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Global Stock Market Integration of Emerging Markets in a Globalizing World

Evolution and Impact of Globalization Sub-Categories

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Abstract :

While emerging countries seem increasingly integrated into global markets, only a few measures are consistent with this intuition. The thesis constructs a measure of integration based on the explanatory power of a multi-factor model. It empirically shows an upwards trend in global stock market financial integration in the Asian, EMEA, and American emerging countries over the last three decades. Only three countries are exceptions. Moreover, the research suggests that emerging countries might be more integrated into the global market via their conditional standard deviation. The analysis of the 2008 crisis has demonstrated that the contagion of a financial crisis decreases the markets' integration, and this observation is especially accurate for the more integrated markets. Finally, financial and informational globalization positively and significantly influences the integration of emerging markets. The inclusion of control variables allows the study to highlight that both local regulatory and global non-regulatory factors impact the financial integration of emerging markets.

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Chapter 1

Introduction

1.1 Context of the Research

Research in finance has mainly focused on developed countries, particularly the United States and the G7 members. These are the most efficient markets in the world where market conditions are most likely to match the assumptions of theoretical models. The data is also rich and granular. The situation is, however, different in emerging markets. The data available is far from extensive and existing models are often inadequate to their specificities. The study of emerging markets allows both the adaptation of current models to new market conditions and the development of new models (Bekaert & Harvey, 2003a). Emerging countries have also attracted interdisciplinary interest that connects investment, corporate finance, international economics, development economics, law, demography, and political science (Bekaert & Harvey, 2002). The unique characteristics of these markets allow a better understanding of the financial markets in a broad economic development.

Emerging markets have therefore attracted particular interest in recent years. Potential high returns and diversification advantages have enabled emerging capital markets to become an increasingly important asset class. Although the percentage of capital flows to emerging countries has increased significantly, it remains relatively low compared to their economic activity. This situation is due to the fact that emerging markets are historically segmented from global markets. International investors may encounter implicit or explicit barriers to acquiring capital. Some financial markets are indeed subject to administrative or tax regulations that may constitute obstacles to foreign investors.

The country's level of integration is, therefore, not without implications. Financial integration is critical in international finance with a profound effect on diversification, risk-sharing, or cost of capital. Furthermore, financial integration is often associated with the wealthiest nations and benefits many citizens. Investors will likely prefer a flexible market, with cap-

ital mobility and cross-border trade, typically experienced in integrated markets. However, financial integration does not only bring benefits and also has disadvantages.

On the one hand, financial integration can promote economic growth, increase risk-sharing or allocate capital more efficiently. On the other hand, it may also lead to high cross-border economic interdependence, and the transmission of shocks (Cappiello, Kadareja, Gerard, & Manganelli, 2006). Increasingly integrated financial markets could induce a strong positive correlation between the equity returns of different countries, which may reduce the benefits of international portfolio diversification.

In this context, it is reasonable to argue that understanding and measuring financial integration is critical for many players in international finance.

1.2 Motivations & Research Questions

Financial integration has received much attention recently, yet only a few integration measures are well-recognized. Most measures are flawed and inconsistent with the intuition that the global market seems increasingly integrated.

In the early 1990s, developing countries gained access to foreign capital, which has led to an increase in emerging countries' capital flows (Bekaert & Harvey, 2002). It has been facilitated by financial liberalization, easing restrictions on foreign ownership of assets, and other measures to develop their capital markets. These actions have often been taken in tandem with macroeconomic and trade reforms. As a result, new capital markets have emerged, and it is commonly believed that financial integration in emerging countries has increased since then.

Nevertheless, most tests that have been conducted either via correlations between returns (Bekaert, Hodrick, & Zhang, 2009), or the evolution of betas relative to a global benchmark ((Bekaert & Harvey, 2000) and (Baele, 2005)) do not find strong evidence for increased integration. It is, therefore, essential to construct a reliable quantitative measure in line with intuition. Indeed, Pukthuanthong and Roll (2009) state that most measures of quantitative integration are wrong while the hunch is correct.

First, this paper aims to build an indicator in line with intuition. The thesis analyzes financial integration's evolution quantitatively to verify the assumption that markets are increasingly integrated. Furthermore, emerging markets seem to be a particularly attractive sample because of their unique characteristics. In this regard, the objective of the master's thesis will be to answer the following research question.

Research Question

"How has evolved global stock market financial integration in emerging countries?"

The literature review ((Imbs, 2010) and (Lane, 2013)) revealed that financial integration leads to a risk of financial contagion, meaning that the probability of a crisis occurring in a given country is higher if another country experiences a financial crisis. For example, this phenomenon was observed in 2008, when the contagion of this crisis around the world had severe consequences for cross-border markets. The growth of cross-border positions in World GDP has stopped, reflected in a decrease in capital flows to and from advanced economies.

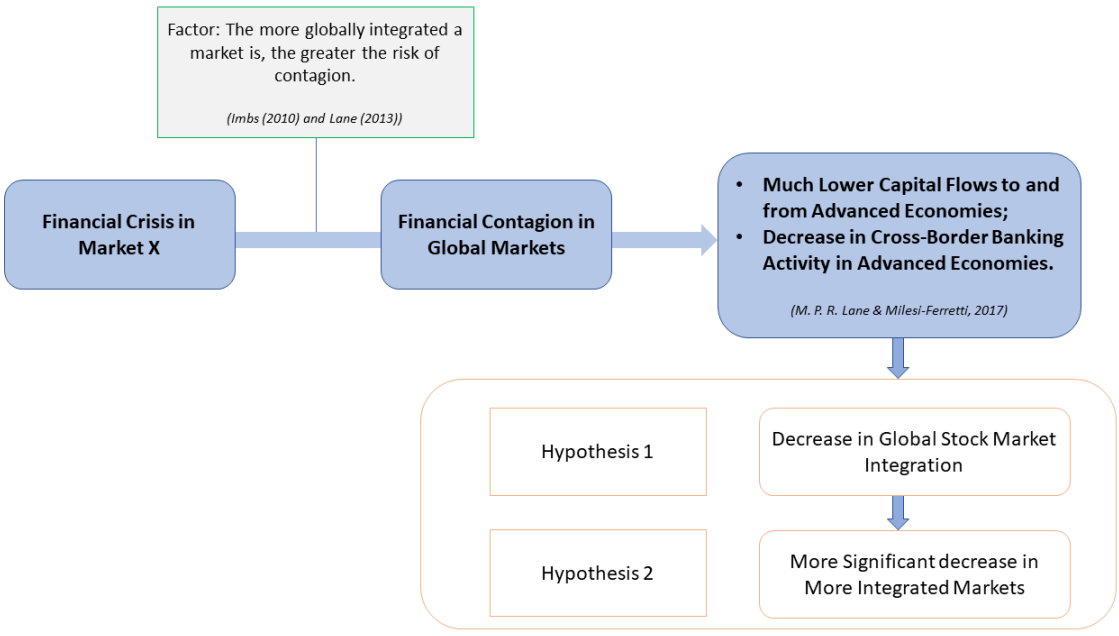
Therefore, the following hypothesis can be formulated:

Hypothesis 1: The global financial crisis induces a decrease in financial integration through the process of financial contagion.

Furthermore, since the financial integration of a market facilitates the contagion of a crisis, the thesis formulates the following second hypothesis:

Hypothesis 2: The decrease in financial integration is more significant in the most financially integrated countries.

Figure 1.1: Overview Sub-Research Question 1



The sub-research question 1 will answer the following question:

Sub-Research Question 1

"Has the financial crisis of 2008 resulted in a decrease in global stock market financial integration and is this decrease more significant for the most integrated markets?

Conditional volatility of market returns evolves through quiet periods and periods of economic turbulence and has recently attracted considerable attention in international finance. For example, Bekaert, Hodrick, and Kiguel (2019) have shown that conditional variance is priced in a 3-factor CAPM. The price of this volatility risk factor is negative because investors see increases in volatility as a deterioration in overall investment opportunities. The impact of integration on macroeconomic volatility has also been studied (Kose, Prasad, & Terrones, 2003). However, no papers have documented financial integration based on conditional volatility of returns. Yet, a market could also be considered globally financially integrated if global factors can explain the conditional volatility of returns. A second sub-research question is defined for this purpose.

Sub-Research Question 2

"How does a measure of financial integration based on conditional volatility evolves compared to a measure based on returns?"

Eventually, the world is becoming increasingly globalized. The abandonment of capital controls in both developed and emerging markets has led to unprecedented financial openness in the world, growing capital mobility, and international trade (Bekaert, Harvey, Lundblad, & Siegel, 2011). Globalization has been proceeding rapidly for a long time, and the influence of globalization on our daily lives remains a debated issue. It is legitimate to ask whether globalization has impacted emerging markets' integration in this environment. Consequently, the master's thesis will also investigate the impact of globalization on financial integration as sub-research question.

Sub-Research Question 3

"What impact has globalization had on the degree of global stock market integration in emerging countries"

1.3 Contributions of the Master's Thesis

This study benefits investors who need an instrument to measure integration and its evolution over time. It is particularly relevant for large institutional investors, such as pension funds and insurance companies, who need to decide on their strategic allocation (Bekaert & Harvey, 2017). Indeed, depending on the level of integration within the global capital markets, emerging markets could no longer be considered a separate asset class. Additionally, investors must consider the possibility that emerging markets are becoming increasingly integrated with associated diversification implications.

Studying the evolutions and factors of financial integration may also be helpful for policymakers. They must accurately measure the state of integration in the different market segments to identify areas where new initiatives are particularly needed. The identification of the factors allows for determining on which aspect to intervene. Central banks could also have an interest in this domain. The degree of financial integration is important in assessing the effectiveness of monetary policy transmission. Furthermore, financial integration also affects the structure of the financial system, which can have consequences on financial stability.

Finally, the master's thesis guides the international pricing model literature on the factors that generate higher risk than most developed markets and that command higher expected returns.

1.4 Structure of the Master's Thesis

The remainder of the paper is organized as follows.

- **Chapter 2** reviews the existing literature on the subject. The characteristics of emerging countries will be studied in the first step. This section will then look in detail at the concept of financial integration and provide an overview of the drivers of financial integration.
- **Chapter 3** focuses on the methodology followed in the master's thesis. It first describes the data-sets as well as the different models used in the study. It is shown how the integration measures are computed and the different tests that are applied to them.
- **Chapter 4** provides and discusses the results of my research. The selection of global factors, the analysis of my two integration measures, and the impact of globalization on financial integration are all addressed.
- **Chapter 5** concludes the thesis. It indicates the implications of the findings and the limitations of the study. Finally, some suggestions for future research are formulated.

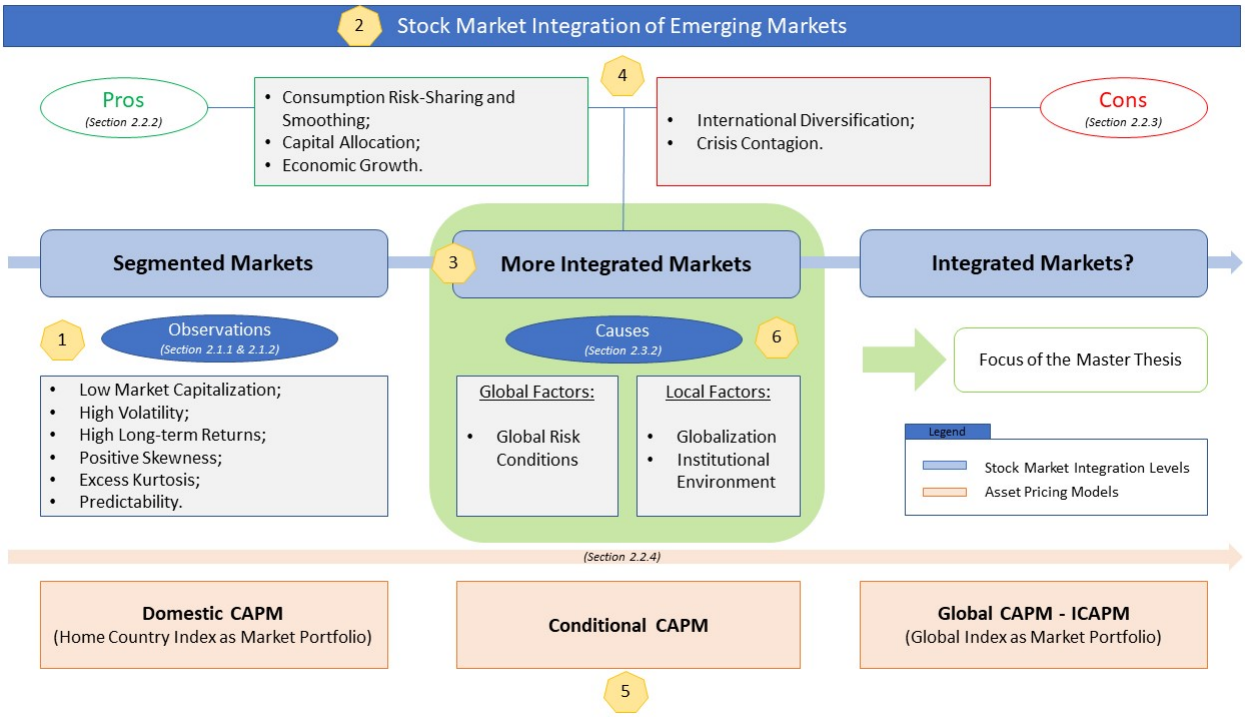
Chapter 2

Literature Review

2.1 Summary of the Literature Review

The purpose of this first part is to describe how the literature review has been conducted and how it helped me define the scope of my study. Figure 2.1 helps to synthesize my research.

Figure 2.1: Overview of the Literature Review



(1) First, the literature review focuses on the particular characteristics of emerging countries. Sections 2.2.2 and 2.2.3 explain the place of emerging countries in the economy and the characteristics of their stock returns. These observations come from emerging countries being historically segmented from the global equity market.

(2) The literature review then looked at the definitions of financial integration (2.3.1). It specifically describes the stock market integration via three indicators based on price, quantity, and regulations. The most recommended approach in the literature is the priced-based method.

(3) It has also been shown that these markets have undergone major changes in the past decades. Bekaert and Harvey (2017) highlights, for example, the liberalization of stock markets in emerging countries. Furthermore, fixed income, equities, and foreign direct investment (FDI) are gradually replacing commercial bank debt as the dominant source of foreign capital. Therefore, it is a common belief that emerging countries' financial integration has increased in recent years.

(4) The question of the benefits and drawbacks of financial integration might arise. Sections 2.3.2 and 2.3.3 thus endorse the pros and cons of financial integration. Although financial integration allows consumption risk-sharing and smoothing, better capital allocation, and economic growth, it diminishes the gains from international diversification and increases the risk of crisis contagion.

(5) This change in the level of financial integration also has a great impact on the theory of asset pricing (2.3.4). If a market is neither perfectly integrated nor completely segmented, an asset pricing model that considers a time-varying level of integration is required. Bekaert and Harvey (1995) have developed a model called conditional CAPM to this end.

(6) The causes of the potential increase in financial integration have been reviewed in Section 2.4.2. It reveals that financial integration can be influenced by global factors (e.g., global risk conditions) and local factors (e.g., the level of globalization of the country).

2.2 Equity Markets in Emerging Countries

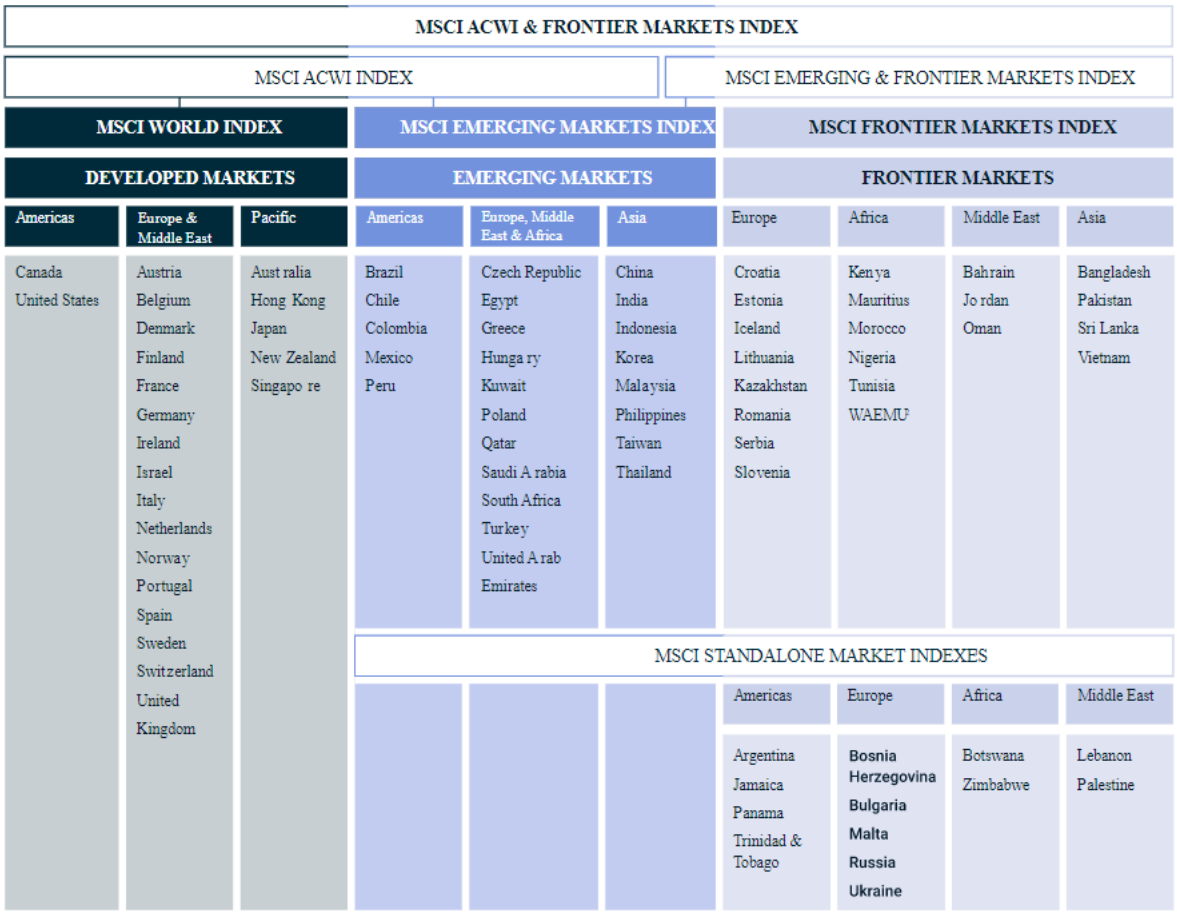
Emerging markets' growth has attracted particular interest in recent years. Potential high returns and diversification advantages have enabled emerging capital markets to become an increasingly important asset class. Although the percentage of capital flows to emerging countries has increased significantly, it remains relatively low compared to their economic activity. Moreover, the composition of this capital flow has evolved. Fixed income flows, equities and foreign direct investment (FDI) slowly replace commercial bank debt as the dominant source of foreign capital (Bekaert & Harvey, 2002).

In the context of this new importance, it is useful to understand emerging markets better. The first section of the literature review defines the term emerging market. It also looks at the place of emerging markets in the global economy and reviews the particular characteristics of emerging markets returns.

2.2.1 Definition

The term "emerging market" is associated with Antoine W. Van Agtmael of the World Bank's International Finance Corporation, who coined the term in 1981. A country is considered "emerging" if its GDP per capita is below a certain threshold that changes over time. It characterizes a nation whose economy is moving from a closed market to an open market system. In development economics, this phenomenon is known as convergence (Bekaert & Harvey, 2002). Nowadays, the World Bank no longer uses the term emerging country; it classifies economies according to their GNI per capita, calculated using the "Atlas" method. To this extent, the classification system does not imply a judgment on the development status of a country or territory. Standard & Poor's and MSCI still use this classification system (Figure 2.2). They distinguish developed, emerging, and frontier countries.

Figure 2.2: MSCI Annual Market Classification (2022)



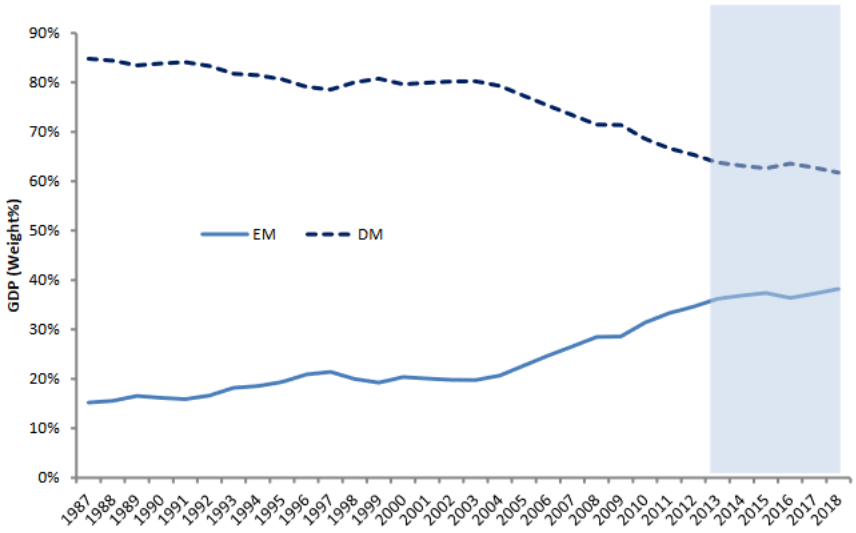
The last group (Frontier Markets) is considered pre-emerging since this market is investable but less accessible and riskier than the more established markets.

2.2.2 Emerging Market in the World Economy

It looks pretty likely that the GDP share of today's emerging markets will soon exceed the GDP share of developed markets (Figure 2.3). Emerging countries account for about 85% of the world's population and have tremendous growth potential. The upward trend is indeed evident. While in 1987, emerging markets contributed for 16% of the world's GDP, this figure rose to 40% in 2016.

However, the growing role of emerging markets in the global economy is not reflected in their capitalization on the global market. According to MSCI, the weight of emerging market capitalization was only 10.8% in 2016 (Figure 2.4). Although both GDP and market capitalization share of emerging markets have increased, they have failed to converge since the market capitalization share of emerging countries remains relatively low.

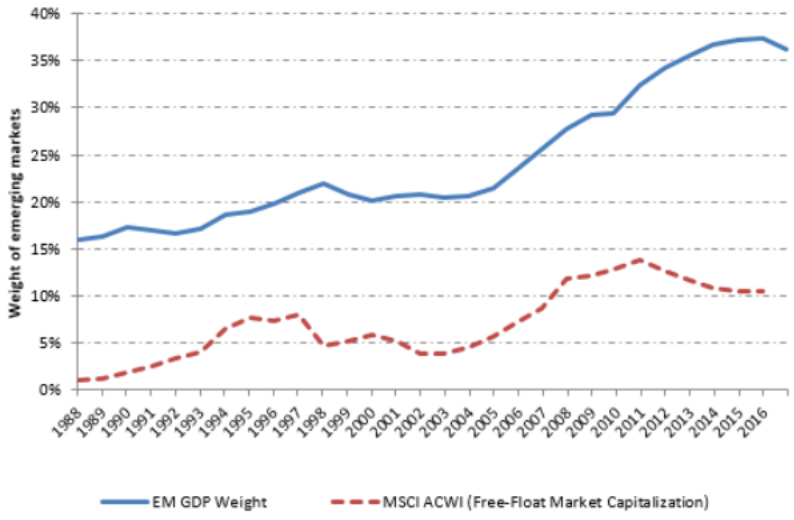
Figure 2.3: Emerging and Developed Countries' Share of World GDP



Source: (Bekaert & Harvey, 2017)

This lack of convergence is first partly explained by economic reasons. In many developing countries, banks are still the primary source of corporate financing, even if equity financing would be a viable financing channel in many large emerging markets (Bekaert & Harvey, 2017). Bekaert and Harvey (2002) suggested that the composition of this capital flow was changing. They predicted that fixed income flows, equities, and foreign direct investment (FDI) would gradually replace commercial bank debt as the dominant source of foreign capital. This transition has yet to take place and would have resulted in an increase in the market capitalization of emerging countries.

Figure 2.4: Emerging Markets' GDP and Equity Market Shares



Source: (Bekaert & Harvey, 2017)

A second important consideration concerns how market capitalization is measured. Indices providers such as MSCI do not report the entire market capitalization. They focus on the "free float" which refers to the level of equity available for investment. The number of outstanding shares available for trading by international investors is only taken into account in the calculations. MSCI excludes shares held by the company, its directors or employees, and governments or affiliated organizations. International investors may encounter implicit or explicit barriers to acquiring capital. Some financial markets are subject to administrative or tax regulations that may constitute obstacles to foreign investors. For example, Huizinga and Demirgüc-Kunt (1996) and Bekaert (1995) claim that regulatory limits may apply to the number of shares available to international investors in emerging countries. Furthermore, local governments may impose restrictions on non-domestic investors for sectors or companies deemed strategic or national interest. To sum up, the gap between the share of global GDP and the equity of emerging markets is explained by the fact that these markets have a low "free float" proportion (Bekaert & Harvey, 2017). It also suggests that emerging markets have a larger share of capital that is not accessible to international investors.

Finally, international portfolio allocation is explained by both rational and irrational behavior (Sercu & Vanpee, 2007). The irrationality of investors is expressed in the form of home bias. This behavioral factor explains why people invest too much in domestic stocks and miss the benefits of international diversification of the theoretically optimal investment portfolio.

2.2.3 Stock Returns in Emerging Markets

Research on emerging equity markets has highlighted particular characteristics of emerging market returns. The literature suggests some empirical regularities: high volatility, high long-term returns, positive skewness & excess kurtosis, and greater predictability than found in developed market returns (Bekaert, Erb, Harvey, & Viskanta, 1998). The following section will go through all the particular characteristics of emerging market returns.

2.2.3.1 Volatility & Average Returns

Emerging markets are often characterized by high volatility and average returns. Harvey (1995b) focuses on these descriptive statistics by analyzing monthly data for twenty countries, primarily from 1976 to 1992, using the IFC's Emerging Markets Database (EMDB). It documents that emerging market equities exhibit high volatility and average returns.

Differences between arithmetic and geometric mean returns also arise. On the one hand, the arithmetic mean provides the return for a strategy that invests an equal amount for each period, and the gains are not reinvested in the market. On the other hand, the geometric mean represents the average return of a buy-and-hold strategy, which is a more attractive portfolio interpretation. A preliminary amount is invested in the first period, and the portfolio is held until the end of the sample. Harvey (1995b) shows that the high volatility of emerging markets can induce large differences between arithmetic and geometric mean returns. The observed geometric average returns are higher than the arithmetic average returns.

De Santis et al. (1997) go in the same direction and argue that emerging markets are more volatile than developed markets. Qualitatively, the results in emerging markets are no different from developed market findings. Indeed, periods of high or low volatility tend to cluster together since volatility has high persistence and is predictable. The difference between emerging and developed market volatility is more pronounced from a quantitative perspective. De Santis et al. (1997) find that volatility is considerably higher in emerging markets, both conditionally and unconditionally.

Finally, Bekaert et al. (1998) provided substantial evidence on time-varying volatility in the 1990s. In fourteen of the nineteen countries, volatility declined. Bekaert and Harvey (2000), argue that this lower volatility is associated with the degree of integration in emerging markets.

2.2.3.2 Kurtosis & Skewness

Investors care about expected returns, variances, and covariances, but emerging market returns cannot be completely characterized by these measures alone. Investors have a preference for asymmetric returns. They prefer positively skewed distributions since there is some probability of earning huge profits that can cover all the frequent small losses. It is, therefore, necessary for investors to follow the distribution of assets.

The first observation is that the asset distribution of emerging markets deviates strongly from normality (Bekaert et al., 1998). Bekaert and Harvey (1997) studied the normality of a sample of 20 emerging countries. The generalized method of moments (GMM) suggests that the null hypothesis of unconditional normality can be rejected at the 5% level in 15 of the 20 emerging markets. The standard Bera-Jarque and Kolmogorov-Smirnov normality tests provide evidence against the normality hypothesis in 18 and 15 of the 20 countries, respectively. Moreover, emerging countries appear to have positive skewness and excess kurtosis distributions. Indeed, between April 1987 and March 1997, Bekaert et al. (1998) showed that seventeen out of twenty countries had positive skewness of returns, and nineteen out of

twenty countries had excess kurtosis. De Santis et al. (1997) go in the same direction. He showed that emerging markets have a higher kurtosis level than developed ones. This finding implies that emerging markets are more likely to be affected by surprises (outliers) due to their fat-tailed nature.

Besides the non-normality, the skewness and kurtosis change over time. Bekaert et al. (1998) observed that there could be dramatic changes in the characteristics of asset returns within emerging markets. To do this, the authors divided their sample into two distinct blocks. The first covers the 1980s period, while the second concerns the 1990s. Although it is challenging to measure skewness precisely over short periods, the study reveals that skewness has increased between the eighties and nineties. Indeed, the skewness increased for fourteen of the nineteen countries. The evidence for kurtosis is similar to skewness, with ten of the nineteen countries showing higher excess kurtosis in the 1990s. Chow's statistical tests are less suggestive, however, as they detect a significant difference between the 1980s and 1990s at the 10% significance level for only 4 countries regarding skewness and 4 for kurtosis.

2.2.3.3 Predictability

Predictability has important implications for asset pricing modeling. It is even more critical for traders and practitioners looking for price patterns to bet on the markets. 3 methods to measure predictability will be introduced.

Predictability can be defined via the concept of Random Walk (RW). If the price of a stock satisfies the Random Walk hypothesis (RWH), it implies that future stock prices are not predictable according to historical prices. Chang, Lima, and Tabak (2004) studied predictability according to multivariate variance ratio (VR) statistics. They claims that the emerging equity market indices do not resemble a random walk. In contrast, using the same methodology, the RWH cannot be rejected in the US and Japan.

Auto-correlation is a more straightforward measure of predictability. Harvey (1995a) studied auto correlations of market returns based on past market returns and showed that emerging markets have greater persistence (predictability). Out of 20 countries, only five developed countries have first-order auto-correlations that exceed 10%, while 12 emerging markets have auto-correlations above 10%. These results suggest that the returns of many emerging markets can be predicted based on past information.

Another branch of the literature focuses on predicting price changes using technical trading rules and determining whether abnormal profits can be made. In this regard, Chang et al. (2004) show that there is some evidence of forecasting power by employing variable

moving average (VMA) and trading range break (TRB) technical trading rules.

This persistence may be due to several factors. First, market imperfections may occur, such as the scarcity of trading in securities. Second, fundamental forces, such as predictable changes in global risk sensitivities, could also cause persistence in the returns (Harvey, 1995b). Nevertheless, Harvey (1995a) argues that local information variables play a much more important role in predicting emerging market returns. Indeed, local information contributes to more than half of the predicted variance of emerging market returns. The fact that much of the predictability is induced by local information is also consistent with the possibility that some countries are segmented from global capital markets.

2.3 Financial Integration

The concept of financial integration is the central element of the particular characteristics of emerging markets (2.2.3). This key concept is one of the main causes of these particular features. This section provides a clearer picture of this concept by defining financial integration and understanding how to measure it. It also states the advantages and disadvantages of being financially integrated. Finally, the importance of financial integration in asset pricing theory is presented.

2.3.1 Definitions & Associated Measures

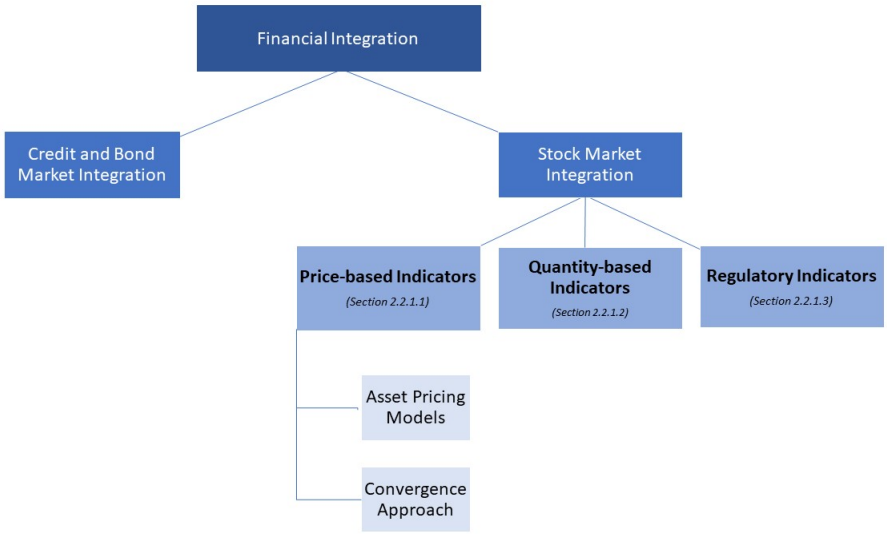
Many possible measures of financial integration have been developed, but few are well-accepted. The degree of integration may seem intuitively obvious to many, but quantitative integration measures often show results at odds with intuition. Pukthuanthong and Roll (2009) argue that the measures are mainly flawed, and the intuition is correct.

Intuitively, a market is said to be financially integrated with another economy if two respective markets are closely linked to each other. For instance, it can be reflected by cross-border capital flows or information sharing between financial institutions. The term financial integration can nevertheless be defined in more detail depending on the type of market considered. A distinction is indeed made between (i) Credit, and Bond Market Integration and (ii) Stock Market Integration (Adam, Jappelli, Menichini, Padula, & Pagano, 2002). Figure 2.5 gives an overview of the possible classification of the definitions of financial integration.

The master thesis will focus on the second category since the stock market indices of emerging countries will be studied. The particular interest in stock market integration comes from the observations of the first section (2.2). It was indeed first shown that despite the large GDP share of these markets in the world economy, the share of their capitalization remains

very moderate. Moreover, it has been shown that emerging stock markets show interesting characteristics, probably due to the fact that emerging stock markets are segmented from the world economy. Therefore, the more general term financial integration will be used to describe global stock market integration.

Figure 2.5: Overview of Financial Integration Classification



Broadly speaking, financial integration can be classified into three categories:

(i) **Price-based Indicators**: It measures differences in asset prices or returns caused by the geographic origin of the assets (2.3.1.1);

(ii) **Quantity-based Indicators**: It quantifies the effects of the frictions faced by the demand and supply of investment opportunities (2.3.1.2)

(iii) **Regulatory (or institutional) Indicators**: It mainly examines the effects of different legal and institutional frameworks on the degree of financial stock market integration (2.3.1.3).

Adam et al. (2002) suggest that it is possible to assess the usefulness of indicators through the availability and reliability of the data, the economic usefulness, and the ease of constructing and updating the indicators. Price-based indicators have attracted more attention because they fulfill the above conditions well. Of course, measures must be selected according to the specificities, and data availability of the market (Billio, Donadelli, Paradiso, & Riedel, 2017).

The following sections provide a definition for each category and the associated indicators.

2.3.1.1 Price-based Indicators

Two methods are possible to measure integration based on prices.

Definition (1):

The first method is based on the theory of asset pricing. Under this point of view, two assets with the same level of risk and the same expected cash flow should have the same price, regardless of the market in which they are traded (Beckers, Connor, & Curds, 1996). In this scenario, asset pricing theory is consistent, and the markets are perfectly integrated. This definition is thus also similar to the law of one price, which is very attractive. However, asset pricing models are difficult to estimate in an international context and require long time series to provide reliable estimates. Moreover, the asset pricing methodology does not generally take into account the dynamic component of financial market integration but only focuses on comparative statistics (Adam et al., 2002).

Measures (1):

The measures of financial integration of such an approach are therefore based on known models of asset pricing (CAPM, ICAPM, etc.).

Definition (2):

The second approach looks at the convergence of security returns across different markets. Specifically, it investigates whether the returns' movements are related to common factors. The more financially integrated a market is, the more the movement of returns is linked to international factors. On the contrary, a market is said to be segmented if the movement of returns is linked to local factors. In the literature, this approach is preferred for research purposes. Since this definition is based on a correlation principle, it will be easier to perform reliable and accurate empirical tests. Moreover, the convergence-based definition requires little historical data to perform the test, whereas asset pricing theory requires much more (Beckers et al., 1996).

Measures (2):

It is also widely accepted that integration is a dynamic concept. It is therefore important to consider a measure that captures the evolution of the degree of integration of equity markets over time (Billio et al., 2017). Billio et al. (2017) then compared the different empirical methodologies of financial integration (Table 2.1). The key challenge of these measurements

is to balance the calculation's complexity with the measurement's accuracy.

Table 2.1: Priced-based (convergence) Financial Integration Measures

Measure	Studies on Financial Integration	Dynamic	Comov.Bias	Heterosk.	Stochastic Interdep.
SC	Goetzmann et al. (2005); Quinn and Voth (2008)	X			
R2	Pukthuanthong and Roll (2009); Yu et al. (2010)	X	X		
1stPC	Volosovych (2011); Volosovych (2013)	X	X		
Corr. (ASI)	Ball and Torous (2006)	X			X
Forbes-Rigobon Corr.	Connolly et al. (2007)	X		X	
DCC-GARCH	Chiang et al. (2007); Wang and Moore (2008); Egert and Kocenda (2011)	X		X	
BEKK-GARCH	Caporale and Spagnolo (2011); Bekiros (2013)	X		X	
Cond. Beta	Choudhry and Jayasekera (2013); Jayasinghe et al. (2014)	X		X	

Source: (Billio et al., 2017)

The main conclusion of his work states that the most sophisticated measures produce almost identical equity market integration patterns. The heteroskedasticity-corrected measures tend to produce more volatile integration patterns in the short run but align with the other measures in the long run.

The standard correlation (SC) would be an easily implementable measure with a straightforward interpretation. Although SC is still widely used as integration measure, it has been the subject of severe criticism in several articles (Bekaert et al. (2009), Carrieri, Errunza, and Hogan (2007), Pukthuanthong and Roll (2009)). Pukthuanthong and Roll (2009) wrote: *"The simple correlation between broad financial market index returns from two countries can be a poor measure of their economic integration"*.

2.3.1.2 Quantity-based Indicators

Definitions:

According to this definition, a market is integrated if all investors have equal access to all securities worldwide. In this framework, the goal is to quantify the effects of friction between the demand and supply of investment opportunities. Hence, statistics providing information on the ease of market access are used to define financial integration. These can be flow measures or holdings measures (Baele, Ferrando, Hördahl, Krylova, & Monnet, 2004). For instance, the greater the number of assets that move from one market to another, the more integrated the market is considered. It can also be referred to as *de facto* integration.

Measures:

The indicators can either be flow measures, or holdings measures.

Table 2.2: Quantity-based Financial Integration Measures

Flow Measures	Holdings Measures
- Amount of international capital flows - Number of trades involving foreign investors	- Share of foreign equities in the total equity portfolio held by national funds (Home Bias) - Share of national assets held by foreign funds

2.3.1.3 Regulatory (or institutional) Indicators

Definition:

The idea of this definition is the same as for the quantity-based approach (2.3.1.2). As seen previously, a market is integrated if all investors have equal access to all securities worldwide. The difference is that this definition is not interested in quantity-based indicators but rather regulatory ones. The term *de jure* integration is sometimes used.

Formally, Baele et al. (2004) define a market as fully integrated if all potential market participants with the same relevant characteristics:

(1) Are faced with a single set of rules when deciding to deal in those financial instruments and/or services;

(2) Have equal access to the above set of financial instruments and/or services;

(3) Are treated equally when they are active in the market.

Indeed, some financial markets may be subject to administrative or tax regulations, which may be obstacles to investing abroad. This definition takes into account both components of a financial market, namely the supply and demand of investment opportunities. It distinguishes between full and partial integration. Full integration requires the same access to financial institutions for investors (demand for investment opportunities) and firms (supply of investment opportunities). Furthermore, integration is considered complete if there is no discrimination between market participants solely based on their place of origin. A region is defined as partially financially integrated if it does not favor domestic investors' access to foreign investors (demand side) but imposes constraints on foreign firms on the domestic exchange (supply-side) (Baele et al., 2004).

Measures:

To measure the heterogeneity of legal systems in a market and their relative efficiency, Adam et al. (2002) recommend using the indicators provided by Djankov, La Porta, Lopez-de Silanes, and Shleifer (2001).

(i) The Dispute Resolution Regulation (DRR) index, which measures the extent to which legal procedures deviate from the hypothetical benchmark of a third party informally resolving a dispute between two other parties;

(ii) The expected duration of the proceedings.

2.3.1.4 Further Considerations

Further considerations must be emphasized in defining financial integration. Financial integration is not about removing friction in the intermediation process (access to or investment of capital through institutions or markets). Even in the presence of frictions, several areas can be financially integrated as long as the frictions affect these areas symmetrically. Financial integration is, therefore, more concerned with the symmetric or asymmetric effects of existing frictions. Baele et al. (2004) gives us a concrete example to illustrate this point. When contracts are written between two countries that do not speak the same language, one option would be to write the document in a third language. In this case, friction exists since the citizens of both countries will have to bear the cost of translating this third language into their respective languages. However, both parties are treated symmetrically by this friction and therefore does not constitute an obstacle to the financial integration between the two countries.

2.3.2 Integration's Advantages

2.3.2.1 Consumption Risk-Sharing & Smoothing

Financial integration offers additional opportunities for consumption risk-sharing and smoothing in both developed and emerging countries (Baele et al., 2004). However, there were serious doubts about these stated benefits, specifically in emerging countries. Indeed, emerging markets and their various types of incompleteness limit the transactions in the international capital market and are even subject to a risk of sudden stoppages of the capital flows.

Contrary to these concerns, Suzuki (2014) shows favorable evidence for the benefits of international financial integration by testing the Rational Expectation and Permanent Income Hypothesis (RE/PIH). Testing these hypotheses is relevant since it explores how financial integration alters consumption responses to income shocks and consumption risk sharing. Specifically, consumption should react less to unexpected slope shocks as countries become more integrated into the global capital market.

Theoretical models show that more integrated countries are better able to cope with various types of income shocks. Thanks to the exchange of shares and securities, consumption is less sensitive to unforeseen transitory income shocks in more integrated countries. The

agents of a zone fully share the risk (Baele et al., 2004).

Furthermore, the results of Suzuki (2014) arose an important political implication. It suggests that greater financial integration, especially through cross-border holdings of financial assets, is beneficial to the public welfare through the sharing and smoothing of consumption risks. This assertion is still valid, despite the incomplete and precarious character of the international capital market of emerging countries.

2.3.2.2 Capital Allocation

Baele et al. (2004) explain that greater financial integration allows for better capital allocation. As segmentation decreases, investors will be allowed to invest their funds where they believe they will be put to the most productive use. Full integration means removing barriers to trading, clearing, and settlement platforms, allowing firms to choose the most efficient trading, clearing and/or settlement platforms. In this way, Baele et al. (2004) conclude that a reallocation of funds to the most productive investment opportunities will occur.

2.3.2.3 Economic Growth

Indirectly, financial integration also has a positive effect on economic growth in the market (Baele et al., 2004). The previous paragraph showed that financial integration should allow for better capital allocation and thus increase the flow of funds for investment opportunities in certain regions. It would primarily promote greater financial development, which would ultimately have a positive effect on economic growth (Figure 2.6).

Figure 2.6: Financial Integration's Impact on Economic Growth

Several studies ((Giannetti et al., 2002), (Baele et al., 2004)) have shown that financial integration promotes financial development in countries. However, the mechanism by which financial integration affects financial development differs between the two studies.

In the first scenario, Giannetti et al. (2002) argue that the integration process will increase competition within less developed regions. As a result, it would reduce intermediation costs and thus improve the efficiency of their financial systems. In addition, the authors argue that it should consequently make the financial systems of these regions more attractive to local and foreign agents. This greater participation would enhance the development of these financial systems.

In the second scenario, Baele et al. (2004) argue that in the process of financial integration, the increased availability of investment opportunities matters, not the location of intermediation. They say that the financial system in the more financially developed regions will take advantage of this greater availability to overtake all or part of the intermediation process in the less financially developed areas. In their view, the financial development of the less financially developed countries that are financially integrated will take place through the resumption of financial activities in that region. Suppose the financial system of a financially well-developed region takes over all or part of the financial activities of another area. In that case, this process can be considered as a development of the financial system of the latter. In this scenario, the study recommends monitoring the integration process closely, as a monopoly situation could arise through takeovers of the banking sector.

Financial systems play a fundamental role in the economy and affect economic growth intuitively through the accumulation of capital and technology (Levine, 1997). Indeed, it allows (i) Reducing uncertainty by facilitating the exchange, hedging, diversification, and pooling of risks; (ii) Allocating resources; and (iii) Mobilizing savings.

Economic growth and financial development are intertwined, and it isn't easy to draw a conclusion about causality. Notwithstanding, Rousseau (2002) finds empirical evidence that financial development promotes investment and business by reallocating capital. Jayaratne and Strahan (1996) show that financial development causes economic growth. Finally, Bekaert, Harvey, and Lundblad (2002) find that equity market liberalization increases subsequent average annual real economic growth.

In conclusion, financial integration is crucial as a further step towards financial development, which appears to be conducive to higher economic growth.

2.3.3 Integration's Disadvantages

2.3.3.1 International Diversification

The benefits of international diversification have been known and studied since the 1970s. Grubel (1968) finds that between 1959 and 1966, American investors would have obtained better risk-return opportunities by investing part of their portfolio in foreign equity markets. Grubel and Fadner (1971) show that between 1965 and 1967, sectoral correlations within countries are higher than sectoral correlations between countries. One solution to show the benefits of international diversification is to compare the variance of an internationally diversified portfolio and a portfolio that invests in only one country. Solnik (1974b) showed that an internationally diversified portfolio has only half the risk of a diversified portfolio of US stocks.

The diversification principle is based on the covariance between stocks. Indeed, the lower the covariance between securities, the lower the variance of a diversified portfolio relative to the variance of the securities that constitute the portfolio (Goetzmann, Li, & Rouwenhorst, 2001). The low correlation between stocks in different national markets is the main reason for international diversification. However, this is not the only way to benefit from international diversification. A second important factor is the number of markets available to investors (opportunity set). The more markets that are available, the more diversification investors can achieve in their portfolios. This factor is significant in determining the long-term benefits of international diversification, as the number of available markets has varied greatly over the past 150 years.

Thanks to this decomposition Goetzmann et al. (2001) state that about half of the diversification benefits offered today to the international investor are due to the increasing number of global markets, and the other half is due to a lower average correlation between the available markets.

Some trends emerge within these two factors. On the one hand, the opportunity set has expanded considerably over the last few decades. The benefits of international diversification have been boosted by the existence of smaller, emerging capital markets. On the other hand, the correlations between the main markets have increased. In this context, financial integration plays an important role. Greater financial segmentation leads to lower correlation. It is due for example to informational barriers, transaction barriers, and political risks ((Chen & Knez, 1995)) and (Korajczyk, 1996)).

In the early 1990s, the advantages of emerging markets in terms of diversification were highlighted. Nowadays, these benefits are questionable. Bekaert and Harvey (2017) pointed out that the emerging market index had a correlation with the world index of about 0.40. Following the stock market liberalization of these markets, the correlations with the rest of the world have increased. Since then, the gradual increase in correlations has continued, which no longer justifies the benefits of diversification in emerging markets, according to Bekaert and Harvey (2017).

Goetzmann et al. (2001) moderate these arguments somewhat. In his view, the periods of greater integration have both advantages and disadvantages for international investors. On the one hand, they widen the range of opportunities since emerging markets are more easily accessible. On the other hand, the integration of emerging countries increases correlations with developed countries, and the benefits of diversification diminish.

In conclusion, today's integration seems deeper and broader than in the past. The integration of global markets is double-edged. Indeed, it allows investors to diversify across borders (opportunity set), but it also reduces the attractiveness of doing so (correlation).

2.3.3.2 Crisis Contagion

While financial integration offers gains in consumption risk-sharing and smoothing or economic growth, it can also carry substantial risks. Indeed, financial linkages between countries are also responsible for the rapid transmission of banking and financial crises across national borders (Devereux & Yu, 2020).

Eichengreen (2010) and Lane (2013) argue that the primary causes of a global crisis are related to regulatory failures and misperceptions of risk concentration. However, they claim that the financial contagion was facilitated by the integration of financial markets. To better understand this concept, it is necessary to define what the authors mean by contagion and financial crisis.

Contagion in equity markets refers to the notion that markets move more closely together during periods of crisis (Bekaert & Harvey, 2003b). Devereux and Yu (2020) specify that financial contagion is the probability of a financial crisis in a given country if another country experiences a financial crisis. To understand the impact of financial integration, Devereux and Yu (2020) simulated the probability of crises and financial contagion as a function of the degree of financial integration and the severity of the crisis.

A financial crisis is defined by Devereux and Yu (2020) as (i) a binding credit constraint and (ii) a one-standard-deviation decline in output from its trend. The term financial crisis is divided into "general crisis" which corresponds to a broad definition of a financial crisis. The "severe crisis" refers closely to systemic crises, while a "deleveraging crisis" is comparable to a "moderate crisis". The different results that the authors have obtained can be found in Table 2.3.

Table 2.3: Simulated Probability of Crises

	(1) **Severe crisis**	(2) **Deleveraging crisis**	(3) **General crisis**
Panel A: Financial autarky:			
Prob. of crises (%)	6	2	19.1
Panel B: Bond market integration:			
Prob.of crises (%)	7.9	3	25
Financial contagion (%)	27.9	4.1	50.6
Panel C: Equity market integration:			
Prob. of crises (%)	9.3	3.5	32.4
Financial contagion (%)	51.6	5.5	73.6

Source: (Devereux & Yu, 2020)

The conditional probability that a second country is impacted a crisis given that the home country is in crisis ("general crisis") is 6% in financial autarky (segmented market). In contrast, this conditional probability rises to almost 52% with financial integration. This tendency can be observed in every type of crisis and clearly shows that the most integrated markets have a greater contagion power.

There are several reasons for this phenomenon. First, if a crisis in one integrated country is associated with a rise in global interest rates, this will increase the cost of borrowing globally. The crisis will likely spread between countries. The second factor concerns the impact of endogenous risk sharing on investor behavior. As explained above, financial integration allows for a substantial increase in risk-sharing and a decrease in consumption variability. However, it sometimes leads to a reduction in precautionary savings and an increase in credit and leverage at the global level. The higher the borrower's leverage, the more likely a rise in global interest rates will generate a crisis (Devereux & Yu, 2020). Finally, balance sheets are directly interdependent in the case of equity integration. Consequently, the value of the collateral in the investors' portfolios is linked to the price of the shares. Since foreign investors are likely to hold an internationally diversified portfolio, shocks to foreign equity prices also directly impact the value of domestic collateral, independent of the global interest rate. This leads to a direct increase in the degree of financial contagion.

Devereux and Yu (2020) conclude that since investors do not take into account the impact

of their borrowing and investment decisions on the probability of financial crises, this contagion represents a negative externality that reduces the welfare benefits of financial integration.

Besides, they find that financial integration introduces a trade-off between the frequency and severity of financial crises. Indeed, although crises arise more often in financially integrated, the study also highlights that the crises in an open global capital market are less severe than in closed economies. According to Devereux and Yu (2020), integrated markets have the ability of international capital markets to absorb country-specific shocks. First, Lane (2013) says that following a decline in domestic asset prices, foreign investors could provide new capital inflows in the form of portfolio investment and foreign direct investment. Second, more integrated countries have the opportunity to repatriate foreign assets, which could help solve liquidity problems.

2.3.4 Importance of Financial Integration in Asset Pricing Theory

It is commonly accepted that the CAPM of Sharpe (1964) and Lintner (1965) must be adapted to an international context, and the question of how to account for additional uncertainties is central. The literature has shown that the notion of financial integration has a vital role to play in answering this question. This section will show how financial integration has emerged as key in this issue.

2.3.4.1 From CAPM to ICAPM

Sharpe (1964) and Lintner (1965) have established that the relevant risk measure for the investment portfolio is not the variance of its returns, as asserted by Markowitz (1952), but its contribution to the total risk of the market portfolio. The impact of a specific investment on the entire risk of the market portfolio is given by its beta coefficient (β_i), which measures the systematic risk.

Bouchet, Clark, and Groslambert (2003) explain that the CAPM could hold in an international portfolio context without any modifications. The beta would still be the most appropriate risk measure. Nevertheless, a very restrictive assumption must be made since it must be assumed that Purchasing Power Parity (PPP) is respected worldwide. In reality, though, Adler and Dumas (1983) have shown that in the short term, PPP does not hold. They have proved that two investors of different origins have different notions of real return for the same security. It happens when their price indices, when converted into the same currency, are different. Adler and Dumas (1983) explain that these differences come from different tastes in terms of consumption on the one hand and from differences in the prices of the various commodities to which investors have access on the other hand. Therefore, international investors face an exchange risk due to the deviation from the PPP. The CAPM

developed by Sharpe (1964) and Lintner (1965) must be adapted to the international context.

In this regard, Solnik (1974a) developed the International Capital Asset Pricing Model (ICAPM) in order to take the exchange risk exposure into account.

$$\mathbb{E}[r_i] = r_f + \beta_i[\mathbb{E}[r_m] - r_f] + \sum_{k=1}^{K} \gamma_{i,k} RP_k \tag{2.1}$$

He added to the previous model (CAPM) a currency risk premia RP_k where $\gamma_{i,k}$ aims to reflect the exposure to exchange risk of asset i in a country k. Solnik therefore still describes the expected return as a function of β_i, but it also includes the currency risk premia, which reflects the exchange risk.

The ICAPM model assumes that capital markets are perfect, with no transaction costs, taxes, or capital controls. This model also implies a complete international market integration since investors are presumed to hold a diversified portfolio of equities from all national markets. Indeed, the market portfolio (r_m) is, in this case, a world market portfolio.

2.3.4.2 Accounting for the Level of Financial Integration

As discussed above, financial integration plays a role in asset pricing theory. Solnik's ICAPM holds under the assumption that markets are perfectly integrated. But two other cases are possible. The market could also be completely segmented. In this case, Bruner, Li, Kritzman, Myrgren, and Page (2008) claim that a domestic CAPM with the home country index as the market portfolio is the appropriate choice. Therefore, the choice of the market portfolio to be used in the regression depends on the level of integration. Finally, we must consider the possibility that a market is neither perfectly integrated nor completely segmented. Agmon (1973), Lessard (1976), Beckers et al. (1996), and Griffin and Stulz (2001) all highlight the fact that markets are driven by local and global factors.

To deal with the last two cases, researchers have developed a series of specific models to calculate the cost of equity in foreign countries, including emerging markets. Most of these models are based on the CAPM. Practitioners tend to adjust the beta coefficient, the risk premium, or the risk-free rate upwards, because the standard CAPM does not correspond to empirical data and seems to give too low discount rates (Bouchet et al., 2003).

A modified version of the CAPM developed by Bekaert and Harvey (1995) considers the possibility that markets are not fully integrated, and that risk measures change over time. They created a dynamic version of the CAPM called conditional CAPM, which allows the

degree of market integration to change over time.

The authors argue that in a perfectly integrated market, the country risk is only reflected by the covariance between a world benchmark portfolio and the country return ($Cov_{t-1}[r_{i,t}, r_{w,t}]$). The expected returns in any country ($r_{i,t}$) is affected by their covariance with a world benchmark portfolio ($r_{w,t}$). In segmented markets, the variance of the expected returns ($Var_{t-1}[r_{i,t}]$) is the relevant measure of country risk. The cost of equity in foreign countries s given in this case by:

$$\mathbb{E}[r_{i,t}] = \phi_{i,t-1}\lambda_{t-1}Cov_{t-1}[r_{i,t}, r_{w,t}] + (1 - \phi_{i,t-1})\lambda_{i,t-1}Var_{t-1}[r_i, t] \tag{2.2}$$

The degree of integration $\phi_{i,t-1}$ with the world financial market will determine what risks explain risk premiums in capital markets. $\phi_{i,t-1}$ fails in the interval [0,1]. If the degree of integration is 1, it implies that only covariance with the world portfolio is priced. The null hypothesis of market segmentation is rejected. Conversely, only variance is priced if $\phi_{i,t-1}$ is zero. A quantitative measure of financial integration is needed to use this model.

2.4 Globalization

In the early 1990s, developing countries regained access to foreign capital, and capital flows to emerging markets increased dramatically (Bekaert & Harvey, 2003a). It was made possible by the process of financial liberalization, easing restrictions on foreign ownership of assets, and taking other initiatives to develop their capital markets. These measures were often taken in tandem with macroeconomic and trade reforms. As a result, new capital markets have emerged. It is, therefore, appropriate to ask what impact globalization has had on the process of financial integration in emerging countries and which factors of globalization have been most influential. To answer this question, a deeper understanding of globalization is needed.

2.4.1 Definition

According to Gygli, Haelg, Potrafke, and Sturm (2018), *"Globalization describes the process of creating networks of connections among actors at intra- or multi-continental distances, mediated through various flows including people, information and ideas, capital, and goods. Globalization is a process that erodes national boundaries, integrates national economies, cultures, technologies, and governance, and produces complex relations of mutual interdependence"*.

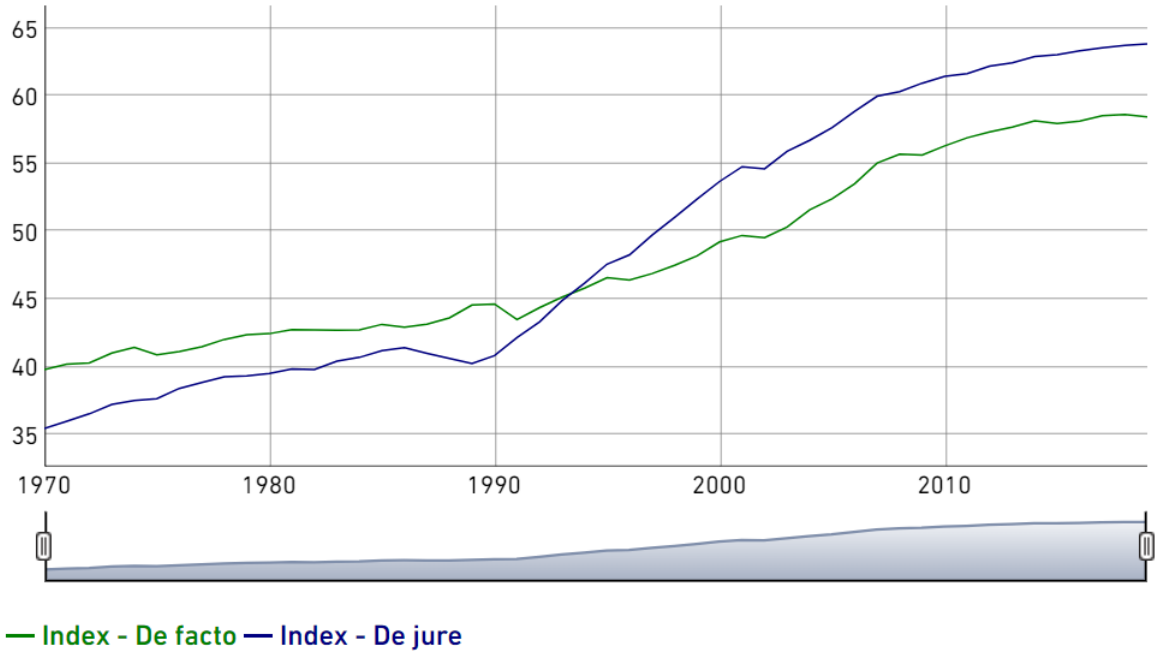
Several terms come very close to globalization, such as internationalization, liberalization, universalization, or westernization. Scholte (2008) and Caselli (2012) have pointed out the differences between the different terminologies. According to them, globalization is the spread of transplanetary or supra-territorial connections between people. Internationalization refers to an increase in transactions and interdependencies between countries. Liberalization refers to removing officially imposed restrictions on the movement of resources between countries, while universalization describes the dispersing of various objects and experiences to people in all inhabited parts of the earth. Finally, westernization is interpreted as a particular type of universalization in which Western societies' social structures are spread worldwide.

All these concepts are close, and the literature sometimes uses these terminologies interchangeably. Figge and Martens (2014), argue that a distinction of all these concepts is not necessary when a pluralistic and multi-scale definition of globalization is employed, which will be the case in our study.

Globalization can be distinguished in three different dimensions (Dreher, 2006). First, economic globalization can be considered, and it characterizes the long-distance flows of goods, capital, and services as well as information and perceptions that accompany market exchanges. Then, social globalization expresses the diffusion of ideas, information, images, and people. Finally, political globalization characterizes the diffusion of government policies.

The definition of globalization can also differ in the way it is measured. *De facto* globalization measures actual flows and activities. *De jure* globalization measures policies, resources, conditions and institutions. Theoretically, *de jure* globalization should facilitate real flows and activities, and thus *de facto* globalization. Nevertheless, the two measures can differ in substantive ways. For example, when a policy is strict on paper but ineffective in practice (Kose, Prasad, Rogoff, & Wei, 2009). Moreover, Figure 2.7 shows that since 1995, *de jure* globalization has been growing considerably faster than *de facto* globalization (Gygli et al., 2018).

Figure 2.7: Evolution of *de jure* and *de facto* Globalization



Source: (Gygli et al., 2018)

2.4.2 Globalization's Impact on Financial Integration

The impact of globalization on financial integration has been little studied, and the literature has instead focused on the impact of globalization on expected returns. However, it is also essential to understand what factors influence financial integration. As globalization has increased rapidly over the past thirty years, the process of globalization is the most obvious candidate for the increase in integration that seems to be occurring (Bekaert et al., 2011).

Bekaert et al. (2011) is the only research that has studied the impact of the globalization factor on a segmentation measure. Their segmentation measure is regressed to 69 countries over a sample period of more than 20 years. The author considered only capital account, equity market, and trade openness to measure *de jure* globalization.

As expected, all the variables that Bekaert et al. (2011) considered to measure globalization have a negative coefficient. Globalization, therefore, tends to decrease financial segmentation. However, not all coefficients are statistically significant. Capital account openness and equity market openness have each higher explanatory power (in terms of R^2) than trade openness. In conclusion *de jure* globalization plays a central role in explaining valuation differences across countries.

Furthermore, they have also decided to consider six new variable categories: Measures of

de facto Openness, Political Risk and Institutions, Financial Development, Risk Appetite and Business Cycles, Information variables, and Growth determinants. By adding these new variables, Bekaert et al. (2011) shows that both a country's regulation for foreign capital flows and certain non-regulatory factors are essential. On the one hand, they show that local factors are important. Indeed, factors such as the institutional environment and the development of local financial markets significantly impact their segmentation measure. On the other hand, variables reflecting global risk conditions, such as the U.S. credit spread, also explain a significant part of the variation in th SEG measure. In total, the variables considered explaining about 30% of the variation in their measure of market segmentation.

From an economic perspective, equity market openness is the most important explanatory variable. Equity market development is almost as important and accounts for most of the variance in explained segmentation.

It seems well admitted that globalization has reduced the effective segmentation of markets in recent decades. Nevertheless, it is difficult to quantify this reduction's magnitude, timing, and sources. Indeed, regulatory openness, or any other factor, is not a proxy of market integration, as other factors, such as political risk and low liquidity, can cause segmentation. For example, past literature (Bekaert and Harvey (1995) and Carrieri et al. (2007)) has reported reversals in the degree of market integration despite increasing globalization.

Chapter 3

Methodology

The objective of this section is to present the different data-sets as well well as the theoretical framework of the models used in this study. Specifically, the section describes practically how it is possible to quantitatively measure the financial integration of a market and assess the impact of different factors.

3.1 Data

The study conducted requires three distinct types of data that will be described in this section. It furthermore details the sources and time frame of the data.

3.1.1 Markets' Indices

The first data set consists of several stock market indices in developed (13) and emerging countries (24). They will be used to construct the quantitative measure of financial integration. The data is collected from Datastream, a platform that provides stock market indices for many countries and long periods. The 24 emerging countries were selected according to the classification made by MSCI (Figure 2.2).

Sometimes, several different indices might be used for the same country. Indeed, DataStream provides indices from different companies such as MSCI, S&P, or FTSE. In this case, the index with the broadest coverage and the longest period is preferred. Table 3.1 shows the selected indices' names, sources, start and end dates, DataStream mnemonic, and the total number of returns considered. The period considered for the returns of the developed countries goes from January 2, 1973, to December 31, 2021. The sample of daily returns then contains 12,784 observations for the developed countries. The starting date of the observations for the emerging countries varies from January 01, 1974 (South Africa) to January 01, 2015 (United Arab Emirates).

Specifically, the selected indices refer to Price Indices (PI) and do not include reinvested dividends. As a general principle, today's index is calculated by applying the change in the market performance to the previous period's index level (MSCI, 2020).

$$PI_t = PI_{t-1} * \frac{Adjusted_t}{Initial_t} \tag{3.1}$$

Where the PI is the Price Index. $Adjusted_t$ is the Adjusted Market Capitalization of the Index at time t, while $Initial$ is the initial Market Capitalization of the Index at time t.

Finally, the indices are converted to a common currency. It is a general practice in empirical studies of international financial markets to mitigate exchange rate effects (Pukthuanthong & Roll, 2009). Therefore, the local currency indices are converted to US dollars. The $ symbol in the mnemonic column of Table 3.1 indicates that the original local currency has been converted to US dollars using the DataStream exchange rate conversion facility. Of course, no conversion occurs if the index is already in US dollars.

Table 3.1: Country Index Sample Periods and Index Identification.

	Country	Name	Sources	DataStream mnemonic	Begins	Ends	# Daily Returns
Developed Countries	Australia	Australia-DS Market $ - Price Index	DataStream	TOTMAU$	02/01/1973	31/12/2021	12784
	Austria	Austria-DS Market $ - Price Index	DataStream	TOTMOE$	02/01/1973	31/12/2021	12784
	Belgium	Belgium-DS Market $ - Price Index	DataStream	TOTMBG$	02/01/1973	31/12/2021	12784
	Denmark	MSCI Denmark $ - Price Index	MSCI	MSDNMK$	02/01/1973	31/12/2021	12784
	France	MSCI France $ - Price Index	MSCI	MSFRNC$	02/01/1973	31/12/2021	12784
	Germany	MSCI Germany $ - Price Index	MSCI	MSGERM$	02/01/1973	31/12/2021	12784
	Ireland	Ireland-DS Market $ - Price Index	DataStream	TOTMIR$	02/01/1973	31/12/2021	12784
	Japan	MSCI Japan $ - Price Index	MSCI	MSJPAN$	02/01/1973	31/12/2021	12784
	Netherlands	Netherlands-DS Market $ - Price Index	DataStream	TOTMNL$	02/01/1973	31/12/2021	12784
	Singapore	Singapore-DS Market $ - Price Index	DataStream	TOTMSG$	02/01/1973	31/12/2021	12784
	Switzerland	MSCI Switzerland $ - Price Index	MSCI	MSSWIT$	02/01/1973	31/12/2021	12784
	United Kingdom	United Kingdom-DS Market $ - Price Index	DataStream	TOTMUK$	02/01/1973	31/12/2021	12784
	United States	S&P 500 Composite - Price Index	S&P	S&PCOMP	02/01/1973	31/12/2021	12784
Americas EM	Brazil	MSCI Brazil $ - Price Index	MSCI	MSBRAZ$	01/01/1988	31/12/2021	8871
	Chile	Chile-DS Market $ - Price Index	DataStream	TOTMCL$	01/01/1990	31/12/2021	8350
	Colombia	MSCI Colombia $ - Price Index	MSCI	MSCOLM$	01/01/1993	31/12/2021	7566
	Mexico	Mexico-DS Market $ - Price Index	DataStream	TOTMMX$	02/01/1989	31/12/2021	8610
	Peru	MSCI Peru $ - Price Index	MSCI	MSPERU$	01/01/1993	31/12/2021	7566
EMEA EM	Czech Republic	MSCI Czech Republic $ - Price Index	MSCI	MSCZCH$	02/01/1995	31/12/2021	7045
	Egypt	MSCI Egypt $ - Price Index	MSCI	MSEGYT$	02/01/1995	31/12/2021	7045
	Greece	Greece-DS Market $ - Price Index	DataStream	TOTMGR$	02/01/1989	31/12/2021	8610
	Hungary	MSCI Hungary $ - Price Index	MSCI	MSHUNG$	02/01/1995	31/12/2021	7045
	Kuwait	MSCI Kuwait $ - Price Index	MSCI	MSKUWA$	02/01/2006	31/12/2021	4175
	Poland	Poland-DS Market $ - Price Index	DataStream	TOTMPO$	02/01/1995	31/12/2021	7045
	Qatar	MSCI Qatar $ - Price Index	MSCI	MSQATA$	02/01/2006	31/12/2021	4175
	Saudi Arabia	MSCI Saudi Arabia $ - Price Index	MSCI	MSSAUD$	01/01/2015	31/12/2021	1827
	South Africa	South Africa-DS Market $ - Price Index	DataStream	TOTMSA$	01/01/1974	31/12/2021	12524
	Turkey	Turkey-DS Market $ - Price Index	DataStream	TOTMTK$	02/01/1989	31/12/2021	8610
	United Arab Emirates	MSCI United Arab Emirates $ - Price Index	MSCI	MSAUAE$	01/01/2015	31/12/2021	1827
Asia EM	China	China-DS Market $ - Price Index	DataStream	TOTMKCH	03/01/1994	31/12/2021	7305
	India	MSCI India $ - Price Index	MSCI	MSINDI$	01/01/1993	31/12/2021	7566
	Indonesia	Indonesia-DS Market $ - Price Index	DataStream	TOTMID$	01/01/1991	31/12/2021	8089
	Korea	Korea-DS Market $ - Price Index	DataStream	TOTMKO$	01/01/1988	31/12/2021	8871
	Malaysia	Malaysia-DS Market $ - Price Index	DataStream	TOTMMY$	01/01/1987	31/12/2021	9191
	Philippines	Philippines-DS Market $ - Price Index	DataStream	TOTMPH$	01/01/1988	31/12/2021	8871
	Taiwan	Taiwan-DS Market $ - Price Index	DataStream	TOTMTA$	01/01/1988	31/12/2021	8871
	Thailand	Thailand-DS Market $ - Price Index	DataStream	TOTMTH$	01/01/1988	31/12/2021	8871

Notes: Thirty-seven countries have index data provided by DataStream, a division of Thomson Financial. Among them, 13 are developed countries, 24 are emerging countries in the Americas, Asia and EMEA. The number of daily returns available varies from 12784 to 4175 depending on the country. All index values are converted into a common currency, the U.S. dollar. The mnemonic DataStream is presented to allow easy retrieval of the index for future searches.

3.1.2 Globalization Index (KOF)

The second data set is designed to study the effects of globalization on financial integration. To further examine the impact, globalization must first be measured. Even if several globalization indices exist, they are the most single indices. They include a single factor, such as trade as a percentage of GDP, as a proxy for globalization. Using a composite index that considers the many facets of globalization would be preferable. Globalization also includes citizens of different countries communicating with each other and exchanging ideas and information, or governments working together to solve global policy problems (Gygli et al., 2018). The advantage of composite indices is that they allow different variables measuring different aspects of globalization to be combined into a single index.

The KOF globalization index was chosen for this purpose. Moreover, it is probably the most popular globalization index because it encompasses an extensive data set of 203 countries and territories. It is calculated from 1970 to 2019, and regular updates allow it to increase its lifetime. Unfortunately, some data are not available for all countries and years. To deal with this issue, the authors decided to impute these missing data within a series thanks to linear interpolation.

The index includes economic, social, and political dimensions of globalization and allows differentiating between *de facto* and *de jure* globalization. In addition, the index is made up of sub-dimensions constructed based on 43 individual variables. All dimensions and individual variables are detailed in Table A.1.

Gygli et al. (2018) decided to perform a channel normalization for each individual variable. The variables are transformed into an index on a scale of 1 to 100. 100 represents the maximum possible value for all countries and for the entire period. The resulting data perform well in terms of sensitivity to outliers, which is a clear advantage over the original series. Also, a weighting will be assigned to each variable and individual variable. The details of the weights can be found in Table 3.2.

First, the weights of the sub-indices are kept fixed over the time horizon. For example, economic globalization is composed of trade globalization and financial globalization, each of which is assigned a weight of 50%. Social globalization comprises personal contacts, information flows, and cultural proximity, each accounting for one-third of the index. Finally, economic, social, and political globalization are aggregated in the Globalization Index with equal weights.

Second, and in contrast to the indices and sub-indices, the weights of the individual vari-

ables vary over time. The weights of these variables are determined by principal component analysis over a 10-year rolling data window, and the weights are determined to maximize the variation of the principal component. The procedure of weighing the variables offers the possibility to adapt to the changing relevance of certain variables.

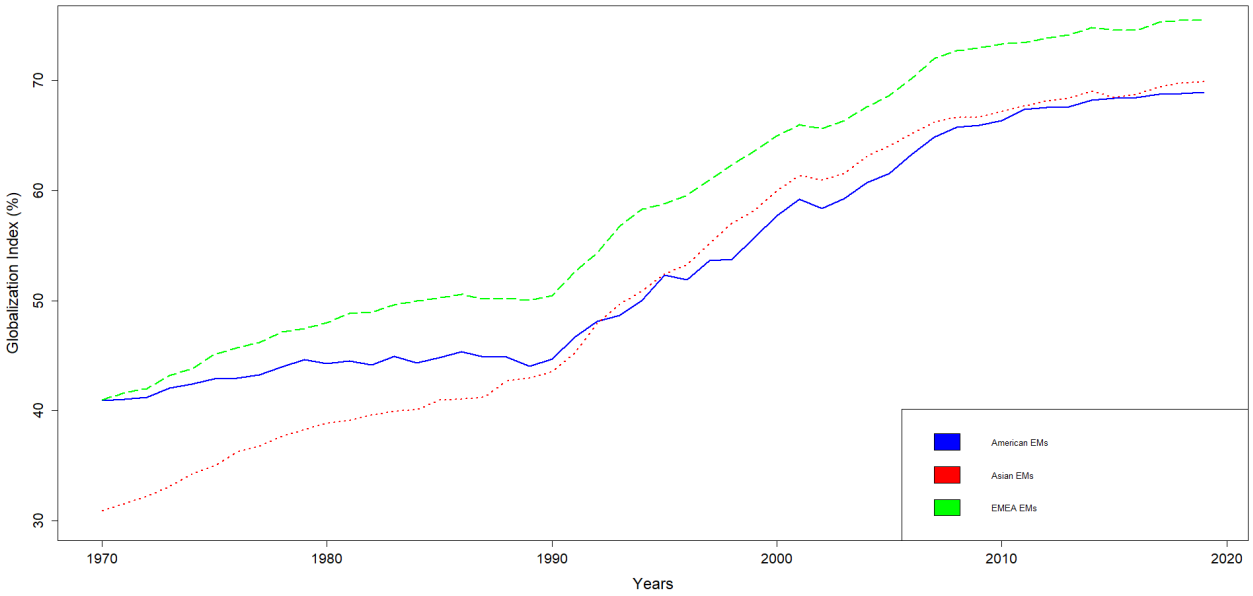
Table 3.2: Globalisation Index: Structure, Variables and Weights

Globalisation Index, de facto	Weights	Globalisation Index, de jure	Weights
Economic Globalisation, de facto	***33.3***	***Economic Globalisation, de jure***	***33.3***
Trade Globalisation, de facto	*50.0*	*Trade Globalisation, de jure*	*50.0*
Trade in goods	37.2	Trade regulations	26.8
Trade in services	43.0	Trade taxes	28.1
Trade partner diversity	19.8	Tariffs	27.1
		Trade agreements	18.0
Financial Globalisation, de facto	*50.0*	*Financial Globalisation, de jure*	*50.0*
Foreign direct investment	26.3	Investment restrictions	30.2
Portfolio investment	16.7	Capital account openness	39.0
International debt	28.6	International Investment Agreements	30.8
International reserves	1.0		
International income payments	27.4		
Social Globalisation, de facto	***33.3***	***Social Globalisation, de jure***	***33.3***
Interpersonal Globalisation, de facto	*33.3*	*Interpersonal Globalisation, de jure*	*33.3*
International voice traffic	20.7	Telephone subscriptions	39.1
Transfers	22.1	Freedom to visit	32.4
International tourism	21.1	International airports	28.6
International students	19.0		
Migration	17.2		
Informational Globalisation, de facto	*33.3*	*Informational Globalisation, de jure*	*33.3*
Used internet bandwidth	40.7	Television access	37.7
International patents	29.6	Internet access	43.3
High technology exports	29.6	Press freedom	19.0
Cultural Globalisation, de facto	*33.3*	*Cultural Globalisation, de jure*	*33.3*
Trade in cultural goods	28.6	Gender parity	22.5
Trade in personal services	24.8	Human capital	41.7
International trademarks	7.9	Civil liberties	35.8
McDonald's restaurant	22.0		
IKEA stores	16.8		
Political Globalisation, de facto	***33.3***	***Political Globalisation, de jure***	***33.3***
Embassies	37.2	International organisations	36.5
UN peace keeping missions	24.7	International treaties	32.4
International NGOs	28.2	Treaty partner diversity	30.9

Notes: Weights in percent for the year 2019. Weights for the individual variables are time variant. Overall indices for each aggregation level are calculated by the average of the respective *de facto* and *de jure* indices.

The KOF globalization index is a panel data set because it presents information across different countries (N) and over time (T). It, therefore, has a cross-sectional and time-series dimension. Moreover, the index corresponds to unbalanced panel data. Indeed, not all individuals are observed over the same time period ($T_i \neq T$). The objective was, therefore, first to balance the dataset. It has been decided to keep the countries with 25 historical data (1995-2019). Qatar, Kuwait, and United Arab Emirates are no longer included in the second part of the research. In the end, the panel dataset is composed of 19 countries ($N = 19$) observed during 25 years ($T = 25$). In total, there are 475 observations. As the number of the year is bigger than the number of countries ($T > N$), it is called a long panel or macro panel.

Figure 3.1: Globalization Index in Emerging Markets (1970-2019)



It can be seen in Figure 3.1 that globalization has been increasing over the last few years and that the level is slightly higher in the emerging countries of EMEA than in the other regions. You will also find a summary Table (A.2) in the appendices with descriptive statistics for each dimension of globalization in the different regions (EMEA, Asia, America).

Globalization indices have though certain limitations. Like many other indices, the KOF index measures globalization at the national level, which has certain drawbacks. First, Martens, Caselli, De Lombaerde, Figge, and Scholte (2015) argue that the index omits all transactions within the country and thus neglects the geographical distribution of linkages. They add that focusing on the national perspective contradicts the idea that globalization is eroding national boundaries.

3.1.3 Control Variables

Besides the globalization variables, the thesis will also consider different control variables. Indeed, many other characteristics might effectively segment markets other than globalization. Table A.3 shows more details about the control variables.

3.1.3.1 Political Risk

The first category of variables controls for Political Risk. Indeed, La Porta, Lopez-de Silanes, Shleifer, and Vishny (1997) stress the importance of investor protection and, more generally, the quality of institutions and the legal environment. Poor institutions and political instability can affect foreign investors' assessment of risk and easily segment capital markets. Financial openness alone may not be enough to attract foreign capital if the country is considered excessively risky (Bekaert et al., 2011). To measure this risk, the *Worldwide Governance Indicators (WGI)* have been selected from *The World Bank*. It reports aggregate and individual governance indicators for over 200 countries and territories across six dimensions of governance: Voice and Accountability, Political Stability Freedom from Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption.

3.1.3.2 Growth Determinants

The second category concerns Growth Factors. In developing countries, growth prospects are likely to be more local and could impact their financial integration. The initial level of GDP per capita and population growth will, therefore, also be incorporated into the model.

3.1.3.3 Risk Appetite & Business Cycle

Finally, the Risk Appetite & Business Cycle might also represent potential push factors driving capital flows. Unlike the other control variables mentioned above, these variables are based on U.S. or global data and only exhibit time-series variation. First, the U.S. corporate bond yield spread is used. Keim and Stambaugh (1986) show that the yield spread has some explanatory power for the variation in equity risk premia. Also, the VIX option volatility index is included to account for risk aversion or global investor sentiment. The VIX index is generally considered an indicator of market uncertainty, and sudden increases in its level lead to a flight to safety. $World\ GDP\ growth$ is used to control the business cycle. Bekaert et al. (2011) explain that the global business cycle affects discount rates and growth opportunities on a global scale and should, therefore, not affect the financially integrated countries. However, this may not be the case for emerging, more financially segmented countries.

3.2 Model

The section explains the different models and is divided into three parts. The first part concerns the creation and study of a measure of financial integration based on the Pukthuanthong and Roll (2009) paper. This first measure is called *Return Integration* ($INTRet$) in the rest of the thesis since it is constructed from the returns of the indices. The second part investigates a new measure of financial integration based this time on the standard deviation of the indices. It will therefore be called *Risk Integration* (INT_{Risk}). Finally, the third part describes how the impact of globalization on financial return integration is studied.

3.2.1 Stock Market Financial Integration (INT_{Ret})

The first part of my paper is devoted to the construction of the quantitative measure of financial return integration (INT_{Ret}). According to Pukthuanthong and Roll (2009), the correlation coefficient may represent an inadequate measure of integration because two perfectly integrated countries may not have a perfect correlation between their returns. As an alternative, they propose a price-based measure constructed on the explanatory power of a linear multifactor model that does not rely on any particular asset pricing model.

3.2.1.1 Creation of the Global Factors

The explanatory variables are global factors obtained by applying PCA to the weighted index returns of 13 major countries. The global risk factors should be interpreted as non-traded risk factors that influence global financial markets. The 13 countries have been chosen since they possess a long tradition of free capital mobility and are recognized by many observers as the most globally integrated countries. Furthermore, they all have historical data from 1973.

The global factors must be created for each sample year (1973-2021). Therefore the first step is to split the daily returns per year. As a result, 49 matrices (X_t) are obtained. X_t is a matrix containing the daily returns of the 13 major countries for each year t, with $t \in$ (1973,2021).

Pukthuanthong and Roll (2009) aimed at producing out-of-sample global factors. To this end, the authors suggest first weight the returns of year t (X_t) by the eigenvectors of the covariance matrix from the previous year (Σ_{t-1}). Then PCA is applied on the weighted returns of year t (W_t). The resulting first k^{th} PCs will be considered the global factors for the year t.

Formally, X_t is a $n_t \times 13$ matrix where n_t is the number of daily returns in year t (varying year to year between 260 and 262). There are 13 columns $(X_1, X_2, ..., X_{13})$, like the number of the major countries included.

$$X_t = \begin{pmatrix} x_{1,1} & x_{1,2} & \cdots & x_{1,13} \\ x_{2,1} & x_{2,2} & \cdots & x_{2,13} \\ \vdots & \vdots & \ddots & \vdots \\ x_{n,1} & x_{n,2} & \cdots & x_{n,13} \end{pmatrix}_t \tag{3.2}$$

In order to weight X_t, the covariance matrix Σ_t (13×13) must first be computed for each year.

$$\Sigma_t = \begin{pmatrix} Var(x_1) & Cov(x_1, x_2) & \cdots & Cov(x_1, x_{13}) \\ Cov(x_2, x_1) & Var(x_2) & \cdots & Cov(x_2, x_{13}) \\ \vdots & \vdots & \ddots & \vdots \\ Cov_(x_{13}, x_1) & Cov(x_{13}, x_2) & \cdots & Var(x_{13}) \end{pmatrix}_t \tag{3.3}$$

Then, the eigenvectors (V_i) can be computed each year from the covariance matrix (Σ) and sorted from the largest to smallest eigenvalues (λ_i). The eigenvalues and eigenvectors are defined as:

$$\Sigma V_i = \lambda_i V_i \tag{3.4}$$

A matrix V_t (13×13) is constructed and composed of the 13 eigenvectors found each year.

$$V_t = \begin{pmatrix} v_{1,1} & v_{1,2} & \cdots & v_{1,13} \\ v_{2,1} & v_{2,2} & \cdots & v_{2,13} \\ \vdots & \vdots & \ddots & \vdots \\ v_{13,1} & v_{13,2} & \cdots & v_{13,13} \end{pmatrix}_t \tag{3.5}$$

The matrix V_{t-1} allows to weight the returns (X_t).

$$W_t = X_t \times V_{t-1} \tag{3.6}$$

$$\begin{pmatrix} w_{1,1} & w_{1,2} & \cdots & w_{1,13} \\ w_{2,1} & w_{2,2} & \cdots & w_{2,13} \\ \vdots & \vdots & \ddots & \vdots \\ w_{n,1} & w_{n,2} & \cdots & v_{n,13} \end{pmatrix}_t = \begin{pmatrix} x_{1,1} & x_{1,2} & \cdots & x_{1,13} \\ x_{2,1} & x_{2,2} & \cdots & x_{2,13} \\ \vdots & \vdots & \ddots & \vdots \\ x_{n,1} & x_{n,2} & \cdots & x_{n,13} \end{pmatrix}_t \times \begin{pmatrix} v_{1,1} & v_{1,2} & \cdots & v_{1,13} \\ v_{2,1} & v_{2,2} & \cdots & v_{2,13} \\ \vdots & \vdots & \ddots & \vdots \\ v_{13,1} & v_{13,2} & \cdots & v_{13,13} \end{pmatrix}_{t-1} \tag{3.7}$$

$$(n \times 13) = (n \times 13) \times (13 \times 13) \tag{3.8}$$

The last step to construct the out-of-sample global factors is to calculate the principal components of the eigenvector-weighted returns W_t. As proxies for global factors, the first k^{th} principal components are retained such that they account for 90% of the cumulative eigenvalues (90% of the total volatility of the covariance matrix). The number of factors selected is arbitrary, but Pukthuanthong and Roll (2009) considered reasonable to assume that it would capture most of the global shocks. The principal components are not precisely orthogonal (as they would be if the eigenvectors had been used as weightings for returns during the same year). However, the correlations are always quite modest according to Pukthuanthong and Roll (2009). Therefore multicollinearity is never a problem when principal components are used for explanatory purposes.

3.2.1.2 Creation of the Financial Integration Measure

As explained before, the financial integration measure is based on the explanatory power of a linear multi-factor model with the global factor as the explanatory variable. Therefore, regressions (3.9) are computed for each country every year. The adjusted R^2 of these regressions is our proposed measure of market integration (INT_{Ret}). It should also be noted that the adjusted R^2 can be negative for certain countries at a particular time. In this case, the value of the integration measure will be set to 0. Indeed, the integration is a measure strictly between 0 and 1. As the measure is based on the return of the indices, this measure of financial integration will be called *Return Integration* (INT_{Ret}).

$$x_{c,t} = \alpha_{c,t} + \beta^1_{c,t} f^1_t + ... + \beta^k_{c,t} f^k_t + \epsilon_{c,t} \tag{3.9}$$

$x_{c,t}$ is the non-weighted country c's market return at time t. $\beta^k_{c,t}$ measures the country c's exposure to the k^{th} out-of-sample global factor (f^k_t) at time t. $\epsilon_{c,t}$ is the residual error of the country c at time t.

This measure considers the convergence approach to defining financial integration since it investigates whether the returns' movements are related to common factors. The intuition behind this quantitative measure of financial market integration is that integration is high if global factors can explain a large proportion of a country's returns.

3.2.1.3 Testing for Increased Financial Integration

It is widely believed that financial integration has increased in emerging countries. In order to confirm this statement, the integration measure (INT_{Ret}) will be regressed for each country on a linear time trend (T) over the years of available data.

$$INT_c = \alpha_c + \beta_c T_c + \epsilon_c \tag{3.10}$$

The objective is to show whether emerging countries have experienced a positive and statistically significant increase (β_c) in financial integration.

Unlike Pukthuanthong and Roll (2009), who conducted their study in 2009, the thesis is able to capture the impact of the 2008 financial crisis on financial integration. A Chow test will be conducted to investigate what impact the crisis had on financial integration and if it constitutes a breakpoint in the integration of emerging markets. Two more regressions will then be considered. The first regression includes the observations till 2008 (3.11) while the second accounts for the observation after 2008 (3.12).

$$INT_{c,1} = \alpha_{c,1} + \beta_{c,1} T_{c,1} + \epsilon_{c,1} \tag{3.11}$$

$$INT_{c,2} = \alpha_{c,2} + \beta_{c,2} T_{c,2} + \epsilon_{c,2} \tag{3.12}$$

The null hypothesis asserts that $\alpha_{c,1} = \alpha_{c,2}$ and $\beta_{c,1} = \beta_{c,2}$.

Let's RSS be the sum of squared residuals in the regression 3.10. RSS_1 and RSS_2 are the sum of squared residuals of the first group (before the crisis) and the second group (after the crisis) respectively. N_1 and N_2 represents the number of observations in each group while k is the total number of parameters (2 in this case). The Chow test statistic is:

$$Chow = \frac{(RSS - (RSS_1 + RSS_2))/k}{(RSS_1 + RSS_2)/(N_1 + N_2 - 2k)} \tag{3.13}$$

If the null is rejected, it would mean that the integration before and after the crisis has significantly changed in emerging countries.

3.2.2 New Financial Integration Measure (INT_{Risk})

Pukthuanthong and Roll (2009) defined their integration measure as the percentage of variability explained (adjusted R^2) in the returns indices by the out-of-sample global factors. The higher this percentage, the higher the financial integration of that country. The ability of global factors to explain variations in returns is, in this case, proposed as the measure of financial integration.

This master's thesis will additionally consider a new measure of financial integration (INT_{Risk}) while keeping the same principles defined by Pukthuanthong and Roll (2009). Indeed, a country could also be financially integrated by the ability of global factors to explain the variation within the risk (standard deviation) of its index. In this framework, the ability of global factors to explain the variation of the risk (standard deviation) in the country index is considered as the measure of financial integration. I will call this new measure *Risk Integration* (INT_{Risk}).

The returns for each country must first be transformed into a series of standard deviations (σ_t) to create this new measure. A GARCH(1,1) (3.14) approach is used to estimate the standard deviation (σ_t) of the different indices.

$$\sigma_t = \sqrt{\alpha_0 + \alpha_1 x_{t-1}^2 + \beta_1 \sigma_{t-1}^2} \tag{3.14}$$

with x_t is the return at time t, and σ_t, the standard deviation at time t:

Then, the same method as earlier is applied to find both the new global factors (3.2.1.1) and the adjusted R^2 of the regressions (3.2.1.2). The only difference is that the series of returns (x_t) has been replaced by a series of standard deviations (σ_t).

3.2.3 Impact of Globalization Variables on Financial Integration

3.2.3.1 General Framework

The second part of the study examines the impact of different globalization variables on the financial return integration measure (INT_{Ret}). Although it seems clear that globalization has reduced the effective segmentation of markets in recent decades, it is difficult to quantify the extent, timing, and sources of this reduction without a quantitative measure of financial integration. Thanks to our previously developed measure, the study can focus more on the impact of globalization (sub-dimensions). As the variables are available from a panel dataset, the globalization will be regressed as a pooled OLS (POLS) in the same way as Bekaert et al. (2011).

$$INT_{c,t} = \alpha + \beta_{c,t} x_{c,t} + \gamma_{c,t} k_{c,t} + \epsilon_{c,t} \tag{3.15}$$

where $INT_{c,t}$ is the measure of integration in year t for country c, and $x_{c,t}$ represents the various candidate explanatory variables of financial globalization. $k_{c,t}$ includes all the possible control variables.

3.2.3.2 Baseline Regression

The objective of this first regression (Reg I) will be to measure the impact of the Global Index of Globalization (KOF) on the financial integration of emerging markets, and it will give a first idea of the direction and strength of the impact without any control variables.

Reg I:

$$INT_{c,t} = \alpha + \beta_{c,t} KOF_{c,t} + \epsilon_{c,t} \tag{3.16}$$

3.2.3.3 Multivariate Analysis

The objective of the following regressions (Reg II (3.17), Reg III (3.18), Reg IV (3.19), and Reg V (3.20)) is to understand the effect of the different dimension of globalization on financial integration. In this respect, 6 sub-dimensions of the KOF index are considered in the POLS: the Trade Globalization (TG), Financial Globalization (FG), Interpersonal Globalization (ItG), Information Globalization (InG), Cultural Globalization (CG), Political Globalization (PG). The regressions progressively include new control variables in an arbitrary order.

Reg II: Reg II includes only the 6 subcategories of the globalization.

$$INT_{c,t} = \alpha + \beta^1_{c,t} TG_{c,t} + \beta^2_{c,t} FG_{c,t} + \beta^3_{c,t} ItG_{c,t} + \beta^4_{c,t} InG_{c,t} + \beta^5_{c,t} CG_{c,t} + \beta^6_{c,t} PG_{c,t} + \epsilon_{c,t} \tag{3.17}$$

Reg III: Reg III includes the 6 subcategories of the globalization as well as some variables to control for Political Risks (PR).

$$INT_{c,t} = \alpha + \beta^1_{c,t} TG_{c,t} + \beta^2_{c,t} FG_{c,t} + \beta^3_{c,t} ItG_{c,t} + \beta^4_{c,t} InG_{c,t} + \beta^5_{c,t} CG_{c,t} + \beta^6_{c,t} PG_{c,t} + \gamma^1_{c,t} PR_{c,t} + \epsilon_{c,t} \tag{3.18}$$

The variables that are included in Political Risks (PR) are: Corruption, Effectiveness, Stability, Regulatory, Law, and Voice. Details of the variables are available Table A.1.

Reg IV: Reg IV will also control for the Risk Appetite & Business Cycle (RABC).

$$INT_{c,t} = \alpha + \beta^1_{c,t} TG_{c,t} + \beta^2_{c,t} FG_{c,t} + \beta^3_{c,t} ItG_{c,t} + \beta^4_{c,t} InG_{c,t} + \beta^5_{c,t} CG_{c,t} + \beta^6_{c,t} PG_{c,t} + \gamma^1_{c,t} PR_{c,t} + \gamma^2_{c,t} RABC_{c,t} + \epsilon_{c,t} \tag{3.19}$$

The variables that are included in Risk Appetite & Business Cycle (RABC) are: Spread, VIX, and World GDP. Details of the variables are available in Table A.1.

Reg V: Reg V finally control for the growth determinants (GD).

$$INT_{c,t} = \alpha + \beta^1_{c,t} TG_{c,t} + \beta^2_{c,t} FG_{c,t} + \beta^3_{c,t} ItG_{c,t} + \beta^4_{c,t} InG_{c,t} + \beta^5_{c,t} CG_{c,t} + \beta^6_{c,t} PG_{c,t} + \gamma^1_{c,t} PR_{c,t} + \gamma^2_{c,t} RABC_{c,t} + \gamma^3_{c,t} GD_{c,t} + \epsilon_{c,t} \tag{3.20}$$

Growth Determinants (GD) covers GDP per Capita, and Population Growth. Details of the variables are available in Table A.1

3.2.3.4 Testing for Multicollinearity among Globalization Variables

In order to control for the multicollinearity of the variables of interest (6 subcategories of globalization), the variance inflation factor (VIF) of these factors will be analyzed. The VIF is a tool to measure and quantify how much the variance is inflated when correlation exists among predictors. Daoud (2017) states that the VIF can be interpreted according to the following table.

Table 3.3: VIF Interpretation

VIF = 1	Not Correlated
1 < VIF ≤ 5	Moderately Correlated
VIF = 5	Highly Correlated

The i^{th} variable of the model is regressed against all other predictors. The R^2 of this regression (R^2_i) is then used to find VIF (3.21) (Daoud, 2017).

$$VIF = \frac{1}{1 - R_i^2} \tag{3.21}$$

3.2.3.5 Testing for Country and Time Effects

The standard OLS is correct when the errors are independent and identically distributed (Greene, 2002). The independence assumption refers to the fact that the covariance between residuals is assumed to be zero, $\mathbb{E}(\epsilon_{i,t}|X_{i,t}) = 0$, while the identical distribution assumption assumes the errors to be homoscedastic, $Var(\epsilon_{i,t}|X_{i,t}) = 0$.

A typical finance panel data set contains observations on multiple countries (firms) across multiple time periods. In POLS, Thompson (2011) claims that the errors may be heteroskedastic but must have zero conditional mean. Therefore, POLS standard errors will be consistent as long as the regression residuals are uncorrelated across both countries and years. Unfortunately, the independence assumption is often violated in panel data.

Different assumptions can be made about the correlations between errors.

(i) **Country effects**: The residuals of a given country may be correlated across years, $\mathbb{E}(\epsilon_{i,t}\epsilon_{i,k}|X_{i,t}X_{i,k}) \neq 0$ ($\forall$t $\neq k$). In this case, it shows time-series dependence. For example, a persistent country-specific shock could induce correlation across time (Thompson, 2011);

Testing for time-series dependence: A Wooldridge test will be conducted to detect a potential time series dependency (country effect). The null hypothesis states that no serial correlation exists in the idiosyncratic errors.

$$H_0 : \mathbb{E}(\epsilon_{i,t}\epsilon_{i,k}|X_{i,t}X_{i,k}) = 0 \ (\forall t \neq k) \tag{3.22}$$

$$H_1 : \mathbb{E}(\epsilon_{i,t}\epsilon_{i,k}|X_{i,t}X_{i,k}) \neq 0 \ (\text{for some } t \neq k) \tag{3.23}$$

Wooldridge (2010) proposed a method that uses the residuals from a regression in first-differences.

$$y_{i,t} - y_{i,t-1} = (X_{i,t} - X_{i,t-1})\beta_1 + \epsilon_{i,t} - \epsilon_{i,t-1} \tag{3.24}$$

$$\Delta y_{i,t} = \Delta X_{i,t}\beta_1 + \Delta\epsilon_{i,t} \tag{3.25}$$

Wooldridge has observed that, if the $\epsilon_{i,t}$ are not serially correlated, the $corr(\Delta\epsilon_{i,t}, \Delta\epsilon_{i,t-1}) = -0.5$. Finally, the procedure regresses the residuals $\Delta\epsilon_{i,t}$ on the lagged differences $\Delta\epsilon_{i,t-1}$ and tests that the coefficient on the lagged residuals is equal to -0.5. Wooldridge test is based on a χ^2 distribution.

(ii) **Time effects**: The residuals of a given year may be correlated across different countries, $\mathbb{E}(\epsilon_{i,t}\epsilon_{j,t}|X_{i,t}X_{j,t}) \neq 0$ ($\forall$i $\neq j$). In this case, it shows cross-sectional dependence. For example, market-wide shocks could induce a correlation between countries at a certain moment in time (Thompson, 2011).

Testing for cross-sectional dependence: To detect a potential cross-sectional dependency (time effect), a Pesaran's CD test will be conducted. Under the null hypothesis, $\epsilon_{i,t}$ is assumed to be independent and identically distributed (i.i.d.) over periods and across cross-sectional units. Under the alternative, $\epsilon_{i,t}$ may be correlated across cross sections, but the assumption of no serial correlation remains (De Hoyos & Sarafidis, 2006).

$$H_0 : \rho_{i,j} = \rho_{j,i} = corr(\epsilon_{i,t}, \epsilon_{j,t}) = 0; \ (\forall i \neq j) \tag{3.26}$$

$$H_1 : \rho_{i,j} = \rho_{j,i} \neq 0; \ (\text{for some } i \neq j) \tag{3.27}$$

Pesaran, Ullah, and Yamagata (2008) have proposed the following statistic:

$$CD = \sqrt{\frac{2T}{N(N-1)}} \left(\sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\rho}_{i,j} \right) \sim N(0,1) \tag{3.28}$$

where $\hat{\rho}_{i,j}$ is the sample estimate of the pairwise correlation of the residuals given by:

$$\hat{\rho}_{i,j} = \hat{\rho}_{j,i} = \frac{\sum_{t=1}^{T} \hat{\epsilon}_{i,t}\hat{\epsilon}_{j,t}}{(\sum_{t=1}^{T} \hat{\epsilon}_{i,t}^2)^{1/2}(\sum_{t=1}^{T} \hat{\epsilon}_{j,t}^2)^{1/2}} \tag{3.29}$$

3.2.3.6 Correction for Country and Time Effects

A number of techniques are available to adjust standard errors for correlation along a single dimension. However, these procedures are only valid if the residuals are correlated over time or between firms, but not between the two.

It is common practice to adjust the standard errors for correlation across firms or over time. For example, Fama and MacBeth (1973) propose a sequential cross-sectional time-series procedure that produces standard errors that are robust to a correlation between firms at a given time. Huber (1967) and Rogers (1983) also shows how to compute "clustered" standard errors that are robust to either correlation between firms at a given point in time or correlation within a firm over time. In the case of simultaneous correlation across firms and time, none of these techniques correctly adjust standard errors.

Using firm and time dummies is the first way to treat firm and time effects simultaneously. For example, the standard errors could be grouped by time and include firm fixed effects (e.g., by including firm-specific dummies in the regression). This procedure will work well in many cases. However, Thompson (2011) argues that fixed effects do not handle many relevant forms of correlated errors. In addition, firm or time-fixed effects regressions limit the covariates that can be included. Indeed, with time dummies, macro variables cannot be included in the regression since they are collinear with the dummies. Also, the dummy variables can significantly increase the standard errors when the covariate does not vary much along a dimension (Thompson, 2011).

Thompson (2011) then proposes the following variance estimation method in the case where we have firm and time effects. The thesis has chosen this method to deal with the independence assumption.

$$\hat{Var}(\hat{\beta}) = \hat{V}_{firm} + \hat{V}_{time,0} + \hat{V}_{white,0} \tag{3.30}$$

Where $\hat{V}_{firm}$ and $\hat{V}_{time,0}$ are the estimated variances that cluster by firm and time, respectively, and $\hat{V}_{white,0}$ is the heteroskedasticity-robust OLS variance matrix (White, 1980).

Finally, the author argues that double clustering is likely to be most useful when the following characteristics are met:

- The regression errors include significant time and firm components;
- The regressors themselves include significant time and firm components;
- The number of firms and periods is not too different.

Chapter 4

Empirical Results

This section presents the results obtained by applying the different models to the data at my disposal. All the tests and regressions were performed on R studio, and you can find the code attached to this paper. Throughout the rest of the paper, bold coefficients denote statistical significance. One asterisk (*) denotes significance at the 10% level, 2 asterisks (**) denote significance at the 5% level, while 3 asterisks (***) denote significance at the 1% level.

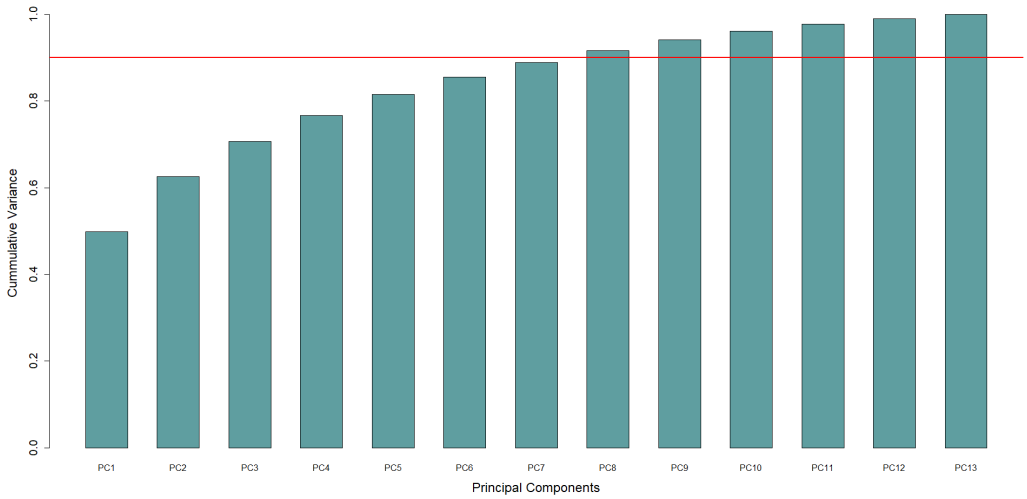
4.1 Stock Market Financial Integration (INT_{Ret})

4.1.1 Global Factors

The first step in constructing the quantitative measure of financial integration was to construct the global factor according to Pukthuanthong and Roll (2009). By applying the procedure explained in the section 3.2.1.1, I obtained 48 weighted returns matrices (W_t) to which I applied a PCA. Table 4.1 and Figure 4.1 show the average of the cumulative percentage of the variance explained by the principal components over the 48 years (1974-2021) of the sample.

On Figure 4.1 and Table 4.1, it can be observed that the first principal component explains about 50% of the variance. Two additional PCs are needed to explain a little more than 70% of the variation. These results imply the existence of multiple global factors, much more than a single one, to explain the global shocks in equity returns. I took the 90% threshold recommended by Pukthuanthong and Roll (2009) to select the global factors. Consequently, the first 8 PCs are selected as global factors, and it is reasonable to think they can cover most global shocks. Moreover, if a shock is not considered with this clustering, it will be the case for all countries, and the impact will be small on the structure of the market integration measures.

Figure 4.1: Average Cumulative Percentage of Variance Explained by Sorted PCs



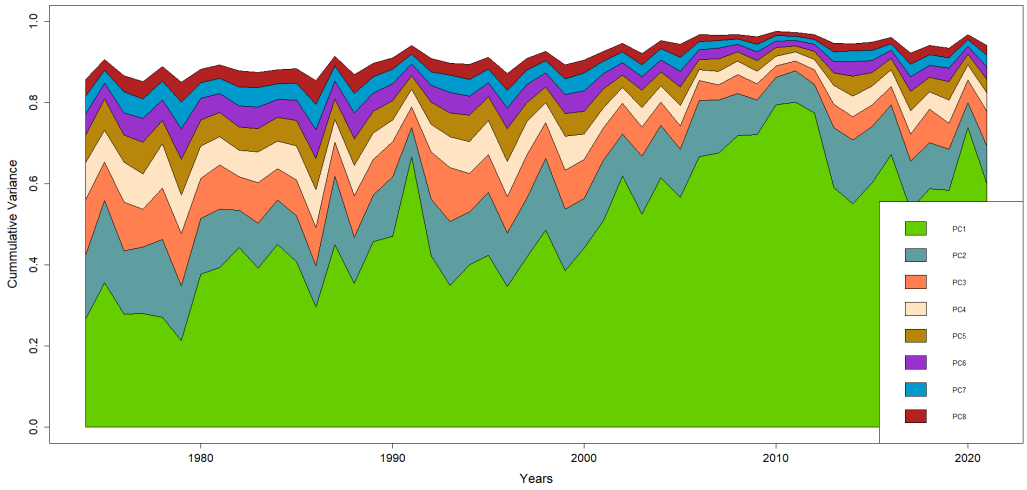
Notes: The average percentage is calculated over 48 sample years (1974-2021). For each calendar year from 1973 to 2021, a covariance matrix (Σ_t) is computed from the index returns of the 13 developed countries. The eigenvectors of the covariance matrix are calculated and sorted from largest to smallest eigenvalue (V_t). Then, the eigenvectors of the previous years (V_{t-1}) are used to weight the return matrix (X_t). Finally, principal components (PCs) are calculated from the eigenvector-weighted returns matrix (W_t) for each country.

Table 4.1: Average Cumulative Percentage of Variance Explained by Sorted PCs

PCs	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10	PC11	PC12	PC13
Average Cum Variance	0.50	0.63	0.71	0.77	0.82	0.86	0.89	0.92	0.94	0.96	0.98	0.99	1.00

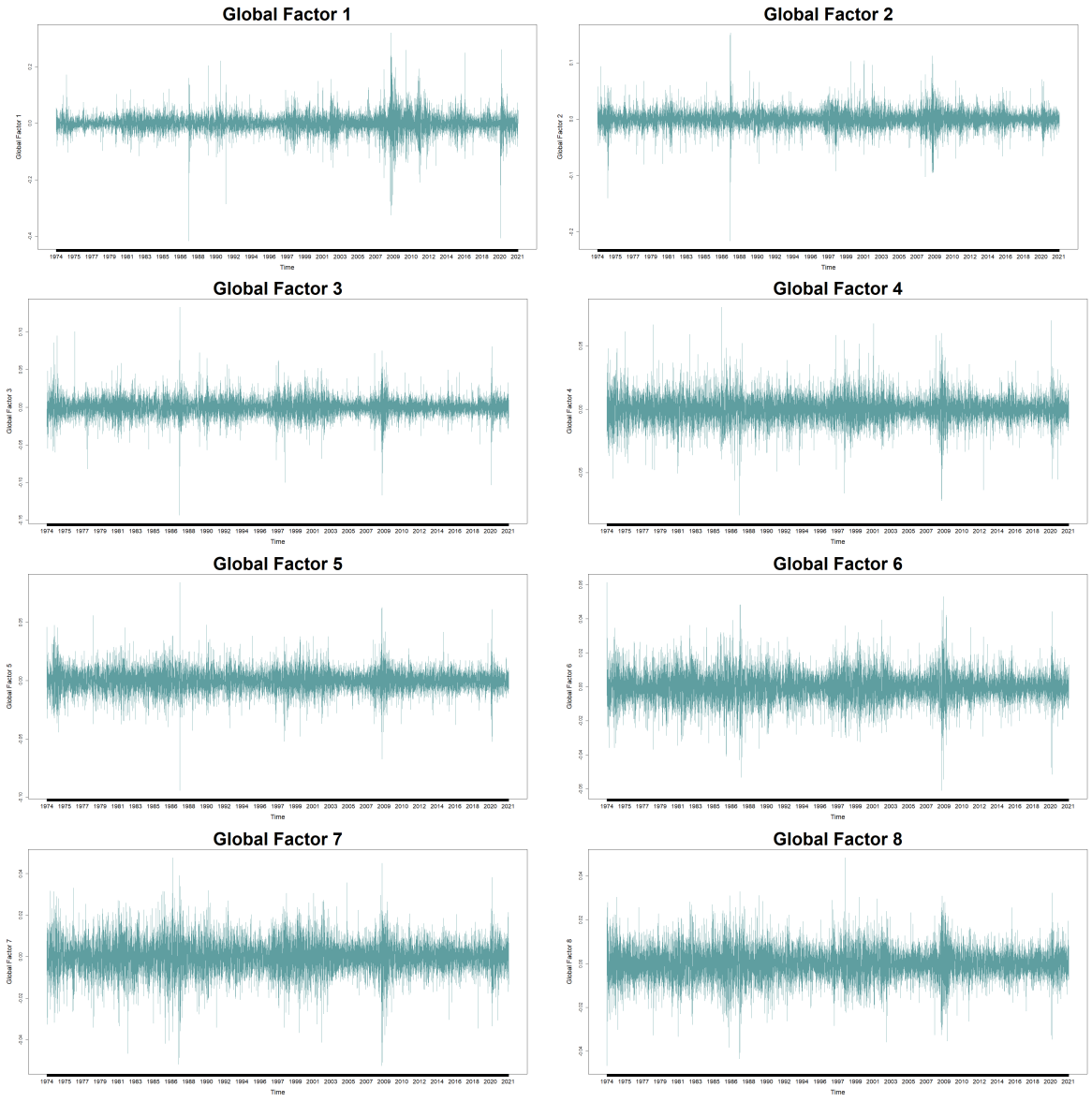
Figure 4.2 presents the cumulative variance explained each year since 1974 by the 8 global factors previously selected. Some variations can be observed yearly, but there seems to be a slight upward trend over time. However, the cumulative variance is consistently around 90% over the entire sample of years.

Figure 4.2: Cumulative Percentage of Variance Explained by Sorted PCs (1974-2021)



The eight global factors are plotted in Figure 4.3. Two main observations can be made. First, the volatility of the global factors decreases as the number of global factors increases. The global factor 1 has a standard deviation of 0.033, while this number is 0.007 for the 8^{th} global factor. It seems logical since the global factor 1 is the first PC, accounting for as much variation in the data as possible. Secondly, we can also observe that the clustering of jumps is observable around crisis periods. It is indeed, particularly the case around 2008.

Figure 4.3: Return Integration (INT_{Ret}) Global Factors (1974-2021)



Notes: The 8 PCs were selected so that the average of the cumulative variance reached the arbitrary level of 90%. In this respect, a PCA was applied on the eigenvectors-weighed returns matrix (W_t). The global factors are used as explanatory variables in a multi-factor model. The explanatory power of this model is my measure of financial integration.

4.1.2 Financial Integration Measure

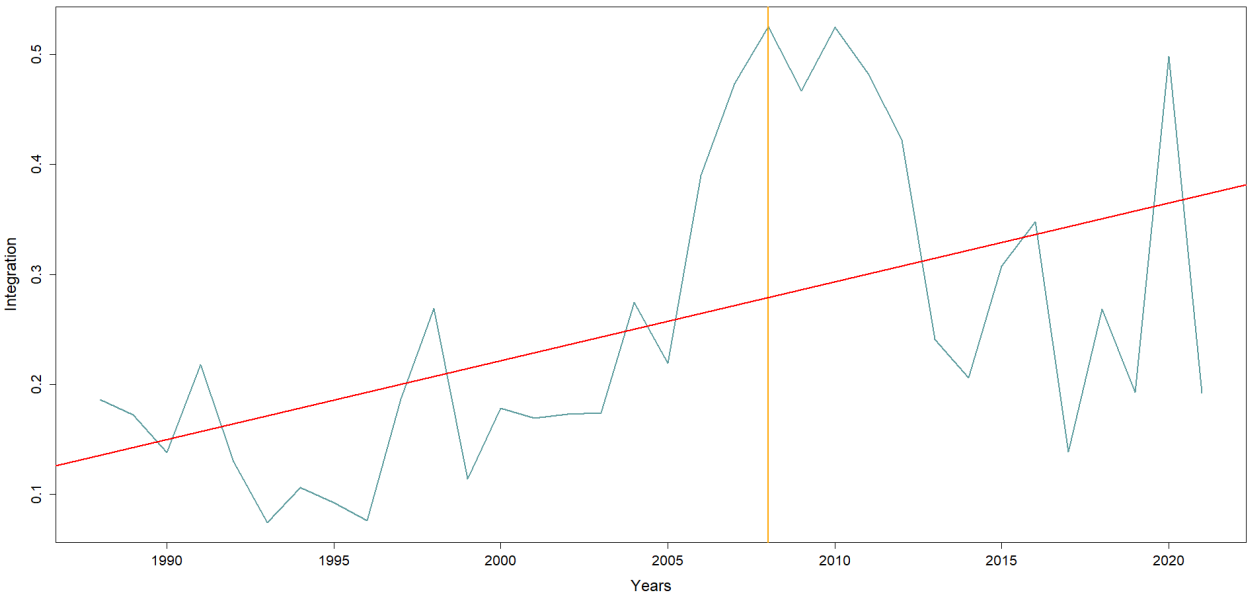
The global factors previously calculated (the first 8 out of sample principal components) will now be used as explanatory variables for a series of regressions (3.9). There is one regression per country and year. This measure allows for the characterization of the time series and cross-country variation in the integration. The R^2 of these regressions represents the return financial integration (INT_{Ret}) of the country concerned. Figure 4.4 shows the evolution of the average financial integration of emerging countries between 1988 and 2021.

4.1.3 Testing for Increased Integration

It is generally believed that the financial integration of emerging countries has increased, and this paper aims to verify this claim. Figure 4.4 shows the average integration level in emerging countries. First, this figure's upward trend (in red) seems to confirm the intuition. Specifically, Table 4.2 presents the results of the R^2 of each country regressed on a linear time trend for the available years. The table will detect whether the positive time trend is significant in the different countries.

The detailed evolution of financial integration, country by country, can be found in Figure C.1 in the appendices.

Figure 4.4: Return Integration (INT_{Ret}) in Emerging Markets (1988-2021)



Notes: The average return integration (INT_{Ret}) of emerging countries is plotted each year. A positive linear time trend (in red) is represented. The orange line depicts the structural break in the degree of integration following the financial crisis of 2008.

The results are quite obvious. Of the 24 countries studied, 17 showed significant growth (at the 10% significant level) in their financial integration. Moreover, Qatar, Egypt, and Kuwait also show a positive time trend but with a lack of significance. Notwithstanding, not all countries integrate at the same speed. Among these countries, South Africa, Korea, and Taiwan have experienced the most significant (largest t-value) increase in financial integration. Regarding the level of integration, Poland has the highest average financial integration degree with 41.00%, while Kuwait is the least integrated country with 2.98% of average financial integration. Furthermore, while the benefits of international diversification diminish as the integration increases, our integration measure proves that it is still possible to diversify away from country-specific risk since the level of integration is still not perfect (¡1).

Table 4.2: Return Integration (INT_{Ret}) Trends in Emerging Markets

	Integration			**Integration Over Time**			
Countries	Average Integration	Rank	SD	Year of First Observation	Coefficient	t-value	P-Value
Brazil* **	28.95%	10	24.04%	1988	**0.0121**	**3.27**	**0.00**
Chile* **	28.50%	11	18.75%	1990	**0.0110**	**3.59**	**0.00**
Colombia* **	20.64%	17	17.63%	1993	**0.0131**	**4.19**	**0.00**
Mexico **	38.03%	3	21.32%	1989	**0.0102**	**2.90**	**0.01**
Peru* **	27.16%	12	18.37%	1993	**0.0132**	**4.01**	**0.00**
Czech Republic*	32.83%	6	20.33%	1995	**0.0089**	**1.84**	**0.08**
Egypt	4.27%	23	7.48%	1995	0.0020	1.05	0.31
Greece **	29.61%	9	18.91%	1989	**0.0070**	**2.15**	**0.04**
Hungary*	35.88%	4	19.88%	1995	**0.0094**	**2.02**	**0.05**
Kuwait	2.98%	24	4.67%	2006	0.0034	1.30	0.22
Poland* **	41.0%	1	22.8%	1995	**0.0175**	**3.85**	**0.00**
Qatar	9.17%	22	5.94%	2006	0.0017	0.49	0.63
Saudi Arabia	10.62%	21	8.53%	2015	-0.0004	-0.02	0.98
South Africa* **	33.53%	5	21.35%	1974	**0.0104**	**6.34**	**0.00**
Turkey **	20.71%	16	20.07%	1989	**0.0092**	**2.73**	**0.01**
United Arab Emirates	16.16%	20	11.26%	2015	-0.0133	-0.59	0.58
China **	30.75%	8	19.61%	1994	**0.0120**	**2.97**	**0.01**
India* **	20.64%	17	17.63%	1993	**0.0131**	**4.19**	**0.00**
Indonesia*	25.51%	14	17.40%	1991	**0.0059**	**1.74**	**0.09**
Korea* **	30.94%	7	21.35%	1988	**0.0145**	**5.19**	**0.00**
Malaysia	38.30%	2	20.37%	1987	-0.0049	-1.47	0.15
Philippines **	17.57%	19	12.85%	1988	**0.0051**	**2.44**	**0.02**
Taiwan* **	25.81%	13	19.17%	1988	**0.0133**	**5.43**	**0.00**
Thailand **	23.82%	15	13.42%	1988	**0.0050**	**2.24**	**0.03**

Notes: Time trends for adjusted R^2 from global factor models. The dollar-denominated index returns are regressed on the 8 global factors each year and for each considered emerging country. The resulting R^2s are the measure of integration. A simple linear time trend is then computed for all available years. The first year of observation, the coefficient, the t-statistic, and the p-value are shown in the "Integration over Time" part of the table. The average integration as well as a ranking among those countries are also shown.

However, there are some exceptions since Saudi Arabia, the United Arab Emirates, and Malaysia show a negative, *not* statistically significant time trend on integration. This downward trend in the United Arab Emirates and Saudi Arabia can be explained by the low number of observations of financial integration (6 observations since 2015). The case of Malaysia is not surprising either. As seen in Figure C.1 and Table 4.2, Malaysia is a country that has developed rapidly and has experienced a high level of integration very quickly. It

is the second country with the highest average level of integration (38.3%). However, during the '90s, this level dropped as the Malaysian government imposed sanctions against the exchange rate (Pukthuanthong & Roll, 2009). What is more, the Prime Minister blamed foreign investors for the country's internal problems (Sargen, 2016), which explained the negative coefficient in the country's level of financial integration.

Financial integration can also be analyzed by grouping emerging countries into cohorts. Countries are thus grouped according to the date of the first observation of financial integration in the country. The thesis considered the pre-1993, 1993-2000, and post-2000 cohorts. When looking at Figure 4.5, three characteristics are evident. First, the general pattern observed earlier is still visible in the different cohorts. Indeed, an upward time trend can be seen in all three cohorts. Second, it also seems that the countries with the most observations (older cohorts) have a higher financial integration level. It is particularly striking between the Pre-1993 and Post-2000 cohorts. Finally, the movements in the average R^2 are rather correlated between the cohorts from year to year.

Figure 4.5: Return Integration (INT_{Ret}) in Emerging Markets by Country Cohort

Notes: Return integration (INT_{Ret}) by country cohorts. The average integration across countries within each cohort is plotted each year. The thesis considers 3 cohorts: the Pre-1993 Cohort, and 1993-2000 Cohort, Post-2000 Cohort.

Looking at all the different figures (4.4, 4.5, and C.1) another observation seems very clear. Even if there is a general growth in the financial integration of emerging countries, an apparent drop in the average integration is noticed around 2008-2010 and 2021. The timing of this decline is not insignificant since these are periods of major crises (Sub-primes and Coronana virus crisis). The study will therefore test if integration is sensitive to major crises

and whether integration has significantly decreased after the 2008 crisis. A Chow test is conducted, as described in the equation 3.13. The result is clear; 21 out of 24 countries experienced a significant structural break in 2008. The majority of countries rejects the null hypothesis. Therefore, a major global crisis would negatively impact financial integration, and most emerging countries are sensitive. Moreover, by comparing the results of the integration's Table (4.2) and the Chow test Table (4.3), it can be stated that the more financially integrated a country is, the more negative the effect of a global crisis will be on integration.

Table 4.3: Chow Test Results for Structural Break in 2008

	Chow Stat	**p-value**
Brazil* **	**15.48**	**0.00**
Chile* **	**11.09**	**0.00**
Colombia **	**4.43**	**0.02**
Mexico* **	**17.10**	**0.00**
Peru **	**4.73**	**0.02**
Czech Republic **	**5.17**	**0.01**
Egypt	2.27	0.13
Greece **	**5.35**	**0.01**
Hungary* **	**8.24**	**0.00**
Kuweit	0.10	0.91
Poland* **	**9.07**	**0.00**
Qatar*	**3.49**	**0.06**
South Africa*	**3.08**	**0.06**
Turkey* **	**16.17**	**0.00**
China **	**6.43**	**0.01**
India **	**4.43**	**0.02**
Indonesia **	**6.19**	**0.01**
Korea* **	**7.14**	**0.00**
Malaysia* **	**6.55**	**0.00**
Philippines **	**3.82**	**0.03**
Taiwan **	**4.88**	**0.01**
Thailand	1.05	0.36

This is empirically proven in my results. Of the 11 countries that experienced the most significant decline in financial integration, 9 are also those with the highest average level of financial integration. Let us take Poland and Kuwait as examples. On the one hand, Poland has the highest average level of financial integration (40.00%) and experienced the fifth most significant decline with a Chow statistic of 9.07. On the other hand, Kuwait has the lowest level of average integration (2.98%) and did not experience a significant decline.

This part of the thesis, which focuses on the evolution of financial integration in emerging markets, tells us several important facts. First, the study confirmed the common belief that emerging markets are becoming less segmented in the global economy. Indeed, 19 of the

24 countries show a positive integration time trend (17 significantly). It was also shown that the countries with the most historical data show a greater financial integration on average than those from the most recent cohort. Finally, the results show that a global crisis has the effect of segmenting markets, which is particularly the case when countries have a high level of global financial integration.

4.2 New Financial Integration Measure (INT_{Risk})

As explained in the methodology section (3.2.2), the thesis also focuses on a new measure of financial integration called risk integration (INT_{Risk}). According to this measure, a country is considered financially integrated if global factors strongly explain the variation in the country's index risk (standard deviation).

The figures related to the global factors of this new measure of integration can be found in the appendices (C.1, C.2, and B.3).

Figure 4.6 shows the evolution of the average risk integration of emerging countries between 1988 and 2021. Unlike the return integration, the positive trend (in red) is not striking. Although the time trend has increased with a t-value of 1.37, the positive evolution is insignificant with a p-value of 0.17.

Figure 4.6: Risk Integration (INT_{Risk}) in Emerging Markets (1988-2021)

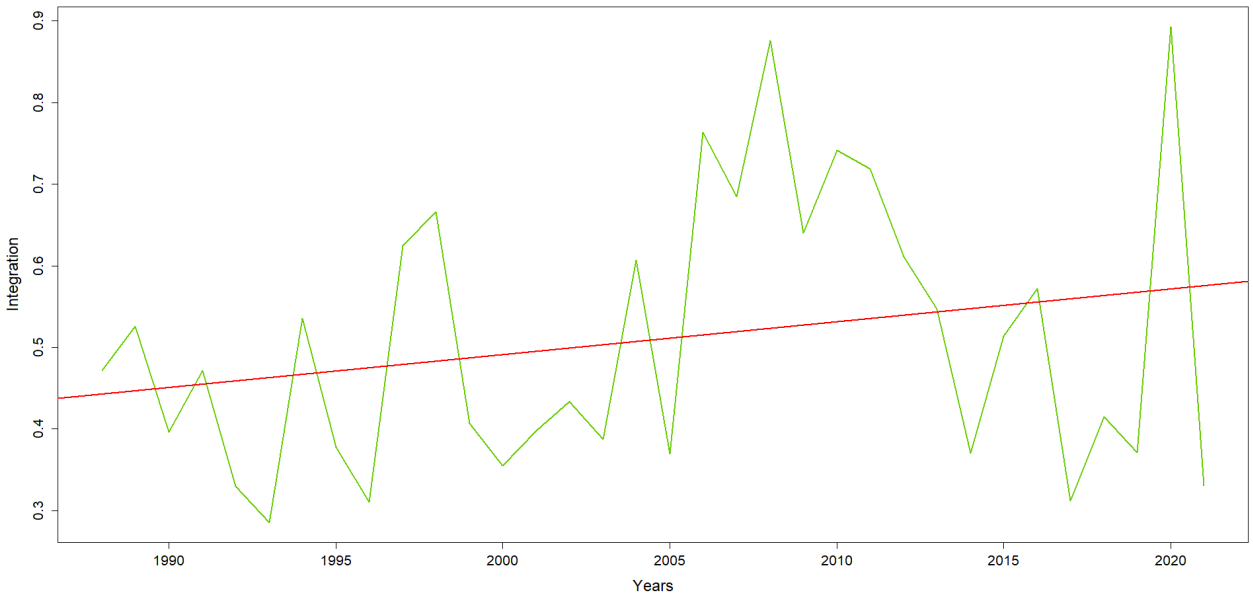


Table 4.4 provides more details and shows different risk integration statistics for each country. The detailed results confirm the first observation since only 5 countries show statistically significant positive coefficients. Another result is very interesting. It can also be seen that the level of financial integration (average integration) is higher using the standard deviation than the return framework. Indeed, the average return integration is only 24.78%, while the average risk integration is 48.79%. It can therefore be said that the risk integration has not increased significantly but is higher than the classic return integration measure. It also means that countries with little integration with respect to returns are more integrated with respect to risk. For example, Egypt, which has a low return integration level (4.27%), has a much higher risk integration level (41.30%).

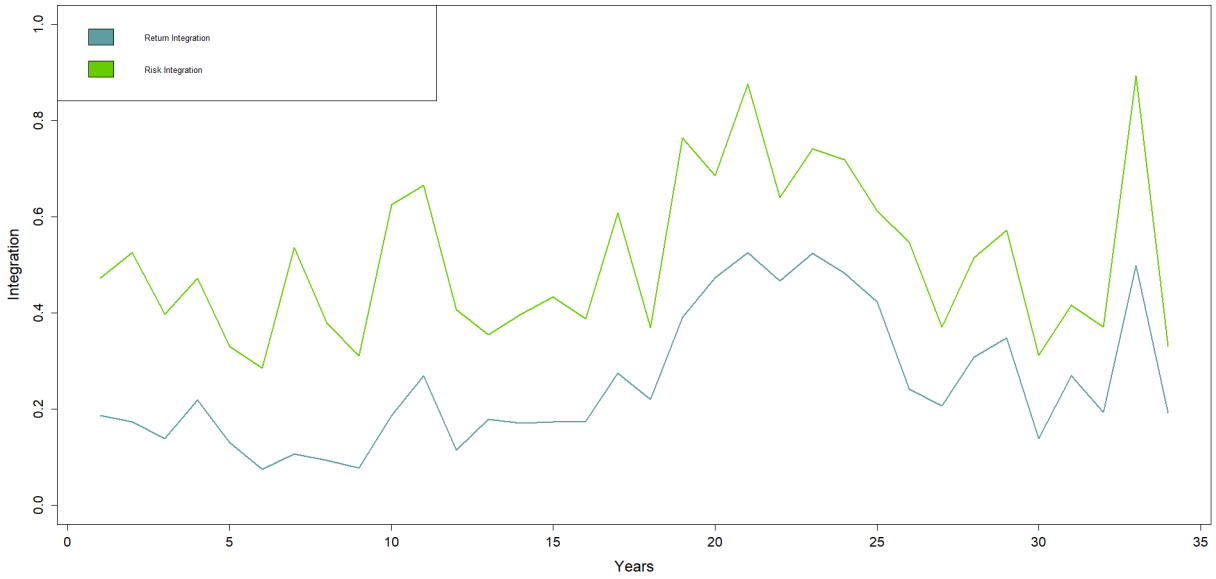
Table 4.4: Risk Integration (INT_{Risk}) Trends in Emerging Markets

	Integration			**Integration Over Time**			
Countries	Average Integration	Rank	SD	Year of First Observation	Coefficient	t-value	P-Value
Brazil*	56.58%	4	25.10%	1988	**0.0082**	**1.94**	**0.06**
Chile	45.65%	17	24.70%	1990	0.0069	1.49	0.15
Colombia	44.54%	18	24.11%	1993	0.0039	0.73	0.47
Mexico*	53.37%	7	27.46%	1989	**0.0093**	**1.93**	**0.06**
Peru	50.28%	12	24.91%	1993	0.0006	0.11	0.91
Czech Republic	50.51%	11	26.37%	1995	0.0059	0.90	0.38
Egypt	41.30%	22	22.49%	1995	-0.0021	-0.37	0.71
Greece	51.29%	9	23.63%	1989	0.0024	0.54	0.59
Hungary	55.97%	6	24.14%	1995	-0.0053	-0.88	0.39
Kuweit	39.73%	23	23.58%	2006	0.0031	1.27	0.23
Poland	60.3%	3	25.7%	1995	0.0092	1.48	0.15
Qatar	45.83%	15	23.32%	2006	0.0012	0.36	0.73
Saudi_Arabia	45.73%	16	18.83%	2015	-0.0161	-0.42	0.69
South Africa**	50.72%	10	27.91%	1974	**0.0074**	**2.73**	**0.01**
Turkey	42.80%	20	24.81%	1989	0.0038	0.83	0.41
United Arab Emirates	48.11%	15	23.55%	2015	0.0227	0.48	0.65
China	52.65%	8	23.45%	1994	0.0010	0.18	0.85
India	44.54%	18	24.11%	1993	0.0039	0.73	0.47
Indonesia	50.13%	13	26.60%	1991	0.0069	1.31	0.20
Korea*	60.59%	2	20.72%	1988	**0.0067**	**1.93**	**0.06**
Malaysia	64.49%	1	23.15%	1987	-0.0062	-1.64	0.11
Philippines	41.60%	21	26.27%	1988	0.0006	0.11	0.91
Taiwan**	56.41%	5	23.65%	1988	**0.0109**	**2.93**	**0.01**
Thailand	49.71%	14	24.35%	1988	-0.0009	-0.22	0.83

Notes: Time trends for adjusted R^2s from global factor models. The standard deviation (SD) are in this case regressed on 8 global factors each year and for each considered emerging country.

To summarize, the risk (SD) of the emerging markets indices is highly integrated, linked to the world economy, and can therefore be strongly explained by global factors. However, no increase in this level is significant. On the other hand, the returns of emerging markets are significantly increasingly integrated to the global capital markets. However, this figure is still lower than the standard deviation-based measure but the movement between the 2 integration measures seems to be correlated. Figure 4.7 highlights these comments.

Figure 4.7: Return Integration (INT_{Ret}) vs Risk Integration (INT_{Risk})



4.3 Globalization's Impact on Financial Integration

The primary objective of the thesis was to study the evolution of financial integration in emerging countries. In this regard, two measures of financial integration were created and studied: return and risk integration. It has been shown that return integration has increased significantly in emerging countries in recent decades. It is also interesting to ask what factors explain this increase in return integration. In an increasingly globalized world, measures of globalization seem to be the ideal factors to study. The data comes from the KOF index (3.2), which offers several sub-indices of globalization.

As a reminder, two regressions will be computed. The first one is a baseline regression that allows analyzing the impact of globalization's global indices (3.2.3.2). This regression aims to have a broad view of the sensitivity of financial integration to globalization. The other regressions are more specific and focus on the impact of the sub-categories of globalization (3.17).

4.3.1 Testing for Multicollinearity among Globalization Variables

Table 4.5 shows the FIVs for each sub-variable of globalization. These results aim to observe if multicollinearity is present between the variables considered. All the FIVs of the factors are between 3 and 5. As stated by Daoud (2017) (3.2.3.4), these figures indicate moderate multicollinearity, which does not require any particular action.

Table 4.5: Globalization Variables VIF

Variables	**VIF**
Trade Globalization	3.13
Financial Globalization	2.28
Interpersonal Globalization	4.13
Information Globalization	3.04
Cultural Globalization	4.52
Political Globalization	1.41

4.3.2 Testing & Correcting for Country and Time Effects

Since the considered regressions are of POLS type (3.2.3.1), some corrections could be requested depending on the detection of country and/or time effect (3.2.3.5). You will find in the Table below (4.6) the results of the Breush-Godfroy/Wooldridge and Pesaran's CD tests.

Table 4.6: Time and Country Effect Tests

	Country Effect (Breush-Godfroy test)				**Time Effect (Pesaran's CD test)**		
Regressions	χ^2	df	p-value	Effect	z	p-value	Effect
Reg I	261.10	25.00	0.00	**Country Effect**	41.70	0.00	**Time Effect**
Reg II	241.01	25.00	0.00	**Country Effect**	39.01	0.00	**Time Effect**
Reg III	242.77	25.00	0.00	**Country Effect**	38.035	0.00	**Time Effect**
Reg IV	217.85	25.00	0.00	**Country Effect**	32.813	0.00	**Time Effect**
Reg V	214.40	25.00	0.00	**Country Effect**	32.106	0.00	**Time Effect**

Notes: Independence assumption is often violated in panel data. Therefore, to detect a potential time series dependency or cross-sectional dependency, the Breush-Godfroy/Wooldridge and Pesaran's CD tests have been conducted.

The null hypotheses of no time series dependency (3.2.3.5) and no cross-sectional dependency in the idiosyncratic errors (3.2.3.5) are both rejected at the 1% level for both the baseline (Reg I) and multiple regressions (Reg II, III, IV, V). This means that a time and country effect are present in these regressions. Therefore, it is necessary to simultaneously adjust standard errors for the country and time effects.

The Thompson's method (3.2.3.6) is therefore used for the variance estimation to deal with the independence assumption. These corrections generally increase the standard errors compared to simple OLS. The following section presents the country and time effect adjusted results of the regressions.

4.3.3 Baseline Regression

Globalization has been increasing rapidly over the past thirty years, and the globalization process seems the most obvious determinant of the upward trend in the return integration (INT_{Ret}) observed. In Table 4.7, the role of globalization (KOF) on financial integration is studied, and the first column reports the effect. As expected, this coefficient is positive (0.01) and highly significant (at the 1% level). The intuition was correct, and we can affirm that globalization in emerging countries has a positive effect on their financial integration.

Table 4.7: Results Baseline Regression

	β	Std. Error	t value	p-value
Global Index of Globalization (KOF)* **	**0.01**	**0.00**	**5.02**	**0.00**

Notes: The sample includes 24 emerging-market countries detailed in Table 3.1. Annual country-level Integration is regressed onto the KOF Globalization Index. I report coefficient estimates from POLS regressions. Reported standard errors account for serial correlation by country and contemporaneous correlation across countries.

The regression's explanatory power (adjusted R^2) is moderate (11.83%). The structure of the index can first explain this figure. As a reminder, the globalization measure (KOF) is composed of different subcategories of globalization (3.2). This measure does not tell us which index component has the most effect on financial integration. For example, it might be assumed that the sub-variable related to financial globalization is a subcategory with a large effect on financial integration. Considering each sub-variable individually in a multiple regression will thus allow for a more detailed understanding of the drivers of globalization that influence financial integration. Secondly, financial integration is not only affected by globalization; other factors can be determinants. It will, therefore, also be essential to consider some control variables (3.1.3). Although these variables are not the main focus of the study, it is important to consider their effect on financial integration in order to capture the most realistic impact of globalization variables.

4.3.4 Multivariate Analysis

The second step is to compute a multiple POLS regression series that considers the 6 sub-variables of globalization as factors of financial integration. A regression with only the subcategories of globalization as independent variables is first considered (Reg II). The control variables are then added progressively in new regressions (Reg III, Reg IV, and Reg V). The sample includes 19 emerging countries over 25 years for a total of 475 observations.

Table 4.8 shows the coefficients of the regressions. It also reports the standard deviation, in parentheses, that accounts for time-series dependency (country effect) and cross-sectional dependency (time effect). The results in the first column focus on the coefficients of Reg II. The main point that emerges from this regression is the great improvement in the explanatory power of globalization since the sub-variables now explain 23.7% of the variability of financial integration (INT_{Ret}). However, only 2 of these variables are positively significant. It concerns information globalization (InG) and, not surprisingly, financial globalization (FG). What is perhaps more unexpected is the negative coefficients for trade (TG) and interpersonal globalization (ItG). These coefficients are nevertheless not statistically significant.

The following regressions consider control variables. Reg III controls for country political risk, Reg IV controls for risk appetite and the business cycle, while Reg V controls for the growth determinants. Regressions III and V include variables that control integration locally, which concern the country's regulations. The control variables in regression IV concern non-regulatory global factors.

Table 4.8: Factors of Financial Integration

	Reg II	Reg III	Reg IV	Reg V
Trade Globalization (TG)	−0.001	0.000	−0.001	−0.001
	(0.001)	(0.002)	(0.001)	(0.002)
Financial Globalization (FG)	**0.003****	**0.003***	**0.003***	**0.003****
	(0.001)	(0.002)	(0.002)	(0.002)
Interpersonal Globalization (ItG)	−0.003	**-0.002***	**-0.002**	−0.002
	(0.002)	(0.001)	(0.001)	(0.001)
Information Globalization (InG)	**0.007*****	**0.006*****	**0.006*****	**0.006*****
	(0.002)	(0.002)	(0.002)	(0.002)
Cultural Globalization (CG)	0.000	−0.001	0.000	0.000
	(0.003)	(0.002)	(0.002)	(0.002)
Political Globalization (PG)	0.000	**0.003***	0.003	0.003
	(0.003)	(0.002)	(0.002)	(0.002)
Corruption		−0.032	−0.020	−0.023
		(0.056)	(0.049)	(0.044)
Effectiveness		**0.190*****	**0.167*****	**0.160*****
		(0.049)	(0.053)	(0.055)
Stability		0.030	0.038	0.010
		(0.055)	(0.039)	(0.025)
Regulatory		**-0.177*****	**-0.160****	**-0.152****
		(0.057)	(0.067)	(0.065)
Law		**0.046***	0.039	**0.050***
		(0.026)	(0.028)	(0.030)
Voice		0.010	0.002	−0.005
		(0.020)	(0.021)	(0.018)
Spread			0.051	0.041
			(0.048)	(0.049)
VIX			**0.010****	**0.011****
			(0.004)	(0.004)
World GDP			0.040	0.032
			(0.028)	(0.027)
Population Growth				0.002
				(0.017)
GDP per Capita Growth				**0.006***
				(0.004)
Intercept	−0.198	**-0.389****	**-0.848****	**-0.844*****
	(0.193)	(0.158)	(0.261)	(0.267)
R^2	0.247	0.309	0.419	0.426
Adjusted R^2	0.237	0.291	0.400	0.405
F-Statistic	25.570	17.196	22.103	19.982

Notes: The sample includes 19 emerging market countries detailed in Table 3.1. Annual country-level integration is regressed onto the 6 subcategories of globalization. I report the coefficient estimates for POLS regressions. Standard errors in parentheses account for serial correlation by country and contemporaneous correlation across countries. Reg III, Reg IV, and Reg V incrementally include variables to control for political risk, risk appetite & business cycle, and the growth determinants.

It is important to note that the progressive addition of these control variables significantly increases the explanatory power of the regression, reflecting the importance of adding these variables. The adjusted R^2 indeed increases from 23.7% to 40.5%. Including these control variables do not influence financial globalization's effect (FG) and only slightly reduces the effect of information globalization (InG). Moreover, these variables remain statistically significant.

In the last column, a significant role emerges for *Government Effectiveness* and *Regulatory Quality*. The *VIX* and *GDP per Capita Growth* variables are also statistically significant. While most of the coefficients of these variables are consistent with intuition, the negative sign for *Regulatory Quality* is intriguing. Indeed, it is most plausible that an improvement in a country's regulations will help it integrate financially. Mullet (1976) explains that this may be because the regressions may exclude important variables from the model. Future research may look for new factors that significantly influence financial integration in emerging countries.

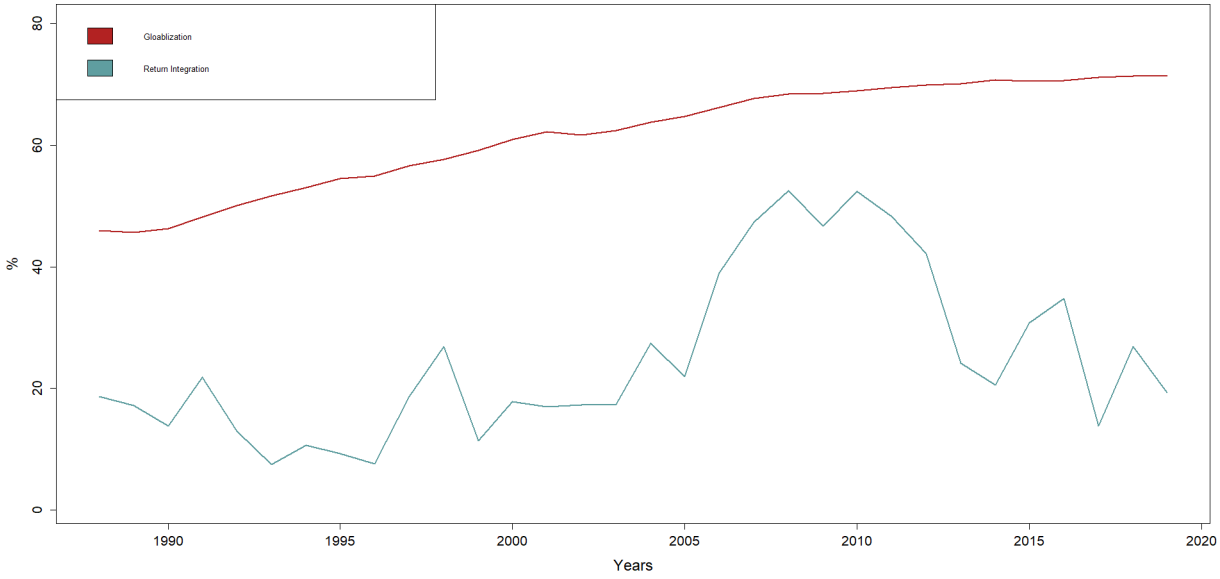
In conclusion, it has been shown that both local regulatory factors and non-regulatory global factors are important in financial integration. Let us first look at the local regulatory factors, specifically those concerning globalization, which are the main focus of the study.

It was observed that the financial (FG) and informational (InG) components of globalization have a significant positive effect on financial integration. Financial globalization (FG) was the most obvious candidate in the regressions. This sub-category included individual variables such as capital account openness, foreign direct investment, or international income payments (A.1). Perhaps, informational globalization (InG) is less obvious, but it also makes much sense. Information plays an essential role in understanding the financial markets. Economic and financial information and its processing are at the core of the proper functioning of financial markets. Based on this information, investors make their investment choices, deciding to buy or sell shares, to favor a particular category of investment. Portes and Rey (2005) also show the importance of information in the level of home bias. Informational frictions play an important role in the tendency of individuals to strongly favor the actions of firms in their home country. The individual variables considered in the information globalization were, for example, television access, press freedom, or high technology exports (A.1).

Secondly, the control variables have also highlighted the important role of the country's political risk profile as well as specific local growth determinants. Local governments can therefore take measures to affect these variables and, consequently, their financial integration. It was also shown that financial integration was impacted by the VIX variable, which measures the risk aversion of the global market.

Finally, the globalization of a country has often been used as a proxy for financial integration. However, globalization is not a good proxy for market integration. Indeed, the study showed that globalization alone explains 23.7% of the variability in financial integration and 40.5% with the control variables. Moreover, we observed that globalization has continuously been increasing while it has been proven that financial integration has been decreasing after the 2008 crisis (Figure 4.8).

Figure 4.8: Globalization Index (KOF) vs Return Integration (INT_{Ret})



Chapter 5

Conclusion

Most measures of financial integration are flawed and contradict the intuition of increasing integration in emerging countries. The simple measure of correlation of returns between two markets has been criticized as a poor measure of integration in the literature. In order to address this problem, a measure of integration based on the explanatory power of a linear multi-factor model with 8 global factors as independent variables was developed. Finally, 24 emerging countries from America, Asia, and EMEA are analyzed.

5.1 Implications of the Research

This part of the conclusion aims to provide an answer to the research questions and their implications.

The empirical results showed strong evidence that emerging markets are becoming less segmented in the global economy. Indeed, 19 of the 24 countries show a positive trend towards integration over time (17 significantly). Not all emerging countries are integrating at the same speed. South Africa, Taiwan, and South Korea are the countries with the most significant positive coefficients. In some countries, on the other hand, financial integration is declining. This is the case in Malaysia, Saudi Arabia, and the United Arab Emirates. Moreover, it has also been shown that countries with more historical data have, on average, greater financial integration than countries in the most recent cohort. The finding of increased integration will inevitably have positive repercussions on economic development, consumption risk-sharing and smoothing, and capital allocation of those markets. While the benefits in terms of international diversification diminish as the integration increases, our integration measure proves that it is still possible to diversify away from country-specific risk.

The financial crisis's contagion risks are more important as financial integration increases. The master thesis showed that, as assumed, a major global crisis would negatively impact

financial integration, and most emerging countries are sensitive to it. A Chow test was performed to prove this point. Moreover, the more financially integrated a country is, the more negative the effect of a global crisis on integration will be.

It has been found that the level of financial integration is higher using the standard deviation than the return framework. Indeed, the average return integration is only 24.78%, while the average risk integration is 48.79%. It means that the risk (SD) of emerging market indices is highly integrated, linked to the global economy, and can therefore be explained by global factors. However, no increase in this level is apparent.

Eventually, it was observed that globalization's financial (FG) and informational (InG) components have a significant positive effect on financial integration. The control variables also highlighted the important role of the country's political risk as well as some local determinants of growth. Financial integration is also influenced by the VIX variable, which measures global market risk aversion. Local regulatory and global non-regulatory factors have turned out to be important for financial integration. Local authorities can thus exert some power to influence the global financial integration of their region.

5.2 Limitations & Future Researches

The R^2 multi-factor model suffers from two limitations. It is, however, readily possible to control them. The main criticism of the model is that it would indicate a greater degree of integration during periods when factor volatility is high relative to country volatility. Since correlations between countries are higher when common volatility is high, Forbes and Rigobon (2002) infer that correlations are biased by heteroscedasticity. This may be due to a sampling error in the global factors. Nevertheless, when comparing the integration between countries, the volatility's sampling error is not a serious problem according to Pukthuanthong and Roll (2009). The estimated R^2s will vary with the sampling error, but the variation will be very highly correlated across countries, and the cross-country rankings should be quite reliable. Another conceptual problem with measuring the R^2 coefficient of multiple factors arises when the global factors are country-specific. Fortunately, this problem can be studied empirically by simply examining the estimated country's exposures to global factors. If the exposures are well distributed across all countries, then it would be valid to use R^2 as an indicator of integration.

The study focused more on the INT_{Ret} measure. The INT_{Risk} measure has nevertheless shown interesting characteristics that future research could investigate. Furthermore, the literature, including my master's thesis, focuses on stock market integration. Studies extend-

ing this measure to other asset classes (e.g., bonds, commodities) might also be considered. Given the numerous integration measures, each with its advantages and disadvantages, future research could moreover attempt to rank them according to specific criteria.

Concerning the drivers of financial integration, the paper focused on the subcategories of globalization. Although the research has introduced control variables in order to have the most accurate view of the effect of globalization, it seems that some variables have not been taken into account in the model. An Omitted Variable Bias (OVB) consequently occurs, and this bias causes the model to assign the effect of missing variables to those that were included. The negative sign for *Regulatory Quality* was, for example, intriguing since it is most plausible that an improvement in a country's regulations will help it integrate financially. Future research can therefore try to focus on identifying a new factor of financial integration, which would allow a more accurate interpretation of the coefficients and help policymakers in their decision-making.

Appendices

Appendix A

Detailed Data Description

A.1 Globalization Dimensions and Individual Variables Description

Table A.1: Dimensions and Individual Variables Description

Dimension	Dimension Description	Sources
Trade Globalisation, de facto	The sub-dimension de facto trade globalization refers to the exchange of goods and services over long distances.	
Trade in goods	*Exports and imports of goods (% of GDP).*	*World Bank WDI (2018)*
Trade in services	*Exports and imports of services (% of GDP).*	*World Bank WDI (2018)*
Trade partner diversity	*Average of the Herfindahl-Hirschman market concentration index for exports and imports of goods (inverted).*	*IMF DOTS (2018a) and own calculations*
Trade Globalisation, de jure	It refers to policies that facilitate and promote trade flows between countries. It is measured using variables on trade regulation, trade taxes, tariff rates and free trade agreements.	
Trade regulations	*Average of two subcomponents: Prevalence of non-tariff trade barriers and compliance costs of importing and exporting.*	*Gwartney et al. (2018)*
Trade taxes	*Income from taxes on international trade as percentage of revenue (inverted).*	*World Bank WDI (2018)*
Tariffs	*Unweighted mean of tariff rates.*	*Gwartney et al. (2018)*
Trade agreements	*Number of bilateral and multilateral free trade agreements.*	*Egger and Larch (2008) and WTO (various years)*
Financial Globalisation, de facto	De facto financial globalization is measured by capital flows and stocks of foreign assets and liabilities. We thus use a quantity-based measure as opposed to a price-based or news-based measure of financial globalization (Baele et al. 2004)	
Foreign direct investment	*Sum of stocks of assets and liabilities of foreign direct investments (% of GDP).*	*Lane and Milesi-Ferretti (2018) and IMF IIP (2018b)*
Portfolio investment	*Sum of stocks of assets and liabilities of international equity portfolio investments (% of GDP).*	*Lane and Milesi-Ferretti (2018) and IMF IIP (2018b)*
International debt	*Sum of inward and outward stocks of international portfolio debt securities and international bank loans and deposits (% of GDP).*	*Lane and Milesi-Ferretti (2018) and IMF IIP (2018b)*
International reserves	*Includes foreign exchange (excluding gold), SDR holdings and reserve position in the IMF (% of GDP).*	*Lane and Milesi-Ferretti (2018) and IMF IIP (2018b)*
International income payments	*Sum of capital and labour income to foreign nationals and from abroad (% of GDP).*	*World Bank WDI (2018)*
Financial Globalisation, de jure	The sub-dimension de jure financial globalization measures the openness of a country to international financial flows and investments.	
Investment restrictions	*Prevalence of foreign ownership and regulations to international capital flows.*	*Gwartney et al. (2018)*
Capital account openness	*Chinn-Ito index of capital account openness.*	*Chinn, Ito (2006, 2008)*
International investment agreements	*Number of Bilateral Investment Agreements (BITs) and Treaties with Investment Provisions (TIPs).*	*UNCTAD (2018)*

Interpersonal Globalisation, de facto	This sub-dimension captures direct interactions among citizens living in different countries	
International voice traffic	*International incoming and outgoing fixed and mobile telephone traffic in minutes (% of population)*	*ITU (2018)*
Transfers	*Secondary income paid and received. Gross inflows and outflows of goods, services, income or financial items without a quid pro quo (% of population).*	*World Bank WDI (2018)*
International tourism	*Arrivals and departures of international tourists (% of population).*	*World Bank WDI (2018)*
International students	*Inbound and outbound number of tertiary students (% of population).*	*World Bank WDI (2018)*
Migration	*Number of foreign or foreign-born residents (% of population).*	*World Bank WDI (2018)*
Interpersonal Globalisation, de jure	De jure interpersonal globalization refers to policies and resources that enables direct interactions among people living in different countries. The variables we have chosen are conceptually close to the ones we use for de facto interpersonal globalization.	
Telephone subscriptions	*Fixed telephone and mobile subscriptions (% of population).*	*World Bank WDI (2018)*
Freedom to visit	*Percentage of countries for which a country requires a visa from foreign visitors.*	*Czaika et al. (2018) and IATA*
International airports	*Number of airports that offers at least one international flight connection (% of population).*	*ICAO (2018)*
Informational Globalisation, de facto	While interpersonal globalization is intended to capture personal interactions, informational globalization is meant to measure the actual flow of ideas,knowledge and images	
Used internet bandwidth	*Total used capacity of international internet bandwidth in bits per second (% of population).*	*ITU (2018)*
International patents	*Patent applications by non residents filed through the Patent Co-operation Treaty procedure or with a national patent office (% of population).*	*World Bank WDI (2018)*
High technology exports	*Exports of high R&D intensity products in current US$ (% of population).*	*World Bank WDI (2018)*
International patents	*Patent applications by non residents filed through the Patent Co-operation Treaty procedure or with a national patent office (% of population).*	*World Bank WDI (2018)*
High technology exports	*Exports of high R&D intensity products in current US$ (% of population).*	*World Bank WDI (2018)*
Informational Globalisation, de jure	De jure informational globalization refers to the ability to share information across countries.	
Television access	Share of households with a television set	ITU (2018)
Internet access	Individuals using the internet (% of population).	World Bank WDI (2018)
Press freedom	Quantification of the legal environment for the media, political pressure that influence reporting and economic factor that affect access to news and information.	Freedom House (2018a)
Cultural Globalisation, de facto	The sub-index de jure cultural globalization refers to openness towards and the ability to understand and adopt foreign cultural influences.	
Trade in cultural goods	*Exports and imports of cultural goods defined as in UNESCO (2009) (% of population)*	*UN Comtrade (2018)*
Trade in personal services	*Exports and imports of personal, cultural and recreational services (% of population).*	*IMF BOPS (2018c)*
International trademarks	*Applications to register a trademark with a national or regional Intellectual Property (IP) office by non residents in percent of all applications.*	*World Bank WDI (2018)*
McDonald's restaurant	*Number of McDonald's restaurants (% of population).*	*McDonald's (various years)*
IKEA stores	*Number of IKEA stores (% of population)*	*IKEA (various years)*
Cultural Globalisation, de jure	Cultural globalization is the most difficult dimension to measure. Following Saich (2000) and Dreher et al. (2008), it refers to some extent to the domination of U.S. cultural products, measured using the number of McDonald's restaurants.The definition has been expanded to western countries being trendsetters in much of the cultural realm, represented by the introduction of the number of IKEA stores to the index.	
Gender parity	*Ratio of girls to boys enrolled in primary education level in public and private schools*	*World Bank WDI (2018)*
Human capital	*Human capital index based on the average years of schooling and an assumed rate of return to education.*	*Feenstra et al. (2015) / Penn World Table 9.0*
Civil liberties	*Quantification of aspects on freedom of expression and belief, associational andorganizational rights, rule of law and personal autonomy and individual rights.*	*Freedom House (2018b)*

Political Globalisation, de facto	De facto political globalization captures the diffusion of government policies	
Embassies	*Absolute number of embassies in a country.*	*Europe World Yearbook (various years)*
UN peace keeping missions	*Personnel contributed to U.N. Security Council Missions (% of population).*	*UN Department of Peacekeeping Operations (various years)*
International NGOs	*Number of internationally oriented nongovernmental organisations (NGO) operating in that country.*	*Yearbook of International Organizations (various years)*
Political Globalisation, de jure	De jure political globalization refers to the ability to engage in international political cooperation	
International organisations	*Number of international inter-governmental organisations in which a country is member.*	*CIA World Factbook (various years)*
International treaties	*International treaties signed between two or more states and ratified by the highest legislative body of each country since 1945.*	*United Nations Treaty Collection (various years)*
Treaty partner diversity	*Number of distinct treaty partners of a country with bilateral investment treaties (BITs).*	*UNCTAD (2018)*

A.2 Descriptive Statistics of Globalization Index

Table A.2: Globalization Index: Descriptive Statistics

		EMEA		**Asia**		**America**	
		Average	SD	Average	SD	Average	SD
Globalization Index	Globalization Index (overall)	59.00%	11.70%	51.77%	13.41%	53.48%	10.19%
	Globalization Index (de facto)	59.20%	9.50%	52.29%	12.01%	49.58%	8.03%
	Globalization Index (de jure)	58.88%	14.03%	51.24%	14.86%	57.35%	12.62%
Economic Globalization	Economic Globalization (overall)	57.26%	9.91%	44.92%	11.29%	42.66%	9.18%
	Economic Globalization (de facto)	54.11%	9.28%	45.18%	11.45%	37.07%	7.72%
	Economic Globalization (de jure)	60.36%	11.14%	44.66%	11.29%	48.25%	11.74%
- Trade Globalization	Trade Globalization (overall)	60.17%	8.69%	43.90%	13.18%	35.40%	8.20%
	Trade Globalization (de facto)	54.37%	7.11%	47.73%	12.16%	26.72%	4.87%
	Trade_Globalization (de jure)	65.91%	10.91%	40.08%	14.85%	44.08%	12.40%
- Financial Globalization	Financial Globalization (overall)	54.40%	11.33%	45.94%	9.75%	49.93%	11.00%
	Financial Globalization (de facto)	53.99%	11.81%	42.64%	11.04%	47.43%	10.91%
	Financial Globalization (de jure)	54.80%	11.72%	49.25%	8.86%	52.42%	12.58%
Social Globalization	Social Globalization (overall)	54.92%	12.45%	41.53%	14.80%	47.19%	11.66%
	Social Globalization (de facto)	57.58%	11.35%	37.84%	15.05%	40.04%	11.84%
	Social Globalization (de jure)	52.60%	13.72%	45.11%	14.86%	54.29%	11.54%
- Interpersonal Globalization	Interpersonal Globalization (overall)	54.59%	8.70%	35.12%	10.17%	39.45%	9.17%
	Interpersonal Globalization (de facto)	58.99%	6.13%	29.51%	6.76%	28.17%	6.28%
	Interpersonal Globalization (de jure)	50.55%	11.55%	40.23%	13.72%	50.40%	12.15%
- Information Globalization	Information Globalization (overall)	55.55%	15.26%	43.42%	21.32%	53.73%	17.32%
	Information Globalization (de facto)	55.85%	13.57%	43.13%	23.82%	51.58%	20.40%
	Information Globalization (de jure)	55.25%	17.82%	43.72%	19.52%	55.89%	14.66%
- Cultural Globalization	Cultural Globalization (overall)	54.53%	13.78%	45.93%	13.11%	48.26%	8.83%
	Cultural Globalization (de facto)	57.99%	15.94%	40.48%	14.82%	39.94%	9.66%
	Cultural Globalization (de jure)	51.99%	12.12%	51.39%	11.81%	56.57%	8.33%
Political Globalization	Political Globalization (overall)	64.99%	13.11%	68.79%	14.65%	70.55%	10.18%
	Political Globalization (de facto)	66.29%	8.86%	73.62%	10.94%	71.59%	6.25%
	Political Globalization (de jure)	63.70%	17.68%	63.95%	18.70%	69.51%	15.20%

A.3 Control Variables Description

Table A.3: Control Variables Description

Control Variables	Control variables are usually variables that are not the primarily interest of the study. Nevertheless , those variables are related to the dependent variable and it is important to remove their effects from the equation.	
Corruption	*Captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.*	*World Bank WGI (2022)*
Effectiveness	*Captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.*	*World Bank WGI (2022)*
Stability	*Measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.*	*World Bank WDI (2018)*
Regulatory	*Captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.*	*World Bank WGI (2022)*
Law	*Captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.*	*World Bank WGI (2022)*
Voice	*Captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.*	*World Bank WGI (2022)*
Spread	*The series is calculated as the spread between Moody's Seasoned Aaa Corporate Bond and 10-Year Treasury Constant Maturity*	*St. Louis FED*
VIX	*The VIX is an indicator of volatility in the US financial market.*	*Cboe (2022)*
World GDP	*Growth of real world per capita gross domestic product.*	*World Bank WDI (2022)*
Population Growth	*Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.*	*World Bank WDI (2022)*
GDP per Capita Growth	*Real per capita gross domestic product*	*World Bank WDI (2022)*

Appendix B

Global Factors

B.1 Risk Integration (INT_{Risk}) Global Factors

Figure B.1: Average Cumulative Percentage of Variance Explained by Sorted PCs (SD)

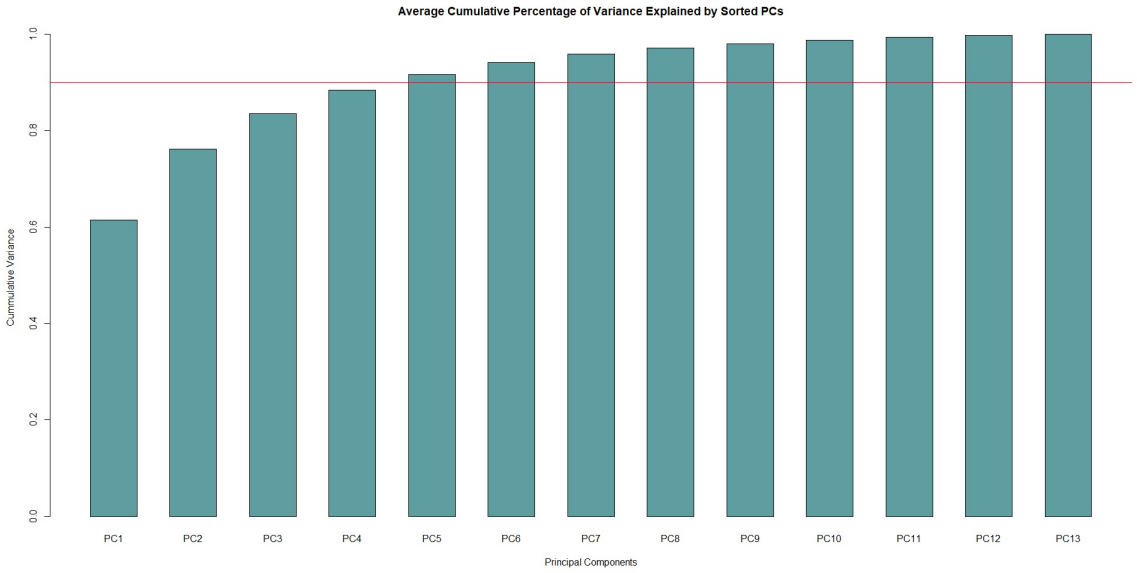


Table B.1: Average Cumulative Percentage of Variance Explained by Sorted PCs (SD)

PCs	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10	PC11	PC12	PC13
Average Cum Variance	0.614	0.762	0.836	0.884	0.917	0.941	0.959	0.972	0.981	0.988	0.994	0.997	1.000

Figure B.2: Cumulative Percentage of Variance Explained by Sorted PCs (1974-2021) (SD)

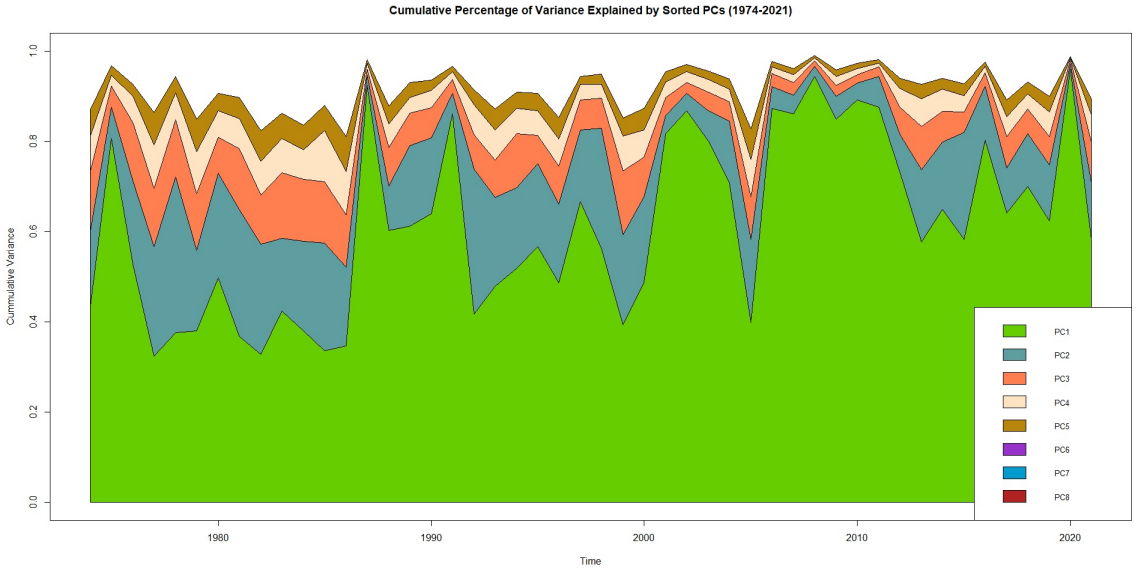
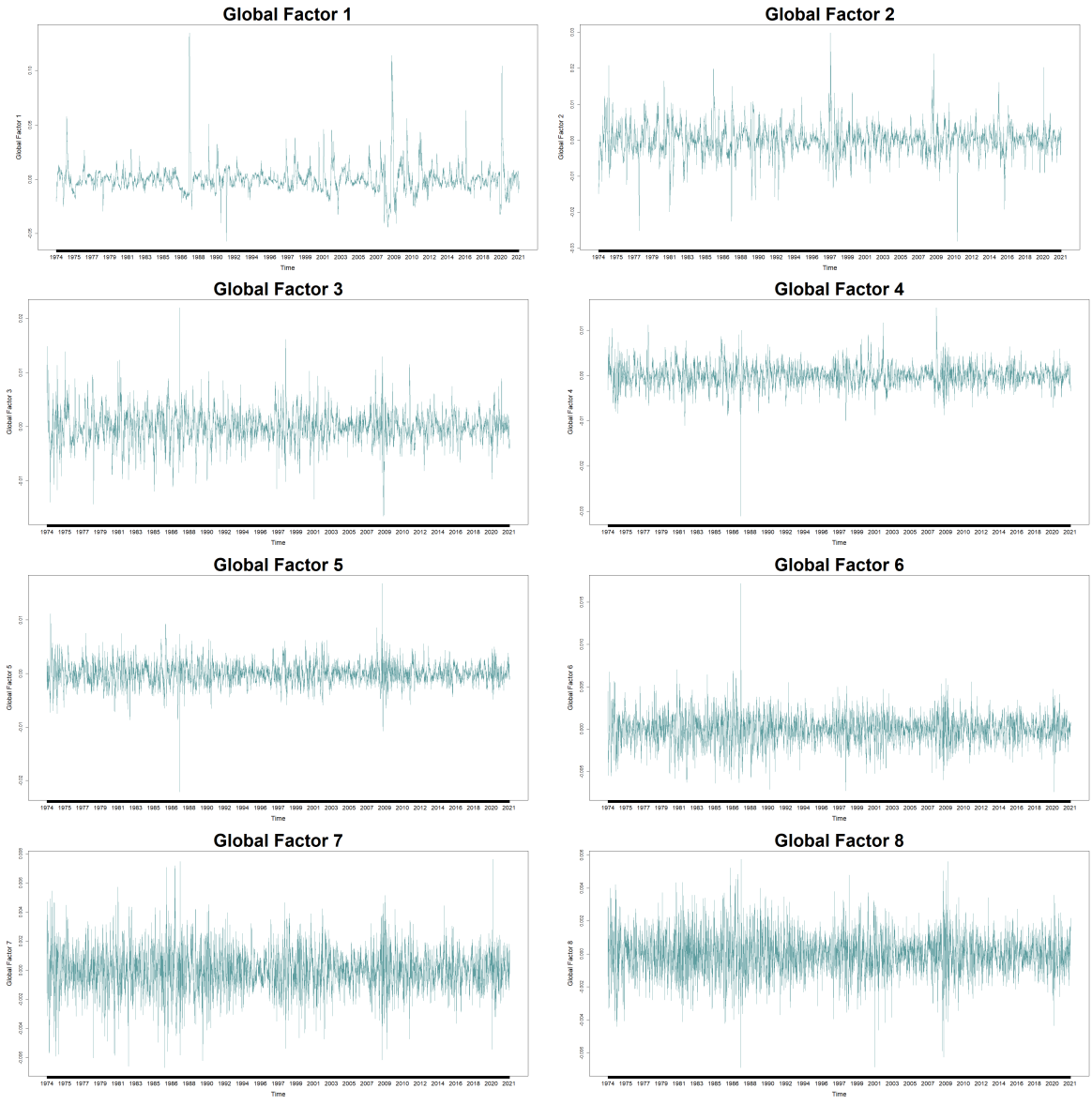


Figure B.3: Risk Integration (INT_{Risk}) Global Factors (1974-2021)

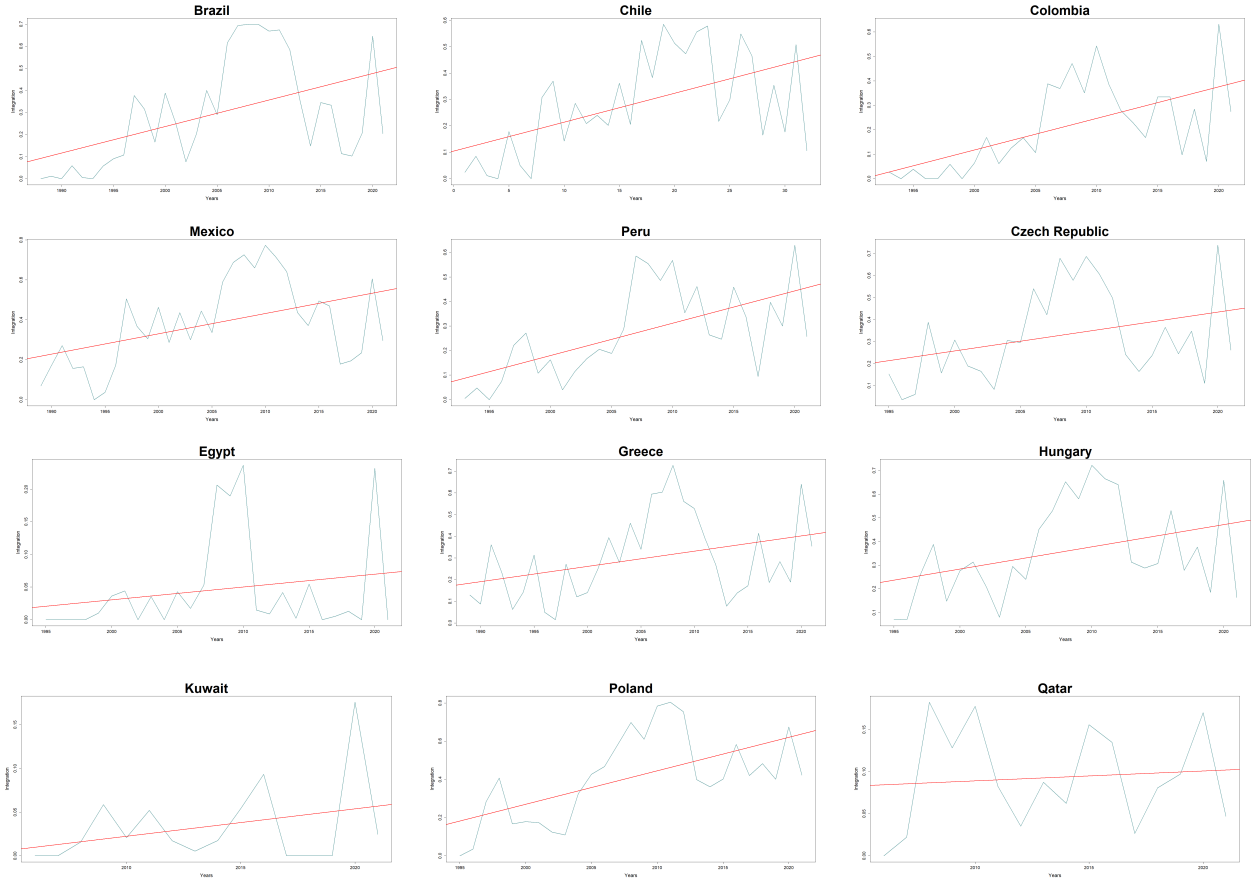


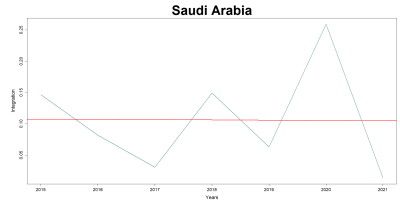
Appendix C

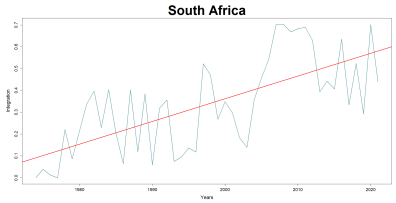
Integration Evolution per Country

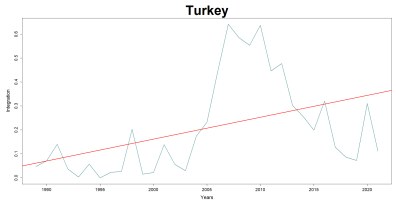
C.1 Return Integration (INT_{Ret})

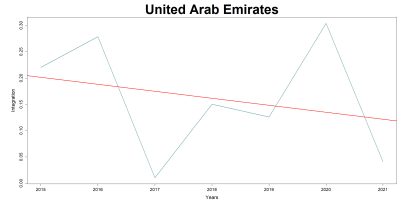
Figure C.1: Return Integration (INT_{Ret}) Evolution per Countries

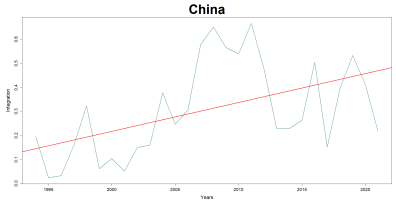


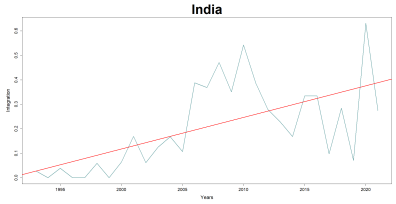

Saudi Arabia
Integration
Years

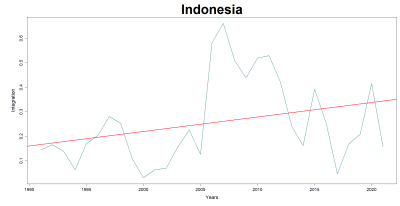

South Africa
Integration
Years

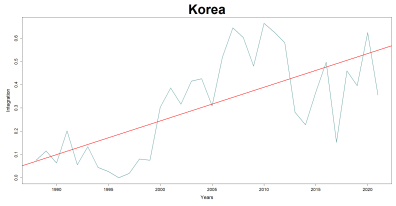

Turkey
Integration
Years

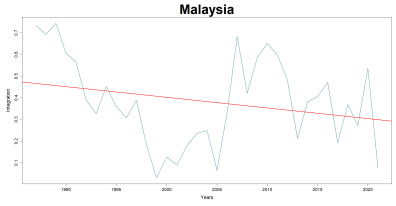

United Arab Emirates
Integration
Years

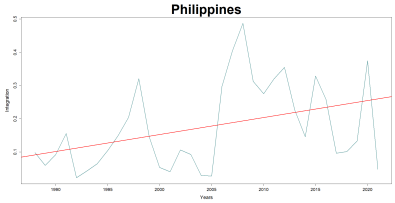

China
Integration
Years

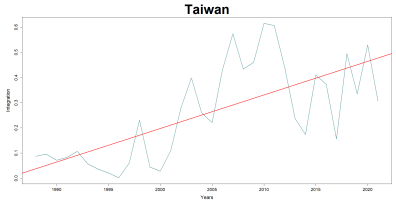

India
Integration
Years

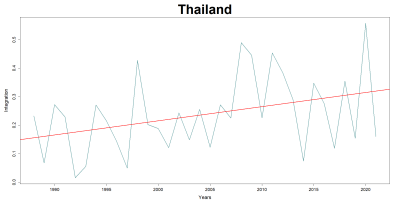

Indonesia
Integration
Years


Korea
Integration
Years


Malaysia
Integration
Years

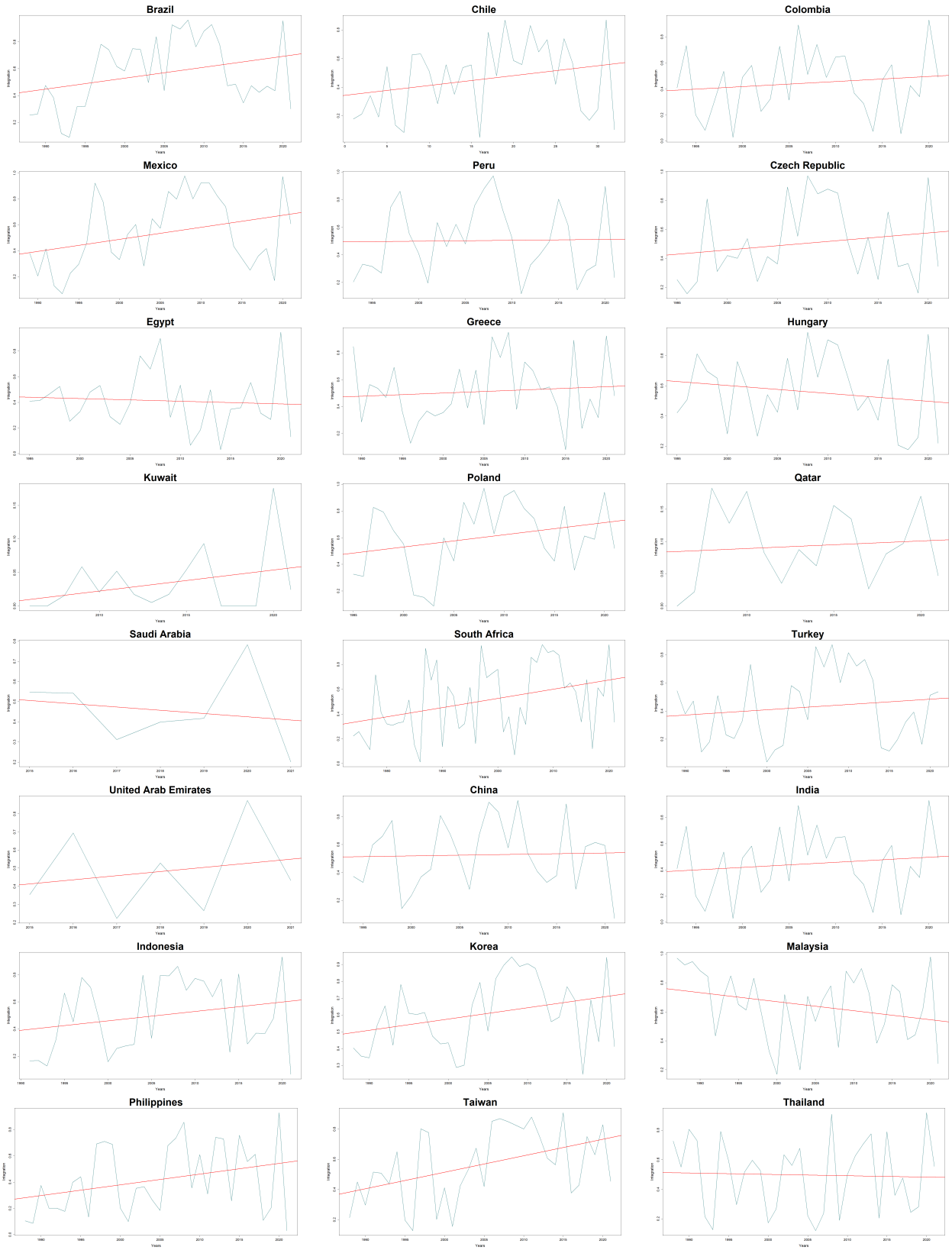

Philippines
Integration
Years


Taiwan
Integration
Years


Thailand
Integration
Years

C.2 Risk Integration (INT_{Risk})

Figure C.2: Risk Integration (INT_{Risk}) Evolution per Country



References

Adam, K., Jappelli, T., Menichini, A., Padula, M., & Pagano, M. (2002). Analyse, compare, and apply alternative indicators and monitoring methodologies to measure the evolution of capital market integration in the european union. *Report to the European Commission*, *2002*, 1–95.

Adler, M., & Dumas, B. (1983). International portfolio choice and corporation finance: A synthesis. *The Journal of Finance*, *38*(3), 925–984.

Agmon, T. (1973). Country risk: The significance of the country factor for share-price movements in the united kingdom, germany, and japan. *The Journal of Business*, *46*(1), 24–32.

Baele, L. (2005). Volatility spillover effects in european equity markets. *Journal of Financial and Quantitative Analysis*, *40*(2), 373–401.

Baele, L., Ferrando, A., Hördahl, P., Krylova, E., & Monnet, C. (2004). *Measuring financial integration in the euro area* (Tech. Rep.). ECB occasional paper.

Beckers, S., Connor, G., & Curds, R. (1996). National versus global influences on equity returns. *Financial Analysts Journal*, *52*(2), 31–39.

Bekaert, G. (1995). Market integration and investment barriers in emerging equity markets. *The World Bank Economic Review*, *9*(1), 75–107.

Bekaert, G., Erb, C. B., Harvey, C. R., & Viskanta, T. E. (1998). Distributional characteristics of emerging market returns and asset allocation. *Journal of Portfolio Management*, *24*(2), 102–+.

Bekaert, G., & Harvey, C. R. (1995). Time-varying world market integration. *the Journal of Finance*, *50*(2), 403–444.

Bekaert, G., & Harvey, C. R. (1997). Emerging equity market volatility. *Journal of Financial economics*, *43*(1), 29–77.

Bekaert, G., & Harvey, C. R. (2000). Foreign speculators and emerging equity markets. *The journal of finance*, *55*(2), 565–613.

Bekaert, G., & Harvey, C. R. (2002). Research in emerging markets finance: looking to the future. *Emerging markets review*, *3*(4), 429–448.

Bekaert, G., & Harvey, C. R. (2003a). Emerging markets finance. *Journal of empirical finance*, *10*(1-2), 3–55.

Bekaert, G., & Harvey, C. R. (2003b). *Market integration and contagion.* National Bureau of Economic Research Cambridge, Mass., USA.

Bekaert, G., & Harvey, C. R. (2017). Emerging equity markets in a globalizing world. *Available at SSRN 2344817*.

Bekaert, G., Harvey, C. R., & Lundblad, C. (2002). *Growth volatility and equity market liberalization* (Tech. Rep.). Working Paper,(Duke University).

Bekaert, G., Harvey, C. R., Lundblad, C. T., & Siegel, S. (2011). What segments equity markets? *The Review of Financial Studies*, *24*(12), 3841–3890.

Bekaert, G., Hodrick, R. J., & Kiguel, A. (2019). Variance risk in global markets. *Columbia Business School Research Paper Forthcoming*.

Bekaert, G., Hodrick, R. J., & Zhang, X. (2009). International stock return comovements. *The Journal of Finance*, *64*(6), 2591–2626.

Billio, M., Donadelli, M., Paradiso, A., & Riedel, M. (2017). Which market integration measure? *Journal of Banking & Finance*, *76*, 150–174.

Bouchet, M. H., Clark, E., & Groslambert, B. (2003). Country risk assessment: A guide to global investment strategy.

Bruner, R. F., Li, W., Kritzman, M., Myrgren, S., & Page, S. (2008). Market integration in developed and emerging markets: Evidence from the capm. *Emerging Markets Review*, *9*(2), 89–103.

Cappiello, L., Kadareja, A., Gerard, B., & Manganelli, S. (2006). Financial integration of new eu member states.

Carrieri, F., Errunza, V., & Hogan, K. (2007). Characterizing world market integration through time. *Journal of Financial and Quantitative Analysis*, *42*(4), 915–940.

Caselli, M. (2012). *Trying to measure globalization: Experiences, critical issues and perspectives* (Vol. 4). Springer Science & Business Media.

Chang, E. J., Lima, E. J. A., & Tabak, B. M. (2004). Testing for predictability in emerging equity markets. *Emerging Markets Review*, *5*(3), 295–316.

Chen, Z., & Knez, P. J. (1995). Measurement of market integration and arbitrage. *The Review of Financial Studies*, *8*(2), 287–325.

Daoud, J. I. (2017). Multicollinearity and regression analysis. In *Journal of physics: Conference series* (Vol. 949, p. 012009).

De Hoyos, R. E., & Sarafidis, V. (2006). Testing for cross-sectional dependence in panel-data models. *The stata journal*, *6*(4), 482–496.

De Santis, G., et al. (1997). Stock returns and volatility in emerging financial markets. *Journal of International Money and finance*, *16*(4), 561–579.

Devereux, M. B., & Yu, C. (2020). International financial integration and crisis contagion. *The Review of Economic Studies*, *87*(3), 1174–1212.

Djankov, S., La Porta, R., Lopez-de Silanes, F., & Shleifer, A. (2001). Legal structure and judicial efficiency: the lex mundi project. *Washington, DC: World Bank*.

Dreher, A. (2006). Does globalization affect growth? evidence from a new index of globalization. *Applied economics*, *38*(10), 1091–1110.

Eichengreen, B. (2010). *Global imbalances and the lessons of bretton woods*. Mit Press.

Fama, E. F., & MacBeth, J. D. (1973). Risk, return, and equilibrium: Empirical tests. *Journal of political economy*, *81*(3), 607–636.

Figge, L., & Martens, P. (2014). Globalisation continues: the maastricht globalisation index revisited and updated. *Globalizations*, *11*(6), 875–893.

Forbes, K. J., & Rigobon, R. (2002). No contagion, only interdependence: measuring stock market comovements. *The journal of Finance*, *57*(5), 2223–2261.

Giannetti, M., Guiso, L., Jappelli, T., Padula, M., Pagano, M., et al. (2002). *Financial market integration, corporate financing and economic growth* (Tech. Rep.). Directorate General Economic and Financial Affairs (DG ECFIN), European ....

Goetzmann, W. N., Li, L., & Rouwenhorst, K. G. (2001). *Long-term global market correlations.* National Bureau of Economic Research Cambridge, Mass., USA.

Greene, W. H. (2002). The behavior of the fixed effects estimator in nonlinear models.

Griffin, J. M., & Stulz, R. M. (2001). International competition and exchange rate shocks: a cross-country industry analysis of stock returns. *The review of Financial studies*,

14(1), 215–241.

Grubel, H. G. (1968). Internationally diversified portfolios: welfare gains and capital flows. *The American economic review*, *58*(5), 1299–1314.

Grubel, H. G., & Fadner, K. (1971). The interdependence of international equity markets. *The Journal of Finance*, *26*(1), 89–94.

Gygli, S., Haelg, F., Potrafke, N., & Sturm, J.-E. (2018). The kof globalisation index-revisited.

Harvey, C. R. (1995a). Predictable risk and returns in emerging markets. *The review of financial studies*, *8*(3), 773–816.

Harvey, C. R. (1995b). The risk exposure of emerging equity markets. *The world bank economic review*, *9*(1), 19–50.

Huber, P. J. (1967). Under nonstandard conditions. In *Proceedings of the fifth berkeley symposium on mathematical statistics and probability: Weather modification; university of california press: Berkeley, ca, usa* (p. 221).

Huizinga, H., & Demirgüc-Kunt, A. (1996). Portfolio investments in emerging stock markets: Direct and indirect barriers. *Investing in Emerging Markets*, 255–270.

Imbs, J. (2010). The first global recession in decades. *IMF economic review*, *58*(2), 327–354.

Jayaratne, J., & Strahan, P. E. (1996). The finance-growth nexus: Evidence from bank branch deregulation. *The Quarterly Journal of Economics*, *111*(3), 639–670.

Keim, D. B., & Stambaugh, R. F. (1986). Predicting returns in the stock and bond markets. *Journal of financial Economics*, *17*(2), 357–390.

Korajczyk, R. A. (1996). A measure of stock market integration for developed and emerging markets. *The World Bank Economic Review*, *10*(2), 267–289.

Kose, M. A., Prasad, E., Rogoff, K., & Wei, S.-J. (2009). Financial globalization: A reappraisal. *IMF Staff papers*, *56*(1), 8–62.

Kose, M. A., Prasad, E. S., & Terrones, M. E. (2003). Financial integration and macroeconomic volatility. *IMF Staff papers*, *50*(1), 119–142.

Lane, P. R. (2013). Financial globalisation and the crisis. *Open Economies Review*, *24*(3), 555–580.

La Porta, R., Lopez-de Silanes, F., Shleifer, A., & Vishny, R. W. (1997). Legal determinants of external finance. *The journal of finance*, *52*(3), 1131–1150.

Lessard, D. R. (1976). World, country, and industry relationships in equity returns: implications for risk reduction through international diversification. *Financial analysts journal*, *32*(1), 32–38.

Levine, R. (1997). Financial development and economic growth: views and agenda. *Journal of economic literature*, *35*(2), 688–726.

Lintner, J. (1965). Security prices, risk, and maximal gains from diversification. *The journal of finance*, *20*(4), 587–615.

Markowitz, H. (1952). Portfolio selection*. *The Journal of Finance*, *7*(1), 77-91.

Martens, P., Caselli, M., De Lombaerde, P., Figge, L., & Scholte, J. A. (2015). New directions in globalization indices. *Globalizations*, *12*(2), 217–228.

MSCI. (2020). *Index calculation methodology for the msci equity indexes.* Retrieved 07/04/2022, from https://www.msci.com/eqb/methodology/meth_docs/MSCI_IndexCalcMethodology_Jan2020.pdf

Mullet, G. M. (1976). Why regression coefficients have the wrong sign. *Journal of Quality Technology*, *8*(3), 121–126.

Pesaran, M. H., Ullah, A., & Yamagata, T. (2008). A bias-adjusted lm test of error cross-section independence. *The Econometrics Journal*, *11*(1), 105–127.

Portes, R., & Rey, H. (2005). The determinants of cross-border equity flows. *Journal of international Economics*, *65*(2), 269–296.

Pukthuanthong, K., & Roll, R. (2009). Global market integration: An alternative measure and its application. *Journal of Financial Economics*, *94*(2), 214–232.

Rogers, W. H. (1983). Analyzing complex survey data. *Rand Corporation memorandum, Santa Monica, CA*.

Rousseau, P. L. (2002). *Historical perspectives on financial development and economic growth.* National Bureau of Economic Research Cambridge, Mass., USA.

Sargen, N. P. (2016). *Global shocks: An investment guide for turbulent markets*. Springer.

Scholte, J. A. (2008). Defining globalisation. *World Economy*, *31*(11), 1471–1502.

Sercu, P., & Vanpee, R. (2007). Home bias in international equity portfolios: A review. *Available at SSRN 1025806*.

Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *The journal of finance*, *19*(3), 425–442.

Solnik, B. H. (1974a). An equilibrium model of the international capital market. *Journal of economic theory*, *8*(4), 500–524.

Solnik, B. H. (1974b). Why not diversify internationally rather than domestically? *Financial analysts journal*, *30*(4), 48–54.

Suzuki, Y. (2014). Financial integration and consumption risk sharing and smoothing. *International Review of Economics & Finance*, *29*, 585–598.

Thompson, S. B. (2011). Simple formulas for standard errors that cluster by both firm and time. *Journal of financial Economics*, *99*(1), 1–10.

White, H. (1980). A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica: journal of the Econometric Society*, 817–838.

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data*. MIT press.