İSTANBUL BİLGİ ÜNİVERSİTESİ

SOSYAL BİLİMLER ENSTİTÜSÜ

İKTİSAT DOKTORA PROGRAMI

THREE ESSAYS IN FINANCIAL MARKETS

Serkan Yüksel

111806004

Danışman: Prof. Dr. Ege Yazgan

İSTANBUL

2017

THREE ESSAYS IN FINANCIAL MARKETS

FİNANSAL PİYASALARI İNCELEYEN ÜÇ MAKALE

Serkan YÜKSEL

111806004

Tez Danışmanı:	PROF. Dr. Ege YAZGAN	.....
Jüri Üyesi:	DOÇ. Dr. Koray AKAY	.....
Jüri Üyesi:	DOÇ. Dr. Cenktan ÖZYILDIRIM	.....
Jüri Üyesi:	DOÇ. Dr. Hüseyin KAYA	..... (Medeniyet Üni.)
Jüri Üyesi:	Yrd. DOÇ. Dr. Nihat GÜMÜŞ	..... (İbn Haldun Üni.)

Tezin Onaylandığı Tarih : 04/05/2017

Toplam Sayfa Sayısı: 160

Anahtar Kelimeler (Türkçe)

1) Rastsal Matriks Teorisi
2) Çapraz Korelasyon
3) Davranışsal Finans
4) Bireysel Yatırımcılar
5) İslami Finans
6) Vektör Otoregresyon

Anahtar Kelimeler (İngilizce)

1) Random Matrix Theory
2) Cross Correlations
3) Behavioral Finance
4) Individual Investors
5) Islamic Finance
6) Vector Autoregression

ACKNOWLEDGEMENTS

I would like express my gratitude to all the people who contributed in some way to the work in this thesis. First and the most, I would like thank my academic advisor Professor Ege Yazgan for his sincere endeavours not only in the process of accomplishment of this thesis but also in the development my academic career from the early years of my undergraduate studies. His diligent efforts and his role model of being educationalist have been the very foundational aspect of my aspiration to be academician. It has been great honour and fortune for me to be his student both at undergraduate and graduate level. He has been always tremendous mentor for me. I am beyond words of gratitude to you for your meritorious encouragement, patience, guidance and valuable comments during the preparation of this thesis.

Besides my advisor, I would also like to thank the rest of my thesis committee members, Associate Professor Koray Akay, Associate Professor Cenktan Özyıldırım, Associate Professor Hüseyin Kaya and Assistant Professor Nihat Gümüş for both serving as my committee members and directing me in my graduate studies. I also thank you all for making my defence an enjoyable moment and much enriched academic discussion. Your brilliant comments and suggestions have made remarkable contributions to my thesis.

I also thank to my both academic and professional colleagues whom I shared the studies with. Their collaboration, valuable comments and selfless efforts have made important contribution to my thesis.

A special thanks goes to my family. Words are meaningless at expressing how grateful I am to them for everything they have endured throughout my studies from all the beginning. I am countlessly indebted to my wife for her praiseworthy love and support that she brings into my life.

CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS

AAOFI: Accounting and Auditing Organization for Islamic Financial Institutions
ACWI: All Country World Index
ADF: Augmented Dickey-Fuller Test
BIS: Bank for International Settlements
BIST: Borsa İstanbul
CAPM: Capital Asset Price model
CBRT: Central Bank of the Republic of Turkey
EU: European Union
IAH: Investment Account Holders
IFI: Islamic Financial Institutions
IFSB: Islamic Financial Services Board
IIFS: Islamic Institutions and Financial Services
IPR: Inverse Participation Ratio
LIBOR: London Interbank Offered Rate
MENA: Middle East and North Africa
MKK: Merkezi Kayıt Kuruluşu
MSCI: Morgan Stanley Capital International
MST: Minimal Spanning Tree
OLS: Ordinary Least Squares
PLS: Profit Loss Sharing Ratio
RMT: Random Matrix Theory
SIC: Schwartz Information Criteria
TDR: Term Deposit Rates
UHT: Ultrametric Hierarchical Tree
VAR: Vector Autoregression

ABSTRACT

This dissertation thesis focus on financial markets using various econometric applications. Main goal of this thesis to address various questions in financial markets especially within the effects of 2008 financial crisis. Three essays included in this thesis focus on financial econometrics, behavioural finance and Islamic Finance.

The first essay applies Random Matrix Theory in order the map of correlations between the global financial markets. The cross-correlation matrix C of the index returns of the main financial markets analysed by using methods of Random Matrix Theory. Cross-correlation matrix properties studied for both periods: before the 2008 crisis and after. The effect of 2008 crisis on the financial markets traced by the interactional change between the financial markets. We test the eigenvalues of C for universal properties of random matrices and find that the majority of the cross correlation coefficients arise from randomness. However, we also show that eigenvector of the largest deviating eigenvalue of C represents true information about all the market characteristics. Results present that high correlation exists between collective market movement and volatility indicating that, diversification cannot be helpful to reduce systematic risk in times of crises. We identify and compare the connection and cluster structure of markets before and after the crisis using minimal spanning and ultrametric hierarchical trees. We find that after the crisis, the co-movement degree of the markets increases. Results indicate that cross-correlation between markets are not totally random hence there exist a non-linear relationship between financial markets. Moreover, the non-linear relationship between the financial markets increases after the 2008 crisis. We have identified connection structure of cross-correlation of financial markets. Our findings indicate that the connection structure includes some leader markets that has been followed by other markets. Spill over effect of the crisis has been represented by the ultrametric hierarchical trees. Moreover, our results show that the connection structure has greatly changed after the global financial markets.

These results have important implications to support the argument that global interdependence of the stock markets is time varying and the connection structure changes after the 2008 crisis.

With the scope of the financial market interactions result indicated in first essay, the second essay focuses on the internal market factors. In the second essay, we tried to understand the market nature of anomalies that have important role in the elevation of the crisis. Since the market movements are consequences of human judgment, interactions and behaviour, the relationship between return performance of the individual investors and their investment patterns is analysed. We examine the return performance of individual investors with respect to various factors such as portfolio size, turnover, holding period and also demographic factors: gender and age. The daily trades in Borsa İstanbul (formerly Istanbul Stock Exchange) of 20,000 individual investors over two year period 2011-2012. Utilizing a weekly data set, we bring new evidence to the current debates on individual investors' trading patterns. First the Capital Asset Pricing Model (CAPM) regression has been applied. Then the Ordinary Least Square (OLS) has been used via a cross section regression of the returns on the before mentioned variables. Our findings can be summarized as follows: There is a positive relationship between holding period and return up a certain return level. The return of the individual portfolio is positively correlated with the portfolio size. The return of the individual portfolio is positively correlated with the portfolio size. Almost 70% of all individual investors cannot beat the market. Investors who have high turnover underperform compared to those who have lower turnover. Male investors trade more and lose more vis-à-vis the female and older investors have higher returns. Hence the behavioural aspects of the individual investors affect the return performance. Behavioural biases have important effect on the return performance of the individual investor portfolios. As a result behavioural biases creates discretions that results deviation from the market efficiency which has played major role in elevation of the global financial crisis. Our findings indicate that behavioural biases has been important reason for the higher trading paradigm in financial markets which played catalyser role in escalation of the 2008 crisis.

Third study focuses on the alternative finance paradigm such as Islamic finance. Inappropriate risk pricing experience during the global financial crisis triggered the research on alternative finance paradigms. Asset based nature of Islamic finance potentially could prevent the toxic debt based finance models. However the Islamic finance represents the very limited portion of global finance assets. Hence the how much Islamic finance is different from the conventional finance models is the main question that should be answered in order to mitigate more on alternative finance methods. Third study provides analysis to determine the relationship between Islamic finance and conventional finance. By looking at the causal relationship between the deposit returns of both Islamic banks (profit-loss-sharing ratio substitute for deposit rates for Islamic finance) and conventional banks, we try to map the causal link between two. Returns in the conventional banking expected to be heavily influenced by the interest rate in the money market. However, Islamic banking returns are interest-free so that interest rate changes are not expected to affect the profit-loss sharing ratio in Islamic banks. Interest rates in the economy is a proxy to highlight the general risk level of the economy. By looking at the causal relationship between the deposit returns of both Islamic banks and conventional banks, it is possible to address the different types of banking in the general risk structure of the economy. We apply Vector Auto Regression (VAR) model and use Granger causality to term deposit rates of Islamic and Conventional Banking. We extend the analysis into pre and post 2008 crisis to address the potential causality effect of the 2008 crisis. Our results suggest that there is no significant relationship between both banking sectors. We report that inferences from pairwise Granger causality alone might be spurious since the analysis based on non-stationary series can be consequence of time functional characteristics of the time series. By subsampling the data for pre and post-crisis periods, Granger causality is rejected. Our results provide evidence that the Islamic finance methods are different from the conventional finance. Interdependence between these two financial models are limited. Moreover the relationship structure greatly changes after the crisis experience which provides further inside that the Islamic finance

model can be important candidate to reduce market frictions that has raised the crisis experience into global economic crisis.

JEL classification: G02; G12; G14; G15; Z12

Keywords: Cross-correlations, Random matrix theory, Complex systems, Minimal spanning tree, Centrality measures, Individual Investor, Turnover, Portfolio Size, Stock Returns, Holding Period, Islamic Banking, Systematic Risk, Granger Causality, Term Deposit Rates, Vector Auto Regression

ÖZET

Bu tez, farklı ekonometrik modeller kullanarak finansal piyasalardaki bazı sorulara ilişkin üç temel çalışma içermektedir. Tezin ana amacı, 2008 krizi sonrasında finansal piyasalarda ortaya çıkan gelişmeleri incelemek ve finansal piyasalarda yaşanan değişimler sonrası ortaya çıkan sorulara dair yanıtlar getirmektir. Bu tezi oluşturan üç makale sırasıyla finansal ekonometri, davranışsal finans ve İslami finans alanlarında literatüre katkı sağlamaktadır.

İlk makalede "Rastsal Matriks Teorisi" uygulanarak, küresel piyasalarda 2008 krizi öncesi ve sonrasında korelasyon haritası çıkarılmış, ve bu korelasyon etkileşim haritası etkileşim incelenmiştir. Küresel piyasalardaki endeks getirilerinden oluşturulan kesit korelasyon matriksi C'nin yapısı, Rastsal Matriks Teorisi metodu ile incelenmiştir. Böylelikle 2008 krizinin finansal piyasalara etkisi araştırılmıştır. Bu C matriksinin yapısı hem kriz öncesi dönem, hem de kriz sonrası dönemde incelenmesi ile birlikte krizin finansal piyasalarda etkileşim yapısında ne gibi değişikliklere neden olduğu gözlenmiştir. C matriksinin karakteristik köklerinin (özdeğerleri) Rastsal Matriks özelliklerine sahip olup olmadığı test edilmiş ve bu karakteristik köklerin çoğunlukla rastsallık teorisine uygun özellikleri sahip olduğu saptanmıştır. Rastsallık Teorisi'nden ayrışan karakteristik kök bulunarak, bu karakteristik köke ait karakteristik vektörün tüm market etkileşim bilgisini içeren vektör olduğu gösterilmiştir.

Bulgular, finansal piyasalarda yüksek korelasyonun olduğunu, böylelikle finansal piyasaları etkileyen şokların bir piyasadan diğerine kolayca aktarıldığını göstermektedir. Ayrıca, özellikle kriz dönemlerinde "yayılma etkisi" ile bir piyasada gözlenen volatilitenin, diğer piyasalara sıçradığı saptanmıştır. Böylelikle sistematik yapısal riskten portföy çeşitlendirmesi ile kaçınmanın çok da mümkün olmadığı gözler önüne serilmiştir. Piyasalar arasında yüksek korelasyonun yüksek volatilite dönemlerinde daha da arttığı saptanmış, ve kollektif piyasa hareketinin tüm piyasaları kapsadığı sonucuna varılmıştır. Çalışmada bağlantı ve kümelenme yapısı "Minimal Kümelenme Haritası Ağaçları" ve "Ultrametrik Hiyerarşi

Ağaçları" yöntemleri ile ortaya konulmuştur. Bu bağlantı haritası kriz öncesi ve kriz sonrası olmak üzere iki ayrı dönem için incelenmiştir. Çalışma sonuçlarına göre, 2008 krizi sonrası finansal piyasalarda entegrasyon artmıştır. Bu duruma ek olarak, lineer olmayan korelasyon ilişkisinde 2008 krizi sonrasında artışlar gözlenmiştir. Kesitsel korelason ilişkisi tamamen rastsal olmayıp, bu linear olmayan ilişkide takip edilen öncü piyasalar olduğu ortaya konulmuştur. Linear olmayan ilişki yapısının haritası çıkarılmış ve bu harita üzerinde etkileşim ağacı oluşturulmuştur.Etkileşim ağacında kriz öncesi ve sonrası yayılma etkisi Ultrametrik Hiyerarşi Ağaçları yöntemi ile gösterilmiştir. Tüm bu bulgular, 2008 krizinin nasıl yayıldığı ve kriz sonrasında değişen etkileşim ve korelasyon yapısını gözler önüne sermek ve küresel bağımlılığın kriz sonrası arttığı hipotezini desteklemek açısından literatüre önemli katkılar sağlamaktadır.

İlk çalışmada finansal piyasların küresel etkileşimi ve krizin yayılma yapısının gösterilmesi ardından, ikinci makalede finansal piyasaların içsel yapısı incelenmiştir. Özellikle krize neden olarak gösterilen piyasaların işleyişinde ortaya çıkan anomaliler ikinci makalede konu edilmiştir. Piyasalarda nominal değişkenler aslında insanların karar mekanizmaları ve davranışları sonucunda ortaya çıkan parametrelerdir. Bu parametreler içinde finansal piyasalarda etkin piyasa hipotezinin öngördüğünden fazla sayıda işlem yapılması en temel piyasa anomalisi olarak karşımıza çıkmaktadır. Özellikle kriz sonrasında gelişen davranışsal finans literatüründe bu husus çokça gündeme gelmiştir.

İkinci makalede, küresel piyasalar içinde en fazla işlem yapılan piyasalar arasında yer alan Türkiye'nin tek sermaye piyasası işlem platformu olan Borsa İstanbul'da işlem yapan bireysel yatırımcılar çalışılmıştır. Literatürde bahsedilen fazla işlem anomalisin net bir şekilde gözlendiği Borsa İstanbul'da bireysel yatırımcıların portföy yapıları incelenerek, bu bireysel yatırımcıların fazla işlem anomalisine neden olan karakteristik yapı ortaya konulmuştur. Yatırımcıların portföy işlem hacimlerine göre getirileri karşılaştırılmış ve işlem sayısı ile portföy getirisi arasında negatif ilişki olduğu saptanmıştır. Bu durum, davranışsal finans

literatüründe konu edilen "aşırı güven" sendromunun Borsa İstanbul'da da gözlendiğini ortaya koymuştur.

2011-2012 yılları arasında işlem yapan yirmibin bireysel yatırımcı örnekleminin portföy getirisi, portföy büyüklüğü, portföy saklama zamanı ve demografik özellikler açısından kategorize edilmiştir. CAPM Modeli uygulanarak bireysel yatırımcıların piyasa ortalamasından daha kötü protföy getirisi elde ettiği ortaya konulmuştur. Kesit regresyon yöntemleri ile farklı parametreler için portföy getirisi ile ilişkileri incelenmiştir.

Bulgular, portföy saklama zamanı ile portföy getirisi arasında pozitif ilişki olduğunu göstermektedir. Böylelikle al-sat yapmayan bireysel yatırımcıların ortalamadan daha iyi portföy getirisi elde ettiği gözlenmiştir. Bu durum da, davranışsal finans literatüründe belirtilen "aşırı güven" davranışsal yanılmasının, aşırı al-sat yapmaya neden olduğu savı ile uyumludur. Aynı zamanda çalışmamızda bu davranışsal yanılmanın getiri performansını olumsuz etkilemekte olduğu sonucuna varılmıştır. Bu durum, portföy devir süratı açısından da incelendiğinde, yüksek portföy devir süratine sahip bireysel yatırımcıların (çok al-sat yapan yatırımcılar) ortalama getirilerinin genel ortalamanın altında kaldığı sonucumuz ile benzeşmektedir.

Farklı demografik özelliklere göre de portföy performansı kesit regresyonlar yöntemi ile incelenmiştir. Tüm sonuçlar, demografik özelliklere göre davranışsal yanılmaların şiddetinin farklılaştığı ve tüm bu davranışsal yanılmaların bireysel yatırımcıları etkin piyasa hipotezindeki varsayımın dışında davranmaya ittiğini göstermektedir. Bu makale, davranışsal yanılmaların fazla işlem yapma paradigmasının en önemli nedenleri arasında olduğuna dair davranışsal finans literatürüne katkı sağlamaktadır. Ayrıca genel olarak 2008 finansal krizi değerlendirildiğinde, krizin şiddetinin artmasında temel etken olan aşırı işlem hacmi paradigmasının davranışsal finansal yanılmaları sebebiyle gerçekleştiği yönünde bulguları da ortaya koymaktadır.

Üçüncü makalede, 2008 krizi sonrasında gündemde daha çok yer tutmaya başlayan İslami Finans modeli üzerine çalışmaya yer verilmiştir. Özellikle küresel

kriz tecrübesinde, doğru fiyatlanmayan risklerin yol açtığı finansal yapıların sorgulanması ile birlikte İslami Finans gibi alternatif finans modelleri gündeme gelmiştir. İslami Finans'ın varlığa dayalı finans modeli ürünleri, kriz esnasında toksik borçlanma sertifikalarına alternatif olması ve daha sağlıklı finans modeli sağlama potansiyeli, bu finans modeline duyulan ilgiyi artırmıştır. Ancak İslami finans varlıkları küresel finans varlıklarının çok sınırlı bir kısmını kapsamaktadır. Bu açıdan bu varlıkların küresel finans varlıkları ile olan ilişkisi incelenmesi gerekmektedir. Bu açıdan, alternatif modeller değerlendirlirken, var olan finans modelinden ne kadar farklılaştığı sorusu gündeme taşınmıştır. Bu soruya yanıt bulmak için, üçüncü makalede İslami Finans'ın konvansiyonel finanstan ne kadar ayrıştığı hususunda çalışmaya yer verilmiştir.

İki finans alternatifi arasında nedensellik ilişkisi "Granger Nedenselliği" metodu ile incelenmiştir. İncelemede konvansiyonel bankacılığın mevduat oranları ile İslami bankacılığın kar-zarar ortaklığı rasyosu kullanılmıştır. Konvansiyonel bankacılığın meduat oranları para piyasalarıdaki faiz getirilerine göre oluşmaktadır. Böylelikle, piyasa riski etkisi direkt olarak mevduat oranlarına yanısmaktadır. İslami bankacılıkta ise faiz yasaklanmıştır ve bu yüzden teorik olarak kar-zarar ortaklığı oranı verilen kredilerin kazanç-kayıp ortalamalarına göre oluşmaktadır. Bu iki parametre arasındaki ilişki, iki finans alternatifinin piyasa risklerinden ne kadar farklı etkilendiğine dair bilgi içermektedir. Küresel risk yapısı içinde bu iki modelin ne kadar ayrıştığını ya da benzeştiğini görmek için nedensellik analizleri yapılmıştır. Ayrıca, Vektör Otoregresif (VAR) ekonometrik modelleme ile, konvansiyonel bankacılığa gelen şokların İslami bankacılığı ne kadar etkilediği test edilmiştir. Benzer şekilde yine aynı model yöntemi ile İslami bankacılığa gelen şokların da konvansiyonel bankacılığı ne kadar etkilediği test edilmiştir. Böylelikle aynı piyasada birlikte var olan finans alternatiflerinin birbirlerinden ne kadar etkilendiği sorusuna dair yanıt aranmıştır. Analiz 2008 krizi öncesi ve sonrası dönem için de ayrı ayrı yapılarak, kriz tecrübesi sonrasında nedensellik yönünün nasıl etkilendiği sorgulanmıştır.

Bulgularımıza göre Granger Nedenselliği uzun dönemde iki taraflı reddedilmiştir. Zaman serilerinin durağanlaştırılması sonrasında uygulanan analizlerde VAR parametreleri de bu sonucu desteklemektedir. Böylelikle İslami finans modelinin konvansiyonel finans modelinden farklılaşmadığı argümanına ters kanıt elde edilmiştir. Ayrıca, nedensellik analizlerine kriz öncesi ve sonrası için yinelendiğinde, kriz sonrasında nedensellik ilişkisinin daha çok reddedildiği gözlenmiştir. Bu durum, kriz sonrasında alternatif finans modeli olarak İslami Finans'ın farklı bir paradigma getirme potansiyeli olduğu argümanını desteklemektedir.

JEL Klasifikasyonu: G02, G12, G15, Z12

Anahtar Kelimeler: Kesit Korelasyon, Rastsal Matriks Teorisi, Komplike Yapılar, Minimal Kapsama Ağacı, Bireysel Yatırımcılar, Portföy Analizleri, Davranışsal Finans, Risk Yapısı, İslami Finans, Sistematik Risk, Granger Nedenselliği, Vetor Otoregresyon Analizi.

1. INTRODUCTION

The crisis that we have experienced in 2008 has been important cornerstone in global financial markets. It has triggered many academic and practical questions. Effects of the financial crisis have transformed into global level which generally accepted to be the great recession. Main economic paradigms have been revisited and wide array of new research have aroused to discuss effects and the reasons of the crisis. This thesis correspondences to the growing literature that analyse the 2008 crisis environment. The thesis provides applied research on financial markets. Main contribution of this thesis is to address various questions raised within the global financial crisis experience. The results of this study gives important insides about the how the financial crisis spread from one market to another, market anomalies that has played significant role in the development of the financial crisis. This thesis also discusses the alternative finance paradigm such as Islamic Finance in order to elaborate on the alternative finance models that could limit the negative effects of the 2008 crisis. Three field of studies -risk analysis, behavioural finance and Islamic Finance- conducted using various econometric modelling and applications.

First study focuses on the financial market integration. 2008 crisis thought us that the market connection could easily extend the effect of a crisis into global level. In first essay we try to understand the global interconnection between the markets. Since the markets are connected to each other in many aspects, a linear analysis would not be complete to determine the potential relationship matrix. Hence we have taken advantage of the benefits of Random Matrix Theory which roughly enables identifying the cluster structure of financial markets. We have found that global financial markets are connected to each other in a way that random relationship hypothesis can be rejected. Further on these findings, we tried to find the relationship cluster leaders between the markets. Our findings indicate that the relationship matrix before and after the crisis experience has changed. Main contribution of the study is to determine the connection structure of the markets to

denote main financial centers. Denoting such a map would help to identify the spill over effect of the any financial crisis. Study also contributes to the literature by showing the difference of cluster connections before and after the financial crisis. Mapping the time varying nature of the connection structure would be beneficial to further study on the channelling the evolution of the connection structure of the financial markets.

After analysing the general market integration, this thesis concentrate on the micro-finance drivers behind the 2008 financial crisis. There is growing literature of behavioural finance which focus on the behavioural biases in the market which have deepened the effect of the crisis. From the global network of the crisis, these biases have been catalyser in the demolishing effects of the crisis. We concentrate on the financial market anomalies especially related to individual investor level biases. Return performance of the investor was the main behavioural aspect of the financial markets. Concerning on the portfolio choices of the individual investors, we analyse the Capital Asset Price Model (CAPM) assumptions. Under the efficient market hypothesis, assets should be priced effectively and the individual investors should react to these effective prices. However high trading level of the stock market was claimed to be inconsistent with the rational expectation models. Analysing such within market anomaly would help to understand micro-financial level biases that accumulated in the financial crisis experience.

Further on, the statistical characteristics of the return performance represented. Return performance of the individuals have been categorized for different demographic specifications. To best of our knowledge, this study is the first study that analyses the individual level data contains the whole financial market investors. The portfolio returns of the individuals are calculated weekly contrary to the most of the literature which use monthly aggregated data. We also differ from most of the studies utilizing a sample from the official depository agency of the country, not a single securities firm.

In third study, the causality between Islamic and conventional finance methods has been questioned. With the 2008 crisis experience, toxic assets nature

of the conventional finance was the main driver of the 2008 financial crisis. Debate on the alternative finance methods that does not have toxic property became main debate topic. Alternative asset structures came into consideration and due to its asset based nature Islamic finance become hot topic. The question: "if the alternative Islamic finance paradigm would be important portion of global assets, would the effect of the crisis be limited than the experience that we have faced?" came into consideration by the literature. Though Islamic finance assets represents very limited portion of the global finance markets, studies on Islamic finance has extended. This study is one of the few invocative studies in Islamic finance literature. The difference of the Islamic finance from the conventional finance has not been studied extensively.

Islamic banking and conventional banking are considered to be different kind of sources for funding. Returns in the conventional banking expected to be heavily influenced by the interest rate in the money market. However, Islamic banking returns are interest-free so that interest rate changes are not expected to affect the deposit returns in Islamic banks. Interest rates in the economy is a proxy to highlight the general risk level of the economy. By looking at the causal relationship between the deposit returns of both Islamic banks and conventional banks, it is possible to address the different types of banking in the general risk structure of the economy.

Third study tried to reveal the relationship between conventional finance and Islamic finance. In order to analyse causality, it is needed to study financial market which includes both financing methods. Hence Turkey would be one of the few natural candidates to map the relationship. With using vector auto regressive analysis and Granger Causality for the term deposit rates of two different finance alternatives, the analysis provide to reveal the relationship between two. By doing so, we are able to track the effects of financial crisis on both conventional and Islamic banks. We present comparative analysis on the impact of the global finance crisis of 2008. Pre and post crisis term deposit returns of conventional and Islamic banks are considered. Term deposit rates are considered to be center of financial

activities so that our analysis study gives important implications on the risk structure. If Islamic banks are not affected much from the financial crisis, this situation can be taken as an implication that Islamic banks are less prone to the systematic risk.

2. ANALYSIS OF CROSS-CORRELATIONS BETWEEN FINANCIAL MARKETS AFTER THE 2008 FINANCIAL CRISIS

2.1 Introduction and Literature Review

The global financial system is composed of a large variety of markets that are positioned in different geographic locations and in which a broad range of financial products are traded. Despite the diversity of markets, index movements often respond to the same economic announcements or market news [Ederington and Lee (1993), Balduzzi and Green (2001), Andersen et al. (2007)] which implies that financial time series can display similar characteristics and be correlated. Since the work of Markowitz (1952), correlations of financial time series are constantly a subject of extensive studies both at the theoretical and practical levels. It is important not only for understanding the collective behaviour of a complex system but also for asset allocation and estimating the risk of a portfolio. In particular since the recent 2008 financial crisis, which originated in the US and then spread to almost all markets in the world, many economists have been studying the correlation structure between financial markets and the transmission of volatility from one to another. One of the major difficulties in these studies are the complicated unknown underlying interactions of the financial markets. As Plerou et al. (2000) indicates, correlations between markets need not be just pairwise but may rather involve clusters of markets and relationship between any two pair may change in time. In earlier times, physicists experienced similar problems. The problem became popular by Wigner's work in the 1950's for application in nuclear physics, in the study of statistical behaviour of neutron resonances and other complex systems of interactions. (See also Mehta (1994)). He tried to understand the energy levels of complex nuclei, when model calculations failed to explain experimental data. To overcome this problem, he assumed that the interactions between the constituents comprising the nucleus are so complex that they can be modelled as random. Based on this assumption, he derived the statistical properties

of very large symmetric matrices with i.e. entries and the results were in remarkable agreement with experimental data. More recently Random Matrix Theory (RMT) has been applied to analyse the financial time series (Plerou et al. (2000), Shen and Zheng (2009), Junior and Franca (2012)). In particular, correlation matrices are computed for the empirical data and quantities associated with these matrices are compared to those of random matrices. Wilcox (2007) showed the extent to which properties of the correlation matrices deviate from random matrix predications clarifies the status of the information derived from the computation of covariances. The literature focuses on the correlations between individual stocks in a market; however, in this study we will analyse the cross-correlations between 87 main financial markets in the world by tools of RMT.

The rest of the paper is organized as follows; in Section 2.2, we give a brief description of the methodology. Section 2.3 describes the data and contains several results of our analysis; in particular Sections 2.3.1, 2.3.2 and 2.3.4 present the eigenvalue and eigenvector analysis of the correlation matrix with discussion of the relation between volatility and correlation of financial markets. In Section 2.3.6, we construct a correlation based market network and compare the structure before and after the 2008 financial crisis by tools of graph theory. In Section 2.4, we use an alternative approach to the construction of the correlation matrix, present the related results and discuss possible further studies. Finally, Section 2.5 contains some concluding remarks.

2.2 Methodology

To observe the correlations between the index movements of different stock markets, index fluctuations are measured such that the result is independent of the scale of the measurement. Let $P_i(t)$ be the index of the stock market i = 1, 2, . . . , N at time t and t = 0, 1, . . . , T . The logarithmic index return of the ith market index over a time interval Δt is given by

$$R_i(t) \equiv \ln P_i(t+\Delta t) - P_i(t) \tag{1}$$

Each index have different levels of volatility, so we consider the normalized returns

$$r_i(t) \equiv \frac{R_i - \langle R_i \rangle}{\sigma_i} \tag{2}$$

where $\sigma_i(t) \equiv \sqrt{\langle R_i^{\,2} \rangle - \langle R_i \rangle^2}$ is the standard deviation of R_i and $\langle \cdot \quad \cdot \quad \cdot \rangle$ is the time average over the considered period. Then the equal time cross-correlation matrix C is the matrix with elements

$$c_{ij} \equiv \langle r_i r_j \rangle \tag{3}$$

which represents the correlation between returns market indices i and j. By construction, C is symmetric with $c_{ij} = 1$ and c_{ij} takes values from [-1,1]. The elements $c_{ij} = 1$, $c_{ij} = -1$ and $c_{ij} = 0$ defines perfect correlation, perfect anti-correlation and uncorrelated pair of markets respectively. In matrix notation, the interaction matrix C can be written as

$$C = \frac{1}{T} RR^t \tag{4}$$

where R is an N ×T matrix with entries $r_{im} \equiv r_i(m\Delta t)$ with i=1,2,...,N; m=1,...,T and R^t denotes the transpose of R. The stochastic modern approach about the dynamics of return is given by

$$dR_i = \mu_i dt + \sigma_i dW \tag{5}$$

where dW is a Wiener process with dW following a normal distribution that $\langle dW \rangle = 0$ and $\langle dW^2 \rangle = 1$, μ_i is the mean return and σ_i is the volatility. Therefore the standardized returns r_i are expected to follow a standard normal distribution.

We will compare the properties of the interaction matrix C with those of a random cross-correlation matrix.

Random Matrix Theory (RMT) was first introduced by Wishart and RMT studies gained momentum after Mehra's invention of the orthogonal polynomial method. Statistical properties of the random matrices have been developed in mathematics and physics literature and have been applied to in many disciplines extensively. To summarize general frame of RMT, Let $x_i(t)$; i = 1, 2, . . . , N where $x_i(t)$ are independent, identically distributed random variables. We define the N × T matrix A by elements $a_{it} \equiv x_i(t)$. The matrix W defined as

$$W = \frac{1}{T} AA^t \tag{6}$$

is called a Wishart matrix as explained in detail by Baker at al. (1998), Edelman (1998) and Sengupta and Miltra (1999). Let each $x_i(t)$ be normally distributed and rescaled to have zero mean and constant unit standard deviation. Under the restriction, $N \to \infty$, $T \to \infty$ with $Q \equiv T/N > 1$ is fixed, the probability density function $\rho_{rm}(\lambda)$ of eigenvalues λ of the matrix W as shown in Edelman (1998) and Sengupta and Mitra (1999):

$$\rho_{rm}(\lambda) = \frac{Q}{2\pi} \frac{\sqrt{(\lambda_{\max} - \lambda)}(\lambda - \lambda_{\min})}{\lambda} \tag{7}$$

$$\lambda_{\min}^{\max} = 1 + \frac{1}{Q} \pm 2\sqrt{\frac{1}{Q}} \tag{8}$$

Where $\lambda_{\min}^{\max}$ are the maximum and minimum eigenvalues of W. For the rest of the paper, the analysed eigenvalues are rank ordered i.e. $\lambda_i < \lambda_j$ for all $i < j$ and α_i denote the corresponding unfolded eigenvalues for all i. The distribution of nearest neighbour eigenvalue spacing of W is given by Wigner–Dyson distribution (Guhr et al. (1998))

$$\rho w_{mn}(s) = \frac{\pi s}{2} \exp(-\frac{\pi}{4} s^2) \tag{9}$$

where $s = \alpha_{i+1} - \alpha_i$. The distribution of next-nearest neighbour eigenvalue spacing of W is given by Brody et. al. (1981):

$$\rho w_{mn}(s) = \frac{2^{18}}{3^6 \pi^3} s^4 \exp(-\frac{64}{9\pi} s^2) \tag{10}$$

where $s = (\alpha_{i+2} - \alpha_i)/2$. The number variance Σ^2 is defined as the variance of the number of unfolded eigenvalues in the intervals of length l, around each α_i (Brody et al. (1981) and Guhr et al. (1998)),

$$\Sigma^2(l) = \langle (n(\alpha, l) - l)^2 \rangle_\alpha \tag{11}$$

Where $n(\alpha, l)$ is unfolded eigenvalues in the interval $[\alpha - l/2, \alpha + l/2]$and $\langle ... \rangle_\alpha$ denotes an average over all α. For large values of l, the number variance for W behaves like $\Sigma^2 \approx \ln l$ and if the eigenvalues are uncorrelated then $\Sigma^2 \approx l$ (Brody et al. (1981) and Guhr et al. (1998)). Let v_k be the eigenvector corresponding to the eigenvalue λ_k. We denote the jth component of v_k as $v_{k,j}$. By construction we have $\Sigma_{j=1}^{N} [v_{k,j}]^2 = 1$. If we normalize the eigenvectors $v_k \to v'_k$ such that $\Sigma_{j=1}^{N} [v'_{k,j}]^2 = N$ then the components of each normalized eigenvector v'_k have a Gaussian distribution with mean zero and unit variance should be as follows as noted in Laloux et al. (1999),

$$\rho(v') = \frac{1}{\sqrt{2\pi}} \exp(-\frac{v'^2}{2}) \tag{12}$$

A useful quantity in characterizing the eigenvectors is the so-called Inverse Participation Ratio (IPR) in Plerou et al. (2001). For the eigenvector v_k, is defined as

$$IPR_k \equiv \sum_{j=1}^{N} {v_{k,j}}^4 \tag{13}$$

For our purposes it is sufficient to know that the reciprocal of the IPR quantifies the number of significant components of the eigenvector v_k. In RMT, the expectation of IPR_k is 3/N since the kurtosis for the distribution of the eigenvector component is 3.

2.3 Data and the Results

We analyse daily closing values of 87 main benchmark indexes in the world between 01/01/2009 and 31/07/2012 (data are obtained from Bloomberg). To reflect the market dynamics better, index values are not converted to a single currency. Markets in some countries do not operate on Fridays; in that case Saturdays' values are considered as Fridays'. If a market is closed on a business day, we carry over the last value. The list of indexes is in the Appendix.

2.3.1 Eigenvalue Analysis

We take $\Delta t = 1$ day and compute the 87×87 cross-correlation matrix C. We have N = 87 and T = 933 giving $Q \approx 10.73$, with theoretical lower and upper limits $\lambda_{\min} \approx 0.48$ and $\lambda_{\max} \approx 1.71$ for the eigenvalues of C. First, eigenvalues of C are compared with the theoretical distribution $\rho_{rm}(\lambda)$ (See Figure 2.1).

One immediate thing to note is that the largest eigenvalue of C is ≈ 23.8 which is 14 times larger than the theoretical upper limit and stands out from all others. Also a first view suggests the presence of a well-defined bulk of eigenvalues. Although $\approx 52\%$ of the eigenvalues fall into the theoretical interval, $\approx 93\%$ of the eigenvalues are smaller than $\lambda_{\max}$

[Insert Figure 2.1 about here]

Since the theoretical distribution is valid strictly for $N \to \infty$, $T \to \infty$, we must test that the deviations for the largest few eigenvalues are not finite size effects as explained in detail by Plerou et al. (2001). First, we construct N = 87 mutually uncorrelated time series generated to have (a) standard normal distribution (as in theory), and (b) identical power-law tails (as in empirical examples in Plerou et al. (1999)) each having length T = 933. Then we compare eigenvalue densities of their cross-correlation matrices with the theoretical distribution (see Figure 2.2(a) and figure 2.2(b)).

[Insert Figure 2.2(a) and 2.2(b) about here]

We find good agreement with the theory suggesting that the deviations of the few largest eigenvalues from RMT in figure 2.1 are not caused by finite size effects or the fact that returns are fat tailed.[1] We apply further RMT tests to strength our claim. The first independent test is the comparison of the distribution of empirical nearest neighbour eigenvalue spacing $\rho_{nn}(s)$ with $\rho_{W_{nn}}(s)$ The agreement suggests that the positions of two adjacent empirical unfolded eigenvalues at the distance s are correlated similar to the eigenvalues of W.

The next test is the comparison of the distribution of empirical next-nearest neighbour eigenvalue spacing $\rho_{nnn}(s)$ with $\rho_{W_{nnn}}(s)$. We demonstrate this correspondence in figure 2.3(a) and figure 2.3(b) which shows a nice agreement between empirical data and the theory.

[Insert Figure 2.3(a) and 2.3(b) about here]

To test for long-range two point eigenvalue correlations, we consider the number variance. It is clear that the number variance of empirical data agrees well

[1] The simulation procedure is repeated many times; in each case similar results as in figure 2.2 are obtained.

with the theory (See Figure 2.4). It can be concluded that the bulk of the eigenvalue statistics of the empirical cross-correlation matrix C are consistent with those of the real symmetric random matrix W and the deviations from the RMT contain genuine information about the correlations in the system.

[Insert Figure 2.4 about here]

2.3.2 Eigenvector Analysis

The deviations of eigenvalue statistics from the RMT results suggest that these deviations should also be displayed in the statistics of corresponding eigenvector components (Plerou (1999)). First, we choose some of the normalized eigenvectors and display their component distribution in figure 2.5 which shows that the probability density of eigenvector components corresponding to eigenvalues in the bulk agrees well with the RMT. However, the component distribution of $\lambda_i > \lambda_{\max}$ shows significant deviation from the theory. In particular $\rho\ (v_{87}^{'})$ is almost uniform.

[Insert Figure 5 about here]

The kurtosis and skewness of the components of each $v_i^{'}$ are given in figure 2.6. For the bulk, kurtosis and skewness fluctuate around 3 and 0 respectively which is consistent with normal behaviour. Components of the v_{87} suggest that most of the financial markets participate in this eigenvector.

[Insert Figure 2.6(a) and 2.6(b) about here]

In addition, almost all components are positive. To have a clear picture, we look at figure 2.7a-c showing the contributions of the stock markets to the eigenvector corresponding to (a) the largest eigenvalue, (b) an eigenvalue from the bulk and (c) the smallest eigenvalue. For the largest eigenvalue, the majority of the markets have positive representations which is an indicative of a common factor that affects almost all markets with the same bias. This gives us a reason to believe

that v_{87} represents a global market itself that is, the result of the interactions between markets. (Please refer to Junior (2012) for determining deviating eigenvector).

[Insert Figure 2.7(a), 2.7(b) and 2.7(c) about here]

2.3.3 Global Market Mode

To see if v_{87} represents a global market itself, we take the projection of the time series $R_i(t)$ on the v_{87} and compare it with a standard measure of a global performance. In our case, the most related global index is the Morgan Stanley Capital International (MSCI) All Country World Index (ACWI). It is a free-float weighted equity index which includes both emerging and developed world markets. The projection of the time series $R_i(t)$ on v_{87} is given by the following,

$$R_{v_{87}}(t) = \sum_{i=1}^{87} v_{87,i} R_i(t) \tag{14}$$

$R_{v_{87}}(t)$ is usually called the market mode by many studies (Plerou (2001), Bouchaud 2011). (in this study we will call it the global market mode). Figure 2.8 shows a comparison of the global market mode and the returns of the MSCI index (we standardize both series to have zero mean and unit variance).

[Insert Figure 2.8 about here]

We find remarkable similarity between the two return series. The empirical correlation coefficient between them is 0.93. The good agreement shows that v_{87} corresponds to a global market factor showing the general trend of all market and quantifies the worldwide influence on them (Plerou (1999)).

Considering components of v_{87} we see that the top six contributers are from European countries. On the other hand, the majority of the markets have very small contributions that are proportional to the size and liquidity of these markets. An interesting case is the very small contributions of the big and liquid markets of South Korea, India and Russia. Since the market eigenvector can be considered as a general trend of all markets, this situation can be identified as the positive diversification of these emerging markets from others after the 2008 crisis.

[Insert Figure 2.9(a) and 2.9(b) about here]

For each eigenvector, the number of markets with a significant participation can be accurately quantified by the IPR. Figure 2.9(a) and Figure 2.9(b) shows the IPR and PR as functions of the eigenvalue index. Eigenvectors corresponding to the bulk have participation ratios around RMT prediction N/3 = 29. However, v_{87} has the highest number (≈ 44) of significant participants which is far from the suggested value. We also see that eigenvectors corresponding to the smallest eigenvalues have the lowest number of significant participants.[2]

2.3.4 Relation between Volatility and Correlation

In order to examine the evolution of the correlations in the financial system, we investigate the mean correlation of returns by a rolling window approach. We pick window length l = 22 (business month) and roll the time window through the data one day at a time. Explicitly, the mean correlation $\bar{c}_l(t)$ for the correlation coefficients $c_{ij}^l(t)$ in a time window [t − l + 1, t] is defined as

$$\bar{c}_l(t) = \frac{2}{N(N-1)} \sum_{i<j} c_{ij}^l(t) \tag{15}$$

[2] That differs from the observations on the US stock market Plerou et al. 2001 where large values of PRs have been found at both edges of the theoretical distribution.

We want to compare the mean correlation of the financial markets with the system's volatility. We take the absolute value of the global market mode as the daily volatility proxy of the financial system. A comparison of mean correlation and volatility is given in Figure 2.10 which shows that high levels of global volatility and correlation are strongly linked.[3] Furthermore, after the times of high volatility, markets still stay highly correlated for some period[4] although we have to keep in mind that the procedure of shifting the window by one data point is partially responsible in this case.

[Insert Figure 2.10(a) and 2.10(b) about here]

It is a good measure of the overall global correlation between the financial markets and it allow us to compare the mean correlation of the financial markets with the system's volatility. The volatility of the market mode is considered as the system's global volatility and the absolute value of market mode is used as the volatility proxy. A comparison of mean correlation and volatility is given in figure 2.10(a) with their actual values. Figure 2.10(a) shows that high levels of global volatility and global correlation are strongly linked. Another observation is that after the times of high volatility, markets still stay highly correlated for some period, although we have to keep in mind that the procedure of shifting the window by one data point is partially responsible in this case. Persistence of the long effect of the shocks in volatile times between markets can be inferred as the effect of the belief that market movements connectedness turns into a self-fulfilling prophecy after the crisis. On the other hand, we can apply the same rolling window procedure for the volatility to understand the co-movement better. Taking a window of the

[3] Other studies find similar results by empirical analyses (Onnela et al. (2003), Solnik et al. (1996), Erb et al. (1994)) and agent based model simulations in LeBaron et al. (1999). For example, Solnik et al. (1996) reveals that cross correlations between nine highly developed markets fluctuate strongly with time and increase in periods of high market volatility. Moreover, based on this phenomenon, Zheng et al. (2001) constructs an indicator of systemic risk by principle component analysis.

[4] In Dalkir (2009) such a situation is explained as the effect of the belief that market movement connectedness turns into a self-fulfilling prophecy after the crisis.

same length, we observe the evolution of global volatility and global correlation in figure 2.10(b). We also standardize both series to have zero mean and unit variance.

In the beginning of the considered time period, system already has a high volatility and correlation probably because of the continuing effects of 2008 crisis. Then for almost a year volatility stays steady, until the May 2010, volatility does not show any significant high values until August 2011 when S&P downgraded US credit rating, and volatility stays at high levels for a few months after then, mostly because of Eurozone's growing debt crisis. Top four volatility values are observed in the weeks of;

(i) 10.05.2010: European Union finance ministers agreed an emergency loan package that with IMF support could reach 750 billion euros to prevent a sovereign debt crisis spreading through the euro zone,

(ii) 08.08.2011: Credit rating agency S&P downgraded credit rating of the US federal government from AAA (out- standing) to AA+ (excellent),

(iii) 22.09.2011: Moody's downgraded three US banks: Bank of America, Citigroup and Wells Fargo; S&P downgraded seven Italian banks: Mediobanca, Findomestic Banca, Intesa Sanpaolo, Banca IMI, Banca Infrastrutture Innovazione e Sviluppo, Cassa di Risparmio in Bologna and Banca Nazionale del Lavoro; and Fed announced significant downside risks to US economy,

(iv) 02.04.2009: European Central Bank lowered the interest rate to %1.25 which was record low at that time. Global correlation also takes some of its highest values around the times when the above cases (i)-(iv) occur (see figure 2.10(a)).

These results clearly indicate the information and announcements have some effect on the volatility.

We also analyse the skewness and kurtosis of return distributions by rolling the time window of length l = 264 (business year) through the full data set (see Figure 2.11(a), figure 2.11(b), fat tails are demonstrated by excess kurtosis).

[Insert Figure 2.11(a) and 2.11(b) about here]

2.3.5 Time-Varying Largest Eigenvalue

After revealing that the largest eigenvalue carries true information, we apply a similar approach of Podobnik (2010) to our data. With a one-year length rolling window, we obtain the time-varying largest eigenvalue of the return correlation matrix and observe its characteristics. Figure 2.12 shows that the largest eigenvalue peaks during the highest global volatility levels and there is a strong link between the magnitude of this eigenvalue and the volatility levels in general. [5]

[Insert Figure 2.12 about here]

2.3.6 Correlation-Based Financial Network Analysis

Financial markets around the world can be regarded as a complex system. This forces us to focus on a global-level description to analyse the interaction structure among markets which can be achieved by representing the system as a network. During the recent years, networks have proven to be a very efficient way to characterize and investigate a wide range of complex systems including stock, commodity and foreign exchange markets[6]. In this study, we are interested in identifying the connection structure and hierarchy in the network of financial markets formed with cross-correlations of returns. In order to do that we construct the Minimal Spanning Tree (MST) and the Ultrametric Hierarchical Tree (UHT) associated with it (Gopikrishnan et al. (2001), Onnela et al. (2003)). To create a

[5] Which coincides with the findings of Podobnik et al. (2010): The authors study 1340 time series with 9 year daily data and investigate how the maximum singular value λ changes over (time lags) for different years and find that it is greatest in times of crises.

[6] There are numerous applied studies. Onnela (2003), Tuminello et al (2005), Bonanno (2001), Micchihe and Bonanno (2003), Brida and Risso (2008), He and Deem (2010) are among them.

network based on return correlations, we use the metric defined by Mantegna (1999),

$$d_{ij} = \sqrt{2(1-c_{ij})} \tag{16}$$

It is a valid Euclidean metric since it satisfies the necessary properties; (i) $d_{ij} \geq 0$, (ii) $d_{ij} \Leftrightarrow i = j$, (iii) $d_{ij} = d_{ji}$ and (iv) $d_{ij} \leq d_{ik} + d_{kj}$. This transformation creates a *NxN* distance matrix D from the *NxN* cross-correlation matrix C. The distance d_{ij} varies from 0 to 2 with small distances corresponding to high correlations and vice versa. MST is constructed as follows: start with the pair of elements with the shortest distance and connect them; then the second smallest distance is identified and added to the MST. The procedure continues until there are no elements left, with the condition that no closed loops are created. Finally we obtain a simply connected network that connects all N elements with N − 1 edges such that the sum of all distances is minimum.[7] . This can be seen as way to find the N − 1 most relevant connections among a total of (N (N − 1))/2 connections. This is especially plausible for extracting the most important information concerning connections when a large number of markets is under study. In terms of financial markets, MSTs can also be considered as filtered networks enabling us to identify the most probable and the shortest path for the transmission of a crisis.

After defining the Euclidean space of financial markets, we next move to the ultrametric space. An ultrametric space is the space where all distances within it are ultrametric. The ultrametric distance d_{ij}^{*} is understood as a regular distance with properties (i)–(iii) and property (iv) is replaced by a stronger condition; $d_{ij}^{*} = \max(d_{ik}^{*}, d_{kj}^{*})$. Ultrametric distances are important to hierarchical clustering since they redefine the distance between two elements as the distance between their closest ancestors. The MST provides the sub-dominant ultrametric hierarchical

[7] This can be seen as a way to find the N − 1 most relevant connections among a total of N(N − 1)/2 connections which is especially appropriate for extracting the most important information concerning connections when a large number of markets is under consideration. In terms of financial markets, MSTs can also be considered as filtered networks enabling us to identify the most probable and the shortest path for the transmission of a crisis.

structure of the markets into what is called UHT. The MST is associated with the single-linkage clustering algorithm as methodology suggested by Tumminello et al. (2007), so we present the UHT using the same method. The most important issue of the construction above is that while it is robust for strongly clustered networks, it has a tendency to link poorly clustered groups into chains by successively joining them to their nearest neighbours, thus the information obtained from MST should be used with caution.

To understand the effects of the 2008 financial crisis on markets' integration structure, we analyse the cases corresponding to two different time periods; period one: 01/01/2005–01/01/2007 and period two: 01/01/2009–31/07/2012. The MSTs and the UHTs of these periods are given in figures 2.13 and 2.14 respectively.[8]

[Insert Figure 2.13a and 2.13b about here]

[Insert Figure 2.14a and 2.14b about here]

For both periods, the three US market indexes are close together as expected and Germany serves as a hub for the connection between two main clusters; North America and Europe. France seems to be the central node as it has the highest number of linkages in both cases and surprisingly the US market, which is usually accepted as the world's most important financial market, displays a somewhat looser connection with the others. The European Union (EU) seems to form the central trunk of the MSTs and the clusters appear to be organized principally according to a geographical position and historical and linguistic ties (Gilmore, Lucey and Boscia (2010)).

In period one, The European countries do not form a single body but tend to form several subgroups. UK serves as a hub for connection between developed European countries and developing countries of Eastern Europe. Eurozone members are connected except Austria and Greece. Austria heads a branch that

[8] Since data were unavailable, we had to omit three markets; Bosnia and Herzegovina, Kuwait and Serbia in the analysis of period one.

includes clusters of additional Europe countries. Six new members of European Union of that time, seems closely related in two different groups; Estonia, Lithuania, Latvia and Czech Republic, Hungary, Poland. Luxembourg connects West Europe to Asia. Hong Kong, which is a key financial centre in the world, acts as a bridge for connecting three other main financial markets in Asia; Singapore, China and South Korea to Europe. South Korea and Singapore head branches with several groupings. Similarly Western and Central Asia countries like Qatar, UAE, Bahrain, Jordan, and Oman form a group tied to West Europe markets through East Europe markets. Some weird connections like Kazakhstan to Malaysia, Venezuela to Slovakia or Macedonia with Bahrain which occur due to the aforementioned problem with MST.

However, major changes are observed between two periods. In particular, the effect of the Eurozone debt crisis shows itself on the financial markets in period 2. The problematic countries Greece, Italy, Portuguese, Spain and Cyprus are all tied together, showing that bond market connection results with stock market connection. UK, not a Eurozone member, loses its importance in the network in period 2. Three important markets that are positively diversified from the others through the 2008 crisis (Russia, India and South Korea) stand isolated in the network.

2.3.7 Centrality Measures

In network theory, the centrality of a node determines the relative importance of that node within a network. Next, we perform a detailed analysis on MSTs using different quantitative definitions of centrality.[9]

[9] Before beginning the analysis, we point out an important observation: even we have an extra three edges in the network in period two, the total distances in the MST is 82.593 whereas this values is 87.651 in period one. This shows increased strength in the correlation of financial markets after the 2008 crisis. A similar conclusion is obtained by using the time-varying correlation data from the Section 2.3.4. In particular, we split the time-varying correlations into two sets as pre and post 2008. A non-parametric median comparison test reveals that the set of correlations in post 2008 has a significantly larger median.

Node degree is the number of nodes that is adjacent to it in a network. In general the larger the degree, the more important the node is. The highest ten node degrees and the frequency distributions are given in Table 2.1 and Figure 2.15 respectively.

[Insert Table 2.1 and Table 2.2 about here]

Node strength is the sum of correlations of the given node with all other nodes to which it is connected. The highest ten node strengths and the frequency distributions are given in Table 2.2 and Figure 2.16 respectively.

[Insert Figure 2.15 and 2.16 about here]

Eigenvector centrality is a measure that takes into account how important the neighbours of a node are. It is useful in particular when a node has a low degree but is connected to nodes with high degrees and thus the given node may influence others indirectly. It is defined as the *i*th component of eigenvector v, where v corresponds to the largest eigenvalue λ of the adjacency matrix A. The highest ten eigenvector centralities and the frequency distributions are given in Table 2.3 and Figure 2.17 respectively.

[Insert Table 2.3 about here]

[Insert Figure 2.17(a) and 2.17(b) about here]

Betweenness centrality measures the importance of a node as an intermediate part between other nodes. For a given node k, it is defined as

$$B(k) = \sum_{i,j} \frac{n_{ij}(k)}{m_{ij}} \tag{17}$$

where $n_{ij}(k)$ is the number of shortest geodesic paths between nodes *i* and *j* passing through k, and m_{ij} is the total number of shortest geodesic paths between *i* and *j*.[10]

[10] MST is a fully-connected network so mij ≠ 0.

The highest ten betweenness centralities and the frequency distributions are given in Table 2.4 and Fig. 18 respectively.[11]

[Insert Figure 2.18(a) and 2.18(b) about here]

[Insert Table 2.4 about here]

Closeness centrality is a measure of the average geodesic distance from one node to all others. This measure is high for strongly connected central nodes and large for poorly connected ones. For node *i* in a network with N nodes, it is defined as:

$$C(i) = \frac{1}{\sum_{j=1}^{N} d(i, j)} \tag{18}$$

where d(i, j) is the minimum geodesic path distance between nodes *i* and *j*. The highest ten closeness centralities and the frequency distributions are given in Table 2.5 and Figure 2.19 respectively.

[Insert 2.5 about here]

Analysis reveals that France takes first place in almost all categories for both periods and other financial centers Germany, Hong Kong and Singapore keep their importance in the network after the crisis. However, the same cannot be said for the UK; while belonging to the top ten in all categories in period one, it belongs to the top ten only in 2 categories in period two.[12]

[Insert Figure 2.19(a) and 2.19(b) about here]

[11] There are 38 indexes in period one and 41 indexes in period two with zero betweenness centrality i.e. for any two markets in the network, no shortest path passes through them.

[12] Note that all frequency distributions of centrality measures (except for closeness centrality) are likely to decrease exponentially. One may say that these measures exhibit a power-law distribution; $p(x) \sim x^{-\beta}$ for measure value x and constant β which in the case the network is called scale-free as explained in Barabsi et al. (1999)

2.4 Discussion

In our study, one concern about the correlations between financial markets is that the relationship may be non-linear; in that case rank correlation may capture the relations better. In order to see the difference, we use a rank correlation approach: for each index *i*, the returns $R_i(t)$ are ranked $R_i^{rank}(t)$ then normalized as

$$r_i^{rank}(t) = \frac{R_i^{rank} - \langle R_i^{rank} \rangle}{\sigma_i^{rank}} \tag{19}$$

where $\sigma_i^{rank} \equiv \sqrt{\langle (R_i^{rank})^2 \rangle - \langle R_i^{rank} \rangle^2}$; then we repeat every analysis. The results are almost indistinguishable. The largest eigenvalue is ≈ 22.44 and $\approx 94\%$ of the eigenvalues are smaller than $\lambda_{\max}$. Considering components of the largest eigenvector, the top six positive contributers do not change. For the network analysis, we define the metric as a linear realization of the rank correlation; $d_{ij} = 1 - c_{ij}$. The major difference is that (instead of Germany) France serves as a hub for connecting North America and Europe in period two.

A lagged relationship is a possible characteristic of many pairwise financial time series. First, it would not be a surprise if one series had a delayed response to another time series, or it had a delayed response to a common event that affects both series. Secondly, it may be the case that the response of one series to the other or to an outside event may spread in time, such that an event restricted to one observation elicits a response at multiple observations. Furthermore, series may not even be stationary in some cases. Equal-time cross-correlations are inadequate to characterize the relationship between time series in such situations. Some authors incorporated these facts into their studies and revealed interesting results using the concepts of detrended and long-range cross-correlations and time lag RMT.[13] These

[13] For example, Kullmann et al. (2002) showed that in many cases the maximum correlation appears at nonzero time shift, indicating directions of influence between the stocks. Similarly, Wang et al. (2011) find long-range

new approaches to our data set would be informative further study and analysing the differences in our findings and further study would give further insides about time lag of connection structure between financial markets.

2.5 Concluding Remarks

The global financial crisis of 2008 began in July 2007 when a loss of confidence by investors in the value of securitized mortgages in the US resulted in a liquidity crisis. In September 2008, the crisis deepened as stock markets worldwide crashed and entered a period of high volatility. This study compares before and after the 2008 crisis by analysing the cross-correlations of financial markets using the tools of RMT and network theory. In particular, we verified the validity of the universal predictions of RMT for the statistics of the eigenvalues and the corresponding eigenvectors of the cross-correlation matrix. Then the cross-correlations between markets not totally explainable by randomness were identified by computing the deviations of the empirical data from the RMT predictions. We showed the presence of a certain linear combination of indexes representing a global market itself that arises from interactions.

By using this particular combination, we observed that markets become highly correlated in times of high volatility (also the time-varying largest deviating eigenvalue peaks during the highest volatility); moreover when the volatility passes to its low levels, the increased degree of co-movement continues for a considerable amount of time. We also find that markets are more correlated after 2008 compared to the period of 2005–2007. These facts lower the diversification potential even if one constructs a widely internationally diversified portfolio of stocks.

We found the connection structure of financial markets for pre and post 2008 crisis using correlation based networks. We show that in an environment of

power-law cross-correlations in the absolute values of returns that quantify risk, and find that they decay much more slowly than cross-correlations between the returns. They find that when a market shock is transmitted around the world, the risk decays very slowly. See also Podobnik et al. (2010), Arianos et al. (2009).

increasing integration of trade and financial markets, geographical position and historical and linguistic ties still play an important role in co-movements of stock markets. Analysis also shows that Eurozone debt crisis forces the stock markets of problematic countries to move together, revealing an interesting fact on how bond and stock markets of a country interact.

We identified key financial markets using several centrality measures. Analysis shows that centers like France, Germany and Hong Kong keep their importance in the financial system after the 2008 crisis. However, the same cannot be said for the UK.

To extract the information arising from non-linear relations between markets, we repeated each analysis using a rank correlation and found that the results are almost indistinguishable. Possible extensions for further research includes applications of the long-range cross-correlations and time lag-RMT to our data.

3. TRADING PUZZLE, PUZZLING TRADE

3.1 Introduction and Literature Review

Stock market movements are consequences of human judgment, interactions and behaviour. Many studies provide extensive evidence that individual traders are imperfectly rational and prone to psychological biases that lead to costly investment mistakes[14]. For example the high trading level of the stock market was claimed to be inconsistent with the rational expectation models (Shiller (1981)). Glaser and Weber (2007) concluded that the rational motives for trade were not sufficient to explain the high trading volume in the stock markets. Even though there are few contrary results (see Ivkovich and Weisbenner (2005) as an example), many studies showed also that individuals underperform the market. It's well accepted that even the models supporting the efficient market model acknowledge the fact that asset prices are too volatile. High volume of trading often denoted as the reason for this volatility and many other market anomalies (Miller (1971)). Studies on the market anomalies raised the importance of well ignored component of stock market: human itself. Shefrin and Statman (1994) showed in their behavioural CAPM model that the noise traders create higher volume in the market. Glaser et. al (2007) concluded that the rational motives for trade are not sufficient to explain the high trading volume in the stock markets.

High trading paradigm in finance literature often denoted as overtrading. There is a huge literature in overtrading since overtrading is conceptualized as counter evidence against efficient market hypothesis. In modern finance theory, investors assumed to be rational and their trading pattern should be consequence of

[14] For abnormal returns: Banz (1981); excessive volatility: Shiller (1981); high volume effect Miller (1977); return pattern related to past performance, DeBond and Thaler (1985, 1987), momentum and disposition effect; Jegadeesh and Titman (1993), Barberis and Shleifer (2003), Grinblat and Titman (2000) etc. Especially, studies that show market anomalies rooted in the individual actions (Schlarbaum et. al. (1978), DeBondt and Thaler (1985, 1987), Shefrin and Statman (1984, 1985), Solt and Statman (1988, 1989), Odean (1999), Barber and Odean (2000, 2002), Barber et al. (2009, 2011)). For psychological factors of imperfect rationality see, Campbell (2006), Fazio (1983), Ajzen (1985, 1988, 1991), Wagenaar and Keren (1986), Russo and Schomaker (1992).

their optimal behaviour. However many empirical researchers found contradictory result which highlight that many investors reach sub-optimal returns due to overtrading. Glaser et al (2004) concluded that the rational motives for trade are not sufficient to explain the high trading volume in finance market. Also Odean (1999) and DeBondt and Thaler (1995) noted that "high trading volume in financial markets is the single most embarrassing fact to the standard finance paradigm."

Many researchers tried to explain the overtrading observed financial market phenomena by trying to capture the behavioural motives of the investors. Finance literature developed in the line of researches that construct the behaviourally based paradigm in which investors are imperfectly rational and prone to systematic biases. There has been ongoing debate on the potential systematic biases but the individual judgment biases took deeper attention. Odean (1999), Gervais and Odean (2001) and Daniel (1998) focuses one specific judgment bias: overconfidence.

Moore and Healy (2008) reconciled the 3 distinct ways of defining overconfidence: overestimation of one's performance, over placement of one's performance relative to others, excessive precision in one's beliefs. In psychology, calibration of subjective probabilities suggests that people tend to overestimate the precision of their knowledge. [Alpert and Raiffa (1982), Linchtenstein, Fischhoff and Phillips (1982)] Many clinic psychological researchers concentrated on observation to exhibit overconfidence in financial investors [Yates (1990)].

Trading in financial market is costly and risky. Traditional economic theory concludes that there is no room for speculative trading [Tirole (1982) and Milgrom and Stokey (1982)]. Hence overtrading might be a consequence of overconfidence. Barber and Odean (2000) noted that average annual turnover is 75% whereas most active traders has turnover ratio that is more than 250%. Such aggressive trading cannot be explained by non-speculative motives but rather by the other systematic biases. According to Odean and Barber (2000) this systematic bias arises from the overconfidence.

Opposite to the regular rational expectation framework developed by Grossman and Stiglitz (1980), Odean and Barber (2000) argued that investors trade

even the marginal benefit of doing so is less the marginal return due to overconfidence bias. They have found an empirical evidence showing that active traders perform poorer than the average individual investors since they over value their personal information. According to empirical evidence presented by Odean and Barber (2000), households who trade frequently earn net annualized mean return of 11.4%, whereas who trade infrequently earn 18.5%. Their research in strictly assumes that overconfidence leads to overtrading hence overconfidence leads to inefficiency in the market.

Odean and Barber (2000) analyzes returns earned on common stock investment by households for the period 1991 to 1997. They have partitioned the sample of households according to their trading activity level. They have compared the returns earned by high turnover investors' to their own benchmark returns which is the value of their portfolio at the beginning of the year. They also analyzed Fama and French (1993) intercept and CAPM intercept to evaluate the return performance of the high turnover investors.

Pioneering study of the Odean and Barber has led to many researches to contribute to the behavioural finance literature. Empirical development of the overconfidence theory has followed two tracks. First aspect has developed parallel to the psychological aspects and generally includes the studies on the psychological backgrounds for overconfidence. (Statman et. al (2003) and Odean (2001)) The other approach is to explain the reasons and consequences of overconfidence and other approach is to develop foundational aspects of overconfidence. (For example, Kirchler nad Maciejovsky (2002), Hilton (2001) and Graham and Harvey (2002)).

Psychological foundations are based on cognitive psychology. Kahneman and Tversky (1982) points three main heuristics that could play important roles in spurring the overconfidence: the representativeness heuristics, the availability heuristics and the adjustment and anchoring heuristics. These three heuristic branches have been studied extensively and they consist of phenomenal concepts such as base-rate neglect (ignoring prior probabilities), sample size neglect, misconception of probability, and insensitivity to predictability, illusory correlation

and self-evaluation bias. [Griffin and Tversky (1992), Lundeberg (1994), Gigerenzer (1991), Barber and Odean (2000)] Contribution of Probabilistic mental model (PMM) allowed researchers to question very existence of the overconfidence whether it arises from the faulty structures of studies or true cognitive biases affecting the judgments. Numerous researchers argued that overconfidence is a consequence of faulty structures due to illusory nature of overconfidence. Juslin (1994) notes that hard and easy effects in cognitive bias has led to faulty interpretations of regression effects. Ayton and McClelland (1997) introduce stochastic component in judgment and concluded that overconfidence is a methodological illusion. Benoit and Dubra (2011) showed that the questionnaires create an evaluation bias by asking only ranking questions whereas an answer given to ranking questions purely a consequence of purely rational Bayesian updaters.

Although some researchers primarily focus on the problematic nature of the modelling overconfidence itself, studies that link overconfidence and the consecutive behaviour goes beyond the foundational aspects' scope. The second approach which is to explain the reasons and consequences overtrading has been analysed by many researchers for different fields. Clinical psychology (Oskamp (1965), physiology (Busyhead (1981)), engineering (Kidd (1970)), entrepreneurship (Dunkelberg (1988)), law (Wagenaar and Keren (1986)), management (Russo and Schomaker (1992)) studies found evidence for overconfidence and they have analysed various aspects related to overconfidence. In finance, after Odean and Barber's (2000) study, numerous researchers found evidence supporting that overconfidence leads to overtrading. [Gervais and Odean (2001), Glaser and Weber (2003), Benos (1998), Grinblatt and Keloharju (2009), Kirchler and Maciejovsky (2002), Lin (2005), Statman, Thorley and Vorkink (2006)]

Another pioneering study by Barber and Odean (2001) suspected the effect of gender difference on overconfident activities and they have concluded that men are more overconfident compared to women in financial trading activities. Also they found evidence that men underperform in respect of return performance.

Tourani-Rad and Stephen Kirkby (2005) found that characteristics such as past success, optimism, confidence in one's abilities, investment experience and investment-related knowledge leads to overconfidence. Lin (2005) focused on the consequences of overtrading: high volatility. Statman, Thorley and Vorkink (2006) studied overconfidence which is the reason for the disposition affect in the finance market. Dorn and Sengmueller (2009) concluded that overtrading can be result of entertainment (gambling motives) rather than overconfidence. Recent literatures expand on the various for and counter evidence for the link between overconfidence and overtrading.

Several studies attributed individual investors' performance to demographic factors. Goetzmann and Kumar (2008) found that individual investors who are younger and poorer tend to hold more under-diversified portfolios, suggesting that they may exhibit stronger cognitive biases due to their demographic characteristics. In another related study, Korniotis and Kumar (2011) showed that cognitive abilities decline with age and they have found evidence to support the notion that investment performance declines with age. Another line of study investigates the gender differences on the return performance and trading behaviour. Barber and Odean (2001) showed that men underperform women in stock trading with higher tendency to trade more and significantly inferior return performance. Grinblatt et al. (1995) and Seiler et. al. (2013) found that home bias, culture and demographic characteristics may have combined effect on the return performance. Bloomfield et al. (2009) noted the informational aspects on the return performance. However, Felton et al. (2003) and Feng and Seasholes (2008) found no significant evidence for the effect of gender characteristics on the return performance.

This study contributes to the understanding of investor behaviour in three ways. First, concerning the scarcity of individual trading data, we add a new market data to the existing field of research which is supposed to contribute to the comparison of investors from different cultures. Huang et al. (2011) noted that Asian markets differ in significant dimensions to the Western markets especially for the cultural pattern as individuals are more prone to cognitive biases. Also,

individual investors dominate the market for the small size stocks. Their study concludes that the fundamental differences in culture can spur the overtrading in the stock market. Barber et al. (2008, 2009), Gao and Lin (2010) analysed the individual investors in Taiwan, Feng and Seasholes (2005, 2008) studied the individual investors in China; both studies have found supporting evidence for the cultural characteristics on the return performance. Our study is unique with its regional data, individual investor trade activities from high turnover MENA region.

Second, this paper contributes to the literature with the weekly performance analysis of individual investors. We explore the return performance of individual investors with respect to various factors such as portfolio size, turnover ratio as well as gender, age. Barber and Odean (2000) initiated a pioneering study on the relationship between turnover and individual investors' portfolio return. They have found that as investor's turnover increase, their respective portfolio return decreases. We differentiate from their work with our weekly aggregated data. By this, we mean that even though we have daily trades of individuals, the returns of their portfolios are calculated weekly. Profitability of the individual investors' trades can switch when the analysis is conducted on weekly data rather than monthly. Barber and Odean (2001) noted that individuals who trades frequently, makes substantial benefits from intra-month trading. The portfolio returns of the individuals are calculated weekly contrary to the most of the literature which use monthly aggregated data. We also differ from most of the studies utilizing a sample from the official depository agency of the country, not a single securities firm.

Third, we aim to focus on several features of the potential factors of individual investors that are expected to be correlated with their return performance. We explore the correlation of return performance of individual investors with respect to several factors such as portfolio size, turnover, holding period, gender and age. Aiming at reaching comprehensive picture of individual investors' trading patterns, we handle our unique data set from different approaches. We provide both separate analyses of the possible individual-related factors counted above and cross-sectional combined analyses including all variables together.

Specifically, we add evidence on the effect of portfolio size on which there are opposite findings and no clear consensus in the literature. Also, to best our knowledge, this study is one of the first studies that present the effects of holding period on the stock returns. We aim to see if individual investors suffer from inadequate decision for holding stocks in a way that selling them earlier or later than possible optimal holding time. Moreover, our findings indicate that return performance increases with portfolio holding time which can be inferred as evidence that individuals hold shorter than optimal holding period.

Before starting the main findings and discussions, we present that investors, on the average, underperform the market. Our results support the previous papers that the return performances of individual investors are inferior to the market index returns, ceteris paribus. We further demonstrate that, on the average, female investors have higher average weekly returns and lower turnovers than male investors.

There has been long debate about the individual investors' performance in the literature. Individual traders often regarded as noise traders who are best uninformed. Therefore, several studies focus on individual investors' performance compared to general market returns. We start presenting our results with the first finding that investors underperform the market. This results is consistent with mainstream papers like Blume and Friend (1995), Odean (1999), Barber and Odean (2000), Grinblat and Keloharju (2001), and Hirshlifer (2001). However, there are some studies concluded different results like Ivkovich and Weisbenner (2005) who found that home bias led individual investors to outperform the general market. Our results indicate that regardless of turnover characteristics of individual investors, their return performance is inferior to the general market returns. Also, underperformance of the individual investors is not dependent on the demographic characteristics.

Second finding is on the relationship between turnover and return performance of the individual investors. As a high turnover stock market, analysis of the individual investors' turnover ratio in Borsa Istanbul can give important

insights about the investment practices. 99% of the investors in Borsa İstanbul are individual investors and 83.1% of the trades are executed by these investors. So it can be inferred that the high trading volume is created by the individual investors and they generally hold on to their purchases for the very short period of time compared to the other investors (Kaniel, Saar, Titman (2008)). Chuang and Susmel (2011) compared institutional vs. individual inventors on their return performances and they concluded that individual investor trades even more aggressively in bearish markets whereas institutional investors trade more conservatively. This result is similar to Gervais and Odean's (2001) conclusion that uninformed individuals trade more aggressively and they tend to be more overconfident. This paper also contributes to the literature with the weekly performance analysis of individual investors. Our results indicate that as the turnover ratio of individual investors' portfolio increases, the return of the portfolio decreases. This result can be considered as a supporting evidence for overconfidence hypothesis. (For further study on relation to the overconfidence hypothesis see Barber and Odean (2000), Yeoh and Wood (2011), Statman, Thorley and Vorkink (2006)

Thirdly, concerning that the effect of the portfolio characteristics on the return performance can give important information on the general structure of the stock market; we presented return performance based on the portfolio size. Consistent with Kumar (2007), we found that the bigger size portfolios have higher returns in general.

Fourthly, we look at the age and gender characteristics of the individual investors and the effect of these characteristics on the return performance. Goetzmann and Kumar (2003, 2008) found that individual investors who are younger and poorer tend to hold more under-diversified portfolios, suggesting that they may exhibit stronger cognitive biases due to their demographic characteristics. Moreover the relationship between portfolio size and age can give important insights about the individual investor's investment decisions. Another line of study goes with the gender differences. Barber and Odean (2001) contributed the pioneering study to show that men underperform women in stock trading. They

analysed individual investor behaviour and concluded that men who are more overconfident than women tend to trade more and have inferior return performance. (Choi et al. (2002), Angew et al. (2003) and Mitchell et al. (2006) are among the other studies supporting the same result). However, Felton et. all. (2003), Feng and Seasholes (2008) found no significant evidence for the effect of gender characteristics on the return performance. Following Odean's study, Hamacher (2001) found contrary result concluding that "gender matters less than personal style, age and education when it comes to rendering good planning advice." Grinblatt et al. (2000) found that home bias, culture and demographic characteristics may have combined effect on the return performance. In another related study, Korniotis and Kumar (2009) showed that cognitive abilities decline with age and they have found evidence to support the notion that investment performance declines with age. Since there are numerous characteristics for individual investors, in sake of simplicity and to keep track of significant characteristics of the individual investors, we only document the effect of age and gender on the return performance. With vast literature developed for the effect of gender characteristics on the aggressive trading strategies, we study both age and gender characteristics of individual investors. We find that on average women have better performances than men. Likewise, age has a positive effect on the portfolio performance of individual investors. We also find that the coefficient "Age*Gender" has a negative and significant sign suggesting that females earn less compared to men when they get older. This interesting evidence implies that behavioural characteristics of individual investors need more attention and combined effect of these characteristics should be studied before any conclusive intuition is asserted.

To the best of our knowledge, this study is one of the few studies with individual data. Also, this is among the few studies that focus only on emerging market stock exchange individual investor's characteristics. Only study that uses individual data from Turkey beside ours is Fuertes et. al. (2012) which tracked brokerage house tracking 59,951 individual investors' accounts over the period 2008-2010. They look for the behavioural reasons for the under diversified portfolio

in Borsa İstanbul. We rather study on the relationship between turnover and returns whereas their study concentrates on the relationship between portfolio size and returns.

Moreover, this study will contribute to understand the behavioural-cultural differences across the various stock markets. Huang, Heian and Zhang (2011) noted that Asian markets differ in significant dimensions to the Western markets especially for the cultural pattern which are more prone to cognitive biases. Also, individual investors dominate the market for the small size stocks. Their study concludes that the fundamental differences in culture can spur the overtrading in the stock market (See also Chen et. all. (2007), Kim and Nofsinger (2003) and Yates et al. (1997)). Barber et. al. (2008, 2010) and Gao and Lin (2010) analyzed the individual investors in Taiwan, Feng and Seasholes (2004, 2005, 2008) studied the individual investors in China; both studies have found supporting evidence for the cultural characteristics on the return performance. This study is unique with its regional data and the individual investors' gender and age characteristics analysis can be inferred as the indicator for cultural patterns which has significant effect on the portfolio returns. Hence, we do not only contribute to the overconfidence literature but also add an important analysis of an emerging country data to the behavioural finance literature.

Last but not the least, we extend our analysis to the average stock holding periods. Individuals generally hold stocks for a very short period of time compared to the institutional investors[15]. We find that return performance increases with portfolio holding period, which can be inferred as that individual investors could perform better if they held their stocks for longer periods. The rest of the paper is organized as follows. We explain the data and methodology in Section 3.3. Section 3.4 gives the empirical results and Section 3.5 concludes.

[15] See Lai et. al. (2013), Kaniel et al. (2008) and Chordia et al. (2011) for individual vs. institutional investor analysis.

3.2 Review of Behavioural Biases in Financial Markets

Our study contributes into behavioural finance literature by analysing the portfolio returns. Main bias that is covered in literature review session above is the overconfidence. However, behavioural finance literature extended with many other behavioural biases that affect investor decisions. In this section, short brief review of behavioural biases that affect investors which would help to map our contribution into literature.

Studies focus on investor's decisions gained momentum after the development behavioural finance literature. Especially after 1980's, anomalies in financial markets attract attention. Before the development of the behavioural finance literature, market anomalies presumed to be consequence of the market disequilibrium. Underlying features of disequilibrium were neglected by the researchers in the previous studies. Pioneering studies by Daniel Kahneman showed that the deviation from the efficient market conditions and irrationalities behind the investor behaviour are the main reasons that led to disequilibrium in the financial markets. After their study, behavioural biases arise from psychological and sociological aspect of investor behaviour have been studied extensively. Literature has extended many experimental studies labelling many behavioural biases. Though the biases defined in the literature overlap for their some features, we represent the most common behavioural biases that is visible in the financial markets in this chapter.

3.2.1 Overconfidence

Overconfidence arise from the misperception that the individual investor's information set is superior to the other investors in the market. Investors tend to believe that their information is unique to themselves hence they tend to legitimize the superiority of their investment decisions. Though "belief" has been covered in cognitive psychology, behavioural finance studies focus on the overconfidence and

its consequences in the market anomalies. Investors who have tendency to be overconfident generally are the investors who have successful investment in their previous investment decisions. Hence, they have tendency to put emphasis on their personal abilities. Overconfidence generally results investor's to take more risks in their further investment decisions. More often, overtrading which creates higher volatility than the efficient market suggest presumed to be the consequence of overconfidence bias (Please refer to the previous chapter which includes detailed literature survey on overconfidence bias).

3.2.2 Regret Minimization

Regret arises from the situation where the unselected investment alternative has better consequences compared to selected one. Investors who have made inferior investment decisions tend to feel regret for unselected better alternative. This bias affect their further choices and these investor tries to minimize their regret by legitimizing their choice such as increasing their further revenue expectations for their choices. Hence, investors under regret minimization bias tend to hold onto their selected portfolio even if their choices stream further losses. Bar-Hilel and Neter (1996) showed in their experimental studies that, people refuse to sell their lottery tickets from the same price or even higher price. In other studies they show that investors hold on to their portfolio's and refrain from selling devalued asset in expectation that they may regain their losses in the future. Shefrin and Statman (1985) showed the other side of the regret minimization bias. When investors have stocks that gained value over time, they tend to hold on to that portfolio rather than realizing their profits. Shefrin and Statman (1985) argued that such choice arises from the regret minimization. Selling a stock with increased price may cause a regret if the price goes higher. Hence, investors try to refrain from the regret by holding more than the optimal holding period under the regret minimization bias. Oechler (2000) points out that regret minimization bias can be consequence of disposition effect which is denoted as riding losers too long. Strong personal

commitment to the purchased stock can do a lot harm to investors. There is Avast growing literature to analyse further the disposition effect in the modern finance theory.

3.2.3 Representativeness Bias

This bias is result of cumulative experience. Investors who have experienced similar results tend to expect the same output. They shift their expectations according to their previous experiences rather than the present conditions. Foundation of this bias relies in the stereotype thinking in psychology. For example, if you toss a coin many times and result is tails in every experiment, then representativeness bias may lead you to expect that if coin is tossed again tails will be outcome or at least you may expect to be probability of tails to be higher than heads. Representativeness bias do not only arise from the persona experiences but also from the tendency to give certain developments, reports or statements more importance or higher degree of probability that they really deserve. A statement of a corporate or an economist can be given too much weight in decisions. This error falls under a broad behavioural finance bias called representativeness bias. Investors have tendency to assume that their experiences enough to represent whole set of events or reverse. In both cases, this bias leads investors to act differently from the rational expectations suggests.

3.2.4 Frame Dependence

Frame Dependence is a result of fast pace information flow in financial markets. Investors set up personal rules to execute any investment decisions. These personal rules are over simplified rules that may alter according to recent information flow that may be accounted with more importance due to behavioural bias. Ability of an investor to tolerate risk dependent on the investor's personal financial circumstances, investment time horizon, size of an investment in the context of

portfolio. Frame dependence refers to tendency to change risk tolerance according to these circumstances with changing market conditions. Typical examples of these behavioural biases are over-reaction and under-reaction. Bal and Brown (1968) noted that under-reaction, investors hold on to their high return portfolios even though the returns of these portfolio's decline over time due to recent development in the market conditions. Their study also confirms that, in the altering scenario, investors reluctant to sell their loosing portfolio due to fallacy of the accounting recent price changes in the financial markets. Over-reaction due to frame dependence occurs when the density of the positive news increase for some stocks, investors give more importance to recent news and they buy extensively by changing their risk tolerance. Bondt and Thaler (1985) studied the frame dependence in the stock markets and concluded that frame dependence bias direct investors to buy in high prices and sell in low prices.

3.2.5 Anchoring

Anchoring is similar to frame dependence. First introduced by the studies of Tversky and Kahneman (1974), anchoring refers to estimation bias due to reference information. Tversky and Kahneman (1974) conducted empirical analysis in which the test subjects are asked to give estimate result of mathematical computation 1*2*…*8. Average estimate is 512 whereas the other subject group asked to give same estimate result for mathematical computation 8*7*…*1. Second group average is 2250 which is higher than the former experiment. Though the mathematical operation is same, experiment group give different estimates since they anchor their expectation to different reference points (1 or 8). Change in the reference point creates fallacy in the estimation of investors. They tend to concentrate on the last price rather than the history of the prices and their decisions suffer from the anchoring bias. Expectations are easily affected by the quick interpretation or very recent information gained in the market reports. Shiller (1998) showed that the anchoring creates bias in pricing strategies in the financial markets.

Investor's personal expectation of the price may be higher or lower than the efficient prices due to their historical experiences in the price movements.

3.2.6 Self-Serving Bias

Self-serving bias generally related to two cognitive defects: optimism and confirmation. Optimism arises when someone's subjective confidence in their judgements is reliably greater than their objective accuracy. Studies of Marottoli and Richardson (1998) showed that 70% of the high school student claim to have above-average leadership skills. This claim is statistically impossible whereas some students should be below average but only few of the people claim to be below average in their skill set (Only 2% in conducted survey). Their conducted survey also present interesting results. 92% of the students said that they were of good character and 79% of those same students admitted stealing from a store within the prior year and 60% said that they had cheated on an exam. This study indicated that people are optimistic about their judgements about their skill set. Similarly, people think that they gather and evaluate facts and data before giving a judgement. Instead people tend to support their pre-conceived conclusions. When a conclusion fits with people's desired narrative, so much the better, because narratives are crucial to how people make sense of reality. This self-confirming nature of our judgements feeds the self-serving bias of investor's. self-serving bias pushes investors to judge their decisions such that good outcomes is a consequence of one's personal doing rather than consequence of high complex interaction of changes in the markets. Thaler (1985) summarizes this mental accounting process as investors record their decisions in different cognitive categories. An outcome of a investment decision recorded into cognitive account and further decisions are referred to recorded cognitive accounts. Hence, mental accounting process affect investor's decisions. This self-serving cognitive mechanism creates self-serving bias in financial markets.

3.2.7 Herding Behaviour

Herding behaviour refers to be influenced by others decisions or following the other agents rather than using adequate information and analysis. When the market is volatile and the risk-reward analysis is hard to execute, investors may prefer to flee to safer heavens by doing what others do. No one wants to fight against the massive power of an increasing majority when all investors are running in the same direction. Shiller (1990) showed how the herding behaviour in institutional risk management strategies amplify the volatility, destabilize the market itself and increase the fragility of the financial system. There are several reasons leading investors to fall into herding behaviour bias. First, other may know something about the return of the investment and their actions reveal this information. Second, the incentives provided by the compensation scheme and terms of employment may be such that imitation is rewarded. Another reason for herding behaviour is the investors may have intrinsic preference for conformity. Herd behaviour or information cascades arise from the information differences.

According to the definition of herd behaviour given above, herding results from an obvious intent by investors to copy the behaviour of other investors. This should be distinguished from "spurious herding" where groups facing similar decision problems and information sets take similar decisions. Such spurious herding is an efficient outcome whereas "intentional" herding need not be efficient. But it needs pointing out that empirically distinguishing "spurious herding" from "intentional" herding is easier said than done and may even be impossible, since typically, a multitude of factors have the potential to affect an investment decision. Fundamentals-driven spurious herding out of equities could arise if, for example, interest rates suddenly rise and stocks become less attractive investments. Investors under the changed circumstances may want to hold a smaller percentage of stocks in their portfolio. This is not herding according to the definition above because investors are not reversing their decision after observing others. Instead, they are reacting to commonly known public information, which is the rise in interest rates.

3.2.8 Loss Aversion

Loss aversion generally refers to investor's tendency to prefer avoiding losses to acquiring potential gains even though they have equivalent value. Loss aversion favours inaction over action and the status quo over any alternatives. Loss aversion should not be mixed with being risk averse. Risk averse investors prefer not to take risk any circumstances whereas the loss aversion lead investors to change their risk preference in the case of potential losses. Kahneman, Knetsch and Thaler (1990) proposed endowment effect (people tend to place higher value on the good they preserve than on an potential good that they do not preserve) is the driving force for the loss aversion bias in the financial markets. They have demonstrated loss aversion by an experimental study. In each experiment, half of the subjects were randomly assigned a good and asked for the minimum amount they would be willing to sell it for while the other half of the subjects were given nothing but asked for the maximum amount they would be willing to spend to buy the good. Since the value of the good is fixed and individual valuation of the good varies from the fixed value only due to sampling variation. The results showed drastic differences between induced value markets and good markets. The prices of buyer and sellers in induced-value markets matched almost every time as the perfect market efficiency suggest. However, goods markets sellers had much higher selling prices than buyers' buying prices. The result does not change over many trials which indicates that good holders were reluctant to sell their good which was taken as an evidence of existence of endowment effect due to loss aversion bias. Investors tend to avoid regret by holding onto their portfolios rather than selling a portfolio thinking of future value might be higher and they would regret their transaction.

3.3 Data and Methodology

3.3.1 Data Specifications

Our dataset, provided by the central security depository of Turkey (MKK), covers the all transactions and holdings in Borsa İstanbul Equity Market. Borsa İstanbul, one of the most advanced emerging markets, is the largest and the most liquid equity market in the Eastern Europe and MENA region together with Moscow Exchange. Equity market has 405 listed companies, with $347 billion annual traded value and $301 billion market capitalization as of December, 2012. Even though only 37% of market capitalization belongs to domestic investors, their traded value is quite high, making 83% of the whole trade. Hence, though portion of domestic investors is lower than foreign, their monthly traded value is higher than the foreign investors. This situation depicts that the domestic investors trade in higher frequencies compared to foreign investors.

[Insert Figure 3.1 about here]

There are 1,090,059 domestic individual investors that capture 21% of the market capitalization. For this study, individuals who traded at least once in the two-year period and held portfolios more than 1,000 TRY (approx. $560) as of the end of 2012 are selected which amounts to 250,827 investors We randomly select 20,000 investors from these investors and used weekly aggregated daily trades for them[16]. Selection of the data is preserved under stratified random data characteristics such as the age, portfolio size distribution of the sample is the same in the population. (See Table 3.1 for details). The portfolio returns of the individuals are calculated weekly contrary to the most of the literature which uses monthly aggregated data. Higher frequency is preferred with aim of having clearer picture

[16] The data consists of approximately 11 million records (See also Barber and Odean (2001) and Statman et al. (2006) for data selection criteria).

for the performance of individuals since the turnover of the Borsa İstanbul is higher than most other markets (4th highest turnover in the world[17]). (See Figure 3.2)

[Insert Figure 3.2 about here]

The representative power of our data compared to other studies also stems from the fact that it is sampled from the depository agency (MKK) rather than a single securities firm. The data is also very reliable due to the fact that equities traded in Borsa Istanbul is fully dematerialized at MKK and therefore the data reflects the official records of the investors' portfolios.

Table 3.1 shows the general demographic characteristics of data set. Minimum age requirement of opening an account to execute stock market transactions is 18. Hence data characteristics are consistent with the general demographic characteristics of Turkey. Young population of Turkey is also visible in data set. Females are younger than males in MKK. Moreover, the median age is lower than the average age for all gender segments. Hence, general distribution of the individual investors is slightly skewed to the left in the data set. These demographic features will be analysed in detail in results section.

[Insert Table 3.1 about here]

The descriptive statistics of the sample is reported in Table 1. 83.1% of the individual investors are male (Percentage dominance of men was similar in Lease et al. (1974) as 80%, Barber and Odean (2001) as 78.7%). The average age of our sample individuals is 43 and average age of women is higher than that of men. Panel B shows that women have higher average portfolio size than men. Descriptive statistics indicate that distributions of the portfolio sizes are clearly positively skewed: the median portfolio size is $8,922, whereas the average of the portfolio size is $71,943. Although the averages of the portfolio sizes greatly differ for

[17] According to WFE Statistics as of 2012.

different genders, the median of the portfolio sizes are close to each other for males and females.

Figure 3.3 depicts the individual investor portfolio sizes. 70% of the individuals in our data set have less than 5 stocks in their portfolio. This interesting notion coincides with the arguments in the literature which states that the investors under-diversify their portfolio by taking extensive risks, notably more than efficient market predicts. 1135 individual investors hold only one stock over the one year period. That is consistent with the overtrading literature such that individual investors do not prefer to hold on to their portfolio for long time span. This picture also confirms that our data set is suitable to conduct behavioural bias analysis since the overtrading pattern is visible in the portfolio sizes.

[Insert Figure 3.3 about here]

[Insert Table 3.2 about here]

3.3.2 Methodology and Regressions

To begin the analysis, we first define the turnover as follows[18] :

$$Turnover_{jt} = \frac{1}{2}\left(\frac{TradedValue_{jt}}{\overline{PSize}_{j}}\right) \tag{20}$$

where $TradedValue_{jt}$ is calculated as 0.5 times the average of weekly total trades in terms of market value for the each investor j, and $\overline{PSize}_{j}$ represents the average of end-of week portfolio holdings in terms of market value for the each investor. Hence, $\overline{PSize}_{j}$ is constant for each investor j in the sample period. Weekly aggregated trade data includes number of shares and values whereas the position data includes only number of shares. Therefore, prices are calculated from trade data and these prices used to obtain end-of-week portfolio values. Then, we

[18] Our calculation methodology is similar to Barber and Odean (2000)

calculate weekly turnovers as the market value of stocks traded in each week divided by the $\overline{PSize}_j$. The second step is to estimate weekly returns of the investors using the portfolio data and adjusted stock prices, which are obtained from Bloomberg. We first calculate weekly returns of each stock and then calculate weighted weekly raw returns of portfolios:

$$r_{jt}^{raw} = \sum_{i=1}^{s_{jt}} p_{ijt} r_{it} \tag{21}$$

where is the weekly return for stock i in week t, p_{ijt} represents the weight that was calculated by dividing the end-of-week market value for stock *i* to the end-of-week market value of portfolio held by investor *j*, and s_{jt} is the number of stocks held by investor *j*. market adjusted returns are calculated weekly as follows:

$$r_{jt} = r_{jt}^{raw} - r_t^m \tag{22}$$

where r_t^m denotes corresponding weekly rate of return on BIST 100 Index (formerly IMKB 100 Index), main broad value-weighted index of Borsa Istanbul's equity market. Having calculated market adjusted weekly returns in (3) and turnover in (1) for each investor, we calculate the average return and average turnover $\overline{Turnover}_j$ for each individual *j* over T=104 weeks from January 2011 to December 2012 as:

$$\bar{r}_j = \frac{1}{T} \sum_{t=1}^{T} r_{jt} \tag{23}$$

$$\overline{Turnover}_j = \sum_{i=1}^{T} Turnover_{jt} \tag{24}$$

Note that the "average return" is market adjusted by subtracting the market index from raw returns as in (3). Next, to analyse return differences between investors with respect to turnover, investors are sorted into quintiles based on weekly turnover. Also, investors are sorted on the basis of portfolio size. To extend the analysis on the effect of portfolio size, we employ Capital Asset Pricing Model (CAPM) in addition to market adjusted returns:

$$\bar{r}_t - r_t^f = \alpha + \beta\left(r_t^m - r_t^f\right) \quad (25)$$

where r_t^m denotes the average return of investors for each week and r_t^f denotes the corresponding risk free rate calculated from term structure of interest rates of Turkish Treasury Bonds. We further analyse the effects of turnover and portfolio size as well as gender and age on average return for each investor in the following cross sectional regression:

$$\bar{r}_j = \beta_0 + \beta_1 \overline{Turnover}_j + \beta_2 Gender_j + \beta_3 Age_j + \beta_4 GenderXAge_j + \beta_5 \overline{PSizeh}_j \quad (26)$$

The variable $Turnover_{jt}$ which is defined in equation (5) is adjusted in a way that values higher than 100% are taken to be 100%. This restriction affects only 0.2% of the investors in the sample. $\overline{PSizeh}_j$ is a dummy variable indicating that the investor has a portfolio higher than the median. The gender is also a dummy variable which equals to 1 if the investor is female. The variable "Age" is the value of investor's age divided by 10.

Last, we repeat the cross-sectional analysis adding the holding periods of investors in each of stocks. Determinants of holding period has been analysed by Shum and Faig (2006), Chung and Wei (2005) but the effect of holding period length on stock return is not presented in the literature. We aim to see if individual investors suffer from inadequate decision for holding stocks such as trading the stocks earlier or later than potential optimal holding time. We calculate $hold_{ij}$, which is number of consecutive weeks in which the investor holds a stock same amount. We then calculate market value-weighted average of $hold_{ij}$ for each investor. We exclude the stocks number of which is 1 and amount of which is less than TRY 100 in the portfolios. Then we estimate the following regression in which we add the average holding period and square of the average holding period to the equation 7. The rationale behind adding the square of the holding period is that a possible change in the sign of the coefficient may imply that there is an upper limit for the benefit

of holding a stock longer, i.e. some level of optimum holding period exists.

$$\bar{r}_j = \beta_0 + \beta_1 \overline{Turnover}_j + \beta_2 \overline{Holdingperiod}_j + \beta_3 \overline{Holdingperiod^2}_j + \beta_4 Gender_j + \beta_5 Age_j + \beta_6 GenderXAge_j + \beta_7 \overline{PSizeh}_j \quad (27)$$

3.3 Results

First, we present our results by giving the return performance of individual investors. As Panel B of Table 3.2 indicates, the average market adjusted return is negative ($\bar{r}_j$ = - 0.29%) which shows that in this high-turnover market, on average the individuals cannot beat the market. 71.1% of individuals' average market adjusted returns are negative. The Capital Asset Pricing Model (CAPM) regression given in Table 3 also yields negative (-0.24, with p-value of 0.13) intercept which infers that the individuals' excess return is less than the market's excess return. Therefore, the average performance of individuals is worse than the market average. This is consistent with the literature in the sense that Kramer (2012) and Coval et al. (2005) showed that only informed individuals can beat the market.

When we divide the data across genders, women significantly outperform men in terms of average market adjusted returns (-0.16% compared to -0.31%). The fifth and the last column show that equality of mean/median adjusted returns of both genders is rejected at 1% level. The results are consistent with the findings of Barber and Odean (2001), Choi et al. (2002) and Charness and Gneezy (2012).

As Panel A of Table 3.2 shows, turnover for the whole sample is 113%. This result is significantly higher than 8.8% reported by Barber and Odean (2000), 2.52% reported by Kaniel et al. (2008) and 4.7% reported by Foucault et al. (2011)[19]. Moreover, the results indicate that both the mean and the median turnover are significantly lower for women than men on the average. In other words, women trade less than men. The results support the previous evidence that men are more likely to be overconfident than women.

[19] Concerning that the mentioned studies use monthly data, our weekly calculated result would have been even higher if a monthly data had been used.

[Insert Table 3.3(a) about here]

[Insert Table 3.3(b) about here]

Next we present the return performances of the individual investors. We define the "winners" as the investors who has average market adjusted return at the end of the portfolio holding period and "losers" as the investors who has negative average market adjusted return portfolio value at the end of the portfolio holding period. Table 3.2b shows that winners have higher portfolio sizes. It can be deducted that the higher asset sizes correlated with higher returns. Moreover, there is significant difference in female ratios which indicates that females have better performances compared to men. This result is also consistent with the literature which suggest that females are less prone to cognitive biases hence they do suffer less from the behavioural biases such as overconfidence. Also average age of winners is higher than the losers. That descriptive result also confirms the behavioural finance literature findings such as the experienced investors are less prone to cognitive biases.

We further analyse the relationship between returns and turnover in more detail. In order to highlight the effect of turnover on the return performance, we sort the individuals according to their turnovers and divide them into quintiles. As Figure 3.1 clearly indicates there is an inverse relationship between turnover and average return (The exact numerical results can be found in Appendix 2). That is, average return decreases as turnover increases. Consistent with Barber and Odean (2000, 2001), Kramer (2012) and Statman, Thorley and Vorkink (2006); higher trading activity results in inferior return performance for individual investors. Note that, highest turnover quintile has almost four times higher turnover than the average individual investor and sixty times higher than the lowest quintile. This high turnover has mainly been attributed to overconfidence by many studies (Odean (2000, 2001), Statman, Thorley and Vorkink (2006)). However some other studies claim that high turnover is due to information asymmetry (Kramer (2012)), private information (Kaniel, Saar, Titman (2012)) or rather individual's assessment of the firm characteristics (Hoffman, Shefrin, Pennings (2012)). Though these studies in

the literature focuses more on the reasons for overtrading, our study rather concentrates on the overtrading puzzle rather than the behavioural foundations of overtrading.

[Insert Table 3.4 about here]

[Insert Figure 3.4 about here]

There is also a positive relationship between average return and portfolio sizes. Figure 3.2 shows that, as portfolio size increases, the average return of the investor increases. (see Panel B of Table 3.3 in Appendix 3.6 for numerical details). High returns for bigger portfolios may be attributed to lower liquidity constraints for wealthy investors, i.e. they may not be forced to sell their stocks in hard times. They may also benefit more from professional investment services of the industry. As Kramer (2012) and Chang et al. (2009) noted that the individual investors who are superior informed or have better financial advice earn higher returns compared to uninformed high turnover traders.

[Insert Table 3.5 about here]

[Insert Figure 3.5 about here]

CAPM analysis across the quintiles of portfolio size provided in Table 3.6 confirms the positive relationship. The excess return (α), negative in all quintiles, is significant in the lowest three quintiles and decreases consistently as portfolio increases.

[Insert Table 3.6 about here]

Our results related to the return performance across different portfolio sizes contradict some studies in the previous literature. Barber and Odean (2000) have found that, small portfolios perform better though the return performance difference is not significantly different than zero. They argue that this difference is likely attributable to the fact that small portfolios tilt more heavily toward small value stocks (See Kumar (2007) also for portfolio diversification and small value stock relationship), which performed well during the sample period. In a similar paper, Shu et al. (2004) sorted the investors in the top turnover quintile by portfolio size

and find that, in the highest-turnover quintile; investors with large portfolio values have higher returns. They argue that active investors with large portfolio values tend to be informed traders. However, their analysis is limited with the highest-turnover quintile and they do not report the relationship for the full sample. Hence, small number of investors with extremely high turnover may lead to their result. These investors are very likely to be professional traders and naturally may earn higher returns.

On the other hand, Anderson (2013) documented that portfolio size positively affects returns. He attributed this fact to fees because when fees are excluded from returns, the effect of portfolio size disappears. He found that, overall wealth had a positive influence on performance even after fees. Another explanation is related to investors' cognitive skills. Grinblatt et al. (2011, 2012) found that high-IQ investors are wealthier and have superior trading performance in two separate studies. High-IQ investors may possibly have larger portfolios and perform better.

We clearly document that, even if not including the effect of small-size stock returns mentioned in Barber and Odean (2000), as portfolio size increases market adjusted return decreases. This reverse relationship can be consequence of the fact that high returns for bigger portfolios may be attributed to lower liquidity constraints for wealthy investors, e.g., they may not have to liquidate their stocks in hard times. The fact that decreasing turnovers as portfolio size increases (Table 3.5 in Appendix) except the highest-turnover quintile also supports our view. Small investors may try to gain by trading impatiently in the short term with their limited money which may not be allocated solely and comfortably for the equity investment. This behavioural pattern may be an explanation for the combined analysis of return, turnover and portfolio size.

Second, they may also benefit more from professional investment services of the industry. As Kramer (2012) and Chang et al. (2009) noted that the individual investors who are superior informed or have better financial advice earn higher returns compared to uninformed high turnover traders. Our findings also extend the

evidence suggesting that irrational investor behaviours are weaker for wealthy investors for several other behavioural biases.

Next analysis is performed via a cross section regression of the returns on the before mentioned variables: turnover, portfolio size, gender together with age. This regression is done in order to control other variables' effect on returns. Results of the equation (7) are given in Table 3.4, which indicates that all the independent variables considered in this study are significant at 1% level. Our finding related to the portfolio size is confirmed here: Portfolio size has a positive and significant coefficient, implying that wealthier investors have better earnings. This may be due to two main reasons as it is discussed above: First, wealthier investor may have lower liquidity constraints to sell their stocks especially in hard times. Second, wealthier investors may be benefiting more from professional services. As Kramer (2012) pointed that "advised portfolios perform much better than self-directed portfolios, thus reducing avoidable risk."

The other variables have expected signs and the significance levels consistent with the literature: Turnover has a negative effect on returns consistent with our previous findings and literature (Barber and Odean (2000, 2001), Statman et al. (2006)). The gender dummy indicates that women have higher returns than men, which confirms our previous findings and the results given by Barber and Odean (2001) and Agnew et al. (2003). Regression results also indicate that the age has a positive impact on investors' performance. Previous literature on learning suggests that, older investors might accumulate greater investment knowledge and exhibit greater awareness of the fundamental principles of investing. Their accumulated investing wisdom could help them make better investment decisions and they might also be less prone to behavioural biases as they grow older and become more experienced (Korniotis and Kumar (2011) and Nicolosi et al. (2009)). On the other hand, the coefficient of genderXage is negative, which suggests that women earn less than compared to men as they get older. According to Korniotis and Kumar (2011), the age-related decline in cognitive abilities is steeper among older women.

[Insert Table 3.7 about here]

When we repeat the regression analysis adding the holding period and its square, the findings of the equation 7 are confirmed. All the independent variables are significant at 1% level. Our newly added variable, holding period, has a positive significant coefficient, i.e., as the average holding period for a stock gets longer, the average return rises. Interestingly, square of holding period has a negative significant coefficient, which may imply that some level of optimum holding period exists. Simply taking first derivative of the return with respect to the holding period, we calculate the level of holding period maximizing return as 55.4 weeks. Only 456 investors -2.3% of our sample- has an average holding period above this level.

[Insert Table 3.8 about here]

3.4 Concluding Remarks

Concerning the high volume of trade in stock markets, one can ask whether these trades generate high returns or not. As Glaser and Weber (2007) suggested, the rational motives for trade are not sufficient to explain the high trading volume in financial markets. Here, we investigated the individual investors in Borsa İstanbul from a behavioural perspective. We use weekly –higher frequency than most of the studies in the literature- aggregated daily trades of 20.000 individual investors from January 2011 to December 2012. Regarding the limited number of individual data sets utilized in the literature, we expand the data covered in this line of research to a new market, which has one of the highest turnovers throughout the world. This study first documents turnover and return performances of individual investors in Turkey and analyses the relationship between the two. This analysis is repeated for the return and portfolio size. A regression analysis is carried out to find the effects of several variables such as turnover, holding period, portfolio size, age and gender on the portfolio returns of the individuals. Our analysis provides five important results:

- First, the individual investors underperform the market.
- Second, there is a reverse relationship between turnover and returns.
- Third, there is a positive relationship between holding period and returns. Moreover, there exists an optimum level of holding period.
- Fourth, men trade more than women, and hence they underperform the women.
- Fifth, there is a positive relationship between portfolio size and returns. That is the bigger the portfolio size, the higher the returns.
- Sixth, age has a positive effect on the portfolio returns.

These results are consistent with the behavioural finance literature which suggests that individuals (mainly due to their overconfidence) that trade aggressively have lower returns compared to the average investor. We contribute to the literature by bringing new evidence to the current debates on individual investors' behavioural patterns and give concluding evidence that individual investor trading pattern could be harmful to portfolio performance (See Lehenkari and Perttunen (2010) for discussion).

We present important evidence from an emerging market which may have some different behavioural patterns compared to the most of the studies in the literature. We find that there is a reverse positive relationship between portfolio size and returns, on which there is no clear consensus in the previous studies. We also find evidence that as the holding period lengthens, the return increases, up to some level. Lastly, our study finds evidence that individual investors hold portfolios less than potential optimal holding period level. Any further studies that elaborate more on the levels of optimal holding period and the dynamics behind the trading patterns related to the individual behavioural biases will add up to the literature. With the accumulating empirical evidence from different countries, cross-cultural or cross-regional insights may more easily be reached in the further studies.

4. CAUSAL LINK BETWEEN ISLAMIC AND CONVENTIONAL BANKING: EVIDENCE FROM TURKISH BANKING SECTOR

4.1 Introduction

2008 global finance crisis has been considered as a major challenge to the modern theory of finance. The lesson that we have learn from the crisis is that the risks were not priced efficiently by the market conditions and the moral hazard problem of the market can put the market in the hands of a crisis so easily. The effects of the crisis has been so deep that it is even compared to the long prolonged "Great Depression" and named as "Great Recession". Financial crisis was a consequence of the collapse of financial assets management. These experiences led academicians and practitioners to questioning fundamentals of the financial system. Recent financial crisis manifested to be consequence of the weakness of the financial eco-system; hence the unconventional financing models attracted attention. Especially, Islamic finance gained popularity in research due to fact that contagion effect in the 2008 crisis spread by banking system (Hasan and Dridi (2010)). Crisis has induced a series of questions on the stability of conventional banks and led to a renewal of Minsky's (1986) critics about the inherent instability of the fractional-reserve banking. Many studies tried to compare Islamic banking model to the conventional banking, since Islamic banking model could potentially increase the quality of funds preserved into the finance system. These studies generally focus on assessing the hypothesis that the Islamic banks have greater resilience to the financial shocks compared to the conventional banks (Abdulle and Kasim (2012)). For some specific regions, studies presented empirical evidence for the stability of the Islamic banks during the recent financial crisis (Kassim and Majid (2010)).

Since the adjective "Islamic" allow one to track back the Islamic finance to the years of Prophet Muhammad (p.b.u.h.), modern experiment of Islamic finance has

started after the 1963 and it gained momentum in recent years[20]. Sharia based and compliant assets reached to nearly 1Trillion Dollar and Islamic banks operate over sixty countries with more than 600 Islamic funds available (Walkshaul and Lobe (2012), Zaman and Movassaghi (2001)). Main unconventional part of Islamic finance is risk sharing rather than offering flat interest rate. Islamic banks play the role of intermediary by sharing loss and profits with the depositors, hence equity-based nature of the savings might help to reduce systematic risk in the economy. Islamic baking provides services under profit and loss sharing under Sharia law and this system allow both parties to share risk[21]. Due to asset backed product structure, Islamic banks are not exposed to some type of assets which are considered to be risky such as financial derivatives (Hassan and Dridi (2010), Zeitun (2012)). However, Islamic banks share similarities in technicalities for instance they take the role of an intermediary and trustees of the people's money (Dusuki (2008), Ghayad (2008)).

This study tries to reveal the relationship between Islamic finance and conventional finance. We concentrate on the understanding the relationship between conventional and Islamic banking to determine the causality link. Our study contributes to the growing literature of Islamic finance by comparing two kind of banking with the specific scope of addressing the credit risk structures. We present comparative analysis on the impact of the global finance crisis of 2008. In this study, pre and post crisis term deposit returns of conventional and Islamic banks are studied. By doing so, we try to elaborate on the question that Islamic finance is less prone to systematic risk and introducing Islamic finance would help to strength the financial market system. Term deposit rates (TDRs) and Profit-Loss-Sharing Ratio (PLS in representative of Islamic Banking offered rates which is noted as Islamic TDRs hereafter) are considered to be center of financial activities (Kaleem and Isa (2012)) so that our analysis study gives important implications on the risk structure. If Islamic banks are not affected much from the financial crisis, this

[20] For the studies focus on history of Islamic finance, see El Salous (1993), Archer & Abd El Karim (2002), Ali & Ahmad, (2004).
[21] For other islamic principles other than profit-loss sharing, see Zeitun (2011), Olson and Zoubi (2008), Chong and Liu (2008)

situation can be taken as an implication that Islamic banks are less prone to the systematic risk. Therefore, if the Islamic banks are less prone to systematic risks, then there is greater possibility that the Islamic banking deposits is heavily influenced by its own historical rate of returns rather than the existing rate of returns of conventional banks (Ariff (1988), Kaleem and Isa (2012)).

In order to see the causality link between conventional banks and Islamic banks to test for the hypothesis that Islamic banks are less prone to the systematic risks, we apply Vector Auto Regression (VAR) model and use Granger causality. A possible causality shift can be evidence for the different risk structure of the Islamic banking. We extend our analysis by looking at the causality before and after the crisis. By doing so, we are able to track the effects of financial crisis on both conventional and Islamic banks. First we take the difference of TDRs and PLS ratio of both conventional and Islamic banking since there is significant evidence for the presence of the unit root in the conventional banking TDRs. For the whole 2005-2013 period, our findings indicate that conventional banking TDRs Granger cause the Islamic banking PLS's whereas the reverse relationship is not supported by the Granger causality. However this relationship inference is spurious due to the presence of the unit root in the conventional TDRs highly influence results. So we study our sample for before and after crisis periods. When the pre and post crisis periods are considered, first result of ours is that: there is a clear picture which highlights that the Islamic banking TDR differences do not Granger cause conventional banking TDR differences for every maturity level. So we present an evidence for the hypothesis that the changes in the Islamic banking profit-loss sharing (PLS) ratios do not affect the changes in the interest rates offered by the conventional banks. Second result is somewhat is not clear as the first one. For the pre-crisis period, the TDR differences of the conventional banks do not Granger cause the TDR differences of the Islamic banks. But, TDR differences of the conventional banks do not Granger cause the Islamic TDR differences for 6 and 12 month periods, whereas it Granger causes for 1 and 3 months periods.. VAR estimations and the impulse response functions altogether shows that dynamic relationship between Islamic banking and conventional banking does not last for

long period and it is not persistent. Hence, our results conclude that there is no stable dynamic relationship between the TDR movements of these two banking systems.

4.2 Islamic Finance and Applications

Main difference of the Islamic banking relies in the roots of the Islamic finance which is based on *fiqh al-mu'amalat*. *Fiqh al-mu'amalat* is the broad definitions and regulations of all social interactions. Under the Shari'ah legal code, business transactions should be fair, transparent and contractual between agents. Moreover, business transactions must be *halal* and free from *riba* (usury), *gharar* (uncertainty), *maisir* (gambling). Shari'ah law does not only restrict interest rate but supports socially responsibility and set up rules to highlight ethics in business transactions (Ariss (2010)). Though it is generally visualized that the prohibition of interest rate is conflicting the time value of money concept, it is common to all Abrahamic faiths. Shari'ah law specifically determines the code of conduct for all regulations in the in finance environment. Recent 2008 crisis due to weak regulatory environment appealed the attention on Islamic banking. Academicians and policy makers point out the advantages of Shari'ah based financial products. In addition, Shari'ah based products becoming more attractive who demand for financial services that are consistent with their religious beliefs (Beck, Kunt, Merrouche (2013)).

Islamic finance stayed out of scope from the conventional finance paradigm so that basic principles are elementary to many experts. Finance has a different set-up in Shari'ah principles. Purpose of the lending activities could arise from two main sources: help and sharing profits. If investor wants to help to the borrower, then the investor must rescind from any claim to any additional amount according to Shari'ah perspective. Investor's principal secured with an agreement but no return over and above the principle is legitimate. For the profit sharing purposes, stipulated proportion of profit could be shared on agreement whereas the loss also should be matter of share. But all transactions should be based on an asset since the main

perspective is to finance commercial, investment, trade and borrowing activities. Monetary papers has no intrinsic utility so that these papers are not subject matter of trade hence the profit generated through monetary transaction prohibited. Islamic finance mostly based on illiquid assets which creates real assets and inventories. All historically developed Islamic finance instruments is bound to be converted into assets having intrinsic utility. Profits are generated through sale of these real assets.

Moreover, Islamic Finance Institutions cannot remain indifferent about the nature of the activity the other party of any transaction. Any activity should not be prohibited by Shari'ah legislation and should not be harmful to the moral health of the society. Secondly, the real asset that is purchased by the financier assumes the risk of the commodity before selling it to the customer. The profit claimed by the financier is the reward of the risk he assumes. Without taking the risk, any return is also prohibited. Thirdly, a selling price once agreed becomes and remains fixed. As a result, even if the purchaser does not pay on time, the seller cannot ask for a higher price, due to delay in settlement of dues. This is because in Shari'ah, there is no concept of time due of money. Risk is assumed by the lessor/financier in any aspects. In leasing contracts, financing is offered through providing an asset having usufruct. if the leased asset is totally destroyed without any misuse or negligence on the part of the lessee, it is the financier/lessor who will suffer the loss.

Islamic finance does not recognize capital and entrepreneurship as the two separate concepts. Every investor who contributes capital (in the form of money) to a commercial enterprise assumes the risk of loss and therefore is entitled to a proportionate share in the actual profit. In this manner 'capital' has an intrinsic element of 'entrepreneurship', so far as the risk of the business is concerned. All the Islamic finance instruments include these properties. Number of Islamic finance instruments escalated in recent years. They all derived from the historical basic instruments. Historical practices involve musharakah, mudarabah, salam, istisna', murabahah and ijarah instruments. We will briefly explain these instruments below.

4.2.1 Musharakah

Musharakah is Arabic originated word which literally means "sharing". It is simply joint venture agreement in which partners share the loss or profit. Both parties share the actual return of the joint venture hence there is no fixed return in proper Musharakah contract. Within this Islamic finance instruments, the financer becomes the partner of the enterprise. In modern finance, use of musharakah is limited due to its over simplistic nature, number of practical problems arises its implementation. However broad principles and numerous forms can accommodate many needs in modern finance. It would be more concrete to give some basic terminology of this instrument, in order to present detailed application.

The broad concept of musharakah derives from "Shirkah" and in the terminology in Islamic Fiqh, it has been divided into two kinds: Shirkat-ul Milk (Joint ownership of two or owner persons in a particular property) and Shirkat-ul-Aqd (A partnership effected by a mutual contract). Shirkat-ul-Aqd further divided into three categories: Shirkat-ul Amwal (where all the partners invest some capital into a commercial enterprise), Shirkat-ul-A'mal (where all the partners jointly undertake to render some services for their customers, and the fee charged from them is distributed among them according to an agreed ratio) and Shirkat-ul-Wujood (where all partners have no investment at all). Though "shirkah" is derived from the terminology of Islamic Fiqh, the term "musharakah" introduced recently into Islamic finance literature due to modern needs of finance. Shirkah has much wider sense than musharakah used by Islamic Finance Institutions today. Practical use of musharakah generally limited to use of "Shirkat-ul-Amwal" applications in modern applications. This contract is established by mutual contract by the parties. Ingredients of this contract should be suitable with traditional Islamic legislation such as the contract must take place with free of consent, without any duress, fraud or misrepresentations and etc. Distribution of the profit must be agreed upon at the time of contract. Ratio of the profit for each partner must be determined in proportion to the actual profit. It is not allowed to fix a lump sum return. (Please refer to Usmani (1998) for detailed discussion of the appropriate legislative issues

on the share of profit). In the case of loss, both partner shall suffer the loss exactly according to the ratio of investment. Though there is no consensus between Islamic legislation scholars on the view that the capital invested must be in liquid form, practical uses generally involves the capital investment rather than in commodity form.

Management of Musharakah is also determined by the integrands of the contract as usual. Principally, every partner has a right to take a part in the management, but the partners may agree upon a condition that the management shall be carried out by one of them, and other partners only could fund for the musharakah. But in this type of musharakah contract, the sleeping partners shall be entitled to the profit only to the extent of their investment, and the ratio of profit allocated by them should not exceed the ratio of their investment. Every partner has a right to terminate the musharakah contract at any time after giving the other partners proper notice. In this case of termination of musharakah contract, if the assets of the musharakah are in cash form, all of them will be distributed pro rate between the partners. But if the assets are not liquidated, the partners must agree among themselves either on the liquidation of the assets on their partition. Mutual agreement on the main terms of contract is the very foundation in musharakah.

4.2.2 Mudarabah

Mudarabah is special kind of partnership whereas one partner becomes fully funder and transfers capital to other party in order to use that monetary capital for investing it in a commercial enterprise. There are several differences between mudarabah and musharakah:

1. In mudarabah, investment is at the hand of sole responsibility of rabb-ul-mal (financer or investor) where mudarib (manager of the investment) whereas in Musharakah investment comes from all the partners.
2. Rabb-ul-mal has no right to participate in the management whereas in musharakah all partners can participate in the management.

3. In musharakah all the partners share the loss to the extent of the ratio of their investment since all partners put some form of capital into the contract whereas in mudarabah potential loss is suffered by only the rabb-ul-mal since the mudarib does not incur any form of capital into the contract.
4. In mudarabah, liability of rabb-ul-mal is limited to his investment, unless he has permitted the mudarib to incur debts on his behalf. Contrarily, the liability of the partners in musharakah is normally unlimited.
5. All the goods purchased by the mudarib are solely owned by the rabb-ul-mal, and the mudarib can earn his share in the profit only in case he sells the goods profitably. Therefore, he is not entitled to claim his share in the assets themselves, even if their value has increased.

Business model of mudarabah is basically involves rabb-ul-mal's investment of money into mudarib's enterprise. The capital of the mudarabah could be used by both of them jointly, and the share of the mudarib shall be distributed between them according to the agreed proportion. In avalid mudarabah contract, parties of the contract should agree at the right at the beginning of the investment on a definite proportion of the actual potential profit to which each one of them is entitled for the investment. The proportion of the share of the profit has been left into the mutual consent of the parties. Hence there is no fundamental restriction on the proportion of the share of profit. However, they cannot allocate a lump sum amount of profit for any party, nor can they determine the share of any party at a specific rate tied up with the capital. Share ratio should solely depend up on the outstanding profit. The contract of mudarabah can be terminated at any time by either of the two parties. The only condition is to give a notice to the other party. If all the assets of the mudarabah are in cash form at the time of termination, and some profit has been earned on the principal amount, it shall be distributed between the parties according to the agreed ratio. However, if the assets of the mudarabah are not in the cash form, the mudarib shall be given an opportunity to sell and liquidate them, so that the actual profit may be determined.

4.2.3 Murabahah

Murabahah contracts are the very widely used in Islamic banks and financial institutions. Its simplistic nature and the functionality make Murabahah useful and most of Islamic mode of financing based on murabahah type contracts. That is the reason why this term has been taken in the economic circles today as a method of banking operations genuinely. If a seller agrees with his purchaser to provide him a specific commodity on a certain price that includes profit added to his cost, then it is called a simple murabahah transaction. The basic ingredient of murabahah is that the seller discloses the actual cost he has incurred in acquiring the commodity, and then adds some profit thereon. This profit may be in lump sum or may be based on a percentage. If a person sells a commodity for a lump sum price without any reference to the cost, this is not a murabahah, even though he is earning some profit on his cost because the sale is not based on a "cost-plus" concept. In this case, the sale is called "*musawamah*." Basic rules of Murabahah are:

1. The subject of sale must be existing at the time of sale or at the time of contract. Thus, a thing which has not yet come into existence cannot be subject to murabahah contract.
2. The subject of sale must be in the ownership of the seller at the time of sale. Thus seller has no right to sell something that he has not owned yet.
3. The subject of sale must be in the physical or constructive possession of the seller when the contract is taking place. "Constructive possession" means a situation where the possessor has not taken the physical delivery of the commodity, but the commodity in all its constructive phases comes into control of the buyer with all the rights and risks of the destruction.
4. The sale must be instant and absolute with property value. The subject of the sale must be specifically known and identified to buyer.

5. The delivery of the sold commodity to the buyer must be certain and should not depend on a contingency or chance.
6. The certainty of price is a must for the validity of a sale. If the price is uncertain, the sale is void. Also the sale must be unconditional such as transaction should not restrict both parties into another contract.

The most essential element of the transaction in murabahah is that the commodity must remain in the risk of the seller before the ownership of commodity transferred to the client. Therefore, it must be fully observed with due diligence at all costs. Foremost question about murabahah arises from its similarity to cash sales of conventional banks. However, money and commodity have different characteristics: money has no intrinsic value. The value of the money is speculative and dependent up on many other financial parameters. It cannot be utilized for fulfilling human needs directly. It can only be used for medium of exchange, especially acquiring some goods or services. The commodities, on the other hand, have intrinsic utility. They can be utilized by someone directly without exchanging them for some other physical asset. The financier purchases the commodity on cash payment and sells it to the client on credit. While selling the commodity on credit, he takes into account the period in which the price is to be paid by the client and increases the price accordingly. The longer the maturity of the murabahah payment, the higher the price. Therefore the price in a murabahah transaction, as practiced by the Islamic banks, is always expected to be higher than the market price. The question arises as to whether the price of a commodity in a credit sale may be increased from the price of a cash sale. Some may argue that the increase of price in a credit sale, being in consideration of the time given to the purchaser, should be treated analogous to the interest charged on a loan, because in both cases an additional amount is charged for the deferment of payment. On this basis, it is generally argued that the murabahah transactions -as practiced in the Islamic banks- are not much different in the essence from the interest-based loans used by the conventional banks. This argument, which looks to be logical in appearance, is based on a misunderstanding about the basic principles of Shari‘ah regarding the prohibition of riba. When money is exchanged for money, no excess is allowed,

neither in cash transaction, nor in credit, but where a commodity is sold for money, the price agreed upon by the parties may be higher than the market price, both in cash and credit transactions. Time of payment may act as an ancillary factor to determine the price of a commodity, but it cannot act as an exclusive basis for and the sole consideration of an excess claimed in exchange of money for money.

4.2.4 Ijarah

Ijarah means to give something on rent in Islamic legislation. Ijarah contracts used to employ the services of a person on wages given for hires services or to transfer the usufruct of a particular property to another person in exchange for a rent. Second type is similar to conventional "leasing" activities. The only difference between ijarah and sale is that in the latter case the corpus of the property is transferred to the purchaser, while in the case of ijarah, the corpus of the property remains in the ownership of the transferor, but only its usufruct i.e. the right to use it, is transferred to the lessee. Basic rules of ijara are:

1. Ijara is a leasing contract whereby owner of something transfer its usufruct at agreed consideration and subject things having no usufruct at all cannot be leased. The period of lease must be determined in clear terms.
2. Corpus of the leased property remains at the ownership of the seller. Thus, anything which cannot be used without consuming cannot be leased out.
3. All the liabilities emerging from the ownership shall be held by the lessor, however the liabilities referable to the use of the property shall be borne by the lessee.
4. The lessee cannot use the leased asset for any other purpose that is not specified in the lease agreement. If no such purpose is specified in the agreement, the lessee can use it for whatever purpose it is used in the normal course.

5. The lessee is liable to compensate the lessor for every harm to the leased asset caused by any improper usage on the part of the lessee.
6. Lessor should bear the remaining risks of the leased asset throughout the lease period for any harm or loss caused by the factors beyond the control of the lessee.
7. A property can be leased out which can be jointly owned by joint owners. The rental that arise from the renting activities shall be distributed between all the joint owners according to their proportion of ownership in the property.
8. It is necessary for a valid lease that the leased asset is fully identified by the parties. A joint owner of a property can lease his proportionate share to his co-sharer only, and not to any other person.

As a matter of fact, leasing is not a mode of financing in its origin. However, certain financial institutions have adopted leasing as a mode of financing instead of long term lending on the basis of interest. But there is substantial difference between leasing and an interest bearing loan. It requires more than twisting the terminology "interest" and "mortgage" with "rent and "leased asset". Unlike the contract of sale, ijarah can be effected for future date. While a forward sale is not allowed in Shari'ah, an 'ijarah' for a future date is allowed, on the condition that the rent will be payable only after the leased asset is delivered to the lessee.

Lessee's liability for the rent does not starts before the lessee takes delivery of the asset. Rent will be charged after the lessee has taken delivery of the asset, and not from the day the price has been paid. If the supplier has delayed the delivery after receiving the full price, the lessee should not be liable for the rent of the period of delay. If the lessee contravenes any term of the agreement, the lessor has a right to terminate the lease contract unilaterally. However, if there is no contravention on the part of the lessee, the lease cannot be terminated without mutual consent. The asset shall be the sole property of the lessor, and after the expiry of the lease period, the lessor shall be at liberty to take the asset back, or to renew the lease or to lease it out to another party, or sell it to the lessee or to any other person. The lessee

cannot force him to sell it to him at a nominal price, nor can such a condition be imposed on the lessor in the lease agreement.

Ijara contracts can also be securitized. The arrangement of ijarah has a good potential of securitization which may help create a secondary market for the financiers on the basis of ijarah. Since the lessor in ijarah owns the leased assets, he can sell the asset, in whole or in part, to a third party who may purchase it and may replace the seller in the rights and obligations of the lessor with regard to the purchased part of the asset. But, it is necessary that the ijarah certificates are designed to represent real ownership of the leased assets, and not only a right to receive rent.

4.2.5 Salam

Salaam is a sale whereby the seller undertakes to supply some specific goods to the buyer at a future date in exchange of an advanced price fully paid at spot. The buyer is "rabb-us-salam" and the seller is "muslam ilaih". Traditional use of Salaam contracts were to meet the needs of the small farmers who needed money to grow their corps and to feed their family up to the time of harvest. Since the interest rate were prohibited, it was allowed farmers to sell the agriculture products in advance. Similarly, traders in Arab peninsula used to export goods to other places and import other goods to their homeland. They could not borrow with interest due to prohibition of interest rate, therefore they were allowed to sell goods in advance. The permissibility of salam was an exception to the general rule that prohibits the forward sales, and therefore, it was subjected to some strict conditions:

1. It is necessary for the validity of Salam contract that the buyer pays the price in full to the seller at the time of effecting the sale. It is necessary because in the absence of full payment by the buyer, it will be tantamount to sale of a debt against a debt, which is strictly prohibited.
2. Salam can be effected in those commodities only the quality and quantity of which can be specified exactly. The things whose quality or

quantity is not determined by specification cannot be sold through the contract of Salam.

3. Salam cannot be effected on a particular commodity or on a product of a particular field or farm. For any commodity the supply of which is not certain, the Salaam contract is not applicable.
4. Quality and the quantity of the commodity should be fully specified in the Salaam contract leaving no ambiguity that could lead to dispute. The exact date and place of delivery must be noted in the contract.
5. If a commodity is not available in the market at the time of the contract, even though it is expected that it will be available in the markets at the date of delivery.

Though Salam intended to be used in agricultural and trade finance, modern finance applications exists. The only problem in Salam is that modern institutions will receive certain commodities from their clients, and will not receive money. Being conversant with dealing in money only, it seems to be cumbersome for them to receive different commodities from different clients and to sell them in the market. It is prohibited for them to sell those commodities before they are actually delivered to them. However "Parallel Salam" has been used extensively by Islamic Finance institutions. After purchasing a commodity by way of Salam, the financial institutions sell it through a parallel contract of Salam for the same date of delivery. The period of Salam in the second (parallel) transaction being shorter, the price may be a little higher than the price of the first transaction, and the difference between the two prices is the profit earned by the institution. In an arrangement of parallel Salam, the bank enters into two different contracts. In one of them, the bank is the buyer and in the second one the bank is the seller. Each one of these contracts must be independent of the other. They cannot be tied up in a manner that the rights and obligations of one contract are dependent on the rights and obligations of the parallel contract. Each contract should have its own force and its performance should not be contingent on the other.

4.2.6 Istisna

Istisna is another type of sale where a commodity is transacted before it comes into existence. In order terms, it is advance sale method as in Salaam contract. It means to order a manufacturer to manufacture a specific commodity for the purchaser. If the manufacturer undertakes to manufacture the goods for him with material from the manufacturer, the transaction of istisna comes into existence. But it is necessary for the validity of istisna that the price is fixed with the consent of the parties and that necessary specification of the commodity (intended to be manufactured) is fully settled between them. Istisna is forward sale in its nature but is different from the Salam contract. First of all, subject of istisna is a good which needs manufacturing, while Salam can be effected on anything. Secondly, it is necessary for Salam that the price is paid in full in advance, while it is not necessary in istisna. The contract of Salam, once effected, cannot be cancelled unilaterally, while the contract of istisna can be cancelled before the manufacturer starts the work and so it is not necessary in istisna that the time of delivery to be fixed. Also note that, if the material is provided by the customer, and the manufacturer is required to use his labour and skill only, the transaction is not istisna. In this case it will be a transaction of ijarah whereby the services of a person are hired for a specified fee paid to him.

Istisna can be used for providing the facility of financing in certain transactions, especially in the house finance sector. If the client has his own land and he seeks financing for the construction of a house, the financier may undertake to construct the house at that open land, on the basis of istisna, and if the client has no land and he wants to purchase the land also, the financier may undertake to provide him a constructed house on a specified piece of land.

4.3 Literature Review on Islamic versus Conventional Finance

Early studies on Islamic banking before modern finance development generally involve discussion and information on the terminology[22]. Khan (1983) and Mirakhor and Khan (1987) made assessment on Islamic banking. Following studies mainly focused on the issue as complacent component to due to rising capital market in the Muslim masses (Ariff (1988)). Fast pace growth of Islamic finance and banking is influenced by the structural reforms in financial systems, global integration of financial markets and introduction of innovative Islamic products (Zaher and Hassan (2002)). Hence, Islamic banking received attention from the academicians and they have compared various aspects of Islamic banking with conventional banking. Haron and Noraffifah (2000) compared the amount of deposits related to the term deposit rates for both conventional and Islamic banking in Malaysia. By utilizing "Adaptive Expectation Model", they have found that the expected returns of Islamic banks are highly correlated with the return rates offered by conventional banks. Moreover, they found evidence for customers who place their deposits at saving and investment account facilities are guided by the profit motive. Kaleem and Isa (2002) used VAR model to test for causality in returns between Islamic banks and conventional banks. Their results support significant competition between Islamic and conventional term deposit rates. They conclude that Islamic banking considers interest rates before adjusting its deposits returns. The rationale of causality link between term deposit rates is important to address general risk similarities between conventional banks and Islamic banks.

Generally, the most dominant source of risk is credit risk for banks. (Sundararajan (2007)). In Islamic banking, Shari'ah based tools for dealing with debt-based contracts changes the risk structure for Islamic banks compared to the conventional banks (Elgari (2003)). Boumedine (2011) empirically demonstrated that Islamic banks have lower credit risk than conventional banks. In the study, 9

[22] Early studies on Islamic banking are mostly in Arabic and Urdu. These studies are structurally different than modern finance papers since their main concern is to define and discuss the Islamic finance products and their eligibility. See Ariff (1988) for excellent discussion.

conventional and 9 Islamic banks are studied and it is presented that the Islamic banks have lower default risk. In order to address the difference in risk structure, Chong and Liu (2009) used bivariate Grange Causality test to understand the term deposit rate linkages between Islamic and conventional banking in Malaysia. Their results suggest that the Islamic deposits are not very different from conventional deposits. So, they claim that the Islamic investment rates for both the banks and the finance companies are closely pegged to the conventional deposit rates which imply similar risk structure for both banking systems. Elfakhani and Hassan (2005) reached similar conclusion by analysing the performance of 46 international Islamic mutual funds from 1997 through 2002. Based on the traditional measures of Sharpe, Treynor, and Jensen, their results suggest that the performance of Sharia based funds and the chosen benchmark is very similar[23]. Hassan and Bashir (2003) analyse how the performance of the Islamic banks is affected by overall financial environment. They utilize cross-country bank level data on Islamic banks in 21 countries for each year in 1994-2001 to closely examine the performance indicators of Islamic banks. In general, they find that financial market structure affects Islamic banks also. These studies support the evidence that general market structure, conventional banking and Islamic banking share causality. Addule and Kasim (2012) examine impact of global crisis both on Islamic and conventional banking. Their results suggest that there is no major difference in credit risk between the Islamic and conventional banks. However, the Islamic banks was holding more to a great extent of liquid assets than their counterparts and are exposed to less liquidity risk than their conventional banks counterparts. Shafique, Faheem and Abdullah (2012) analysed the bank reports and reported that impact of global financial crises on Islamic banking system is comparatively severe compared to conventional banks. Rashwan (2012) found contradicting evidence which suggest that the effect of 2008 crisis is not significantly different but the Islamic banks

[23] There are many studies on the literature focuses on the performance comparasion between Islamic and conventiona banking. For example see Omar et al. (2007), Hussein and Omran (2005), Forte and Miglietta (2007), Albaity and Ahmad (2008), Hoepner, Hussain, and Rezec (2011), Kader and Asarpota (2007). Literature on the performance comparasion is beyond the scope of this hence these studies are not discussed in this study.

outperformed in profitability to conventional banks. Hakan and Gulumser (2011) analyses the response of the deposits and loans held at conventional and Islamic banks to interest rates using monthly data between 2005 and 2009 based on VAR methodology. Their results show that any change in the interest rates affects not only the deposits and loans of conventional banks but also such instruments of Islamic banks which can be taken as an evidence for causality link between both counterparts.

4.4 Risks in Islamic Banking and Conventional Banking

Before we present the analysis, risk structure of both conventional and Islamic finance have been summarized in this section. Though both finance alternative paradigms may operate in the same environment, their methodology and general risk structures differ greatly. Islamic Financial Institutions (IFI) steadily penetrating into conventional finance system. It is not expanding only in the nations with Muslim community but also in other countries in which Muslims represent only small fraction of the population. Since banking assets are the highest in the global financial markets, we concentrate on comparing both banking sector risks. A representation of their respective risk structure and the comparison would create basis to understanding foundation of our analysis. As table 4.1 indicate that balance sheet of the IFI and conventional banks vary greatly, their risk structure intersects in some aspects and differ due to their different offered finance instruments. Risk parameters effect both banking sectors are represented in session 4.4.1. The risks that are unique to IFI are presented in session 4.4.2.

TDRs and respectively Profit-Loss-Sharing Ratio's (PLS Ratio) for IFI are consequences of these risk structures. As Kaleem and Isa (2012) states, TDRs are the center of financial activities, hence studying TDRs would be one of the best candidate to represent the general activities both banking sector under their specific risk exposures. Before we present our methodology, it would be more complete to

discuss on the risk comparison between conventional and Islamic finance institutions.

[Insert Table 4.1 about here]

4.4.1 Risk Structure comparisons: General Risk Structure Comparison

Risk structure and management principles in Islamic finance has been addressed in Islamic Financial Services Board (IFSB) publications.[24] Since the application of Islamic finance shows great difference in regions, IFSB guidelines has been accepted as grounding basis standards. These standards has been stated by the taking into account international best practices. IFSB principles set out Shari'ah adherent international standards and provide guidance on the effective regulation and supervision. Similarly, Bank for International Settlements (BIS) provides documents through Basel committee reports pursuing global financial stability and sustaining risk management. Basel Committee standards set out the general risk management framework for conventional banks. Risk structure in both Islamic and Conventional finance includes general risk scheme, credit risk, market risk, liquidity risk and operational risks.

General Risk Scheme imply comprehensive risk management and reporting process. Appropriate senior management oversight is essential to hold adequate capital against general risks. Supervision in Islamic finance essential since the general finance paradigm of Islamic finance is asset based so that project surveillance compliance with Shari'ah principles and ensuring the adequacy of risk reporting to the supervisory authority is crucial. Whereas, in the conventional banking, the goal of risk management is to maximize value of the bank by its profitability. Risk management, treasury function, financial management,

[24] (Guiding Principles of Risk Management, issued in December 2005, IFSB-IRTI-IDB: Islamic Financial Services Industry Development: Ten-year Framework and Strategies, issued in May 2007, TN-1: Issues in Strengthening the Liquidity Management of IIFS: The Development of Islamic Money Markets, issued in March 2008 and IFSB-IRTI-IDB: Report on Islamic Finance and Global Financial Stability, issued in April 2010.)

accounting and internal controls covers strategic planning, asset-liability management and financial institution's business plan. Conventional or Islamic, in both sector the evaluation general risk structure is complex proves in a competitive and volatile market environment. In addition, sound policies and consistent legal framework is crucial to attain effective market discipline. Financial analysis assessments are primary sources of data whether they are prepared under the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) or International Financial Reporting Standards (IFRS).

Credit Risk is the counterparty risk that a debtor may not repay the principal and/or other investment related cash flow according to the term specified in credit agreement. Credit Risk Management should be set out with a strategy in financing using various instruments. Credit risk includes potential credit exposures that may arise from the different stages of the various financing agreements. Islamic Finance Institutions differ from conventional banks in their form of financial intermediation and structure of financial statements. Hence Islamic Finance Institutions (IFI) subject to different framework in mitigating credit risks. The principles and procedures for measuring and controlling risk show great similarity but the practices of supervision differ greatly. Especially given that the credits in Islamic Finance involves some sort of partnership, special credit risk exposures arises. In murabahah transactions, when the bank delivers the asset to the client but does not receive payment from the client in determined time. In this case, non-binding murabahah client has right to refuse delivery of the product purchased by the bank. In this case bank is further exposed to price and market risks. In istisna contracts, the bank holds extra risk due to potential failure of supplying the product in proposed time interval or to supply the quality of good different from the specific contract statements. Such failure could potentially create a delay in default payment or in delivery of product. As a result such failure may result financial losses of income or capital in IFIs. In mudarabah investments, additive to the general principal-agent problems, IFI are exposed to extra monitoring risks. Since the activities of agent cannot be monitored by the bank accurately, information asymmetry is higher in mudarabah contracts. Moreover, further externalities reside

in the nature of Islamic finance principles in mudarabah contracts. In the case of default of agent, IFI cannot charge interest or impose penalty for unaccounted reasons leading to default. Creditors may take advantage by delaying payment, knowing that no punishment process or requirement of extra payment suitable with Islamic finance principles. In musharakah contract, IFI's share in the capital invested is transformed into a debt obligation in case of proven negligence or misconduct of the musharakah's managing partner. Rules to recover a debt is far different from the conventional applications. Using collateral as security against credit risk is common practice. Illiquidity of this collateral or inability of IFS to sell the collateral creates extra risk for the IFS. Even the regional legislation and weak legal institutions create another burden on the credit risks of IFS.

Market Risk; can be systematic, arising from the macroeconomic environment or unsystematic such as being asset or instrument specific. Instrument specific risks are more on speculative positions that has been taken by the financial institution. Hence, market risks related to the instruments is higher in conventional finance compared to Islamic finance. This situation mainly due to nature of the Islamic finance which do not allow investing speculative trading (proprietary trading). However, both finance models would be affected from the same market price movements. Exposure to general market conditions would be similar for both finance alternatives but the portfolio structure of the financial institutions will be crucial in the exposure levels. Unfavourable price movements have deliberatively creates further exposure for IFS since volatility in the value of tradable asset has more direct effect on the investment instruments.

Additively, IFS are also exposed to mark-up risk; PLS ratio in financial contracts are fixed for the duration of the contract while the interest rate offered by the conventional bank can change over time. This means that the IFS is locked into fixed PLS ratio. In order to mitigate such extensive risk IFS general preserve a "market rate" often use the London Interbank Offered Rate (LIBOR) which aligns their market risk closely with the movement of LIBOR rates. On top of mark-up risks, IFS could not use derivate products for hedging. Hence any currency price

movements may create mismatch between values of the asset and liabilities denominated in foreign currency.

Liquidity Risk; arises from the difference between expected and unexpected balance sheet fluctuations. Liquidity risk results may create either shortage of cash that must be funded. Lack of liquidity restricts financial institutions ability to manage portfolios and access to funding. Liquidity risk lies at the heart of banking system. Typical instruments of liquidity management are available to the conventional finance. Interbank market, secondary market for debt instruments, discount flows from the Central Banks are all part of these instruments. However there is limited availability of Shari'ah compatible money market which is essential drawback for IFS. Prohibition of money borrowing with interest and the absence of active interbank money market restricts IFS's options to manage their liquidity risks. Shallow secondary markets are another source of liquidity risk. The financial instruments that can be traded in the secondary market are limited, and the Shari'ah imposes certain limitations on the trading of financial claims, unless such claims are linked to a real asset. Therefore, there is a need to develop asset-backed tradable securities, known as sukuk. Even where instruments are available, the number of market participants is limited.

Certain characteristics of IFS give rise to liquidity risks for them. Liquidity becomes a problem when murabahah contract has been cancelled. Second market for cancelled murabahah contracts do not exist or their functionality is limited since murabahah and bay-al salaam contract can be traded only at par. Introduction of sukuk market is advantageous development for IFS. But in practice, second market for the sukuk is really low. Hence limited access to debt instruments to hedge for liquidity risk vital drawback for risk management for IFS.

Operational risk; is direct or indirect loss as a consequence of internal processes or external events. Internal processes include failure related to human resources, technology, corporate governance etc. These risks arise from the nature of business environment, market competition and practices. Basel committee has prepared Basel III document which include methods of measuring operational risks. These

method are all applicable to IFS also. Operational risks are significant for IFS since the IFS's experience accumulation has taken place only in recent years. Since the legal environment progress through application problems and potential solutions raised for these problems, accumulated experience of the problems is limited for IFS. People who maintain problem solving of technical and analytical issues may not gained to offer efficient methodologies yet. Islamic finance faces the risk of securing management skills fully conversant with the principles of conventional and Islamic finance. Familiarity with either finance rules or Shari'ah rules may not be an issue, but individuals with knowledge of both are hard to find. In addition, compliance with Shari'ah rules requires management information systems that are scarce.

Islamic finance contracts are unique and complex in their nature. A survey conducted bt Khan and Ahmed (2001) shows that the managers of IFS perceive operational risk as the one of the most critical risk due to lack of experience in the field. Experts who are educated in both Islamic legislation and finance are scarce. Moreover, the experiences are region specific and the human resources are limited.

Technology risk is another type of operational risk that arise from use of software tools that are not designed specifically to the needs of IFS. Analytical toolbox offered by software programs do not focus on the risk assessment of the project finance which is the grounding risk factor due to Islamic Finance's asset based nature.

Operational risks also include issues related to the corporate governance. Risk arising from a failure to govern institutions, negligence in conducting business and meeting contractual obligations, and a weak internal and external institutional environment, including legal risk, whereby banks are unable to enforce their contracts.

4.4.2 Risk Structure comparisons: Risks that are Unique to IFS

Equity investment risk is unique to IFS. Conventional banks hold branches deal with equity investments by investment corporations which invest in portfolio of assets rather than project investment. IFS offer mudarabah and musharakah positions in which they are extend to potential decrease of fair value of the equities. Equity participation of IFS can vary from direct investment in projects to indirect Shari'ah compliance investment. In this range of participation, IFS may suffer from the decline in the value of its equity position, it can lose any return on its investment. Equity investment risk has multiple risk factor since the potential decrease or even total loss in investment capital can escalade more credit and liquidity risks. IFS should be cautious before entering into a contract by analysing the background and the business plan of the managing partner and the legal and economic environment in which the proposed investment project that would take place.

[Insert Table 4.2 about here]

Commercial risk is also unique to Islamic finance since IFS do not offer fixed interest in exchange of investments or deposits. Depositors in Islamic finance expect to share and profits of their deposits. However, in practice investors expect returns and for many customers conventional banking is a subsidy for Islamic banks hence they can easily withdraw their investment for higher returns. So in practice, Islamic banks offer "profit-loss sharing ratio" based arising from multitude investments. If the one of the projects suffer from losses they try to balance it from the other profitable investment. As a result, Islamic firms face *displaced commercial risk;* they're forced to pay returns to fund providers even if the underlying assets don't earn profits. The financial institution must smooth out their returns. IFS give up a portion of its profit from the revenues of high profitable investment to finance the losses in other low return or defaulted investment projects. This situation creates a fund called a *profit equalization reserve* by setting aside a percentage of previous years' profits to use when investment returns dip too low.

Rate of return risk, again rises from the fact that IFS could easily be substitute for conventional banking. Unexpected changes in the market rate of return adversely affect earnings. In a conventional financial institution, returns are fixed; both the firm and fund providers know in advance what their returns will be. In IFS, returns are uncertain and investors share both profits and losses with the institution. If the firm fails to respond to the market rate increase, that failure may lead to liquidity risk (because customers may withdraw funds too rapidly).

Shari'ah Compliance Risk, Shari'ah compliance is the very fundamental of the Islamic Finance. Hence adhering to the principles and guidelines is essential. However international practices vary over the countries. Moreover, Shari'ah compliance of a financial instruments has been attained by the scholar authorities. The authorities resemble the Shari'ah Board of the IFS. Shari'ah boards may not give authority for some investments over time. Monitoring the investment projects not always efficient and potential rejection from the scholars could be harmful to the reputation of the IFS.

4.5 Data and Methodology

Our aim is to find an answer to the hypothesis: "The Islamic banking is not very different from the conventional banking system so Islamic banking has no value in reducing the persistent risks in the financial market". We utilize the term deposit rates for 9 conventional banks and PLS rates for 4 Islamic banks from Turkey since term deposit rates are the most visual parameter so present the general risks of the market. Also on the demand side, term deposit rates offered by two banking system is the main difference for customers. Not that PLS ratio for the Islamic banks are unique to instrument type. Hence PLS ration for mudarabah, musharakah, murabahah are all same. Islamic banks have unique risk characteristics as explained in previous session. But the risk variance over the different type of products are limited. This situation creates easiness for our study. Rather than having many PLS

ratios to match for different products for conventional instruments, general analysis for TDR and PLS ratios is possible.

Our data set covers the monthly returns from 2005 to 2013. Average PLS ratios of the Islamic banks are calculated from the individual bank announcements whereas the average term deposit rates for conventional banks are obtained from the Central Bank of the Republic of Turkey (CBRT). Following figures 4.1 and 4.2 show the term deposit rates for 1 month, 3 months, 6 months and 12 months periods. Longer term deposit rates are higher than short term deposit rates for both conventional and Islamic banking. However fluctuations in term deposit rates are lower for Islamic banks compared to the conventional banks. This figure can imply that the Islamic banks react more transitionally. There is a clear picture of the effect of the crisis for conventional banking TDRs as they fall significantly whereas this decline is smoother in Islamic Banks.

[Insert Figure 4.1 about here]

[Insert Figure 4.2 about here]

Figures indicate a visual difference between TDR and PLS ratios before and after the financial crisis. In order to address the potential casualty link, we use Granger causality to address the causality link between Islamic and conventional banking. Granger (1969) presented the test to suspect the explanatory power of two series for each other. In our study, Granger Causality helps us to determine the linkages between two banking systems and their relation to each other give us inferences about if they do follow each other. Since the management of Islamic banking is different than the conventional banks, one could expect that the Islamic banks have no causality to the conventional banks; hence their profit sharing returns must not be linked to the interest rates offered by conventional banks (Kaleem and Isa (2003)).

Granger causality test is performed for the following model:

$$TDR_{Islamic t} = \alpha + \beta TDR_{Conventional t} + \varepsilon_t \quad (28)$$

$$TDR_{Conventional_t} = \alpha + \beta TDR_{Islamic_t} + \varepsilon_t \quad (29)$$

$TDR_{Islamic_t}$ and $TDR_{Conventind_t}$ represents the term deposit rates for both banks and the Granger causality test is applied for all 1 month, 3 months, 6 months and 12 months time periods. However, in order to avoid the spurious regressions problem proposed by Granger and Newbold (1974), we take the first difference of the term deposit rates if they are non-stationary. We use the regular ADF unit root test to see if the series are stationary.

4.6 Results

First, ADF unit root test results are presented in Table 1. The test statistics were computed based on the regressions that include lags according to SIC offered lags. In every case except the 12 month term deposit rate series, the unit root test is not rejected. When the first differences are taken, t-stats give inferences that the first order differences are stationary. This indicates that the term deposit rates are integrated of order one.

[Insert Table 4.3 about here]

Before we make the Granger causality test, we search for the optimal lag periods. Both AIC and SIC criterion finds that 2 lag periods are significant. Since the unit root test is not rejected for the level values, we take the first difference of the TDR's for both banking and use pairwise Granger causality test to determine the linkages between conventional and Islamic banking. Table 4.2 shows that the hypothesis conventional bank TDR differences do not cause the Islamic TDR differences is rejected at %5 levels. However the hypothesis cannot be rejected at % 1 especially for 12 months maturity period. Hence the conclusion is not totally clear for the hypothesis that conventional banks TDR differences do not Granger cause the TDR differences of Islamic banks. On the other hand, Table 4.2 also shows that the hypothesis the Islamic banks do not Granger cause conventional banks is rejected for all maturity periods. Since we use difference values of the

TDRs, result imply that the changes in the interest rates do affect the changes in the PLS offered by the Islamic banks but this relationship does not work other way around.

[Insert Table 4.4 about here]

We suspect that the result presented above can be affected by the 2008 crisis. As figure 2 depicts, there is a structural change in the term deposit rates for the conventional banks. As Perron (1989) shows, the unit root test are not reliable if there is a structural break in the data. In order to highlight the effect of the 2008 crisis we divide our data sample into two subsamples: before and after crisis periods. Table 4.3 gives the stationary test for the pre-2008 period.

[Insert Table 4.3 about here]

[Insert Table 4.4 about here]

Table 4.3 and 4.4 shows that, when we divide our sample into pre and post crisis periods, the unit root test confirms the stationary of the TDRs for both conventional and Islamic banks. Results in Table 4.3 and 4.4 confirm that due to structural break, unit root test spuriously cannot reject the non-stationary hypothesis. Hence, Granger causality results in the Table 4.2 are also spurious. One should be cautious before reaching such a conclusion only by interpreting the results from the Granger causality tests.

[Insert Table 4.5 about here]

[Insert Table 4.6 about here]

When we use Granger causality test for both pre and post 2008 crisis period, Table 4.5 and 4.6 shows that neither conventional banking Granger causes the Islamic banking and nor the vice versa. Hence we can say that the Islamic banking has its own structure and the PLS ratios are not affected by the interest rates offered by the conventional banks.

Next we use VAR (Vector Autoregressive) model and associated impulse response functions to study the interactions between conventional and Islamic

banking. VAR specifications are determined for 1 month, 3 months, 6 months and 12 months maturity periods as follows:

$$Y_t = \alpha + \beta_1 \times Y_{t-1} + \beta_2 \times Y_{t-2} + e_t \quad (30)$$

where $Y_t = \left[TDR_{Conventional_t} TDR_{Islamic_t}\right]$ and t=1 month, 3, 6, 12 months maturity periods. The regression coefficient β_1 and β_2 estimates of the relationship between lead and lag variables. Number of lagged of endogenous variables are 2 which is set by SIC. Based on the VAR model, we employ impulse response functions to illustrate how the endogenous variables relate to each other over time. We replicate the VAR estimates and the impulse response functions for both pre and post 200 crisis period. Then we compare both impulse response functions to figure how the relationship developed before and after the 2008 financial crisis.

1 month maturity VAR estimations for the differenced values are:

$$TDR_{Conventional_t} = 0.00 - 0.64 \cdot TDR_{Conventional_{t-1}} - 0.26 \cdot TDR_{Conventional_{t-2}} + 0.05 \cdot TDR_{Islamic_{t-1}} + 0.19 \cdot TDR_{Islamic_{t-2}}$$

(-1.01) (5.86) (-2.48) (0.36) (1.30)

$$TDR_{Islamic_t} = 0.00 - 0.05 \cdot TDR_{Conventional_{t-1}} + 0.21 \cdot TDR_{Conventional_{t-2}} + 0.08 \cdot TDR_{Islamic_{t-1}} + 0.31 \cdot TDR_{Islamic_{t-2}}$$

(-0.96) (-0.75) (2.98) (0.85) (3.17)

Whereas before the crisis the VAR estimation for differences:

$$TDR_{Conventional_t} = 0.00 - 0.36 \cdot TDR_{Conventional_{t-1}} - 0.241 TDR_{Conventional_{t-2}} + 0.11 \cdot TDR_{Islamic_{t-1}} + 0.34 \cdot TDR_{Islamic_{t-2}}$$

(0.61) (2.13) (-1.27) (0.29) (0.92)

$$TDR_{Islamic_t} = 0.00 - 0.07 \cdot TDR_{Conventional_{t-1}} + 0.12 \cdot TDR_{Conventional_{t-2}} + 0.53 \cdot TDR_{Islamic_{t-1}} - 0.07 \cdot TDR_{Islamic_{t-2}}$$

(0.66) (1.10) (1.82) (3.33) (0.49)

and after the crisis:

$$TDR_{Conventional_t} = 0.00 - 0.65 \cdot TDR_{Conventional_{t-1}} - 0.26 TDR_{Conventional_{t-2}} + 0.16 \cdot TDR_{Islamic_{t-1}} + 0.11 \cdot TDR_{Islamic_{t-2}}$$

(-0.94) (4.59) (-1.95) (0.69) (0.70)

$$TDR_{Islamic_t} = 0.00 + 0.14 \cdot TDR_{Conventional_{t-1}} + 0.07 \cdot TDR_{Conventional_{t-2}} + 0.44 \cdot TDR_{Islamic_{t-1}} + 0.14 \cdot TDR_{Islamic_{t-2}}$$

(0.08) (1.93) (1.06) (3.49) (1.78)

Corresponding impulse response functions are given in Figure 4.3 and 4.4 which highlights the similar patterns. The shocks to the conventional banking only stay for 3 periods and vice versa. But the endogenous shocks from the own banking sectors live for 4 periods. These results indicate that the relationship between conventional banking and Islamic banking is short lived. This result indicates that the Islamic banking PLS returns are not affected much from the conventional banking interest rates. This evidence supports the hypothesis that Islamic banking differs from the conventional counterpart. Moreover, impacts of the global crisis do not change the general picture in the causal relationship and also the linkage between both banking sectors. Hence, Islamic banking can be alternative source to the general risk structure of the economy.

[Insert Figure 4.3 and 4.4 about here]

[Insert Figure 4.5 about here]

4.7 Concluding Remarks

In this study, we studied the causal relationship between conventional and Islamic banking. We use TDRs offered by both conventional and Islamic banking. Our results suggest that there is no significant relationship between both banking

sectors. This result can be interpreted as Islamic banks do not adjust their PLS ratios pegged to the interest rate offered by conventional banks. Also conventional banks determine their interest rate without any connection to the Islamic banking PLS ratios. Our overall results contradict the findings of studies which conclude that Islamic banking might not be different from the conventional banking. We report that inferences from pairwise Granger causality alone might be spurious since the analysis based on non-stationary series can be consequence of time functional characteristics of the time series. By subsampling the data for pre and post-crisis periods, Granger causality is rejected.

These result support the argument that lack of exposures to the type of assets associated with most of the losses conventional banks experienced during the crisis, have shielded Islamic banking from the impact of the crisis. The loss of assets resulting in sharp reduction on TDR have not been experienced in PLS ratios. Moreover the movement in TDR ratios significantly different from the PLS ratio changes. No correlation and causal relationship supports that Islamic finance's unique product scale differentiate it from the conventional finance and its potential risk structure. However our analysis and causality results would not lead to concrete indication that Islamic finance increases financial stability. Further analysis on the default ratio of Islamic banks during the crisis, distance to default analyses would lead to more reliable general conclusion about the financial stability issues.

Further studies can also concentrate on the how Islamic banking reduces the systematic risk in the economy. This hypothesis can be tested by the efficiency tests on both banking structures. Moreover, further study with weekly or daily data can gasp the more efficient impulse response effects and can shed better light on the lead-lag relationship between the both banking sectors.

5. CONCLUSION

The studies in financial markets have increased significantly after the global crisis experience. Practical questions raise theoretical challenges. This study demonstrates some applied analysis from the fields of financial econometrics, behavioural finance and Islamic finance. Three essays included in this thesis present answers applying the econometric models.

The first study uses RMT and the cross-correlations between markets. Our results indicate that cross-correlations between financial markets are not totally explainable by randomness. Hence we identified by computing the deviations of the empirical data from the RMT predictions. We showed the presence of a certain linear combination of indexes representing a global market itself that arises from interactions which indicates that the financial markets follow each other. We tried to map the causality link in between market. We found that there certain market leaders and some emerging markets follow them. Also these leaders and followers change after the 2008 crisis experience.

In the second study, we examine the individual investor behaviour in financial markets. We use the daily return rates of the portfolios. Regarding the limited number of individual data sets utilized in the literature, we expand the data covered in this line of research to a new market, which has one of the highest turnovers throughout the world. This study first documents turnover and return performances of individual investors in Turkey and analyses the relationship between the two. This analysis is repeated for the return and portfolio size. A regression analysis is carried out to find the effects of several variables such as turnover, holding period, portfolio size, age and gender on the portfolio returns of the individuals. Our analysis provides five important results:

- First, the individual investors underperform the market.
- Second, there is a reverse relationship between turnover and returns.

- Third, there is a positive relationship between holding period and returns. Moreover, there exists an optimum level of holding period.
- Fourth, men trade more than women, and hence they underperform the women.
- Fifth, there is a positive relationship between portfolio size and returns. That is the bigger the portfolio size, the higher the returns.
- Sixth, age has a positive effect on the portfolio returns.

These results are consistent with the behavioural finance literature which suggests that individuals (mainly due to their overconfidence) that trade aggressively have lower returns compared to the average investor. We contribute to the literature by bringing new evidence to the current debates on individual investors' behavioural patterns and give concluding evidence that individual investor trading pattern could be harmful to portfolio. We present important evidence from an emerging market which may have some different behavioural patterns compared to the most of the studies in the literature. We find that there is a reverse positive relationship between portfolio size and returns, on which there is no clear consensus in the previous studies. We also find evidence that as the holding period lengthens, the return increases, up to some level. Lastly, our study finds evidence that individual investors hold portfolios less than potential optimal holding period level. Any further studies that elaborate more on the levels of optimal holding period and the dynamics behind the trading patterns related to the individual behavioural biases will add up to the literature. With the accumulating empirical evidence from different countries, cross-cultural or cross-regional insights may more easily be reached in the further studies.

Last study investigate the alternative finance model after the financial crisis: Islamic finance. We try to investigate if the Islamic finance significantly different than the conventional model. We analysed the term deposit rates offered by two different finance models. We focused on the relationship between Islamic and

conventional banking. Our results suggest that there is no significant relationship between both banking sectors. This result can be interpreted as Islamic banks do not adjust their PLS ratios pegged to the interest rate offered by conventional banks. Also conventional banks determine their interest rate without any connection to the Islamic banking PLS ratios. Our overall results contradict the findings of studies which conclude that Islamic banking might not be different from the conventional banking. We report that inferences from pairwise Granger causality alone might be spurious since the analysis based on non-stationary series can be consequence of time functional characteristics of the time series. By subsampling the data for pre and post-crisis periods, Granger causality is rejected. Further studies can concentrate on the how Islamic banking reduces the systematic risk in the economy.

6. REFERENCES

Ajzen, I. (1985), "From intentions to actions: A theory of planned behaviour. In: J. Kuhl & J. Beckmann (Eds.), Action Control: From Cognition to Behavior" *NY: Springer Verlag* 11-39

Ajzen, I. & Madden, T. J. (1986), "Prediction of goal-directed behaviour: Attitudes, intentions, and perceived behavioural control" *Journal of Experimental Social Psychology*, 22: 453-474.

Ajzen, I. (1991), "The theory of planned behavior", *Organizational Behavior and Human Decision Processes*, 50: 179-211.

Altunbas, Y., Evans, L. and Molyneux, P. (2001) "Ownership and efficiency in banking", *Journal of Money, Credit and Banking* 33, 926-954.

Andersen T.G., Bollerslev T., Diebold F.X. C. and Vega C., (2007) "Real-time price discovery in stock, bond and foreign exchange markets" *Journal of International Economics, 73*(2), 251-277.

Anderson, A. (2008), "Trading and Under-Diversification", working paper, Institute for Financial Research, Stockholm.

Andrade, S.C., C. Chang, and M.S. Seasholes (2008), "Trading Imbalances, Predictable Reversals, and Cross-Stock Price Pressure," *Journal of Financial Economics* 88:406- 423.

Ausloos M., Lambiotte R., (2007) "Clusters or networks of economies?: A macro economy study through Gross Domestic Product" *Physica A 382*, 16-20.

Baker, M. P., and J. C. Stein, 2004, Market liquidity as a sentiment indicator, *Journal of Financial Markets* 7, 271–99.

Baker H., Forester P.J., Pearce P.A., (1998) "Random matrix ensembles with an effective extensive external charge" *Journal of Physios A* 31(29) 6087-6095.

Balduzzi P., Elton E.J., and Green T.C. (2001) "Economic news and bond prices: Evidence from the U.S. Treasury market," *Journal of Finance Quantative Analysis*, 36, 523-544.

Banz, W. (1981), "The relationship between return and market value of common stocks," *Journal of Financial Economics*, 9, 1:3-18

Barabsi A.L., Albert R., Jeong H., (1999) "Mean-field theory for scale-free random networks" *Physica A 272* (1), 173-187.

Barber, B.M., Y. Lee, Y. Liu, and T. Odean (2007), "Is the Aggregate Investor Reluctant to Realize Losses? Evidence from Taiwan," *European Financial Management* 13:423-447.

Barber, B.M., Y. Lee, Y. Liu, and T. Odean (2009), "Just How Much Do Individual Investors Lose by Trading?" *Review of Financial Studies* 22:609-632.

Barber, B.M., Y. Lee, Y. Liu, and T. Odean (2011), "The Cross-Section of Speculator Skill: Evidence from Taiwan," working paper

Barber, B.M. and T. Odean (2000), "Trading Is Hazardous to Your Wealth: The Common Stock Investment Performance of Individual Investors," *Journal of Finance* 55:773-806.

Barber, B.M. and T. Odean (2001), "Boys Will Be Boys: Gender, Overconfidence, and Common Stock Investment" *Quarterly Journal of Economics* 116:261-292.

Barber, B.M. and T. Odean (2004), "Are Individual Investors Tax Savvy? Evidence from Retail and Discount Brokerage Accounts," *Journal of Public Economics*, 88, 419-442.

Barber, B.M. and T. Odean (2008),All that Glitters: The Effect of Attention on the Buying Behavior of Individual and Institutional Investors*" Review of Financial Studies*, 21: 785-818.

Barber, B.M., T. Odean, and N. Zhu (2009), "Systematic Noise," *Journal of Financial Markets*, 12:547-469.

Barberis, N. and R.H. Thaler (2003), "A Survey of Behavioral Finance," in G. Constantinides, M. Harris, R. Stultz eds., *Handbook of the Economics of Finance*.

Benos, A.V. (1998), "Overconfident Speculators in Call Markets: Trade Patterns and Survival," *Journal of Financial Markets* 1:353-383.

Biroli G., Bouchaud J.P. and Potters M. (2007) "Extreme value problems in random matrix theory and other disorder systems" *Journal of Statistical Mechanics.* 78(7) (2007).

Blume, M. E., and I. Friend. (1975), "The Asset Structure of Individual Portfolios and Some Implications for Utility Functions." *Journal of Finance,* 30 585–603.

Bonanno G., Lillo F., Mantegna R.N., (2001) "High frequency cross-correlation in a set of stocks" *Quantitative Finance* 1 96-104.

Bonanno G., Caldarelli G., Lillo F., Micciche S., Vandewalle N., Mantegna R.N., (2004) "Networks of equities in financial markets" *European Physical. Journal B* 38 363.

Bonanno G., Vandewalle N., Mantegna R.N., (2000) "Taxonomy of stock market indices" *Physical. Review E* (62) 7615.

Bonanno G., Lillo F., Mantegna R.N., (2001) "Levels of complexity in financial markets" *Physica A* 299 16-27.

Borghesi C., Marsili M., Micciche S., (2007) "Emergence of time-horizon invariant correlation structure in financial returns by subtraction of the market mode" *Physical Review E,* 76 026104.

Bouchaud J.P., Laloux L., Miceli M.A., Potters M. (2007) "Large dimensions forecasting models and random singular varlue spectra" *European Physical Journal B 55*(2) 201-207.

Brida J.G., Risso W.A., (2008) "Multidimensional minimal spanning tree: the dow jones case" *Physica A* (387) 5205-5210.

Brody T.A., Flores J., French J.B., Mello P.A., Pandey A., Wong S.S.M., (1981) "Random-matrix physics: spectrum and strength fluctuations" *Review Modern Physics* 53 385-392.

Campbell, J.Y. (2006), "Household Finance," *Journal of Finance* 61:1553-1604.

Carhart, M. M., 1997, "On persistence in mutual fund performance", *Journal of Finance* 52, 57–82.

Chong, B. S. and Liu, M.-H. (2009) "Islamic banking: interest-free or interest-based?", *Pacific-Basin Finance Journal* 17, 125-144.

Chen, G., K. Kim, J. Nofsinger, and O. Rui (2007), "Trading Performance, Disposition Effect, Overconfidence, Represenativeness Bias, and Experience of Emerging Market Investors," *Journal of Behavioral Decision Making* 20:425-451.

Choi, J. J., D. Laibson, and A. Metrick (2002), "How Does the Internet Affect Trading? Evidence from Investor Behavior in 401(k) Plans." *Journal of Financial Economics*.64: 397-421

Chuang, W. I. and Susmel, R. (2011) "Who is the more overconfident trader? Individual versus Institutional investors", *Journal of Banking and Finance* 35, 1626-1644.

Coelho R., Gilmore C.G., Lucey B., Richmond P., Hutzler S., (2007) "The evolution of interdependence in world equity markets—Evidence from minimum spanning trees" *Physica A 376*, 455-466.

Conlon T., Ruskin H.J., Crane M., (2009) "Cross-correlation dynamics in financial time series" *Physica A* 388 (5), 705-714.

Cooper C., Woo C. , Dunkelberg W., (1988), "Entrepreneurs' perceived chances for success" *Journal of Business Venturing*, 3, 2: 97-108

Coronnello C., Tumminello M., Lillo F., Micchiche S., Mantegna R.N., (2005) "Sector identification in a set of stock return time series traded at the London Stock Exchange" *Acta Physical Polonica B* 36 2653.

Dalkir, M. (2009). “Revisiting Stock Market Index Correlations” *Finance Research Letters*, 6(1), 23-33.

Daniel, K., M. Grinblatt, S. Titman, and R. Wermers (1997), “Measuring Mutual Fund Performance with Characteristic-Based Benchmarks,” *Journal of Finance* 52: 1035-1058.

DeBondt, W. F. M. and Thaler, R. H. (1985), “Does the stock market overreact?”, *Journal of Finance,* 40:793–808.

DeBondt, W. F. M. and Thaler, R. H. (1987), “Further evidence on investor overreaction and stock market seasonality”, *Journal of Finance,* 42: 557–81.

Dimov I.I., Kolm P.N., Maclin L., Shiber D.Y.C. (2012) “Hidden noise structure and random matrix models of stock correlations” *Quantitative Finance 12*(4) 567-572.

Drozdz Z., Forczek M., Kwapien J., Oswiecimka P., Rak R. (2007) “Stock market returns distribution: From past to present” *Physica A 383*(1), 59-64.

Drozdz S., Grummer F., Ruf F., Speth J., (2001) “Towards identifying the world stock market cross-correlations: DAX versus Dow Jones” *Physica A* 294, 226-234.

Edelman, A. (1988): "Eigenvalues and Condition Numbers of Random Matrices." *SIAM Journal of Matrix Analysis Appl* 9(4), 543-560.

Ederington L.H. and Lee J.H. (1993) “How Markets Process Information: News and Releases and Volatiliy” *Journal of Finance, 48*(4) 1161-1191.

Elgari, M. A. (2003) “Credit risk in islamic banking and finance” *Islamic Economic Studies* 10(2), 1–25.

Elfakhani, S., Kabir M., K., (2005) “Performance of Islamic mutual funds”, American University of Beirut, Working Paper.

Eom C., Oh G., Jung W.S., Jeong H., Kim S., (2009) “Topological properties of stock networks based on minimal spanning tree and random matrix theory in financial time series” *Physica A 388* (6), 900-906.

Erb C.B., Harvey C.R, Viscanta T.E., (1994) "Forecasting international equity correlations" *Financial Analysis Journal* 50 32-45.

Eryigit M., Eryigit R., (2009) "Network structure of cross-correlations among the world market indices" *Physica A* 388, 3551-3562.

Fagiolo G., (2010) "The international-trade network: gravity equations and topological properties" *Journal of Economic Interaction and Coordination* 5(1) 1-25.

Fazio, R. (1983), "Multiple Process by which Attitudes Guide Behavior: The Mode Model as an Integrative Framework", *Advances in Experimental Social Psychology*, 23: 75-89

Feng, L. and M. Seasholes (2004), "Correlated Trading and Location," *Journal of Finance* 59, 2117-2144

Feng, L. and M. Seasholes (2005), "Do Investor Sophistication and Trading Experience Eliminate Behavioral Biases in Financial Markets*?" Review of Finance 9*, 305-351.

Feng, L., and M. Seasholes (2008), "Individual Investors and Gender Similarities in an Emerging Stock Market," *Pacific-Basin Finance Journal* 16, 44-60.

Forte, Gianfranco, & Miglietta, Federica (2007). "Islamic mutual funds as faith-based funds in a socially responsible context", Bocconi University, Working Paper.

Frazzini, A. (2006), "The Disposition Effect and Underreaction to News," *Journal of Finance* 61, 2017:2046.

Gervais, S. and T. Odean (2001), "Learning to Be Overconfident", *Review of Financial Studies* 14, 1-27.

Gilmore C.G., Lucey B.M., Boscia M.W., (2010) "Comovements in government bond markets: A minimum spanning tree analysis" *Physica A 389* (21), 4875-4886.

Glaser, M. and M. Weber (2007), "Overconfidence and Trading Volume", *Geneva Risk and Insurance Revue* 32, 1-36.

Glaser, M., and M. Weber, 2009, "Which past returns affect trading volume?" *Journal of Financial Markets* 12, 1–31.

Goetzmann, W. and A. Kumar (2008), "Equity Portfolio Diversification," *Review of Finance* 12, 433-463.

Gopikrishnan P., Rosenow B., Plerou V., Stanley H.E., (2001) "Quantifying and Interpreting Collective Behavior in Financial Markets" *Physical Reiew. E* (64), 1-4.

Granger, C. W. J. (1969). "Investigating Causal Relations by Econometric Models and Cross-spectral Methods". *Econometrica* 37 (3), 424–438

Griffin, J. M., J. H. Harris, and S. Topaloglu, 2003, "The dynamics of institutional and individual trading", *Journal of Finance* 58, 2285–2320.

Grinblatt, M. and M. Keloharju (2000), "The Investment Behavior and Performance of Various Investor Types: A Study of Finland's Unique Data Set", *Journal of Financial Economics* 55, 43-67.

Grinblatt, M. and M. Keloharju (2009), "Sensation Seeking, Overconfidence, and Trading Activity," *Journal of Finance* 64, 549-578.

Grossman, S.J. and J.E. Stiglitz (1980), "On the Impossibility of Informationally Efficient Markets," *American Economic Review* 70, 393-408.

Guhr T., Muller-Groeling A., Weidenmuller H.A., (1998) "Random Matrix Theories in Quantum Physics: Common Concepts" *Phys. Rep.* (299), 190-205.

Hakan and Gulumser, (2011) "Impact of Interest Rates on Islamic and Conventional Banks: The Case of Turkey" working paper.

Hassan, M.K. and Bashir, A.H.M. (2003), "Determinants of Islamic Banking Profitability." International Seminar on Islamic Wealth Creation. University of Durham, UK, 7-9 July.

Hassan and Dridi (2010) "The Effects of the Global Crisis on Islamic and Conventional Banks: A Comparative Study" *IMF working paper.*

He J., Deem M.W., (2010) "Structure and response in the world trade network" *Physical Review Letters* 105-112.

Hirshleifer, D. (2001), "Investor Psychology and Asset Pricing," *Journal of Finance* 56, 1533-1597.

Hong, H., and J. C. Stein, (2003), "Differences of opinion, short-sales constraints and market crashes", *Review of Financial Studies* 16, 487–525.

Hong, H., and J. C. Stein, (2007), "Disagreement and the stock market", *Journal of Economic Perspectives* 21, 109–28.

Hussein, Khaled, & Omran, Mohammed (2005). "Ethical investment revisited: Evidence from Dow Jones Islamic Indexes". *Journal of Investing*, 14, 105–126.

Ivkovic, Z., and S. Weisbenner (2005), "Local Does as Local is: Information Content of the Geography of Individual Investors' Common Stock Investments." *Journal of Finance*, 60 267–306.

Jegadeesh, N., and S. Titman, (1993) "Returns to buying winners and selling losers: Implications for stock market efficiency". *Journal of Finance* 48, 65–91.

Kader, Janbota M., and Asarpota, Anju K. (2007), "Comparative Financial Performance of Islamic vis-à-vis Conventional Banks in the UAE." Paper presented at 2006-2007 Annual Student Research Symposium & First Chancellor's Undergraduate Research Award at UAE University.

Kaleem, A. and Isa, M. M. (2006) "Islamic banking and money demand function in Malaysia: an econometric analysis", *Pakistan Economic and Social Review*, 44, 277-290.

Kaniel, R., S. Liu, G. Saar, and S. Titman (2011), "Individual Investor Trading and Return Patterns around Earnings Announcements," *Journal of Finance*.

Kaniel, R., G. Saar, and S. Titman (2008), "Individual Investor Trading and Stock Returns," *Journal of Finance* 63, 273-310.

Keskin M., Deviren B., Kocalkaplan Y., (2011) "Topology of the correlation networks among major currencies. using hierarchical structure methods" *Physica A* 390 719.

Khan,and Mirakhor, A., (1986) "The framework and practice of Islamic banking", Finance and Development, September.

Khan, M. Fahim, (1983) 'Islamic banking as practised now in the world' in Ziauddin, Ahmad et al. (eds.).

Koestner, Meyer, Hackethal (2012), "Do Individual Investors Learn from Their Mistakes?" *Goethe University Frankfurt Working Paper Series*.

Korniotis, G.M. and A. Kumar (2009), "Do Older Investors Make Better Investment Decisions?" *Review of Economics and Statistics* 93, 244-265.

Kulkarni V. and Deo N. (2007) "Correlation and volatility in an Indian stock market: A random matrix approach" *European Physical Journal B (60*) 101-109.

Kullmann L., Kertesz J., Kaski K., (2002) "Time-dependent cross-correlations between different stock returns" *Physical Review Letters E* 66.

Kumar, A. (2009), "Hard-to-Value Stocks, Behavioral Biases, and Informed Trading," *Journal of Financial and Quantitative Analysis,* 44, 1375-1401.

Kwapien J., Drozdz S., Gorski A.Z., Oswiecimka P., (2006) "Asymmetric matrices in an analysis of financial correlations"*Acta Physica Polonica B (37)* 3039-3048.

Kwapien J., Gworek S., Droyzdyz S., Gorski A., (2009) "Analysis of a network structure of the foreign currency exchange market" *J. Econ. Interact. Coord.* (4) 55.

Laloux L., Cizeau P.,Bouchaud J.P., Potters M. (1999) "Noise dressing of financial correlation matrices" *Physics Review Lettters, 83* (1999) 1467-1470.

Laloux L., Cizeau P., Potters M. and Bouchaud J.P. (2000) "Random matrix theory and financial correlations" *International Journal Theory and Application of Finance* (3), 391-397.

LeBaron B., Arthur W.B., Palmer R., (1999) “Time series propoerties of an artificial stock market” *J. Econ. Dyn. Control* 23, 1487-1516.

Lo, A.W., and J.Wang, (2006), “Trading volume: Implications of an intertemporal capital asset pricing model”, *Journal of Finance* 61, 2805–40.

Mantegna R.N., (1999) “Hierarchical structure in financial markets” *European. Physical Journal B* (11) 193-197.

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

Martins A.C.R., (2007)“Non-stationary correlation matrices and noise” *Physica A (379)* 552-558.

Martins A.C.R., (2007b) “Random but not so much. A parametrization for the returns and correlation matrix of financial time series” *Physica A (383)* 527-532.

Maslov S., (2001) “Measures of globalization based on cross-correlations of world financial indices” *Physica A* 301 397–406.

Mehta M., (2004) *Random Matrices* (3rd ed.), Academic Press.

Micchiche S., Bonanno G., Lillo F., Mantegna R.N., (2003) “Stability of a minimum spanning tree of price return and volatility” *Physica A* 324 66-73.

Miller, (1977), “Risk, Uncertainty and Divergence in Option” *Journal of Finance,* 32,4:1151-1168.

Minsky (1986) “Stabilizing an Unstable Economy” New Hevan: Yale University Press.

Munnix M.C., Schafer R., Guhr T., (2010) “Compensating asyn- chrony effects in the calculation of financial correlations” *Physica A* 389(4) 767-779.

Namaki A., Jafari G.R., Raei R., (2011) "Comparing the Structure of an Emerging Market with a Mature One under Global Perturbation," *Physica A* 390 3020-3025.

Namaki A., Shirazi A.H., Raei R., Jafari G.R., (2011) “Network analysis of a financial market based on genuine correlation and threshold method” *Physica A 390*(21), 3835-3841.

Noh J.D., (2000) “Model for correlations in stock markets” *Physical Review E* 61 5981-5982.

Odean, T. (1998), “Volume, Volatility, Price, and Profit When All Traders Are Above Average," *Journal of Finance* 53, 1887-1934.

Odean, T. (1999), “Do Investors Trade too Much?" *American Economic Review* 89, 1279-1298.

Oh G., Eom C., Wang F., Jung W.S., Stanley H.E., Kim S., “Statistical properties of crosscorrelation in the Korean stock market” (2011) *European Physical Journal B* 79 55-60.

Onnela J.P., Chakraborti A., Kaski K., Kertesz J., (2003) “Dynamic asset trees and Black Monday” *Physica A 324* 247-252.

Onnela J.P., Kaski K., Kertesz J., (2004) “Clustering and information in correlation based financial networks” *Eur. Phys. J.* B 38 353.

Onnela J.P., Chakraborti A., Kaski K., Kertesz J., Kanto A., (2003) “Dynamics of market correlations: Taxonomy and portfolio analysis” *Phys. Rev. E* 68(5).

Pan R.K. and Sinha S. (2007) “Modular networks emerge from multiconstraint optimization” *Physical Review E*(76) 1-9.

Perron, Pierre, (1989). "The Great Crash, the Oil Price Shock, and the Unit Root Hypothesis," *Econometrica*, Econometric Society, vol. 57(6).

Plerou V., Gopikrishnan P., Rosenow B., Amaral L.E., Stanley H.E. (1999) “Universal and nonuniversal properties of financial cross-correlations matrices” *Physical Review Letters 83,* 1471-1475.

Plerou V., Gopikrishman P., Rosenow B., Amaral L.A., Stanley H.E., (1999) “Scaling of the distribution of price fluctationss of individual companies” *Physical Review E (60)* 5305-5316.

Plerou V., Gopikrishnan P., Rosenow B., Amaral L.A. and Stanley H., “A random matrix theory approach to financial cross-correlations” *Physica A* 287(3) 374-382.

Podobnik B., Wang D., Horvatic D., Grosse I., Stanley H.E., (2010) "Time-lag cross-correlations in collective phenomena" *Europhys. Letters* 90(6).

Podobnik B., Grosse I., Horvatic D., Ilic S., Ivanov P., Stanley H.E., (2009) "Quantifying cross-correlations using local and global detrending approaches" *The European Physical Journal B-Condensed Matter and Complex Systems* 71, 243-252.

Podobnik B., Horvatic D., Petersen A.M., Stanley H.E., (2009) "Cross correlations between volume change and price change" Proceedings of the National Academy of Sciences 106 (52), 22079-22084.

Potters M., Bouchaud J.P., Laloux L., (2005) "Financial applications of RMT: old laces and new pieces" *Acta Physica Polonica B (36)* 2767-2784.

Rak R., Kwapien J., Drozdz S., Oswiecimka P., (2008) "Different fractal properties of positive and negative returns" *Acta Physica Polonica A* 114, 547-553.

Rosenow B., Plerou V., Gopikrishnan P., Amaral L.A., Stanley H.E. (2000) "Application of random matrix theory to study cross-corelations of stock prices" *International Journal of Theoretical and Applied Finance 3*(3) 399-403.

Rosenow B., Gopikrishnan P., Plerou V., Stanley H.E. (2002) "Random magnets and correlations of stock price fluctations" *Physica A* 314, 762-767.

Russo, J. E. and Schoemaker, P. J. H., (1992) "Managing Overconfidence," *Sloan Management Review*, Winter, 7-18.

Sandoval L., Franca I.P., (2012) "Correlation of financial markets in times of crisis" *Physica A 391*(1), 187-208.

Scheinkman, J. and W. Xiong (2003), "Overconfidence and Speculative Bubbles," *Journal of Political Economy* 111, 1183-1219.

Seasholes, M.S., and G. Wu (2007), "Predictable Behavior, Profits, and Attention," *Journal of Empirical Finance*, 15, 590-610.

Seasholes, M.S. and N. Zhu (2010), "Individual Investors and Local Bias," *Journal of Finance* 65, 1987-2010.

Sengupta A.M., Mitra P.P., (1999) “Distributions of singular values for some random matrices” *Physical Review E* 60, 3389–3392.

Seru, A., T. Shumway, and N. Stoffman (2010), “Learning by Trading," *Review of Financial Studies*, 23, 705-839.

Schlarbaum, G.G., W.G. Lewellen, and R.C. Lease (1978), “Realized Returns on Common Stock Investments: The Experience of Individual Investors," *Journal of Business*, 51, 299-325.

Shefrin, H. and Statman, M. (1984), “Explaining investor preference for cash dividends”, *Journal of Financial Economics*, 13, 253–82

Shefrin, H.M. and M.S. Statman (1985), “The Disposition to Sell Winners too Early and Ride Losers too Long: Theory and Evidence,” *Journal of Finance*, 40, 777-790

Shen J. and Zheng B. (2009) “Cross-correlation in financial dynamics” *Europhysics Letters 86*(4) 48005.

Shiller, R. J. (1981), “Do stock prices move too much to be justified by subsequent changes in dividends?, “*American Economic Review*, 71, 421–98.

Sias, R., L. T. Starks, and S. Titman, (2006), “The price impact of institutional trading”, *Journal of Business* 79, 2869–2910.

Siddiqi, M.N., (1982) “Islamic approaches to money, banking and monetary policy: a review” in M. Ariff (ed.),

Siddiqi, M.N., (1983) Issues in Islamic Banking, Leicester: Islamic Foundation.

Sieczka P., Holyst J., (2009) “Correlations in commodity markets” *Physica A 388* (8), 1621-1630.

Solnik B., Bourcrelle C., Le Fur Y., (1996) “International market correlation and

Volatility” *Financial Analyst Journal* 52, 17-34.

Solt and Statman (1988), “How Useful is the Sentiment Index” *Financial Analysts Journal*, 44(5), 45-55

Solt and Statman (1989), “Good Companies, Bad Stocks” *The Journal of Portfolio Management,* 15(4) 39-44

Statman, M., S. Thorley, and K. Vorkink, (2006) “Investor overconfidence and trading volume”, *Review of Financial Studies* 19, 1531–65.

Subrahmanyam, A. (2008), “Behavioral Finance: A Review and Synthesis,” *European Financial Management* 14, 12-29.

Sundararajan, V. (2007). “Risk characteristics of Islamic products: implication for risk measurement and supervision. In Islamic Finance: The Regulatory Challenge”, Abdel Kareem, R. A., and Archer, S. (eds), 40–68. John Wiley & Sons.

Tuminello M., Aste T., DiMatteo T., Mantegna R.N., (2005) “A tool for filtering information in complex systems” *Proc. Natl. Acad. Sci.* 102, 10421-10426.

Tumminello M., Lillo F., and Mantegna. R. N. (2007) “Kullback-Leibler distance as a measure of the information filtered from multivariate data” *Phys. Rev. E*, 76.

Tumminello M., Aste T., Di Matteo T., Mantegna R. N. (2007) “Correlation based networks of equity returns sampled at di_erent time horizons” *Eur. Phys. J. B*, 55, 209–217.

Tumminello M., Lillo F., Mantegna R.N., “Correlation, hierarchies, and networks in financial markets” *Journal of Economic Behavior & Organization* 75 (1), 40-58.

Wagenaar, W. and G. B. Keren: 1986, “Does the Expert Know? The Reliability of Predictions and Confidence Ratings of Experts”. In: E. Hollnagel, G. Mancini, and D. D. Woods (eds.): Intelligent Decision Support in Process Environments. *Berlin et al: Springer.*

Wang D., Podobnik B., Horvatic D., Stanley H.E., (2011) “Quantifying and modeling long-range cross correlations in multiple time series with applications to world stock indices” *Physical Review E* 83 (4), 046121.

Wilcox D. and Gebbie T. (2007) “An analysis of cross-correlation in an emerging market” *Physica A 375*(2) 584-598.

Yates, J. F., J. Lee, and J. G. Bush, (1997) “General knowledge overconfidence: Cross-national variations, response style, and reality,” *Organizational Behavior and Human Decision Processe*s 70, 87–94.

Zeitun (2012), “Determinants of Islamic and Conventional Banks Performance in GCC Countries Using Panel Data Analysis” *Global Economy and Finance Journal* Vol. 5(1), 53-72.

Zhang Y., Lee G.H.T., Wong J.C., Kok J.L., Prusty M., Cheong S.A., (2011) “Will the US economy recover in 2010? A minimal spanning tree study” *Physica A 390* (11), 2020-2050.

7. FIGURES

Figure 7-1 **Figure 2.1** Empirical vs. Theoretical Eigenvalue Distribution

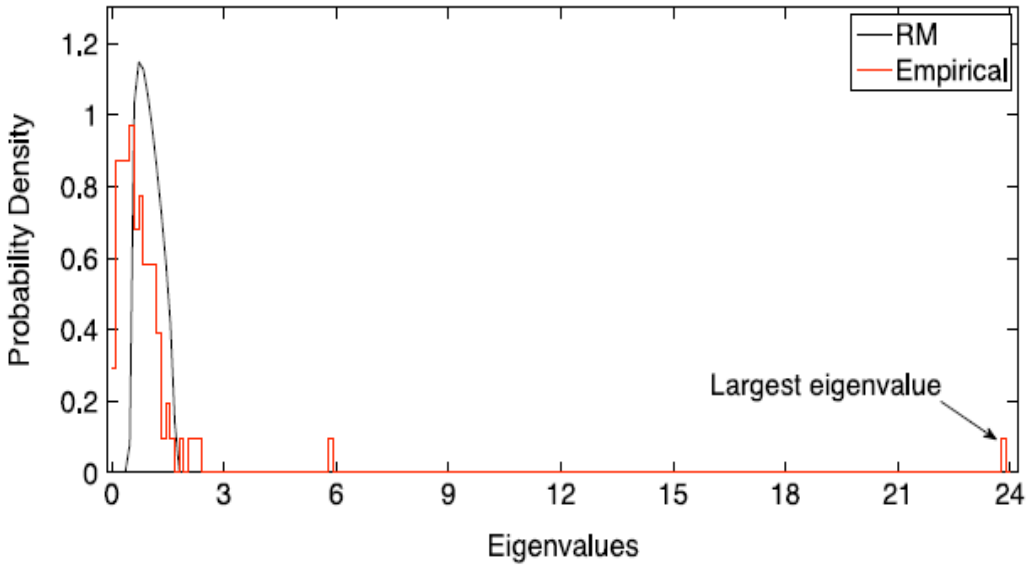


Figure 7-2 **Figure 2.2(a)** Simulation Finite size vs. Theoretical Eigenvalue Distribution

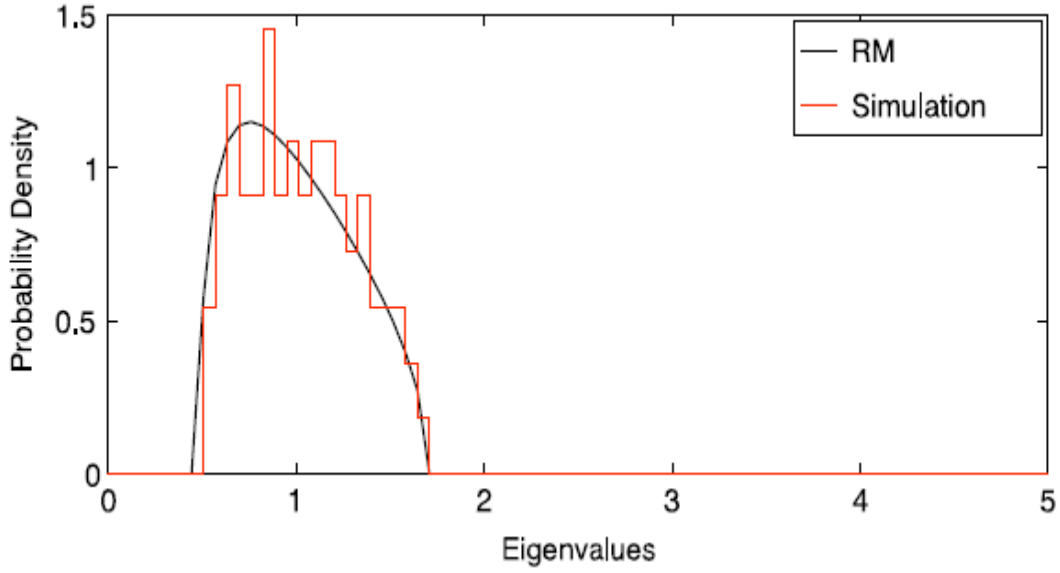


Figure 7-3 **Figure 2.2(b)** Simulation Fat Tails vs. Theoretical Eigenvalue Distribution

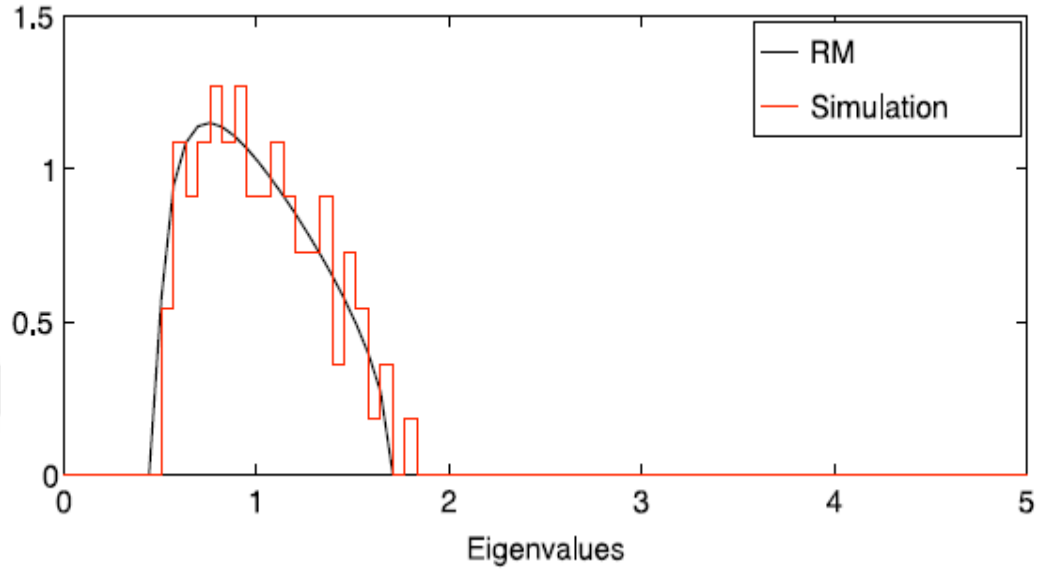


Figure 7-4 **Figure 2.3(a)** Nearest Neighbour Spacing Distribution of Eigenvalues

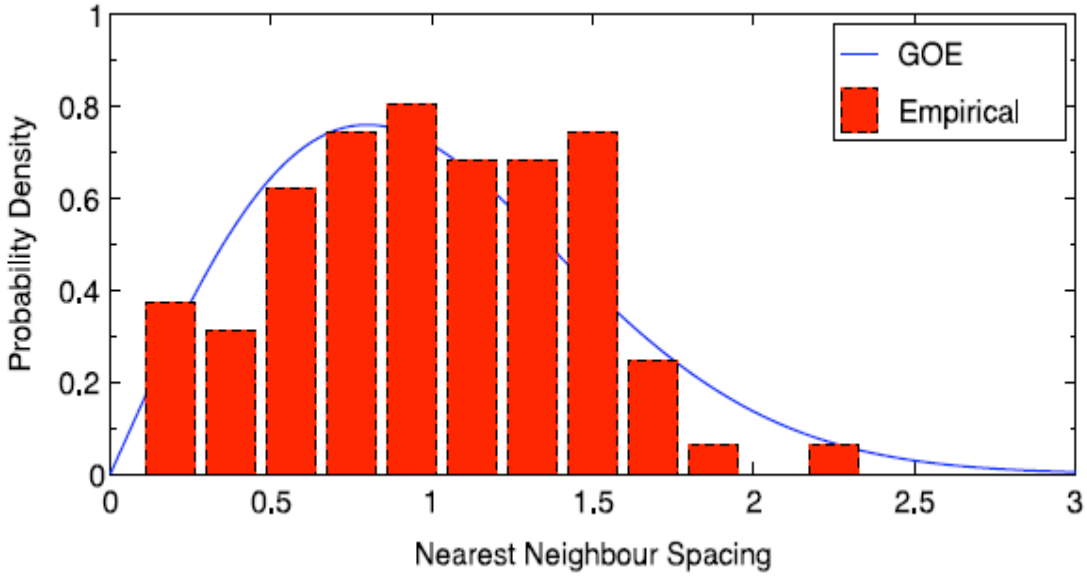


Figure 7-5 **Figure 2.3(b)** Next-Nearest Neighbour Spacing Distribution of Eigenvalues

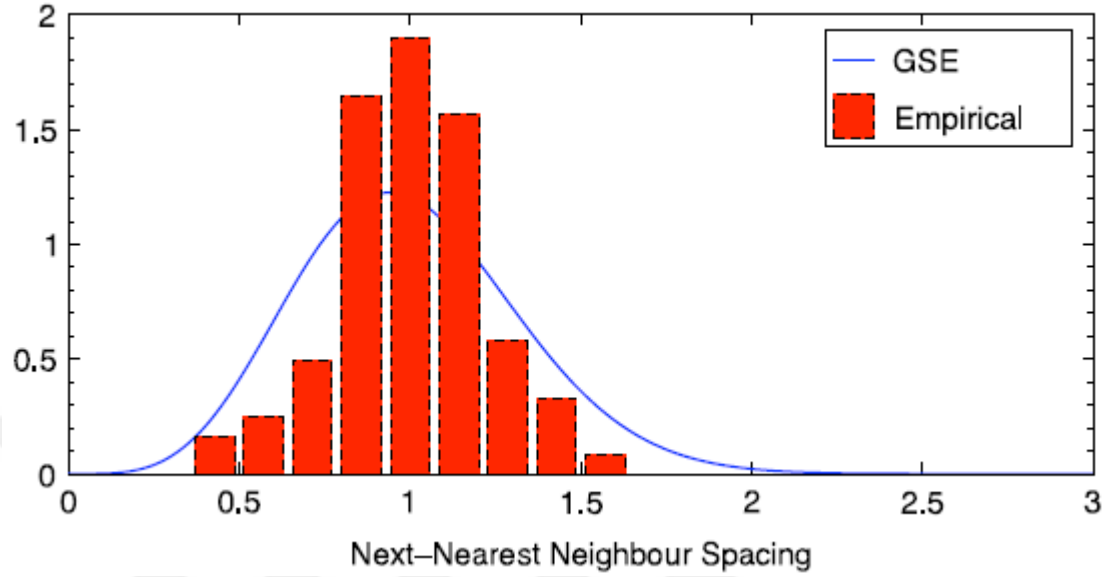


Figure 7-6 **Figure 2.4** Number Variance

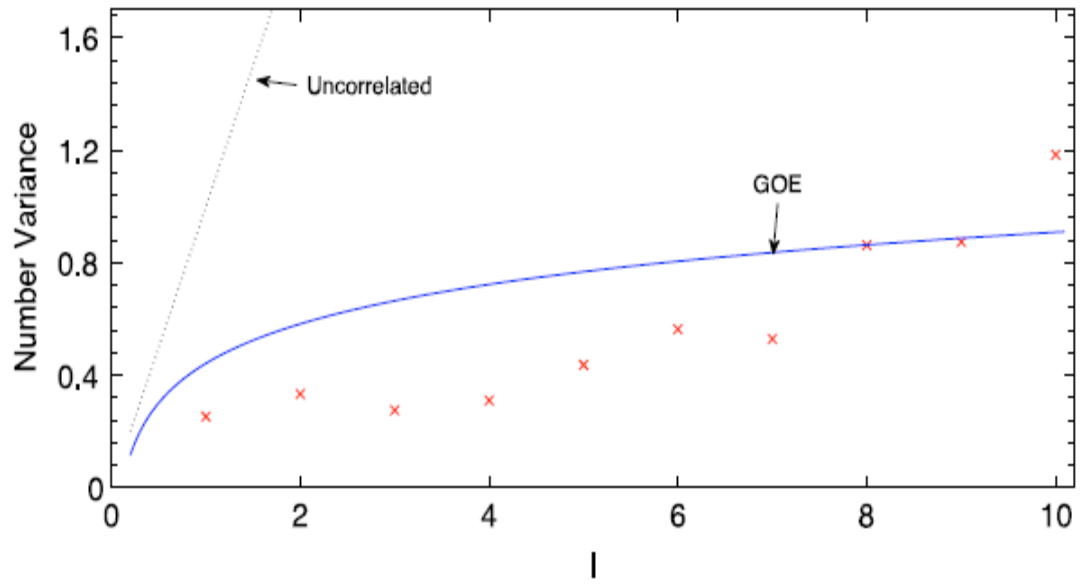


Figure 7-7 **Figure 2.5** Density Components of the Normalized Eigenvectors

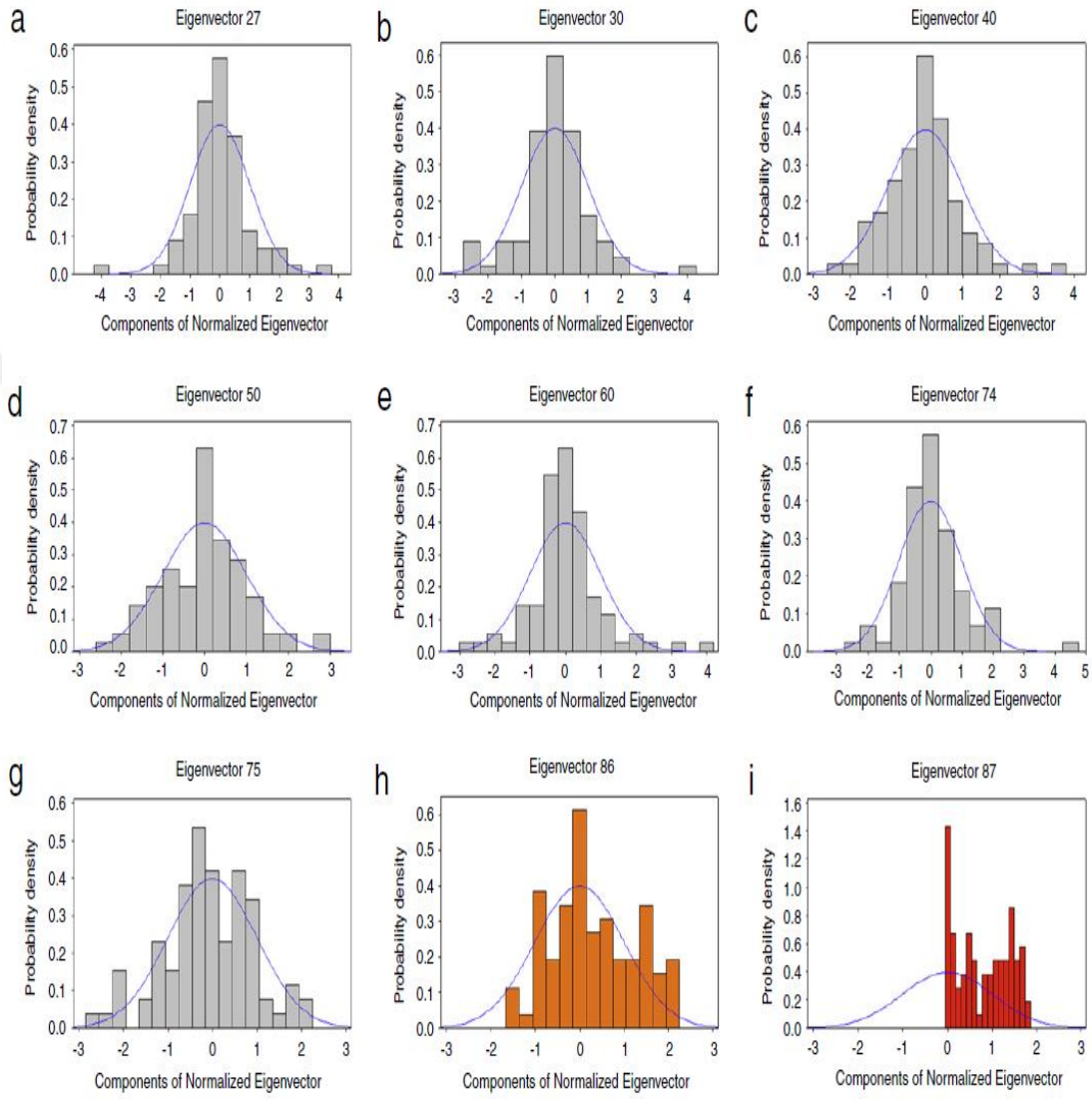


Figure 7-8 **Figure 2.6(a)** Kurtosis Component of Each Eigenvector

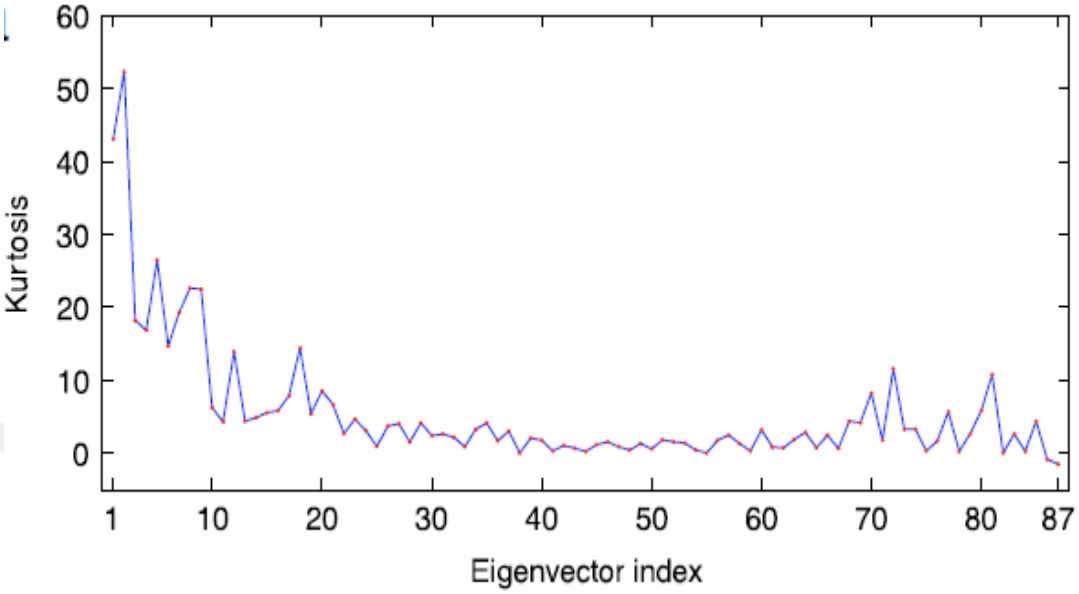


Figure 7-9 **Figure 2.6(b)** Skewness Component of Each Eigenvector

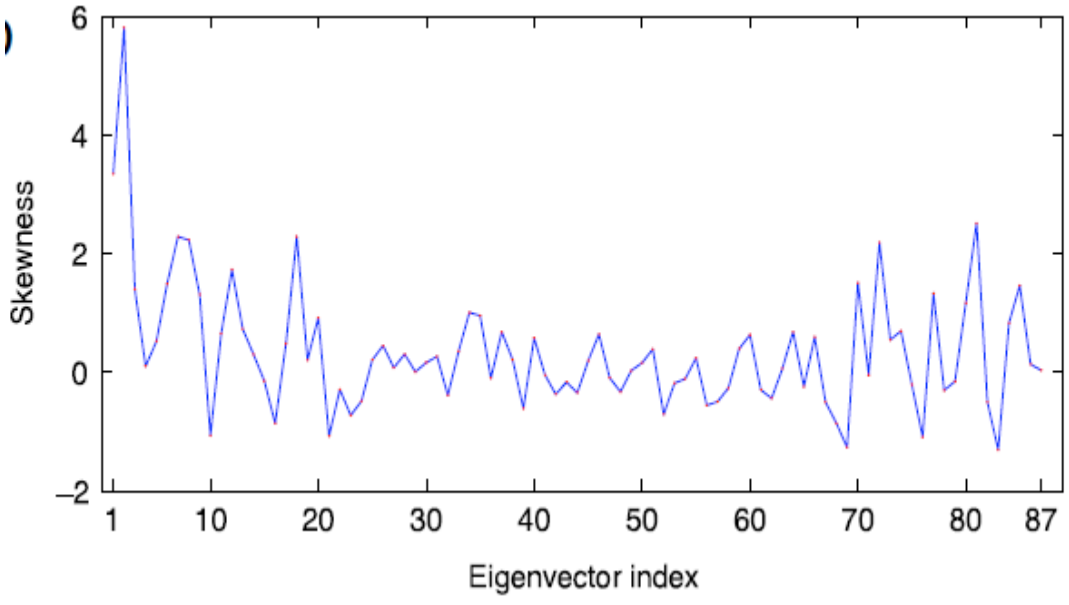


Figure 7-10 **Figure 2.7(a)** Contributions of Stock Markets: Components of the Largest Eigenvector

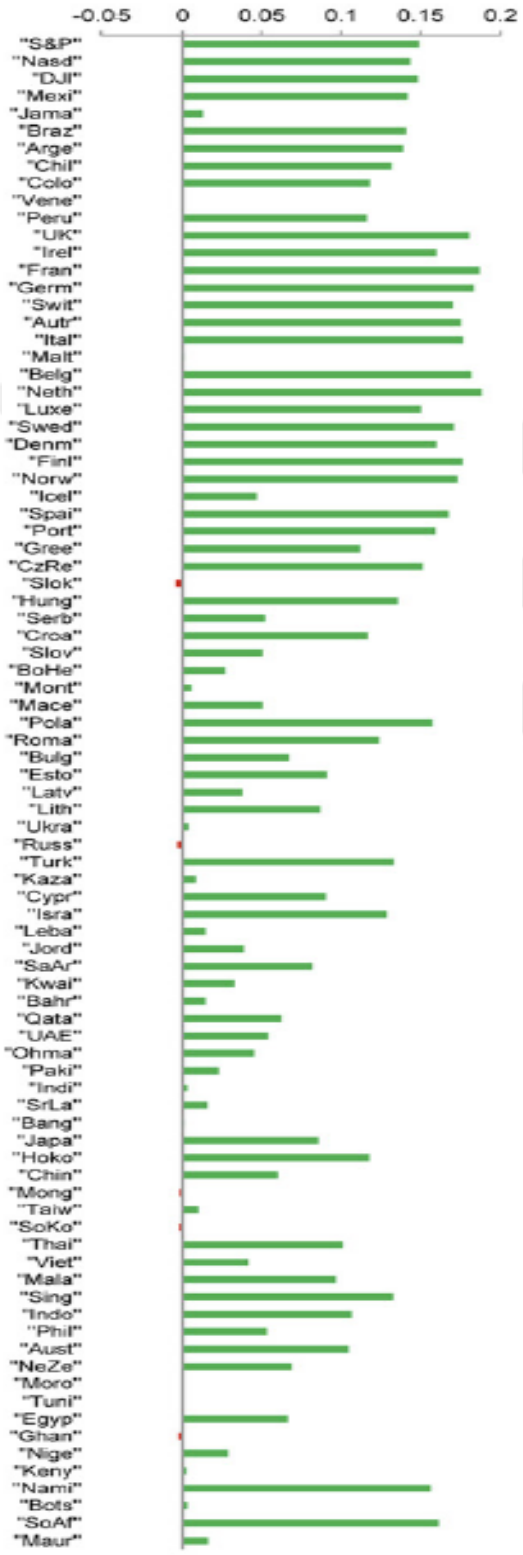


Figure 7-11 **Figure 2.7(b)** Contributions of Stock Markets: Eigenvector Corresponding to 50th Eigenvalue

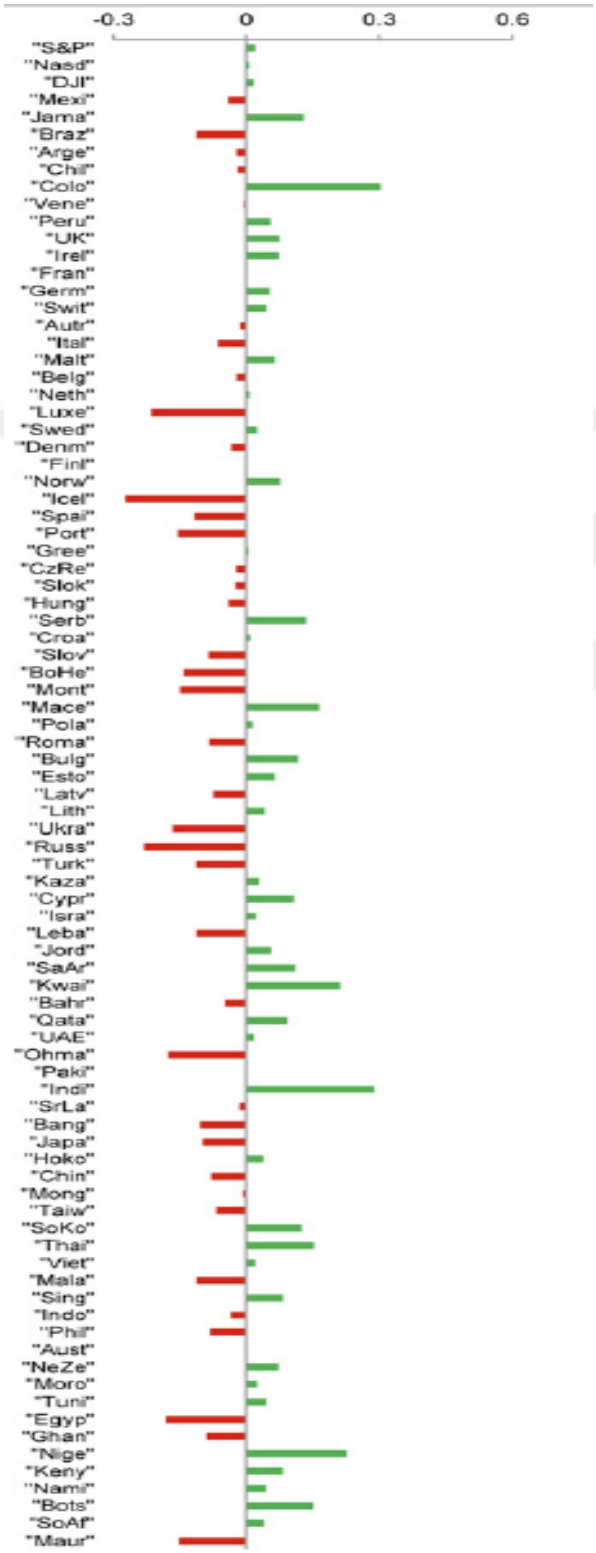


Figure 7-12 **Figure 2.7(c)** Contributions of Stock Markets: Components of the Smallest Eigenvector

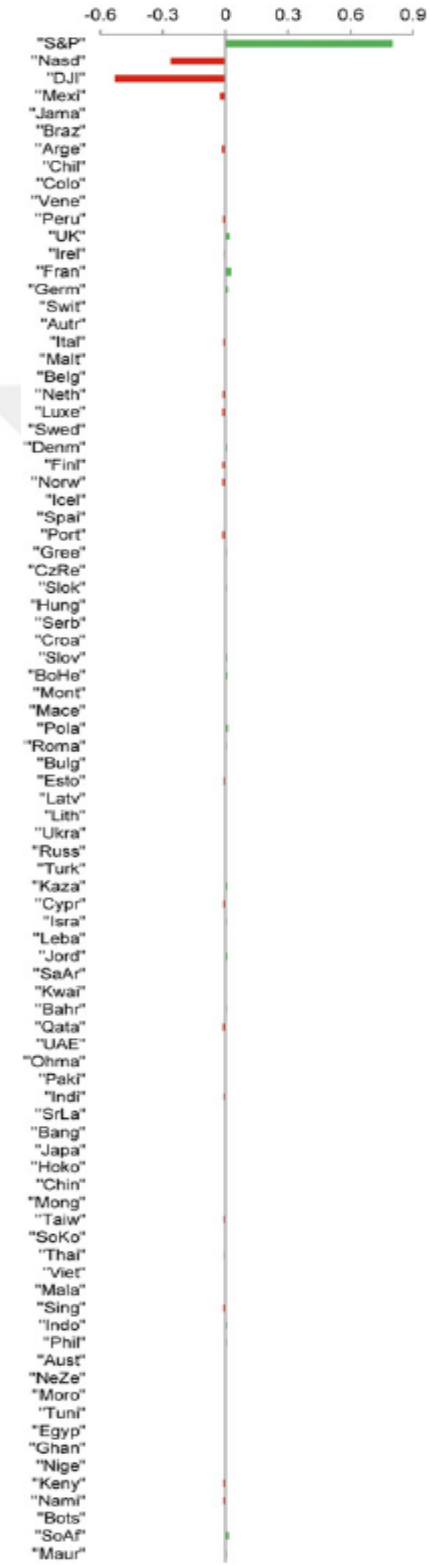


Figure 7-13 **Figure 2.8** MSCI country World Index Returns vs. Global Market Mode

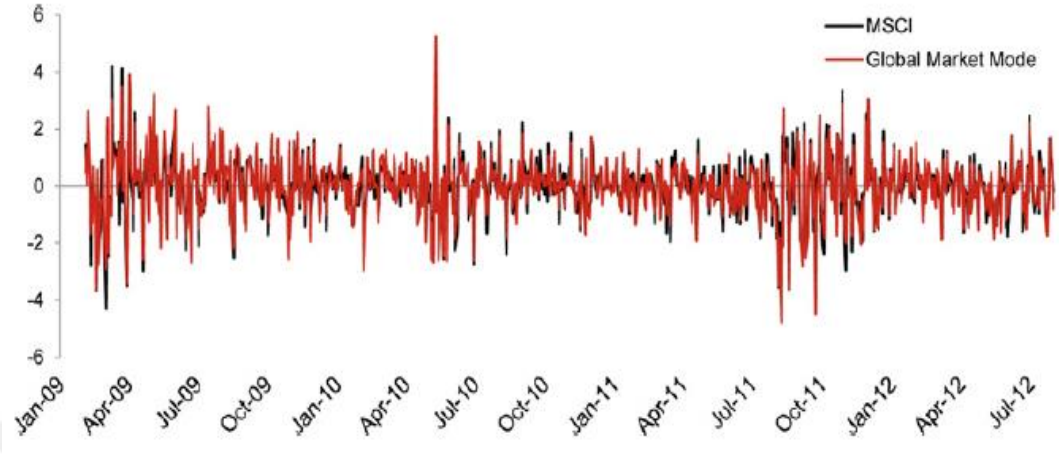


Figure 7-14 **Figure 2.9(a)** IPR of the Eigenvectors

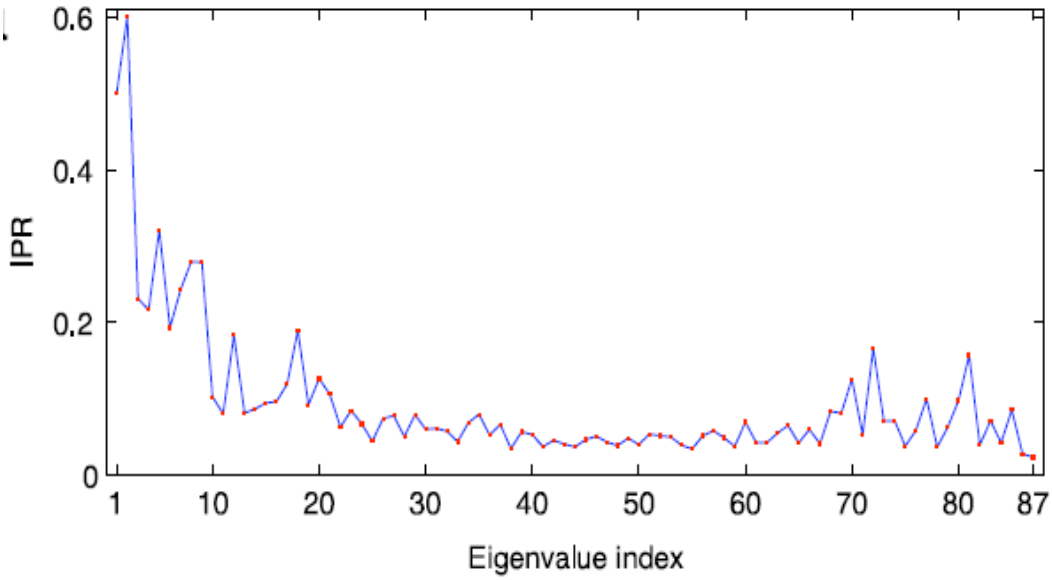


Figure 7-15 **Figure 2.9(b)** PR of the Eigenvectors

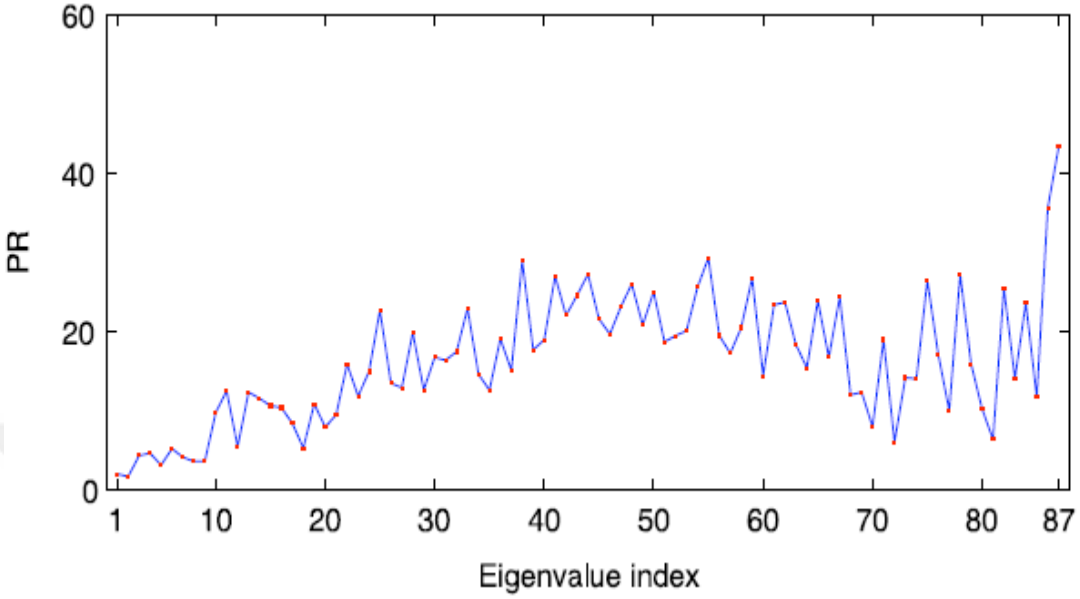


Figure 7-16 **Figure 2.10(a)** Global Volatility vs. Global Correlation

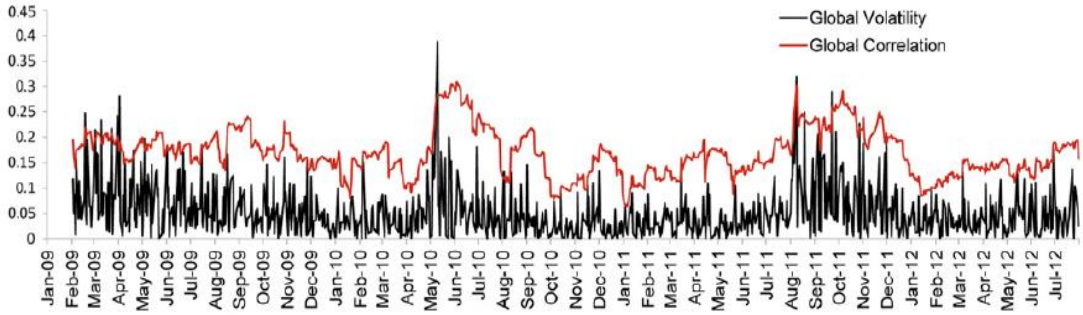


Figure 7-17 **Figure 2.10(b)** Global Volatility (Moving Window) vs. Global Correlation

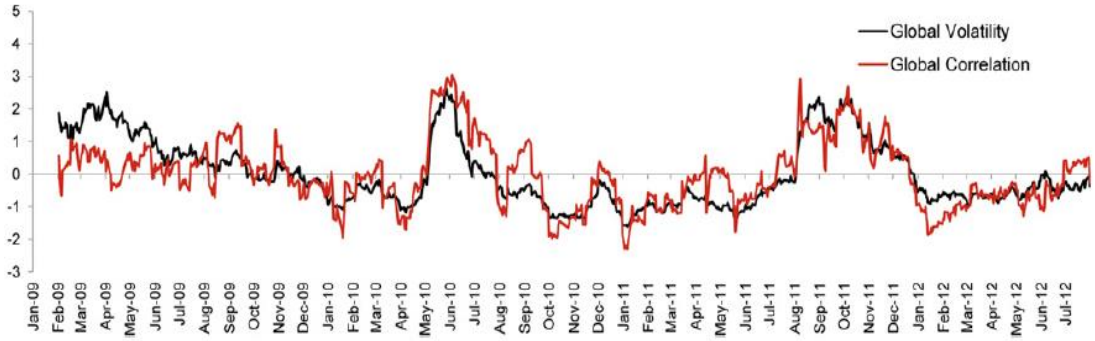


Figure 7-18 **Figure 2.11(a)** Kurtosis of Returns Obtained from a Moving Window

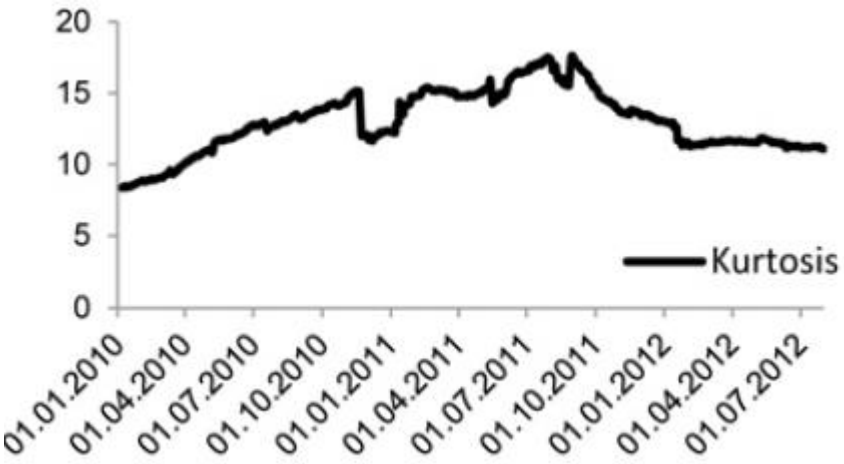


Figure 7-19 **Figure 2.11(b)** Skewness of Returns Obtained from a Moving Window

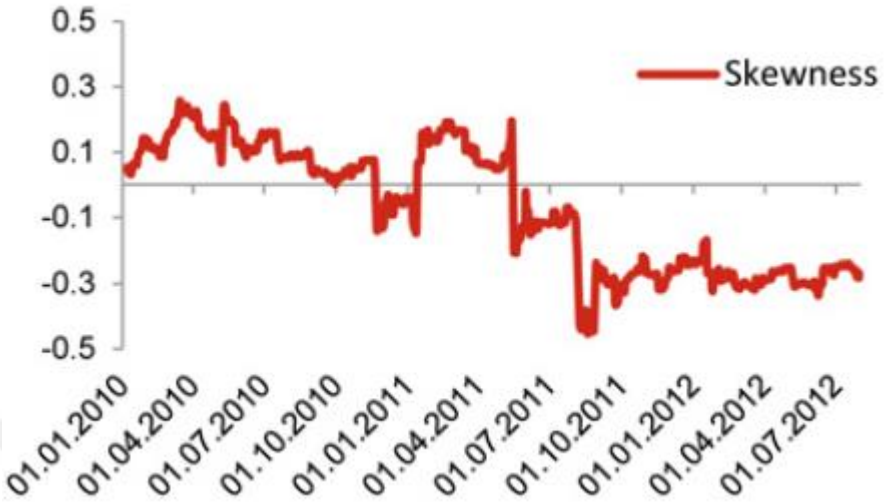


Figure 7-20 **Figure 2.12** Time-Varying Largest Eigenvalue of the Correlation Matrix Obtained from 1-Year Length Rolling Window

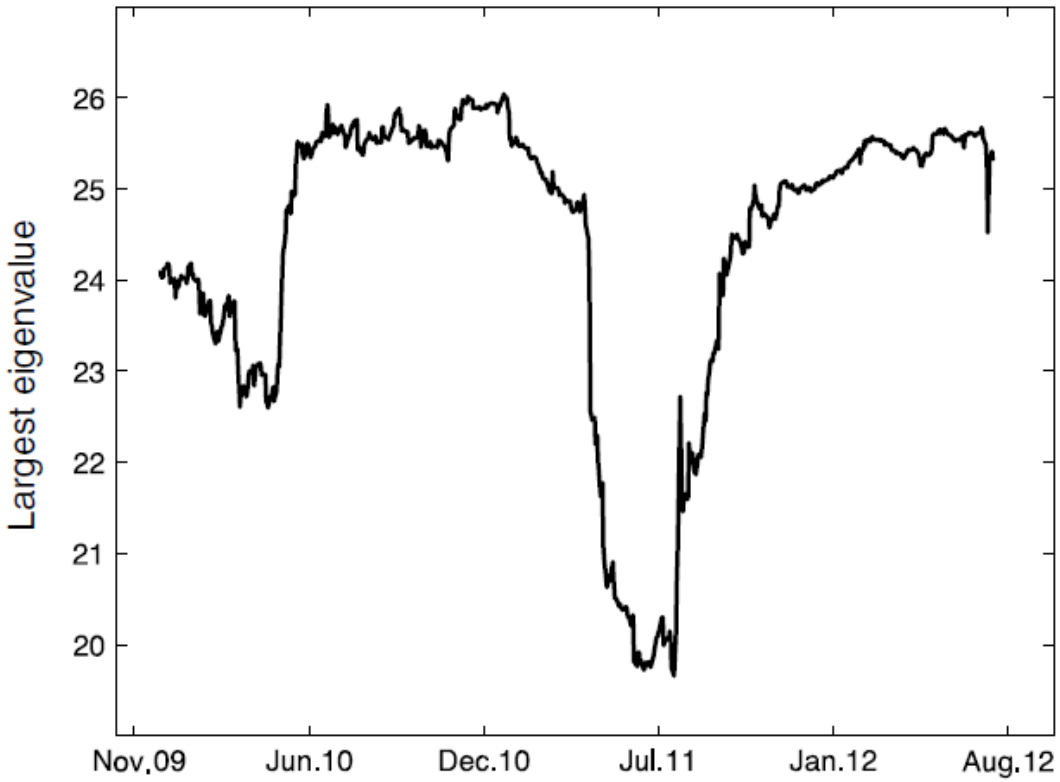


Figure 7-21 **Figure 2.13(a)** Minimal Spanning Trees of 2005-2007 (Period 1)

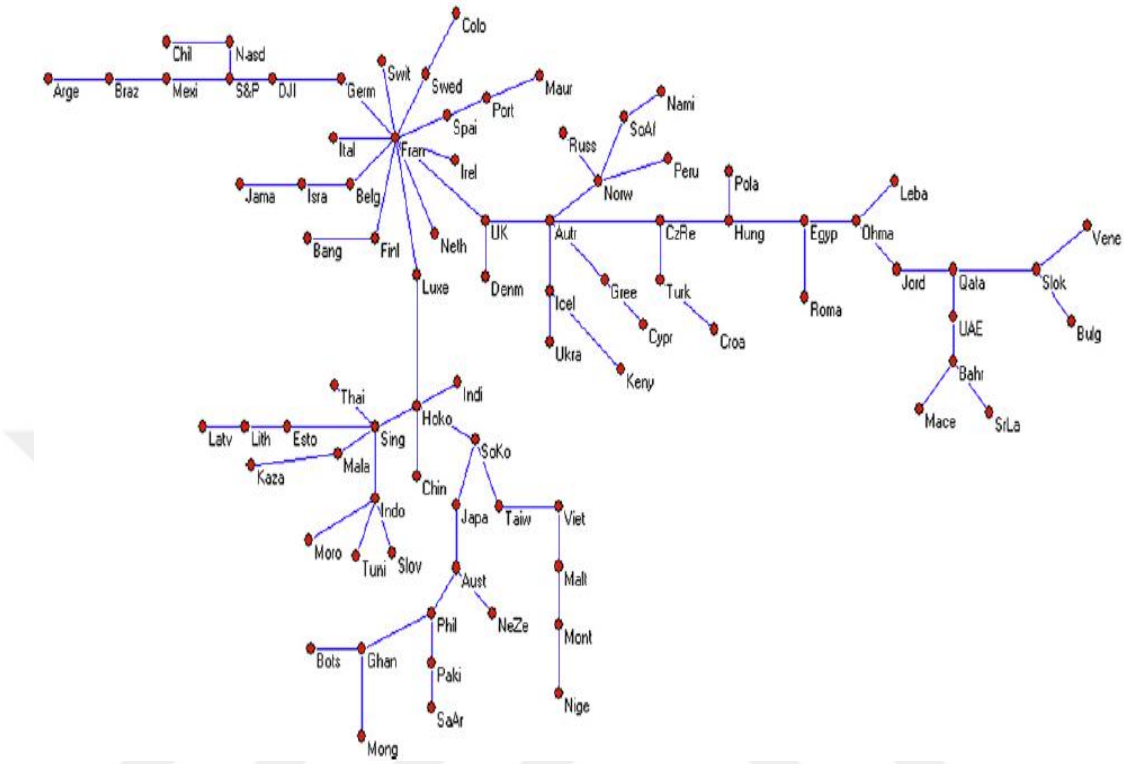


Figure 7-22 **Figure 2.13(b)** Minimal Spanning Trees of 2009-2012 (Period 2)

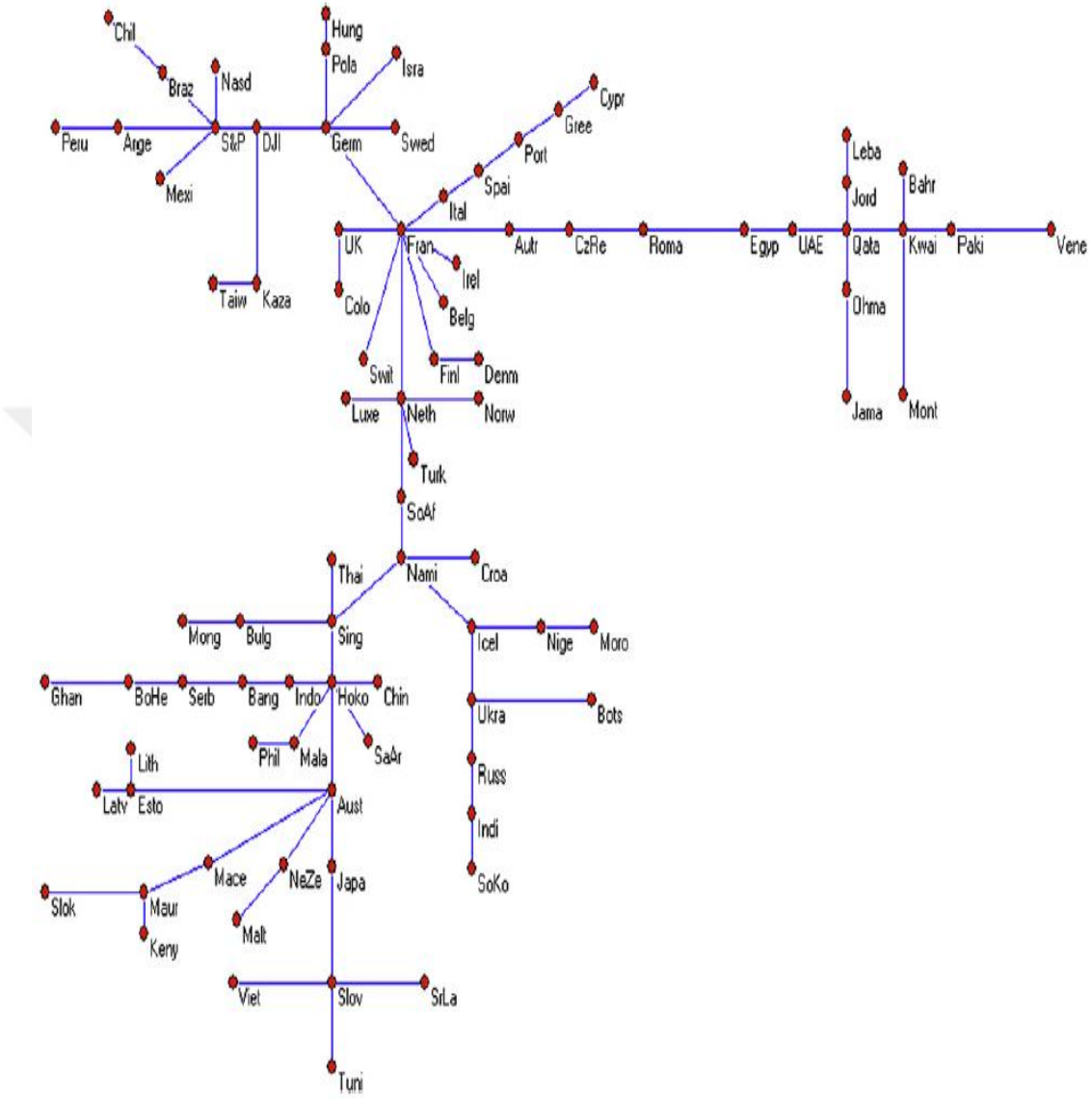


Figure 7-23 **Figure 2.14(a)** Ultrametric Hierarchical Trees of 2005-2007 (Period 1)

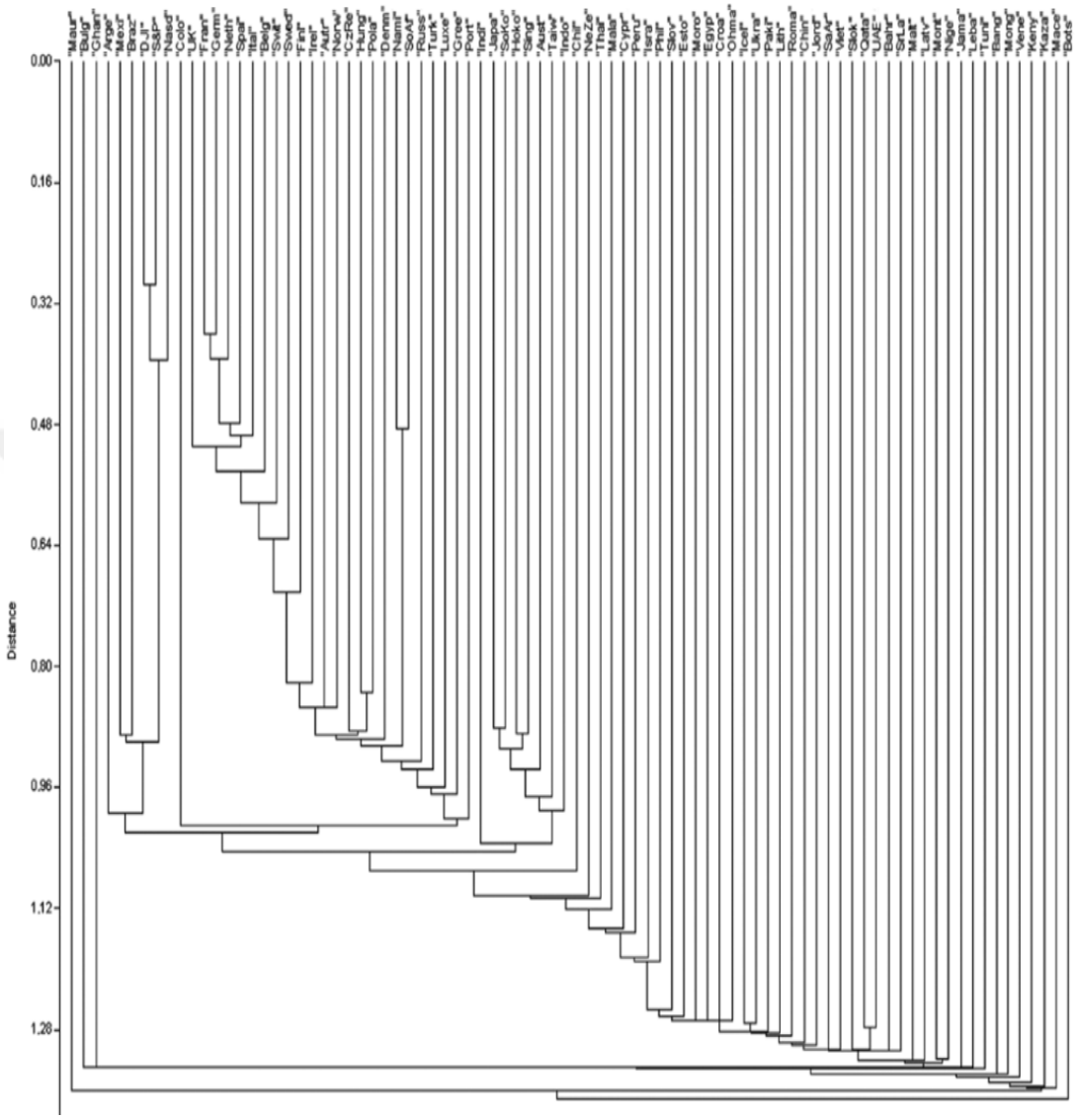


Figure 7-24 **Figure 2.14(b)** Ultrametric Hierarchical Trees of 2009-2012 (Period 2)

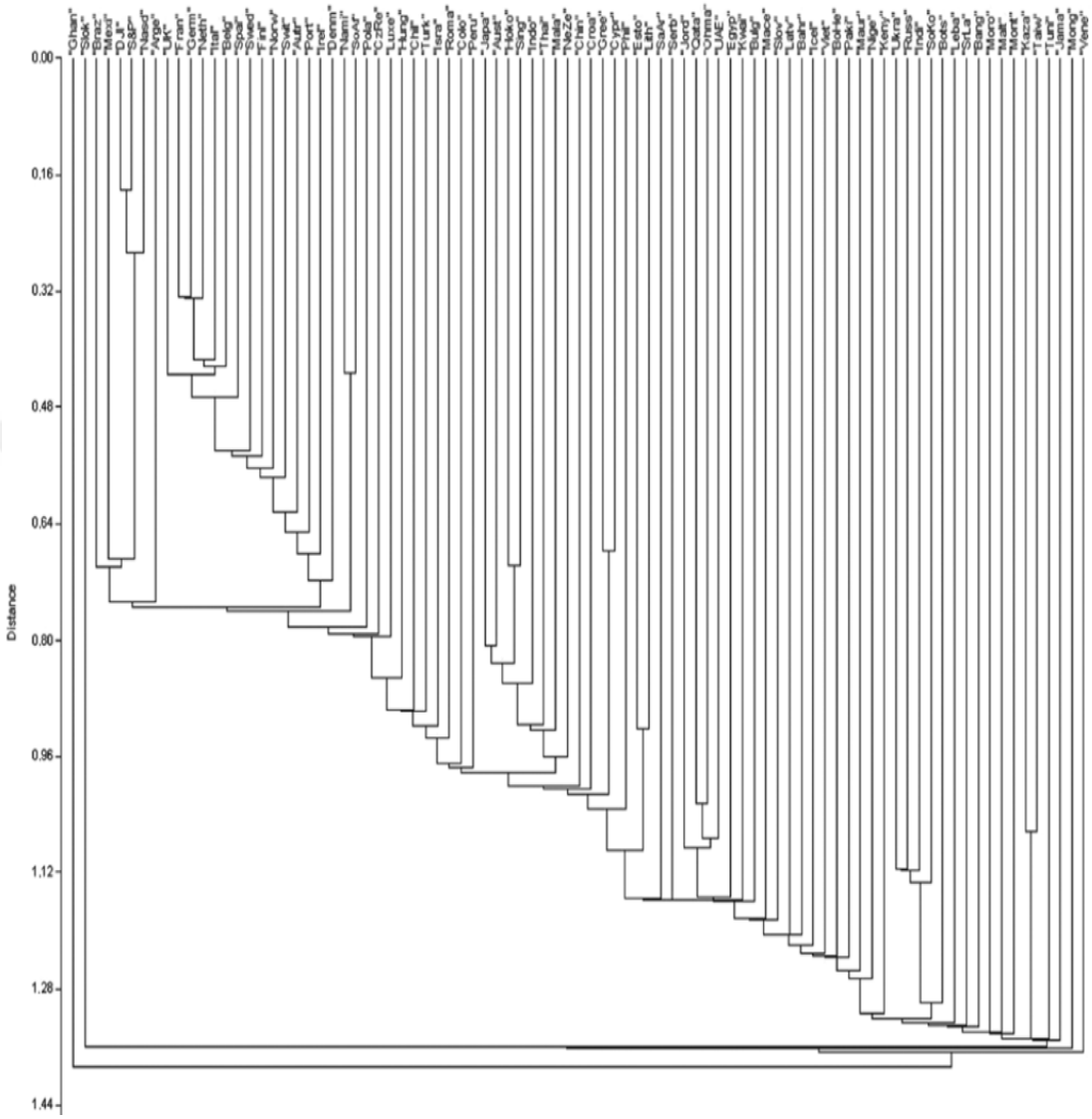
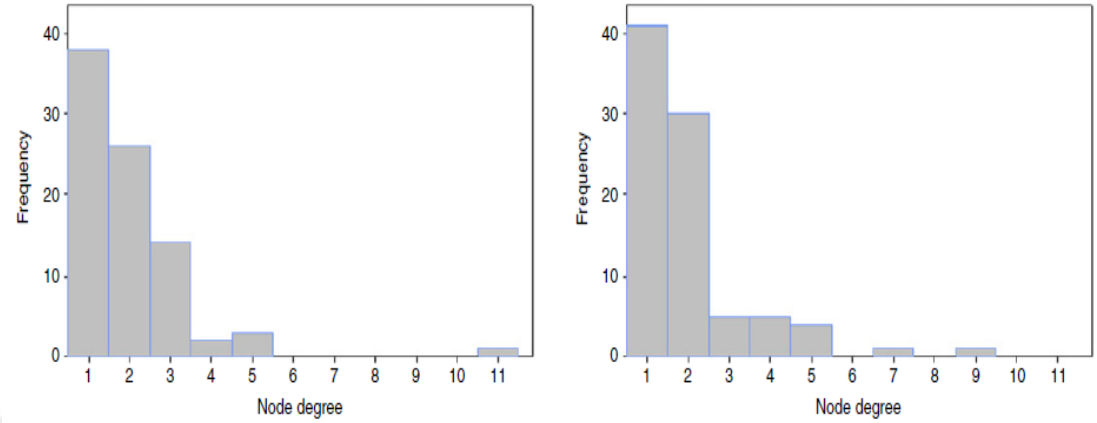
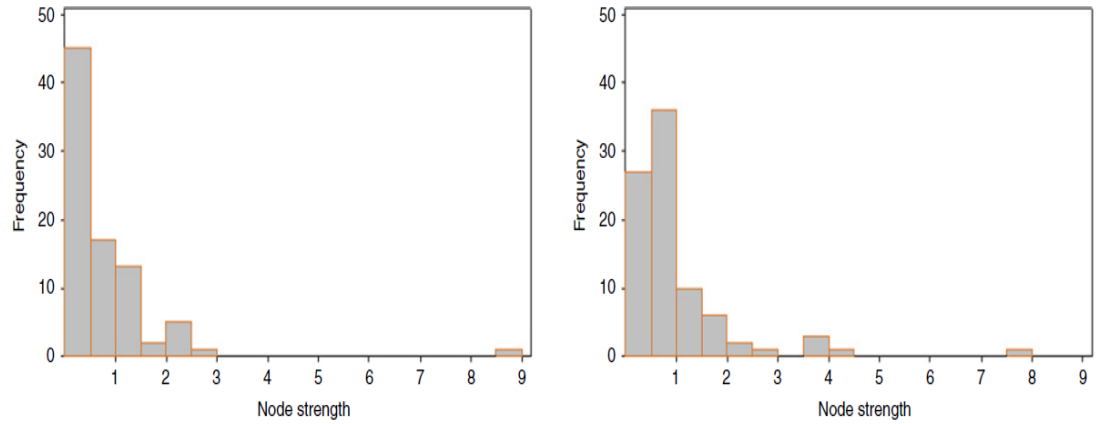


Figure 7-25 **Figure 2.15** Frequency Distribution of Node Degree



(a) Period one. (b) Period two.

Figure 7-26 **Figure 2.16** Frequency Distribution of Node Strength



(a) Period one. (b) Period two.

Figure 7-27 **Figure 2.17(a)** Frequency Distribution of Eigenvector Centrality (Period 1)

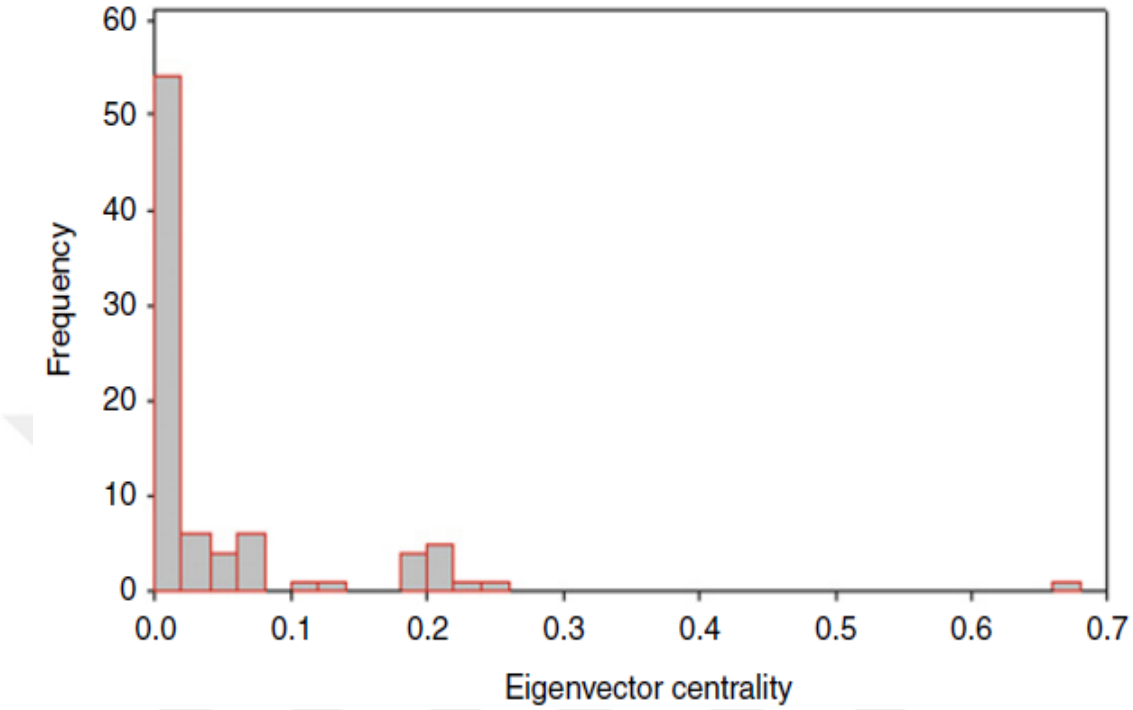


Figure 7-28 **Figure 2.17(b)** Frequency Distribution of Eigenvector Centrality (Period 2)

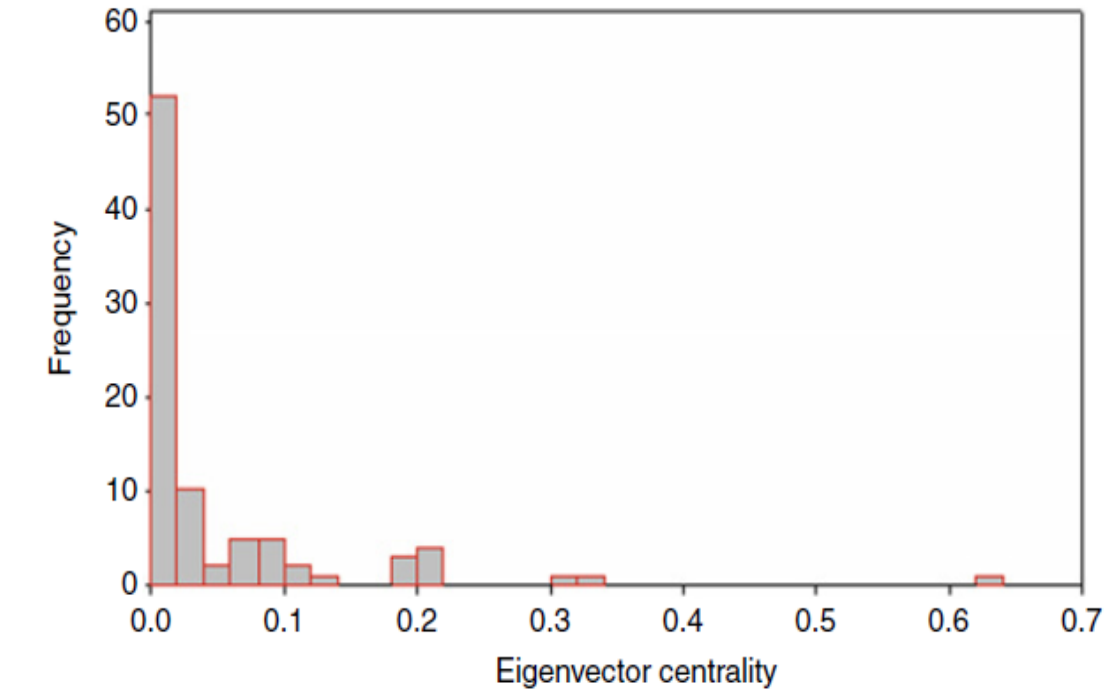


Figure 7-29 **Figure 2.18(a)** Frequency Distribution of Betweenness Centrality (Period 1)

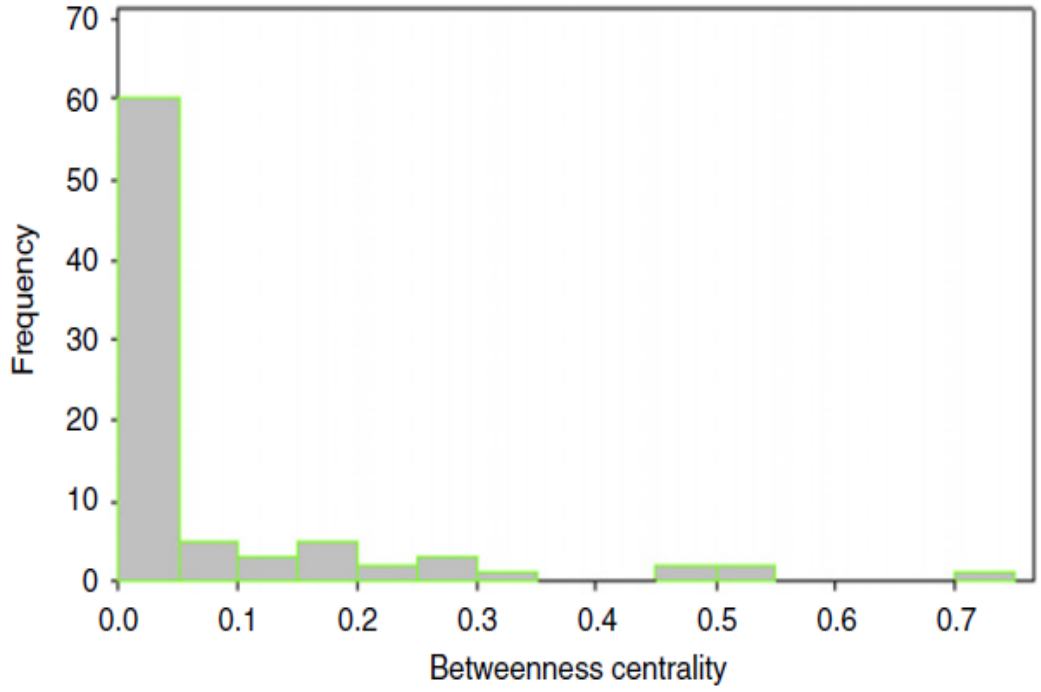


Figure 7-30 **Figure 2.18(b)** Frequency Distribution of Betweenness Centrality (Period 2)

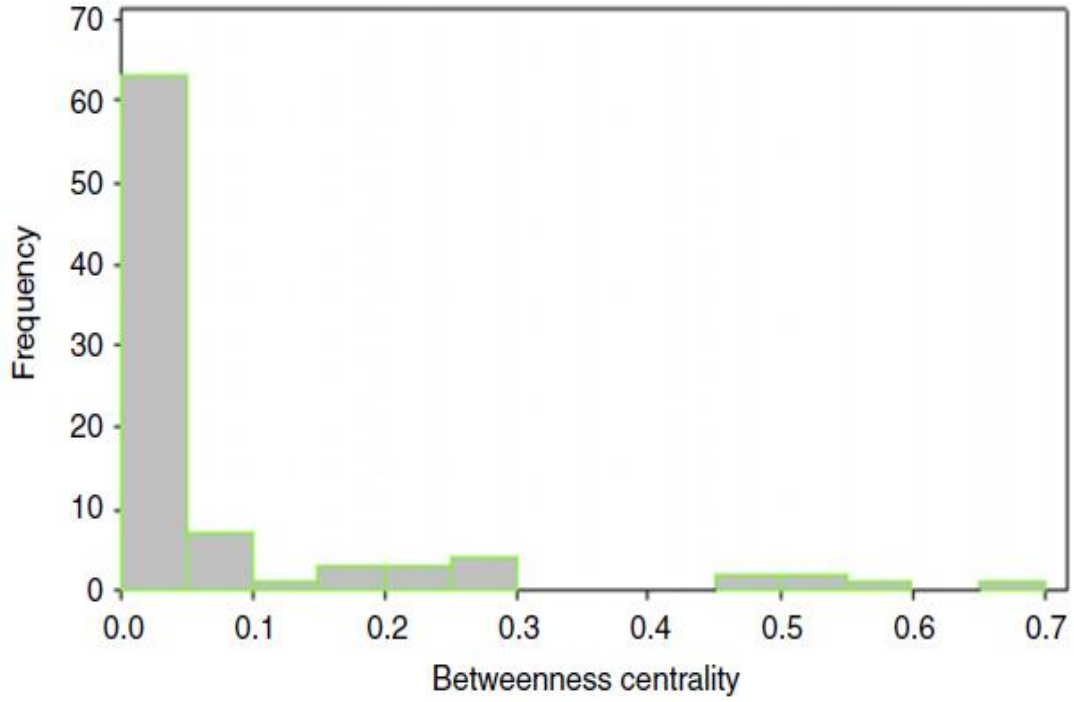


Figure 7-31 **Figure 2.19(a)** Frequency Distribution of Closeness Centrality (Period 1)

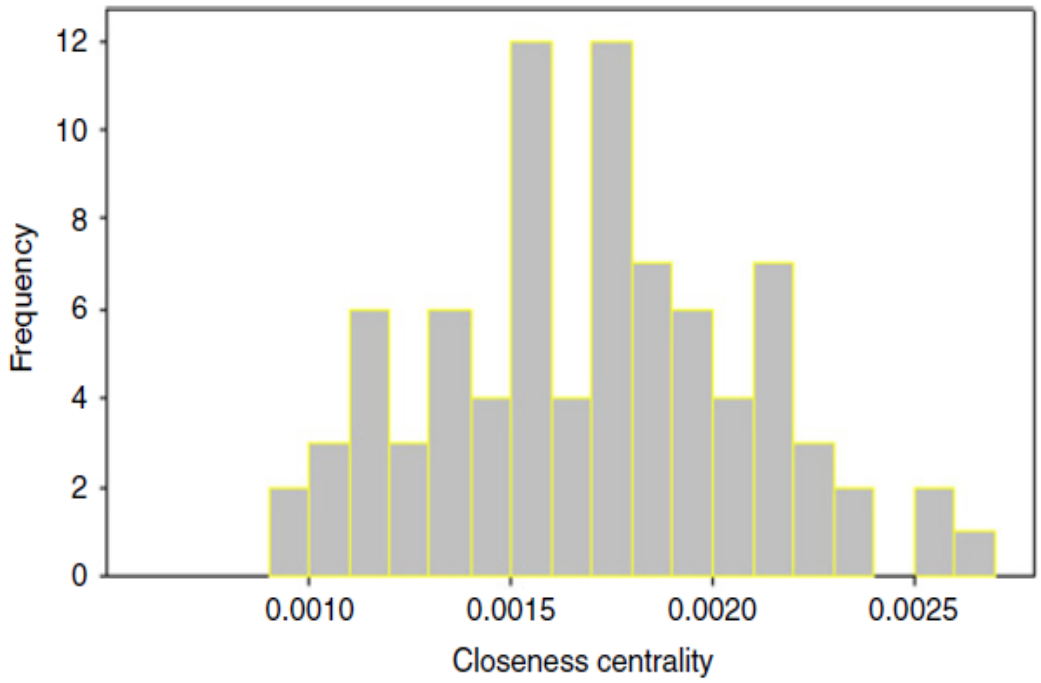


Figure 7-32 **Figure 2.19(b)** Frequency Distribution of Closeness Centrality (Period 2)

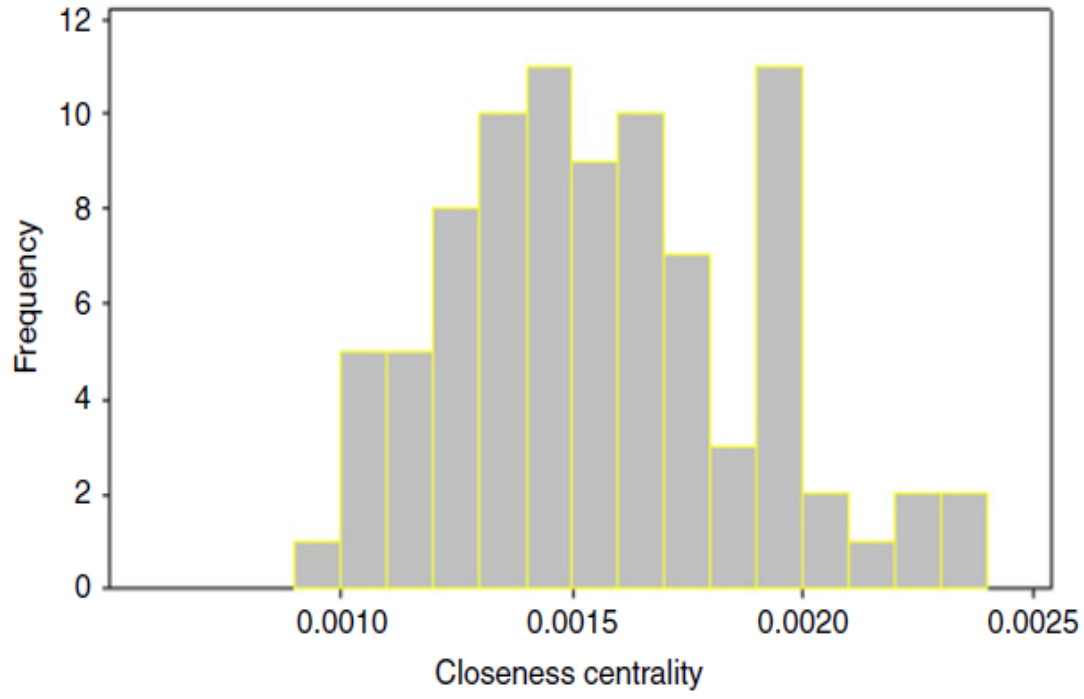


Figure 7-33 **Figure 3.1** Portion of Individual Investors in Market Capitalization and Monthly Traded Value

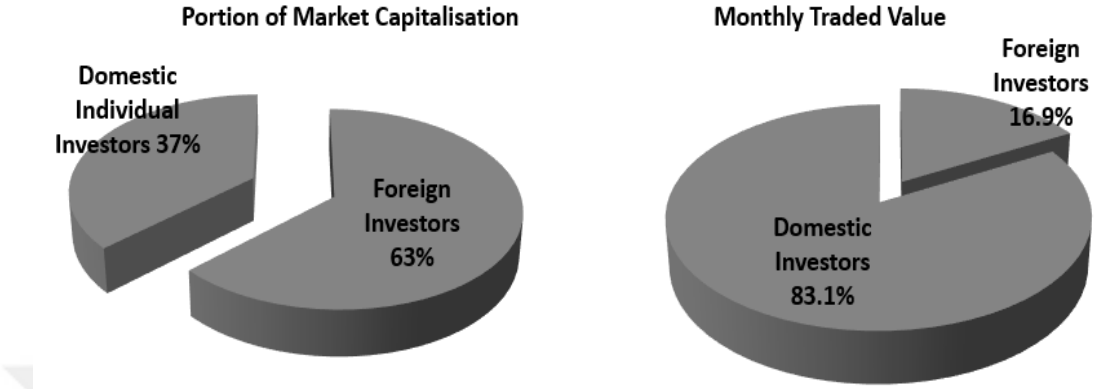


Figure 7-34 **Figure 3.2** Turnover Ratios* of Selected Markets

**Turnover Ratio is the ratio of the portfolio trade value over the portfolio market capitalization. Share Turnover Ratios were calculated by monthly data over 2011-2012.*

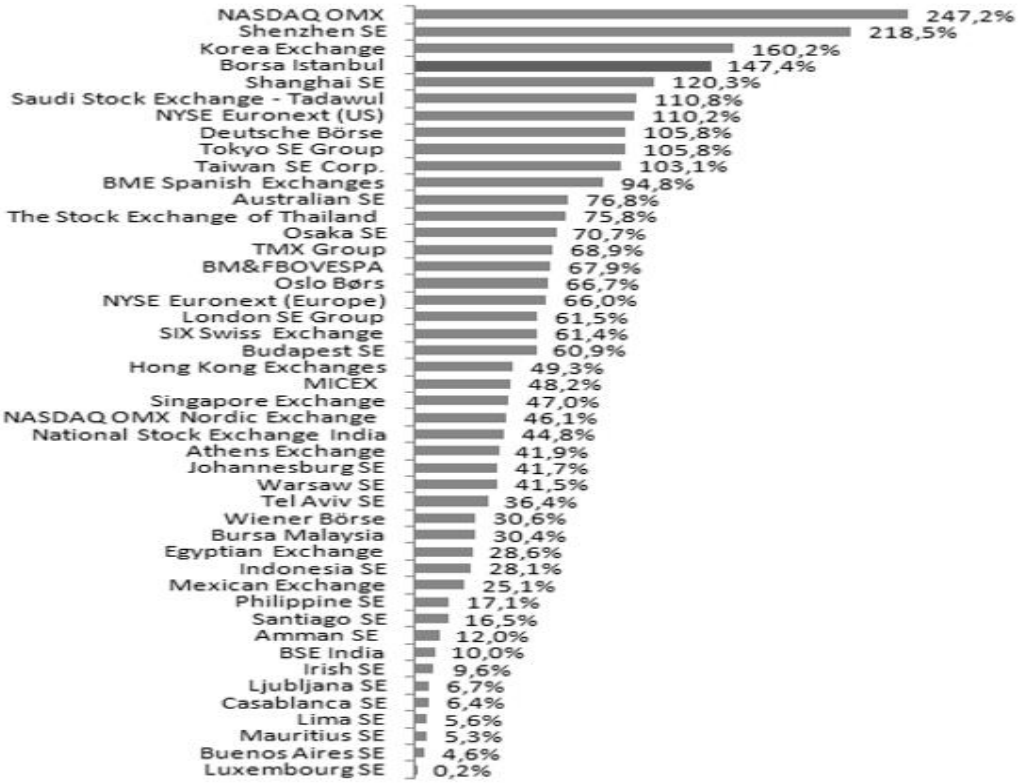


Figure 7-35 **Figure 3.3** Portfolio Sizes of Individual Investors in Data

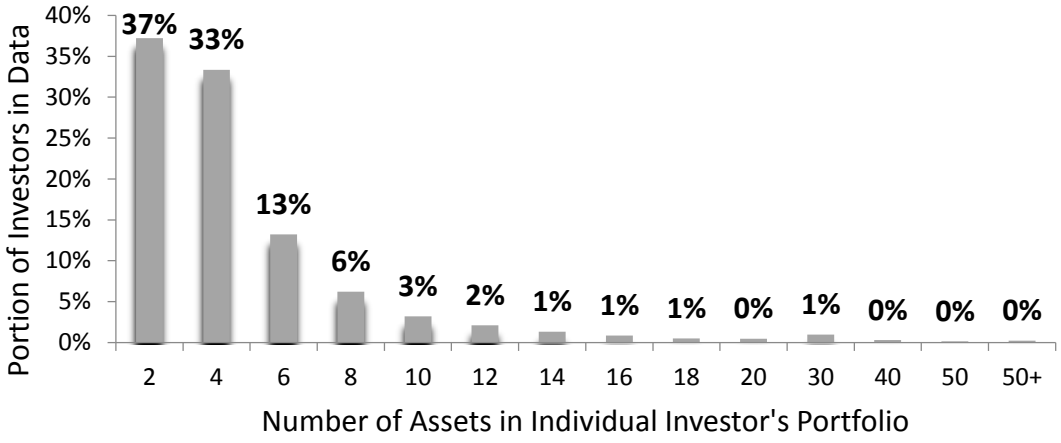


Figure 7-36 **Figure 3.4** Relationship between Turnover and Return

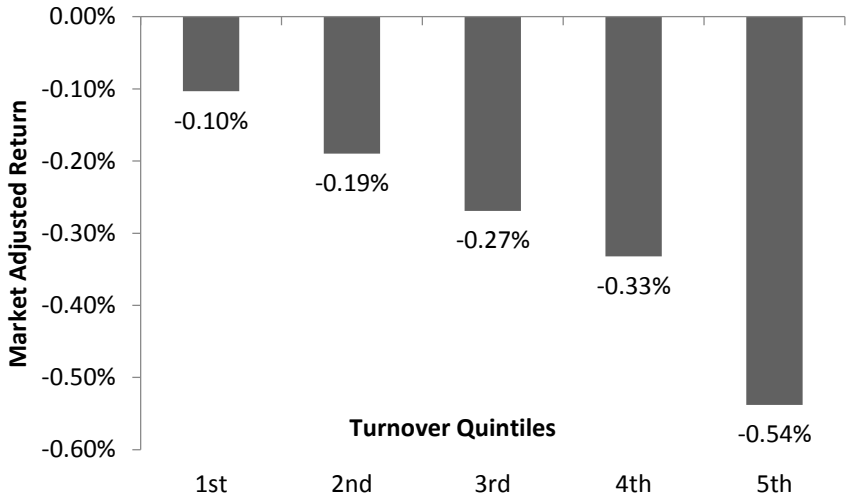


Figure 7-37 **Figure 3.5** Relationship between Portfolio Size and Return

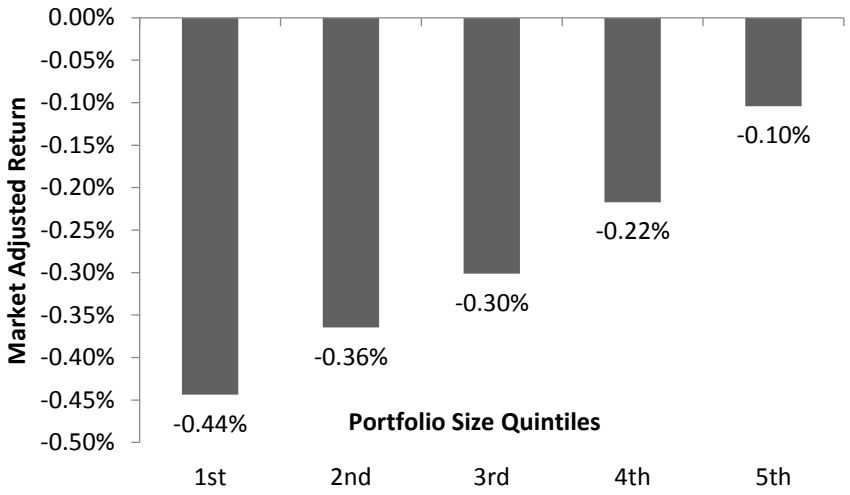


Figure 7-38 **Figure 4.1** Profit Loss Sharing Ratios for Islamic Banks

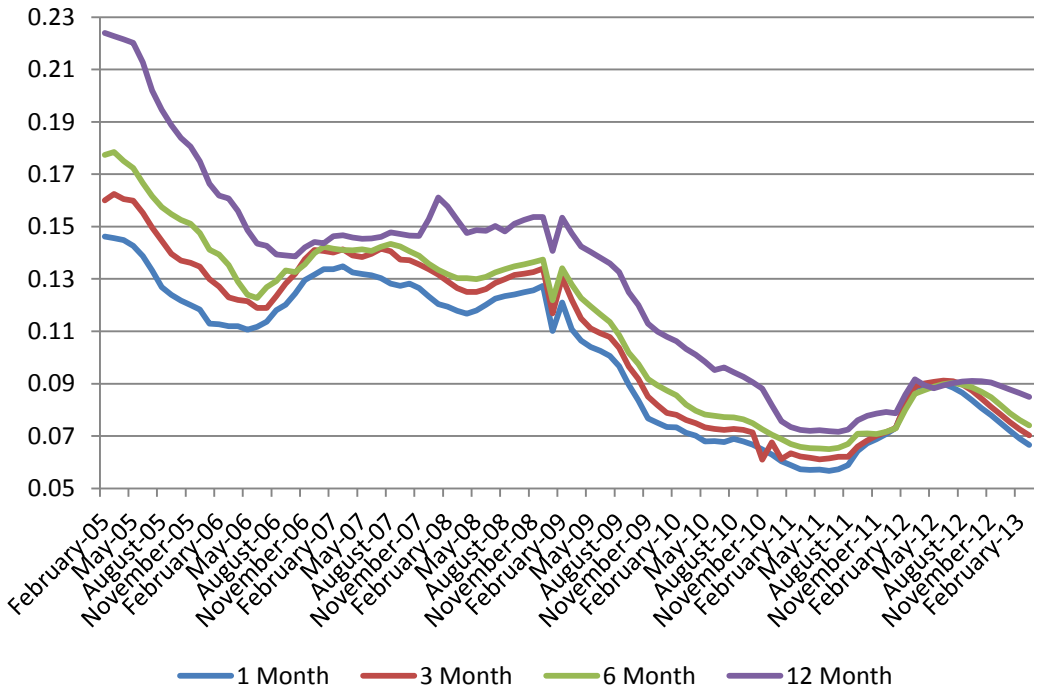


Figure 7-39 **Figure 4.2** Term Deposit Rates for Conventional Banks

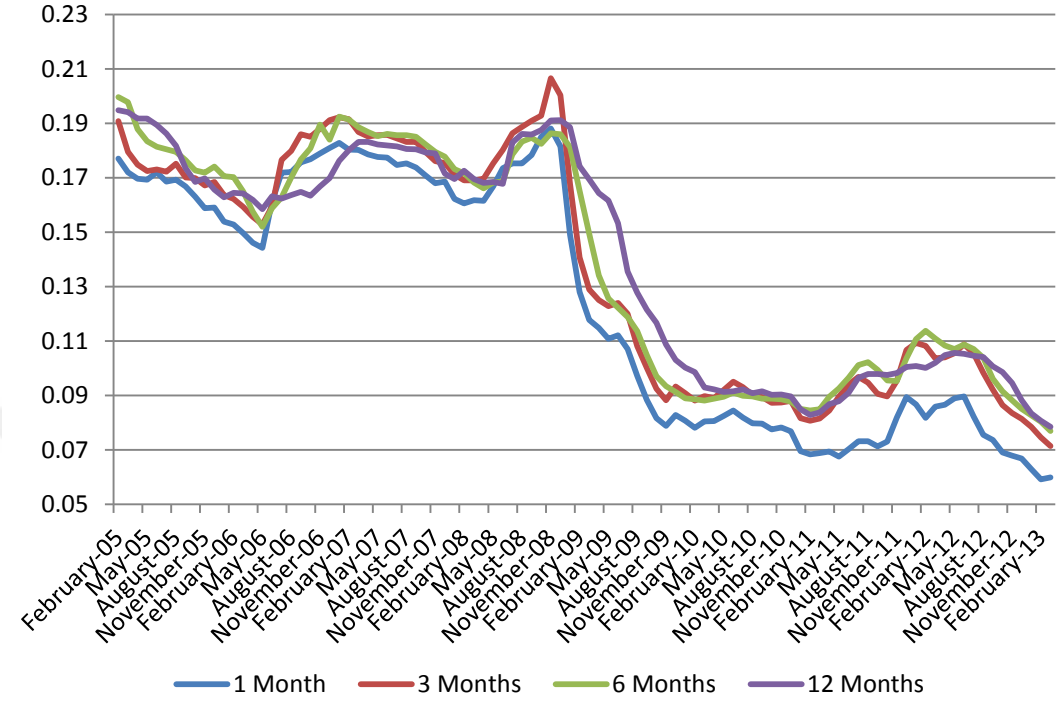


Figure 7-40 **Figure 4.3**. Impulse Response Functions for 2002-2013 Period

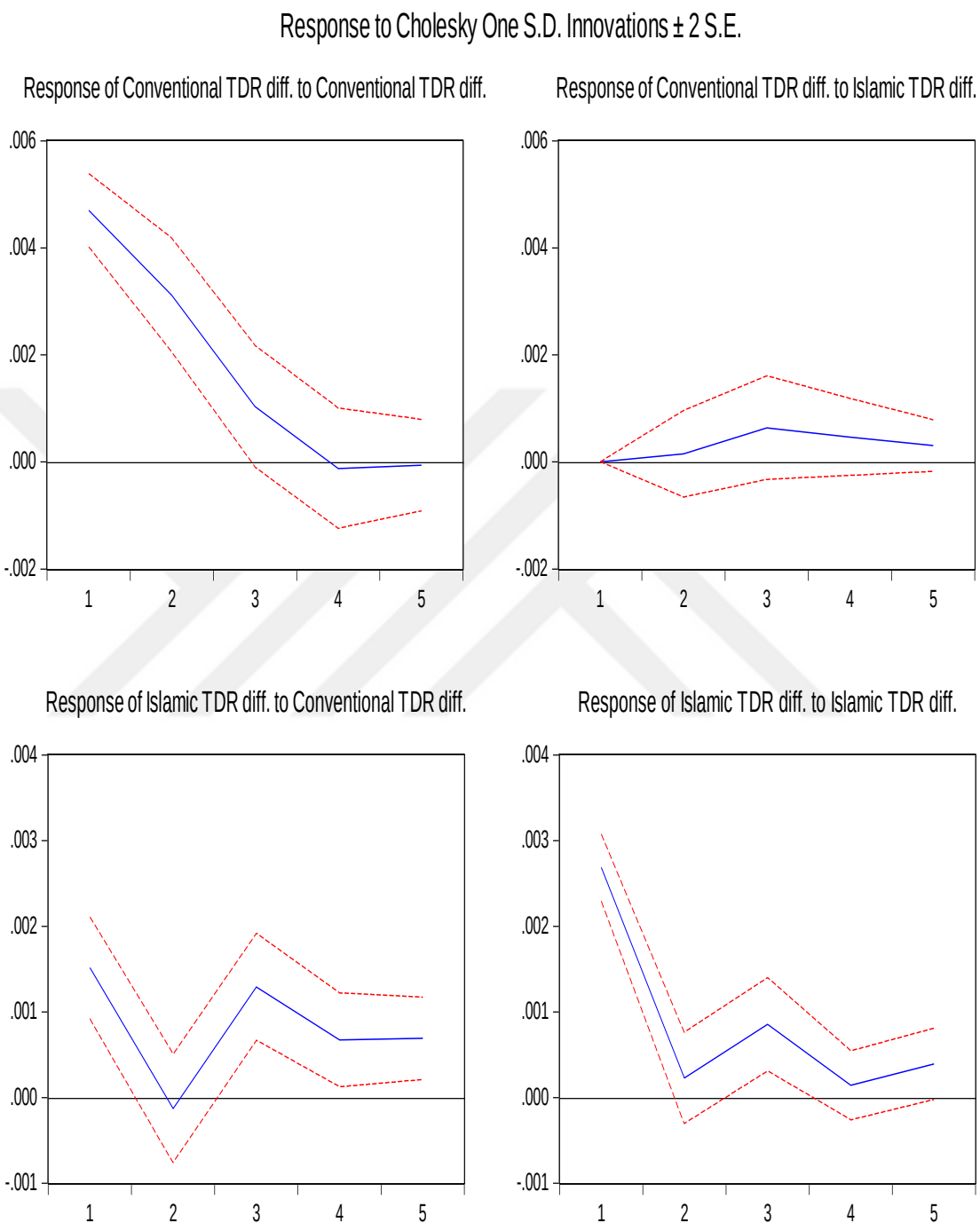


Figure 7-41 **Figure 4.4** Impulse Response Functions for pre-Crisis Period

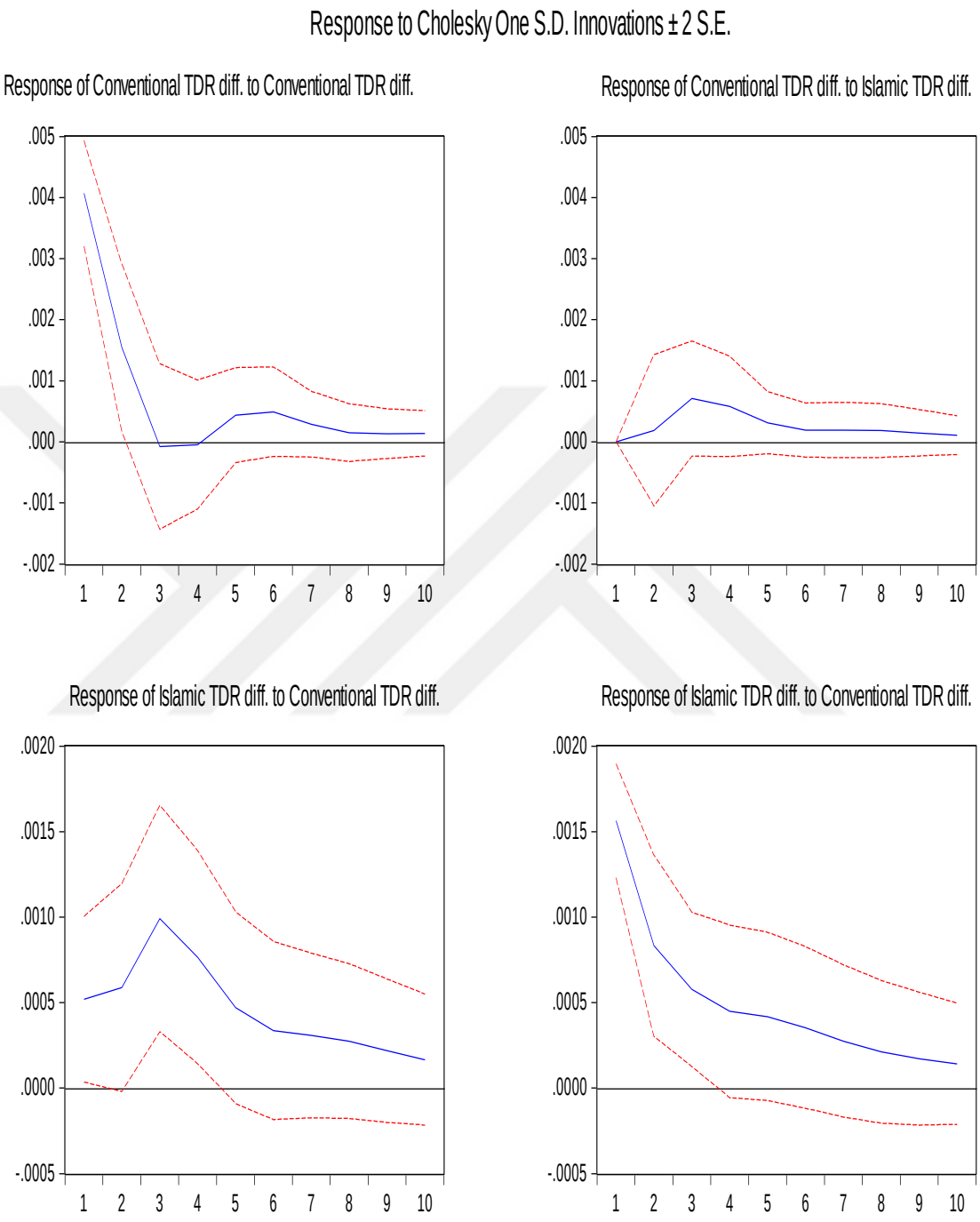
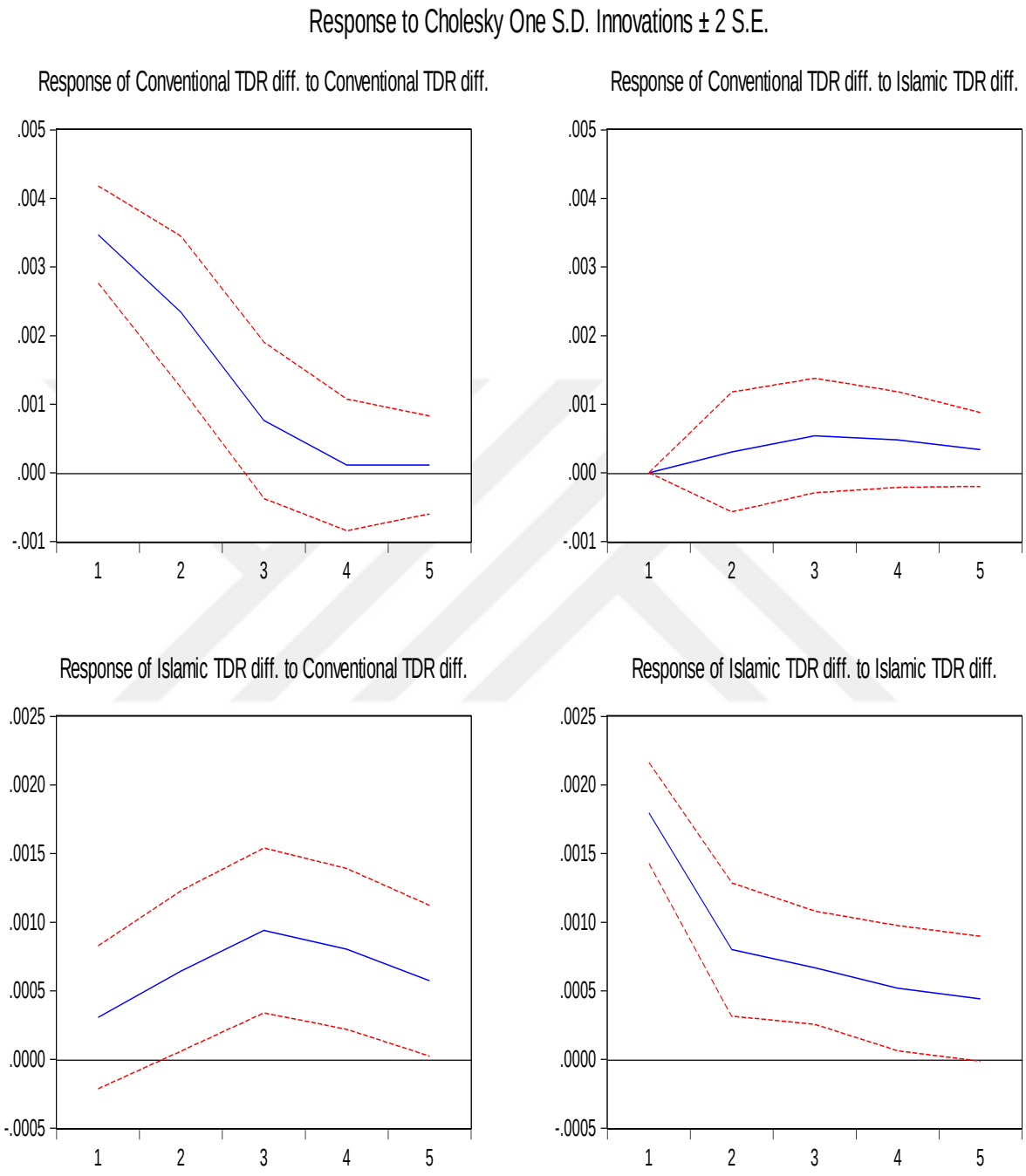


Figure 7-42 **Figure 4.5** Impulse Response Functions for post-Crisis Period



8. TABLES

Table 8-1 **Table 2.1** Markets with Highest Node Degrees

(a) Period 1		(b) Period 2	
Market	Node degree	Market	Node degree
France	11	France	11
Hong Kong	5	Hong Kong	5
Singapore	5	SP	5
Austria	5	Germany	5
Indonesia	4	Netherlands	4
Norway	4	Australia	4
SP	3	Singapore	3
UK	3	Qatar	3
South Korea	3	Kuwait	3
Australia	3	Slovenia	3

Table 8-2 **Table 2.2** Markets with Highest Node Strength

(a) Period 1		(b) Period 2	
Market	Node strength	Market	Node strength
France	8.93286	France	7.88209
Austria	2.57976	SP	4.18860
SP	2.47343	Germany	3.79013
Hong Kong	2.26497	Netherlands	3.77997
Norway	2.13227	Hong Kong	3.77615
UK	2.10376	Australia	2.57149
Singapore	2.07421	Singapore	2.18214
Czech Republic	1.77035	Namibia	2.17670
South Korea	1.72229	Italy	1.80545
South Africa	1.47247	DJI	1.79151

Table 8-3 **Table 2.3** Markets with Highest Eigenvector Centrality

(a) Period 1		(b) Period 2	
Market	Eigenvec. centrality	Market	Eigenvec. centrality
France	0.666	France	0.624
UK	0.249	Germany	0.323
Luxembourg	0.224	Netherlands	0.310
Germany	0.213	Austria	0.212
Belgium	0.212	Italy	0.212
Spain	0.212	UK	0.209
Sweden	0.210	Finland	0.209
Finland	0.210	Switzerland	0.190
Switzerland	0.193	Belgium	0.190
Netherlands	0.193	Ireland	0.190

Table 8-4 **Table 2.4** Markets with Highest Betweenness Centrality

(a) Period 1		(b) Period 2	
Market	Btw. centrality	Market	Btw. centrality
France	0.7249486	France	0.68044
Hong Kong	0.5166030	Namibia	0.57264
Austria	0.5145460	Netherlands	0.53953
UK	0.4757567	South Africa	0.50150
Luxembourg	0.4601822	Singapore	0.46539
Czech Republic	0.3385248	Hong Kong	0.45253
South Korea	0.2970908	Australia	0.29521
Hungary	0.2876873	Germany	0.28810
Egypt	0.2535998	Austria	0.27579
Singapore	0.2248016	Czech Republic	0.25964

Table 8-5 **Table 2.5** Markets with Highest Betweenness Centrality

(a) Period 1		(b) Period 2	
Market	Closeness centrality	Market	Closeness centrality
France	0.002660	Netherlands	0.002336
UK	0.002513	France	0.002331
Luxembourg	0.002500	South Africa	0.002299
Austria	0.002358	Namibia	0.002252
Hong Kong	0.002347	Singapore	0.002114
Germany	0.002252	Germany	0.002058
Belgium	0.002203	Austria	0.002058
Spain	0.002203	Italy	0.001976
Sweden	0.002193	Hong Kong	0.001961
Finland	0.002193	UK	0.001953

Table 8-6 **Table 3.1** Demographic Characteristics of Data Set

		Gender	
Age	General	Male	Female
Maximum	93	88	93
Average	43.4	44.8	43.1
Median	42.0	43.0	41.0

Table 8-7 **Table 3.2** Descriptive Statistics by Age, Gender and Portfolio Sizes

Descriptive Statistics by age, gender and portfolio sizes of individual investors in the Borsa İstanbul. This table reports the descriptive statistics by investor's age, gender and portfolio size on Borsa İstanbul. The values are as of the end of 2012. Portfolio size values are in USD dollars. Portfolio sizes are taken from MKK in Turkish Lira (TRY and converted to USD dollar by CBRT effective average exchange rate). The source of the raw data is MKK.

	All individuals	Women	Men
Number of individuals	20,000	3,390	16,610
PANEL A: Age			
mean	43.4	44.8	43.1
median	42.0	43.0	41.0
standard deviation	11.5	12.6	11.3
PANEL B: Portfolio size			
mean	$71,943	$90,810	$68,092
median	$8,922	$8,036	$9,083
standard deviation	$2,192,690	$3,003,394	$1,987,095

Table 8-8 **Table 3.3(a)** Turnover and Return Performance of Individual Investors

*Turnover and Return Performance of Individual Investors. Average Turnover is calculated as in equation (5), average return is calculated as in equation (4). *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively. Tests for differences in medians are based on Wilcoxon signed rank and Wilcoxon/Mann-Whitney test statistics.*

	All individuals	Female	Men	Gender Difference
Number of individuals	20,000	3,390	16,610	-
Panel A: Average Turnover				
mean	113.0%	73.3%	121.2%	-47.9%*
median	38.4%	31.2%	39.9%	-8.7%***
Panel B: Average Return				
mean	-0.281%***	-0.163%***	-0.311%***	0.148%***
median	-0.221%***	-0.109%***	-0.247%***	0.138%***

Table 8-9 **Table 3.3(b)** Winners and Losers

Return Performance of Individual Investors. Average return is calculated as in equation (4).

	Portfolio Size	Female Ratio	Average Age	Average Stocks in Portfolio
All Investors Average	109,515	20%	43	4.1
All Investors Median	15,363		42	2.5
Winners Average	224,260	21.9%	45	4.2
Winners Median	19,848		44	2.6
Losers Average	59,405	14%	42	4.0
Losers Median	14,012		41	2.5

Table 8-10 **Table 3.4** Return Performances and Turnover Ratios

Returns for Investor Quintiles Based on Mean Turnover and Portfolio Size. *Records of 20,000 investors are sorted into quintiles based on weekly turnover. Quintile 1 contains investors with the lowest turnover; quintile 5 contains investors with the highest. Raw return is the average weekly return for the average investor. Market adjusted return is calculated as subtracting benchmark market index from raw return. The values are as of the end of 2012. Mean Portfolio size values are in USD dollars. Portfolio sizes are taken from MKK in Turkish Lira (TRY and converted to USD dollar by CBRT effective average exchange rate for 2011 to 2012). The source of the data is MKK.*

		Quintile (Turnover Ratio)				
	All investors	1 (low)	2	3	4	5 (high)
Mean Turnover	113%	7.3%	20.8%	38.8%	71.5%	427.8%
Raw Return	-0.051%	0.089%	0.020%	-0.038%	-0.077%	-0.251%
Market Adj. Return	-0.286%	-0.103%	-0.190%	-0.269%	-0.332%	-0.538%

Table 8-11 **Table 3.5** Return Performances and Portfolio Size

Returns for Investor Quintiles Based on Mean Turnover and Portfolio Size. *Records of 20,000 investors are sorted into quintiles based on weekly turnover. Quintile 1 contains investors with the lowest turnover; quintile 5 contains investors with the highest. Raw return is the average weekly return for the average investor. Market adjusted return is calculated as subtracting benchmark market index from raw return. The values are as of the end of 2012. Mean Portfolio size values are in USD dollars. Portfolio sizes are taken from MKK in Turkish Lira (TRY and converted to USD dollar by CBRT effective average exchange rate for 2011 to 2012). The source of the data is MKK.*

		Quintile (portfolio size)				
	All investors	1 (low)	2	3	4	5 (high)
Mean Size	$71,943	$1,653	$4,647	$9,644	$21,651	$298,316
Mean Turnover	113%	197.6%	94.5%	92.8%	81.5%	98.9%
Raw Return	-0.051%	-0.1038%	-0.121%	-0.080%	-0.011%	0.093%
Market Adj. Return	-0.286%	-0.444%	-0.365	-0.301%	-0.217%	-0.104%

Table 8-12 **Table 3.6** Relationship between Portfolio Size and Return

Relationship between Portfolio Size and Return: CAPM Results. *This table presents the results of the time series regression analysis performed in equation (6). Alfa is the CAPM intercept and beta is the coefficient on* ($r_t^m - r_t^f$). *T-statistics in parentheses and *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.*

		Quintile (portfolio size)				
	All investors	1 (low)	2	3	4	5 (high)
Alfa	-0.24%	-0.33%	-0.32%	-0.27%	-0.12%	-0.09%
	(-1.51)	(-2.05)**	(-1.92)*	(-1.64)*	(-1.22)	(-0.66)
Beta	95.34%	95.36%	95.67%	95.61%	95.42%	94.80%
	(20.87)	(20.26)***	(19.89)***	(20.06)***	(20.62)***	(23.27)***

Table 8-13 **Table 3.7** Cross Sectional Regression of Return

*This table presents the results of the cross-sectional regression analysis performed in equation (7).Reported are the estimated coefficients with their t-statistics in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively. Standard errors are corrected for heteroscedasticity.*

Dependent variable	Market adjusted return (%)
Intercept	-0.655
	(-37.88)***
Turnover	-0.009
	(-5.00)***
Gender dummy	0.297
	(7.85)***
Age/10	0.068
	(18.67)***
Gender X Age	-0.037
	(-4.84)***
Portfolio size high	0.149
	(18.69)***
R^2	6.0%
Adjusted R^2	6.0%
F-value	254.16

Table 8-14 **Table 3.8** Cross Sectional Regression of Return

*This table presents the results of the cross-sectional regression analysis performed in equation (8).Reported are the estimated coefficients with their t-statistics in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively. Standard errors are corrected for heteroscedasticity.*

Dependent variable	Market adjusted return (%)
Intercept	-0.722
	(-39.45)***
Turnover	-0.006
	(-3.21)***
Holding period	0.011
	(16.30)***
Holding period^2	-0.0001
	(-11.00)***
Gender dummy	0.254
	(6.73)***
Age/10	0.058
	(16.18)***
Gender X Age	-0.034
	(-4.47)***
Portfolio size high	0.151
	(19.18)***
R^2	7.6%
Adjusted R^2	7.6%
F-value	234.35

Table 8-15 **Table 4.1** Balance Sheet comparison of Islamic and Conventional Banks

Islamic Financial Institutions	**Conventional Finance Institutions**
ASSETS	**ASSETS**
Cash and cash equivalents	Cash and cash equivalents
Investment in securities	Investment in securities
Sales Receivables	Loans and advances
Investments in leased assets	Statutory deposits
Investments in real estate	Investment in Subsidiaries
Equity/Profit-sharing financing	Fixed assets
Investment in Subsidiaries	Other assets
Fixed assets	
Other assets	
LIABILITIES	**LIABILITIES**
Current Accounts	Current Accounts
Other Liabilities	Saving and Time Deposits
	Other Liabilities
Owner's Equity	**Owner's Equity**
[Off-balance Sheet] [letters of credit/guarantees]	Off-balance Sheet [letters of credit/guarantees/derivatives]
Equity of profit-sharing investment account.	
Profit-sharing investment account (Unrestricted)	
Profit Equalization Reserve	
Investment Risk Reserve	

Table 8-16 **Table 4.2** Risk Perception for Islamic Finance Products

	Credit risk	Market risk	Liquidity risk	Operational risk
Murabaha	2.47 (17)	2.75 (12)	2.62 (16)	2.8 (15)
Mudaraba	3.38 (13)	3.56 (9)	2.57 (14)	2.92 (13)
Musharaka	3.71 (14)	3.67 (9)	3.0 (13)	3.08 (12)
Ijara	2.64 (14)	3.17 (6)	3.1 (10)	2.9 (10)
Istisnaa	3.13 (8)	2.75 (4)	3.0 (6)	3.29 (7)
Salam	3.20 (5)	3.25 (4)	3.2 (5)	3.25 (4)
Diminishing *musharaka*	3.43 (7)	3.5 (6)	3.43 (7)	3.17 (6)

The results are based on a survey conducted in 2001 and reported in Khan and Ahmed (2001). The numbers in parentheses indicate the number of respondents; 1 to 5 indicating respectively from "not serious" to "critically serious.

Table 8-17 **Table 4.3** Unit Root Tests for both Islamic and Conventional Banks

ADF Test for Islamic Banks		
	t-stats for Level Values	t-stats for First Difference
1 Month	-1.42	(-3.86)***
3 Months	-1.52	(-3.24)***
6 Months	-1.60	(-4.23)***
12 Months	(-2.65)*	(-7.09)***
ADF Test for Conventional Banks		
	t-stat for Level Values	t-stats for First Difference
1 Month	-0.89	(-5.72)***
3 Months	-0.68	(-5.98)***
6 Months	-1.04	(-4.77)***
12 Months	-0.77	(-5.42)***

Note: Significance levels: * % 10, ** % 5, *** %1.

Table 8-18 **Table 4.4** Granger Causality for both Islamic and Conventional Banks on Difference TDRs

	Conventional TDRs do not cause Islamic TDRs		Islamic TDRs do not cause Conventional TDRs	
	F Statistics	P Values	F Statistics	P Values
1 Month	4.75	0.01	0.96	0.38
3 Months	3.70	0.02	0.91	0.40
6 Months	9.18	0.00	0.73	0.48
12 Months	4.73	0.01	3.62	0.03

Note: Significance levels: * % 10, ** % 5, *** %1.

Table 8-19 **Table 4.5** Granger Causality Tests for both Islamic and Conventional Banks pre-2008 Crisis

	Conventional TDRs do not cause Islamic TDRs		Islamic TDRs do not cause Conventional TDRs	
	F Statistics	P Values	F Statistics	P Values
1 Month	3.02	0.06	1.18	0.31
3 Months	5.68	0.00	0.35	0.70
6 Months	1.79	0.17	1.71	0.19
12 Months	1.30	0.28	2.08	0.13

Table 8-20 **Table 4.6** Granger Causality Tests for both Islamic and Conventional Banks post-2008 Crisis

	Conventional TDRs do not cause Islamic TDRs		Islamic TDRs do not cause Conventional TDRs	
	F Statistics	P Values	F Statistics	P Values
1 Month	4.08	0.02	1.05	0.35
3 Months	10.46	0.00	1.83	0.17
6 Months	5.02	0.01	0.77	0.46
12 Months	6.76	0.00	0.58	0.55

9. APPENDIX

Table 9-1 **Table 2.6** Analyse Market Exchanges in Selected Countries

Country	Index	Symbol
Argentina	Merval	Arge
Australia	SP/ASX 200	Aust
Austria	ATX	Autr
Bahrain	Bahrain all share index	Bahr
Bangladesh	DSE general index	Bang
Belgium	BEL 20	Belg
Brazil	Ibovespa	Braz
Bosnia and Herzegovina	SASE 10	BoHe
Botswana	Gaborone	Bots
Bulgaria	SOFIX	Bulg
Chile	IPSA	Chil
China	Shangai SE composite	Chin
Colombia	IGBC	Colo
Croatia	CROBEX	Croa
Cyprus	CSE	Cypr
Czech Republic	PX	CzRe
Denmark	OMX Copenhagen 20	Denm
Egypt	EGX 30	Egyp
Estonia	OMXT	Esto
Finland	OMX Helsinki	Finl
France	CAC 40	Fran
Germany	DAX	Germ
Ghana	Ghana all share index	Ghan
Greece	Athens SX general index	Gree
Hong Kong	Hang Seng	HoKo

Country	Index	Symbol
Hungary	Budapest SX Index	Hung
Iceland	OMX Iceland all share index	Icel
India	SENSEX 30	Indi
Indonesia	Jakarta composite index	Indo
Ireland	ISEQ	Irel
Israel	Tel Aviv 25	Isra
Italy	FTSE MIB	Ital
Jamaica	Jamaica SX market index	Jama
Japan	Nikkei 225	Japa
Jordan	ASE general index	Jord
Kazakhstan	KASE	Kaza
Kenya	NSE 20	Keny
Kuwait	Kuwait SE weighted index	Kwai
Latvia	OMXR	Latv
Lebanon	BLOM	Leba
Lithuania	OMXV	Lith
Luxembourg	Luxembourg LuxX	Luxe
Macedonia	MBI 10	Mace
Malaysia	KLCI	Mala
Malta	Malta SX Index	Malt
Mauritius	SEMDEX	Maur
Mexico	IPC	Mexi
Mongolia	MSE TOP 20	Mong
Montenegro	MOSTE	Mont
Morocco	CFG 25	Moro
Namibia	FTSE/Namibia overall	Nami
Netherlands	AEX	Neth
New Zealand	NZX 50	NeZe
Nigeria	Nigeria SX all share index	Nige
Norway	OBX	Norw
Oman	MSM 30	Ohma
Pakistan	Karachi 100	Paki
Peru	IGBVL	Peru
Philippines	PSEi	Phil
Poland	WIG	Pola
Portugal	PSI 20	Port
Qatar	DSM 20	Qata
Romania	BET	Roma
Russia	MICEX	Russ
Saudi Arabia	TASI	SaAr
Serbia	BELEX 15	Serb
Singapore	Straits times	Sing
Slovakia	SAX	Slok
Slovenia	SBI TOP	Slov
South Africa	FTSE/JSE Africa all share	SoAf
South Korea	KOSPI	SoKo
Spain	IBEX 35	Spai
Sri Lanka	Colombo all-share index	SrLa
Sweden	OMX Stockholm 30	Swed
Switzerland	SMI	Swit
Taiwan	TAIEX	Taiw
Thailand	SET	Thai
Tunisia	TUNINDEX	Tuni
Turkey	ISE national 100	Turk
Ukraine	PFTS	Ukra
United Arab emirates	ADX general index	UAE
United Kingdom	FTSE 100	UK
United States of America	Dow Jones industrial	DJI

Country	Index	Symbol
United States of America	Nasdaq composite	Nasd
United States of America	SP 500	SP
Venezuela	IBC	Vene
Vietnam	VN-Index	Viet

Figure 9-1 **Figure 3.6** Portfolio Size Comparison

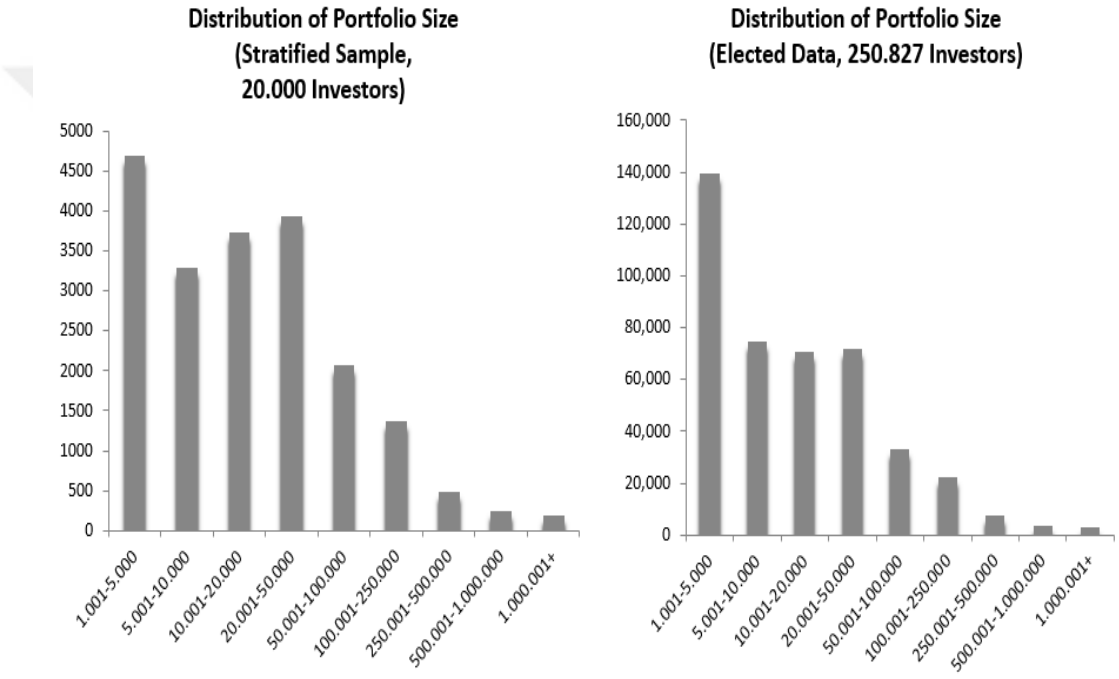
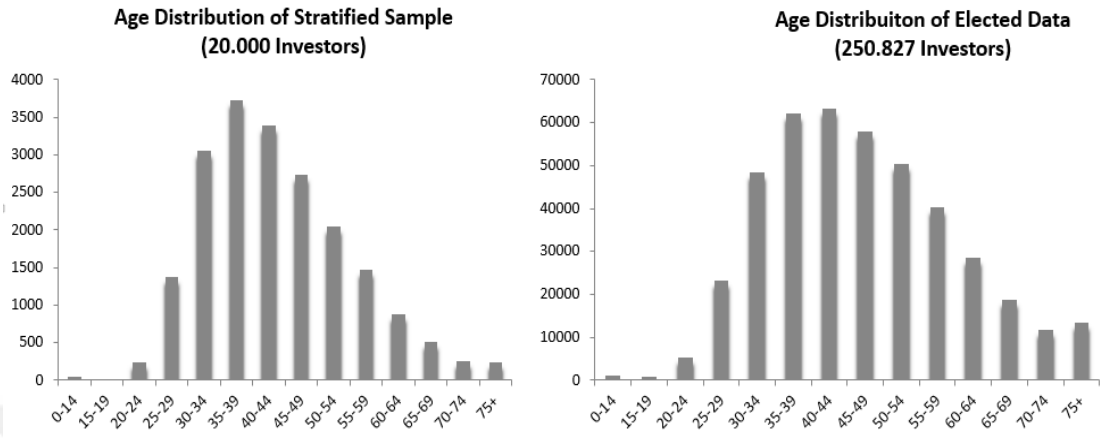


Figure 9-2 **Figure 3.7** Portfolio Age Comparison



Appendix Figures 3.6 and 3.7: Comparison of Data Set with Sample. Below graphical comparison shows that our stratified sample set have good representative power of the whole data set. Portfolio size characteristics distributional match for our study.

Table 9-2 **Table 3.9** Individual Investors' Detailed Portfolio Information

Investor	Investor Identity Type	Number of Investors with Account	Ratio of Individual Investor in Identity Type	Total Account Balance of Individual Investors (TL)	Ratio of Balance in Investor Type
DOMESTIC	Funds	277	0,03%	2.782.284.330,24	1,99%
	Corporate	3.111	0,28%	17.213.355.580,04	12,32%
	Other	229	0,02%	2.477.095.778,68	1,77%
	Real Accounts	1.086.400	98,96%	29.959.298.800,93	21,44%
	Trust Company	42	0,00%	427.922.842,93	0,31%
	Total	**1.090.059**	**99,30%**	**52.859.957.332,82**	**37,84%**
FOREIGN	Funds	2.085	0,19%	61.095.767.271,36	43,73%
	Corporate	1.100	0,10%	25.399.783.931,61	18,18%
	Other	2	0,00%	9.049.058,54	0,01%
	Real Accounts	4.545	0,41%	345.922.654,11	0,25%
	Total	**7.732**	**0,70%**	**86.850.522.915,61**	**62,16%**
TOTAL		**1.097.791**	**100,00%**	**139.710.480.248,43**	**100,00%**

Table 9-3 **Table 3.10** Individual Investors Total Portfolio Size

Investor Identity Type		TOTAL	
	Account Value Interval (TL)	Number of Individual Investor	Total Individual Investors Accuont Value (TL)
Reeal Accounts	0-1	136.482	37.141,64
	1-10.000	739.490	1.066.467.478,66
	10.000-50.000	150.054	3.412.298.178,94
	50.000-100.000	32.228	2.244.976.287,03
	100.000-500.000	27.136	5.403.774.165,67
	500.000-1.000.000	3.044	2.097.894.465,08
	>1.000.000	2.511	16.079.773.738,01
	Total	**1.090.945**	**30.305.221.455,05**

Table 9-4 **Table 3.11** City of Residence of Individual Investors'

City		Number of Investors	Total Account Value
34	İSTANBUL	345.805	18.096.866.279,51
35	İZMİR	104.205	2.410.008.304,65
6	ANKARA	127.186	2.349.792.650,17
16	BURSA	42.029	695.775.982,48
7	ANTALYA	31.848	488.398.146,44
1	ADANA	27.142	466.424.718,02
0	DİĞER	6.691	423.893.266,48
10	BALIKESİR	23.402	385.837.492,65
41	KOCAELİ	24.127	340.980.585,73
31	HATAY	10.385	280.811.090,60
33	MERSİN	18.645	279.584.983,13
9	AYDIN	15.955	234.448.152,46
42	KONYA	19.457	223.521.866,21
20	DENİZLİ	16.244	215.572.264,76
38	KAYSERİ	9.508	212.385.403,30
48	MUĞLA	16.335	209.475.701,27
78	KARABÜK	13.955	186.382.880,11
27	GAZİANTEP	7.610	154.597.182,39
67	ZONGULDAK	11.517	149.826.156,58
45	MANİSA	17.174	141.892.557,88
26	ESKİŞEHİR	11.208	135.339.074,19
55	SAMSUN	10.097	113.867.116,33
59	TEKİRDAĞ	9.138	110.365.803.93

Table 9-5 **Table 3.12** Age Interval of Individual Investors

Age Groups	Number of Investors
0-19 Age Interval	4.642
20-24 Age Interval	14.989
25-29 Age Interval	56.871
30-34 Age Interval	122.361
35-39 Age Interval	163.496
40-44 Age Interval	165.078
45-49 Age Interval	156.778
50-54 Age Interval	130.928
55-59 Age Interval	106.630
60-64 Age Interval	69.896
65-69 Age Interval	42.470
70-74 Age Interval	25.518
75+ Age Interval	31.288

Figure 9-3 **Figure 4.6** Impulse Response Functions for 2002-2013 Period (3 Months Maturity)

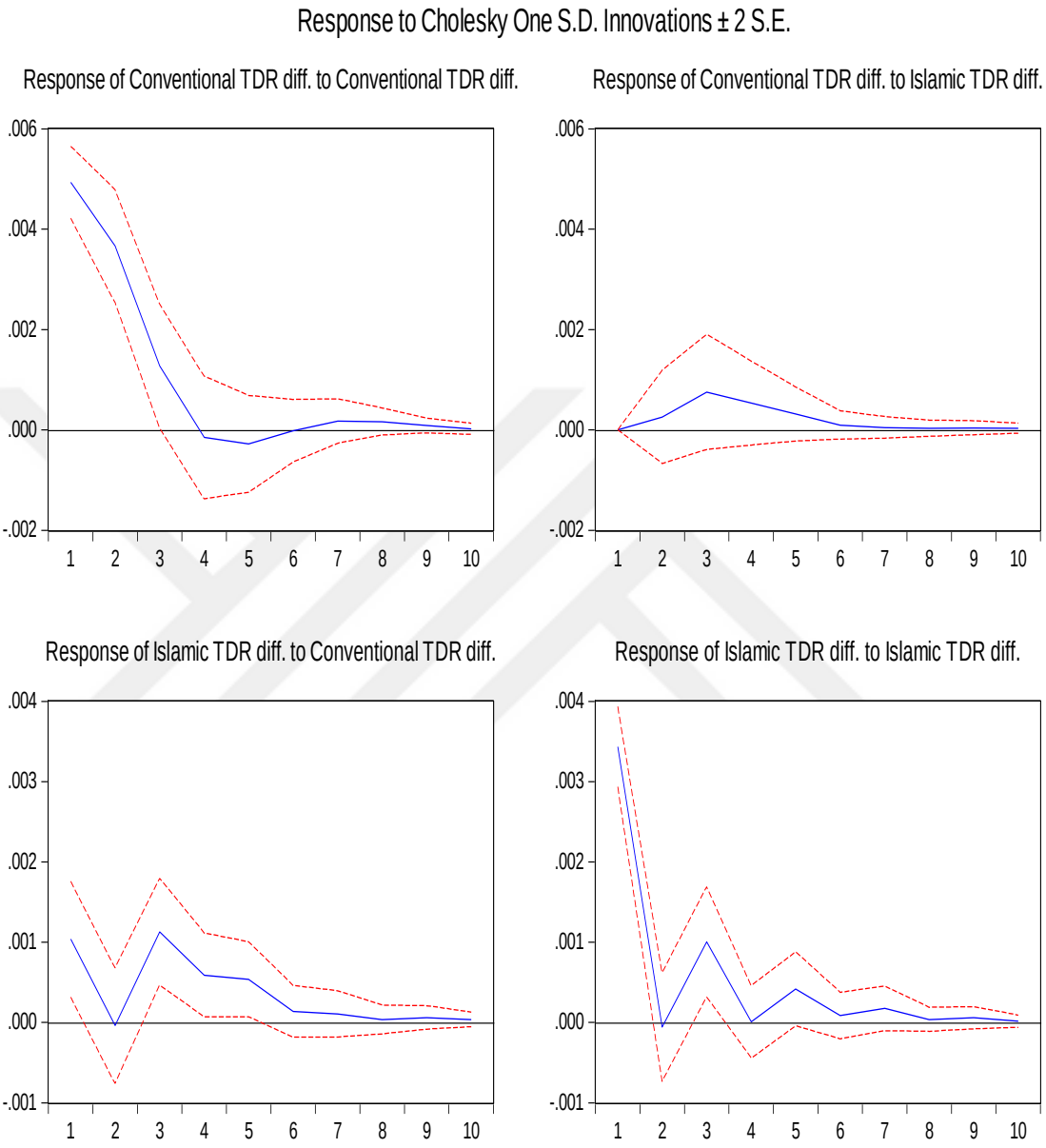


Figure 9-4 **Figure 4.7** Impulse Response Functions for 2002-2013 Period (6 Months Maturity)

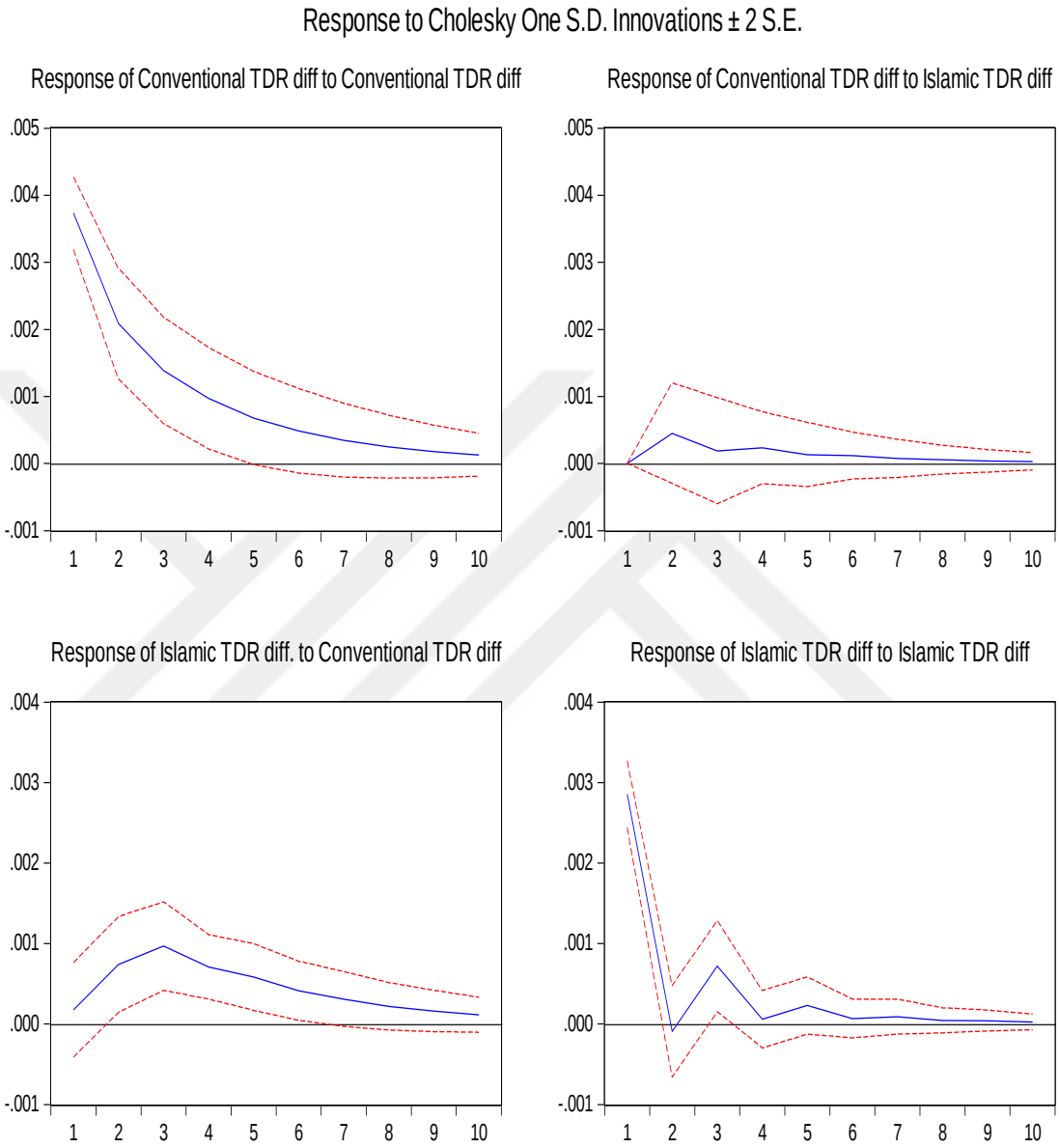


Figure 9-5 **Figure 4.8** Impulse Response Functions for 2002-2013 Period (12 Months Maturity)

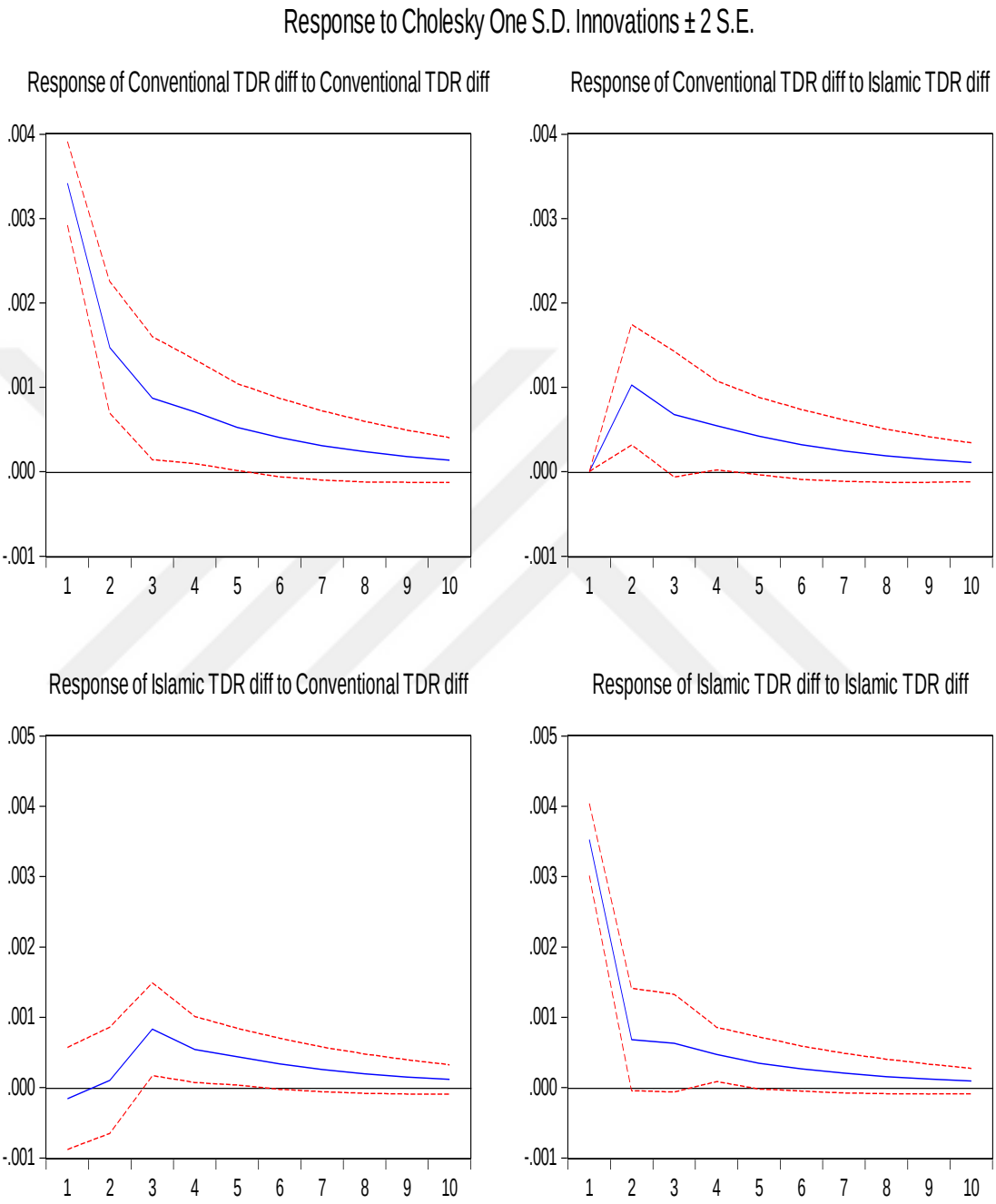


Table 9-6 **Table 4.7** Key Instruments in Islamic Finance

Term	Description
Ijārah (Lease, lease purchase)	A party leases a particular product for a specific sum and a specific time period. In the case of a lease purchase, each payment includes a portion that goes toward the final purchase and transfer of ownership of the product.
Istisna' (Deferred payment, deferred delivery)	A manufacturer (contractor) agrees to produce (build) and to deliver a certain good (or premise) at a given price on a given date in the future. The price does not have to be paid in advance (in contrast to *salam*). It may be paid in installments or part may be paid in advance with the balance to be paid later on, based on the preferences of the parties.
Mudarabah (Trustee finance contract)	An investment which represents the ownership of units of equal value in the equity of the *Mudarabah*. The provider of capital supplies the funds needed to finance a project while the entrepreneur offers labor and expertise. Profits are shared between them at a certain fixed ratio, whereas financial losses are exclusively borne by capital's owner. The liability of the entrepreneur is limited only to his time and effort.
Murabahah (Mark–up financing)	A widely-used sale transaction between customers and banks. The buyer approaches the bank to acquire goods. In turn, the bank purchases them from a third party (a supplier) and then resells them to the borrower at an agreed mark-up for immediate or deferred payment. The seller informs the buyer of the cost of acquiring the specified product and the profit margin is negotiated between them. The total cost is usually paid in installments.
Musharakah (Equity participation)	An investment that represents ownership of partnership equity. The bank enters into an equity partnership agreement (joint venture) with one or more partners to jointly finance an investment project. Profits are distributed according to predetermined ratios, and losses are shared strictly in relation to the respective capital contributions.
Qard (Benevolent loan)	These are zero-return loans that the Qur'an encourages Muslims to make to the needy. Banks are allowed to charge borrowers a service fee to cover the administrative expenses of handling the loan. The fee should not be related to the loan amount or maturity.
Salam (Prepayment, deferred delivery)	The buyer pays the seller the full negotiated price of a product that the seller promises to deliver at a future date.

Sukuk Al Istithmar	Under a *Sukuk Al Istithmar* (broadly understood as investment *Sukuk*), it may be possible to package and sell a pool of *ijara contracts* (and underlying assets), *Murabahah* receivables, *istisna* receivables, as well as equity shares or other *Sukuk* certificates. Although not universally accepted, *Sukuk Al Istithmar* can be issued when it is not possible to identify a tangible asset or originator. Holders share returns according to stated ratios and bear losses in proportion to their investment.
Tawarruq	A multi-step transaction heavily used for interbank financing and liquidity management, often based on commodities traded on the London Metal Exchange (LME). The AAOIFI (2006, 525) defines *Tawarruq* as 'the process of purchasing a commodity for a deferred price determined through *Musawama* (bargaining) or *Murabahah* (mark-up sale), and selling it to a third party for a spot price so as to obtain cash. *Tawarruq* is most disliked by Shari'ah scholars when the borrower sells the commodity back to the original seller. These practices have yet to gain AAOIFI's Shari'ah Board consensus.
Wadi'ah (Demand deposits)	Deposits held at the bank as a trustee for safekeeping purposes. They are guaranteed in capital value, and earn no return.
Wakalah (Agency)	One party (either the bank or client) acts as an agent to the other party to undertake transactions on his behalf. For example, the bank invests funds on behalf of a client or the bank appoints the client as an agent to buy the needed merchandise in a *Murabahah* transaction.

Annex 4.1 IFSB Risk Principles

1. General Requirement

Principle 1: Islamic Institutions and Financial Services (IIFS) shall have in place a comprehensive risk management and reporting process, including appropriate board and senior management oversight, to identify, measure, monitor, report and control relevant categories of risks and, where appropriate, to hold adequate capital against these risks. The process shall take into account appropriate steps to comply with *Sharī`ah* rules and principles and to ensure the adequacy of relevant risk reporting to the supervisory authority.

2. Credit Risk

Principle 2.1: IIFS shall have in place a strategy for financing, using various instruments in compliance with *Sharī`ah*, whereby it recognises the potential credit exposures that may arise at different stages of the various financing agreements.

Principle 2.2: IIFS shall carry out a due diligence review in respect of counterparties prior to deciding on the choice of an appropriate Islamic financing instrument.

Principle 2.3: IIFS shall have in place appropriate methodologies for measuring and reporting the credit risk exposures arising under each Islamic financing instrument.

Principle 2.4: IIFS shall have in place *Sharī`ah*-compliant credit risk mitigating techniques appropriate for each Islamic financing instrument.

3. Equity Investment Risk

Principle 3.1: IIFS shall have in place appropriate strategies, risk management and reporting processes in respect of the risk characteristics of equity investments, including *Muḍārabah* and *Mushārakah* investments.

Principle 3.2: IIFS shall ensure that their valuation methodologies are appropriate and consistent, and shall assess the potential impacts of their methods on profit

calculations and allocations. The methods shall be mutually agreed between the IIFS and the *Muḍārib* and/or *Mushārakah* partners.

Principle 3.3: IIFS shall define and establish the exit strategies in respect of their equity investment activities, including extension and redemption conditions for *Muḍārabah* and *Mushārakah* investments, subject to the approval of the institution's *Sharī`ah* Board.

4. Market Risk

Principle 4.1: IIFS shall have in place an appropriate framework for market risk management (including reporting) in respect of all assets held, including those that do not have a ready market and/or are exposed to high price volatility.

5. Liquidity Risk

Principle 5.1: IIFS shall have in place a liquidity management framework (including reporting) taking into account separately and on an overall basis their liquidity exposures in respect of each category of current accounts, unrestricted and restricted investment accounts.

Principle 5.2: IIFS shall assume liquidity risk commensurate with their ability to have sufficient recourse to *Sharī`ah*-compliant funds to mitigate such risk.

6. Rate of Return Risk

Principle 6.1: IIFS shall establish a comprehensive risk management and reporting process to assess the potential impacts of market factors affecting rates of return on assets in comparison with the expected rates of return for investment account holders (IAH).

Principle 6.2: IIFS shall have in place an appropriate framework for managing displaced commercial risk, where applicable.

7. Operational Risk

Principle 7.1: IIFS shall have in place adequate systems and controls, including *Sharī`ah* Board/ Advisor, to ensure compliance with *Sharī`ah* rules and principles.

Principle 7.2: IIFS shall have in place appropriate mechanisms to safeguard the interests of all fund providers. Where IAH funds are commingled with the IIFS's own funds, the IIFS shall ensure that the bases for asset, revenue, expense and profit allocations are established, applied and reported in a manner consistent with the IIFS's fiduciary responsibilities.