Impact of Culture on Stock Market Returns and Volatility Spillover: Case of World Frontier Markets

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Dr. Syed Zulfiqar Ali Shah   April, 2017

بسم الله الرحمن الرحيم

In the name of Allah, the most merciful and beneficent

DEDICATION

I dedicate this thesis to my Beloved Prophet Hazrat Muhammad (S.A.W), to

whom I am indebted so much, who wept for me when I was wasn't born

even.

(Acceptance by the Viva Voice Committee)

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ABSTRACT

As integration is related to systemic risk and rewards in the markets, it's coupled with both weak and semi-strong form efficiency. Little or no evidence is found on return and volatility spillover of Frontier markets let alone the very new emerging area of cultural Finance.

This study takes US and fifteen frontier markets out of 32 from all five regions defined by MSCI 2015, based on their data availability from January 2000 to December 2015 for sixteen years. This study uses the Diebold and Yilmaz's (2009) measure of financial integration which uses decomposition of Variances in vector autoregressive models, on weekly data of returns and realized volatility to arrive at static and dynamic return and volatility indices. At the second layer of analysis the static indices are used in cross sectional country pair financial gravity model to know the determinants of return and volatility spillovers followed by Balli, Balli, Jean Louis, and Vo, (2015). With addition of Weighted mahalanobis, asymmetrical Cultural distance measure of Yeganeh (2014) by taking four dimension of culture from Hofstede (2001), in the cross sectional determinant model this study take next step by examining the relationships in independently pooled panel data paradigm.

By taking bi-lateral returns and volatility spillovers with four sub-sample periods of 2000-2003, 2004-2007, 2008-2011, 2012-2015 of four years each, the study incorporates dynamism in integration of not only interdependence in financial markets but also in cultural variables. Moreover, in both cross sectional and panel data setting this study investigates the channels through which Culture operates, motivated by the work of Lucey & Zhang (2010); Eun, Wang, and Xiao (2015); and Rothonis, Tran, and Wu, (2016) through introducing moderators in OLS models. Finally this study also includes the crisis

index developed by Sachs, Tornell, and Velasco (1997) and used by Zhu and Yang (2008) to know the contagion of crisis in frontier markets and if Culture is a channel of contagion through simple OLS methodology in panel settings.

The Markets are partially integrated and spillovers are low as compared to previous results of emerging and developed markets. The overall high volatility spillovers against returns give way to behavioral and cultural factors and non-existence of rational models of finance in decision making. US as representative of the developed markets shows highest contribution to the shocks in Frontier markets variance ratios in both cases. This study found high significant positive relationship to our cultural distance measure and support the notion that culturally distant countries have low levels of spillovers in both returns and volatility. Geographical proximity related hypothesis was completely rejected proving that frontier markets financial dynamics are not derived by regions.

Trade openness is a channel through which relationship between culture and financial integration weakens in both spillovers, which leads to the theory of liberalization and efficiency as posited by Bekaert, Harvey, and Lundblad (2003). On the other hand Capital account openness enhances the culture-spillover relationship a little bit which is against the theory but we can attribute it to sociological concept of cultural lag, and as theorized by Lucey and Zhang (2010), it is proved that trading is also channel of cultural impact on both returns and volatility spillover. Interestingly from the five international scaled crises only Sovereign Debt crises created the relationship between national crisis index and Volatility/returns spillovers. According to results only return spillover spread through channel of culture not the volatility spillover.

Theoretically it proves that both weak and Semi-Strong form of efficiency do not hold in frontier markets. Significant impact of cultural distances can be attributed to home biasness and information costs, moreover openness is gradual and time taking process.

JEL Classification: F3, F31, G1, G15,

Key words: Stock market Integration, Spillovers, Contagion, Culture, Religion, Language, Frontier Markets

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DECLARATION

I hereby declare that this thesis, neither as a whole nor as a part thereof, has been copied out from any source. It is further declared that I have prepared this thesis entirely on the basis of my personal effort made under the sincere guidance of my supervisor and colleagues. No portion of work, presented in this thesis has been submitted in support of any application for any degree or qualification of this or any other university or institute of learning.

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My immediate and extended family has been integral in completion of my thesis. My beloved Parents and husband, Shahbaz Israr Khan have played an extremely important role. They kept me motivated and provided me support when it was needed the most. They have been always been pillars of strength for me and has been with me through thick and thin.

FORWARDING SHEET

The thesis entitled "Impact of Culture on Stock Market Return and Volatility Spillover: Case of World Frontier Markets" submitted by <u>Najam Us Sahar</u> as partial fulfillment of Ph.D degree in Management Sciences with specialization in Finance, has completed under my guidance and supervision. The changes advised by the external and the internal examiners hava also been incorporated. I am satisfied with the quality of student's research work and allow her to submit this thesis for further process as per IIU rules & regulations.

Date:_____   Signature:_____

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Abbreviations and Acronyms

AMH	Adaptive Markets Hypothesis
ARCH	Autoregressive Conditional Heteroscedasticity
ARDA	Association Of Religion Data Archives
ASEAN	Association of Southeast Asian Nations
CAPM	Capital Asset Pricing Mode
CD	Cultural Distance
CEPII	Centre d'Etudes Prospectives et d'Informations Internationales
EMH	Efficient Market Hypothesis
EU	European Union
FPI	Foreign Portfolio Investments
GARCH	Generalized Autoregressive Conditional Heteroscedasticity
GDP	Gross Domestic Product
ICRG	International Country Risk Guide
IFC	International Finance Corporation
IFS	International Foundation For Science
IMF	International Monetary Fund
IND	Individualism
IPT	International Portfolio Theory
MAS	Masculinity
MENA	Middle East and North Africa
MSCI	Morgan Stanley Capital International
NAFTA	North American Free Trade Agreement
NBER	National Bureau of Economic Research
OLS	Ordinary Least Square
PD	Power Distance
S&P	Standards and Poor
SAARC	South Asian Association for Regional Cooperation
UA	Uncertainty Avoidance
UK	United Kingdom

UN	United Nation
US	United States
USA	United States of America
VAR	Variance decomposition of Vector Autoregressive

Chapter 1

All stock markets were once frontier markets. (Speidell, Arnott, & Aronson, 2011)

1. Introduction:

With the undeniable phenomenon of globalization, financial markets are interlinked and asset allocation is becoming boundary-free causing more efficient allocation of resources, fewer intermediation costs, maturation of domestic capital markets and in turn impacting economic growth. On one hand, the markets have more competition and expanding to realize their full growth potential, but on the other financial systems are not fully integrated with confirmations of home country bias and segmentation of domestic markets. This integration is not only affecting firms and country finance globally, but it has resulted in regional arrangements like EU, NAFTA, ASEAN, SAARC and MENA with Intra-regional financial sector policy coordination strengthened, for macroeconomic monitoring and liquidity support to increase regional financial stability. Beyond regional cooperation initiatives, there are differences in development and integration of national capital markets in the same region and worldwide.

The financial linkage between the markets is of fundamental significance as it is related to systematic risk with implications for both stable and crisis situations (Hartmann et al., 2004). Levine & Zervos (1998) pointed towards the complications of market integration and more capital flows as it not only opens the doors of diversification, but also the higher risk regarding the spread of crises and gaps in trade with developed countries. According to IMF report, 2007 globalization also threatens economically weak countries if there are transmission channels with higher volatility

spillover. Financial connectedness and the drivers of connectedness are of crucial importance to study and explore in this globalizing world.

Individual market integration with world market has an inverse association with portfolio investment benefits; as implied by the Finance theory. International Capital flows are constantly increasing at high rates from the last three decades with equity and debt markets as the major portion of these flows. The direction of flow is more tilted towards emerging and frontier markets as paybacks of investing in these markets are high returns with high volatility and lower portfolio risk due to semi-integration with the developed world indices makes these attractive for institutional investors and individuals (Aggarwal, Inclan, & Leal, 1999; Harvey, 1995).

MSCI (2013) describes Frontier markets as markets that "demonstrate a relative openness to and accessibility for foreign investors" and not suffering from an economic or political crisis situation. The term of Frontier Markets was first coined by IFC; private part of the World Bank. These markets as described as small-sized with less developed infrastructure and promising growth in future, can be known as Frontier emerging or merging emerging markets. Speidell (2009) termed them as unknown and also unknowable markets, but emphasized on travelling the road untraveled by investing in them. Studies in empirical finance assert to invest in markets having future more glorious than current growth numbers and prospects. Frontier markets are becoming the havens providing a lower price to earnings ratios than developed, and emerging markets with the long-term expected growth. Moreover, with more capital inflows, through policy revival Governments of these countries are making better financial infrastructure and improving on Corruption Perception Index (Berger, Pukthuanthong, & Yang, 2011).

According to UN, World Bank FactSet (2015), Frontier markets Comprise of the World's 19% population, 24% of World Land Mass. 7% GDP and 2% of world Capitalization, according to Millay (2016) at Forbes , Frontier markets will follow the similar pattern of emerging markets which were 1% of world Capitalization 30 years back and now forms 10%. World Bank (2014) report demonstrated the growth of frontier markets as 4.2%, in comparison to 2.4% world economy and growth of 1.21% in US economy, and there is a positive link between market capitalization and GDP, so the size of Frontier Markets will increase resultantly (Speidell & Krohne, 2007). Long-term Investment benefits are attached to the frontier markets, as they are anticipated to have less co-movement with developed and world markets, and these markets are studied very less in the amount as compared to developed and emerging markets (Chen et al., 2014). These markets are attractive for international investors as they promise high growth in returns and low co-movement with the global market in stable times (Baumöhl & Lyócsa, 2014; Amin & Orlowski, 2014).

Hofstede (1983) defines Culture as "Collective programming of mind", that is comprised of beliefs and values including the thought processes that extricates one group having the same Culture from others. One generation passes Culture to another, and it changes so slowly that it can be taken as static and provides the paradigm to the brain about interpreting information and taking decisions (North, 1990). The management literature recognizes culture as a major determinant of business behaviour and ultimately decision-making of human beings. So it can be extrapolated that culture affects financial decision-making as well, through familiarity bias for the nations closer to their own culture, patterned decision-making and same risk tolerances. Certain dimensions of culture

can impact the decision-making of individuals and can impart systematic biases, which can affect stock prices and their co-movement.

In Finance there is enormous literature devoted to returns co-movement and volatility spillover, but it's still unknown that why national markets differ in level of volatility and can't be estimated in the future which markets will suffer more. The reduced amount of co-movement in national markets can be attributed to economic variables and also can be attributed to behavioral and unobservable dynamics (King & Wadhwani, 1990; Turner & Wiegel, 1993). Even in the liberalized markets with no barriers on cross-national asset holding investors invest in their home country more and unobtrusive quantities of foreign investments (French & Poterba, 1991; Tesar & Werner, 1995).

Based on the arguments of Stulz and Williamson (2003), Li, Morck, Yang and Yeung (2004) Cowen (2006), and Jones (2006), less developed countries with trade and capital markets partially opened are more inclined to have a strong relationship of culture in stock price movements. Trade and capital account openness, open the nation to new sets of beliefs, thinking patterns and eventually moderates the decisions regarding stock trading. It can be surmised on the basis of the frontier market's trade and capital structures that their national culture has more influence on stock trading, comovement, and spillovers in comparison to their developed and emerging market counterparts. Moreover, the regular asset pricing models are ineffective, especially in the emerging markets (Bekaert & Harvey 1995), it can be deduced that the situation of frontier markets as well and can attribute it to culture and behavioral aspects.

Aggarwal, Kearney, and Lucey (2009) assert that cultural distance hinders Foreign Portfolio Investments (FPI) such that there is more cross-market FPI with low cultural distance and vice versa. In the gravity model, cultural distance is more important variable than geographic distance and effects the information symmetry and familiarity with the market more, in case of equity rather than debt investments, so culture impact cross-border financial markets, their co-movements and ultimately return and volatility spillover. Carrieri, Errunza, and Hogan (2009) clarify that the risk-return features on national financial markets are dependent on not only the national characteristics of the market but also cross-border integration globally.

With the globalization of investments, financial integration gives access to everyone to take advantage of the unconstrained access to international financial markets and openness of economies facilitates diversification of finance. Integration gives stability to markets (Ibrahim, 2005), aid economic prosperity (Lee, 2013; Lee & Hsieh, 2014), and decreased the cost of capital (Odell & Ali, 2016) on one hand and on the other hand in case of contagion of crises it makes national markets grips shocks too quickly through increased volatility spillover. In this context, it's substantial to study the financial linkages of national markets with global markets in academia, for policymakers and portfolio managers. Canvassers study both the returns as well as volatility spillover, as returns volatility is taken as a basic measure of risk and understanding level and form of both is vital to individuals and institutions in terms of the application of Value at Risk and hedging strategies.

Little or no evidence is found in return and volatility Spillover of Frontier markets let alone the very new emerging area of cultural Finance (Samarakoon, 2011). Therefore this study puts a

unique effort to develop return and Volatility Spillover indices, their dependency on the cultural distance, the paths through which culture impacts and the specification of contagion in Frontier markets. The inclusive aim of such study is to take the maximum benefits of international financial integration while taking care of potential problems (Thapa & Poshakwale, 2012).

1.1 Theoretical Background:

Fama (1970) seminal work on efficient market hypothesis (EMH) drawn from his PhD thesis dissertation is most refereed theoretical basis in the pricing of markets. He postulates that human beings are rational and the information is symmetric in the market, the participants of markets do incorporate the available information in their decisions with right probabilities and measures, as a result, there is information efficiency in the market. No one can beat the market on consistent basis with superior information as securities are rightly priced with the incorporation of all the available information. With the famous axiom of prices is always right, EMH assumes assets to be fundamentally priced, literature asserts more about the speed, the amount, and accuracy of adjustment in prices. Fama (1991), further explained efficiency by the level of information incorporation as a weak, semi-strong and strong form. When prices reflect all the historical price information, its weak form, when semi-strong efficiency holds, prices incorporate all publically available information, for a strong form of efficiency prices must reflect all the public and private information.

In national financial markets even weak form of efficiency is challenged, as many studies with the focus on both returns and volatility proved that markets can be forecasted on today's information (Chaudhuri & Wu, 2003; Narayan, 2008; Hasanov, 2009). International evidence by many studies

like Eun and Shim (1989) and Ghosh, Saidi, and Johnson (1999) indicated that prices and volatility can be estimated through spillover working. EMH is not that a dominant concept today and received a lot of criticism theoretically and empirically in behavioral finance paradigm after 90's but it's not an obsolete one and will be a tale in coming years (Yen & Lee, 2008). Resultantly behavioral, psychological and cultural variables other than customary macroeconomic variables to understand financial markets and their interplay, as an intellectually equipoise model proposed by Lo (2004) called Adaptive Markets Hypothesis calls for the conditions of time and place (market) in market efficiency.

Against EMH in 1990's behavioral finance explained financial decision-making. Behavioral finance along with another course of studies of Psychology, sociology, and statistics attempts to describe human investing behaviors and its impact on the overall market (Sewell, 2005). Individuals make decisions that are not fully rational bounded by their mental filters, biases, and heuristics, making decisions less optimal (Alexakis & Xanthakis, 2008). Culture in behavioral finance has an edge of application to every market case by case, which is not achievable through Psychology. But in finance, the potential of culture is not yet explored to its par (Graham & Pirouz, 2010; Dutta and Mukherjee 2012), both nationally and cross-culturally its impact on investment decision-making is untapped. Guiso, Sapienza, Zingales, and Mccormack, (2006) contend that insertion of culture in economics paradigm will enrich and enhance the field and will usefully capture real-world peculiarities. . Culture instills systemic biases in investor's behaviors and also in managers (Roe, 2003). Culture is not independent of evolving psychological mechanisms, and evolutionary processes are relevant to a wide range of social phenomena. Studying the financial

and economic measures through cultural context can also lead to models of finance that are culturally sensitized.

International Portfolio Theory:

For securities, the higher the standard deviation, the greater the dispersion of returns and the higher the risk associated with the investment. As described by modern portfolio theory (MPT), volatility creates risk that is associated with the degree of dispersion of returns around the average. In other words, the greater the chance of a lower-than-expected return, the riskier the investment.

One of the most important and influential economic theories dealing with finance and investment, Harry Markowitz developed MPT and published under the title "Portfolio Selection" in the 1952 Journal of Finance. MPT says that it is not enough to look at the expected risk and return of one particular stock. By investing in more than one stock, an investor can reap the benefits of diversification - chief among them, a reduction in the riskiness of the portfolio. MPT quantifies the benefits of diversification, also known as not putting all of your eggs in one basket.

In the International Portfolio Theory (IPT), the key determinant of optimal portfolio is that the correlation between the securities should be negative or their relationship should be weak. Cross economics diversification can be achieved only when equity markets are not moving very closely with each other. A high return through minimizing risk, in general, can be attained only unless stepping into broader diversification (Bailey & Stulz 1990). However, selecting investments on the basis of returns alone is not sufficient (Brodie, Daubechies & Loris, 2009). Furthermore,

international portfolio diversification theory is a fundamental concept which assets that investment portfolios are not to be selected individually but rather how each of these asset changes in price relative to how another asset in the portfolio changes in prices, this can be considered as an influence of international portfolio theory on investment of a country's stock market (Hakeem, Tsoho, Abdul, & Dogara, 2016).

While investing in international markets and portfolio allocation, an analysis of change in volatility can be useful in determining the appropriate group of the countries. Therefore an analysis into volatility spillover not only provides information about stock market efficiency but also have implications for diversification of portfolio (Li & Majerowska, 2008). In the presence of stock market integration, an expected episode in a market can affect both return and volatility in other markets. It is evident that mostly returns may remain unchanged with the upcoming news but the risk associated with equity returns is highly affected. Any such change in volatility can provide important ground for portfolio diversification.

Market Integration Theory:

This theory suggests markets are well-thought-out to be integrated when assets of the same risk class through the efficiency of the market facilitate the same expected return regardless of their location. Rising concern in the practice of integration of worldwide different markets has generated an extensive amount of work in the capacity of spillover impact (Bhar & Nikolova, 2007).

Due to globalization and fast means of communication all the markets operating in the world are linked and integrated. Any economic shock or event/happening in the market can make a big change in another market due to close integration. Market Integration shows an important role in worldwide and growth of economics. The economics' worldwide emphasis on the prospective wellbeing improvement of market integration such as risk diversification advantages. As far as the growth of economics is concerned, many researchers have begun to trace the investment and developmental advantages of integration of the equity markets (Obstfeld, 1992; Bekaert et al, 2001; and Henry, 2000 as cited by Bekaert, Harvey, & Lumsdaine, 2002).

The degree of stock market integration has important implication for cross-border portfolio diversification. In the financial integrated markets, the local investors are capable of investing in international assets. In this way the same returns can be expected from the assets of the same risk class not dependent on the location of the trading Bekaert, Harvey, & Lumsdaine, 2002). So integration is directly linked to the stock returns.

According to Chen and Knez (1995), there are two notions of "integrated market". First, the two markets cannot be integrated, in any sense, if the prices for the same products or the return of the same portfolio are generated differently. Second, there is no market integration once the opportunities of arbitrage across markets still exist. However, according to a study carried by Asplund and Friberg (2001) on the holding of Law of One Price in some markets, identical goods that are sold at the same location even do not have the same price because of the currency exchanges. Therefore, while Law of One Price provides the basic framework for studying the financial market integration, other studies conducted by Errunza & Losq (1985), Bekaert & Harvey

(1995), Canjels (2002) on measuring market integration have been done with different arguments to provide alternative principles.

As the scope of financial markets has been expanded tremendously over the recent decades through introductions of vast amounts of stocks and diverse derivatives products, anecdotal evidences indicate that the levels of interactions within and among financial markets have increased significantly over the last decade. Thus the expanding landscape of financial markets may not result in a much expanded investment opportunity set. In fact, markets with highly correlated traded assets, even with the total market capitalization being large, do not necessarily provide diverse investment opportunities to market participants. Market participants must comprehend the inter-related spillover structures in markets in order to truly assess the investment opportunity set so that they can practice portfolio diversification and risk managements effectively.

Further, recent research has shown large increases in return comovement between developed and emerging markets leading to the conclusion that emerging markets are also a fleeting source of diversification (Carrieri, Errunza, and Hogan (2007) and Berger, Pukthuanthong, and Yang (2011). The frontier markets may provide the solution to the diversification problem.

Market spillovers through high capital mobility, lower transaction cost, and symmetric information are directly related to market efficiency and Culture through collective preferences and behavior systematically impacts the links between the markets. If culture is important and triggering force, it can cause a wave of herding in turbulent times through unified investment decisions and can

hurt market mechanism. So exploring culture in financial market integration and linkage is a topic of market efficiency.

1.2 Research Gap:

1. There has been a vast literature on financial market integration (Bekaert & Harvey, 1995; Bracker, Canjels, Prakash-Canjels, & Taylor, 2002; Barari, 2004; Carrieri, Errunza, & Hogan, 2006; Arouri & Jawadi, 2009). On Return and Volatility Spillover (Todorov & Bidarkota, 2011; Turner & Wiegel, 1993; Joshi, 2011; Outlook, 2013; Alotaibi & Mishra, 2015). Interdependencies between developed markets like the USA, the UK, and emerging markets such as China, India, Malaysia, Thailand, Indonesia, and other Pacific Basin economies (for example Worthington & Higgs, 2003; Wong et al., 2004; Baele, 2005; Kuper & Lestano, 2007; Majid et al., 2008) and Latin American countries (for example, Calvo and Reinhart, 1996; Pahan & Soydemier, 2000; Barari, 2004; Meric et al., 2012) have been widely studied. However, a review of the literature on cross-market interdependencies reveals that only a handful of studies have attempted to investigate frontier markets (Akdogan, 1996; Bekaert & Harvey, 1997; Miles, 2005; Logoarde-Segot & Lucey, 2007; Berger et al., 2011; Samarakoon, 2011; Bley & Saad, 2012; De Groot et al., 2012; Demirer, 2013; Chen et al., 2014; Amin & Orlowski, 2014). Therefore, to extend the literature by examining and analyzing the financial integration levels in these markets through times fills a big research gap in the literature.

2. There are studies which proves culture as an important variable in financial paradigm like the cost of equity capital (Gray, Kang, & Yoo, 2013), ability to get financing (Aggarwal & Goodell, 2014), momentum trading (Chui, Titman, & Wei, 2010), mergers and acquisitions

(Chakrabarti,Gupta-Mukherjee, Jayaraman, 2009), corporate policies (Roe 2003; Chan & Cheung,2012), stock price synchronicity (Eun, Wang, & Xiao, 2015), to list a few but at the global level there are not many studies explaining the role of culture in integrating the markets, in the paradigm of financial transmission of returns and volatility.

3. According to the theory of stock market co-movements, there is a close link between market prices and country development (Panton, Lessig, & Joy, 1976). Bekaert and Harvey, (1997) along with some recent studies like (Balli, Balli, Jean Louis, and Vo, (2015) Mobarek, Mollah, Gulnur Muradoglu, and Ai Jun Hou, (2016), illustrated that financial markets are interdependent through linkages of returns and volatility that can be explained by economic as well as behavioral factors. One issue that remains Unresolved is whether the economic, cultural and social factors that drive co-movement/ integration in more mature markets are also common to Frontier markets.

4. Abid, Kaabia, and Guesmi (2014) are of the view that there is little work on the dynamics of integration and its time-varying components. The present literature is general in nature about the emerging market's integration. A+gain little work is present in case of frontier markets.

5. Integration of financial markets has benefits of low cost of capital, enhanced risk diversification and possibilities of future economic growth with the caution of the risk of global shocks affecting local markets (Bekaert et al., 2005). So it's important to study the vulnerabilities of not only developed and emerging markets but the frontier markets too, it adds value to academicians.

6. Frontier markets are not yet studied in the context of the block and their relationship with the developed market, in terms of return and volatility spillovers and Cultural distance, so

this study is adding value to empirical finance literature. This study attempts to discuss the topics of the theory of stock market Integration, between Frontiers markets globally and their dynamics in the crisis situation.

7. In addition, emerging and the frontier market's cultural differences are rarely taken which are structurally changing and can cause time-varying shifts in returns, which causes biased analysis of financial integration (Abid et al., 2014a). The objective is thus to know the investment portfolio fitness of these markets which definitely guides the investors about their priorities in terms of considering integration level and risk-return dynamics. In this ever-changing globalized world the process of integration is undeniable and the basis of complexities in asset pricing and economic cooperation among nations, so knowing the level of integration is of phenomenal importance.

8. Previous studies focused on country-level analysis (Adjasi, Osei, & Fiawoyife, 2011) or region level analysis (Moss, Ramachandran, & Standley, 2007) to tap frontier market integration. This research not only studies all the Frontier markets with the developed market in terms of spillovers but also dig into the determinants of returns and volatility spillovers, as indicated by Wang, Wu, and Yang (2013) to derive equity movements. What drives the returns and volatility spillover is studied rarely like the study of Balli, Balli, Jean Louis, and Vo, (2015b), which studies developed and emerging markets with only cross-sectional analysis.

1.3   Statement of the Research Problem:

To have a cultural and social insight into the financial phenomenon is becoming more important as the nations are integrating financially through globalization. As both financing and investing is

becoming boundary free, both local and global variables impacts the risk and return dynamics, and their spillover with structural time shifts, concerning both investors and policy makers. The existing state of empirical and theoretical research in finance literature lacks the studies on dynamics of Return and Volatility Spillovers from the cultural context among nations; let alone Frontier markets of the world. So, there is need to know the current trend of Returns and Volatility Spillovers, how Cultural Distance, developed and other Frontier market's dynamics impact this trend, and the channels through which culture impacts this transmission. There is a dire need to know how culture impacts the spread of local and global crises in an international context from academic and policy perspective.

1.4   Research Questions:

- What are the current levels of Returns and Volatility spillover Exist in Frontier Stock Markets?

- How much of the spillover effects can be attributed to other Frontier markets and Developed Markets?

- Does Cultural Distance Contribute to Returns and Volatility spillover?

- What are the channels through which Culture operates in returns and volatility spillover in Frontier Markets

- To know if Culture has a role in Contagion of the crisis in these markets?

1.5   Objectives of Research:

- To find the current level of static and time-varying, Returns and volatility spillovers among Frontier Markets.

- To find out the impact Developed market's dynamics on the intensity of Returns and Volatility of Frontier Markets.

- To know how Cultural Distance Impacts the Returns and Volatility Spillover of Frontier Markets.

- To differentiate the impact of geographical proximity from Cultural distance on Returns and Volatility Spillover of Frontier Markets.

- To know the channels through which Culture Operates in Returns and Volatility Spillover in Frontier Markets

- To know if Culture has a role in Contagion of crisis in these markets

1.6   The significance of the Study:

1.6.1   **Theoretical Contribution**

This study extends the empirical and theoretical literature on Frontier markets in terms of international integration/segmentation discussion, asset pricing, portfolio diversification, and Risk Management, explanatory variable research, and contagion research; moreover social and cultural differences evidence contributes to the existing state of knowledge.

1. According to Bracker, Docking, and Koch (1999) integration of financial markets opens whole new strand of studies on how macroeconomic, social, and cultural factors affect

emerging markets, particularly their stock markets. However, most of the studies limit themselves to economic determinants and do not take into account behavioral variables such as culture, language and religion (Stahl & Voigt, 2003; Stafford & Miles, 2013). A key area of literature gap is the role played by culture in the development of market linkages. The need to study the impact of culture on market linkages is warranted since several studies document the role of behavioral traits such as culture in the development of financial markets (De Jong & Semenov 2002; Pirouz & Graham 2010; Dutta & Mukherjee 2012). Second, it uses a comprehensive data representing Frontier markets across the world and thus overcomes the shortcomings of some of the literature in this area, which tends to be region-specific.

2. There is a large amount of significance given in terms of investment prospects to the Frontier markets, especially the Asian ones e.g Berger, Pukthuanthong, and Yang (2011) but very limited research is available on these Financial Markets. There has been a vast literature on financial market integration (Bekaert & Harvey, 1995; Bracker et al., 2002; Barari, 2004; Carrieri et al., 2006; Barari, Lucey & Voronkova, 2008; Arouri & Jawadi, 2009). However, there are not many studies mentioning about returns and volatility spillovers of Frontier markets, their cultural linkages. A handful of studies include frontier markets in the sample (For example Akdogan, 1996; Miles, 2005; Logoarde-Segot & Lucey, 2007; Berger et al., 2011; Kohlert, 2011; Samarakoon, 2011, Bley & Saad, 2012; De Groot et al., 2012; Demirer, 2013; Chen et al., 2014; Baumöhl & Lyócsa, 2014; Amin & Orlowski, 2014). All these studies documented low correlations and interdependence between frontier markets and their developed and emerging counterparts. Furthermore, low

correlations were also documented among frontier markets themselves (Amin and Orlowski, 2014).

3. This study extends the literature related to the impact of culture on equity market's cross country variations in terms of returns and volatility spillover/ integration/linkages (Stulz & Williamson, 2003; Jin & Myers, 2006; Fernandes & Ferreira, 2009; Lucey & Zhang, 2010; Eun et al., 2015) and the literature which describes economic and social determinants too (Barberis, Shleifer & Wurgler, 2005, Bekaert, Hodrick, & Zhang, 2009; Devault, Sias, & Starks, 2014; Mobarek et al., 2016).

4. This study extends the literature discussing both empirically in new markets and new evidence about how culture interacts with other variables and impacts cross-country spillovers through them. (Eun et al., 2015; Rothonis, Tran, & Wu, 2016a).

5. The strong notion described by Pagano and Sedunov (2014) explicate that there is a spillover effect from shocks in developing markets to developed ones also, so this study through bi-directional analysis is significantly adding value in knowledge.

6. Likewise, Frontier markets Governments are taking steps to policy and structural reforms which facilitate more investments and integration, having a cross-sectional view on determinants of such linkages produces a biased result. With Diebold and Yilmaz (2009) measure of integration, this study looks into determinants at four points in time as well through pool data analysis to get a more realistic and unbiased picture, which also helps in dynamically covering crises periods in the global economy.

7. This study uses two-step analysis, by first quantifying the extent of integration by Diebold and Yilmaz, (2009) measure of spillover and then using that to know which factors along

with cultural variables derive the spillovers (Aggarwal, Kearney, & Lucey, 2012a; Balli et al., 2015a; A. Mobarek et al., 2016) both in cross-sectional and panel settings.

8. Role of culture in the contagion of crises is not studied at all yet alone Frontier markets. This study uses the Crises Index instead of using crises dummy followed by Sachs, Tornell, and Velasco, (1997) and Zhu and Yang, (2008) to know if crises impact spillover alone and through Culture in these market..

1.6.2 **Practical Contribution**

1. Morgenstern (2013) in Economist Magazine discusses the contagion of debt crunch due to financial integration and asks for more co-operation among regulators. Special Report on Global Finance in Economist argues that the liberalization of goods and services is rather simple than that of international finance so the risks of financial integration with proper costs and benefits must be incorporated in the policies. So this study provides some basics of integration dynamics in shape of determinants and crises situation analysis of variables to the regulators to weigh the risks in the more rigorous way.

2. Frontier markets are considered to be a very tiny and relatively inaccessible asset class, which outperformed emerging markets for consecutive two years to 2014. These are getting more attentiveness because of the exceeded growth, especially as the larger economies such as China, Brazil, and Russia have begun to slow. A closer look reveals that frontier markets' recent outperformance reflects a confluence of factors— some fundamental, some not, and many that are specific to frontier-markets equities. Economic Freedom Index managed by Heritage Foundation shows that many Frontier markets are ahead of emerging markets and progressively achieving more from last 20 years. An examination of some of these factors in

this study help illustrate the notable idiosyncrasies and challenges related to investing in frontier markets (Odell & Ali, 2016).

3. Errunza (2001) and Bekaert, Harvey, and Lundblad, (2003) study the result of Financial integration on Financial growth and concludes that economy increases marginally with liberalization after controlling the determinants of growth variables per capita GDP, secondary school enrollment, trade openness, government size, and inflation. With less intermediation cost market integration promises long-term economic growth. So, this study aids the argument of more integration for development benefits.

4. An article, "Investing: the Final Frontier", at Forbes by Wright, (2014), argues that in coming years the dynamics of frontier equity markets will be local rather than global, so investors must have these markets in their portfolio basket. Barbara Wall (2016), director of asset management research group Cerulli Associates contends that there is a trend of investing more in frontier markets in comparison with other financial markets over past three years. So, the study also contributes to policies and investing patterns of mutual fund investors as Thabo Ncalo, Mutual fund manager of Stanlib is of the view that the frontier stock markets from Africa are a real source of enticement and investors love to invest in funds tracking an index from these markets. In future in these market's valuation will raise and deepen, private mutual funds will progressively look to these markets to realize their investments.

5. From a national, regional and international policy-making Perspective, it's important to note that integration has its boons and curses. How should a policy be made that individual economies with upgraded information flows enjoy the benefits from integration at the same time curtail the risk through the proper strengthening of regulation?

6. With evidence of Contagion of crises (Masih & Masih, 1999; Baele & Inghelbrecht, 2010; Aloui, Aïssa, & Nguyen, 2011; Luchtenberg & Vu, 2014) study in these markets is of fundamental importance for hedging strategies, substitution possibilities among asset classes, as spillover intensities are imperative in risk-return tradeoffs.

7. As economies are integrating, there are several trade ties and mutual benefits associated. Parker and Parker (2014) discuss that even institutional investors are home biased and invest in countries more proximate in culture than others. Therefore, while making investment decisions, both in local and foreign markets, a better understanding of culture along with better knowledge of market dynamics and clear understanding of factors behind integration could result in more accurate valuation, estimation, and forecasting decisions. Spillover of returns and volatility confines the benefits of diversification and raises the systematic risk, so analyzing, modelling and estimation of frontier market's linkage are vital.

1.7 Thesis Structure:

The remaining thesis is structured as follows, Chapter 2 gives the theoretical background along with comprehensive literature review about stock market integration, returns and volatility transmission mechanisms in a globalized world, the significance of Culture in cross country return and volatility spillovers, and the spread of crises and its associations with Culture. Chapter 3 describes the methodology adopted to peruse the objectives of the thesis, it discusses the Diebold and Yilmaz, (2009) returns and volatility Indices in the paradigm of Variance decomposition of Vector Autoregressive(VAR) process, Weighted Mahalanobis, asymmetrical Cultural Distance Measure of Yeganeh, (2014), Crises index as adapted by Zhu and Yang, (2008) and the cross-

sectional and pool regression model used for analysis in the context of the hypothesis made. This chapter also elaborates on data sources, frequency and operationalization. Chapter 4 analyzes the results from statistical and econometric modelling about the level of spillovers and their interaction with other variables and chapter 5 concludes the discussion with practical implications and way for future research.

Chapter 2

2. Literature Review:

Cultural finance started to appear as a complete discipline of research just two decades ago, except for the very early pioneer work by Stonehill and Stitzel (1969). Against this background, one can rightly speak of it as a "young" research field, this might be one of the reasons why no fitting "watchword" such as "Cultural Finance" or "Culture and Finance" has emerged, despite the justifiability of such terminology. Guiso, Sapienza, Zingales, and Mccormack (2006) contend that bringing Culture to economics discipline will add more value to the field and make it richer, more pragmatic with an added ability to know the material world.

2.1 Efficient Market Hypothesis:

In finance literature there are three types of efficiencies discussed. Allocative Efficiency (Pike & Neale, 2006), which is about the allocation of resources, a market is efficient if resources are rightly distributed to the worthy projects. A market is operationally efficient if competition creates the lowest possible truncation cost for trading in securities. Tale of today is informational efficiency, how quickly and well the new information is incorporated in prices in a manner that market participants can't receive more than the risk-adjusted returns.

Long before Fama's Efficient Market Hypothesis, economist Kendall and Hill (1953) work on international prices of twenty Countries for a span of ten years resulted in Random Walk Hypothesis (RWH), exhibited that previous stock prices are not correlated with the current ones

and follows Random Walk. Afterwards, Samuelson (1965) also proves that the security prices are irregular in their pattern. Fama (1970) describes stock prices with characteristics of randomness, following rationality of behavior and investor's uniformity along with normal distribution. Rational Expectations are defined by the utility theory with the ability to make choices according to statistical models. Moreover, these market participants behave similarly when confronted with same choices as they have matching goals along with same time span. Thirdly followed by the work of Bachelier (1900) these prices follow Brownian motion or stochastic process and can't be predicted.

There are three forms of Efficiency described by Fama (1970). Weak Form efficient Markets are those which incorporate historical information in their patterns so quickly that technical analysis does not render any abnormal returns. Semi-strong efficient markets are the ones with all public information incorporated and strong form are those with private information along with the publicm is incorporated in security prices. As result prices in the market are always in equilibrium, in line with their fundamental values and you cannot beat the market on consistent basis by any type of extra information.

There are chronicles of high volatile periods, bubbles, local and international market crises giving insight into the irrational behavior of market participants in the estimation of risk and asset allocation. Which give doubt to the existence of EMH. After 1970 there are a plethora of studies debating about EMH. Empirically there are inconsistent results with some supporting EMH like Vaidyanathan and Gali (1994) Cheung and Coutts, (2001) Alexeev and Tapon (2011) and Karan and Kapusuzoglu (2010) and others with the rejection of hypothesis on weak and semi-strong form

efficiency level (Lo and MacKinlay, 1988; Demirer and Karan, 2002; Hasanov, 2009; Ozer and Ertokatli,2010; Dong et al., 2013). Concluding this discussion Majumder, (2014) is of the view that for every research evidence in support of EMH one can contemplate a rival evidence of non-conformity.

2.2   Behavioral Finance:

Rationality is the basic assumption of traditional Economics and Finance, individuals take their decisions according to Baye's Law and make acceptable choices through the concept of Subjective Expected Utility. But through times this paradigm is challenged by the inclusion of behavioral factors in finance and it emerged that individual's trading and investment behavior, equilibrium in stock markets, market efficiency, the cross-section of returns are too multifaceted to be explained by such a simple model.

Market participants in real life are not rational nor are alike, some are individual investors, speculators and others institutional, some trade for the day and other for long-term, some takes risk and others are averse, some trade on fundamentals and others on sentiments. With a large amount of attention to Human behavior, Behavioral Finance (Shiller, 2003; Barberis, 2011; Ritter, 2003; Shefrin and Statman, 2011) a paradigm against EMH emerged as a separate field. This paradigm takes human factor in models to explain market movements, and received much attention as it could describe the financial crises of 1987, 2008-2009 which can't be explained by rationality.

Behavioral finance exhibits the results when traditional rationality assumptions are relaxed. Individuals can have sub-optimal choices and can miscarry the available estimation procedures

with faulty up-gradation of beliefs. Against this background, Kahneman and Tversky (1979) gave a theory based on laboratory experiments. Prospect theory describes systematic biases in investor's thinking procedures, by taking gambling examples, it shows that individuals give more weight to lose than gain and are risk-averse. In the paradigm of gain, they are risk averse and in the paradigm of losses they are risk takers. In behavioral finance with experiments, the biases of human behavior are notices in terms preferences and risk perceptions in financial decision-making.

The traditional notion of arbitrage to correct the inconsistencies caused by irrational investors by arbitrage is challenged by Shleifer and Vishny, (1997). Cognitive psychology is discussed and included in the model of behavioral finance (Ritter, 2003). Efficient asset pricing is challenged as equilibrium point can only be achieved in theory, practical arbitrage involves both risk and capital, on the other hand, arbitrageurs are not bias-free and individuals with limitations to perform in short run. Behavioral finance looks into decisions of individuals on a psychological basis, humans are Homo sapiens instead of homo-economicus, with emotional and cognitive biases and heuristics that are not able to grasp all the gimmicks of financial markets (Thaler, 2000, Benartzi and Thaler, 2007).

Against the traditional EMH paradigm, there is a strand of studies identifying market anomalies like value (Basu 1977), size (Banz 1981), momentum (Jegadeesh & Titman 1993), calendar anomalies (De Bondt and Thaler 1985, 1987) as evidence that EMH can't comprehend. Moreover, Shiller (1992) contends that extreme market movements demonstrate that markets are semi-strong in-efficient, as publically available information is non-varying in nature and if incorporated in

prices they would rather reflect intrinsic values. So efficient markets can't be volatile due to nature of information, rendering the inverse relationship between volatility and efficiency.

Lo, (2005) come up with another theory as Adaptive Markets Hypothesis (AMH), this settles and resolves traditional and behavioral finance view by the notion of financial interactions financial markets may vary in their behavior. With dynamism of market competition, participants' adaption to environment and features of the market like regulations and structure the gradation of EMH may adjust. In developed markets like the US, UK and Japan AMH is proved through phases of independence and dependence in long-term data (Urquhart & Hudson, 2013). So, it's imperative to look into the determinants behind the outlook of efficiency and non-efficiency.

2.3   Culture and Psychology:

De Bondt and Thaler (1985) initiate the studies of financial decision-making in conjunction with Experimental Psychology. The deviation from fundamentals is described on the cognitive and Psychological basis, by intricate psychological experimentation that indicates the systematic biases in financial decision-making. Economic estimation, preferences, and decisions are derived by the psychological processes; how rational investors are helpless in contrast to irrational noise traders (Camerer, 1995; Gilovich, Griffin & Kahneman 2002).

Malkiel (2003) describes that technical analyst through their charting of patterns in security markets have a belief that only ten percent of the arrays in prices are logical and the remaining are psychological. Cultural psychologists, with the help of ancient philosophical theories, describe the perception of reality in nations. East Asian have an orientation towards framework and

Westerners' towards substance connected with ancient Chinese and Greek philosophies. Moreover Mauss, Bunge, and Gross (2007) are of the view that Culture shapes and regulates our emotions, our expression of emotions is largely defined by invariant culture inherited generation through generation, so biases whether emotional or cognitive are determined by Culture. Cultural differences can answer the difference in the conception of risk, estimation of associated returns, economic decision patterns and framing of financial choices. Similarly, Simpson and Kenrick (1997) have pointed out that genes can influence complex behavior, culture is not independent of evolving psychological mechanisms, and evolutionary processes are relevant to a wide range of social phenomena. Studying the financial and economic measures through cultural context can also lead to models of finance that are culturally sensitized.

Levinson and Peng, (2007) reject the notion of looking at financial decision-making as universal and found a difference in behavior of Chinese and American investors in terms of framing, estimation of value, morality and property ownership. Nguyen and Truong (2013) study cross-country information content in the context of culture and signifies the importance of culture through Hofstede (2001) cultural dimensions, individualist countries have high content and uncertainty-avoiding Counties have low information content; Investors from different cultures have differing preferences regarding firm-specific information. Discussing cross country synchronicity Eun, Wang, and Xiao (2015) verify that culture is an omitted variable in financial linkage literature.

2.4 International Financial Integration:

In the extant of literature this process is named differently like International Financial Integration (Baele & Inghelbrecht, 2010), Co-movement (Beine & Candelon, 2006), Synchronization (Kalok Chan & Chan, 2014), Spillovers (Majdoub & Mansour, 2014), Inter-connectedness ((Raddant, Matthias; Kennett, 2004; Barunik, Kocenda, & Vacha, 2016), Contagion (Islam, Islam, & Chowdhury, 2013), Interdependence (Samarakoon, 2011), Linkage (Balli et al., 2015b) and Correlation (Chiang, Jeon, & Li, 2007). Where as in these concepts interdependence and spillovers are directional concepts about which market is effecting the other (Diebold & Yilmaz, 2012).

In the context of the efficient market hypothesis (EMH), integration of international markets can be well-defined by Law of One Price. Barrett (2001), defines the law of one price as the equilibrium point with the non-existence of arbitrage opportunity, prices are identical with bound of transaction cost. There is a strand of literature titled to international financial integration (Baele & Inghelbrecht, 2010; Bekaert, Hodrick, & Zhang, 2009; Candelon, Piplack, & Straetmans, 2008; Krugman 1995; Lin, Engle, & Ito, 1994) which clarifies that there is ever increasing integration in markets through liberalization and globalization.

Kaplanis' (1988) did the most primitive work in the integration of markets by looking at the correlation between stock indices in four periods. Ragunathan and Mitchell (1997) also find significant correlations in equity market returns through diagonal Vech Model, but couldn't justify its time variation. Fratszcher (2002) and Kearney and Poti (2003), both explore European region and found time variation in integration with increased conditional correlation in equity markets through time.

Bekaert and Harvey (1995) are the first to model the integration level by taking effect of a single global factor on time variation of returns, by taking a sample of emerging and developed markets. In this approach, the integration is studied through the beta coefficient as an influence in the world market. Eiling and Gerard (2007) add regional indices along with one global factor and established time-varying integration to explain the country return variance. On the other hand many others finds that developed markets are fully integrated and emerging markets show less or partial integration (Bhattacharya & Daouk, 2002; Marshall, Maulana, & Tang, 2009; Balli, Balli,Louis, & Vo, 2015b) Scarce work is available on Frontier markets of the world (Berger, Pukthuanthong, & Yang, 2012; Berger, Pukthuanthong, & Yang, 2011; Samarakoon, 2011).

Dong et al., (2013) explain that if there is an evidence regarding the interconnectedness/spillover between the markets, it means that markets are semi-strong inefficient. If markets are co-integrated then there are arbitrage opportunities, the markets are not efficient and the law of one price is breached (Arshanapalli & Doukas, 1993). On the other hand, there are studies emphasizing the violation of weak form of efficiency with evidence of market integration, as lagged price one market can predict the current price of another (Laopodis 2004; Diamandis, 2009). Moreover with fully integrated markets the benefits of diversification extinguishes, (Balli, Pericoli, & Pierucci, 2014; Balli, Basher, & Louis, 2013; Berger et al., 2011; Shawky, Kuenzel, & Mikhail, 1997; You & Daigler, 2010) so it's important to know the integration levels in terms of both returns and volatility.

2.5   Frontier Markets and International Financial Integration:

IFC the private section of World Bank first coined the term of Frontier markets which have low capitalization coupled with a lesser amount of liquidity but faster growing with other properties of emerging markets. These are also known as pre-emerging or emerging-emerging markets. It is believed that these markets possess the same characteristics as emerging markets had a decade ago, which makes extrapolation about their investment attractiveness as next emerging markets. Integration of these frontier markets lacks the abundance of literature. Compared to developed and emerging markets infrequent empirical evidence are found.

Berger, Pukthuanthong, and Yang (2011) study the potential diversification benefits of frontier markets. Boubaker, Nguyen, and Taouni, (2009), Francis, (2013) Sayani, (2015), focused on individual country integration whereas Moss, Ramachandran, and Standley (2007), Amin & Orlowski (2014) and Guney, Kallinterakis, and Komba (2016) studies specific regions. On the other hand Samarakoon (2011), Chen, Chen, and Lee (2014) Jantunen, (2014) documents integration of these markets in general with world capital markets. The studies investigating determinants of integration are sparse.

Berger et al. (2011), while looking into diversification benefits of investing in frontier markets noticed that integration of these markets is not increasing significantly with time. On the other hand, Samarakoon, (2011) when examining frontier and emerging markets in relation to interdependence with US stock markets observed less correlation with US markets in normal time periods and more in crises in case of Frontier markets. These results render portfolio diversification and hedging ineffective. Todorov and Bidarkota (2011) report significant time variation in both return and volatility spillover of these markets and contend that these are more volatile than US

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market. On the other hand, they reject the polar hypothesis of being segmented or completely integrated but semi integration.

Baumöhl and Lyócsa (2014) working on emerging as well as Frontier markets conclude that with time the relationship with developed markets is increased and it further increases in the episodes if high volatility rendering diversification without value. Chen, Chen, and Lee, (2014) take a step further and take into account leading market hypothesis along with determining what causes integration in Frontier markets. The study contends that these markets are integrated with differing individual patterns and population growth, imports in the energy sector, industry value, gross saving and interest rate are factors determining interdependence, moreover these determinants changes in case of turmoil periods.

Very recent work of Blackburn and Cakici, (2017) show that all Frontier markets are priced by local factors and there is no enhancement in models by adding global, size, vales and momentum anomalies. Which results in the strong case of diversification benefits of frontier markets.

There is scarce research related to the determinants of interdependence rather taking alone the factor of Culture, which is a new and cross-cutting theme of today. Adding Culture in the paradigm of Frontier markets not only adds value to academic world but also give practical insights into individual Frontier markets.

2.6   Culture and Stock Market Integration:

Ease of understanding the language, culture, religion, institutional structures, norms, and behaviors are always considered as main factors in inter-country trade mobilization other than geographical proximity as considered by Senior (1827) and Cairns (1874). It's relatively new to consider these factors as determinants of financial markets performance and foreign Investors.

The efficient market hypothesis is challenged by empirical findings of not holding in most of the markets. Culture instils systemic biases in investor's behaviors and also in managers (Roe, 2003). As many types of research now explained that Psychological evolutionary processes and mechanisms are impacted by culture, which impacts societal progress.

Drogendijk and Slangen (2006) prove that culture can define the corporate foreign investment policy. Chan and Cheung (2012) demonstrate that there is a significant contribution of culture on corporate governance and policies. Huberman (2001) discusses a bias known as familiarity bias, investors do invest in markets which they are familiar or similar to their own language, religion, and geography, which can, in turn, impact the stock price movements.

Previous studies have examined the role of culture in different areas of finance. Importantly, it is shown that culture is important in the development of financial systems (Kwok & Tadesse, 2006), the legal system, levels of investor protection and ultimately economic development (Stulz & Williamson, 2003).

Bley and Saad, (2010) are of the view that taking Cultural dimensions as anomalies enhances the asset pricing model and explain the differences in behavior patterns of stock markets. On the other hand, Tinbergen (1969) first uses Newton's theory of gravity in trade modelling to proxy for transactional and informational costs, Finance borrowed the idea of defining international financial linkages. Aggarwal, Kearney, and Lucey (2012) add cultural variables to Foreign portfolio investments model on the premise that the distance factors do not capture the information cost caused by distant friction and cultural distance as defined by Kogut and Singh's (1988) on the work of Hostede (2001) makes the model holistic. Most cited work in the field of Culture and finance are King, Sentana, and Wadhwani (1994) and Stulz and Williamson (2003) who detect cultural dimension vital to the financial linkage.

Recently Aggarwal and Goodell (2014) explain that firms often can't access to finance other than traditional sources and markets because of uncertainty avoidance. These results can be related to the stream of research about the familiarity of dimensions of the external society. Chui, Titman, and Wei (2010) by assessing the equity markets explains that trading strategies are also not only influenced but also derived from the culture of the country. Mobarek et al., (2016) add culture and religious variables as determinants of pairwise co-movements in time-varying volatility framework and found both the variables as significant ones.

2.6.1   **Dimensions of Culture**

Hofstede (1980) defines Culture as "*Collective Programming of Human Mind, which distinguishes the members of one human group from another*". His seminal work of framing Culture in dimensions has a deep and long-lasting contribution to many disciplines like management

sciences, Organizational behavior and obviously finance. Financial decision-making can be taped much better in cultural paradigm. The quantificational measurement of culture by Schwartz and Sagiv (1995); Hofstede (2001) and House, Javidan, Hanges and Dorfman (2002) have commendable insights in exploring scholarly questions in finance and other business disciplines.

2.6.1.1 Hofstede Cultural Dimensions:

Hofstede (1980) explains that certain dimensions of Culture have fruitful insights into workplace behaviors and Organizational behavior, it can be extrapolated to investors and trends in investments. There are other scholars who mentioned dimensions of culture like Schwartz(1992), Breuer and Quinten (2009) but , this study uses the framework of Hofstede as it is comprehensive and covers a wide array of cultural factors with evidence from financial literature(Aggarwal et al., 2012a; Chakrabarti, Mukherjee, Jayaraman, 2009; Gray et al., 2013; Karolyi, 2016; Singh, Li, & Roca, 2017) . This data also comprise most of the countries, even those which were not in the initial study, were later researched separately and form a comprehensive database of countries with ready availability and mass applicability. Previous studies proved four dimensions of culture more relevant in the cross country gravity model of finance. Four Dimensions of Culture are under study as

Power Distance (PD): PD takes into account the degree to which members of the society with less power accept the unequal power distribution. Thus in cultures with higher PD, people are more power-centric and inequality is considered normal and has higher tendencies to keep independence. (De Jong & Semenov, 2002). Power Distance may also refer to the approach of

different societies to human inequality, usually formalized in boss-subordinate relationships. Power distance also casts light on the interpersonal relation founded on wealth, power, and social status in general. A culture having a high PDI (Power Distance Index) value would disappoint assertiveness and boost subdual of emotion (Matsumoto, Yoo, & Nakagawa, 2008). Inesi (2010) demonstrate that in societies with high PD, individuals would feel more pessimistic about the results of losses

Uncertainty Avoidance (UA): UA shows the extent to which people feel comfortable or uncomfortable with uncertainty and risk situations and attempt to escape such circumstances. In countries where people have attitudes to avoid uncertainty, they prefer a secure, predictable and stable environment where they may avoid risks. Offermann and Hellmann (1997), On the other hand, in low uncertainty countries people are more inclined towards taking risks. In comparison to other three dimensions, uncertainty avoidance is perhaps the most pertinent dimension to equity investment. Particularly in case of inefficient markets, there is a high probability that investors are posed with the possibility of not having a full picture which might in turns affect the future price movement. So, the uncertainty may also be triggered by information asymmetry. Therefore, the UA level in a society may proportionally impact the attitudes and inclinations of investors and can be a yardstick to measure the resilience of a society to uncertain situations.

Individualism Vs. Collectivism (IND): This dimension measures the extent to which individuals are incorporated into groups. A country having high individualism, the investors have more tendencies to guard their self-interests. In such societies, while making investment decisions, individuals exert to secure success rather expecting profits thus capitalizing on outcomes as of success and failure (Hirshleifer & Thakor, 1992). Such attitudes lead to a probability of adaptation of more conservative investing strategies to gain success and maintain their standing. In contrast,

there is a high probability in countries with the low individualism that managers would behave more aggressively. Such a difference of cultures may arise because of different viewpoints on interpersonal relationships. In societies like East Asia where there are collective behaviors, people recognize themselves as part of bigger social groups. On the other side, individualistic societies give more value to personal values and accomplishments. Furthermore, with reference to the "cushion hypothesis," social support from the peer network renders a "cushion" for possible financial risks. Thereby inducing lower perceived risk and resultantly less risk-averse behavior in collectivistic societies (Hsee & Weber, 1999)

Masculinity vs. Femininity (MAS): Hofstede (2001) suggests that in high MAS cultures, children are reared to more goal-oriented, and the norm is to be the best student, however in low MAS cultures, children are trained to be more modest, and the norm is an average student. High MAS is also related with more aggressiveness. On the other side, the trends in the countries having low masculinity are more conservative; this opposite pole is referred as Femininity. In contrast, "Feminine societies" have high relationship building tendencies as compared to "Masculine societies" which are more egoistic and self-centred. Cross-cultural clinical researchers exhibit that high MAS increases the tendencies with regard to national fear and psychological stress levels (Arrindell, Steptoe, & Wardle, 2003; Fodor, 1974). MAS emphasizes elements such as accomplishments, financial rewards, and consequences. Individuals are extremely self-confident and competitive in a high masculinity country. In such environments, managers lead decisions and have the readiness to seek competitive results (De Jong & Semenov, 2002). Furthermore, in high individualistic and masculine countries, investors and managers have tendencies to overreact and overconfidence in case of investing in shares.

Aggarwal, Kearney, and Lucey (2009) while looking at foreign portfolio investments explicate that different cultural dimensions promote FPI rather than becoming a hindrance to the stock market integration process.

2.6.2 **Cultural Distance:**

By means of the Hofstede's (1980) four cultural dimensions, namely Power Distance (PD), Individualism (IND), Masculinity (MAS), and Uncertainty Avoidance (UA) Kogut and Singh (1988) formed a single index to measure cross-country differences in Culture. They defined cultural distance as "*degree to which the cultural values in one country are different from those in another*". This measure named as KSI is applied most widely in business and finance literature. Yeganeh (2014) building on the criticism of KSI about an equal weight of all dimensions, ignoring the correlation between the dimensions and overlooking an asymmetry in distances among countries, made another comprehensive measure of Cultural distance without the aforementioned flaws.

Financial integration literature sparsely uses cultural distance (CD) as gravity variable other than management and organizational research. Aggarwal et al. (2009) prove that Cultural distance discourages foreign portfolio investment. Lucey & Zhang,(2010) uses CD measure of Kogut and Singh (1988) in the paradigm of market movement and find that it's a relevant variable even in the integrated world. Karolyi, (2016) finds the high explanatory power of CD of KS in international portfolio holdings about investment biases. Rothonis, Tran, and Wu (2016) find a significant impact of cultural similarity in enhancing volatility linkages.

2.6.3 **Religion and Language:**

Guiso et al (2003) in their study conclude that there are certain attitudes of religious people that enhance economic and social development. Shu, Sulaeman, and Yeung (2010) while studying mutual funds find that risk behaviors are affected by religious beliefs of the area. Kumar, Page, and Spalt (2011) use religion to explain gambling tendencies, corporate decisions, and stock returns. In exchange and gaining expertise religion as a social institution give enhancements and considered advantageous, so commonality in religion will certainly have implications in financial linkages and ultimately spillovers.

Risk-averse behavior is consistently proved to be attached to Muslim and Christian Societies (Miller & Hoffmann 1995; Osaba, 2003) and Muslims are more risk averse than Christians as concluded by Bartke and Schwarze (2008) in their seminal work if the risk is determined by nation or religion. In line with this argument if being Muslim effects risk preferences than having similar faith nationally in a collective nexus can influence the bilateral linkages as well as international financial market connectedness in terms of both returns and volatility spillovers. The scarcity of research in the vein of Religion and Volatility dynamics, also its linkage to financial decision-making is unexpected as religion is repeatedly recognized as an important factor in micro and macroeconomic level.

Lucey and Zhang (2010) use shared religion as a proxy of culture and showed that religious similarity leads to market integration. Akhtar, Jahromi, and John (2011) examine the volatility linkage among the intensity of volatility linkages between Islamic and conventional markets and

found religion as a relevant factor. Our research shares the ground of explaining culture as a determinant of returns and volatility co-movement. The countries with less cultural distance should show similar risk-taking behaviors and exerts systematic biases in the market and contribute to the integration of financial markets.   Shi and Tang, (2015) record the significant impact of similar religion and ethnicity on alliance formation and returns announcement.

Frankel, Stein, and Wei (1997) find that controlling for regional groupings and common borders in gravity equations, a common language is a significant factor to increase trade. Lewer and Van den Berg (2007) take into account that common religious culture tends to raise trade. Portes & Rey (2005) found the significance of a common language in some models. In the gravity model of intra-bank flows, Rosati & Secola (2006) alongside market traits also include linguistic similarity and a common border effect. They found that language explains the high values of inter-bank liquidity. The language also causes people to trust more and take risks that normal people don't perceive as worth taking. In case of stock price volatility, Pirouz and Graham (2010) record the impact of language similarity, linguistic structures, and common values through the mediation of level of liberalization. On the other hand, Aggarwal, Kearney, and Lucey (2009) do not find any significant evidence of common language and religion enhancing foreign portfolio investments. Kim, Cho, & Kim, (2015) while investigating spatial spillover in three regions of the world find religious similarity and language along with six other characteristics influence the cross-border portfolio flows.

2.7 Geographical Proximity and Return/Volatility Spillover:

In the cross country, integrational research geography and connected variables like market opening hours are consistently evidencing a significant relationship with financial integration (Portis & Rey 2005). Eun and Shim (1989) discover that geographical proximity in advanced countries determines the correlation dynamics of stock markets. Bracker, Docking, and Koch, (1999) find that geographic distances are costs in real economic integration and illustrated a significant negative between geographic distance and co-movement. Geographic distance and regions can explain the shocks in financial markets are transmitted to other financial markets (Balli, Balli, Jean Louis, & Vo, 2015c). Recently Saleem, Al-Hares, and Ahmed, (2016) explain that geographical proximity in frontier markets can explain cross-market return and volatility spillovers, and Singh et al.(2017) also reported the negative significant impact of distance in regions and economic cycles.

Conversely, the seminal work of Stulz and Williamson (2003) proves that actual openness has more effect on market capitalization relative to geographic proximity. The evidence on South-East Asian markets suggests that regional integration is not significant coupled with results of Frankel and Wei (1995) that distance is not an explanatory variable in financial gravity research.

Anderson (2000) suggests incorporating non-financial variables like distance and language, as these can be proxies for transaction costs in intercountry linkages. Recently Singh et al. (2017) found regional proximity as the most influential variable contributing to linkages of stock markets.

2.8   Return and Volatility Spillover:

Diebold and Yilmaz (2009) investigate the return and volatility spillover throughout the world equity markets. Engle et al. (2012) study the East Asian equity markets, Joshi (2011) study Asian Markets and find a bi-directional evidence. On the other hand, there are studies on the Currency market and interaction of the equity and currency markets. Do, Brooks, Treepongkaruna, and Wu, (2016) study both the equity and currency market in three higher moments and found evidence of spillover in both developed and emerging markets. Antonakakis, (2012) also studies the currency markets in this vein of literature. So spillovers of returns and volatility are extensively researched the phenomenon.

The existing literature diverts in two categories on the subject of spillover, real/ fundamental or economic models and financial models of spillovers. Case and Pavlova (2004), the advocates of fundamentals proved the linkages are due to real trade and un-systematic reasons, there are many other studies in this strand like Cole and Obstfeld, (1991), Baxter and Crucini, (1993) who advocate the tie of real economy and finance is the only linkage. These real models could not rationalize the financial crises contagion in countries where there are no fundamental linkages and its spread in countries other than neighbouring ones. On the other hand, financial models theoretically explained the reasons for spillovers/contagion through financial linkages like foreign Direct Investments (Hattari & Rajan, 2011), rebalancing off portfolios by fund managers (Rijckeghem & Weder, 2001), liquidity issues and sovereign ratings (Christiansen, 2007) and, information asymmetries through related information cascade models and herding behaviors (Bikhchandani & Sharma ,2000; Hernandez & Valdes, 2001). The financial linkage models

contribute more to the understanding of globalized financial markets in returns/volatility connectedness both in stable and crisis situations.

According to Chang, Cheng and Wu (2007) market efficiency is not only affected by the spillover of returns as the foreign investors along with equity return correlation also incorporate the effect of market volatility into their portfolio selection process. An analysis of the causes and effects of both return and volatility interactions can provide investors reliable set of information that can help them to diversify internationally.

Economic growth is adversely affected by the negative effect of exchange and stock market volatility on investment through increased risk. Countries that are linked to trade, investment, or any other means can be disrupted by spillover effects, due to the withdrawal of capital and increased cost of trading. As risk and return relationship is evident in finance literature, this study is taking both spillovers as in the study of Diebold & Yilmaz (2009) both give different behaviors. It is observed that in last fifteen years return spillover is a gradually increasing phenomenon with no evidence of burst which can probably be associated with stock market integration in these years. On contrary volatility, spillovers can be identified with clear crisis events not driven by trends but a clear burst.

There is extensive literature available on spillover effect in financial markets. One stream of research is focused on the return or volatility spillover across the border for identical assets. The major concentration in literature is found in international equity markets. Engle et al. (2012) study equity volatility spillovers for East Asia, whereas Diebold and Yilmaz (2009) explore different

global markets. Several studies are also available on volatility spillover in different sectors of the market. Recently, the effect of sovereign bond yield on volatility spillover in EU is studied by Clays and Vasicek (2012) Similarly Skinzti and Refenes (2006) study the effect of Bond market volatility on spillover across the border and Christiansen (2007) demonstrates the effect of volatility in swap markets of UK, US, and Japan. A stream of research is also available on the effect of volatility spillover in Currency markets (Grobys, 2015).

According to real linkage model, it is argued that in shock are idiosyncratic in nature and are transmitted through trade linkages (Helpman & Razin, 1978; Backus, Kehoe & Kydland, 1992; Baxter & Crucini, 1993; Case & Pavlova, 2004). Majority of the literature rationalize spillover effects through the presence of low market fundamental correlation. However, in the realm, literature provides evidence against this rationale (Kaminsky & Reinhart, 2000). Thus these studies in the presence of significant real linkages not only failed on the ground to clearly cause crisis spread in Latin America, East Asia, and Eastern Europe but also were unable to explain the reasons that how these financial crises can be restricted from contaminating the economies across the border.

King and Wadhwani (1990) discuss different information channels in contributing spillovers, Fleming, Kirby and Ostdiek (1998) attribute portfolio rebalancing for the spikes in contaminated asymmetric information. They elaborate that the information generation process is affected by how the risk-averse investors react to private information. In general, it is believed that information transmission is symmetrical among the markets. However, the information is heterogeneous in the most volatile market. In order to find the reasons of idiosyncratic shocks,

diverse information available to strategic traders could lead to the increase in volatility that can be transmitted through contagion.

The availability of real and financial linkages among financial markets provide investor implication for potentially exploitable investment strategies. If investors are able to earn an abnormal profit after deducting transaction cost by using these strategies, then markets are no longer efficient. Strong market linkages abolish the potential benefit of investing in emerging markets, therefore the benefit of international diversification is eliminated. Therefore, the analysis of the linkages of volatility spillover is important as volatility can be used as a proxy for risk in security analysis and portfolio diversification.

Majority of studies focuses on the spillover shocks transmission from developed to the emerging markets in the presence of return and volatility spillovers (Liu & Pan, 1997; Ng 2000; Wang Gunasekarage & Power 2005). In a recent study, Ranta (2013) analyzed 25 years of data (1984 to 2009) in order to evaluate the progression of interdependence between developed markets of the USA, the UK, Germany, and Japan in general, and at the time of various crises, in particular. The author drew the conclusions that the interdependence between the selected developed markets during the last 25 years has increased, especially between the USA and the European markets.

2.9 Culture and Return /Volatility Spillovers:

Plenty of literature is available in this domain, but this study discusses the literature directly discussing national culture as a major determinant of stock market dynamics. A recent work by Eun et al. (2015) includes systematic biases along with culture as important factors to determine stock price synchronicity and find high synchronicity in the presence of above-stated variables. Similarly, Parker and Parker (2004) investigate high co-movement in stock returns among Asian Markets. This study does not include the role of culture directly, but from their findings, one can assume that culture can play a vital role as within this region cultural traits are almost similar. Other studies in the thread focused on the role of cultural distance and shared religion as a measure of religious. This factor can be used as an important determinant of stock market integration (Lucey & Zhang, 2010). Cifarelli and Paladino (2008) study the role of information flow on volatility transmission in different markets. The effect of volatility spillover is well documented in other markets as well. However, a gap is available in the literature on the determination of the effect of culture on both returns and volatility spillovers.

Li et al. (2011) investigate the impact of national culture on corporate risk-taking using three dimensions of culture, namely individualism, harmony uncertainty avoidance by Schwartz and Hofstede. They find a positive effect of individualism while an uncertainty avoidance and harmony and are found to have a negative effect on firm's risk-taking behavior. According to Kwok and Tadesse (2006) financial system of a country is a reflection of the country's degree of risk tolerance that is measured by the uncertainty index developed by Hofstede (1991). Aggarwal and Goodell (2010) use power distance, individualism, and uncertainty avoidance to examine the effect of culture on other institutional factors on national firms. However, Beugelsdijk and Frijns (2010)

argue that investors invest more in the foreign markets of their own region. They conclude that in a high-risk environment investors with high uncertainty avoidance prefer institutions on markets. Chui et al. (2010) find a positive relationship between individualism and momentum profits.

2.10   Control Variables:

Bi lateral Trade: Several studies document bilateral trade linkages to be a significant contributing factor to stock market linkages (Pretorius 2002; Forbes and Chinn 2004; Wälti 2005). Countries with strong bilateral trade relationships are likely to exhibit interdependent economies and stock markets.

Political, Financial and Economic Risk: There are many additional country characteristics that may effectively segments or integrates markets other than formal capital or trade restrictions. Poor institutions and political instability may affect risk assessments of foreign investors, effectively segmenting capital markets (Bekaert, 1995), and financial openness might not suffice to attract foreign capital if the country is viewed as excessively risky. Poorly developed financial systems may also be an important factor driving market segmentation. For example, in a survey by Chuhan (1992), equity market illiquidity was mentioned as one of the main reasons that prevented foreign institutional investors from investing in emerging markets. Moreover, poor liquidity as a priced local factor may lead to valuation differentials. When markets are closed, efficient capital allocation should depend on financial development (Wurgler 2000; Fisman & Love, 2004). Because banks are still the dominant financing source in many countries, poor banking sector development may severely hamper growth prospects and lower valuations. We employ several measures to quantify stock and banking sector development. Differences in International Country

Risk Guide (ICRG)'s economic, financial, and political risk indexes between two countries, respectively are taken as measures. Bekaert et al. (2011) show these indicators are relevant for stock market integration.

Exchange Regime: The inclusion of this variable is motivated by Kim et al. (2005) finding that the adoption of the euro as a common currency was an important determinant of enhanced stock market return linkages and financial integration across European countries.

Sovereign Debt Rating: Variable rating is the difference of the average sovereign credit ratings given by S&P between two countries. A larger disparity in the credit quality of two countries is likely to reduce information transmission and hence, returns and volatility linkages on the basis of risk-return arguments.(Bekaert, Harvey, et al., 2011)

Stock Market Capitalization Difference: Recent studies demonstrate that emerging markets are more segmented compared to developed markets (Bekaert et al., 2014; Carrieri et al., 2007; Christoffersen et al., 2012), due to their fundamental characteristics such as size, institutional structure, and geographical location (Forbes & Rigobon, 2002; Carrieri et al., 2007; Christoffersen et al., 2012). Our study fills this research gap by investigating the drivers of the stock markets' comovements. Imbs (2004, 2006) and Kose et al. (2003) show that the integration of financial fundamentals positively impacts the synchronization. So the differences the relative size of the stock markets as determinants of the stock markets' spillover in returns volatility is taken.

Turnover Ratio Difference: This measures captures the relative difference in trading activity and

development in terms of market depth and liquidity. A larger disparity in these aspects of financial market development is likely to reduce market Spillover.

Growth and Information Variables: A rather extensive literature on home bias (Portes and Rey 2005) shows that informational frictions play a large role in determining international transactions in financial assets and the level of home bias. To the extent that there is a link between home bias and valuation, such measures may help determine segmentation levels. We therefore also include several proxies for the degree to which countries are connected with the world through telecommunication. In particular, we include the number of telephone line subscribers per one hundred people and the number of Internet users per one hundred people.

It is conceivable, especially for Frontier markets, that growth prospects are more local in nature. Following the extensive work on growth determinants (Barro 1997), we therefore include several measures related to cross-country expected growth differentials: the initial level of per-capita GDP, the percentage of secondary school enrollment as a measure of human capital, the log of life expectancy, and population growth

2.11 Crises, Spillovers, and Contagion:

Forbes and Rigobon (2002) describe interdependence as the co-movement of the financial time series due to fundamental connections in country pairs during normal, this can also be named as spillover. Contagion occurs when during the crisis the interdependence escalates from the stable period spillovers, or there is an upsurge in linkages that was probable (Edwards, 2000). Forbes and Rigobon (2002) define contagion as a significant increase in cross-market linkages after a

shock to one market. Bekaert et al. (2005) define contagion as excess correlation, which is the correlation over and above what is expected.

There are three types of contagion described in the literature, one is where several countries are affected in chorus due to crises in common stock known as a Moosonal effect (Masson, 1998, 1999). The second type of contagion is known as a spillover effect in which crises in one country cause crises in fundamental variables of other countries, mainly interdependent through trade and financial means. Whereas the third form of contagion is pure contagion or shift contagion (Forbes & Rigobon, 2000) which is the spread of crises to other countries without any fundamental reason, rather this propagation of crises can be justified by the investor's behavioral factors or psychology. Investors intensify the crises first by following the news and at the second stage, the behavior becomes public by herding the phenomenon, and the turmoil spreads in other countries.

In the periods of financial turmoil and crises, the diversification benefits cease to work in portfolios due to contagion effect, which is true for both domestic and global diversification (Forbes & Rigobon, 2002). Chan et al. (2011) explain that there is a capital flight from stock market to real estate, gold, and bonds in crises regime. There is contradictory evidence in the literature about the relationship between integration and financial turmoil, Bekaert et al. (2011) show that there is a reversal in integration levels in crises, regimes, and the most integrated countries suffer least in crises, however, Pukthuanthong and Roll (2009), Berger and Pukthuanthong (2012) prove contagion due to integration and with fragility index contends that negative shock prevail in integrated markets. This thesis takes the contagion as a significant upsurge in volatility spillovers

from the normal trend (Forbes & Rigobon, 2002). There is no contagion if returns and volatility spillovers before and after the event of crises are at high levels.

Although there is evidence of the segmentation of frontier markets from developed markets. Samarakoon (2011) argues that while these countries may remain decoupled from the developed markets during tranquil times, they tend to be affected by a financial crisis in an influential market like the USA. However, there are exceptions to these standard results regarding the behavior of frontier markets during the crisis. For example, Amin and Orlowski (2014) demonstrated that the South Asian frontier markets experienced high volatility spillovers from the USA during the crisis.

2.12 Contagion and Cultural Distance:

Very few and recent studies are found in this vein of literature, Sander, Kleimeier, and Heuchemer, (2016) find that culture becomes more relevant in a financial crisis situation and obstructs financial market integration. Mobarek, Mollah, Muradoglu, and Hou (2016) while finding the determinants of stock market co-movements contends that cultural distance is the crisis conditional variable, especially in emerging market group. Based on the results of Rothonis et al. (2016) that culturally Proximate Countries have higher volatility linkage it can be conjectured that countries with positive cultural distance have more contagion of crises than with negative cultural distance countries. Yeganeh (2014) reports that cultural un-evenness impacts the behavior towards investing and consequently effects the co-movement of stock, same is embraced by Eun et al. (2015).

2.13 Theoretical Framework:

2.13.1 Cross Country Efficient Market Hypothesis:

Chan, Gup, & Pan (1997) gave the idea of the Cross-country market efficiency hypothesis that if two financial markets are weak-form efficient in the long run then their stock prices cannot be co-integrated as having an impact on the other market gives arbitrage opportunity and violates the assumption of efficiency in the market.

Inefficient markets, returns and volatility can be a basis of fair price determination, but in reality, medium-term investor and traders use volatility to predict the future outcome (Gregoriou 2009). Stock market returns and volatility transmission is closely related to EMH and have vital associations (Fayyad, 2013). Harris and Pisedtasalasai (2006) contend that in the presence of efficient markets, it is not possible to forecast returns of a stock on the basis of lagged returns of another stock in the absence of time-varying risk premium. The presence of the returns/volatility spillover effect implies that if the investors are able to earn an abnormal profit after deducting transaction cost by using these strategies, then markets are no longer efficient.

2.13.2 Portfolio Diversification and Market Integration theory:

To allocate the resources efficiently across the different country and asset classes, and to take advantage of country-specific risk premium, enhanced market integration leads to low return-differentials across markets and erodes the opportunity to earn excess returns by portfolio diversification (Akdogan, 1996). Relatively segmented markets are of great interest to investors

and portfolio managers as they are a viable option for risk diversification, and the maximization of returns.

Bhattacharya and Daouk (2002), Hardouvelis et al. (2006) and many others find that developed markets are fully integrated and emerging markets show less or partial integration. Chan-Lau (2014) finds increased co-movement of assets returns between Frontier Markets and global financial markets is in line with the higher post-crisis correlation and fund flows to these markets, but somewhat in contrast with the finding of no evidence that Frontier Markets, more broadly defined, are becoming increasingly integrated over time (Berger, Pukthuanthong & Yang, 2011).

2.13.3 **Returns and Volatility Spillover:**

Carrieri, Errunza, and Hogan (2007) show that correlation method (Dumas, Harvey, & Ruiz, 2003) of measuring integration is fallacious as in many cases, correlation is far less than actual economic inter-relations. Schotman and Zalewska (2006) measure this level through R-square and beta between developing and developed countries, but again this approach is questionable as a beta can be biased (low/high) due to the risk profile of industrial concentration in the developing world.

This Study uses the measure developed by Diebold & Yilmaz (2009) which uses a vector autoregressive (VAR) models following Engle et al. (1990) and focus on Variance decomposition to measure the interconnectedness of returns and volatility. The Quantitative measure serves as a scale of spillover of returns and volatility in Frontier markets and the US financial market.

2.13.4 **Culture and Returns /Volatility Spillover:**

Eun et al. (2015) contend that cultural similarity provokes correlated trading strategies in stock markets. As provided by Rothonis et al. (2016) cultural similarities impact the trading patterns of investors and trading decisions are systematically biased by analyzing information. The cross-country cultural distance has an inverse relationship with returns/volatility spillover. Moreover, investors disproportionately invest in stock markets by tilting more towards their own regions, (Beugelsdijk & Frijns, 2010) making stock market linkages significant amount geographically close countries.

H1: Cultural distance has a significant negative impact on return/volatility spillover.

H2: Geographical Proximity has a significant positive impact on return/volatility spillover.

2.13.5 **Openness and Culture-Spillover Relationship:**

Globalization of the economy coupled with the liberalization of markets made diffusion of other countries' cultures internationally. With trade openness, there are more human relationships that make a globalized culture hence weakening national cultures (Cowen, 2006). As participants of one culture can interact with other and experience the norms, values, and tradition of other and bring diversity in the programming of mind. Jones (2006) advocates that openness in trade shrinks the transaction and information costs. On the other hand, Bekaert and Harvey (2003) suggest that more capital account liberalization leads to greater market integration, consequently making culture related costs irrelevant. This line of arguments suggests that openness in an economy

impacts returns/volatility spillovers and culture relationship to make markets more efficient by weakening culture specifics behaviors; countries more open to trade will have the diminishing impact of culture.

H3: Openness will negatively impact the relationship of return/volatility spillover and Cultural distance such that more open economies will have less impact of culture.

2.13.6 Active Trading and Culture-Spillover Relationship

The non-normal distribution of returns in frontier markets can be, to some extent, attributed to illiquid, thinly traded markets which are not efficient enough to incorporate current information in price behaviors (Kawakatsu & Morey, 1999). Grinblatt and Keloharju (2001) are of the view that markets with more trading or liquid markets are more sophisticated and the impact of behavioral or cultural elements are negligible, thus rendering liquid markets are more efficient. According to Lucey and Zhang (2009) the culture impact strongly in the markets which are active in trading, so the effect of culture can only be seen in active trading markets and it will be a waste to check this relationship in thinly traded markets.

 H4: *Active trading will negatively impact the relationship of return/volatility spillover and Cultural distance such that Active trading economies will have more impact of culture.*

2.13.7 **The Effect of Crises on returns and Volatility Spillover of Frontier Markets:**

King and Wadhwani (1990) and Forbes and Rigobón (2002) distinguishe normal spillovers and contagion, spillovers are the transmission of innovations in one market to other in the calm period through economic and financial linkages, on the other hand, contagion is defined by regime change in determinants of propagation of negative shocks. These definitions extricate the arguments that shocks are transmitted through normal determinants of spillover from psychology and behavioral shifts in reacting to shocks in turmoil situations. Valdes (1997) explains that crisis situation causes illiquidity in markets and investors sell their assets in markets which are not crisis-stricken and eventually taking the crisis in stable markets. Calvo and Mendoza (2000) indicate that crisis in one country causes investors to form a herd in rebalancing their portfolios, investors in one market start selling cause selling patterns in other markets in the same characteristics countries due to lack of trust, which leads to increased volatility spillovers.

H5: Impact of International Financial Crises in national markets will have a significant impact on the return/volatility spillover.

2.13.8 **The Impact of Culture on Contagion of Crises:**

Based on the results of Rothonis et al. (2016) that culturally Proximate Countries have higher volatility linkage it can be affirmed that countries with positive cultural distance have more contagion of crises than with culturally distant countries. As Yeganeh (2014) reports cultural un-evenness impacts the behavior towards investing and consequently effects the co-movement of stock, same is embraced by Eun et al. (2015).

H6: Culturally proximate countries will have more contagion of Crises than culturally distant countries.

The visual depiction of the thread of relationships is described in figure 1.

Figure 2.1: A functional Framework of the relationship between Cultural Distance and Return/Volatility Spillover
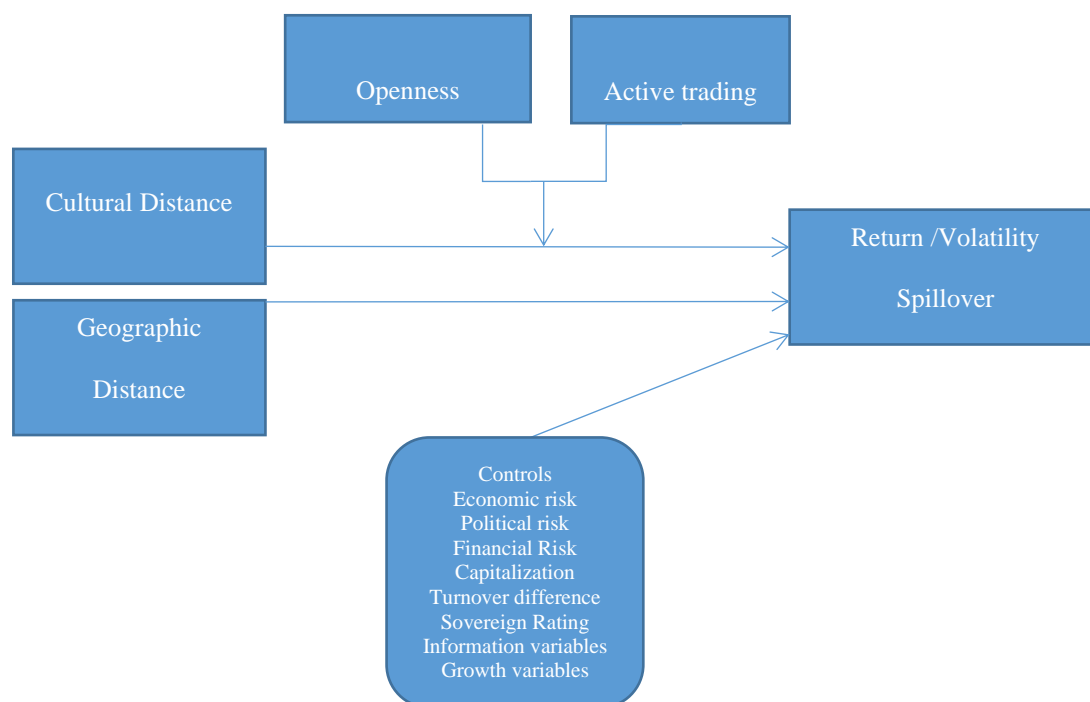
Source: Made by author

Culturally Proximate countries will have a positive relationship with both returns and volatility spillover, as ease of understanding the language, culture, religion, and behaviors are always considered as main factors in inter-country trade mobilization other than geographical proximity. There can be two channels through which culture can impact the market linkages, Openness of trade / capital account (liberalization) and active trading. Openness in trade shrinks the transaction

and information costs and more capital account liberalization leads to greater market integration, consequently making culture related costs irrelevant. On the other hand the Culture impact strongly in the markets which are active in trading, so the effect of culture can only be seen in active trading markets and it will be a waste to check this relationship in thinly traded markets. Culturally Proximate Countries have higher volatility linkage it can be conjectured that countries with positive cultural distance have more contagion of crises.

Chapter 3

3. **Methodology of Research**

Integration of financial markets can be accessed by different statistical and econometric models. Forbes and Rigobon (2002) identify four different classes of methodologies to dig out the phenomenon of interdependence, namely, Cross-country correlations, uni /multi-variate analysis like OLS, modelling by ARCH / GARCH, and vector autoregressive models(used by current study). Paas and Kuusk (2012) maintain that difference in data frequency and econometric techniques can cause controversies and differences in results of interdependence in international markets, so it's imperative to consider the intricacies of methodology into account. This Chapter explains data and the methodological framework used.

3.1   Research Design

Hypotheses have been developed in accordance with the theoretical framework and are tested through different econometric techniques. With Return/Volatility Spillover as dependent variables and Cultural distance, Geographic distance, Openness, trading and crisis as explanatory variables.

3.1.1   **Time Horizon**

This study uses the period from January 2000 to December 2015. The list of Frontier markets of 2015 is taken from MSCI website as given in Fig 1. From 32 markets, 15 markets comply with data consistency in all respect during the period. The US is also taken to see the impact of developed market shocks as well.

Figure 3.1: The Regional classification of Frontier markets.

Source: www.msci.com

3.1.2 **Type of Study**

This study can be categorized as an explanatory study. This study adopts the Vector Auto Regression (VAR) modelling to develop returns/Volatility Indices as Engle et al. (1990) contend that variance decompositions allow to aggregate spillover effects across markets, distilling a wealth of information into a single spillover measure. Cros sectional and independently pooled Panel data analysis to know the effect of cultural distance on the spillovers.

Secondary data are collected from different sources, including Data Stream, IFS, IMF data, World Development Indicators, ICRG database, CEPII data, UNData, Geert Hofstede website, NBER, ARDA, and S&P, as can be seen in table 1.

Table 3.1: Description of data

Variable	Data	Frequency	Source	Reference
Return/Volatility Spillover	Index prices	daily	Data Stream	(F. Diebold & Yilmaz, 2009; Rothonis et al., 2016b)
Cultural distance	Measures four dimension of Culture	annual	Geert Hofstede database	(Yeganeh, 2014)
Geographic Distance	Population-weighted-great-circle distance, in km	annual	CEPII data	(Fouquin & Hugot, 2016)
Language	spoken by more than 9% population	Dummy	CEPII data	(Fouquin & Hug, 2016)
Religion	More than 80%	Dummy	ARDA	(Lucey & Zhang, 2009)
Trade openness	trade to Gdp ratio	annual	WDI	(A. A. Mobarek, 2010)
Capital Account Openness	Chinn-Ito (2008)	annual	NBER	Chinn-Ito (2008)
Trading	Value traded/GDP	annual	WB	(B. M. Lucey & Zhang, 2010)
Crisis	crisis windows	index value	author created	(Lehkonen, 2015; Zhu & Yang, 2008)
Political risk		annual	ICRG	(Bekaert et al., 2011;Rothonis et al., 2016,)
Financial Risk		annual	ICRG	(Bekaert et al., 2011;Rothonis et al., 2016,)
Economic Risk		annual	ICRG	(Bekaert et al., 2011;Rothonis et al., 2016,)
Exchange Regime		Dummy	IMF	(Bekaert et al., 2011; Rothonis et al., 2016,)
Sovereign Debt Rating	alphanumeric ratings	annual	S&P	(Ferri, Liu, & Stiglitz, 1999)
Legal-origin		Dummy		La Porta, Lopez-de- Silanes, Shleifer and Vishny (1997)
Internet	Internet users per 100 people	annual	WDI	(Lehkonen, 2015)
Mobile	Per hundred people	annual	WDI	(Lehkonen, 2015)
Landline	Phone lines per 100 people	annual	WDI	(Lehkonen, 2015)
GDP growth	Log lagged growth	annual	World Bank	(Lehkonen, 2015)
Population	Log of Growth of All residents	annual	WDI	(Lehkonen, 2015)
Life expectancy	Newborn mortality	annual		(Lehkonen, 2015)
Bilateral Trade	Total import and export	annual	CPII data	(Fouquin & Hugot, 2016; A. A. Mobarek, 2010) Forbes and Chinn (2004)
Capitalization Diff		annual	UNDATA	(Singh et al., 2017)
Turner over Diff	equity value traded /market capitalization	annual	UNDATA	(Singh et al., 2017)
Exchange rate	Change per US dollar	Annual	IFS	(Sachs et al., 1997)
Total Reserves minus Gold	% loss	annual	IFS	(Zhu & Yang, 2008)

3.2 Methodology

3.2.1 Equity Market Return and Volatility

Daily nominal local-currency stock market indexes from Data Stream are used for the period of 2000-2015, for all Frontier markets and US. Returns are calculated as the change in log price, Friday-to-Friday. When price data for Friday are not available due to a holiday, Thursday is used. Weekly returns from nominal to real terms are converted using monthly consumer price indexes from the IMF's International Financial Statistics. This study assumes that the weekly inflation rate is constant within the month, so it can be calculated simply as the 1/4th power of the monthly inflation rate. $(1 + r_t)/(1 + \pi_t) - 1$, where r_t is weekly nominal return and π_t is weekly inflation rate.

Where $R_t = Ln\dfrac{P_t}{P_{t-1}}$

This study uses realized volatility (RV), calculated as the sum of the square of daily returns over a trading week.

$$RVt = \sum_{k=0}^{n} \text{rt}^2$$

As intraday Data is not available for many countries, so not to lose any country in perspective of Culture this research uses daily prices instead of the intraday ones to compute the weekly RV. Andersen et al. (2001) show that realized volatility is an accurate measure of true volatility compared to other estimated measures based on parametric models such as the popular GARCH model. For another example, Koopman et al. (2005) show that realized volatility provides far more

accurate volatility forecasts compared to the forecasting power of the stochastic volatility and GARCH models. Similarly, Martens and Zein (2004) demonstrate the strength of realized volatility over implied volatility, as it provides much more accurate forecasts when applied to equity, foreign exchange, and commodity markets. Others have also used this method as one of its advantages is that it is model-free.

3.2.2 **Return and Volatility spillover:**

This study base measurement of return and volatility spillovers on vector autoregressive (VAR) models as adopted by Diebold and Yilmaz (2009). Following Engle et al. (1990) variance decompositions allow to aggregate spillover effects across markets, distilling a wealth of information into a single spillover measure. For each stock market i, this study adds the share of its forecast error variances coming from shocks originating from stock market j for all $i \neq j$. Next, it adds across all $i = 1,…,N$ in order to obtain a single spillover index. Quantitatively, the spillover index is the sum of all non-diagonal elements of the forecast error variance-covariance matrix.

For simplicity of exposition, the study uses a covariance stationary first-order bivariate VAR given by:

$$y_t = \Phi_1\ y_{t-1} + \varepsilon_t \qquad (1)$$

Where $y_t = (y_{1t}, y_{2t})$, Φ is a 2 ×2 parameter matrix, and the vector of error terms ε_t has zero mean. y_t is either a vector of stock returns or volatilities. On the assumption that the VAR has stationary covariance, its moving average exists and is given by:

$y_t = O(L)\varepsilon_t$

where $O(L) = (1 - \Phi L)^{-1}$. Using the Cholesky decomposition of the covariance matrix of ε_t, the moving average can be rewritten as:

$y_t = A(L)\mu_t$

where $A(L) = O(L)Q_t^{-1}$, $\mu_t = Q_t\varepsilon_t$, $E(\mu_t \mu_t') = I$, and Q_t^{-1} is the lower triangular Cholesky factor of the covariance matrix of ε_t. As a result, μ_t represents the orthogonalized structural shocks, with zero mean and a matrix of variance-covariance with ones as diagonal elements and zeroes elsewhere.

For the one-step-ahead forecast, the optimal forecast is given by:

$$y_{t+1,t} = \Phi_1 \, y_t \qquad\qquad\qquad (2)$$

with the corresponding one-step-ahead error vector and Co-variance matrix. Therefore, the variance of the one-step-ahead error forecast of y_{1t} is $a^2_{0,11} + a^2_{0,12}$ and that of y_{2t} is $a^2_{0,21} + a^2_{0,22}$. Intuitively, this study finds what fraction of the one-step-ahead error variance in forecasting y_1 is due to own shocks (y_1) or spillover shocks from y_2. Likewise, what fraction of the one-step-ahead error variance in forecasting y_2 is due to own shocks (y_2) or to spillover shocks from y_1?

In the bivariate case, the aggregate spillover is $a^2_{0,12} + a^2_{0,21}$, whereas the total forecast error variation is given by $(A_0 A_0') = a^2_{0,11} + a^2_{0,12} + a^2_{0,21} + a^2_{0,21}$, Hence the spillover index ratio is:

$$S= (a^2_{0,12} + a^2_{0,21})/trace(A_0 \ A'_0)*100$$

By generalizing this process for a one-step-ahead forecast with a pth-order N- variable VAR, the spillover index can be represented as:

$$S= \sum^N_{i, \ j=1} a^2_{0,ij}/trace(A_0 \ A'_0)*100$$

This S measure is calculated both for returns and volatility spillover.

3.2.3 A measure of Cultural Distance:

Hofstede's (2001) dimensions of degree of individualism-collectivism, masculinity-femininity, power distance and uncertainty avoidance, and Kogut and Singh's (1988) aggregate and disaggregated cultural distances based on Hofstede's cultural characteristics. Hofstede (2001) cultural dimensions are used because they are widely known, commonly used, readily available for multi-country studies, and as Taras Rowney and Steel (2009) show, they can encompass over 90% of the other measures that have been proposed. As reported by Yeganeh (2014) the measure of Kogut and Singh (1988), KSI is not an appropriate measure and according to Shenkar (2012) the KSI is a flawed and superficial measure that "can do more harm than good." the measure uses Hofsted data and have confused results when used in business studies, it neglects three basic things. First, it takes all dimensions as equally important, secondly, it does not takes into account the correlation among different dimensions, thirdly, it takes the cultural distance as symmetrical, while the studies show it's asymmetrical depending on the direction of travel.

On this basis this study uses the measure developed by Yeganeh (2014) incorporating the three loopholes in the new measure, which uses weighted, Mahalanobis (a mathematical method that takes correlations into account), and asymmetrical approach. The formula is as follows:

$$CD_{i \to j} = \pm\sqrt{(x_i - x_j)^T C^{-1}(x_i - x_j)}$$

Where:

$CD_{i \to j}$ stands for the cultural distance from country i to country j x_i and x_j denote 4-dimensional vectors (Weighted Hofstede's four dimensions) of x for i^{th} and j^{th} countries. C is the covariance matrix for x, T is the transpose operator, HDI_i and HDI_j are respectively the long-term averages of human development index for countries i and j. $CD_{i \to j}$ is positive if $HDI_j > HDI_i$ $CD_{i \to j}$ is negative if $HDI_i > HDI_j$. $CD_{i \to j}$ can be either negative or positive and neutral if exceptionally $HDI_i = HDI_j$. This study explores both absolute and directional Cultural Distance.

Variable Name	Measurment
Returns and Volatility Spillover	$S = \sum^N_{i,\,j=1} a^2_{0,ij} / trace(A_0\,A'_0)*100$
Cultural Distance	$CD_{i \to j} = \pm \sqrt{(x_i - x_j)^T C^{-1}(x_i - x_j)}$
Religion	Dummy Value of 1 if two countries share same religion as per ARDA data with more than 80% population with same religion, otherwise 0
Language	Dummy Value of 1 if same languge is spoken by 90% of population as per CEPII data
Legal origin	Dummy Value of 1 if both coutries share same legal origin as per La Porta othersie 0
Geographic Distance	$d_{ij} = \left(\sum_{k \in i}(\text{pop}_k/\text{pop}_i) \sum_{\ell \in j}(\text{pop}_\ell/\text{pop}_j)d_{k\ell}^{\theta} \right)^{1/\theta}$
Openness	Directional Difference of Ratio Sum of Import And Export To GDP And directional difference of Capital Account openness of Chinn-Ito measure
Active Trading	Directional Difference of Value traded/GDP
economic risk($e rij,t$), political risk($prij,t$) and financial Risk($frij,t$)	Directional difference between the ICRG risks measures
Sovereign credit rating	S&P numeric Conversion (appendix)
Exchange Regime	Dummy Takes the value of 1 of countries share same exchange regime as IMF data.

Turner-over Diff	Directional difference in ratio of equity value traded /market capitalization
Information($Inf_{ij,t}$)	Differentials in country i and j of Internet, Mobile, Landline developed by World bank.
Growth($g_{ij,t}$)	Differentials in country i and j of Population, GDP and Life Expectancy developed by World bank.
Crises Index	$$\text{CIND} = \left[\left(\left(1/\sigma_{\text{EXD}}^2 \right) / \left(\left(1/\sigma_{\text{EXD}}^2 \right) + \left(1/\sigma_{\text{RLOS}}^2 \right) \right) \right) * \text{EXD} \right]$$ $$+ \left[\left(\left(1/\sigma_{\text{RLOS}}^2 \right) / \left(\left(1/\sigma_{\text{EXD}}^2 \right) + \left(1/\sigma_{\text{RLOS}}^2 \right) \right) \right) * \text{RLOS} \right]$$

For cross-sectional analysis the main variable of concern Spill RT and Spill VT are taken from Static Spillovers country pair Variance decompositions, Cultural distance is measured by Yeganeh's (2014) weighted Mahalanobis method by taking HDI of 2015 reported in 2016 as the dependent variable in regression and coefficients as weights, all other control and interaction variables are the bilateral end of 2015 figures of difference and interactions. Dummy Variables of Language, Legal origin and Religion takes the value of 1 if countries share same properties and 0 otherwise.

For independently pooled analysis, panel data are taken from static Spillover Variance Decomposition ratios for four periods of four years at the time of 2000-2003, 2004-2007, 2008-2011, 2012-2015, which gives an outlook about changing patterns of integration. On the other hand, Culture is slow moving and time-invariant variable but the cultural Distance as weighted by Human Development Index of UNDP is varying with time but with very slow pace. Cultural distance is also taken for four points for all country pairs. Other Controls and interaction Variable are the end of period differential values in country pairs.

3.2.4 Cultural Distance and returns and Volatility Spillover:

With Spill-over measure of Diebold and Yilmaz (2009) and Cultural distance measure adopted from Yeganeh (2014), the argument of stock markets located in the same geographical area are more closely related to one another as a result of regional economic interdependence and political interaction. Following is the panel regression model for all frontier markets and the US.

$$SI_{ij,t} = \propto_\circ + \propto_1 CD_{ij,t} + GEOG_{Ij} + \sum_{n=1}^{11} \gamma_n C_{ij,n} + \varepsilon_{ij,t}$$

Where $SI_{ij,t}$ is the time measure of Spillover index from country i to j, $CD_{i,t}$ represents the dependent variables Cultural Distance and $GEOG_{Ij}$ represents the population weighted distance by CEPII for geographical proximity, $C_{ij,n}$ are 10 control variables and ε is an error term capturing all other omitted variables. Many variables cause both return and volatility spillovers, this study uses three variables of ICRG data namely economic risk($er_{ij,t}$), political risk($pr_{ij,t}$) and financial risk($fr_{ij,t}$) as used by Bekaert et al. (2011) showing them fundamental to integration of financial markets, following Van Horen et al. (2006), this study uses information($Inf_{ij,t}$) and growth($g_{ij,t}$) differentials in country i and j developed by World bank. Kim et al.'s (2005) finding that the adoption of the euro as a common currency was an important determinant of enhanced stock market return linkages and financial integration across European countries, so variable *Fxreg* is a dummy variable having value of 1 when i and j country are from the same forex regime and 0 otherwise. Yeyati et al. (2008) emphasized the role of capital control, market depth and liquidity for integration of markets, so variables of is the difference in the average number of trades scales by total market capitalization is used. Variable *fxtrad* is similarly defined for the foreign exchange

market, is included to tap the difference in development. Arezki and Candelon (2011) proved credit rating as vital force for financial market linkage so *rating* is the difference of the average sovereign credit ratings given by S&P between two countries.

3.2.5 Impact of Openness on Culture-Spillover Relationship:

Recently this moderating relationship of trade openness is discussed by Eun et al. (2015) based on arguments of Cowen (2006) that trade openness motivates the globalization of culture, which weakens country-specific culture, so does the returns and volatility spillovers. Following equation is tested to see the relationship including the control variables used before:

$$SI_{ij,t} = \propto_{\circ} + \propto_1 \ CD_{ij,t} + GEOG_{Ij} + \propto_2 \ Opn_{ij,t} + \propto_3 \ CD_{ij,t} * Opn_{ij,t} + \sum_{n=1}^{11} \gamma_n \ C_{ij,n} + \varepsilon_{ij,t}$$

Where *Open* is the openness measure as in Bekaert et al. (1995) and Edison and Warnock (2003). Capital market openness measure is a measure of Chinn & Ito, (2008)based capital restriction described in annual reports of IMF is standardized principal component ranging from 0 to 1.

3.2.6 Crises Index:

Instead of taking crisis dummy or pre and post periods to explore contagion of crisis, this study takes the method used by Sachs et al. (1997) and Zhu & Yang (2008). This crisis index (CI) is a weighted average of currency depreciation and international reserve loss for predefined crisis window. This study uses the variation by Zhu & Yang, (2008) to incorporate the volatility in both measures monthly percentage change means of both variables and using inverse variance divided

by the total variance of exchange depreciation and Reserve Depreciation, weights are incorporated in the model. Depreciation is calculated on the basis of the average of previous 36 years.

$$\text{CIND} = \left[\left(\left(1/\sigma_{\text{EXD}}^2 \right) / \left(\left(1/\sigma_{\text{EXD}}^2 \right) + \left(1/\sigma_{\text{RLOS}}^2 \right) \right) \right) * \text{EXD} \right]$$
$$+ \left[\left(\left(1/\sigma_{\text{RLOS}}^2 \right) / \left(\left(1/\sigma_{\text{EXD}}^2 \right) + \left(1/\sigma_{\text{RLOS}}^2 \right) \right) \right) * \text{RLOS} \right]$$

Crisis Windows are 3/2001-11/2001, 12/2007-6/ 2009, 8/2007–6/2009, 9/2008–6/2009, and 9/2008-9/2011 for US Recession period 1, US Recession 2, GFC long, GFC short and European Sovereign Debt Crisis respectively.

3.2.7 **Global and Local Financial Crises Contagion**

As the spillover indicator is in ratio form, this standardization makes it easy to compare the countries. Our definition of a crisis period follows Eichengreen et al. (1996) and Gelos and Sahay (2001) in that a crisis means extreme values of the spillover index. Using the index developed following equation is estimated:

$$SI_{ij,t} = \propto_{\circ} + \propto_1 \; CD_{ij/g,t} + GEOG_{Ij} + \propto_2 \; Crises_{i/j/g\prime t} + + \sum \gamma_k C_{ij,t} + \epsilon_{ij,t}$$

3.2.8 **Impact of Culture on Contagion of Crises:**

Based on the results of Rothonis et al.(2016) that culturally Proximate Countries have higher volatility linkage; countries with positive cultural distance have more contagion of crises than with negative $CD_{ij,t}$ countries. As Yeganeh, (2014) reported cultural un-evenness impacts the behavior

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towards investing and consequently effects the comovement of stock, same is embraced by Eun et al., (2015). To check this impact in the event of crises this study tests following equation

$$SI_{ij,t} = \alpha_\circ + \alpha_1 \ CD_{ij,t} + GEOG_{Ij} + \alpha_2 \ Crises_{i/j,t} + \alpha_3 \ CD_{i,j} Crises_{j't} + \sum \gamma_k C_{ij,t} + \epsilon_{ij,t}$$

Where $SI_{ij,t}$ is the time measure of Spillover index from country i to j, $CD_{i,t}$ represents the dependent variables Cultural Distance and $GEOG_{Ij}$ represents the population weighted distance by CEPII for geographical proximity, $Crises_{i/j,t}$ are crises windows, $C_{ij,n}$ are 10 control variables and ε is an error term capturing all other omitted variables.

Here $CD_{i,j}$ is cultural Distance in two countries. Cultural proximity will strengthen the contagion of crises, so expects positive α_3 parameter. Where $CD_{i,j}$ is Cultural proximity, having positive cultural distance measure.

Chapter 4

4. **Results and Discussion**

This chapter deals with results, analysis and discussion. Before going deeper into spillover indices of returns and realized volatility, it describes the data properties with the help of descriptive statistics. After presenting the correlations between the frontier markets it presents spillovers and determinants of spillover including the Cultural distance with crises index incorporated. For comprehensiveness and dynamic properties of interdependencies, the cross-sectional, as well as panel technique, is used.

4.1 Descriptive analysis:

Table 4.1 and 4.2 presents the descriptive statistics of weekly returns and returns volatility data of fifteen frontier markets along with the United States. As can be seen, the highest mean value of returns is from Argentina 0.0461 and the lowest is of Croatia 0.007, it's noteworthy that the US mean value in returns is lowest among all with 0.0005. Argentina has the maximum weekly returns as .3702 and Lithuania giving the lowest weekly returns -0.2943 from the sample period starting from January 2000 to December 2015. The period is taken from Jan to December because of the involvement of Macroeconomic factors. Most of the returns are negatively skewed and fatter tails more through kurtosis more than +3, rejecting the normal distribution assumption.

Table 4.1: Descriptive Statistics, Weekly Stock Market RETURNS, 1/2000 – 12/2015

	Mean	**Median**	**Maximum**	**Minimum**	**Std. Dev.**	**Skewness**	**Kurtosis**
ARG	0.0461	0.0482	0.3702	-0.1901	0.0579	0.0125	5.53
BOTS	0.0027	0.0019	0.0822	-0.065	0.0117	0.6651	12.0
BULG	0.0024	0.0016	0.18	-0.2817	0.036	-0.8271	15.64
CRO	0.0007	0.0001	0.1156	-0.1318	0.0277	-0.3098	6.84
EST	0.0026	0.0017	0.1455	-0.2019	0.0287	-0.4415	9.66
JAM	0.0027	0.0016	0.1477	-0.0899	0.0187	0.7078	10.63
JOR	0.0016	0.001	0.1035	-0.1678	0.0257	-0.5322	7.89
KUW	0.0013	0.0002	0.0759	-0.1725	0.0216	-1.4222	12.25
LEB	0.0012	-0.0004	0.1559	-0.1388	0.0263	0.6637	10.80
LITH	0.0024	0.0025	0.1961	-0.2943	0.0283	-1.2578	24.53
OMAN	0.0016	0.0018	0.151	-0.2478	0.027	-1.5256	22.57
PAK	0.0045	0.0069	0.1565	-0.1967	0.0335	-1.1172	9.547
ROM	0.0035	0.0034	0.1405	-0.1831	0.0365	-0.4755	6.48
SRI	0.004	0.0047	0.1728	-0.1893	0.031	-0.1942	8.4479
TUN	0.002	0.0015	0.0921	-0.0958	0.015	-0.0336	10.5959
US	0.0005	0.002	0.1003	-0.1766	0.025	-0.7912	8.7308

Returns are inflation-adjusted and measured weekly.The sample size is 814.

Table 4.2 is describing weekly stock return volatility with a highest volatile mean value of Argentina by 0.0023 and lowest mean volatility of Botswana and Tunisia by 0.0001. Realized weekly volatility is maximum for Kuwait and Lebanon by 0.1266 and 0.1088 and minimum of 0 volatility in all markets in the period. Moreover, volatility is positively skewed and kurtosis values are very high up to 613 and 715 in case of Jordan and Kuwait. Deviation from the means is as less as 0.0004 and 0.0006 in case of Tunisia and Jamaica. Pakistan and Argentina are exhibiting lowest Skewness by 4.1489 and 4.3464.

Table 4.2: Descriptive Statistics, Weekly Stock Market Volatility, 1/2000 – 12/2015

	Mean	**Median**	**Maximum**	**Minimum**	**Std. Dev.**	**Skewness**	**Kurtosis**
ARG	0.0023	0.0012	0.0329	0	0.0034	4.3464	29.0189
BOTS	0.0001	0.0000	0.0092	0	0.0005	10.4745	147.3804
BULG	0.001	0.0003	0.0538	0	0.0028	10.9381	172.9127
CRO	0.0008	0.0002	0.036	0	0.0025	8.5229	92.9803
EST	0.0006	0.0002	0.0163	0	0.0012	6.7741	70.2081
JAM	0.0003	0.0001	0.0075	0	0.0006	6.2481	56.349
JOR	0.0007	0.0002	0.0818	0	0.0031	23.5628	613.6245
KUW	0.0006	0.0001	0.1266	0	0.0046	26.2838	715.5691
LEB	0.0008	0.0001	0.1082	0	0.0052	17.9352	344.7647
LITH	0.0006	0.0002	0.038	0	0.0022	12.2366	182.1401
OMAN	0.0005	0.0001	0.0259	0	0.0016	8.4414	98.9242
PAK	0.0009	0.0004	0.0162	0	0.0014	4.1489	29.4709
ROM	0.0012	0.0004	0.0254	0	0.0025	5.6515	42.4178
SRI	0.0007	0.0002	0.0355	0	0.0022	11.0435	157.5899
TUN	0.0001	0.0001	0.005	0	0.0004	8.8059	98.5864
US	0.0008	0.0003	0.0251	0	0.0018	7.0728	68.8384

Realized Volatility is measured weekly.The sample size is 814.

Table 4.3 and 4.4 presents the correlation between the markets in terms of weekly returns and realized volatilities. In returns, most of the correlations are positive except between Argentina and Botswana, Jordan and Botswana, Lebanon and Sri Lanka. The US had a positive correlation with all the markets, with the highest correlation with Argentina 0.420 followed by Estonia 0.376 and Croatia 0.364. As evident by the table Jamaica and Botswana are the countries with lowest correlations with other countries in the group.

On the other hand in table 4 realized volatilities shows a mixed pattern of negative and positive correlations with the US having positive correlation up to 0.545 with Croatia followed by 0.497 with Pakistan. The US only has negatively correlated with Kuwait -0.019. Countries with mostly negative correlations are Kuwait, Botswana, Lebanon, and Jamaica.

Table 4.3: Correlation, Weekly Stock Market Returns, 1/2000 – 12/2015

	ARG	BOST	BUL	CRO	EST	JAM	JOR	KUW	LEB	LITH	OMAN	PAK	ROM	SRI	TUNI	US
ARG	1.000															
BOST	-0.002	1.000														
BUL	0.197	0.089	1.000													
CRO	0.230	0.031	0.281	1.000												
EST	0.276	0.093	0.282	0.384	1.000											
JAM	0.064	0.041	0.071	0.071	0.106	1.000										
JOR	0.107	-0.035	0.150	0.234	0.263	0.068	1.000									
KUW	0.122	0.071	0.179	0.182	0.125	0.018	0.347	1.000								
LEB	0.068	0.051	0.086	0.094	0.113	0.068	0.168	0.127	1.000							
LITH	0.239	0.067	0.342	0.319	0.588	0.108	0.276	0.233	0.155	1.000						
OMAN	0.225	0.031	0.238	0.223	0.273	0.056	0.388	0.387	0.210	0.339	1.000					
PAK	0.136	0.077	0.106	0.101	0.125	0.036	0.120	0.222	0.026	0.135	0.182	1.000				
ROM	0.273	0.051	0.281	0.327	0.287	0.038	0.189	0.207	0.068	0.300	0.267	0.188	1.000			
SRI	0.121	0.010	0.118	0.151	0.149	0.059	0.146	0.059	-0.006	0.155	0.123	0.068	0.100	1.000		
TUNI	0.049	0.041	0.062	0.086	0.152	0.061	0.145	0.086	0.096	0.169	0.170	0.035	0.051	0.073	1.000	
US	0.420	0.058	0.226	0.364	0.376	0.072	0.169	0.140	0.092	0.315	0.238	0.137	0.331	0.056	0.051	1.000

Table 4.4: Correlation, Weekly Stock Market Volatility, 1/2000 – 12/2015

	ARG	BOST	BUL	CRO	EST	JAM	JOR	KUW	LEB	LITH	OMAN	PAK	ROM	SRI	TUNI	US
ARG	1.000															
BOST	0.008	1.000														
BUL	0.241	0.020	1.000													
CRO	0.318	0.012	0.197	1.000												
EST	0.249	0.020	0.186	0.296	1.000											
JAM	0.013	-0.004	0.027	0.021	0.080	1.000										
JOR	0.044	-0.008	0.031	0.101	0.066	0.000	1.000									
KUW	0.000	-0.014	0.049	-0.012	-0.020	-0.025	-0.005	1.000								
LEB	-0.002	-0.015	0.024	0.013	-0.011	-0.004	0.061	-0.005	1.000							
LITH	0.178	-0.016	0.189	0.362	0.549	0.030	0.092	-0.005	0.015	1.000						
OMAN	0.262	-0.001	0.201	0.425	0.349	0.061	0.133	-0.014	0.029	0.450	1.000					
PAK	0.019	-0.010	-0.014	0.164	0.049	0.010	0.049	0.007	0.016	0.029	0.113	1.000				
ROM	0.285	-0.011	0.165	0.400	0.397	-0.023	0.182	0.014	0.018	0.357	0.429	0.096	1.000			
SRI	0.172	-0.003	0.010	0.028	0.042	0.006	0.012	-0.014	0.005	0.038	0.097	0.018	0.019	1.000		
TUNI	0.083	0.023	0.142	0.213	0.221	-0.008	0.037	0.002	0.002	0.297	0.301	-0.023	0.187	0.000	1.000	
US	0.464	0.003	0.260	0.545	0.441	0.089	0.143	-0.019	0.010	0.378	0.495	0.012	0.497	0.059	0.208	1.000

Table 4.5 represents the Unit root tests for stationarity. VAR results can be spurious if series are non-stationary, the results show stationarity in both Returns and volatility series by all three methods at 99% confidence levels, moreover, stability condition for Vector Autoregressive process is also checked and no root lies outside the circle. This study can opt for VAR method of developing indices through Variance decompositions (Diebold & Yilmaz, 2009).

Table 4.5: Unit root test Weekly Stock Market Returns, 1/2000 – 12/2015

Method	Returns		Volatility		Observations	Cross-sections
Im, Pesaran and Shin W-stat	-68.7244	0.000	52.0565	0.000	12896	16
ADF - Fisher Chi-square	2080.19	0.000	1632.6	0.000	12896	16
PP - Fisher Chi-square	2781.73	0.000	2859.27	0.000	12849	16

Khim and Liew (2004) advocate AIC and FPE information criteria for economic series to determine the optimum lag length Criteria. Ventzislav and Lutz (2005) are of the view that Akaike Information Criterion (AIC) renders precise approximation for both structural and semi-structural impulse-response in VAR. Table 4.6 presents that for returns 2-week lags are optimal and for volatility, 6-week lags are optimal in estimating variance decomposition in VAR process.

Table 4.6: Lag-length criteria

	Returns		Volatility	
Lag	LogL	AIC	LogL	AIC
0	27990.67	-73.61754	61018.64	-160.3223
1	28369.09	-73.93971	62014.14	-162.2658
2	28626.29	-73.94286*	62433.18	-162.6943
3	28863.94	-73.89458	62730.64	-162.8033
4	29060.39	-73.73787	63177.63	-163.3052
5	29254.42	-73.57479	63435.78	-163.3109
6	29420.67	-73.3386	63699.85	-163.3321*

4.2   Static Spillover Indices:

In static sample analysis, this study follows the method of   Diebold and Yilmaz (2009) to create Spillover indices for returns in Table 4.7 and Volatilities in Table 4.8. The lag length Criteria lag 2 in returns and 6 in volatility by AIC. Cholesky VAR decompositions were taken which were ten-step ahead and market importance is taken to form the order selected (as order matters in this decomposition).The tables in framework countries as i and j can be explained, such that it computes the shock in variable j coming from i through forecast error variance for all i and js. For the full sample weekly data from 2000-2015, the off-diagonal sum of ijth Forecast Error Variance (FEVs) is categorized as "Contribution from others" and form the nominator, the sum of all rows is "Contribution Including own" is the denominator of Index. The Spillover Index is reported in table 7 and 8 at the lowest right represent returns and volatilities Spillover Indices. In Table 7 US can be easily identified the US as the market giving shocks to other markets 103.31 in returns dynamics. This is in line with Chen, Chen, and Lee (2014) who demonstrated that US market granger cause Frontier markets, and despite the advancement of Euro area and Japan, US is still the largest economy giving spillovers (IMF Outlook Report, 2013). The US is mostly impacting Argentina (18.21), Croatia (18.37), and Estonia (16.46). From the group of these Frontier markets

Jordan (30.0), Bulgaria (23.36) and Estonia (21.05) are the ones transmitting innovations within the group. On the other hand, Jamaica (4.68) and Sri Lanka (5.10) are ones with the lowest influence. Within the group Estonia is giving shocks as large as 14.18 to Lithuania and Jordan is giving shocks to Oman by 10.24 variance ratio. Lithuania (44.84), Estonia (31.83), Oman (30.14), and Croatia (29.15) are the biggest accepter of shocks in FEVs.

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*R*eturns Spillover:

Table 4.7: Frontier Markets Spillover, Stock Returns, 1/2000 – 12/2015

	US	PAK	JOR	ARG	BOT	BUL	SRI	CRO	JAM	KUW	LEB	OMAN	ROM	EST	TUN	LITH	From Others
US	94.07	0.50	0.36	0.71	0.11	0.98	0.07	0.07	0.29	0.13	0.27	0.28	0.56	0.63	0.07	0.89	**5.93**
Pak	3.76	91.71	0.84	0.44	0.08	0.14	0.26	0.26	0.21	0.05	0.25	0.54	0.04	0.09	0.14	1.18	**8.29**
JOR	4.61	0.69	89.41	0.78	0.19	0.65	0.06	0.48	0.29	0.51	0.52	0.30	0.13	0.74	0.14	0.48	**10.59**
ARG	18.21	0.48	0.98	71.76	3.83	0.68	0.12	0.04	0.05	0.86	0.36	0.29	0.75	0.51	0.59	0.49	**28.24**
BOT	0.46	0.29	0.14	1.32	94.01	1.17	0.11	1.08	0.17	0.16	0.11	0.59	0.26	0.04	0.08	0.02	**5.99**
BUL	5.34	0.31	1.21	0.71	1.53	86.28	0.35	0.17	0.43	0.18	0.20	1.03	0.47	0.32	0.77	0.69	**13.72**
SRI	2.85	0.15	1.18	0.90	0.20	0.51	90.22	1.02	0.26	0.12	0.40	0.18	0.19	0.51	0.20	1.12	**9.78**
CRO	18.37	0.31	2.10	0.62	0.74	2.97	0.35	70.85	0.30	0.14	0.32	0.70	0.28	0.25	1.03	0.67	**29.15**
JAM	0.46	0.15	0.45	0.46	1.14	0.57	0.15	0.13	91.91	0.45	0.84	0.58	0.81	0.74	0.77	0.38	**8.09**
KUW	0.23	0.74	1.25	0.18	0.21	0.31	0.06	0.10	0.00	94.65	0.20	0.76	0.11	0.22	0.02	0.96	**5.35**
LEB	2.06	0.13	1.98	0.14	0.76	0.46	1.11	0.46	1.39	0.07	89.86	0.12	0.30	0.43	0.24	0.49	**10.14**
OMAN	5.39	2.06	10.24	0.65	0.65	2.66	0.20	0.44	0.09	3.78	1.41	69.86	0.29	1.51	0.11	0.67	**30.14**
ROM	13.80	1.96	1.18	1.14	0.28	2.73	0.42	1.54	0.12	0.90	0.22	1.29	73.10	0.07	1.14	0.11	**26.90**
EST	16.46	0.21	2.68	1.26	0.26	3.09	0.44	2.40	0.20	0.21	0.25	1.29	0.69	68.17	0.07	2.31	**31.83**
TUN	0.69	0.26	1.26	0.43	0.13	0.30	0.62	0.30	0.53	0.64	0.39	1.12	0.43	0.80	91.21	0.90	**8.79**
LITH	10.62	0.49	4.15	0.66	0.35	6.15	0.76	1.45	0.36	0.51	0.89	2.73	0.71	14.18	0.84	55.16	**44.84**
Ctr. others	**103.31**	**8.74**	**30.00**	**10.39**	**10.46**	**23.36**	**5.10**	**9.94**	**4.68**	**8.70**	**6.63**	**11.81**	**6.03**	**21.05**	**6.23**	**11.36**	**277.77**
Ctr. own	**197.39**	**100.45**	**119.41**	**82.14**	**104.47**	**109.64**	**95.32**	**80.78**	**96.59**	**103.35**	**96.49**	**81.67**	**79.13**	**89.21**	**97.44**	**66.51**	**17.4%**

By using VAR order 2 by AIC criteria and Cholesky factor ordering as in Table first Column. The ij-th reading shows the contribution TO the innovations in Ten weeks ahead variance of stock Returns of country i FROM country j's real stock returns Shocks.

The overall Spillover Index is 17.4%, which is less than all the reported returns spillovers of different asset classes, time periods and market groups' until now. Diebold and Yilmaz (2009) reported 29% return index in the global equity market, Suwanpong (2011) reported 30.92 percentage of FEVs in Spillover of global currency market and 46.35 in the equity market, Louzis (2013)_ reported 55.67% with different asset class markets. Guimarães-filho and Hong (2016) reported as big as 81.29% static spillover in returns of Asian Equity Markets. Moreover, Yilmaz (2010) reported 31.6% only in East Asian Equity Markets. By these results and comparisons, this can well go with the notion of these markets segmented and have diversification benefits.

Table 4.8 presents the directional static spillover index of Realized Volatility, again with the conception of Koutmos and Booth (1995) and Huyghebaert and Wang (2010), US is the biggest volatility shock giver to the Frontier equity markets contributing 142.55 forecast error variance. Romania (25.86), Oman (20.80), Croatia (20.72) and Argentina (20.38) are the leading taker of shocks from US. Among the group, Oman (56.69) is the largest volatility giver followed by Estonia (22.09), Croatia (21.69) and Pakistan (21.19). Oman is giving shocks not only to other frontier markets but also to the US by 14.98 variance ratio, Estonia is giving Shocks to Lithuania by 12.04 and Croatia is giving a major shock to Pakistan by 6.89 FEV. Lebanon (5.12), Kuwait (5.86), Sri Lanka (7.32) and Jordan (7.42) lowest givers of innovation. On the other hand, Lithuania (49.30), Croatia (45.39), Romania (43.55) and Argentina (39.03) are the major receivers of shocks of volatility. Total Volatility Spillover Index is 24.3%. Previous studies have the same pattern of amplified Volatility spillover in comparison to returns spillover specific to equity market like Diebold and Yilmaz (2009) and Yilmaz (2010) who reported 31% in global equity markets and

Volatility Spillover:

Table 4.8: Frontier Markets Spillover, Stock Realized Volatility, 1/2000 – 12/2015

	US	PAK	JOR	ARG	BOT	BUL	SRI	CRO	JAM	KUW	LEB	OMAN	ROM	EST	TUN	LITH	From Others
US	76.51	0.62	0.47	0.38	0.32	0.84	0.30	0.30	0.67	0.11	0.03	14.98	0.55	1.38	1.40	1.15	**23.49**
PAK	0.55	83.08	0.67	1.19	0.35	0.20	0.36	6.89	0.97	0.06	0.14	1.60	2.10	0.41	0.90	0.53	**16.92**
JOR	3.26	1.84	87.55	0.71	0.16	0.25	0.07	1.13	0.32	0.04	0.73	1.65	1.12	0.72	0.23	0.22	**12.45**
ARG	20.38	1.42	0.31	60.97	0.52	2.67	3.60	2.60	0.72	0.36	0.09	2.93	0.38	0.27	1.17	1.61	**39.03**
BOT	0.16	0.44	0.15	3.24	90.44	3.34	0.27	0.27	0.13	0.72	0.05	0.22	0.04	0.29	0.19	0.06	**9.56**
BUL	5.44	0.28	0.26	1.42	1.15	82.82	0.27	0.52	1.19	3.44	0.07	0.88	0.56	0.23	0.74	0.73	**17.18**
SRI	0.54	4.55	0.69	2.46	0.20	0.06	83.97	0.81	1.19	0.08	3.06	0.44	0.47	0.83	0.08	0.56	**16.03**
CRO	20.72	2.98	1.87	1.36	0.22	1.59	0.24	54.61	0.38	0.23	0.07	8.38	1.17	1.20	2.02	2.96	**45.39**
JAM	3.22	0.61	0.09	0.69	0.35	0.99	0.28	0.80	88.05	0.26	0.29	1.19	0.16	1.17	0.57	1.28	**11.95**
KUW	0.55	0.24	0.13	0.50	1.88	0.30	0.10	0.39	0.10	91.04	0.05	0.35	0.50	0.23	0.18	3.45	**8.96**
LEB	0.17	0.87	0.32	0.07	0.03	0.19	0.19	0.26	0.14	0.05	97.08	0.20	0.15	0.06	0.10	0.12	**2.92**
OMAN	20.80	2.72	0.26	0.70	0.53	1.27	0.44	2.30	1.14	0.07	0.14	62.96	2.08	0.60	1.45	2.54	**37.04**
ROM	25.86	1.98	1.18	1.04	0.41	0.78	0.44	1.30	1.71	0.02	0.07	6.25	56.45	1.69	0.26	0.55	**43.55**
EST	18.99	0.49	0.42	0.59	1.05	0.49	0.20	0.41	1.41	0.19	0.16	5.68	3.44	63.74	1.09	1.64	**36.26**
TUN	7.36	0.21	0.07	0.64	1.17	0.52	0.30	2.09	0.42	0.14	0.02	3.43	0.48	0.97	81.01	1.16	**18.99**
LITH	14.54	1.90	0.52	0.36	0.51	0.77	0.25	1.62	1.23	0.09	0.15	8.51	4.84	12.04	1.97	50.70	**49.30**
Ctr. Others	**142.55**	**21.16**	**7.42**	**15.36**	**8.83**	**14.26**	**7.32**	**21.69**	**11.72**	**5.86**	**5.12**	**56.69**	**18.04**	**22.09**	**12.34**	**18.56**	**389.00**
Ctr. own	**219.06**	**104.24**	**94.97**	**76.34**	**99.27**	**97.08**	**91.29**	**76.30**	**99.76**	**96.90**	**102.20**	**119.66**	**74.49**	**85.83**	**93.36**	**69.26**	**24.3%**

By using VAR order 6 by AIC criteria and Cholesky -factor ordering as in Table's first Column. The ij-th reading shows the contribution TO the innovations in Ten weeks ahead variance of stock Volatilities of country i FROM country j's real stock return Volatility Shocks.

77% in East Asian markets respectively. Suwanpong (2011) reported 56.78% equity spillover index. On the other hand evidence on other asset classes like in bonds 54.23% in full sample of EMU sovereign Bonds (Fernández-Rodríguez, Gómez-Puig, & Sosvilla-Rivero, 2016).

Inference:

Here Objective one is achieved by knowing the overall static levels of Returns/Volatility Spillovers and Objective two is achieved through knowing the impact of Innovations of US (Developed) market on Frontiers markets.

Results are in line with Frontier market properties of partial integration. The overall high volatility against returns gives way to behavioral and cultural factors and non-existence of rational models of finance in decision-making (Shiller, 1992). In both cases of Returns and Volatility the US is the largest market giving shocks to other markets, this is in line with Chen, Chen, and Lee (2014) who demonstrated that US market granger cause Frontier markets, and despite the advancement of Euro area and Japan, US is still the largest economy giving Spillovers (IMF Outlook Report, 2013).

4.3 Dynamic Spillovers:

As Described by Diebold and Yilmaz (2009), it's necessary to look into the dynamic analysis. Evidently, from 2000 -2015, the world is more capitalized, more trade ties, more electronic trading, more integration, and connectivity. Other than globalization there came some financial and political crises that effect the overall world by the contagion of crises. As Bekaert and Harvey, (1995); Bekaert, Hodrick, and Zhang (2005) and recently Abid, Kaabia, & Guesmi (2014) are of the view that there is time variation in international market integration, so the methods to track the phenomenon should capture the time variation. Moreover, the spillover of returns and volatility can show very different behavior at the same time.

This study uses the rolling-Vector Autoregressive (VAR) framework of the 200-week window with ten step ahead analysis fixing the ending date of the window as proposed by Diebold and Yilmaz, (2009). Figure 4.1 and 4.2 are plotting the rolling Returns and Volatility Spillovers over time, there is an enormous difference in behaviors. Explaining the Dynamic returns spillover plot, there was a gradual increase in stock market integration in Frontier markets through growth and globalization, but after Global financial crises this level jumped to its peak near 50%, after the major global crises the governments of Frontier markets liberalized their selves and made open to international investors and there is persistence increase in levels after the small sharp drop. Spillover levels after mid-2012 drop significantly in these markets which is against the developed and emerging market's evidence. It can be attributed to structural strengthening after openness and liberalization, due to which these market are integrated but tale shocks from the developed markets like US and others.

Figure 4.1: Dynamic Returns spillover

Spillover plot. Returns. 200 weeks window. 10 step horizon
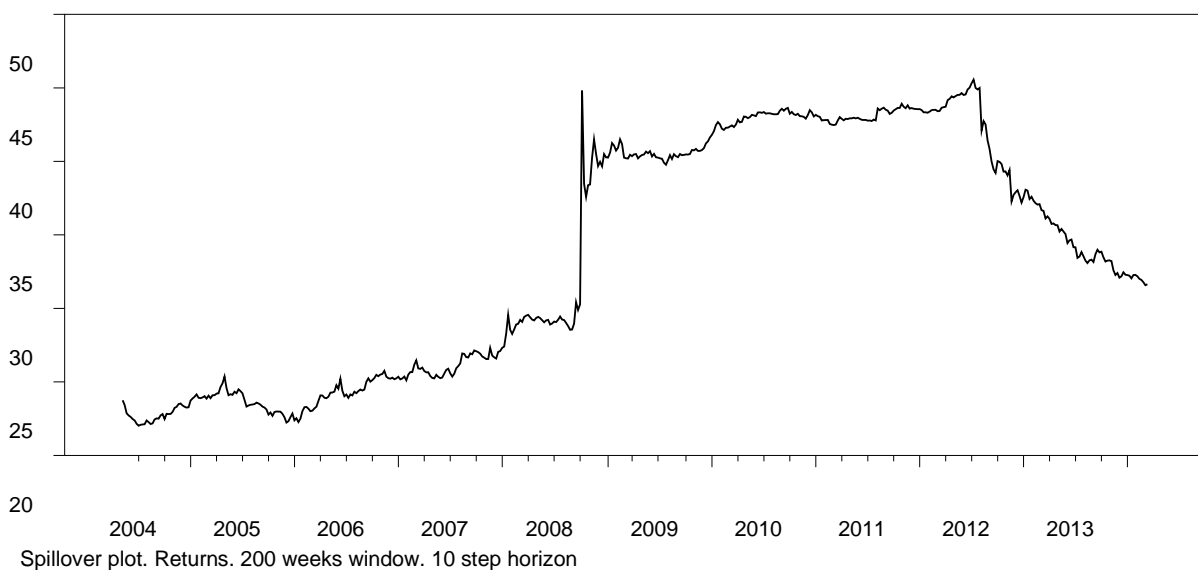
Volatility Spillover rolling Plots many crusts and troughs with heights as peaked as 75%. With Iraq war 2003 and start of 2005 to 2006, this plot responds to the Federal Reserve interest policy than the Indonesian mini-crisis. The levels of spillover in volatility in these market responded to Global financial crises after Lehman Brother's fall late than developed and emerging markets along with Sovereign debt crises from mid-2008 to mid-2011, higher post-crisis correlation found by Chan-Lau (2014) but somewhat in contrast with the finding of no evidence that FMs. It can be conjectured in 2012 there is a hype due to Ukrainian crises, and 2013 due to Cyprus financial crises, 2013 was the year of the taper tantrum too.

Figure 4.2: Dynamic Volatility Spillover Plot

Spillover plot. Volatility. 200 week window. 10 step horizon
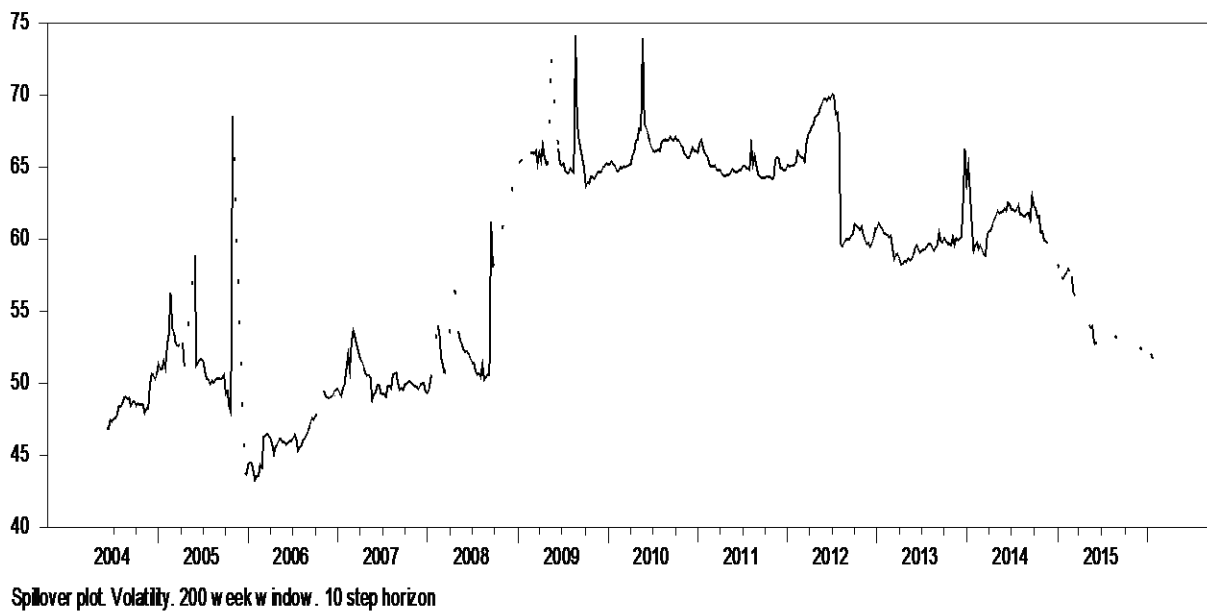
Figure 4.3 is plotted with a different time horizon of 10 and 2 weeks and rolling window length of 75 weeks and the behavior of volatility time series changes a little with small and big jumps

up to 65%. Figure 4.4 is drawn with randomly chosen VAR ordering and almost same patterns can be seen as in figure 4.1.

Inference: Objective one is achieved by knowing the overall static levels of Returns/Volatility Spillovers. More broadly defined, Frontier markets are becoming increasingly integrated over time (Berger, Pukthuanthong, & Yang 2011). The range of spillovers is robust to the ordering chosen (Klobner & Wagner, 2013). Despite consolidating the evidence of different crises when volatility takes a hype, there is confusion on what type of circumstances cause volatility spillover time series to change its dynamics.

Figure 4.3: 75-week rolling window
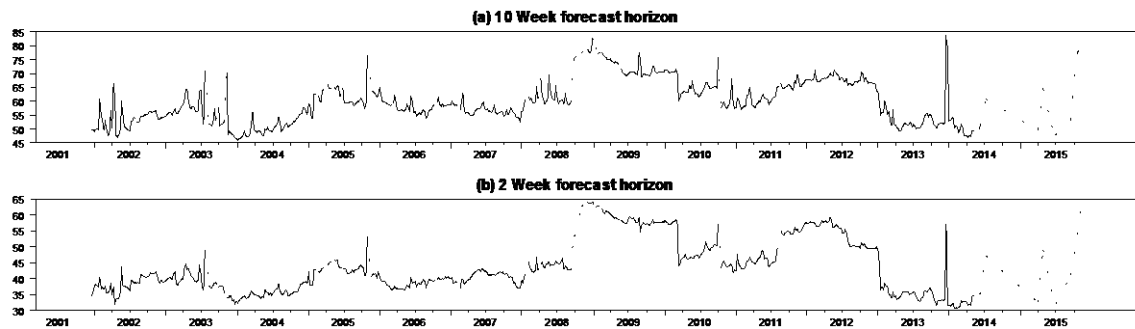
Figure 2 Spillover plot, Frontier Market Volatility
75 Week Rolling Window s

Figure 4.4: Random Cholesky orders
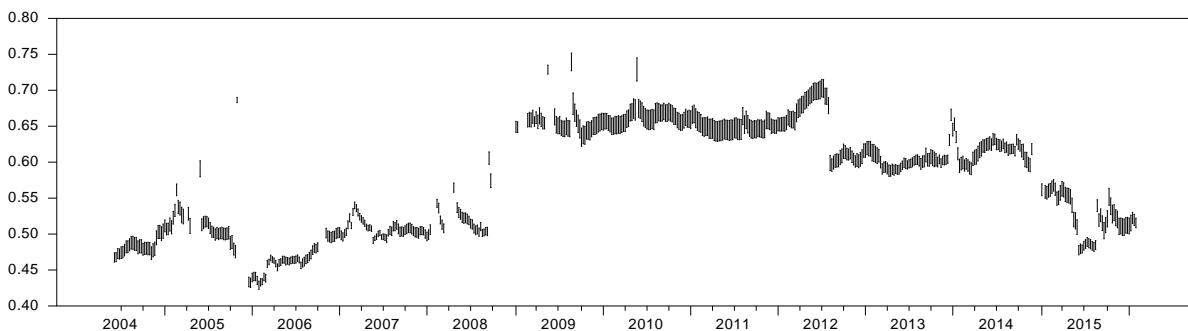
Figure 4. Maximum and minimum spillovers
Randomly Chosen Orderings

4.4   Cultural Distance:

Abid et al., (2014), is of the view that stock market integration is time-varying and emerging markets are still semi-integrated proving hedging and diversification benefits. In this line Frontier markets are less integrated with world markets, to get the benefits and manage the curses it's important to look into what causes spillovers. With the conventional models, this study incorporates Cultural Distance Measure of Yeganeh, (2014). Table 4.9 presents the Directional Weighted-Mahalanobis Cultural Distance values of Frontier markets. Positive sign show flow of culture or proximity, on the other hand, negative sing represents distance.

By the virtue of asymmetrical nature of Yeganeh's (2014) measure of the cultural distance, It can be seen that the US is the giver of the culture or there is less distance between the US and other nations, due to the direction of travel (Yildiz, 2014). Cultural move from Estonia and Romania are positive for all except the US, means that these countries are more proximate to the group culturally. On the other hand, Botswana, Pakistan, Sri Lanka and Tunisia have more cultural distances within the group and are major receivers of culture.

Table 4.9: Cultural Distance

	US	ARG	BOT	BUL	CRO	EST	JAM	JOR	KUW	LEB	LITH	OMAN	PAK	ROM	SRI	TUN
US	0.00	-3.32	-1.50	-3.54	-3.27	-2.86	-4.23	-3.38	-3.66	-2.89	-3.21	-3.37	-4.82	-3.51	-4.38	-2.87
ARG	3.32	0.00	-2.45	-1.70	2.04	2.46	-4.35	-2.47	3.03	-3.29	2.84	3.23	-2.51	-2.76	-4.72	-2.81
BOT	1.50	2.45	0.00	2.40	2.14	2.17	3.04	2.04	2.63	1.73	2.66	2.83	-3.44	2.65	3.66	1.82
BUL	3.54	1.70	-2.40	0.00	0.54	2.15	-3.83	-1.17	1.55	2.46	2.37	2.22	-2.16	1.55	-3.28	-1.76
CRO	3.27	-2.04	-2.14	-0.54	0.00	2.12	-3.67	-0.91	1.12	-2.06	2.34	2.03	-2.49	-1.21	-2.90	-1.30
EST	2.86	-2.46	-2.17	-2.15	-2.12	0.00	-3.47	-2.14	-3.01	-3.17	-0.61	-1.46	-2.91	-3.16	-3.05	-2.85
JAM	4.23	4.35	-3.04	3.83	3.67	3.47	0.00	-2.81	3.91	2.79	3.92	4.16	-3.22	4.47	-3.81	-3.49
JOR	3.38	2.47	-2.04	1.17	0.91	2.14	2.81	0.00	1.35	1.65	2.45	2.25	-2.16	1.83	-2.61	-1.34
KUW	3.66	-3.03	-2.63	-1.55	-1.12	3.01	-3.91	-1.35	0.00	-1.79	3.16	2.53	-3.23	-0.79	-2.64	-0.96
LEB	2.89	3.29	-1.73	-2.46	2.06	3.17	-2.79	-1.65	1.79	0.00	3.56	3.28	-3.46	-2.14	-3.18	-1.02
LITH	3.21	-2.84	-2.66	-2.37	-2.34	0.61	-3.92	-2.45	-3.16	-3.56	0.00	-1.11	-3.24	-3.30	-2.90	-3.14
OMAN	3.37	-3.23	-2.83	-2.22	-2.03	1.46	-4.16	-2.25	-2.53	-3.28	1.11	0.00	-3.57	-2.71	-2.10	-2.71
PAK	4.82	2.51	3.44	2.16	2.49	2.91	3.22	2.16	3.23	3.46	3.24	3.57	0.00	3.52	4.23	3.34
ROM	3.51	2.76	-2.65	-1.55	1.21	3.16	-4.47	-1.83	0.79	2.14	3.30	2.71	-3.52	0.00	-3.24	-1.15
SRI	4.38	4.72	-3.66	3.28	2.90	3.05	3.81	2.61	2.64	3.18	2.90	2.10	-4.23	3.24	0.00	-2.96
TUN	2.87	2.81	-1.82	1.76	1.30	2.85	3.49	1.34	0.96	1.02	3.14	2.71	-3.34	1.15	2.96	0.00

Hofstede (2001) cultural dimensions of PDI, COL, MAS, UAI are taken with weights through HDI of the country and calculated Mahalanobis Cultural Distance of 16 countries.

4.5 Cross-Sectional and Panel Descriptive Statistics:

In Literature, there are both ways of finding determinants of integration. Balli, Balli, Louis, and Vo (2015) uses Cross-Sectional analysis, on the other hand, Mobarek, Mollah, Muradoglu, and Hou, (2016) and Outlook, (2013) use panel data regression to explore the analysis, this study uses both methods.

Table 4.10: Cross sectional Descriptive Statistics

	Mean	Median	Max	Min	Std. Dev.	Skew	Kurt	Obs.
SPILL VT	1.62	0.54	25.87	0.02	3.53	4.49	24.79	239
SPILL RT	1.16	0.47	18.37	0.00	2.57	4.90	28.78	239
CD	0.01	0.54	4.82	-4.82	2.83	-0.01	1.38	239
LANG	0.09	0.00	1.00	0.00	0.29	2.82	8.97	239
LEG ORG	0.28	0.00	1.00	0.00	0.45	0.96	1.91	239
REL	0.41	0.00	1.00	0.00	0.49	0.35	1.12	239
BI TRADE	0.01	0.00	0.25	0.00	0.03	6.01	43.73	239
CA OPN	0.00	0.00	1.00	-1.00	0.51	-0.01	2.39	239
TRD OPN	0.25	0.40	131.49	-131.49	58.60	-0.01	2.44	239
CAP DIFF	-0.04	-0.46	100.87	-100.87	41.09	0.00	3.31	239
DISTW	6290.80	5642.73	16239.72	217.59	4245.82	0.47	2.08	239
TRADING	-0.01	-0.01	196.69	-196.69	69.09	0.00	7.86	239
ECO RISK	0.02	0.00	20.50	-20.50	8.47	-0.01	2.64	239
FIN RISK	0.01	0.00	19.71	-19.71	8.02	0.00	2.52	239
POL RISK	0.03	0.38	28.63	-28.63	10.74	-0.01	2.68	239
SD RAT	0.13	0.00	70.00	-70.00	33.14	-0.01	2.36	239
EXC REG	0.11	0.00	1.00	0.00	0.31	2.51	7.31	239
GDP G	0.00	0.00	5.91	-5.91	2.30	0.00	2.52	239
LIFE EXP	0.00	0.03	14.78	-14.78	5.68	0.00	3.51	239
POP	-0.01	0.00	6.59	-6.59	2.69	0.01	2.84	239
INT	0.10	0.17	70.41	-70.41	29.28	-0.01	2.45	239
LND	0.04	0.46	35.93	-35.93	15.12	-0.01	2.44	239
MOB	0.04	0.66	164.85	-164.85	56.16	0.00	3.10	239

Table 4.10 and 4.11 present the descriptive statistics of cross-sectional and panel Cultural, Financial, Information and Growth Variables. It can be noted that by comparison of the tables that

mean values of Spill Vt and Spill Rt has more variation in panel settings. Spill Rt from 0.00 to 18.37 and Spill Vt from 0.02 to 25.87 in Cross-sectional settings as opposed to Spill Rt 0.183 to 40.924 and Spill Vt from 0.016 to 45.707.

On the other hand Cultural Distance Range from -4.82 to +4.82 in a cross-sectional setting in comparison with -4.980 to +4.980.

Table 4.11: Panel Descriptive Statistics

	Mean	Median	Max	Min	Std. Dev.	Skew	Kurt	Obs.
SPILL VT	2.040	1.194	45.707	0.016	3.247	6.128	58.289	960
SPILL RT	4.375	3.239	40.924	0.183	3.985	3.200	19.294	960
CD	0.002	0.000	4.980	-4.980	2.855	0.000	1.377	960
LANG	0.092	0.000	1.000	0.000	0.289	2.830	9.010	960
LEG ORG	0.283	0.000	1.000	0.000	0.451	0.962	1.925	960
REL	0.413	0.000	1.000	0.000	0.493	0.355	1.126	960
BI TRADE	0.008	0.000	0.375	0.000	0.033	6.932	58.221	960
CA OPN	0.000	0.000	1.000	-1.000	0.467	0.000	2.410	960
TRD OPN	0.000	0.000	136.465	-136.465	51.224	0.000	2.709	960
CAP DIFF	0.0	0.0	216.8	-216.8	59.8	0.0	4.8	960
DISTW	6274.6	5536.1	16239.7	217.6	4237.8	0.5	2.1	960
TRADING	0.000	0.000	235.067	-235.067	75.923	0.000	6.338	960
ECO RISK	-0.009	0.000	22.528	-22.528	8.481	0.002	2.662	960
FIN RISK	0.000	0.000	23.542	-23.542	8.202	0.000	2.717	960
POL RISK	0.000	0.000	32.379	-32.379	11.356	0.000	2.756	960
SD RAT	0.000	0.000	70.000	-70.000	31.736	0.000	2.349	960
EX REG	0.108	0.000	1.000	0.000	0.311	2.520	7.352	960
GDP G	0.000	0.000	19.989	-19.989	4.431	0.000	4.468	960
LIFE EX	0.000	0.000	26.512	-26.512	6.856	0.000	5.677	960
POP	0.000	0.000	10.917	-10.917	2.969	0.000	3.784	960
INT	0.000	0.000	71.120	-71.120	27.865	0.000	2.805	960
LND	0.000	0.000	59.804	-59.804	18.842	0.000	3.082	960
MOB	0.000	0.000	164.847	-164.847	46.648	0.000	3.054	960

Fig 4.5 shows the trend of Spill Rt, Spill Vt and Cultural distance at four points in time in Panel data. As expected spillover in volatility is vibrant with extreme changes as compared to spillover

in RT which is a measure of financial integration and growth. On the other hand, Cultural distance is moving slowly is a very narrow band of ratios.

Figure 4.5: Behavior of Spillovers and Cultural Distance
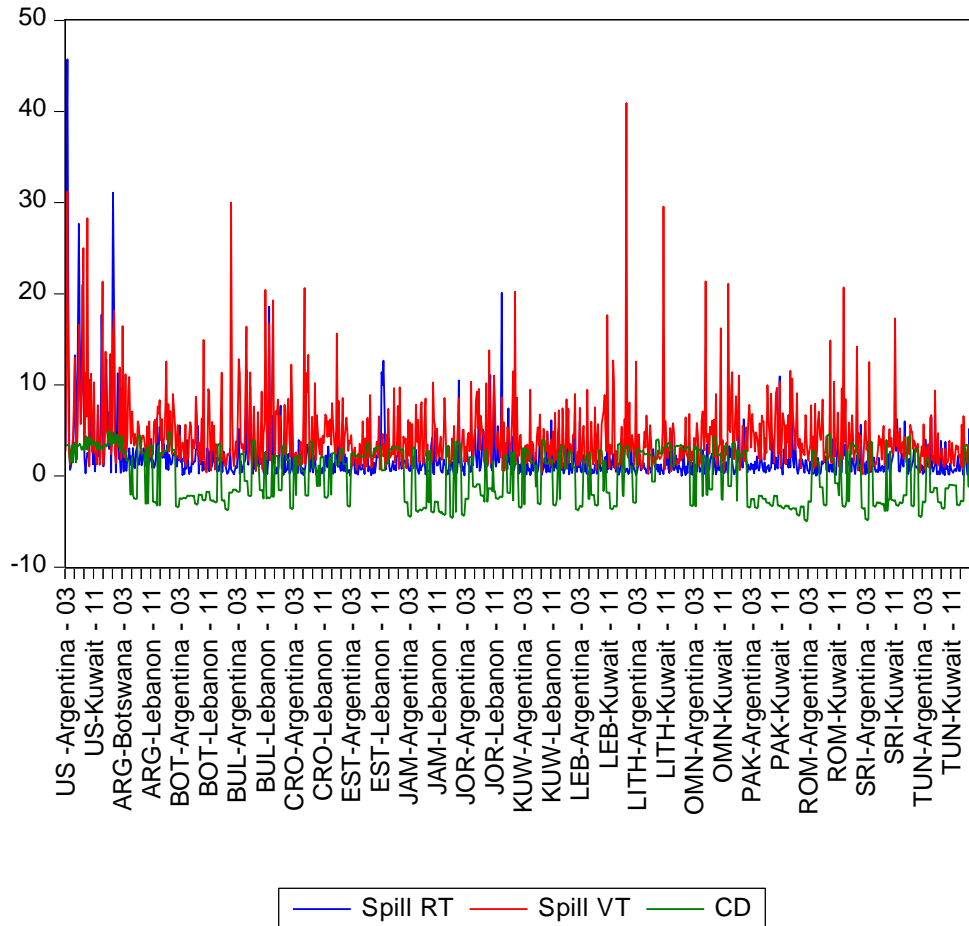
4.6 Unconditional Correlations:

In table 12 it can be seen that the Unconditional Correlations between the variables, there is not much difference in significance levels of the variables, but clearly there is difference of coefficient of Correlation, especially with respect to integrating variable of Spill Rt and Spill Vt that goes with

Table 4.12: cross-sectional correlation

	SPILL RT	SPILL VT	CD	ECO RISK	FIN RISK	POL RISK	GDP G	POP	LIFE EX	INT	LND	MOB	SD RAT	TRD OPN	TRADING
SPILL VT	0.76***	1.00													
CD	0.13**	0.17***	1.00												
ECO RISK	0.03	0.08	0.41***	1.00											
FIN RISK	-0.04	-0.02	-0.07	0.55***	1.00										
POL RISK	0.24***	0.24***	0.48***	0.50**	0.08	1.00									
GDP G	-0.01	0.06	-0.01	0.10	0.21***	-0.22***	1.00								
POP	0.02	0.09	-0.03	0.42***	0.61***	-0.05	0.25***	1.00							
LIFE EX	0.05	0.08	0.57***	-0.01	-0.38***	0.08	0.09	-0.02	1.00						
INT	0.01	0.05	0.75***	0.45***	-0.07	0.32***	-0.15**	0.09	0.77***	1.00					
LND	0.13**	0.12*	0.63***	0.14**	-0.48***	0.39***	-0.13	-0.4***	0.65***	0.66***	1.00				
MOB	0.01	-0.03	0.22***	0.67***	0.65***	0.36***	-0.23***	0.3***	-0.06	0.36***	-0.13**	1.00			
SD RAT	0.19***	0.18***	0.53***	0.66***	0.17***	0.65***	-0.18***	-0.06	0.05	0.46***	0.38***	0.54***	1.00		
TRD OPN	-0.20***	-0.17***	0.23***	0.25***	0.05	0.06	-0.34***	-0.04	0.15**	0.42***	0.07***	0.31***	0.30***	1.00	
TRADING	0.46***	0.40***	0.43***	0.14**	-0.15**	0.59***	0.03	-0.03	0.28***	0.23***	0.48***	-0.04	0.52***	-0.40***	1.00
CA OPEN	0.13**	0.12*	0.37***	0.26***	0.13**	0.54***	-0.12***	0.03	0.19***	0.36***	0.26***	0.30***	0.56***	0.55***	0.24***

* sig at 0.05
** sig at 0.01
***sig at 0.00

The idea that integration is not static and changing with time. (Bekaert & Harvey, 1995; Abid, Kaabia, & Guesmi, 2014b). Even the relationship in between return and Volatility Spillover is reduced in dynamic settings.

Table 4.12 shows the significant relationship of Cultural Distance, Political Risk, and the difference in Landlines, Difference in Sovereign Debt ratings, capital account openness, and trade openness and trading as a percentage of GDP, trade openness has the only negative coefficient of correlation. On the other hand Spill, Vt also shows a significant relationship with same variables with the same negative sign of coefficient with trade openness. Dummy Variables are not included for correlation analysis.

Table 4.13 shows Panel Correlation Matrix, with Spill Rt and Vt both having a significant relationship with Cultural Distance, Capital Account Openness, Trade Openness, Political Risk, Capital Difference, and Sovereign debt rating. While Spill Rt has a significant relationship with growth variable of GDP and Information variable of the internet.

Table 4.13: Panel Correlation Matrix

	SPILL RT	SPILL VT	CD	BI TRADE	CAOPEN	CAP DIFF	CD RAT	ECO RISK	FIN RISK	GDP g	INT	MOB	POL RISK	POP	TOPEN
SPILLVT	0.4***	1													
CD	0.11***	0.07**	1												
BI TRADE	-0.03	-0.05	-0.24***	1											
CAOPEN	0.09***	0.09***	0.38***	-0.13***	1										
CAP DIFF	0.26***	0.12***	0.19***	-0.21***	0.34***	1									
SD RAT	0.15***	0.03	0.51***	-0.29***	0.53***	0.34***	1								
ECO RISK	0	-0.01	0.32***	-0.09***	0.23***	0.26***	0.67***	1							
FIN RISK	-0.05	-0.03	-0.14***	0.1***	0.06*	0.14***	0.21***	0.51***	1						
GDP g	-0.07**	-0.05	0.08***	0.1***	-0.07**	-0.04	0.08**	0.22***	0.12***	1					
INT	0.08**	-0.02	0.73***	-0.27***	0.39***	0.23***	0.56***	0.3***	-0.19***	0.02	1				
MOB	-0.07**	-0.07**	0.4***	0	0.39***	0.07**	0.46***	0.45***	0.23***	0.17***	0.49***	1			
POL RISK	0.15***	0.08**	0.45***	-0.24***	0.5***	0.46***	0.68***	0.58***	0.21***	-0.08***	0.42***	0.43***	1		
POP	0	0	-0.12***	0.04	0	0.36***	0.04	0.39***	0.46***	-0.08**	-0.11***	-0.09***	0.01	1	
TOPEN	-0.18***	-0.15***	0.11***	0.2***	0.48***	-0.06**	0.25***	0.19	0.09	0.1	0.23	0.41	0.14	-0.05	1

* sig at 0.05
** sig at 0.01
***sig at 0.00

4.7 Multicollinearity:

Independent variables must not be collinearly related to each other as regression assumption. Multicollinearity is tested through VIF and as rule of thumb, it must not be greater than 10 (Neter Wesserman, & Kutner, 1985). As in table 4.14, all of the VIF values are less than 4 except for economic risk being 5.97 which is acceptable by the definition of Allison, (1999).

Table 4.4.14: VIF for cross-sectional RT and VT

Variable	Coeff	Uncentered	Centered
CD	0.00	2.72	2.72
REL	0.09	1.87	1.09
EX REG	0.22	1.17	1.04
ECO RISK	0.00	5.97	5.97
POL RISK	0.00	3.09	3.09
INT	0.00	2.74	2.74
POP	0.00	3.16	3.16
SD RAT	0.00	3.65	3.65
FIN RISK	0.00	2.40	2.40
LEG ORG	0.10	1.49	1.06
CAP DIFF	0.00	2.63	2.63
C	0.04	1.92	

4.8 Cultural Variables, Cultural Distance, and Geographic Proximity:

To shrink the number of regressors in OLS, this study follows the method of Bekaert et al. (2011), Bekaert, Ehrmann, Fratzscher, and Mehl (2014) and Lehkonen, (2015). Their general to specific technique takes into account the variables that are preeminent in explaining financial integration. The results presented are the final models arrived after excluding the non-impacting insignificant

variables. In cross sectional setting Language, Mobile usage, GDP   growth and Turnover difference are excluded from the model.

Table 4.15 presents the cross-sectional as well as the panel estimation of spillover of returns as the dependent variable. Both estimations are having Significant F-statistics that represents the goodness of fit of the model with p-value less than 0.05. Moreover, R-Square and Adjusted R-Square of static cross-sectional analysis are far more by 0.302 and 0.262 reactively as compared to 0.178 and 0.163 in case of panel data analysis.

Cultural distance is having positive coefficient with 95% and 99% confidence level significance in cross-sectional and Panels analysis respectively. Our results about the cultural distance are in line with our hypothesis in both models, as positive signs in CD measure represents high proximity and negative signs are culturally distant country flow. There is a direct and significant relationship between cultural distance and Returns spillover, such that culturally proximate countries in the context of Hofstede (2001) cultural dimensions have higher spillovers of returns. Spillover in returns is considered as higher integration and growth. It can be related to the explanation of Boyacigiller (1990) who takes cultural distance as transaction costs. Recently Singh, Li, and Roca (2017) by using Kogut and Singh (1988) measure of Cultural distance proved the significant relationship between CD and stock market correlation. Aggarwal, Kearney, and Lucey (2012) and Lucey and Zhang (2010) also proved the significant relationship. In this line of argument cultural distance acts as the cost of asymmetry in information, familiarity bias and transactional cost, such that it impedes the market integration process. This study uses an aggregate measure of distance

in cultures, it would be more interesting to look into Hofstede (2001) Globe Project's individual dimension differences in the context of spillovers.

On the other hand, Geology or physical distance in case of Frontier markets are highly insignificant with coefficient almost zero. This result is very different from previous literature in emerging and developed markets where geographic distance was not only significantly affecting stock returns co-movement but also have negative coefficients (Flavin, Hurley, & Rousseau 2002; Zhu & Yang 2010; Lucey & Zhang 2010; Mobarek, Muradoglu, & Mollah,2014; Balli, Balli, Louis, & Vo, 2015b). This result is just included for reporting purpose; as this study hypothesize geographic distance in the framework.

Three more dimensions of culture, namely Religion, legal origin and language are taken into account and in case of returns. Common language is totally insignificant and omitted variable in cross-sectional analysis, on the other hand, it's inversely related to returns spillover. It is concluded that having the same language has no relationship with market trends, moreover, there are only four cases of a common language in frontier markets. These results are uninterpretable. The results are in contrast with Bracker, Docking, and Koch (1999) and Goetzmann, Li, and Rouwenhorst (2005) who contents that same language is fundamental to cross country co-movements.

Religion is found highly significant in both cross-sectional and panel setting with P-value less than 0.01 and positive coefficient. These results are in line with a study on the emerging markets by Lucey and Zhang, (2009), where having shared religion positively impact co-movement of equity

markets even if these markets are thinly traded. Later on, there are evidence of the same relationship by Mobarek et al. (2016) and Singh et al. (2017). These results indicate that religion as an aspect of culture makes belief system and instil systematic biases in the collective behavior of markets.

Legal origin is significant in the context of cross-sectional OLS regression and insignificant in a longitudinal panel setting. The world is changing for frontier markets with the horizon broader than legal origin, there is a negative relationship between the two against the results of Lehkonen, (2015).

Turning to Control variables, Exchange regime is highly significant at a p-value less than 0.01 is both models with a positive coefficient, which relies on the argument with floating rate regimes, if countries have common exchange regimes, shocks in one market are more likely to spread to others (Narayan, Sriananthakumar, & Islam, 2014; Rothonis et al., 2016a). From three risk measures of ICRG data, the financial risk is showing a significant negative relationship with returns spillover in line with Imbs (2006) show that financial structures and integration are positively related, such that with fewer differences in financial risk, there will be more spillovers in cross-sectional settings. On the other hand in panel data settings economic and political risk are significant at 5 and 10-percent levels. Economic risk differential is negatively related to return spillover and political risk differential is positively related to spillovers in a long period of times. Information variables of Internet significant in both settings and mobile is significant in only panel data settings such that when there is a greater informational differential between the nations there is less spillover in returns. Whereas growth variables of population and GDP are insignificant in

both settings. Sovereign debt rating has highly significant coefficient with p-value less than 0.01, such that the gap in credit quality is enhancing the spillovers. Bilateral trade flow is impacting the spillover positive and significantly, as with high bilateral flow, the transmission of returns shocks also increase. Walti (2011) along with Chin and Forbes (2004) maintain a positive relationship between equity spillovers and bilateral trade linkages. This results in the argument of economic linkages, causing financial linkages. Capitalization difference and the turnover difference shows a highly significant relationship with p-values less than 0.01 with returns spillover. Countries accept shocks from other frontier markets and the US when there is a larger disparity in size of the market and turnover in financial markets (Levine & Zervos, 1998; Lehkonen, 2015).

Table 4.15: Impact of Cultural Distance and Geology on spillover of Returns

	Cross-Sectional				Panel			
	Coeff.	Std. Err	t-Stat	Prob.	Coeff.	Std. Err	t-Stat	Prob.
C	0.562	0.303	1.852	0.065	1.510	0.205	7.365	0.000
CD	0.181	0.084	2.159	0.032	0.137	0.051	2.669	0.008
GEOG	0.000	0.000	0.053	0.958	0.000	0.000	0.342	0.732
LANG					-0.696	0.409	-1.701	0.089
LEG ORG	-0.468	0.333	-1.403	0.000	-0.238	0.247	-0.966	0.334
REL	1.061	0.305	3.481	0.001	0.992	0.208	4.778	0.000
EX REG	1.379	0.470	2.936	0.004	0.952	0.319	2.982	0.003
ECO RISK	0.006	0.041	0.154	0.877	-0.081	0.023	-3.567	0.000
FIN RISK	-0.054	0.028	-1.942	0.053	-0.001	0.016	-0.051	0.960
POL RISK	-0.012	0.024	-0.496	0.621	0.026	0.015	1.736	0.083
INT	-0.022	0.008	-2.729	0.007	-0.011	0.006	-1.863	0.063
MOB					-0.006	0.003	-2.031	0.043
POP	0.036	0.095	0.384	0.701	-0.020	0.049	-0.413	0.680
GDP G					-0.003	0.025	-0.119	0.905
SD RAT	0.013	0.008	1.544	0.124	0.021	0.005	3.969	0.000
BI TRADE	17.022	5.950	2.861	0.162	11.721	3.276	3.578	0.000
CAP DIFF	0.027	0.006	4.726	0.005	0.011	0.002	4.772	0.000
TURN DIFF					0.005	0.001	5.014	0.000
R^2	0.302	**Durbin-Watson**		1.628	0.178	**Durbin-Watson**		1.323
Adj. R^2	0.262	**F-statistic**		7.490	0.163	**F-statistic**		12.020
Obs.	239	**Prob.**		0.000	960	**Prob.**		0.000

Table 4.16 presents the results of cross-sectional and independently pool panel analysis in case of Realized volatility Spillovers. With significant F–statistics interestingly, the R-Square and adjusted R-square is 22.9% and 17.7% respectively against 5.5 and 3.8% in panel data sets. The low percentages of R-Square do provide incite that volatility linkages of these markets are changing so rapidly that it is needed to delve more into determinants of spillovers. Looking at the main relationship in the investigation, the findings are in line with the hypothesis that Cultural distance is positively associated with Volatility Spillover such that more culturally proximate countries have high spillover and vice versa. This result is in line with Rothonis et al. (2016), where they incorporated all six dimensions of Hofstede (2011), and in aggregation finds a significant positive relationship. With a coefficient of 0.251 and 0.237 and significance level near to less than 0.05 and 0.01 respectively in cross-sectional and panel data setting respectively Cultural distance do exhibit transactional cost and informational asymmetry and impact the financial linkages (Aggarwal et al., 2012; Lucey & Zhang, 2010).

Other results of Geography, language, and Legal origin are same as in case of returns spillover. Conversely, Religion is insignificant in describing volatility spillovers in Frontier markets in panel settings and is significantly impacting in cross-sectional settings aligned with results of Balli et al. (2015); Lucey and Zhang (2009) and Singh et al. (2017). Financial and Economic risks are not significant in the panel data set that goes with Bordo and Helbling (2004) that financial basics do not have an impact on financial market integration. Moreover, it goes with evidence of the emerging market's financial growth not impacting the integration process by Lehkonen (2015).

Other control variables have expected directions as return spillover except bi-lateral trade has an insignificant impact in case of longitudinal analysis, that opposes that relationship between economic linkages impacts financial linkages.

Table 4.16: Impact of Cultural Distance and Geology on Spillover of Volatility

	Cross-Sectional				Panel			
	Coeff.	Std. Err	t-Stat	Prob.	Coeff.	Std. Err	t-Stat	Prob.
C	0.976	0.445	2.195	0.029	4.580	0.270	16.962	0.000
CD	0.251	0.128	1.966	0.051	0.237	0.068	3.508	0.001
GEOG	0.000	0.000	0.984	0.326	0.000	0.000	-1.346	0.179
LANG	-1.029	0.880	-1.169	0.244	0.121	0.539	0.224	0.823
LEG ORG	-1.124	0.533	-2.110	0.036	-0.274	0.325	-0.845	0.399
REL	1.120	0.448	2.501	0.013	0.374	0.273	1.370	0.171
EX REG	1.075	0.688	1.563	0.120	-0.337	0.420	-0.803	0.422
ECO RISK	-0.039	0.064	-0.609	0.543	-0.029	0.030	-0.961	0.337
FIN RISK	-0.092	0.040	-2.296	0.023	-0.010	0.021	-0.482	0.630
POL RISK	0.046	0.037	1.243	0.215	0.034	0.020	1.718	0.086
INT	-0.026	0.012	-2.085	0.038	-0.025	0.008	-3.170	0.002
MOB					-0.003	0.004	-0.894	0.372
POP	0.300	0.138	2.172	0.031	-0.002	0.065	-0.031	0.976
GDP G	0.146	0.108	1.353	0.178	-0.009	0.033	-0.284	0.776
SD RAT	0.020	0.013	1.609	0.109	-0.001	0.007	-0.092	0.927
BI TRADE	20.692	8.678	2.384	0.018	1.270	4.312	0.295	0.768
CAP DIFF	0.017	0.008	2.000	0.047	0.005	0.003	1.713	0.087
TURN DIFF					0.004	0.001	3.162	0.002
R²	0.229	**Durbin-Watson**		1.828	0.055	**Durbin-Watson**		1.926
Adj. R²	0.177	**F-statistic**		4.413	0.038	**F-statistic**		3.203
Obs.	239	**Prob.**		0.000	960	**Prob.**		0.000

Inference:

This section caters for, objective number three and four, the impact of cultural distance and Geological distance in Frontier Market's Return/Volatility spillover.

Hypothesis 1 is fully supported, Cultural distance has a high significant negative relationship with both returns and volatility spillovers, and such that culturally proximate countries have high spillovers and the culturally distant countries have low spillovers. The coefficients of volatility measures are higher than returns, indicating that Volatility spillover can be more explained by Culture. Other cultural variables have mix results; Language similarity is significant in determining returns spillover in panel settings and Religion is significant in both. In volatility spillover, Religion is explaining spillovers in cross-sectional settings.

Hypothesis 2 about geographic distance is not supported, this result is in line with the very recent study of Blackburn and Cakici (2017) that Frontier markets are segmented within the group and found low correlation regionally.

This can be explained by market integration theory, that these markets are taking more impact of developed markets and other counterparts than their own regional markets.

4.9   Openness and Culture-Spillover Relationship

There are channels or interactions through which Culture can impact the return and volatility linkages. Eun, Wang, & Xiao (2015) maintain that openness and trading are both the channels through which culture operates in the integrated financial markets. A specific measure of equity account openness; ratio of investable capitalization of IFC/S&P in global indices suggested by

Bekaert (1995) is not available for all the frontier markets so capital account openness is taken as measure of Chinn and Ito (2006).

Table 4.17 records the direct and moderated impact of trade-openness and capital account openness on returns spillover in both cross-sectional and panel settings with significant F-statistics. As can be seen that trade openness has a direct relationship with returns spillover, having highly significant negative co-efficient of 0.008 and 0.009 with a p-value less than 0.05 and 0.01 in cross-sectional and panel settings. The negative sign suggests an inverse relationship such that with countries having less difference in openness, there is more stock returns spillover and vice versa. This is in line with Mishra's (2007) notion of increased financial activity in the presence of trade openness. These results also confirm with emerging markets' integration in the presence of amplified openness (Lehkonen, 2015). On the other hand, capital account openness has no direct significant relationship with returns spillover in frontier markets. Frontier markets start liberalizing their capital account in 2007 and for that mostly their FDI that does not bring volatility and another shock in transmission (Jahan & Wang, 2016).

When looking at interaction term our results are in complete coherence with the notion of Cowen (2006), Jones (2006) and Eun at al. (2015) with highly significant coefficientswith P-value less than 0.01in both settings. Culture impacts transmission of returns shocks through openness in trade and capital account. Openness in financial structures leads to decrease the transaction cost and information asymmetry hence increasing financial efficiency, and decreasing spillover level. So, trade openness weakens the cultural distance and returns spillover relationship as indicated by the

negative sign and coefficient differences, such that the relationship would be weaker when there are high differences in trade openness (Eun & Shim, 1989; Rothonis et al., 2016a).

Table 4.17: Impact of Openness on Cultural Distance and Return Spillover relationship

	Cross-Sectional				Panel			
	Coeff.	Std. Err	t-Stat	Prob.	Coeff.	Std. Err	t-Stat	Prob.
C	1.016	0.310	3.280	0.001	1.669	0.213	7.843	0.000
CD	0.137	0.081	1.705	0.090	0.092	0.052	1.771	0.077
TD OPN	-0.008	0.004	-1.918	0.057	-0.009	0.003	-3.453	0.001
CA OPN	0.386	0.499	0.773	0.440	0.261	0.303	0.859	0.391
CD*TOPN	-0.005	0.001	-4.602	0.000	-0.005	0.001	-5.684	0.000
CD*CAOPN	0.411	0.127	3.235	0.001	0.388	0.090	4.318	0.000
GEOG	0.000	0.000	-1.900	0.059	0.000	0.000	-1.266	0.206
LANG	-1.423	0.586	-2.428	0.016	-1.031	0.403	-2.561	0.011
LEG ORG	-0.152	0.350	-0.435	0.664	-0.194	0.241	-0.804	0.421
REL	1.312	0.298	4.397	0.000	1.165	0.206	5.663	0.000
EX REG	1.032	0.463	2.231	0.027	0.566	0.322	1.761	0.079
ECO RISK	0.006	0.045	0.126	0.900	-0.066	0.023	-2.830	0.005
FIN RISK	-0.045	0.027	-1.645	0.101	0.000	0.016	0.019	0.985
POL RISK	-0.017	0.025	-0.692	0.490	0.013	0.015	0.860	0.390
INT	-0.015	0.008	-1.722	0.087	-0.007	0.006	-1.238	0.216
MOB					-0.004	0.003	-1.424	0.155
POP	0.032	0.094	0.340	0.734	-0.034	0.049	-0.702	0.483
GDP G					-0.007	0.025	-0.266	0.790
SD RAT	0.014	0.009	1.512	0.132	0.022	0.006	3.905	0.000
BI TRADE	7.962	6.454	1.234	0.219	5.956	3.611	1.649	0.099
CAP DIFF	0.021	0.006	3.419	0.001	0.010	0.002	4.726	0.000
TURN DIFF					0.003	0.001	2.712	0.007
R^2	0.386	**Durbin-Watson**		1.712	0.221	**Durbin-Watson**		1.385
Adj. R^2	0.336	**F-statistic**		7.695	0.204	**F-statistic**		12.702
Obs.	239	**Prob.**		0.000	960	**Prob.**		0.000

Table 4.18 presents the results of the same phenomenon with volatility spillover, with the significant F-statistic cross-sectional model has good explanatory power in comparison to panel one. In case of volatility spillover, the available variable lacks the power to explain the relatively small amount of integration in Frontier markets as compared to emerging and developed ones.

Possible inclusion of the lagged value of spillover, VIX (Volatility in Chicago Board of Exchange), and local sentiments may improve the R square. It's imperative that modelling volatility spillover is already a challenge with high explanatory power, but in frontier markets, the mix of national, international, economic and cultural differences are not enough to make a good model. Maybe the properties of the source and destination Countries instead of differences can increase the power of R square.

Both trade and Capital account openness has an insignificant direct relationship with volatility spillover in cross-sectional settings. Whereas there is a direct significant relationship with p-values as low as 0.000. Trade openness had negative coefficient suggesting the countries having less difference in trade openness are more integrated.

On the other hand, the capital account openness has a positive sign indicating that with high differences in capital account openness in markets, there is a high level of spillover within markets conflicting to the argument of Umutlu, Akdeniz, and Altay-Salih's (2010) results that with more capital account openness in medium and small markets, the difference in liberalization brings accuracy of public information and decrease volatility spillover. While considering liberalization as a channel, it can be seen that cross-sectional analysis does show a significant relationship, as in returns spillover paradigm, with p-values less than 0.01. Trade openness with negative sign instils the weakening of the cultural spillover relationship as proposed by Eun et al. (2015) and capital account openness, enhancing the culture-spillover relationship, through more investments and as a capital account in these countries has to go a cultural lag to instil common trends and

informational symmetry. Rothonis et al. (2015) also confirm this channel in volatility linkages between 49 financial global markets.

These results are following Bekaert and Harvey (2003) that more capital account liberalization leads to greater market integration. The frontier markets are less integrated so, the direct impact of openness is insignificant and openness operates through Culture. Cultural proximity impacts volatility and returns spillover through market openness. When two countries are culturally proximate to each other openness differences in the capital account enhances the relationship in international context and shocks in one market creates shock in others. That also leads to the conclusion that financial openness instills herding behaviors through Cultural proximity in less developed markets. Guney, Kallinterakis, and Komba (2016) recently found the herding phenomenon in the frontier market of Africa through both volatility stable and crisis periods.

Inference:

These results go with objective five about channels through which culture operates in Returns/Volatility Context and proves openness as moderator.

Hypothesis 3 is supported in case of trade openness in both returns and volatility paradigm, more openness weakens the national cultural effect and negatively impact the Cultural distance and spillover relationship. On the other hand, capital account openness has opposite results, with more openness in the capital account there is a minor amount of enhancement in a cultural-spillover relationship. This can be attributed to market development and maturity level, there is a cultural

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lag[1] in CA openness and its operational efficiency. The markets are information in-efficient and there are opportunities to play smart.

Table 4.18: Impact of openness on Cultural Distance and Volatility Spillover Relationship

	Cross-Sectional				Panel			
	Coeff.	Std. Err	t-Stat	Prob.	Coeff.	Std. Err	t-Stat	Prob.
C	1.586	0.450	3.525	0.001	4.822	0.283	17.029	0.000
CD	0.224	0.123	1.824	0.070	0.159	0.069	2.310	0.021
TD OPN	-0.008	0.007	-1.190	0.235	-0.013	0.004	-3.579	0.000
CA OPN	0.148	0.855	0.173	0.863	1.661	0.404	4.115	0.000
CD*TOPN	-0.008	0.002	-4.812	0.000	-0.003	0.001	-2.928	0.004
CD*CAOPN	0.578	0.185	3.132	0.002	0.073	0.119	0.614	0.539
GEOG	0.000	0.000	-0.544	0.587	0.000	0.000	-2.250	0.025
LANG	-1.729	0.851	-2.031	0.044	-0.096	0.535	-0.179	0.858
LEG ORG	-1.021	0.508	-2.009	0.046	-0.276	0.320	-0.861	0.389
REL	1.351	0.434	3.116	0.002	0.477	0.274	1.743	0.082
EX REG	0.388	0.672	0.578	0.564	-0.722	0.428	-1.688	0.092
ECO RISK	-0.036	0.075	-0.472	0.637	0.015	0.031	0.487	0.626
FIN RISK	-0.077	0.040	-1.931	0.055	-0.010	0.021	-0.496	0.620
POL RISK	0.035	0.043	0.811	0.418	0.009	0.020	0.471	0.638
INT	-0.019	0.013	-1.496	0.136	-0.019	0.008	-2.335	0.020
MOB					-0.004	0.004	-1.024	0.306
POP	0.299	0.139	2.142	0.033	-0.040	0.065	-0.612	0.541
GDP G	0.070	0.125	0.556	0.579	-0.007	0.033	-0.199	0.842
SD RAT	0.021	0.015	1.438	0.152	-0.008	0.007	-1.055	0.292
BI TRADE	5.591	9.400	0.595	0.553	-0.628	4.803	-0.131	0.896
CAP DIFF	0.010	0.009	1.192	0.235	0.003	0.003	1.070	0.285
TURN DIFF					0.003	0.002	1.725	0.085
R^2	0.229	**Durbin-Watson**		1.828	0.085	**Durbin-Watson**		1.974
Adj. R^2	0.177	**F-statistic**		4.413	0.065	**F-statistic**		4.170
Obs.	239	**Prob.**		0.000	960	**Prob.**		0.000

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[1] Cultural lag is a sociological concept defined as *"slowness in the rate of change of one part of a culture in relation to another part, resulting in a maladjustment within society, as from the failure of the nonmaterial culture to keep abreast of developments in the material culture."* That is totally understandable in financial liberalization concept, adaption to openness needs time.

4.10 Trading and Culture-Spillover Relationship:

In terms of trading, there are two competing theories in international financial Integration. Grinblatt and Keloharju (2001) are of the view that markets with more trading or liquid markets are more sophisticated and the impact of behavioral or cultural elements are negligible, thus rendering liquid markets are more efficient. On the other hand, Lucey and Zhang (2009, 2010) keeps that Culture influence market by investing behavior and trading, so the effect of culture can only be seen in active trading markets and it will be a waste to check this relationship in thinly traded markets.

Table 4.19 shows the trading's direct and interactional effect with cultural distance on return spillover. Both the models have significant F statistics and enhanced R-square of 41.1 % and 27.5 % in both models. The direct effect of trading in cross-sectional settings is insignificant, on the other hand, panel analysis maintains a highly significant (P-value less than 0.01) positive impact on Returns Spillover. Looking at moderation, as conjectured culture-return spillover relationship enhances by high differential trading activities proxied by the difference in stock value traded as a percentage of GDP. It's important to note that against the evidence of developed and emerging markets in which liquidity is a major determinant of efficiency in markets here high liquidity within a group does not mean more sophistication in markets but a playfield to instill cultural traits in trading patterns. So we can see in Frontier market cross-sectional and longitudinal analysis proves cultural distance playing through trading and impacting returns spillover in country pairs (Lucey & Zhang, 2009).

Looking at the table 4.20 it can be seen that the interactional impact of trading differences in volatility spillovers. Volatility spillovers models have significant F statistics and cross-sectional R-square is 36.7% and panel model is 9.7%. Trading and its interactions have exactly the same pattern of behavior as in returns spillover, with highly significant positive coefficients with P-Value less than 0.01. Trading has a highly significant positive moderating impact on Culture-Volatility spillover, such that it enhances the relationship.

Table 4.19: Impact of trading on Cultural Distance and return Spillover Relationship

	Cross-Sectional				Panel			
	Coeff.	Std. Err	t-Stat	Prob.	Coeff.	Std. Err	t-Stat	Prob.
C	0.875	0.286	3.056	0.003	1.782	0.195	9.131	0.000
CD	0.156	0.082	1.912	0.057	0.057	0.050	1.148	0.251
TRADING					0.017	0.003	5.856	0.000
CD*TRADING	0.005	0.001	6.195	0.000	0.004	0.000	8.626	0.000
GEOG	0.000	0.000	-2.453	0.015	0.000	0.000	-2.504	0.013
LANG	-1.148	0.563	-2.038	0.043	-0.966	0.386	-2.503	0.013
LEG ORG	0.048	0.343	0.141	0.888	-0.010	0.234	-0.042	0.967
REL	0.982	0.287	3.422	0.001	0.774	0.197	3.939	0.000
EX REG	1.476	0.439	3.359	0.001	0.913	0.300	3.040	0.002
ECO RISK	0.021	0.041	0.506	0.614	-0.053	0.022	-2.469	0.014
FIN RISK	-0.044	0.026	-1.710	0.089	0.009	0.015	0.602	0.547
POL RISK	-0.022	0.023	-0.934	0.351	0.018	0.014	1.285	0.199
INT	-0.021	0.008	-2.667	0.008	-0.015	0.006	-2.712	0.007
MOB					0.001	0.003	0.429	0.668
POP	0.012	0.088	0.136	0.892	-0.009	0.046	-0.202	0.840
GDP G	-0.015	0.069	-0.211	0.833	0.010	0.024	0.439	0.660
SD RAT	0.008	0.008	1.007	0.315	0.007	0.005	1.322	0.186
BI TRADE	-6.098	6.729	-0.906	0.366	0.704	3.717	0.189	0.850
CAP DIFF	0.025	0.005	4.647	0.000	-0.001	0.003	-0.464	0.643
TURN DIFF					0.000	0.001	0.363	0.716
R²	0.411	**Durbin-Watson**		1.787	0.275	**Durbin-Watson stat**		1.468
Adj. R²	0.369	**F- statistic**		9.697	0.261	**F-statistic**		18.790
Obs.	239	**Prob.**		0.000	960	**Prob.**		0.000

Inference:

These results go with Objective five about channels through which Culture operates in Returns/Volatility Context and proves active trading Markets as moderator.

Hypothesis 4 is also supported confirming to Lucey and Zhang (2009), the notion of active trading markets with spillover –culture relationship, such that country pairs high in cultural similarity have less spillover levels both in returns and volatility.

Table 4.20: Impact of trading on Cultural Distance and volatility Spillover relationship

	Cross-Sectional				Panel			
	Coeff.	Std. Err	t-Stat	Prob.	Coeff.	Std. Err	t-Stat	Prob.
C	1.360	0.408	3.338	0.001	4.765	0.268	17.772	0.000
CD	0.222	0.116	1.916	0.057	0.167	0.067	2.503	0.013
TRADING					0.016	0.003	4.719	0.000
CD*TRADING	0.008	0.001	6.952	0.000	0.003	0.001	4.231	0.000
GEOG	-1.363	0.801	-1.702	0.090	0.000	0.000	-2.729	0.007
LANG	-0.685	0.488	-1.402	0.162	-0.068	0.530	-0.128	0.898
LEG ORG	0.000	0.000	-1.260	0.209	-0.132	0.322	-0.410	0.682
REL	0.867	0.408	2.125	0.035	0.224	0.270	0.831	0.406
EX REG	1.057	0.625	1.691	0.092	-0.363	0.413	-0.879	0.380
ECO RISK	-0.010	0.058	-0.167	0.868	-0.005	0.028	-0.163	0.870
FIN RISK	-0.077	0.037	-2.105	0.036	-0.002	0.021	-0.083	0.934
POL RISK	0.026	0.033	0.764	0.446	0.028	0.019	1.452	0.147
INT	-0.025	0.011	-2.258	0.025	-0.028	0.008	-3.649	0.000
MOB					0.003	0.004	0.651	0.515
POP	0.257	0.125	2.052	0.041	0.006	0.063	0.102	0.919
GDP G	0.093	0.099	0.947	0.344	0.001	0.032	0.040	0.968
SD RAT	0.011	0.011	1.000	0.319	-0.013	0.007	-1.739	0.082
BI TRADE	-17.067	9.572	-1.783	0.076	-5.131	5.101	-1.006	0.315
CAP DIFF	0.014	0.008	1.886	0.061	-0.006	0.004	-1.466	0.143
TURN DIFF					0.003	0.001	2.712	0.007
R^2	0.367	**Durbin-Watson stat**		2.134	0.091	**Durbin-Watson stat**		1.974
Adj. R^2	0.321	**F-statistic**		8.037	0.074	**F-statistic**		5.234
Obs.	239	**Prob.**		0.000	960	**Prob.**		0.000

4.11 Crises Index:

Ahluwalia (2000) posits the term "discrimination contagion" for emerging markets. In case of fundamentals, the low level of trust of investors in these markets cause their asset classes focused in a different way than the securities from other markets. Taking the fundamental in contagion modeling is imperative, not only in fundamental contagion, but for Pure contagion as well.

Table 4.21 presents the Crisis Index as used in Zhu and Yang (2008) developed by Sachs, Tornell, and Velasco (1997), by a weighted average of effect on the exchange rate and reserve losses during turmoil period. The Crises windows are taken as defined by Lehkonen (2015) and Beirne and Fratzscher (2013) in emerging markets case. It takes into account the two US recession periods in 2001 and 2007-2009, Global financial crises with shorter and longer horizons and the sovereign debt crisis. As in the table with small coefficients, these values are mostly positive indication of crisis do impact frontier markets in times of High Volatility.

Table 4. 21: Crises index

	3/2001-11/2001 US Ress 1	12/2007-6/ 2009. US Ress 2	8/2007–6/2009 GFC long	9/2008–6/2009. GFC short	9/2008-9/2011 Sov. Debt
Argentina	-0.044	0.010	0.009	0.021	0.009
Botswana	0.005	-0.007	-0.004	-0.008	-0.001
Bulgaria	0.006	0.003	0.002	0.001	0.002
Croatia	0.010	0.002	0.000	0.003	0.004
Estonia	0.005	0.004	0.000	0.005	0.001
Jamaica	0.004	0.012	0.011	0.019	0.005
Jordan	0.000	0.015	0.015	0.000	0.000
Kuwait	0.000	0.003	0.001	0.007	0.001
Lebanon	0.000	0.034	0.026	0.031	0.017
Lithuania	0.023	0.002	0.000	0.004	0.003
Oman	0.022	0.012	0.024	0.010	0.008
Pakistan	0.003	0.015	0.013	0.010	0.005
Romania	0.018	0.010	0.012	0.014	0.008
Sri Lanka	0.022	0.002	0.001	0.006	0.001
Tunisia	0.006	0.006	0.002	0.009	0.005
United States	0.006	0.009	0.011	0.015	0.026

Sri Lanka (0.022) , Lithuania(0.023) and Oman (0.022) are the countries that suffered most in the group by US-Recession period one, Lebanon (0.034), Jordan (0.015), Jamaica (0.012) and Pakistan(0.015) in case of US recession period two, Lebanon (0.026) and Oman (0.024) in Global Financial crises with large window, Lebanon (0.031) Argentina (0.021) and Jamaica(19) in case of the shorter horizon, and Lebanon (0.017) and US (0.026) in the event of Sovereign Debt Crises.

4.12 The contagion of Crises:

This study takes the next level of analysis for crises, if crises are hitting national markets, is that impacting the spillovers in case of both Returns and Volatility. Crises variable is constructed not by the difference or bi-literalism, but in country pairs, the value of source country from crisis index is taken into account. Claessens, Tong, and Zuccardi (2012) elucidates that contagion of crises is

through financial Linkages. Didier, Love, and Peria (2012) found that there is a little linkage of economic fundamentals in Global Financial crises period.

In table 4.22 with significant F-statistics and interpretable R squares, the effect of the crisis is taken on returns Spillover. US Recession period two and Global financial crisis for long period are insignificant so are not taken for model fitness. Three non-overlapping crises have a high significant impact in independently polled panels. Panel regression analysis is more appropriate to explain as it matches the period of crises with respect to spillover and crisis index. While in case of US recession period and Global Financial Crises, this impact is negative, that means that when the crisis hit one country the spillovers in returns are decoupled or come to a low level, which renders that Frontier markets are heavens of investments in case of crisis.

On the other hand, there is evidence of crisis impacting positively on returns linkages in European Sovereign debt crisis. The sovereign debt crisis was debt crisis and there is evidence of market linkage tightening after the crisis. So the answer is not straightforward, the nature of crisis matters in case of contagion.

These mix results in contagion are in line with Calvo and Mendoza (2000) and Bekaert and Harvey (2003) that crisis has an impact on financial markets, but in both ways, it can create high linkages as well as decoupling. These results further need to be confirmed by taking only crisis windows. Maybe it is pointing towards spillover in Frontier markets are more sensitive to money supply crisis, this only happened after 2007 when these markets liberalized their capital accounts

Table 4.19: Contagion of Crises in Returns Spillover

	Coeff.	Std. Err	t-Stat	Prob.	
			Panel		
C	1.520	0.200	7.588	0.000	
CD	0.079	0.049	1.612	0.107	
US REC	-24.452	12.475	-1.960	0.050	
GFC S	-167.894	28.830	-5.824	0.000	
SOV DC	396.437	40.894	9.694	0.000	
GEOG	0.000	0.000	-0.479	0.632	
LANG	-0.757	0.387	-1.955	0.051	
LEG ORG	-0.181	0.233	-0.775	0.438	
REL	0.900	0.196	4.587	0.000	
EX REG	0.949	0.302	3.146	0.002	
ECO RISK	-0.053	0.022	-2.425	0.016	
FIN RISK	0.007	0.016	0.441	0.660	
POL RISK	0.010	0.014	0.721	0.471	
INT	-0.008	0.006	-1.465	0.143	
MOB	-0.004	0.003	-1.491	0.136	
POP	-0.066	0.047	-1.408	0.160	
GDP G	0.001	0.024	0.030	0.976	
SD RAT	0.015	0.005	2.854	0.004	
BI TRADE	8.897	3.115	2.856	0.004	
CAP DIFF	0.011	0.002	5.359	0.000	
TURN DIFF	0.003	0.001	3.069	0.002	
R^2	0.270	**Durbin-Watson**			1.339
Adj. R^2	0.255	**F-statistic**			17.371
Obs.	960	**Prob.**			0.000

Crises in volatility spillovers behave same as in case of returns spillover with significant F statistics and good R square. Both the recession periods and Global financial crises have a negative impact with a significance level of 10% and 1% respectively. This negative association can be attributed to portfolio rebalancing towards developed and stable markets in case of crisis, on the other hand, the sovereign debt crisis has the positive significant impact with high P-value of 0.000, that indicates that volatility spillover in these markets is subject to the herding phenomenon, which leads to the argument of Calvo and Mendoza (2000) that crisis in one country cause investors to

form a herd in rebalancing their portfolios, investors in one market start selling cause selling patterns in other markets in the same characteristics countries due to lack of trust, which leads to increased volatility spillovers.

Inference:

These results deal with the last objective by first simply adding contagion in Returns/Volatility Spillover context, it is proved that in selective crisis situations, spillovers behave differently.

Hypothesis five is supported by evidence of the significant relationship of national crisis index measurement in the event of international notable crisis effecting return/volatility spillover. While US recession period and Global financial crises decoupled the markets and the sovereign debt crisis significantly increased spillover levels.

Table 4.20: Contagion of Crises in Volatility Spillover

	Panel			
	Coeff.	**Std. Err**	**t-Stat**	**Prob.**
C	4.680	0.277	16.915	0.000
CD	0.204	0.068	3.018	0.003
US REC	-29.597	17.228	-1.718	0.086
GFC S	-125.764	39.815	-3.159	0.002
SOV DC	235.313	56.477	4.167	0.000
GEOG	0.000	0.000	-1.744	0.082
LANG	0.109	0.535	0.204	0.839
LEG ORG	-0.248	0.322	-0.770	0.441
REL	0.307	0.271	1.132	0.258
EX REG	-0.342	0.417	-0.821	0.412
ECO RISK	-0.011	0.030	-0.376	0.707
FIN RISK	-0.001	0.022	-0.029	0.977
POL RISK	0.025	0.020	1.273	0.204
INT	-0.022	0.008	-2.709	0.007
MOB	-0.003	0.004	-0.819	0.413
POP	-0.032	0.065	-0.497	0.619
GDP G	-0.013	0.033	-0.386	0.700
SD RAT	-0.005	0.007	-0.733	0.464
BI TRADE	-0.316	4.302	-0.073	0.942
CAP DIFF	0.005	0.003	1.784	0.075
TURN DIFF	0.003	0.001	2.179	0.030
R^2	0.076	**Durbin-Watson**		1.989
Adj. R^2	0.056	**F-statistic**		3.850
Obs.	960	**Prob.**		0.000

4.13 The Contagion of the Crisis through Culture:

The similarity in risk-related behaviors causes in market co-movements and linkages (Gray et al., 2013). Countries with less cultural distance have same risk tolerance levels and have strong financial linkages as explained by Lucey and Zhang (2010). Combining these two arguments with a crisis situation, the psychological state of investors converge and the culture-spillover relationship must enhance in the periods of crisis due to herding phenomenon.

As can be seen in Table no. 4.23 that the only significant interactive term is with Sovereign Debt crises at 10% significant level. The positive sign can be interpreted as culture and returns spillover relationship enhances in case of a crisis situation. Such that when countries are culturally proximate and one country is hit by the crisis, the other country gets the heat and the spillover between the countries increases. This indicates that Sovereign Debt crises become contagious through Cultural ties in Frontier markets. These results are in line with Singh et al. (2017) who presents the same results in case of religious similarity and similar language.

Masson (1999) reported an increase in levels of market negative sentiments in turmoil periods and Kaminsky and Schmukler (1999) indicated that it leads to higher volatility and more risk. According to Singh et al. (2017) assessing mostly developed and emerging markets, culture plays its role more in turbulent periods than in stable times. Culture is not a significant variable to determine stock market co-movements. The results are conflicting in the volatility spillover paradigm of frontier markets in this study.

Table 4.21: Contagion of Crises through Culture in Returns spillover

		Panel		
	Coeff.	**Std. Err**	**t-Stat**	**Prob.**
C	1.557	0.201	7.729	0.000
CD	0.079	0.052	1.534	0.125
US REC	-24.744	12.710	-1.947	0.052
GFC S	-127.449	37.594	-3.390	0.001
SOV DC	301.048	68.081	4.422	0.000
CD*USREC	0.318	3.992	0.080	0.937
CD*GFCS	-16.618	10.590	-1.569	0.117
CD*SOVDC	35.237	19.321	1.824	0.069
GEOG	0.000	0.000	-0.663	0.507
LANG	-0.784	0.388	-2.023	0.043
LEG ORG	-0.152	0.233	-0.652	0.515
REL	0.901	0.196	4.588	0.000
EX REG	0.940	0.302	3.113	0.002
ECO RISK	-0.050	0.022	-2.267	0.024
FIN RISK	0.005	0.016	0.316	0.752
POL RISK	0.006	0.014	0.439	0.660
INT	-0.009	0.006	-1.556	0.120
MOB	-0.004	0.003	-1.372	0.170
POP	-0.060	0.047	-1.262	0.207
GDP G	-0.004	0.024	-0.172	0.864
SD RAT	0.015	0.005	2.884	0.004
BI TRADE	8.203	3.142	2.610	0.009
CAP DIFF	0.011	0.002	5.314	0.000
TURN DIFF	0.003	0.001	2.804	0.005
R^2	0.273	**Durbin-Watson**		1.348
Adj. R^2	0.255	**F-statistic**		15.256
Obs.	960	**Prob.**		0.000

Table 4.24 shows the results of moderation of crisis in a relationship with culture and there is no significant relationship between the interactive term of all three crisis index on volatility spillover. These results suggest that in the events of high volatility, the culture does not impact on the level of spillovers in Frontier markets.

Table 4. 22: Contagion of Crises through Culture in Volatility

	Coeff.	Std. Err	t-Stat	Prob.
	Panel			
C	4.716	0.278	16.946	0.000
CD	0.218	0.071	3.057	0.002
US REC	-29.513	17.558	-1.681	0.093
GFC S	-87.280	51.936	-1.681	0.093
SOV DC	138.304	94.054	1.470	0.142
CD*USREC	-0.035	5.515	-0.006	0.995
CD*GFCS	-23.803	14.631	-1.627	0.104
CD*SOVDC	40.540	26.691	1.519	0.129
GEOG	0.000	0.000	-1.856	0.064
LANG	0.076	0.535	0.143	0.887
LEG ORG	-0.210	0.322	-0.650	0.516
REL	0.306	0.271	1.129	0.259
EX REG	-0.344	0.417	-0.824	0.410
ECO RISK	-0.006	0.030	-0.199	0.843
FIN RISK	-0.003	0.022	-0.141	0.888
POL RISK	0.020	0.020	1.003	0.316
INT	-0.023	0.008	-2.827	0.005
MOB	-0.003	0.004	-0.681	0.496
POP	-0.026	0.065	-0.405	0.686
GDP G	-0.018	0.033	-0.522	0.602
SD RAT	-0.005	0.007	-0.741	0.459
BI TRADE	-1.186	4.341	-0.273	0.785
CAP DIFF	0.005	0.003	1.736	0.083
TURN DIFF	0.003	0.001	2.015	0.044
R^2	0.078	**Durbin-Watson**		1.984
Adj. R^2	0.056	**F-statistic**		3.465
Obs.	960	**Prob.**		0.000

Inference:

These results directly tackle the sixth objective by taking culture in contagion and spillover paradigm of return/Volatility spillover.

Hypothesis 6 is partially supported as the contagion of culture is only proved in case of volatility spillover through the turmoil period of the sovereign debt crisis. The results are conflicting in volatility spillover paradigm of frontier markets in this study, culture is not a channel for spreading of crises. The area of Culture impacting the contagion of crisis is new, on the other hand, frontier markets also have less literature base in terms of international and national financial linkages. It's imperative to see contagion through culture with developed and emerging markets as well.

Chapter 5

5. Conclusion

With the advent of globalization and advances in technology coupled with increasing financial Liberalization, financial markets are becoming more integrated and the financial linkage between the markets is of fundamental significance as it is related to systematic risk with implications for both stable and crisis situations (Hartmann et al. 2004). According to Pretorius (2002) studies in Stock market spillovers can be distributed in three levels. First, the ones are those that explore the levels of integration in different markets, second are those which seek to find the static or dynamic nature of integration and the third and the most fruitful level is to find what drives stock market interdependence. This thesis covers all these three levels to add to both academic and practical world in the context of Frontier Markets defined by MSCI. Adding Cultural distances in the integration paradigm makes this study unique and contributing to extant literature, including crisis periods and contagion of crises through cultural ties as new avenues of research.

As integration is related to systemic risk and rewards in the markets, it is connected to both weak and semi-strong form efficiency. Little or no evidence is found on return and volatility Spillover of Frontier markets let alone the very new emerging area of cultural Finance. Therefore this study puts a unique effort to develop return and Volatility Spillover indices, their dependency on the cultural distance, the paths through which culture impacts and the specification of contagion in Frontier markets. The inclusive aim of such study is to take the maximum benefits of international financial integration while taking care of potential problems (Thapa & Poshakwale, 2012).

This study takes the US and fifteen frontier markets out of 32 from all five regions defined by MSCI 2015, based on their data availability from January 2000 to December 2015 for sixteen years. This study uses the Diebold and Yilmaz's (2009) measure of financial integration which uses the decomposition of Variances in vector autoregressive models, on weekly data of returns and realized volatility to arrive at the static and dynamic return and volatility indices. At the second layer of analysis, the static indices are used in cross-sectional country pair financial gravity model to know the determinants of return and volatility spillovers followed by Balli, Balli, Jean Louis, and Vo (2015). With the addition of Weighted Mahalanobis, the asymmetrical cultural distance measure of Yeganeh (2014) by taking four dimensions of culture from Hofstede, (2001), in the cross-sectional determinant model this study takes the next step by examining the relationships in independently pooled panel data paradigm. By taking bi-lateral returns and volatility spillovers with four sub-sample periods of 2000-2003, 2004-2007, 2008-2011, 2012-2015 of four years each, the study incorporates dynamism in the integration of not only interdependence in financial markets, but also in cultural variables. Moreover, in both cross-sectional and panel data set, this study investigates the channels through which Culture operates, motivated by the work of Lucey & Zhang (2010), Eun, Wang, & Xiao (2015), and Rothonis, Tran, and Wu, (2016) through introducing moderators in OLS models. Finally, this study also includes the crisis index developed by Sachs, Tornell, and Velasco (1997) and used by Zhu and Yang (2008) to know the contagion of the crisis in frontier markets and if culture is a channel of contagion through simple OLS methodology in panel settings.

The data analysis and discussion bring attention-grabbing comprehensions in case of the theory of efficiency and integration of frontier markets and the role of cultural similarities and differences

in returns and volatility spillovers. Following are the conclusion within the framework of theory and objectives of research:

- The **First Objective** was to find the current levels of Returns and Volatility Spillover. The Markets are partially integrated and spillovers are low as compared to the previous results of the emerging and developed markets. The overall high volatility spillovers against returns give way to behavioral and cultural factors and non-existence of rational models of finance in decision-making (Shiller, 1992). With the time dynamic spillovers show a higher level of spillovers both in Returns and volatility, with volatility spillover taking more crusts and trough in plots. More broadly defined, Frontier markets are becoming increasingly integrated over time (Berger, Pukthuanthong, & Yang, 2011). Moreover, by plotting the spillover series in a line graph, after taking into account the global crisis situation, there is confusion on what type of circumstances cause volatility spillover time series to change its dynamics.

- **Objective 2** was about the impact of the developed market's innovation in returns and volatility in these markets. The US as the representative of the developed markets shows the highest contribution to the shocks in Frontier markets' variance ratios labelled as a contribution to others in both cases.

- **Objective 3** was about the influence of cultural distances on stock market integration. This study found a high significant positive relationship to our cultural distance measure. As high values of CD means proximity and negative values mean distance that supports the notion that culturally distant countries have low levels of spillovers in both returns and volatility. The coefficients of volatility measures are higher than returns, indicating that comparatively Volatility spillover can be more explained by Culture. Other Cultural

variables taken into account were Language and religion, where language was found outright insignificant, religious similarity induces biases and impacts both returns and volatility interdependences. Theoretically, it proves that both weak and Semi-Strong form of efficiency does not hold in frontier markets. The significant impact of cultural distances can be attributed to home bias and investors tracking their segmented markets only and information costs of frontier markets are too high, moreover, openness is a gradual and time taking process. Another reason may be attributed to foreign investors playing with their own cultural values and instilling their culture causes returns and volatility spillover.

- **Objective four** was about Geographical proximity measured by bilateral weighted distance (Fouquin & Hugot, 2016), the related hypothesis was not supported confirming the recent results of Guney, Kallinterakis, and Komba (2016) that frontier markets financial dynamics are not derived from regions. Even these markets are not financially integrated within their regions. Interestingly, on the financial map, the borders of geographic proximities are indistinct and new borders of Cultural proximities are emerging.

- **Objective five** was about the channels through which culture operates in these markets, trade openness is a channel through which relationship between culture and financial linkage weakens in both spillovers, that leads to the theory of liberalization and efficiency as posited by Bekaert, Harvey, & Lundblad (2003). Capital account openness enhances the culture-spillover relationship a little bit which is against the theory but it can be attributed to the sociological concept of cultural lag, as these market will be more mature they will get the dynamics of liberalization in their behaviors and the spillovers will get aligned with market efficiency theory. As theorized by Lucey and Zhang (2010) it is proved that trading is also a channel of cultural impact on both returns and volatility spillover.

- **Objective Six** postulated that a crisis spreads through Cultural proximity, interestingly from the five international scaled crises only Sovereign Debt crises created the relationship between national crisis index and Volatility/return spillovers. According to results only return spillover spread through the channel of culture, not the volatility spillover. The research field of Cultural finance and the especially contagion of the crisis through culture is new, on the other hand, Frontier markets were not affected much by the crisis due to partial integration. To know the cultural proximity act as a channel or not, this relationship must be tested in the country group that is affected heavily by crises

5.1   Relationship with the Literature:

With the dynamic world, the research work is also dynamic, exploring new avenues with changing the landscape of research this is how the body of literature is always extending. This thesis is also one piece of work that is adding to literature, following are the main points to ponder

- This thesis documents a case against EMH. In the frontier market, it shows that one market takes the effect of another market in volatility and returns, but also can model the determinants of such spillovers. This thesis adds that predictability exists in Frontier markets, but is multifaceted, bringing in past information, country dynamics, behavioral, economic and financial factors along with cultural distances. This is in line with the literature on stock market integration and efficiency by Demirer and Karan (2002), Hasanov (2009), Ozer and Ertokatli(2010), Dong et al. (2013) and pointing towards behavioral factors that can cause in-efficiency. The conception of theory Lo (2005) named as Adaptive Markets Hypothesis (AMH) can be validated, that financial markets may differ

in their behavior with change is maturity, market, structures, competition and the investor's Characteristics in relation to the environment.

- This thesis adds to empirical literature about the volatility and returns spillover dynamics in Frontier markets. There is a thin body of literature, giving empirical findings of the interconnectedness of these markets as a group of potential investments. Moreover, the determinants behind the spillovers in these markets are seldom discussed, let alone culture. So, this thesis adds to market integration research, explanatory variable research, and contagion research, social and cultural finance research.

- This thesis adds specifically to the young research field of Cultural finance, the body of knowledge is enhanced starting from Stulz and Williamson (2003) in terms of linkages in returns and volatility and at this point, this is describing culture as a determinant in cross country variations in spillovers. So this study is not only extending the literature to new markets but coupled with new evidence in explanatory variable research, thus bridging the gap between cross-country financial literature with cross-country cultural literature.

- Frontier markets are going through reformative processes and opening their economies, liberalizing capital accounts and changing structures and regulations. This research through taking cross-country evidence on four points in time covered the dynamism in markets.

- This study documents the mechanism through which culture operates. The Culture-spillover relationship is enhanced by more trading and capital account openness conversely trade openness weakens the relationship between Frontier markets. Confirming to Rothonis, Tran, and Wu, (2016) results similarity in cultural backgrounds brings systematic biases in financial interdependence intensifying the returns and volatility linkages.

- This is the first study to use the crisis index of Sachs, Tornell, and Velasco, (1997) as an explanatory variable in contagion research, with Culture as a channel of spreading crisis. This documents evidence in the returns spillover process and points towards the further deepening of examination.

5.2   Practical implications:

- In line with the relevant literature (for example, Miles, 2005; Chen et al., 2014), the results provide evidence that the frontier markets in the sample receive low foreign contributions to their returns and volatility. The results are in line with the literature with respect to the returns in frontier markets, which are greatly dependent on their past returns (for example, Amin and Orlowski, 2014) and have large self-contributions, suggesting that local events are more important in determining their returns and volatility. If these markets are considerably segmented from the developed and emerging markets and from each other, they provide a viable option for diversification to investors. Berger et al. (2011) provide evidence that inclusion of frontier markets in the portfolio enhances returns while limiting risk, which is especially true during a bull period.

- This study gives more weight to Culture as an increasingly important variable not only nationally but cross nationally too. Culture shapes the overall behavior including the financial decision making and that makes patterned decisions in frontier markets' financial linkages. Understanding the cultural dynamics and the channels through which culture operates in returns and volatility spillovers, and extreme events like crises can be beneficial to investors to diversify their portfolios with learned risk and return dynamics.

- Due to scarcity in research and empirically thin literature, investor's perception of risk is extraordinary and hesitate to invest in Frontier markets. So, this research gives investors an '*early-mover advantage'* to diversify their portfolios and take the arbitrage opportunity.

- On the policy level, for deepening of financial integration, this thesis calls the policymakers of frontier markets to further work on financial structures and regulations in the intricacies. To get benefits from financial integration, it is important to develop a defence mechanism against the crisis and appropriate sequencing of capital account openness. This needs ensuring stability in the national economy through comprehensive macroeconomic management known as working on fundamentals, and a vigilant regulatory framework to improve investor confidence, increasing the diversity of products and enhancing allocative efficiency, and sound legal systems and market infrastructure which will encourage domestic as well foreign investors to invest and markets will remain liquid (Hsieh, Chen, Lee, & Yang, 2013).

- The findings on considering the influence of culture when studying cross-country differences in trading activities are adding to both the literature on cross-country differences in stock returns/volatility co-movement/integration/linkages (Fernandes & Ferreira, 2009) and the literature that uses psychological factors to explain this phenomenon (Green & Hwang, 2009). It not only adds to portfolio diversification discussion but gives a new strategy in gravity modelling.

- The geographic proximity results are insignificant to explain spillovers, which means these markets are segmented from each other even regionally, that is beneficial for investors diversifying their portfolios. Investors can diversify by having Frontier markets with other

advanced and emerging markets in portfolios with supplementary diversification within these markets as well.

- The significance of trade openness in enhancing market efficiency in Frontier markets necessitate policy makers to keep this road open with regulatory, institutional and infrastructural reforms.

- The empirical results indicate that, if investors want to reduce their risk by portfolio diversification, they should carefully consider the contagion effect, because an investment strategy relies on the assumption of constant correlation between international markets might not work or lead to terrible performance during turmoil periods. Studies like Samarkoon (2011), Baumöhl and Lyócsa (2014), Chen et al. (2014) also document lower interdependencies between the frontier markets and developed markets during tranquil periods. The study by De Groot et al. (2012) using company level data across several frontier markets suggests that significant excess returns ranging between 5% and 15% can be generated by employing an appropriate value and momentum strategies in frontier markets.

- The crisis in a global market like the Sovereign Debt Crises may propagate to smaller markets, resulting in increased interdependencies between these markets as documented by Samarkoon (2011). Hence, investors may need to adjust their investment and hedging strategies accordingly.

- Investors need to take into account high domestic Returns and volatility and also need to be vigilant about the structural risks that are prevalent in frontier markets. As economic risk, political risk, and financial risk, information and growth differentials, the same *forex* regime, a difference in the average number of trades' scales by total market capitalization

and credit rating differences are significant in spillover paradigm. High transaction costs, and limited depth and breadth of markets may act as impediments in the efficient allocation of resources. Hence, investors need to balance out systemic risk with the country-specific risk and make investment choices accordingly.

5.3   Limitations:

Methodologically this thesis uses two-step analysis by first creating spillover index through Diebold and Yilmaz's, (2009) spillover technique of variance decompositions in VAR and incorporating that in cross-sectional OLS and Independently pooled panel data regressions to find the determinants.

- There is a limitation of using weekly data for realized volatilities instead of intraday data. As most of the Frontier markets lack intraday data, which can provide out of sample predictability and add robustness to results.

- Taking the lag of spillovers in case of both returns and volatility modelling will improve the explanatory power of the overall model. As our model took data on four points, there can be a study with yearly bi-lateral data taking lagged values of spillovers into account.

- A specific measure of equity account openness of the ratio of investable capitalization of IFC/S&P in global indices suggested by Bekaert (1995) is not available for all the frontier markets so this study takes capital account openness measure of Chinn and Ito (2006).

- Findings of this thesis can be generalized to all Frontier markets as the sample size is large enough and spread in all five regions of MSCI. But their comprehensiveness is not verified

to the developed and emerging markets as spillovers are determined by market-specific factors.

- This study uses an aggregate measure of distance in cultures, it would be more interesting to look into Hofstede (2001) Globe Project's individual dimension differences in the context of spillovers.

5.4 Future Research

Future research may include the impact of specific dimensions of cultures defined by Hofstede (2001) on the stock market linkages. It would also be interesting to explore if culture has an impact on real economic integration levels rather than financial. To get robustness in integration segmentation discussion, if the global market and Fama and French factors explain variation in frontier market's national indices can be checked.

In contagion of crises, empirical findings only validate contagion during the Sovereign debt crisis in Frontier, it needs further research on triggering factors, maybe it is pointing towards spillover in Frontier markets are more sensitive to money supply crisis, or this only happened after 2007 when these markets liberalized their capital accounts. On the other hand contagion of Culture postulate should be tested in countries where global crisis spreads well to disintegrate cultural channel of contagion from others. Frontier markets are not a good sample to give insights.

The literature on contagion/cross-market spillovers due to investors' sentiments is extensive and is beyond the scope of this thesis. Future studies can focus on this aspect and examine cross-market spillovers due to investors' reactions during turbulent times.

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6. **Annexure:**

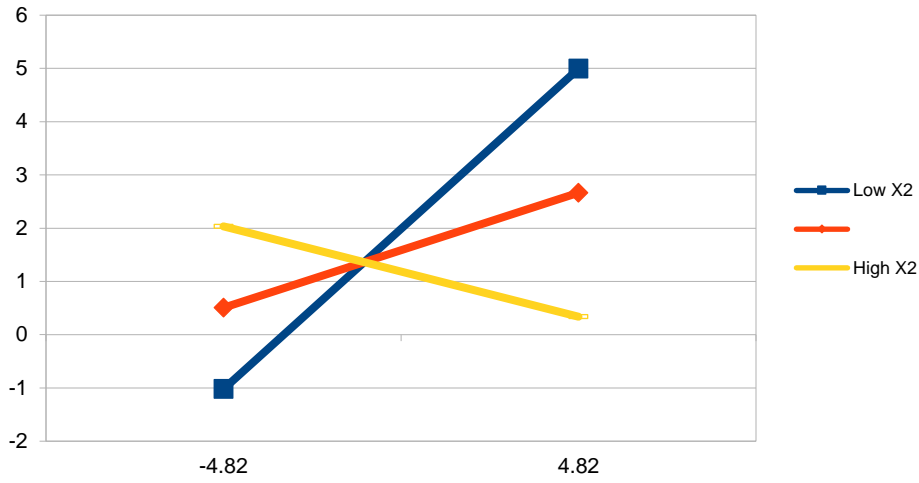*Figure 6.1: Moderation graph of trade account Openness and return spillovers*

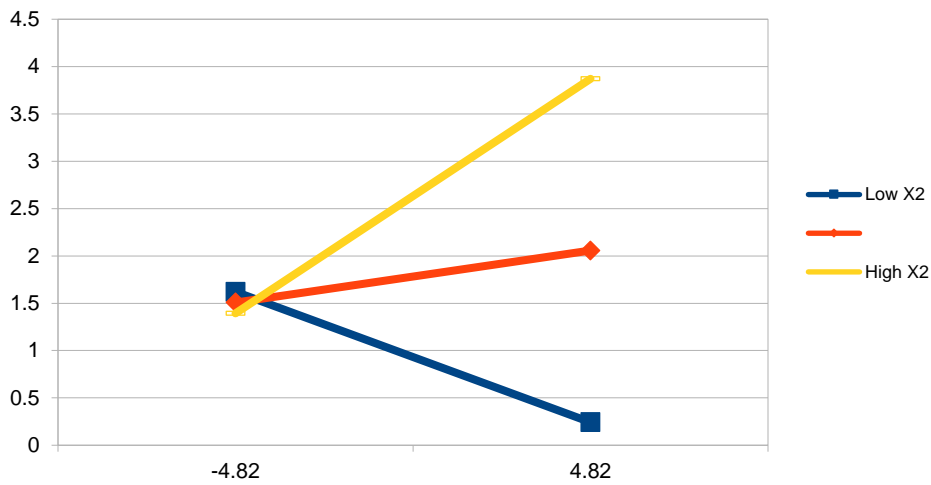*Figure 6.2: Moderation graph of trading and return spillovers*

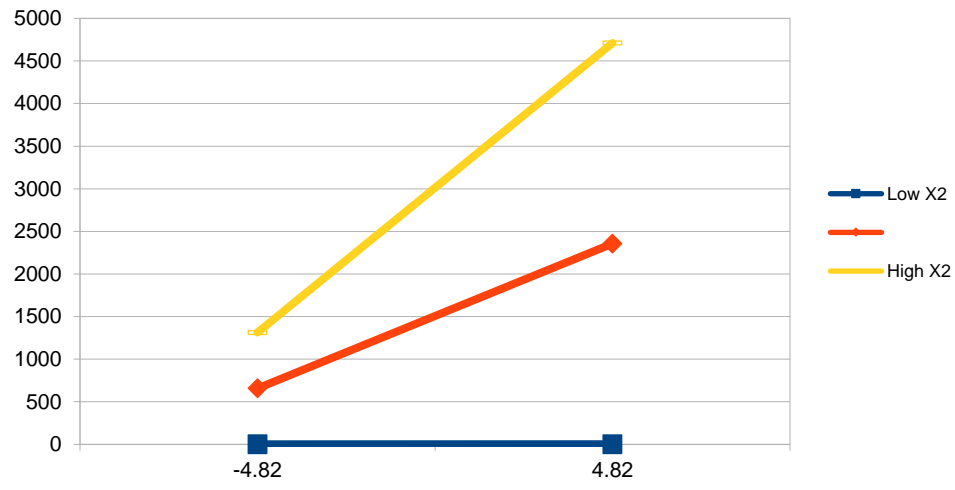*Figure 6.3: Moderation graph of Sov. Debt crisis and return spillovers*

Figure 6.4: S&P numeric Conversion

Table 1
Moody's and S&P alphanumeric ratings' conversion into numeric values

Moody's	S&P	Numeric equivalent
Aaa	AAA	100
Aa1	AA+	95
Aa2	AA	90
Aa3	AA−	85
A1	A+	80
A2	A	75
A3	A−	70
Baa1	BBB+	65
Baa2	BBB	60
Baa3	BBB−	55
Ba1	BB+	50
Ba2	BB	45
Ba3	BB−	40
B1	B+	35
B2	B	30
B3	B−	25
Caa1	From CCC+ to CCC−	20
Caa2	CC	15
Caa3	C	10
Caa	D	5

Table 6.1: Data for determining weights of Cultural Dimensions from Regression

Countries	PD	UA	COL	MAS	HDI average
Albania	80	68	38	53	0.68
Argentina	49	86	46	56	0.77
Australia	36	51	90	61	0.91
Austria	11	70	55	79	0.84
Bangladesh	80	60	20	55	0.48
Belgium	65	94	75	54	0.85
Brazil	69	76	38	49	0.68
Bulgaria	70	85	30	40	0.74
Canada	39	48	80	52	0.88
Chile	63	86	23	28	0.76
China	80	30	20	66	0.61
Colombia	67	80	13	64	0.66
Costa Rica	35	86	15	21	0.71
Czechia	57	74	58	57	0.84
Denmark	18	23	74	16	0.87
Estonia	40	60	60	30	0.81

Finland	33	59	63	26	0.84
France	68	86	71	43	0.84
Germany	35	65	67	66	0.88
Greece	60	112	35	57	0.81
Guatemala	95	101	6	37	0.56
Hong Kong	68	29	25	57	0.84
Hungary	46	82	80	88	0.78
India	77	40	48	56	0.52
Indonesia	78	48	14	46	0.61
Ireland	28	35	70	68	0.85
Iran	58	59	41	43	0.70
Israel	13	81	54	47	0.84
Italy	50	75	76	70	0.82
Jamaica	45	13	39	68	0.70
Japan	54	92	46	95	0.85
Korea (South)	60	85	18	39	0.81
Luxemburg	40	70	60	50	0.84
Malaysia	104	36	26	50	0.71
Malta	56	96	59	47	0.78
Mexico	81	82	30	69	0.70
Morocco	70	68	46	53	0.54
Netherlands	38	53	80	14	0.88
New Zealand	22	49	79	58	0.87
Norway	31	50	69	8	0.90
Pakistan	55	70	14	50	0.47
Panama	95	86	11	44	0.72
Peru	64	87	16	42	0.68
Philippines	94	44	32	64	0.62
Poland	68	93	60	64	0.78
Portugal	63	104	27	31	0.77
Romania	90	90	30	42	0.75
Russia	93	95	39	36	0.76
Singapore	74	8	20	48	0.85
South Africa	49	49	65	63	0.64
Slovakia	104	51	52	110	0.80
Spain	57	86	51	42	0.82
Surinam	85	92	47	37	0.71
Sweden	31	29	71	5	0.87
Switzerland	34	58	68	70	0.88
Thailand	64	64	20	34	0.65
Trinidad	47	55	16	58	0.73
Turkey	66	85	37	45	0.67
Uruguay	61	100	36	38	0.74

United States	40	46	91	62	0.89
Venezuela	81	76	12	73	0.70
Vietnam	70	30	20	40	0.59