0.6647	
			2.6023	10.6384	
VIX_t					-2.1184
					0.7562*
TED_t					-4.9887
					7.1917
$MBGR_{t-1}$					2.7487
					1.4205***

Notes: (1) The models were estimated with Fixed Effects and Bootstrap standard errors. (2) CR is the credit rating variable and refers in specific to the comprehensive credit rating in foreign currency. (3) The first figure refers to the corresponding coefficient and the second figure is the corresponding SE. (4) *,**,*** refer to statistical significance in 1%, 5% and 10% respectively.

These results are in line with the findings of other papers for global factors in general. VIX is the global risk index or as sometimes called the global "fear" index. When global risk goes up, equity flows are discouraged. Similar results on the effect of VIX are found in Ahmed and Zlate (2014), Forbes and Warnock (2012), Fratzscher (2012), Gosh *et al.* (2014) and Lo Duca (2012). On U.S. monetary expansion and capital inflows, our results are in line with Ahmed and Zlate (2014) who have found positive effects of unconventional U.S. monetary policy on emerging economies inflows and also with Fratzscher *et al.* (2013) who showed how unconventional monetary policy measures have contributed to portfolio reallocation.

In the next model, we extend our results by adding the domestic (pull) factors considered relevant by economic theory. We have considered various macroeconomic and political variables as follows: real GDP growth, inflation, trade balance, change in exchange rates, volatility of exchange rates, domestic stock market volatility and political risk. All domestic macroeconomic variables are included with a lag to account for the delayed release of these data. Given that VIX and TED spread are used as global risk factor and as a measure of funding conditions for banks and are available to market participants without delay, it makes more sense to include them in their current value.

The results are in Table 2.5. Global risk and U.S. money growth continue to be significant determinants of capital flows. Additionally, among the domestic macroeconomic variables statistically significant are the trade balance and the exchange rate change. Countries with higher trade surplus (lower trade deficit) attract more flows and countries with exchange rate go up/depreciate attract fewer flows. A host country's exchange rate appreciation provides additional returns for a foreign investor while depreciation the opposite. Also, political risk, as measured by the ICRG index, has no significant effect. Using the same indicator Edison and Warnock (2008) also found the level of political risk was not significant for equity inflows.

Regarding the importance of push vs. pull factors, Ahmed and Zlate (2014), Broto *et al.* (2011), Calvo *et al.* (1993), Fratzscher (2012), Ghosh *et al.* (2014), Kim (2000) and Marchiori (2011) have found results similar to our own. Specifically, Ghosh *et al.* (2014) found that global factors are key determinants of the occurrence of a surge in capital flows. Kim (2000) found that the resurgence in capital movement is mainly due to external reasons. Calvo *et al.* (1993) found that global factors had a dominant role in the early 1990s in driving capital flows to Latin America and Asia. Ahmed and Zlate (2014) found that global risk appetite is a statistically and economically important determinant of capital flows. Fratzscher (2012) found that common shocks had a large effect on capital flows during the crisis and recovery periods. Comparing and quantifying the results, common factors (push factors) were shown as overall the main drivers of capital flows during the crisis. Broto *et al.* (2011) found that since 2000 the significance of global factors has increased at the expense of country-specific factors.

Table 2.5: Results from model (2.3)

Model	(2.3)	(2.3a)	(2.3b)
$CR_{i,t}$	-0.8057	1.8899	-0.3520
	2.6508	2.2819	2.7847
VIX_t	-2.1856	-2.1184	
	0.7405*	0.7562*	
TED_t	-11.0004	-4.9887	
	10.6483	7.1917	
$MBGR_{t-1}$	3.6458	2.7487	
	1.4401**	1.4205***	
$RGDP_{i,t-1}$	-0.4572		0.1473
	2.2548		2.2770
$INFL_{i,t-1}$	-0.9275		-0.9878
	1.3550		1.4119
$TB_{i,t-1}$	0.0134		0.0133
	0.0031*		0.0031*
$ERC_{i,t-1}$	-3.8466		-4.6530
	1.8205**		1.9152**
$ERV_{i,t-1}$	0.1537		0.1769
	0.1537		0.1529
$SRV_{i,t-1}$	0.0683		-0.0413
	0.1836		0.2020
$PR_{i,t-1}$	1.7329		1.7820
	2.2239		2.2622

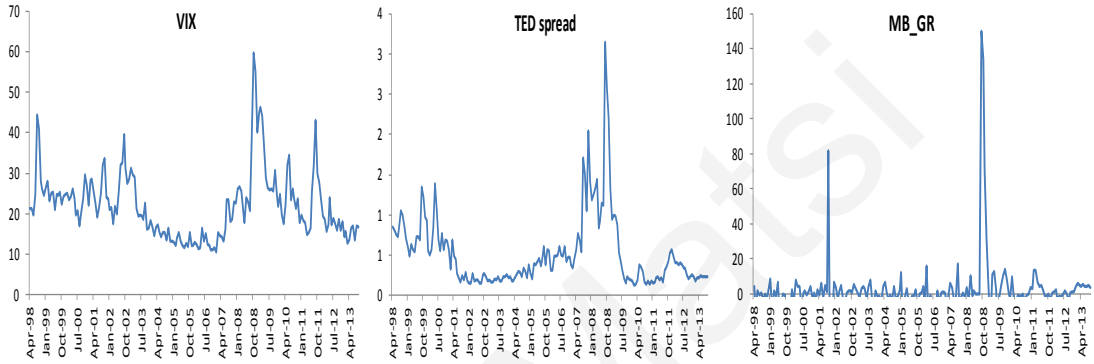
Notes: (1) The models were estimated with Fixed Effects and Bootstrap standard errors. (2) CR is the credit rating variable and refers in specific to the comprehensive credit rating in foreign currency. (3) The first figure refers to the corresponding coefficient and the second figure is the corresponding SE. (4) *,**,*** refer to statistical significance in 1%, 5% and 10% respectively.

2.5.2 The Lehman crisis effect

In the discussion so far we have looked at the determinants of equity flows throughout the whole sample period 4/1998–9/2013. The dominant economic event during the sample period is the global financial crisis and its aftermath, in the latter part of our sample period. In this section, we explore whether equity flows to emerging economies behave differently during different sub periods. Specifically, as is evident from the behavior of our global

push factors in Figure 2.7, there is a marked increase in global uncertainty around the time of Lehman bankruptcy as evident in the spikes in the VIX index and the TED spread. In order to test for differences in responsiveness of equity flows to global push factors during different sub periods characterized by the Lehman bankruptcy in September 2008 and its aftermath, we have introduced interaction effects for the VIX index and U.S. money growth variables (the two global push factors that were significant for the whole sample period) as well as for exchange rate changes, the domestic variable that was significant.

Figure 2.7: VIX, TED and MBgr



Specifically, we have estimated the following model

$$
\begin{aligned}
Flow_{i,t} = {} & a_i + b_1 * CR_{i,t} + b_2 * TED_t + b_3 * VIX_t * DpreL_t + b_4 * VIX_t * DL_t \\
& + b_5 * VIX_t * DpostL_t + b_6 * MBGR_{t-1} * DpreL_{t-1} + b_7 * MBGR_{t-1} * DL_{t-1} \\
& + b_8 * MBGR_{t-1} * DpostL_{t-1} + b_9 * RGDP_{i,t-1} + b_{10} * INFL_{i,t-1} + b_{11} * TB_{i,t-1} \\
& + b_{12} * ERC_{i,t-1} * DpreL_{t-1} + b_{13} * ERC_{i,t-1} * DL_{t-1} + b_{14} * ERC_{i,t-1} * DpostL_{t-1} \\
& + b_{15} * ERV_{i,t-1} + b_{16} * SRV_{,t-1} + b_{17} * PR_{i,t-1} + e_{i,t} \qquad (2.5)
\end{aligned}
$$

where $DpreL_t$ is a dummy variable that is equal to 1 before 9/2008 and is zero otherwise, DL_t is 1 from 9/2008 to 11/2008 (the three months surrounding the Lehman default) and zero otherwise, and $DpostL_t$ is 1 from 12/2008 until the end of the sample and is zero otherwise.

Table 2.6 presents the results for the interaction terms in model (2.5).[20] Most interaction effects are statistically significant. Specifically, global risk is statistically significant in all periods, exchange rate changes is significant only in the post Lehman periods and U.S.

[20] The coefficient estimates and standard errors for the other variables are similar to those presented earlier and are not reported (but available on request) to clarify exposition.

monetary growth is significant only in the post Lehman period. The different behavior of these global variables in the three subsamples is also captured by differences in coefficient estimates. For instance, *VIX* was more responsive during the crisis period than before or after and U.S. monetary growth is significant after the financial crisis but not before it.

Results are in line with the findings by other papers. For instance, Ahmed and Zlate (2014) found that there have been significant changes in the behavior of net inflows between the period prior to the global financial crisis and after. Fratzscher (2012) found that common shocks had a large effect on capital flows in the crisis and recovery periods. Lo Duca (2012) found that big changes in the drivers of capital flows coincide with significant market events/shocks.

Table 2.6: Coefficient comparison

	Model (2.5)	**Coefficient**	**St. Error**	**p-value**
VIX_t	b_3 (pre L)	-2.1244	0.9910	0.032**
	b_4 (L)	-3.4214	1.1084	0.002*
	b_5 (post L)	-1.8086	0.6946	0.009*
$MBGR_{t-1}$	b_6 (pre L)	0.0992	3.8906	0.980
	b_7 (L)	2.0080	1.8044	0.266
	b_8 (post L)	4.5555	2.4097	0.059***
ERC_{t-1}	b_{12} (pre L)	-1.6090	1.0212	0.115
	b_{13} (L)	2.2306	3.4599	0.519
	b_{14} (post L)	-10.3945	4.6707	0.026**

Note: *,**,*** refer to statistical significance in 1%, 5% and 10% respectively.

Next, we test for coefficient equality between the three sub periods to see whether the interaction coefficient terms were significantly different across regimes. The latter is the null hypothesis H_0: $b_3 = b_4 = b_5$, $b_6 = b_7 = b_8$ *and* $b_{11} = b_{12} = b_{13}$. Results are shown in Table 2.7.

Based on results from Table 2.7, we can reject the equality hypothesis among sub periods decisively in the case of VIX. For exchange rate changes, we can reject that they are equal pre and post and during and post.

Table 2.7: Coefficient tests

	Model (2.5)	p-value
VIX_t	$b_3 = b_4 = b_5$	0.011**
	$b_3 = b_4$	0.152
	$b_3 = b_5$	0.698
	$b_4 = b_5$	0.058***
$MBGR_{t-1}$	$b_6 = b_7 = b_8$	0.106
	$b_6 = b_7$	0.468
	$b_6 = b_8$	0.359
	$b_7 = b_8$	0.379
ERC_{t-1}	$b_{12} = b_{13} = b_{14}$	0.214
	$b_{12} = b_{13}$	0.315
	$b_{12} = b_{14}$	0.034**
	$b_{13} = b_{14}$	0.038**

Note: *,**,*** refer to statistical significance in 1%, 5% and 10% respectively.

Because we cannot reject the null that the coefficients for U.S. monetary growth and exchange rate changes are equal across regimes, we also present results with different coefficient estimates across all sub periods only for *VIX*. Therefore, we re-estimate model (2.5) as follows

$$Flow_{i,t} = a_i + b_1 * CR_{i,t} + b_2 * TED_t + b_3 * VIX_t * DpreL_t + b_4 * VIX_t * DL_t + b_5 * VIX_t * DpostL_t + b_6 * MBGR_{t-1} + b_7 * RGDP_{i,t-1} + b_8 * INFL_{i,t-1} + b_9 * TB_{i,t-1} + b_{10} * ERC_{i,t-1} + b_{11} * ERV_{i,t-1} + b_{12} * SRV_{i,t-1} + b_{13} * PR_{i,t-1} + e_{i,t} \quad (2.6)$$

The results in Table 2.8 show the estimated coefficients for VIX for the three sub periods are negative and significantly different from zero; in the test for equality of coefficients across the sub periods we reject the null. We conclude that VIX appears to have statistically significant and different spillovers to equity flows to emerging markets between the three sub periods.

Table 2.8: Coefficient estimates and significance tests

	Model (2.6)	Coefficient	St. Err.	p-value
VIX_t	b3 (pre L)	-2.2324	0.9376	0.017**
	b_4 (L)	-3.2038	1.0131	0.002*
	b5 (post L)	-1.8696	0.7111	0.009*
Test:	$b_3 = b_4 = b_5$			0.015**
	$b_3 = b_4$			0.182
	$b_3 = b_5$			0.622
	$b_4 = b_5$			0.029**

Note: *,**,*** refer to statistical significance in 1%, 5% and 10% respectively.

2.5.3 Differences across geographic regions

In subsections 2.5.1 and 2.5.2 we have looked at the determinants of equity flows throughout the whole sample and have checked whether these equity flows behave differently during different sub periods. In this subsection, we assess whether equity flows behave differently for each of the three regions (Asia, Latin, and EMEA). For this purpose, we have created regional dummy variables and introduced regional interaction terms into the model as follows

$$\begin{aligned} Flow_{i,t} = {} & a_i + b_1 * CR_{i,t} * Dasia_t + b_2 * CR_{i,t} * Dlatin_t + b_3 * CR_{i,t} * Demea_t \\ & + b_4 * VIX_t * Dasia_t + b_5 * VIX_t * Dlatin_t + b_6 * VIX_t * Demea_t + b_7 * TED_t * Dasia_t \\ & + b_8 * TED_t * Dlatin_t + b_9 * TED_t * Demea_t + b_{10} * MBGR_{t-1} * Dasia_t \\ & + b_{11} * MBGR_{t-1} * Dlatin_t + b_{12} * MBGR_{t-1} * Demea_t + e_{i,t} \end{aligned} \quad (2.7)$$

where $Dasia_t$ is equal to 1 if the country is in the Asian region and 0 otherwise, $Dlatin_t$ is equal to 1 if the country is in the Latin region and 0 otherwise and finally $Demea_t$ is equal to 1 if the country is in the EMEA region and 0 otherwise.

Results for the interaction terms are shown in Table 2.9.

Table 2.9: Regional interaction terms

	Model (2.7)	Coefficient	Std. Err.	p-value
$CCR_{i,t-1}$	b_1 *(Asia)*	0.6328	5.2454	0.904
	b_2*(Latin)*	-1.7835	2.0952	0.395
	b_3 *(EMEA)*	4.4322	2.7441	0.106
VIX_t	b_4 *(Asia)*	-2.8938	1.2080	0.017**
	b_5 *(Latin)*	-1.4166	1.1664	0.225
	b_6 *(EMEA)*	-1.2937	1.1601	0.265
TED_t	b_7 *(Asia)*	-24.8271	8.2203	0.003*
	b_8 *(Latin)*	21.1507	12.9056	0.101
	b_9 *(EMEA)*	10.3926	11.1071	0.349
$MBGR_{t-1}$	b_{10} *(Asia)*	4.7032	2.6801	0.079***
	b_{11} *(Latin)*	1.4707	1.4985	0.326
	b_{12}*(EMEA)*	0.5753	1.1942	0.630

Note: *,**,*** refer to statistical significance in 1%, 5% and 10% respectively

Results from Table 2.9 indicate that global variables are significant for the Asian economies but not for others. We have also tested for differences across time periods for Asian economies and the results showed no significant differences between the three sub periods.

Next, we examined regional differences also for the domestic factors. We have created interaction terms for two domestic variables (the trade balance and exchange rate changes), which were the significant domestic variables in model (2.3). Results are shown in Table 2.10.

$$\begin{aligned} Flow_{i,t} = {} & a_i + b_1 * CR_{i,t} + b_2 * VIX_t * Dasia_t + b_3 * VIX_t * Dlatin_t + b_4 * VIX_t * Demea_t \\ & + b_5 * TED_t * Dasia_t + b_6 * TED_t * Dlatin_t + b_7 * TED_t * Demea_t \\ & + b_8 * MBGR_{t-1} * Dasia_t + b_9 * MBGR_{t-1} * Dlatin_t + b_{10} * MBGR_{t-1} * Demea_t \\ & + b_{11} * TB_{i,t-1} * Dasia_t + b_{12} * TB_{i,t-1} * Dlatin_t + b_{13} * TB_{i,t-1} * Demea_t \\ & + b_{14} * ERC_{i,t-1} * Dasia_t + b_{15} * ERC_{i,t-1} * Dlatin_t + b_{16} * ERC_{i,t-1} * Demea_t + e_{i,t} \end{aligned} \quad (2.8)$$

Table 2.10: Regional interaction terms

	Model (2.8)	Coefficient	St. Err.	p-value
VIX_t	b_2 *(Asia)*	-2.9464	1.1407	0.010**
	b_3 *(Latin)*	1.2665	2.0780	0.542
	b_4 *(EMEA)*	-1.2452	1.0741	0.246
TED_t	b_5 *(Asia)*	-28.9331	13.2605	0.029**
	b_6 *(Latin)*	22.1396	9.6695	0.022**
	b_7 *(EMEA)*	14.1819	14.1204	0.315
$MBGR_{t-1}$	b_8 *(Asia)*	4.3159	2.0868	0.039**
	b_9 *(Latin)*	3.3624	1.5638	0.032**
	b_{10} *(EMEA)*	0.9135	1.1710	0.435
TB_{t-1}	b_{11} *(Asia)*	0.0107	0.0049	0.028**
	b_{12} *(Latin)*	0.0444	0.0217	0.041**
	b_{13} *(EMEA)*	0.0025	0.0017	0.139
ERC_{t-1}	b_{14} *(Asia)*	-4.0129	4.4190	0.364
	b_{15} *(Latin)*	-6.6027	4.6840	0.159
	b_{16} *(EMEA)*	-2.2759	2.0026	0.256

Note: *,**,*** refer to statistical significance in 1%, 5% and 10% respectively

Including domestic variables and regional interaction terms, there is evidence that the global factors (except VIX) and trade balance are significant for the Asian and Latin America economies but not for the EMEA economies. Global risk is significant only for the Asian economies.

2.5.4 Discussion of results

Our results are broadly in line with the findings by other authors, especially on the relative importance of the global (push) factors over the domestic (pull) factors. Moreover, our findings are consistent with the results of Edison and Warnock (2008) on the issue of political stability, who also found that the level of risk (ICRG composite index) was not significant.

On U.S. monetary expansion and capital inflows, our results agree with Ahmed and Zlate (2014) who have found positive effects of unconventional U.S. monetary policy on

emerging economies inflows and with Fratzscher *et al.* (2013) who showed how unconventional monetary policy measures have contributed to portfolio reallocation.

On the relative importance of global factors over domestic factors, Ahmed and Zlate (2014), Broto *et al.* (2011), Calvo *et al.* (1993), Fratzscher (2012), Ghosh *et al.* (2014), Kim (2000), Marchiori (2011) and Burns *et al.* (2014) have found results similar to our own. Those studies have found among others that global factors are key determinants of the occurrence of a surge in capital flows and that the importance of global factors has increased at the expense of country-specific factors. Burns *et al.* (2014) argue that the most important factor determining capital flows to emerging economies are global factors.

On the recent financial crisis, Fratzscher (2012), Lo Duca (2012) and Ahmed and Zlate (2014) found that the behavior of capital flows to emerging economies was different around the global financial crisis period.

Our results though, do not agree with the findings on the issue of credit ratings effects. For instance, Kim and Wu (2008) and Gande and Parsley (2010) have found credit ratings to be a significant factor affecting flows. Either examined alone or within a framework with other variables, credit ratings do not seem to be a factor affecting equity flows. What is new in this paper and its contribution to the literature is that credit ratings, global variables, domestic macroeconomic variables and political variables are all combined within the same framework.

Taking into account the external common factors, it appears they are the most important determinant of capital flows and credit ratings are not significant. Given their widespread reporting in the financial press, one would expect credit ratings to be at least one of the main factors affecting equity flows. But, either alone or with any of the other variables we have considered, they do not seem to be significant.

Domestic economic fundamentals do not seem to be significant except for the trade balance. The exchange rate variable is a significant one but probably because it is a variable accounting for another "risk factor". All other macro variables including real GDP growth, inflation, stock market volatility does not seem to affect flows. Political risk as measured by the ICGR and also other international institutions also does not seem to be a significant factor after taking into account all the other factors.

Our results also indicate significant differences in behavior of global factors around the global financial crisis period. The global factor that behaved differently between the pre, during and post crisis period was VIX. It had its biggest negative influence on equity flows during the crisis period. Also, the coefficient was statistically significant during the crisis and after the crisis period.

Regarding regional differences, with only global variables our results indicate that the global variables were significant for the Asian economies but not for the rest (Latin and EMEA). Also taking into account the domestic variables, global variables were significant for the Asian and Latin economies. For the EMEA economies, the global factors were not as significant.

2.5.5 Robustness issues

In addition to the variables reported above, we have also examined other explanatory variables. On the measure of credit ratings, we have also introduced another measure of creditworthiness namely whether a country is in investable grade or not. Also we have taken into account a country's credit outlook and combined that with CCR to create an alternative measure of credit outlook. These variables were examined both in local and foreign currency terms. Results remain broadly the same, the credit rating variables do not seem to affect equity flows, especially after taking into account the macroeconomic variables.

In addition to the ICGR's composite political risk indicator, we have also examined the ICGR's composite financial risk indicator, the Corruption Perception Index of Transparency International and the PolityIV indicator of a country's regime. We have tried adding them one at a time or in combinations and results do not change; the global variables are still the ones that mainly affect equity flows.

We also tested whether our results are robust to alternative model specifications. Firstly, we have examined estimating our panel using Random Effects (RE) instead of Fixed Effects (FE) and results remain broadly the same. In models (2.1)-(2.5) the only difference is in the constant and some changes concerning differences in the statistical significance levels in a few variables and in models (2.6)-(2.7) some variables become insignificant while others become significant.

Secondly, we have tried the multilevel mixed-effects linear regression. Models (2.1), (2.3) and (2.5) are qualitative the same. Regarding models (2.2) and (2.4) differences concern lagged monetary growth which is now not significant. On models (2.6)-(2.7) there are some differences in some interaction terms variables.

Thirdly, we recognize that the relative size of the countries in our sample is very different. Therefore we estimated the models by weighted least squares (WLS) with GDP as weight. Results are very similar those presented above.

2.6 Conclusions

The purpose of this paper is to investigate what determines equity flows across emerging markets. It identifies the main significant factors driving equity flows across emerging markets among the following: domestic economic and political factors, sovereign credit rating by rating agencies and global factors.

Our results show that equity flows to emerging markets are mainly driven by global "push factors" rather than by country specific "pull factors". Aggregate volatility, as measured by the VIX index and U.S. money expansion are the factors significant in explaining capital flows towards emerging economies. Domestic pull factors, with the exception of the trade balance and exchange rate changes, are not significant determinants. Moreover, credit ratings do not seem to have any explanatory power in determining equity flows to emerging markets, after account is taken of other determinants of equity flows. Political stability seems to be marginally significant on its own, but, when added to a model with other economic factors, only the push factors, trade balance and exchange rate changes remain significant.

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Appendix 2

Table A2.1: Test for autocorrelation in panel data

Model	Wooldridge test for autocorrelation in panel data	
	F(1,15)=	**Prob > F =**
(2.1)	68.873	0.0000
(2.2)	67.301	0.0000
(2.3)	64.698	0.0000
(2.4)	67.718	0.0000
(2.5)	65.499	0.0000
(2.6)	68.540	0.0000
(2.7)	64.732	0.0000

Note: H0: no first-order autocorrelation.

Table A2.2: "Fund flow" data availability

A. Latin America
1.Brazil
2. Chile
3. Mexico
B. EMEA
4. Czech Republic
5. Egypt
6. Russia
7. South Africa
8. Turkey
C. Asia
9. China
10. India
11. Indonesia
12. South Korea
13. Malaysia
14. Philippines
15. Taiwan
16. Thailand

Table A2.3: Comprehensive Credit Rating (CCR)

Explicit Credit Rating	
Sovereign Rating	**CCR**
AAA	21
AA+	20
AA	19
AA-	18
A+	17
A	16
A-	15
BBB+	14
BBB	13
BBB-	12
BB+	11
BB	10
BB-	9
B+	8
B	7
B-	6
CCC+	5
CCC	4
CCC-	3
CC	2
C	1
SD, D	0

Note: As denoted in Gande and Parsley (2010)

Table A2.4: Data Sources

Variables	Source
Flow variables	
Flow data	EPRF Global
Credit Rating variables	
Credit Ratings	Constructed from data by S&P corporation
Political variables	
PR	International Country Risk Guide (ICRG)
Macro& Global variables	
Imports, exports, share prices, exchange rates, inflation, real GDP	International Financial Statistics
VIX	Chicago Board of Exchange
Money Base, TED	FRED (Board of Governors of the Federal Reserve System)

Chapter 3: Which factors affect portfolio allocation across emerging economies?

3.1 Introduction

After a large drop during the 1980s, international capital started to flow into developing countries again in the 1990s. Since the early 2000s, emerging markets have been one of the hottest areas to invest. Removing restrictions on international financial assets trading led to flows of financial capital surge across the globe in the last two decades. New funds and new ways to invest were popping up all the time. However, the risks behind these investments were sometimes understated. Investors who used to invest in the developed countries diversified more in emerging markets, due also to the potential benefits from international financial asset diversification. But the currency crises and as well other problems in macroeconomics in a variety of security markets in Asia and also the Latin America have driven those investors towards other emerging markets, like those in Central Europe (Gilmore et al 2005).

In this paper we try to identify the asset allocation drivers across fifteen emerging markets from three different regions. With monthly data for 2001-2012, we will try and identify which are the factors that explain why someone would invest in these fifteen emerging countries. We are trying to explain equity shares, the share of each country's equity to the sum of equities of all countries, which is quite interesting. These equity shares, by taking into account country size and not be affected by common external factors, gives us the opportunity examine flows allocations in another framework. Results indicate a combination of factors that determine this such as credit ratings, standardized stock market returns, standardized competitor's stock market returns, inflation, debt to GDP, political risk rating and currency depreciation.

The paper is organized as follows. Section 3.2 provides a brief literature review of the factors which explain financial asset allocation in countries following international finance theories. Section 3.3 presents the indicators used for these determinants, describes the data series and their corresponding descriptive statistics. Section 3.4 discusses the methodology and empirical results. Section 3.5 provides the results of the robustness checks while the final section concludes the paper.

3.2 Literature review

International finance theory says that foreign portfolio flows are the inevitable outcome of investors investing across countries to diversify their portfolio risk and have higher returns too. Institutional investors have long recognized that asset allocation is the most crucial decision required to achieve their investment goals. The basic problem in asset allocation is to decide in which asset classes to invest and in what proportions. Stock markets around the world, offer investors an extensive menu of choices, offering potentially higher rates of return and various types of risks.

Modern Portfolio Theory (MPT) by Markowitz (1952, 1959) and post-modern portfolio theory (PMPT) by Rom and Ferguson (1993, 1994) asset allocation is based on the tradeoff among risk and expected return since assets with higher expected returns are in general riskier. The main difference between PMPT and MPT is that PMPT focuses on the return that must be earned on the assets in a portfolio in order to meet some future payout[21].

Similarly according to the capital asset pricing model (CAPM) the expected return of any security is the sum of the risk-free rate plus the beta of the security multiplied by the market risk premium. Investors from different countries view money market investments in other countries as risky because of the exchange rate risk. Fama and French (1992, 1995, and 1998) proposed an alternative factor model to CAPM. The Fama-French factors also measure the exposure of a stock to a portfolio going long in small stocks and short in large stocks and the stock's exposure to a portfolio long in high book-to-market stocks and short in low book-to-market stocks.

The international financial theory highlights the positive impact on international portfolio value of market segmentation because when investors spread the risks among different countries, they can minimize the negative effects of market volatility. There is a large empirical literature on this area.

Garg and Dua (2014) used a long-run macro econometric model (ADRL to estimate the long run coefficients) and analyzed the macroeconomic determinants of portfolio flows to India. The determinants examined are domestic stock market performance, domestic

[21] PMPT measures risk and reward relative to internal rate of return (IRR) while MPT on the other hand ignores IRR and measures risk as a dispersion about the mean or as average return. The result from this difference is substantially different portfolio constructions.

growth, exchange rate, currency risk, country risk, stock return risk, risk diversification, global liquidity, interest rate differential, returns in other emerging markets and capital controls. They found evidence that lower exchange rate volatility and bigger risk diversification opportunities are conducive to portfolio flows and also that higher equity returns in other emerging markets discourage flows.

Another part of the empirical literature on portfolio flows analyzed the determinants of portfolio flows by debating the significance of domestic (pull) and external (push) factors and by also examining country-specific equity market characteristics, information, ease of access, transaction costs and how these explain variations in foreign equity portfolio allocation.

Some empirical studies have emphasized that *global factors* have pushed capital to developing countries. For example Calvo *et al*. (1993), Byrne and Fiess (2011) and Taylor and Sarno (1997) study the U.S. interest rates, Fernandez-Arias (1996) the low returns in industrial countries, Kim (2000) the external reasons and Broto *et al*. (2011) global factors beyond the control of emerging economies like the world GDP growth rate, global liquidity and as well inflation, 3-month T-bill rate and SP500 index for the US economy. Some other studies have found that *domestic factors* (pull factors) have attracted portfolio flows to developing countries. For instance Bekaert *et al*. (2002) consider past domestic returns, Bohn and Tesar (1996) expected/predicted returns, Mody *et al*. (2001) pull factors in general like CPI, domestic credit, short-term debt to reserves ratio, industrial production, domestic short-term interest rate, credit ratings, reserves to import ratio and domestic stock market index, Felices and Orskaug (2008) propose credit ratings, EME spreads and EME equity index, Montiel and Reinhard (1999) study capital controls and policy response to capital inflows. Finally, some studies showed evidence that both *domestic (pull)* and *global (push)* are important as well like Chuhan *et al*. (1998), Fratzscher (2012), Ghosh *et al*. (2014), Ahmed and Zlate (2014) and Yang *et al*. (2013).

Thapa and Poshakwale (2012) study the question on whether country-specific equity market characteristics explain variations in foreign equity portfolio allocation. They have found that foreign investors prefer to invest more money in larger and highly visible developed markets which are more liquid, have bigger market efficiency and lower trading costs. Aggarwal *et al*. (2005) examined the investment allocation choices of actively-managed US mutual funds in emerging market equities after the 1990s market crises. They

have found that US funds invest more in open emerging markets with stronger accounting standards, shareholder rights, and legal frameworks.

Additionally, the empirical literature has also examined the issue of spillover effects from the recent crises and risk, since the best strategy for asset allocation depends on investor's risk profile. For instance, Chiang *et al*. (2013) investigate the spillover effects of returns and volatility in the U.S. stock market on the stock markets of Brazil, Russia, India, China and Vietnam after the sub-prime mortgage crisis. They found that the greatest contagious effects of returns and volatility from the US market before the crisis was in Russia and after the crisis the most intense spillover effects were on Vietnam. India, which is the most efficient among these markets, demonstrates the lowest total long-run risk, where an inverse situation is for China and Brazil.

3.3 Data

In this section we provide a description of our data and how we constructed some variables.

3.3.1 Data descriptive statistics

Emerging equity markets have relatively low correlations with developed countries stock markets. Many of them were liberalized in the 1990s and this improved fully or partially the accessibility of their stock markets to foreign investors. The existence of many investment barriers in emerging markets had segmented them from the global capital market, however, the liberalization process led to increased asset prices, higher correlations with the world market, and thus lower expected returns.

In this study, we are trying to explain country equity shares. These shares are constructed by each country's total net financial assets divided by the sum of all emerging countries total net financial assets.

So, who has the biggest equity share in the pie of these countries? During the period 2001-2012, Table 3.1 shows that the biggest average equity share belongs to China with 7.6% followed by India with 7.2%. The smallest averages belong to Czech, Philippines, Indonesia, Turkey and Chile with average equity shares below 0.5%. Russia, Korea and Brazil average equity shares are in the middle with average equity shares 3.5%, 3.1% and 2.9%, respectively. In the beginning of the sample though, the picture was quite different,

with India leading and China having a small share. China is the biggest "winner" in share from 1.2% in 1/2001 to 13.8% in 12/2012 (increase of 12.6%).

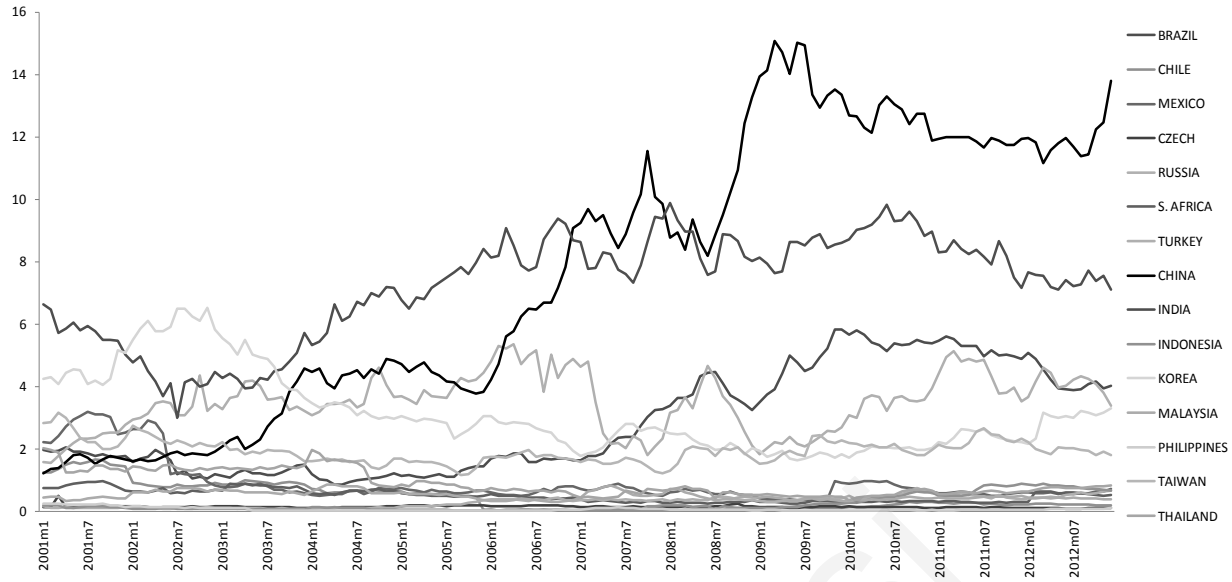
Table 3.1: Equity shares to all emerging markets (Latin America, Asia & EMEA)

Country	*Beginning of sample*	*End of sample*	*Average*	*Difference*
Brazil	2.0	4.0	2.9	2.0
Chile	1.2	0.2	0.4	-1.1
Mexico	2.2	0.7	0.9	-1.5
Czech	0.1	0.1	0.1	0.0
Russia	1.6	3.4	3.5	1.8
S. Africa	0.7	0.5	0.5	-0.2
Turkey	0.2	0.7	0.3	0.5
China	1.2	13.8	7.6	12.6
India	6.6	7.1	7.2	0.5
Indonesia	0.2	0.6	0.2	0.5
S. Korea	4.2	3.3	3.1	-0.9
Malaysia	0.4	0.4	0.5	-0.1
Philippines	0.2	0.1	0.1	-0.1
Taiwan	2.8	1.8	1.9	-1.0
Thailand	2.0	0.8	0.9	-1.2

Note: Equity shares in this table refer to country's i total net financial assets divided by all emerging markets total net financial assets. All emerging markets are the sum of Latin America, Asia and EMEA emerging markets.

Total net financial assets in the countries examined here have been increasing from 2004 until before the global crisis, and picked up soon after until around 2011/9. The country with the biggest share at the end of the sample, as also shown from the volume in Figure 3.1, is China followed by India. The middle shares belong to Brazil, Russia and Korea while the lowest shares belong to Czech, Philippines and Chile.

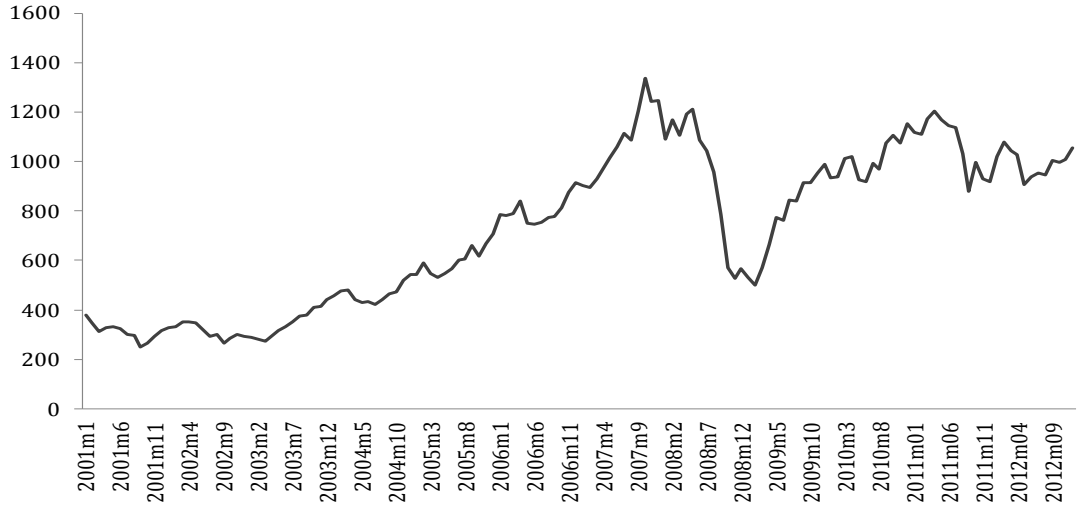
Figure 3.1: Equity shares to all emerging markets



This pattern is also apparent by looking at the Morgan Stanley Composite Index for Emerging Markets (MSCI-EM). The MSCI Emerging Markets Index is a free float-adjusted market capitalization index that is designed to measure equity market performance in the global emerging markets. Today it covers over 800 securities across 23 markets and represents approximately 13% of world market cap.

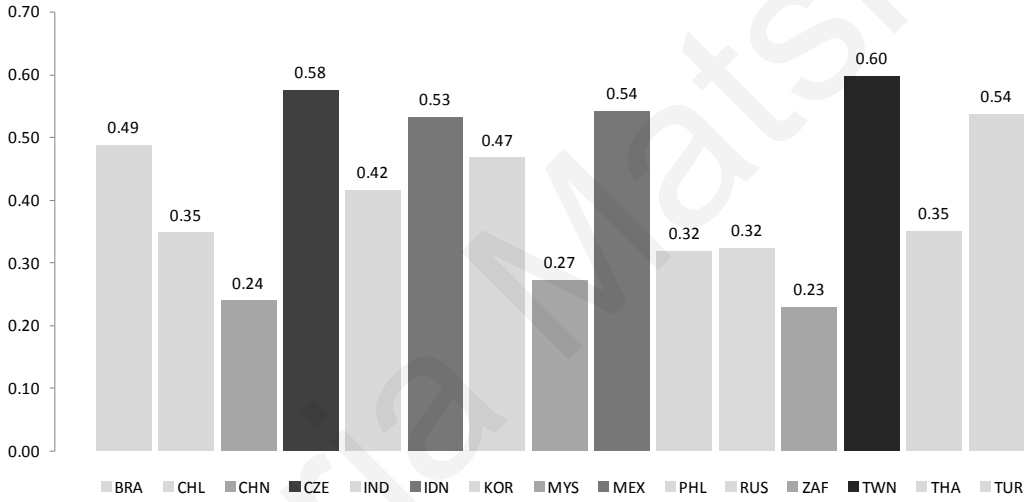
The index was increasing until 2008/05 (1209.87), then it fell by over 50% in the next nine months (499.304 in 2009/2) before starting to increase again (see Figure 3.2). The index and the GDP weighted one, had the highest annual performances in 2003-2007, and declined in 2008 and 2011, rebounded 2009-2010 and 2012.

Figure 3.2: MSCI-EM stock market price index Emerging Markets



The fundamental concept behind MPT is that assets in an investment portfolio should not be selected individually but to also take into account how each asset price changes relative to how every other asset price in the portfolio changes (correlations among securities). Figure 3.3 present the correlations between the individual country's stock returns with the returns of the SP500. The average correlation to SP500 is 0.42. The country with the highest correlation to SP500 is Taiwan with 0.60 followed by Czech with 0.58 while the countries with the lowest correlation are South Africa and China with 0.23 and 0.24 respectively. Similar results hold for the MSCI world stock market index (see Figure A3.1 in Appendix 3).

Figure 3.3: Correlations of the EM stock returns with the SP500 returns



3.3.2 Determinants

The potential variables to explain asset allocation among countries are the following ones and they all capture different parts of the portfolio flows driving mechanism.

(i) Performance factors

Domestic stock market performance: The stock market performance in the domestic country can have either a positive or a negative effect on portfolio flows, depending on what foreign investors are chasing after. If they are chasing returns then portfolio flows will increase due to higher returns but if investors buy/sell when the prices are falling/rising with the expectation of a reversal in the future then the relationship between returns and flows can turn negative.

Domestic growth: The real GDP growth indicate sound macroeconomic and institutional fundamentals in the home country which. Growth is often a significant factor in attracting capital. Higher growth implies of rapid expansion in positive economic activity which can lead to higher profitability of investments in that country.

Exchange rate: capital earns a return also through FX change and a host country's currency appreciation provides the foreign investor with an additional way of gaining returns.

(ii) Volatility factors / Risk tolerance factors

Currency risk: exchange rate volatility is expected to have a negative effect on portfolio flows since it represents higher uncertainty on returns for investors.

Political risk: Political risk is the risk that a government action will affect in negative way a company's cash flows country risk is a broader concept. It encompasses the potential adverse effects of a country's political environment and as well its economic and financial environment.

Country risk: Country risk refers to the country's availability of sufficient liquidity so it does not default on the payments in case of fund withdrawals by investors. A country that has enough availability is credit worthy and has smaller odds to default. A country with lower risk attracts more portfolio flows.

The understanding of these two types of risk, political and country risk is a significant part of international capital budgeting and operations management in other countries, especially developing ones. A country's economic health, affects directly the cash flows of multinationals, and the better the economic situation is the country is less likely to face political and social turmoil that would harm foreign and domestic companies.

Stock return risk: Stock markets are also characterized by volatility, so a foreign investor takes into account the returns and as well the variability associated with the returns from investing in an asset because it is important to determine the investments expected returns. Unless sufficiently compensated for volatility, the investor is discouraged by higher return variability.

Risk diversification: Investors invest internationally to diversify their portfolio risk. Investors want to reduce their portfolio variance and by adding a country's asset that it will reduce this overall risk, then there are diversification gains. But this depends on how correlated the domestic and the foreign markets are. Lower co-movements of domestic and global equity returns give more diversification benefits and thus higher portfolio flows.

(iii) Other factors

Interest rates: As suggested by the Mundell-Fleming traditional open economy macroeconomic model capital flows occur to restore interest parity meaning that capital moves in or out of a country until domestic and foreign interest rates are equalized. But, in the meantime investors invest their capital whenever the risk adjusted interest rates are higher.

Competitor's returns in other emerging markets: According to Buckberg (1996) investors in deciding their capital allocation follow a two-step process. In the first step, they determine the total capital to invest in emerging markets and in the second step they allocate a part of that capital to each emerging market based on returns. So, if investors allocate a high part of their capital to emerging markets, if their equity returns are rising this will happen, then each emerging economy has more odds in getting a greater amount of capital. Different emerging economies can be viewed as competitors to each other and each one is trying to get a bigger share of foreign investment.

3.3.3 Data description and sources

The analysis is based on monthly (panel) data covering the period 1/2001 to 12/2012. The sample includes fifteen emerging markets covering three regions, Latin America, EMEA and Asia. For detailed country list see Table A3.1 and for complete data sources Table A3.2 in Appendix 3.

3.3.3.1 Equity shares and Total Net Assets

The equity shares used are calculated using country' total net assets (total fund assets). We divide each country's total net financial assets to the sum of all countries total net financial assets. The data are monthly. Total net assets measures total net assets of country *i* during month *t*. Data to construct our main variable are from equity investments by global funds in emerging economies. They are from a proprietary data set compiled by *EPFR Global.*

The funds tracked are registered globally and thus the data track global investor flows to emerging economies.

3.3.3.2 Performance factors

The first category of explanatory factors examined here are the performance factors (domestic stock market performance, domestic growth, exchange rate as mentioned in section 3.3.2). These broader factors include the following (i) inflation, (ii) trade balance, (iii) real GDP growth, (iv) stock market returns, (v) FX returns and (vi) debt ratio to GDP. Debt is measure of fiscal fragility. The source of all these data is IMF's International Financial Statistics.

Inflation is the percentage change of the CPI index. Trade balance is imports (c.i.f. in US$) minus exports (f.o.b. in US$). The GDP data are available only on quarterly basis[22]. We follow the simplest approach to construct a monthly index by assigning each month of a given quarter the same value. Stock market return is the percentage change in the stock price index. FX rates are defined as local currency per US dollar. Government gross debt as percentage to GDP is available for all countries for the entire period in annual form only. Thus, they are made monthly by assigning each month of a given year the same annual value.

3.3.3.3 Volatility factors / Risk tolerance factors

The second category of explanatory factors are the risk factors (currency risk, political risk, country risk, stock return risk and risk diversification, as in section 3.3.2).

(i) Currency and stock return risk

Foreign exchange market volatility and stock market volatility are both calculated using a GARCH model.

(ii) Risk diversification

On competitors' stock returns, for market j they are calculated as the average stock returns of all the other markets examined here ($i \neq j$). Since this variable is the average of the other fourteen countries stock returns each time, this variable does not vary especially per i but instead it varies per t.

[22] We use quarterly GDP data because monthly IP data are not available for most of the countries for the long time span of our study.

(iii) Political risk / Country risk

Many and different types of political and institutional variables capturing country risk are considered here. Country risk indicators are available from Institutional Investor, Euromoney magazine, the Composite Risk Indicator from Economist Intelligence Unit, Business Environment Risk Intelligence (BERI) S.A. and the Political Risk Services (PRS) Group International Country Risk Guide **(**ICGR). The last one, and the one we choose to employ here, is PRS's Group ICGR mainly because it's on a monthly basis and it also covers all of our countries for the whole time period.

International Country Risk Guide (ICRG)

PRS produces the ICGR on a monthly basis and is available since 1980. The ICRG rating consists of 22 underlying variables which are grouped/split into three major risk subcategories: the political risk index (PRR), the financial risk index (FRR), and the economic risk index (ERR). For each of these three subcategories, a separate index is created. The Political Risk index is based on 100 points, the Financial Risk index on 50 points, and the Economic Risk index also on 50 points (for details see Table A3.3 in Appendix 3). Then, the total points from these three indices are divided by two in order to produce the weights for inclusion in the Composite Country Risk (CRR).

The highest overall rating is theoretically 100 and the lowest rating is theoretically zero. Higher overall rating indicates lower risk and lower overall rating indicates higher risk. An increase means lower risk while a decrease means higher risk. Values in the range of 00.00%-49.9% indicate very high risk, while values in the range 80.00%-100% indicate very low risk.

On the Political Risk Rating (PRR), the following risk components and weights (Table 3.2) are used for producing it:

Table 3.2: Political Risk Rating (PRR) components

Sequence	*Component*	*Points (max.)*
A	Government Stability	12
B	Socioeconomic Conditions	12
C	Investment Profile	12
D	Internal Conflict	12
E	External Conflict	12
F	Corruption	6
G	Military in Politics	6
H	Religious Tensions	6
I	Law and Order	6
J	Ethnic Tensions	6
K	Democratic Accountability	6
L	Bureaucracy Quality	4
Total		**100**

Source: The PRS Group, Inc

Credit Ratings

We also examine whether changes in sovereign credit ratings affected asset allocation. We have collected for each emerging economy the Standard and Poor's (S&P) sovereign credit ratings at the end of each month. We only used ratings from Standard and Poor`s, since as Jaramillo and Tejada (2011) pointed out, the ratings do not differ substantially across the three main agencies. Gande and Parsley (2010) also mention that ratings among agencies are highly correlated. Gande and Parsley (2010) also tested whether there exist a leader/follower relationship between the rating agencies and their results indicate that the "leader" among rating agencies is S&P.

Standard and Poor's use letter designations to indicate a country's credit rating, so in order to use these ratings we need to transform them in numerical terms. The transformed numerical variable will be the country's Comprehensive Credit Rating (CCR). CCR is calculated by assigning next to each letter rating provided by S&P for each country (the letter ratings range from AAA to SD/D) a number from 21 to 0 equivalently (see Table A3.4 in Appendix 3). So, a rating action or a rating event for a country is defined as a change (negative, positive or neutral) in the country's CCR.

Besides our basic credit rating variable CCR, we have also created another variable that combines this comprehensive credit rating with the country's outlook position. We construct this new variable as follows:

CCR_t +1 if the country has a positive outlook at time t for t=1…T
CCR_t -1 if the country has a negative outlook at time t for t=1…T
CCR_t -0.5 if the country has a negative watch outlook at time t for t=1…T

Negative watch is a status that S&P give while they are deciding whether to lower the credit rating. Once been placed on negative watch, there is a 50% chance of the rating being lowered in the next three months.

This will be referred to as CCR_O.

Since this combination is complicated, we can combine in a simpler version, by focusing only on positive and negative outlook, as follows:

CCR_t +1 if the country has a positive outlook at time t for t=1…T
CCR_t -1 if the country has a negative outlook at time t for t=1…T

They will be referred as CCR_Oadj.

Other political risk variables

There were also other variables capturing political risk besides the ICGR variables and credit ratings which we also examine and discuss in the robustness section.

3.3.3.4 Other domestic market variables

Other domestic market variables examined here are: **(**i) the money-to-GDP ratio since this is associated with lower interest rates and enhances international investments towards domestic stocks over the less attractive domestic bonds, (ii) GDP per capita, and (iii) accounting standards, shareholder rights, legal frameworks and reserves.

3.4 Methodology

We estimate a pooled Seemingly Unrelated Regression (SUR) Generalized Least Squares (GLS) model, of fifteen cross sections and 144 months, to analyze the determinants of portfolio choice among these countries. Based on the portfolio asset allocation determinants discussed in the Section 3.3, the following basic empirical model is estimated:

$$S_{i,t} = b_0 + b_1 * \mathbf{X}_{i,t-1} + b_2 * \mathbf{Z}_{i,t-1} + b_3 * \mathbf{\Xi}_{i,t} + e_{i,t} \quad (3.1)$$

The dependent variable, $S_{i,t}$, is the "share_to_region" defined as country's i Total Net Assets ($A_{i,t}$) divided with the sum of the region's Total Net Assets of the three regions (Asia excluding Japan, Latin America and EMEA): $S_{3,i,t=}A_{i,t} / \sum A_t$ for i=1..3 (3.2)

The explanatory variables are divided in three categories, (i) macro/performance, (ii) political risk and (iii) financial factors, summarized in vectors **X**, **Z** and **Ξ** respectively**.** We assume investors decision to allocate the share of assets ($S_{i,t}$) at time t in the fifteen emerging markets in our model by considering the historical or lagged effects of the macro and political (**X**, **Z**) determinants given that they are observed with a lag whereas the financial variables are considered contemporaneously given the timely nature of financial markets.

Vector **X** includes the country specific macro/performance variables that capture the soundness of the macroeconomic framework. This includes variables like economic growth, inflation, trade balance and as well public debt (expressed as percentage to GDP). Vector **Z** includes the risk/political factors (risk tolerance) like the ICGR composite political risk indicator and as well other political/institutional variables like the credit ratings. Vector **Ξ** includes the financial factors like the currency depreciation, the currency volatility, the standardized stock market returns and as well the standardized competitor's stock returns.

Before doing any estimation, we have checked the data for the presence of a unit root. Testing for unit roots in the variables of this study we find no support for the unit root hypothesis using the panel unit root test of Im-Pesaran-Shin.

3.5 Empirical Analysis

Because our data are balanced and our dependent variable is shares, we estimate a pooled Seemingly Unrelated Regression (SUR) Generalized Least Squares (GLS) model.

We start with a simple model with the partial correlations of the credit ratings (CCR) at times t-1, t and t+1 with the equity shares (shown in Table 3.3a) in order to examine if CCR is a leading, contemporaneous or lagged indicator of equity shares. Results indicate that only lagged credit ratings affect the equity shares and this effect is positive. Hence we examine if CCR_{t-1} is still a significant predictor in a more comprehensive model.

Following the literature, in the extended model we include real GDP growth, inflation, trade balance, debt to GDP and PRR, all lagged at time t-1. We examine the contemporaneous effect of currency depreciation, currency volatility, standardized stock returns and standardized competitor's stock returns given that financial markets and financial data are available more promptly. These results are shown in Table 3.4.

Based on results from Table 3.4, we find that the equity shares are affected positively by previous period's credit ratings, PRR and contemporaneously by standardized stock returns whereas they are affected negatively by inflation, debt to GDP, currency depreciation and standardized competitor's stock returns. All signs are as expected from the economic theory. An improvement in a country's credit rating increase flows and consequently the country's share in the pie. Similarly, an increase in its stock returns also increases flows and the country's share. A higher PRR value means lower risk and thus improvement in equity shares. An increase in inflation, public debt share to GDP, competitor's stock returns and currency depreciation are increased risk, volatility and fragility factors, respectively, and affect flows negatively and thus lead to smaller equity shares.

Next, we proceed examine the impact of the recent financial crisis 2007-2008 on the mean equity shares in these fifteen emerging markets. We replace the constant in the above models with the following dummies defined as follows:

$DpreL_t$ is a dummy variable equal to 1 before 9/2008 and 0 otherwise,
DL_t is 1 from 9/2008 to 11/2008 and 0 otherwise, and
$DpostL_t$ is 1 from 12/2008 until the end of the sample and 0 otherwise.

Partial correlations are presented in Table 3.3b while results of the extended model are presented in Table 3.5 and results are broadly similar to Table 3.4 regarding the macro, political and financial variables. Regarding the crisis dummies, they are all statistically significant with a positive sign. Table 3.6 presents coefficients equality tests for these variables among the three regimes (pre, during and post crisis). The test results also indicate that the coefficients are statistically different among regimes, especially the pre vs. during and the pre vs. post crisis. The post crisis coefficients are relatively bigger than those of the pre crisis, in all cases examined, which implies larger average equity shares in these fifteen emerging countries post crisis.

We also examine further the various components of political risk by replacing the composite political risk indicator, PRR, with its five main components, the ones with the highest weights in the PRR index. These are (i) government stability, (ii) socioeconomic conditions, (iii) investment profile, (iv) internal conflict and (v) external conflict. These effects of these lagged variables are found in Tables 3.7-3.8, with and without crisis dummies in the constant, respectively. Results remain again broadly the same on the rest of the macro/political/financial variables. The political variable that appears significant from the PRR's components is "socioeconomic conditions" which affects equity shares positively, as expected. This variable is an assessment of the socioeconomic pressures at work in society which could limit Government's action or enhance social dissatisfaction. The risk rating assigned to these components is the sum of three subcomponents, (i) unemployment, (ii) consumer confidence and (iii) poverty. Table 3.9 presents coefficients equality tests for the crisis dummies among the three regimes (pre, during and post crisis). The test results are similar to the ones in Table 3.6, and also indicate that the coefficients are statistically different in the pre vs. during and the pre vs. post crisis.

Our results in general on the significance of the determinants are broadly in line with the findings by the studies of other authors, besides real GDP growth, but these variables were not within a same framework. On the issue of credit ratings, Kim and Wu (2008) and Gande and Parsley (2010) found credit ratings to be a significant factor affecting flows. Also, Felices and Orskaug (2008) found that higher credit ratings affect positively the capital flows for most individual emerging countries they examined. On exchange rates and stock returns, we are also in line with empirical literature. Garg and Dua (2014) found that higher equity returns of other emerging markets discourage flows to India. Additionally, they have also found that other portfolio flows determinants are the domestic

equity performance, the exchange rate and the output growth. Felices and Orskaug (2008) found that local equity index levels affect positively the capital flows for most of the emerging countries they examined. Similarly, Bohn and Tesar (1996) and Mody *et al*. (2001) found that domestic factors like equity index and country creditworthiness have attracted portfolio flows to developing countries. Ghosh *et al*. (2014) found that the global factors act as "gatekeepers" that determine when surges of capital to EMEs will occur. But whether a specific EME receives a surge it mainly depends on domestic factors such as its external financing need, capital account openness, and exchange rate regime.

Regarding the recent financial crisis and differences across regimes, Fratzscher (2012) also found that the country specific fundamentals and institutions are important in explaining the differences in capital flows, and in particular they are important during the crisis period (2007–2008).

Robustness issues

We also examined other macroeconomic domestic market variables like: **(**i) the money-to-GDP ratio, (ii) GDP per capita, and (iii) current account to GDP. Also**,** we examined other variables capturing political risk besides the ICGR variables and credit ratings like (i) Corruption Perception Index (CPI), (ii) Worldwide Governance Indicators (WGI), (iii) Polity project (IV), (iv) Civil Liberties Index (CLI), (v) Central Bank Independence (CBI) and (vi) Cultural Indicators. These did not turn out to be significant factors.

Besides domestic market variables, we have examined additionally global and US variables like: (i) VIX, a measure of global risk (as captured by the implied volatility in S&P500, and (ii) US returns and volatilities (as captured by the S&P500 returns, volatilities and standardized returns). They did not turn out to be significant factors.

Table 3.3a: Correlation of lag, lead and contemporaneous CCR with equity shares

CCR:	***CCR***		***CCR_O***	
Constant	0.4740	0.1185*	1.1858	0.2329*
CCR_t	0.0025	0.0044	0.0051	0.0031
CCR_{t-1}	0.0101	0.0044**	0.000002	0.0031
CCR_{t+1}	-0.0018	0.0044	0.0005	0.0030

CCR:	***CCR_Oadj***	
Constant	0.6683	0.1196*
CCR_t	-0.0009	0.0026
CCR_{t-1}	0.0049	0.0026***
CCR_{t+1}	-0.0018	0.0025

Notes: (1) The models were estimated with GLS (heteroskedastic with cross-sectional correlation and panel-specific AR(1)). (2) *,**,*** refer to statistical significance in 1%, 5% and 10% respectively.

Table 3.3b: Correlation of lag, lead and contemporaneous CCR with equity shares

CCR:	***CCR***		***CCR_O***	
Constant*$DpreL_t$	0.5876	0.1305*	1.1721	0.2349*
Constant*DL_t	0.5941	0.1308*	1.1799	0.2355*
Constant*$DpostL_t$	0.5901	0.1310*	1.1804	0.2360*
CCR_t	0.0034	0.0045	0.0054	0.0033
CCR_{t-1}	0.0100	0.0044**	-0.0006	0.0033
CCR_{t+1}	-0.0007	0.0045	0.0006	0.0032

CCR:	***CCR_Oadj***	
Constant*$DpreL_t$	0.8173	0.1371*
Constant*DL_t	0.8250	0.1373*
Constant*$DpostL_t$	0.8200	0.1375*
CCR_t	-0.0007	0.0025
CCR_{t-1}	0.0050	0.0025***
CCR_{t+1}	-0.0015	0.0025

Notes: (1) The models were estimated with GLS (heteroskedastic with cross-sectional correlation and panel-specific AR(1)). (2) *,**,*** refer to statistical significance in 1%, 5% and 10% respectively.

Table 3.4: Empirical results from equation 3.1

CCR:	***CCR***		***CCR_O***	
Constant	0.9339	0.2024*	1.2937	0.1983*
CCR_{t-1}	0.0662	0.0090*	0.0431	0.0074*
PRR_{t-1}	0.0044	0.0023***	0.0044	0.0023***
Real GDP_{t-1}	-0.0006	0.0017	-0.0007	0.0017
Inflation $_{t-1}$	-0.0068	0.0019*	-0.0079	0.0021*
Trade Balance $_{t-1}$	-0.000002	0.000002	-0.000002	0.000002
$Debt\_to\_GDP_{t-1}$	-0.0063	0.0017*	-0.0062	0.0018*
Currency depreciation $_{t}$	-0.0031	0.0006*	-0.0029	0.0006*
Currency volatility $_{t}$	0.0001	0.0002	-0.0001	0.0002
STD stock returns $_{t}$	0.0104	0.0019*	0.0111	0.0019*
STD comp. stock returns $_{t}$	-0.0106	0.0024*	-0.0111	0.0023*

Table 3.4 (continued): Empirical results from equation 3.1

CCR:	***CCR_Oadj***	
Constant	1.4650	0.1848*
CCR_{t-1}	0.0228	0.0052*
PRR_{t-1}	0.0061	0.0022*
Real GDP_{t-1}	-0.0004	0.0017
Inflation $_{t-1}$	-0.0081	0.0020*
Trade Balance $_{t-1}$	-0.000002	0.000002
$Debt\_to\_GDP_{t-1}$	-0.0081	0.0015*
Currency depreciation $_{t}$	-0.0030	0.0007*
Currency volatility $_{t}$	0.0001	0.0002
STD stock returns $_{t}$	0.0095	0.0018*
STD comp. stock returns $_{t}$	-0.0088	0.0026*

Notes: (1) The models were estimated with GLS (heteroskedastic with cross-sectional correlation and panel-specific AR(1)). (2) The first figure refers to the coefficient and the second to the SE. (3) *,**,*** refer to statistical significance in 1%, 5% and 10% respectively.

Table 3.5: Empirical results from equation 3.1

CCR:	***CCR***		***CCR_O***	
Constant*DpreL$_t$	0.9085	0.2110*	1.3610	0.2076*
Constant*DL$_t$	0.9739	0.2113*	1.4342	0.2079*
Constant*DpostL$_t$	1.0066	0.2112*	1.4738	0.2075*
CCR$_{t-1}$	0.0752	0.0094*	0.0466	0.0077*
PRR$_{t-1}$	0.0052	0.0024**	0.0049	0.0024**
Real GDP$_{t-1}$	-0.0008	0.0018	-0.0008	0.0018
Inflation $_{t-1}$	-0.0071	0.0020*	-0.0082	0.0022*
Trade Balance $_{t-1}$	-0.000001	0.000002	-0.000002	0.000002
Debt_to_GDP$_{t-1}$	-0.0063	0.0018*	-0.0061	0.0018*
Currency depreciation $_t$	-0.0032	0.0007*	-0.0029	0.0007*
Currency volatility $_t$	0.00005	0.0002	-0.0001	0.0002
STD stock returns $_t$	0.0104	0.0020*	0.0111	0.0020*
STD comp. stock returns $_t$	-0.0100	0.0025*	-0.0104	0.0025*

Table 3.5 (continued): Empirical results from equation 3.1

CCR:	***CCR_Oadj***	
Constant*DpreL$_t$	1.4361	0.1919*
Constant*DL$_t$	1.5171	0.1922*
Constant*DpostL$_t$	1.5641	0.1920*
CCR$_{t-1}$	0.0260	0.0055*
PRR$_{t-1}$	0.0076	0.0023*
Real GDP$_{t-1}$	-0.0007	0.0018
Inflation $_{t-1}$	-0.0086	0.0021*
Trade Balance $_{t-1}$	-0.000001	0.000002
Debt_to_GDP$_{t-1}$	-0.0087	0.0017*
Currency depreciation $_t$	-0.0030	0.0007*
Currency volatility $_t$	0.0001	0.0002
STD stock returns $_t$	0.0093	0.0019*
STD comp. stock returns $_t$	-0.0089	0.0027*

Notes: (1) The models were estimated with GLS (heteroskedastic with cross-sectional correlation and panel-specific AR(1)). (2) The first figure refers to the coefficient and the second to the SE. (3) *,**,*** refer to statistical significance in 1%, 5% and 10% respectively.

Table 3.6: Coefficient equality and difference for crisis dummies

	Test (=0)	Coef.	Std. Err.	P>|z|
CCR	DpreL - DL - DpostL	-1.0720	0.2159	0.0000*
	DpreL - DL	-0.0654	0.0312	0.0361**
	DpreL - DpostL	-0.0981	0.0433	0.0234**
	DL - DpostL	-0.0327	0.0313	0.2958
CCR_O	DpreL - DL - DpostL	-1.5470	0.2122	0.0000*
	DpreL - DL	-0.0733	0.0310	0.0181**
	DpreL - DpostL	-0.1128	0.0432	0.0090*
	DL - DpostL	-0.0395	0.0311	0.2042
CCR_Oadj	DpreL - DL - DpostL	-1.6452	0.1979	0.0000*
	DpreL - DL	-0.0811	0.0341	0.0174**
	DpreL - DpostL	-0.1281	0.0469	0.0063*
	DL - DpostL	-0.0470	0.0341	0.1677

Note: *,**,*** refer to statistical significance in 1%, 5% and 10% respectively.

Table 3.7: Empirical results from equation 3.1

CCR:	***CCR***		***CCR_O***	
Constant	0.3120	0.1964	0.7551	0.2034*
CCR_{t-1}	0.0859	0.0083*	0.0607	0.0074*
Government $Stability_{t-1}$	0.0012	0.0043	0.0010	0.0045
Socioeconomic $Conditions_{t-1}$	0.0314	0.0085*	0.0393	0.0090*
Investment $Profile_{t-1}$	0.0008	0.0081	0.0050	0.0084
Internal $Conflict_{t-1}$	0.0131	0.0085	0.0189	0.0090**
External $Conflict_{t-1}$	0.0129	0.0113	-0.0065	0.0121
Real GDP_{t-1}	-0.0005	0.0018	-0.0006	0.0019
$Inflation_{t-1}$	-0.0046	0.0019**	-0.0068	0.0022*
Trade $Balance_{t-1}$	-0.000002	0.000002	-0.000002	0.000002
$Debt\_to\_GDP_{t-1}$	-0.0062	0.0017*	-0.0068	0.0018*
Currency $depreciation_{t}$	-0.0035	0.0007*	-0.0035	0.0008*
Currency $volatility_{t}$	0.00004	0.0002	-0.0001	0.0002
STD stock $returns_{t}$	0.0111	0.0021*	0.0128	0.0022*
STD comp. stock $returns_{t}$	-0.0099	0.0026*	-0.0111	0.0028*

Notes: (1) The models were estimated with GLS (heteroskedastic with cross-sectional correlation and panel-specific AR(1)). (2) The first figure refers to the coefficient and the second to the SE. (3) *,**,*** refer to statistical significance in 1%, 5% and 10% respectively.

Table 3.7 (continued): Empirical results from equation 3.1

CCR:	***CCR_Oadj***	
Constant	1.1370	0.1850*
CCR_{t-1}	0.0280	0.0054*
Government Stability $_{t-1}$	0.0026	0.0042
Socioeconomic Conditions$_{t-1}$	0.0311	0.0083*
Investment Profile $_{t-1}$	0.0045	0.0080
Internal Conflict $_{t-1}$	0.0081	0.0082
External Conflict $_{t-1}$	0.0160	0.0117
Real GDP_{t-1}	-0.0008	0.0018
Inflation $_{t-1}$	-0.0066	0.0019*
Trade Balance $_{t-1}$	-0.000002	0.000002
$Debt\_to\_GDP_{t-1}$	-0.0098	0.0015*
Currency depreciation $_{t}$	-0.0032	0.0007*
Currency volatility $_{t}$	0.0001	0.0002
STD stock returns $_{t}$	0.0100	0.0020*
STD comp. stock returns $_{t}$	-0.0079	0.0027*

Notes: (1) The models were estimated with GLS (heteroskedastic with cross-sectional correlation and panel-specific AR(1)). (2) The first figure refers to the coefficient and the second to the SE. (3) *,**,*** refer to statistical significance in 1%, 5% and 10% respectively.

Table 3.8: Empirical results from equation 3.1

CCR:	***CCR***		***CCR_O***	
Constant*DpreL_t	0.2614	0.2042	0.7176	0.2091*
Constant*DL_t	0.3347	0.2043	0.8123	0.2093*
Constant*DpostL_t	0.3644	0.2040***	0.8632	0.2092*
CCR_{t-1}	0.0909	0.0085*	0.0618	0.0075*
Government Stability $_{t-1}$	0.0011	0.0044	0.0007	0.0046
Socioeconomic Conditions $_{t-1}$	0.0323	0.0087*	0.0398	0.0092*
Investment Profile $_{t-1}$	0.0016	0.0083	0.0051	0.0086
Internal Conflict $_{t-1}$	0.0137	0.0088	0.0196	0.0092**
External Conflict $_{t-1}$	0.0157	0.0117	-0.0063	0.0124
Real GDP_{t-1}	-0.0004	0.0018	-0.0005	0.0020
Inflation $_{t-1}$	-0.0046	0.0019**	-0.0065	0.0023*
Trade Balance $_{t-1}$	-0.000002	0.000002	-0.000002	0.000002
$Debt\_to\_GDP_{t-1}$	-0.0058	0.0017*	-0.0061	0.0018*
Currency depreciation $_t$	-0.0035	0.0007*	-0.0034	0.0008*
Currency volatility $_t$	0.00005	0.0002	-0.0001	0.0002
STD stock returns $_t$	0.0112	0.0021*	0.0129	0.0022*
STD comp. stock returns $_t$	-0.0086	0.0027*	-0.0100	0.0029*

Notes: (1) The models were estimated with GLS (heteroskedastic with cross-sectional correlation and panel-specific AR(1)). (2) The first figure refers to the coefficient and the second to the SE. (3) *,**,*** refer to statistical significance in 1%, 5% and 10% respectively.

Table 3.8 (continued): Empirical results from equation 3.1

CCR:	***CCR_Oadj***	
Constant*DpreL_t	1.1374	0.1926*
Constant*DL_t	1.2172	0.1925*
Constant*DpostL_t	1.2581	0.1918*
CCR_{t-1}	0.0308	0.0056*
Government $Stability_{t-1}$	0.0026	0.0043
Socioeconomic Conditions $_{t-1}$	0.0334	0.0085*
Investment Profile $_{t-1}$	0.0057	0.0082
Internal Conflict $_{t-1}$	0.0096	0.0084
External Conflict $_{t-1}$	0.0174	0.0119
Real GDP_{t-1}	-0.0009	0.0018
Inflation $_{t-1}$	-0.0064	0.0020*
Trade Balance $_{t-1}$	-0.000002	0.000002
Debt_to_GDP_{t-1}	-0.0098	0.0016*
Currency depreciation $_t$	-0.0031	0.0007*
Currency volatility $_t$	0.0001	0.0002
STD stock returns $_t$	0.0102	0.0020*
STD comp. stock returns $_t$	-0.0072	0.0028*

Notes: (1) The models were estimated with GLS (heteroskedastic with cross-sectional correlation and panel-specific AR(1)). (2) The first figure refers to the coefficient and the second to the SE. (3) *,**,*** refer to statistical significance in 1%, 5% and 10% respectively.

Table 3.9: Coefficient equality and difference for crisis dummies

	Test (=0)	Coef.	Std. Err.	P>|z|
CCR	DpreL - DL - DpostL	-0.4378	0.2090	0.0362**
	DpreL - DL	-0.0733	0.0337	0.0295**
	DpreL - DpostL	-0.1031	0.0455	0.0235**
	DL - DpostL	-0.0297	0.0338	0.3784
CCR_O	DpreL - DL - DpostL	-0.9579	0.2147	0.0000*
	DpreL - DL	-0.0947	0.0353	0.0073*
	DpreL - DpostL	-0.1456	0.0474	0.0021*
	DL - DpostL	-0.0508	0.0355	0.1517
CCR_Oadj	DpreL - DL - DpostL	-1.3379	0.1975	0.0000*
	DpreL - DL	-0.0799	0.0354	0.0240**
	DpreL - DpostL	-0.1207	0.0475	0.0110**
	DL - DpostL	-0.0408	0.0354	0.2487

Note: *,**,*** refer to statistical significance in 1%, 5% and 10% respectively.

3.6 Conclusions

The purpose of this paper is to investigate the drivers of asset allocation across emerging markets (EMEs) in three different regions. Possible factors are the macroeconomic performance and soundness indicators, political and country risk indicators as well as emerging market competitor's stock market returns and volatilities.

Our findings indicate a combination of factors that determine equity shares. Credit ratings, standardized stock market returns, standardized competitor's stock market returns, inflation, debt to GDP, political risk rating (PRR) and currency depreciation were the factors found significant in explain equity shares for these fifteen economies.

Future work can extend this paper regarding the lag structure of the determinants and alternative model specifications.

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Appendix 3

Table A3.1: TNA data availability

Region	Emerging Market
Latin America	Brazil
	Chile
	Mexico
EMEA	Czech Republic
	Russia
	South Africa
	Turkey
Asia	China
	India
	Indonesia
	South Korea
	Malaysia
	Philippines
	Taiwan
	Thailand

Table A3.2: Data Sources

Variables	Frequency	Source
(i) Total Net Assets	Monthly	EPRF Global
(ii) Country Risk	Monthly	International Country Risk Guide (ICRG) PRS Group Inc.
(iii) Imports, exports, share prices, exchange rates, inflation, GDP, net lending/borrowing, gross debt, current account	Monthly/ Quarterly/ Annual	IMF database (International Financial Statistics)/Local Central Banks/Local Statistical Services
(iv) Credit ratings	Monthly	Constructed from data by S&P corporation

Table A3.3: ICGR Risk Components

(i) POLITICAL RISK COMPONENTS	***Points***
Component	***(max.)***
Government stability	12
Socioeconomic conditions	12
Investment profile	12
Internal conflict	12
External conflict	12
Corruption	6
Military in politics	6
Religious tensions	6
Law and order	6
Ethnic tensions	6
Democratic accountability	6
Bureaucracy quality	4
Maximum total points	**100**

(ii) FINANCIAL RISK COMPONENTS	**Points**
Component	**(max.)**
Foreign debt as a percentage of GDP	10
Foreign debt service as a percentage of XGS*	10
Current account as a percentage of XGS*	15
Net liquidity as months of import cover	5
Exchange rate stability	10
Maximum total points	**50**

Table A3.3 (continued): ICGR Risk Components

(iii) ECONOMIC RISK COMPONENTS *Component*	***Points (max.)***
GDP per head of population	5
Real annual GDP growth	10
Annual inflation rate	10
Budget balance as a percentage of GDP	10
Current account balance as a percentage of GDP	15
Maximum total points	**50**

Note: XGS is exports of goods and services

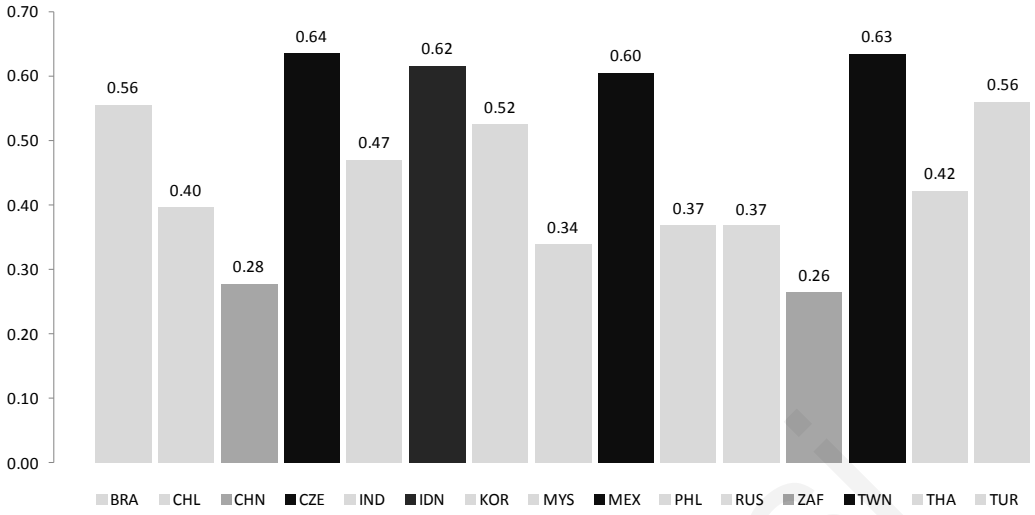
Source: The PRS Group Inc., www.prsgroup.com

Table A3.4: Comprehensive Credit Rating (CCR)

Explicit Credit Rating	
Sovereign Rating	CCR
AAA	21
AA+	20
AA	19
AA-	18
A+	17
A	16
A-	15
BBB+	14
BBB	13
BBB-	12
BB+	11
BB	10
BB-	9
B+	8
B	7
B-	6
CCC+	5
CCC	4
CCC-	3
CC	2
C	1
SD, D	0

Note: As denoted in Gande and Parsley (2010)

Figure A3.1: Correlations of the EM stock retruns with the MSCI world index returns



The average correlation to MSCI world index returns is 0.47. Regarding MSCI world index returns, the countries with the highest correlations are Czech (0.64), Taiwan (0.63), Indonesia (0.62) and Mexico (0.60) while the countries with the lowest correlation are South Africa (0.26) China (0.28).

Conclusion

The thesis provides a number of novel empirical results for the emerging financial markets using both time-series and panel model models.

In Chapter 1 we investigate bi-directional return and volatility spillovers between the emerging stock market and the foreign exchange market, by also incorporating spillovers from the global and regional stock market, for twelve emerging economies. We estimate a multivariate VAR model with a GARCH type variance-covariance dynamic specification for each country. Findings indicate strong evidence of bi-directional causality in variance between the stock and the foreign exchange markets in all emerging economies examined, with the exception of Colombia. The global and regional stock markets contribute significantly to volatility spillovers as well. On assessing the effects of the Asian crisis using the notion of shift contagion, we have found a significant effect on the volatility transmission mechanism between the emerging stock market and the foreign exchange market in both directions. Additionally, our findings indicate that more flexible exchange rate regimes are associated with higher volatility spillovers between the emerging stock market and the foreign exchange market for most of the economies examined here.

In Chapter 2 we investigate the determinants of equity flows across emerging markets and identify the main significant factors among the following: global factors, domestic economic and political factors and also sovereign credit ratings. We estimate a panel fixed effects model for a sample for sixteen countries. Our findings indicate that equity flows are mainly driven by global "push factors" instead of by country specific "pull factors". The VIX index, often referred to as the "fear" index and a measure of aggregate volatility, and the US money expansion are the significant factors explaining capital flows. The domestic pull factors that turn out to be significant are the exchange rate changes and the trade balance. Interestingly, once we take into account other determinants of equity flows, the credit ratings are not found to have any explanatory power in explaining equity flows. Finally, the political stability indicator appears marginally significant on its own, but included in a model along with other economic factors, then only the global "push factors", exchange rate changes and trade balance are the only remaining significant.

In Chapter 3 we investigate what drives asset allocation across fifteen emerging markets from three geographical regions**.** According to economic theory the factors driving asset allocation are the macroeconomic performance and soundness indicators, political and country risk indicators and emerging market competitor's stock market returns and volatilities as well. Estimating a Seemingly Unrelated Regression model our results indicate a combination of factors affecting equity shares. The significant factors explaining equity shares for these fifteen economies are inflation, debt to GDP, credit ratings, political risk rating, currency depreciation, and as well standardized stock market returns and standardized competitor's stock market returns.