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Ege Akademik Bakış

Ege Academic Review

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A Research on Sustainability Reports of Business in Terms of Corporate Social Responsibility

Emine ŞARDAĞI[1], Gül COŞKUN DEĞİRMEN[2]

ABSTRACT

The purpose of this study is to determine, how much companies are committed to sustainability reports they publish by using content analysis method. The companies are chosen from 2019 Fortune Turkey Top 500 list, in which companies with highest net income are listed. The sample of the research consists of the top 100 companies in the list. It presents findings from an analysis of 100 companies' websites in Turkey and their sustainability reports and discusses the findings within this conceptual context. The findings of the research showed that the majority of the companies that were examined did not share their sustainability-oriented efforts on their websites. Most of the companies that shared their reports try to make their commitments towards sustainability concrete with at least one initiative. It was determined that the least mentioned element in all the themes in the reports was about the results of performance measurement. As a result, companies make a commitment and support it in an initiative, while paying less attention to sharing its results for performance measures and being less willing to do so.

Keywords: Sustainability, sustainability report, environmental sustainability, economic sustainability, social sustainability.

INTRODUCTION

The variety of social, economic, cultural and political needs and the insensible use of the resources to meet these needs, have caused the balance of resources to deteriorate and diminish. The problems faced in the world we live in do not affect only one country or region. Various attempts have been made, especially after the 1970s, with the start of a period in which life-threatening problems are now more difficult to prevent. The fact that these problems that we face have gained a global dimension rather than a local one, brings along approaches with new collaborations. This made it necessary for the institutions to pay attention to the problems of the environment they live in and to act on the basis of sustainability in economic, social and environmental issues. Expectations that were merely financial in the past were replaced by social expectations. Actually, financial expectations have not been completely lost. Instead, in the new order, it increased the chance for the competition of the businesses with a high sense of responsibility. These businesses are the ones that give social messages, that protect and look out for the environmental and social values (Kuşat, 2012: 228).

The most acceptable sustainability concept had emerged in the Brundtland Report that was published in 1987 with the term "sustainable development". Brundtland Report defined sustainable development as "development seeking to meet the needs of the present generation without compromising the ability of future generations to meet their own needs" (WCED, 1987). According to Diesendorf (2000:3), "this definition emphasises the long term aspect of the concept of sustainability and introduces the ethical principle of achieving equity between the present and future generations. The definition indicates that 'needs' include a sound environment, a just society and a healthy economy".

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The present study aims to determine the commitments (statements) of the companies in their sustainability reports and to determine how much they are committed to these reports. In this study, the sustainability reports and information shared by the companies on their websites were evaluated by using content analysis method. Accordingly, 2019 Fortune Turkey Top 500 list, in which companies with highest net income are listed, was used. Top 100 companies from the list were chosen and information about sustainability practices on their websites were analyzed. The reports and the information were analyzed in three stages. In the first stage, it has been examined whether the companies have sustainability commitments in their reports and websites. In the second stage, the fact that how many of these commitments were concluded with at least one initiative was discussed. In the last stage, it was analyzed whether they perform performance measurements for the results of these initiatives. By this means, this research tries to reveal how many of the commitments in these reports are realized.

Studies in the field of sustainability are generally examined through their effects on financial performance. 78% of the studies revealed that there is a positive relationship between sustainability and financial performance (Alshehhi et.,2018). In these studies, research were generally carried out over sustainability reports (Weber,2017; Laskar et.,2017; Nnamani et.,2017; Lu and Taylor,2016). However, this study deals with sustainability reports from a different perspective. This study was carried out on the basis of De Grosbois' research that was conducted in 2016. De Grosbois analyzed the websites and sustainability reports of 50 cruise lines in the tourism industry. De Grosbois (2016) approached his work only in terms of tourism sector. However, in this research, the companies with highest net income from different sectors were evaluated.

The study is important in terms of revealing how much of this is put into practice, even if the companies express the protection of the environment and society at every opportunity. No other similar study was found during the research process.

The paper is organized as follows: the literature review on the sustainability and sustainability reports are analyzed in the first section. The second section provides the details of the research methodology adopted for this study. In the third section, statistical analysis results are exhibited and the paper is finalized with the conclusion section.

CORPORATE SUSTAINABILITY CONCEPT AND LITERATURE REVIEW

The concept of sustainability, which was first formally used in 1987, was included in the report titled "Limits of Growth". This report was first put forward by the Club of Rome on the challenges facing humanity in the 21st century (Meadows and Meadows, 1972 as cited in Akgül:2010). Rising popularity of the sustainability concept, awareness about the environment-development relationship and changing of the content is caused by Brundtland's "Our Common Future" report. It was presented to world public opinion in 1987 and was prepared by World Commission on Environment and Development (WCED) (Şen, et al.,2018:15). The Bruntland Commission (United Nations, 1987) defines sustainability "as meeting the current needs of present generations without compromising the ability of future generations to meet their own needs". There are different definitions in the literature about sustainable development. However, the most widely accepted definition is included in the Brundtland Report. "An important point in this definition is that future generations are accepted as stakeholders of current generations" (Çalışkan, 2014:248).

Sustainable development is used as a social concept and "corporate sustainability" is considered more as a corporate concept. The International Institute for Sustainable Development (IISD, 1992) defined the corporate sustainability concept as "adopting the preservation, maintenance and expansion of natural and human resources that will be needed in the future, while creating business strategies and activities to meet the needs of institutions and stakeholders".

Szêkely and Knirsch (2005: 628) define sustainability in terms of institutions. They state that "sustainability is about creating a society in which an appropriate balance is created between economic, social and ecological goals". And for businesses, that means economic growth, shareholder value, prestige, corporate reputation, customer relations, maintaining and expanding the quality of services and product. Van Marrewijk (2003:102) as well, states that corporate sustainability means social and environmental concerns are incorporated into commercial activities and stakeholder interactions. Milne and Gray (2002) state that the concept of sustainability does not only mean the efficient allocation or use of resources, but also the fair distribution of these resources and opportunities between present and future generations. According to Fisher et. (2020:89), "business managers are becoming

more aware that sustainability measures benefit the environment, society in general, and their own firms; at the same time, investors request businesses to behave in a sustainable way and assess the full triple bottom line".

Sustainability is an important concept because of multitude of reasons. These reasons can be listed as follows (Hitchcock &Willard, 2009:14-16):

- Natural resources are now a limiting factor,
- Environmental issues are becoming global,
- Health concerns are rising,
- Social, environmental and economic factors are entangling, and they are creating instability,
- Energy supplies are a significant threat,

According to Costa Maynard et al (2020:1804), "even though economic growth has improved the living conditions of billions of people, globalization is causing severe environmental crises, increasingly leading to the exhaustion of nature and its natural resources". The consequences of environmental problems in the 21st century are growing steadily. In this process, both businesses and people living in the society have great responsibilities, because nature's resources are no longer limitless. Increasing population growth brings more consumption. It causes excessive use of non-renewable resources. Another important reason is the increased demands from various stakeholder groups. These demands forced organizations to adopt some responsible management practices.

Dimensions of Sustainability

Sustainability is examined in three dimensions in the literature; environmental, economic and social (Fischer et.2020; Choi and Ng,2011; Reddy and Thomson,2015). According to the sustainability approach, these dimensions should be integrated into business strategies. It also requires reporting of the performance of business activities related to these three dimensions (Atağan, 2017:513).

The dimensions of sustainability can be briefly explained as follows:

Economic sustainability "is focused on the cost-effectiveness of all economic activities, emphasising the financial components. This dimension of sustainability at its simplest can be interpreted as how organisations stay in business" (Cozzio,2019:63). The economic dimension refers to how to use the resources of the planet and the efficient application of natural resources in a competitive environment (Bertotto et. 2014). "Economic sustainability is directly related to both environmental and social sustainability" (Reddy and Thomson,2015). According to Caradonna (2014:13), "the economic dimension requires a system that can constantly produce goods and services, avoid excessive debt, and balance the demands of different sectors of the economy".

Environmental sustainability refers to "conserving and managing resources in such a way that the environmental damage is minimised and biological diversity and natural heritage are preserved" (Cozzio,2019:63). Environmental sustainability is one of the biggest and most important issues faced by the mankind at present. Environmental sustainability, which is not unlimited in natural resources and is related to the carrying capacity of the natural environment, is actually one of the dimensions that emerge with a greater burden on nature. The environmental dimension of sustainability is concerned with the principle of environmental integrity that requires human activities to not erode the world's land, air and water resources, and the welfare of natural systems over time.

Social sustainability: Social sustainability is a difficult dimension to define as it covers society, communities and culture (Høgevold etc.2015). Social sustainability includes "the respect of human rights, the empowerment of the local culture and the avoidance of any forms of cultural destruction" (Cozzio,2019:64). According to Choi and Ng (2011), "the social dimension of sustainability is concerned with the well being of people and communities as a noneconomic form of wealth" (p:270). Another definition of social sustainability is "the condition of a society where social tensions do not escalate but are solved in a peaceful way" (Ketschau,2017:339).

De Grosbois (2016), on the other hand, examines sustainability with five themes developed based on GRI standards which consist environmental sustainability, employment quality, diversity and accessibility, social and community well-being. The commitments put forward as a part of sustainability indicates that the initiatives that are undertaken and the performance level of these initiatives are important**.**

Sustainability Reports

There are different sustainability reports named such as "sustainability reports", "sustainable development reports", "corporate social responsibility reports", "corporate responsibility reports", "triple bottom line reports " and "accountability reports". Sustainability

reports are defined by the World Business Council for Sustainable Development (WBCSD,2002:7) as "public reports that provide internal and external stakeholders with a framework for economic, environmental and social activities".

The Global Reporting Initiative (GRI), defines sustainability reports as "a report published by a company or an organization about the economic, environmental and social impacts caused by its everyday activities". According to Clarissa and Rasmini (2018) "sustainability report is a report containing non-financial information that consists economic, social and environment performance. Sustainable company is a company that not only pays attention to the benefits, but also aware about environmental and social issues around their company" (p:139).

Nowadays sustainability reporting is gaining popularity as a communication instrument between a corporation and its stakeholders (Cahyandito and Ebinger, 2005). Herremans et al. (2016) state that the concept of sustainability was developed in response to stakeholder demands. And, one of the key mechanisms for stakeholder participation is sustainability statements, usually in the form of a report. In non-financial reporting, corporate sustainability is widely accepted as a reporting tool and is conceptualized as bottom triple bottom line (TBL) reporting. This concept briefly expresses the necessity of considering and reporting the social, environmental and economic impacts of business activities as a whole. In literature, it is symbolized as "three P's": people, planet and profit (Çalışkan, 2014: 255).

Corporate sustainability reports combine the economic, environmental and social performance of an institution in a single report. Gavana et al. (2017: 12) states that sustainability reports are a way of showing that an institution's activities are in line with the system of values shared by society and thus protect socioemotional assets. Dagilienė (2014: 1660) states that the following corporate factors are effective in the development of sustainability reporting in organizations:

- *Mandatory factors* - the formal and informal impact of public authorities and other social forces (e.g. market regulators) on companies.
- Normative factors - impact of professional organizations on the development of sustainability reporting methodologies, standards and principles.
- Economic factors - the impact of economic changes and sustainable development. Due to economic factors, commercial companies have crossed traditional boundaries and went beyond the disclosure of financial information to shareholders and potential investors.
- Copying factors - companies tend to behave in a similar way to their successful equals. These factors are considered less important in sustainability reporting.

There are various reasons for reporting the activities of the institutions on environmental, economic and social issues. In the survey conducted by the Boston College Center for Corporate Citizenship and EY in 2013, it is found that transparency, risk management and stakeholder pressure are the top three reasons. Apart from these, there are different reasons for reporting: reputation (Farneti and Guthrie, 2009); gaining legitimacy and informing stakeholders (Mussari and Monfardini, 2010); transparency and accountability (Greco et al., 2015; Rixon, 2010); monitoring progress according to specific objectives; furthering awareness, transparency and increased reliability for broad environmental issues (Kolk, 2010).

Stakeholders pressured organizations to be more open and transparent and this pressure made it compulsory for institutions to share not only reports on their financial performance, but also reports about their social and environmental impact on society. This situation is approached by institutions and their stakeholders as part of corporate sustainability and sustainability reports are becoming increasingly important.

Objectives and Benefits of Sustainability Reporting

Global Reporting Initiative states that sustainability reports can be used for *benchmarking* (comparison and evaluation of sustainability performance according to laws, norms, rules, performance standards and voluntary initiatives), *demonstrating* (showing how the institution influences and is influenced by expectations about sustainable development), and *comparing* (comparing performance that covers specific times within an organization and between different organizations). Herzig and Schaltegger (2006: 302) list these objectives and the benefits of sustainability reporting as corporate legitimacy, reputation and brand value, competitive advantage, corporate performance indicator, benchmarking with competitors, internal transparency and accountability, employee motivation, internal information and control process. Sustainability

reports are one of the tools that play an important role in changing external perceptions of the institution, initiating dialogue with stakeholders, and establishing communication and relations between the institution and its stakeholders (Bonsón and Bednárová, 2015: 183). The Global Reporting Initiative lists the internal and external benefits of sustainability reporting for businesses and organizations, as shown in the table below:

Many studies have been carried out in the literature on sustainability reporting. The focus of these studies is the impact of sustainability on financial performance. There are different results in the literature regarding the effects of sustainability and financial performance. While some studies have found that sustainability reporting has a positive effect on financial performance (Sumaryati and Rohman,2019; Whetman,2017;Aggarwal;2013) others state that it has a negative effect (Asuquo et al.,2018; Tarigan and Semuel,2014).

A comprehensive study on the results on this subject has been done by Alshehhi et al. in 2018. Alshehhi et.al. (2018) examined 132 articles published in the best journals in their content analysis study. As a result of the research, they found that 78% of the articles reported a positive relationship between corporate sustainability and financial performance. It is also stated that 6% of the articles show a negative effect between sustainability and financial performance. Clarissa and Rasmini (2018) also analyzed the effect of sustainability reports on financial performance by observing each aspect of the sustainability reports. The results of the research, social and environmental performance disclosure has a positive effect on financial performance. However, economic performance disclosure has been found to have a negative impact on financial performance. Similarly, Al Matarneh (2019) examined the impact of the environmental, social and economic dimensions on the quality of financial disclosure. The results of the questionnaire indicate that social and economic dimensions are important factors that affect the quality of financial disclosure. Also in the study, it is revealed that "social dimension" had the highest mean score, followed by "economic dimension" and "environmental dimension".

METHODOLOGY

The present study aims to determine the commitments (statements) of the companies in their sustainability reports and to determine how much they are committed to these reports. The results of the study are not only important for seeing companies' commitments for sustainability practices. It is also important to find out to what extent they have realized these commitments. The study is based on this perspective. Accordingly, the study tries to answers the research questions below:

RQ 1:Do companies make target-specific commitments in sustainability activities?

RQ 2:Do companies have at least one attempt to achieve this goal?

RQ 3:Is, at least, one performance measurement performed to address companies'

contribution to the target?

Table 1: The internal and external benefits of sustainability reporting for businesses

Internal Benefits	External Benefits
• Increasing risks and opportunities, • Emphasizing the link between financial and non-financial performance, • Influencing long - term management strategy, policy and business plans • Simplifying processes, reducing costs and increasing productivity • Comparing and evaluating sustainability performance according to laws, norms, codes, performance standards and voluntary initiatives • Avoiding public environmental, social and governance failures • Comparing internal and inter-institutional performance	• Alleviating or reversing negative environmental, social and governance impacts • Improving reputation and brand loyalty • Enabling external stakeholders to understand the true value of the institutions, its tangible and intangible assets • Demonstrating how the institution influences and is influenced by expectations about sustainable development

Source: Adapted from Benefits of Reporting.
https://www.globalreporting.org/information/sustainability-reporting/Pages/reporting-benefits.aspx (Accessed on 11.06.2019)

In this study, which examines the commitments and initiatives of companies in their sustainability reports, descriptive research design is included. In descriptive design, the concept of descriptor describes what a situation, condition, man, organized activity, communication process and policy is, and tries to clarify these concepts. (Erdoğan, 2007: 138). In this study, content analysis method was used to reach the data. Binark (2014) stated that the main purpose of content analysis is to investigate how often the characteristics in a text are repeated, how they are presented, and to determine the formal characteristics of the messages. The reason of using content analysis method in the study is to find out how often the commitment, initiative and performance measures related to sustainability themes are observed in the information of the Fortune 500 companies in their reports and websites.

Population and Sample

Population of the study is consisted of companies in 2019 Fortune 500 in which largest companies of Turkey are listed. And the sample group is determined as the first 100 companies in this list. As part of the study, sustainability reports and information on official websites of selected companies between 1-9 July 2019 were examined. The findings of the study are limited to the information and reports shared by the companies on their websites on 1-9 July 2019. In addition, reviews were made based on the most recent reports published by companies regardless of year.

Collection of Data

The data collection process was carried out in two stages. In the first stage, companies in the sample group were listed and their website addresses were confirmed. Afterwards, the information and reports of these companies under the heading of sustainability on their websites were examined. Whether the sustainability information is available on the websites was checked, and quantitative data such as which sections are presented on the website, which year the last published report belongs to, how many reports were published and the number of pages were evaluated.

In the second stage of the study, the latest reports published by the companies and the information on the websites were reviewed. When the companies' websites are examined, it is seen that some of them publish their sustainability activities in a year-based report and some of them share detailed information on sustainability on their websites. For this reason, in order to provide comprehensive data to the study, it was considered appropriate to include both formats that are under the heading of sustainability.

Report and information contents of the companies which offer sustainability reports and information about sustainability on their websites are analyzed based on "Corporate social responsibility reporting in the cruise tourism industry: a performance evaluation using a new institutional theory based model" research that is written by De Grosbois (2016). In this study, De Grosbois (2016) tries to explain, based on Global Reporting Initiative (GRI) standards, sustainability and corporate social responsibility reporting behavior with the model created in terms of institutional theory. "Five corporate social responsibility themes consisting of environmental sustainability, employment quality, diversity and accessibility, social and community well-being that are developed based on GRI standards and 36 targets under these themes" in De Grosbois' study underlie our research. It has been analyzed whether the targets determined accordingly are included as commitments in the reports and websites of the companies. Also, it has been examined whether or not they have performed at least one initiative for these commitments and whether they have been measured or not. For each company that publishes reports and provides information on sustainability on the website, a three leveled coding has been done through five social responsibility themes and 36 target.

Coding of the reports in the study was performed in conjunction by the researchers. Firstly, two researchers conducted a preliminary study and evaluated 5 companies separately, then ensured reliability between the encoders by checking the similarity of the data obtained. Then the research form was applied to the whole sample group. The data obtained were evaluated with SPSS 25 package program. In the first part of the study, frequency analysis of the data was done. In the section where data on social responsibility themes and targets were evaluated, multiple response analysis was performed.

FINDINGS

1. Results from Websites for Sustainability Information

In this part of research, these are the things that are primarily analyzed: the sectoral distribution of top 100 companies in 2019 Fortune 500 Turkey list, information on sustainability at companies' websites, sections of this information on the website, number of businesses

reporting and providing information on sustainability, number of sustainability reports by years, number of reports prepared in accordance with the Global Reporting Initiative, abbreviated as GRI, and number of matrix to "scale priority issues" in reports.

The sectoral distribution of the companies in the study is based on the sectors specified in the Fortune list. In the Table 2 above, it is seen that companies from 33 different sectors are ranked. Looking at the sectoral distribution of the top 100 companies in the 2019 Fortune 500 Turkey list, it is seen that the highest ratio (12%) belongs to the energy sector. "Metal casting and processing" is the second sector in the list. And "production and distribution of petroleum and derivatives", and "construction contracting" are the other areas with the highest proportion.

The "Others" part of the examined sectors consists of companies in 11 different sectors, each of which is 1%. These sectors can be listed as follows; heavy industry construction and contracting, information and communication services, iron and steel trade, natural and processed solid fuel, economic state organization, linen fiber and fiber yarn, machinery and equipment, medical and pharmaceutical, marble, metals and ores, metal refinery services.

Table 2: Number of Companies Examined by Sectors

Sector	Number (n)	%
Energy/Petroleum and energy	12	12
Metal casting and processing	9	9
Manufacture and distribution of petroleum and derivatives	7	7
Construction contracting	7	7
Retail trade stores	6	6
Travel and transportation services	5	5
Grain, milk, meat and seafood	5	5
Industrial food manufacturing	5	5
Storage, transport and logistics services	4	4
Chemical substances	4	4
Vehicles and equipment manufacturing and maintenance	4	4
Electronics and telecommunications	3	3
Computer, software and office machines	2	2
Glass and glass products	2	2
Non-ferrous metals	2	2
Household electrical appliances	2	2
Ready-wear, underwear and sportswear	2	2
Jewelry	2	2
Sale and service of motor vehicles	2	2
Plastics & Rubber	2	2
Wholesale food, drinks and cleaning products	2	2
Others	11	11
Total	100	100

Table 3: Existence of Sustainability Information on the Website

	Number (n)	%
Sustainability report shared	29	29,6
Information only shared on the website	16	16,3
No information shared	53	54,1

While examining the results about the existence of sustainability information on the websites, it was found that 3 companies in the top 100 on the 2019 Fortune 500 Turkey list referred to the same website. While these companies were identified as "Trakya Cam Sanayi", "Soda Sanayi" and "Anadolu Cam Sanayi", it was seen that these companies were included in the Şişecam Group and published a single report. Therefore, these three companies are considered as one company. As a result, the number of companies examined is 98 and the number of reports reached is 29. In this respect, the data obtained in the next section were evaluated as total of 45 companies, including 29 companies that published sustainability reports on their websites and 16 companies that did not have reports on their websites but shared information on this issue. When the websites of 98 companies were examined, it was found that more than half (54.1%) did not share any information reports about sustainability on their websites. On the other hand, while 29.6% presented sustainability information as a report, 16.3% shared information in different sections of their websites under the heading of sustainability.

Table 4: Section of the Website that Includes Sustainability Information

Section	Number (n)	%
Sustainability Section	30	66,7
About Us -Corporate Section	9	20
Investor Relations Section	4	8,9
Others	2	4,4
Total	45	100,0

When the information on the sustainability of 45 companies is examined in terms of the sections on their web sites, it is found that 66.7% of the companies present their activities that contribute to society under the headline of "sustainability". 20% share information on their About Us-Corporate section. And 8,9% share information to their stakeholders in Investor Relations section.

When the number of pages of these 29 companies' reports were examined, it was seen that the majority (14 companies - 48.3%) had 51-99 pages. There are only 4 companies that published 100 pages or more. The number of companies that published 50 pages or less is 11. Looking at the distribution of 29 reports published as of July 1-9, 2019, 16 companies shared sustainability reports in 2018. In 2019, only one company published a report. The number of companies that published reports in 2017 is 9. And in 2016, there is only one company report. In addition, two companies shared their reports in 2014-2015 and 2016-2017. In this respect, it is seen that the most reports were shared in 2018. When we look at the frequency of the reports, it was found that 17 companies shared 1-5 reports on their websites and 10 companies shared 6-10 reports. There are only 2 companies that have published more than 10 reports.

Various globally accepted standards are used in the preparation of sustainability reports. Institutions share the information that should be based on these standards when preparing sustainability reports.

In this sense, one of the standards used in sustainability reporting is the Global Reporting Initiative, abbreviated as GRI.

Table 5: Number of Pages, Year and Frequency of Publication in the Sustainability Reports Presented by the Companies

		Number (n)	%
Page Number	50 page or under	11	37,9
	between 51-99 pages	14	48,3
	100 page or over	4	13,8
Report Year	2019	1	3,4
	2018	16	55,1
	2017	9	31
	2016	1	3,4
Frequency of Publication	1-5	17	58,6
	6-9	10	34,5
	10 and over	2	6,9
Declaration of adherence to GRI standards	Yes	27	93,1
	No	2	6,9

Founded in 1997 with the support of the United Nations Environment Program, GRI offers internationally recognized criteria that help organizations to understand and transfer their impact on society. Following this initiative, the Sustainability Reporting Guide was published and efforts were made to encourage sustainability reports. Institutions evaluate their environmental, social and economic impact on society within the framework of these established standards and share the results they obtained. The number of those who declare that their reports have been prepared in accordance with the basic content of GRI standards is 27. In this respect, it can be said that almost all of the companies that publish reports have information about the existence of such a standard and consider these standards while preparing their report. In the reports of the companies, it is stated that there is a committee for sustainability studies composed of authorized persons within the company. The committee establishes a scaling matrix (low-high priority) by identifying priority issues on sustainability studies. Accordingly, when the information of the companies about this issue was evaluated, it was determined that 14 companies formed a matrix of scaling priority issues in their reports and 5 companies listed them as subject priorities. 10 companies did not share any information regarding their priorities in the reporting process.

Looking at the distribution of the five main sustainability themes in the reports and websites of the companies examined, it is seen that the companies share their knowledge about commitments to the highest employment quality by 36.6% in the reports and websites. While the second place was shared by the themes of environmental sustainability (31.1%) and economic prosperity (31.1%); it is determined that by 23% of the commitments mentioned in reports and websites, the least mentioned is the main theme of diversity and accessibility. However, although the companies examined share information about their commitments and initiatives, it is seen that the information on performance measurements in all themes is the least mentioned theme in reports and websites.

2. Sustainability Themes, Commitment, Initiative, Performance Measurement Findings

In this part of the study, it has been investigated whether there are five corporate social responsibility themes and commitments related to 36 targets under these themes in the information and reports of the companies. At the same time, the existence of information about the initiatives and performance measurements of these undertakings were investigated. Accordingly, three levels of coding were realized on 5 themes and 36 targets.

Coding was evaluated by multiple response analysis in SPSS program. Because of the multiple responses, the number of answers is not equal to the number of samples. Thus the resulting percentage of answers can exceed 100% and the number of samples exceeds the specified sample volume. Within the scope of multi-response analysis, the research of 45 companies providing information on sustainability and publishing sustainability reports on the website was conducted in the following order:

- First, the number of companies that made a commitment is examined.
- Afterwards, of those that made a commitment, it was examined how many gave information about at least one initiative they undertook related to the commitment they have made.
- In the last stage, it was examined how many of the people who shared the information about the initiative gave information about the performance measurement.

As a result of the research, the results related to the objectives under the themes of environmental sustainability, employment quality, diversity and accessibility, social and community well-being are as follows:

Table 6: General Distribution of Sustainability Themes

Themes/Goal*	Commitment/ goal statement	Initiatives	Performance Measurements	Unspecified
Employment Quality	36%	26,3%	13,3%	24,4%
Environmental Sustainability	31,1%	25,1%	17,6%	26,3%
Economic Prosperity	31,1%	25,1%	17, 6%	26,3%
Social and Community Well-Being	28,4%	26,0%	16,1%	29,5%
Diversity and Accessibility	23,0%	20,9%	11,8%	44,2%

*more than one option is selected.

Table 7: Environmental Sustainability Theme and Objectives Research Results

Sub Themes *	Commitment/ goal statement	Initiatives	Performance Measurements	Unspecified
Mitigate the impacts of climate change / reduce CO2 or greenhouse gases emissions	39 (86,7%)	30(66,7%)	21 (46,7%)	5 (11,1%)
Waste reduction and recycling	39 (86,7%)	36 (80%)	29 (64,4%)	5 (11,1%)
Reduce energy consumption	35 (77,8%)	30(66,7%)	27 (60%)	8 (17,8%)
Reduce water consumption	34 (75,6%)	30(66,7%)	27 (60%)	10 (22,2%)
Use renewable energy sources / Produce own clean energy	28 (62,2%)	21(46,7%)	16 (35,6%)	15 (33,3%)
Contribute to biodiversity conservation and habitat restoration	22 (48,9%)	19 (42,2%)	10 (22,2%)	23 (51,1%)
Responsible design, construction and renovations	20 (44,4%)	19 (42,2%)	7 (15,6%)	24 (53,3%)
Reduce air pollution and fuel use	15 (33,3%)	11 (24,4%)	5 (11,1%)	29 (64,4%)
Preservation of non-renewable resources	15 (33,3%)	6 (13,3%)	3 (6,7%)	30 (66,7%)
Reduce water pollution	10 (22,2%)	8 (17,8%)	5 (11,1%)	35 (77,8%)
Reduce noise	5 (11,1%)	2 (4,4%)	-	40 (88,9%)

* more than one option is selected.

The objectives set under the name of environmental sustainability and the data obtained related to these objectives in order to mitigate the negative impacts of the companies on the environment in their community activities are shown in Table 7. Looking at the table; reducing the effects of climate change, waste reduction and recycling is among the most promised issues of the companies. Accordingly, 86,7% of the companies have sustainability reports and commitments in their websites related to mitigating the effects of climate change. While 66,7% of the companies that made commitment to climate change stated that they have made at least one attempt to reduce this effect; 46,7% of those made performance measurements in terms of their contribution to society. It is stated that companies' initiatives to reduce climate change include initiatives to mitigate the effects of greenhouse gas, conducting emission measurements and analyzing obtained measurements. In performance measurement, emission measurement results and greenhouse gas reduction rates obtained during the initiatives taken throughout the year are shared.

Other issues frequently mentioned by companies in their environmental sustainability reports are commitments to reduce waste and to recycle with 86,7% and reducing energy consumption with 77,8%. It was determined that 80% of the companies participating in the research made initiatives on waste reduction and recycling while 64.4% performed performance measurements. Among the initiatives of companies in waste reduction and recycling, it is stated that in order to prevent wastes from entering the nature, they take initiatives such as separation from source, temporary storage and recycling or disposal. In the reports, the performance measurements related to this, the number and rates of waste during the year and the data obtained from their recycling are shared. It is determined that while 66.7% of the companies committed to reducing energy consumption talk about their initiatives, 60% perform performance measurement. It is stated that the energy management system is in line with the Energy Management System studies and the projects developed within this scope are mentioned. With the measurements related to this, the results of the projects are shared. It has been determined that the theme with the least commitment made by the companies in their reports and the content they share for sustainability studies on their websites is the reduction of noise with 11.1%. Only 5 of the companies surveyed made a commitment to reduce noise in the environment in which they operate; while only 2 (4.4%) took initiatives in this direction. However, it was found that none of the companies surveyed performed any performance measurement towards reduction of noise.

Table 8: Employment Quality Theme and Objectives Research Results

Sub Themes *	Commitment/ goal Statement	Initiatives	Performance Measurements	Unspecified
Create a safe work environment	41 (91,1%)	33(73,3%)	22 (48,9%)	4 (8,9%)
Employee well-being, healthy working environment	33 (73,3%)	13 (28,9%)	3(6,7%)	12(26,7%)
Ensure non-discrimination (equal opportunities)	33 (73,3%)	21 (46,7%)	12 (26,7%)	12 (26,7%)
Provide opportunities for learning and development	33 (73,3%)	29 (64,4%)	24 (53,3%)	11 (24,4%)
Provide opportunities for career advancement	25 (55,6%)	20 (44,4%)	8 (17,8%)	21 (46,7%)
Increase employee empowerment / feedback	25 (55,6%)	20 (44,4%)	14 (31,1%)	20 (44,4%)
Provide fair wages and benefits	24 (53,3%)	13 (28,9%)	1 (2,2%)	21 (46,7%)
Employee assistance programs	20 (44,4%)	17 (37,8%)	4 (8,9%)	23 (51,1%)
Employee performance awards	18 (40%)	15 (33,3%)	6 (13,3%)	24 (53,3%)
Providing work/life balance policies	13 (28,9%)	13 (28,9%)	4 (8,9%)	32 (71,1%)

*more than one option is selected.

Table 8 shows the commitments determined for the employees, which are defined as the main force behind the success of the companies. According to this table, the theme that has the most amount of commitment in the companies' reports is creating a safe working environment for employees. It was determined that 91,1% of the companies surveyed promised to provide a safe work environment for their employees whom they considered to be one of their most important key stakeholders, while 73,3% made initiatives related to this, and 48,9% performed performance measurements. At this point, some of the most frequently used initiatives by companies is providing safety training exercises in the workplace and obtaining certification by applying to certification bodies. In the performance measurements, information regarding the accident, loss rates and the number of people / hours participating in the training exercises they organized in the year that the report was published is shared.

Another issue that 73,3% of the companies examined in the study have undertaken is to provide equal opportunity to their employees and to not discriminate between employees. It is also observed that 46,7% of those who declare that they provide equal opportunity among the employees state that they have taken initiatives for this, while 26.7% share the performance measurements for the results of these initiatives. The most emphasized issues of equal opportunity among companies that do not discriminate among employees on the basis of race, gender, nationality, political thought, religion and language are that they try to include women's employment equally in the working environment, support women's participation in business life and place this at the center of human resources policies. It is stated that they evaluate the results obtained for their initiatives in this regard according to the increase in the number of female employees and their ratio in the number of employees.

Another commitment related to employees is to provide fair wages. It is stated that 53,3% of the companies surveyed adopt an equal wage to equal work policy in line with the job evaluation and grading principle and market researches within the company and that employee wages are determined depending on the positions. There is only one company that performs performance measurement in this regard and shares its performance assessment in years of wage increase in its reports.

Among the companies surveyed, 44,4% made commitments to provide employee assistance programs to their employees, and 37.8% of them talk about their initiatives towards these commitments. The rate of those who measure the results of these initiatives is 8,9%. The assistance programs provided to the employees in the reports of the companies include private health-pension insurance, gift packages, food packages, food and transportation, and seniority awards. In addition, the results of the survey conducted for employee satisfaction are shared and it is stated that regulations are made in line with the demands of the employees. Although the number of companies performing performance measurement in this regard is small, information on the number of people benefiting from these rights during the year was shared in performance measurements.

The issue with least amount of commitments in the company's reports is the statements towards ensuring work/life balance of employees. Only 28,9% of the companies make commitments to ensure the work/life balance of their employees and only 8,9% share information about the results of these initiatives. It was determined that most of the opportunities provided for the work/life balance of the employees include breast-feeding hour, free nursery, etc. applications for mothers. For this purpose, data on how many employees benefit from these rights are shared during the performance measurement.

The information obtained from the shares made by companies on sustainability towards diversity and accessibility is shown in Table 9. In this respect, one of the subjects with the highest commitment is towards accessibility for employees with 46,7%. While all of the companies that made commitments talk about their initiatives, only 17,8% performed a performance measurement. Among the initiatives undertaken by the companies surveyed in terms of accessibility for their employees, it is stated that there are initiatives such as communication channels created for employees to connect with the company, practices where employees can share their suggestions, complaints and ideas, and open notification channels. In performance measurement, information about how many times employees used these channels and how many problems were solved at this point were shared. Similarly, initiatives have been taken for the communication channels that enable them to reach the company for customers and suppliers, and even various applications and portals offered by the company are mentioned. At this point, the communication channels they use for both internal and external stakeholders and their frequency of use are among the data shared in line with performance measurement.

In terms of diversity both for employees and suppliers, it has been determined that the companies examined have commitments to provide diversity in terms of human resources and suppliers in domestic and abroad according to their field of activity and take initiatives to do so. Especially the number of suppliers domestic and abroad, and the distribution of employees in this direction are among the topics shared under this title. Another issue that companies share in diversity is that they also try to contribute to the employment of people with disabilities.

Table 9: Diversity and Accessibility Theme and Objectives Research Results

Sub Themes*	Commitment/ goal statement	Initiatives	Performance Measurements	Unspecified
Accessibility for employees	21 (46,7%)	21 (46,7%)	8 (17,8%)	22 (48,9%)
Accessibility for suppliers and partners	20 (44,4%)	19 (42,2%)	8 (17,8%)	25 (55,6%)
Accessibility for customers	18 (40%)	18 (40%)	13 (28,9%)	27 (60%)
Increase diversity in workforce	11 (24,4%)	6 (13,3%)	5 (11,1%)	33 (73,3%)
Increase diversity among suppliers and partners	6 (13,3%)	5 (11,1%)	5 (11,1%)	39 (86,7%)

*more than one option is selected.

Table 10: Socıal and Communıty Well-Beıng Theme and Objectives Research Results

Sub Themes*	Commitment/ goal statement	Initiatives	Performance Measurements	Unspecified
Social assistance for local or global community (donation, employee volunteering, scholarship, philanthropy,etc)	29 (64,4%)	27 (60%)	21 (46,7%)	15 (33,3%)
Raise employee awareness of and involvement in sustainable development issues	26 (57,8%)	21 (46,7%)	13 (28,9%)	18 (40%)
Responsible products/healthy product choices	24 (53,3%)	23 (51,1%)	11 (24,4%)	20 (44,4%)
Raise, customer and/or public awareness of and involvement in sustainable development issues	22 (48,9%)	21 (46,7%)	12 (26,7%)	21 (46,7%)
Safe environment for customers and employees	20 (27,8%)	17 (23,6%)	11 (15,3%)	24 (33,3%)
Heritage and local culture/traditions protection and preservation	9 (20%)	8 (17,8%)	5 (11,1%)	36 (80%)

*more than one option is selected.

The information obtained from the shares of the companies on the social contribution towards sustainability is shown in Table 10. While companies carry out their commercial activities, they continue to engage in activities that will serve the society in which they live. Among the companies' commitments to contribute to the society they live in, in their reports and sharing, the applications that are described as social assistance for local or global community come first. At this point, 64,4% of the companies reported commitments on this issue, while 60% of the companies implemented these initiatives. When the share of performance measurements of these applications is examined, it is seen to be 33,3%. Donations, sponsorships, practical training exercises, information on developing vocational training and charitable activities are shared among the social assistance provided by companies to the society. In performance measurement, donations made during the year, the amount of scholarship given information etc. is shared.

The issue of sustainability gains importance not only by the work of the top management, but also by the inclusion of employees in this understanding. While 57,8% of the companies made commitments to raise employee awareness and involvement in sustainable development issues, 46,7% took initiatives about this, and 28,8% made performance measurement. In order to ensure the participation of the employees in this direction, it is mentioned that they have benefited from voluntary activities by allocating time to various social issues within working hours, collective tree-sapling planting activities and awareness training exercises given about sustainability. In the performance measurement, information on how many employees participated in voluntary activities during the year, number of tree-seedlings planted with employees as well as the number of person hours of awareness-raising training exercises are shared.

Protection and preservation of heritage and local culture-traditions is the subject with least commitments under this title. While 20% of the companies committed to the protection of the heritage and culture of the society in which they live, 17.8% were found to be making initiatives. It is stated that among the initiatives of the companies in line with this objective, there are initiatives such as sponsoring archaeological studies, supporting excavation and restoration works. In performance measurement, information is shared about the amount of support they give to these studies and how many studies are conducted in this direction.

Undoubtedly, one of the main priorities of companies is to create value and increase the welfare level by supporting the economic development of the society in which they live. The information obtained from the shares of the companies on economic contribution is shown in Table 11. One of the issues in which companies contribute to their economic activities is to support to the local economy. At this point, it was determined that 64,4% of the companies made commitment to support the local economy in their activities. It was found that the rate of companies making initiatives in this direction was 51,1% and the rate of those performing performance measurement was 44,4%. Among the initiatives that companies use to support the local economy and reduce external dependence are local supply chain practices in the process of purchasing goods and services, supporting local products and manufacturers, local business partnerships and so on. It has been determined that these initiatives contribute to the strengthening of the local economy. Performance measurements related to this are shared with the number of local suppliers during the year, their economic indicators, and the support they provide to the local producer.

Table 11: Economic Prosperity Theme and Objectives Research Results

Sub Themes*	Commitment/ goal statement	Initiatives	Performance Measurements	Unspecified
Supporting the local economy	29 (64,4%)	23 (51,1%)	20 (44,4%)	14 (31,1%)
Sustainable supply chain	26 (57,8%)	24 (53,3%)	17 (37,8%)	17 (37,8%)
Cooperation with industry and public sector	26 (57,8%)	24 (53,3%)	13 (28,9%)	18 (40%)
Quality / local employment creation	23 (51,1%)	13 (28,9%)	11 (24,4%)	22 (48,9%)

*more than one option is selected.

The companies act in accordance with the sustainability approach in the way of doing business with the suppliers they work with and undertake to work with institutions that have this perspective in the supplier selection. In the selection of suppliers, companies state that they implement supply chain implementations within the framework of their own policies, quality, and standards. At this point, 57,8% of the companies examined stated that they act in line with the sustainability policy in supplier preferences and talk about supplier evaluation processes. While 53,3% of the companies express their initiatives for this, 37,8% share their knowledge about performance measurement. Among the initiatives carried out in this direction, it is stated that the companies determine certain quality and standards in procurement and services through the supply chain committees established within their own bodies, and they also evaluate the supplier's compliance with environmental, social and ethical standards. In the procurement process, it is stated that local suppliers are preferred among the suppliers in compliance with the specified standards. In the performance measurements at this point, the information obtained from the audits performed by the committees they create are shared, and information is provided on the number of those who cannot meet the conditions determined in the supplier audit process.

In addition to the practices aimed at supporting the local economy, the commitment of companies to create local employment is another theme encountered in the reports. At this point, it was found that 51,1% of the companies made commitment to support local employment and create local employment, 28,9% had made an initiative and 24,4% performed performance measurement. It is stated that the initiative of the companies in this regard is to give priority to providing employment to the people of the region. In the performance measurement of the information shared on this subject, information on the amount of employment provided to the people of the region is included according to the field in which the entity operates.

CONCLUSION

At a time when the world is changing, with climate change affecting the whole world, water resources constantly decreasing, and energy consumption gradually increasing, it has become important for institutions to do something for the society they live in. Being aware of the fact that they shape the future with the activities they perform, institutions are obliged to act in consideration of their social and environmental impacts for the society. In fact, our starting point in this study was to show whether the reports really reflect the truth, and how much of this was put into practice even if the companies expressed about the protection of the environment and society at every opportunity. Therefore, this study which is based on the commitments of the 100 companies included in Fortune 500 in accordance with the sustainability reports and information they share, is in fact important in terms of revealing how much of these commitments resulted in an initiative and how much is being measured accordingly. The results of the study showed that in fact, companies take care to make at least one initiative towards the targets they have committed. When the sustainability themes are evaluated in general, there appear to be no big differences between the commitments and the initiative rates.

Determining the universe and sample within the scope of the study, Fortune 500 Turkey is one of the most respected lists of the companies with the highest net income domestically. Each year, companies are working to be included in these lists. Unfortunately, a surprisingly large proportion (54,1%) of the companies surveyed with the highest income do not share any information on their sustainability activities. From this point of view, it is important that these companies, who can contribute greatly to the realization of the works that will play an important role in the change of society, should do something for the society and share it with the future generations.

The results obtained from the research show that there is a difference between the previous studies. When we look at the distribution of the 5 main sustainability contacts determined in the reports and websites of the companies examined, it is seen that the companies share their information on the commitments in terms of employment quality with the highest rate of 36.6%. Therefore, it can be said that companies clearly share detailed information in order to attract more qualified workforce to their own companies. In the study of De Grosbois (2016), which is the basis of the research, it was revealed that the most mentioned theme in the reports of the examined companies was the environmental sustainability theme with 76%. In our study, it was revealed that the commitments for the environmental sustainability theme was the second most mentioned theme in the reports. Another difference emerged in the theme of employment quality.

The quality of employment theme is one of the least mentioned in De Grosbois' work. However, in our study, it is seen that the quality of employment is the most mentioned theme in the reports of the companies. It can be said that the sector diversity of companies in the sample is effective factor for the emergence of this difference. Because in our study the data obtained from companies in different sectors are evaluated, but in the De Grosbois' research, only the companies in the tourism sector were examined.

One of the results similar to the work of De Grosbois is performance measurement. In both studies, the least mentioned factor in companies' reports is the information about the results of the initiatives. One of the most controversial issues in public relations in general and corporate social responsibility practices in particular is in the area of measurement. This study also showed once again that although companies take various initiatives to create value for society, they are weak in measuring their outcomes. The values for the measurement of performance in the sustainability areas of the companies examined have always remained at the lowest levels. Therefore, companies should not only make an initiative, but also measure the contribution of this initiative to the society and share the results.

The study has some limitations. First, the study was carried out of the top 100 companies with the highest revenue in Turkey. Second, the research is limited to the information obtained from the sustainability reports shared by the companies on their web pages. The research limitations and empirical findings provide opportunities for future research. Therefore, it is possible to increase the number of samples to obtain more comprehensive data in future research. This research can also be expanded to include different countries or lists and this way the results can be compared. In addition, the research method can be extended. Because in this study, content analysis method was used. For example, more detailed data can be obtained via interviewing company managers.

REFERENCES

Aggarwal, P. (2013). Sustainability reporting and its impact on corporate financial performance: A literature review. *Indian Journal of Commerce and Management Studies*, *4*(3), 51.

Akgül, U. (2010). Sustainable Development: Action Field of Applied Anthropology. *Ankara University Faculty of Letters Anthropology Journal,* 24, 133-164.

Al Matarneh, G. F. (2019). The Impact of Sustainability Dimensions in Improving the Quality of Financial Disclosure of Jordanian Shareholding Industrial Companies from the Point of View of External Jordanian Auditors. *International Journal of Academic Research in Accounting, Finance and Management Sciences,* 9(3).

Alshehhi, A., Nobanee, H., & Khare, N. (2018). The impact of sustainability practices on corporate financial performance: Literature trends and future research potential. *Sustainability*, *10*(2), 494.

Asuquo, A. I., Dada, E. T., & Onyeogaziri, U. R. (2018). The Effect of Sustainability Reporting on Corporate Performance of Selected Quoted Brewery Firms in Nigeria. *International Journal of Business & Law Research*, *6*(3), 1-10.

Atağan, G. (2017). Sustainability Reporting Versus Integrated Reporting: BIST Sustainability Index . (New Trends in Finance and Accounting (Kitabı İçinde). (Ed: David Procházka). Springer: Switzerland.

Bertotto, B. B., Pohlmann, M., & da Silva, F. P. (2014). The dimensions of sustainability: concepts and strategies in the textile and clothing supply chain in Brazil. *Sustainable Design and Manufacturing* 218-229.

Binark, M.(2014). *Yeni Medya Çalışmalarında Araştırma Yöntem ve Teknikleri*. Ayrıntı Yayınları: İstanbul.

Bonsón, E.& Bednárová, M. (2015). CSR Reporting Practices of Eurozone Companies. *Revista de Contabilidad*, *18*(2), 182-193.

Cahyandito, M. F., & Ebinger, F. (2005). The Effectiveness of Sustainability Reporting: Is It Only About The Report's Design And Content. *Available at SSRN 1670702*.

Choi, S., & Ng, A. (2011). Environmental and economic dimensions of sustainability and price effects on consumer responses. *Journal of business ethics*, *104*(2), 269-282.

Clarissa, S. V., & Rasmini, N. K. (2018). The Effect of Sustainability Report on Financial Performance with Good Corporate Governance Quality as a Moderating Variable.

Caradonna, J. L. (2014). "Sustainability A History. Oxford University Press. New York

Cozzio, C. (2019). The concept of sustainability in hotel industry: current dominant orientations and future issues. *International Journal of Sustainable Development*, 22(1/2),61-87.

Çalışkan, A. Ö.(2014). How Accounting and Accountants May Contribute in Sustainability?. *Social Responsibility Journal*, 10(2), 246-267.

da Costa Maynard, D., Vidigal, M. D., Farage, P., Zandonadi, R. P., Nakano, E. Y., & Botelho,

R. B. A. (2020). Environmental, Social and Economic Sustainability Indicators Applied to Food Services: A Systematic Review. *Sustainability*, *12*(5), 1804.

Dagilienė, L. (2014). Impact of Normative Institutional Factors on Sustainability Reporting. *International Journal of Economics and Management Engineering*, 8(6), 1659-1664.

De Grosbois, D. (2016). Corporate Social Responsibility Reporting in The Cruise Tourism Industry: A Performance Evaluation Using A New İnstitutional Theory Based Model. *Journal of Sustainable Tourism*, *24*(2), 245-269.

Diesendorf, M., 2000, 'Sustainability and sustainable development', in Dunphy, D, Benveniste, J, Griffiths, A and Sutton, P (eds) Sustainability: The corporate challenge of the 21st century, Sydney: Allen & Unwin, chap. 2, 19-37.

Erdoğan, İ. (2007). *Pozitivist Metodoloji: Bilimsel Araştırma Tasarımı, İstatistiksel Yöntemler, Analiz ve Yorum* (2.baskı). Erk Yayınları: Ankara.

Farneti, F. & Guthrie, J. (2009). Sustainability Reporting by Australian Public Sector Organisations: Why They Report. *In Accounting Forum*, 33(2), 89-98.

Fischer, D., Brettel, M. & Mauer, R. (2020). The three dimensions of sustainability: a delicate balancing act for entrepreneurs made more complex by stakeholder expectations. *Journal of Business Ethics*, 1-20.

Gavana, G., Gottardo, P., & Moisello, A. M. (2017). Sustainability Reporting in Family Firms: A Panel Data Analysis. *Sustainability*, *9*(1), 38.

Gray, R. & Milne, M. (2002). Sustainability Reporting: Who's Kidding Whom?. *Chartered Accountants Journal of New Zealand*, *81*(6), 66-70.

Greco, G., Sciulli, N.& D'Onza, G. (2015). The İnfluence Of Stakeholder Engagement On Sustainability Reporting: Evidence From Italian Local Councils. *Public Management Review*, *17*(4), 465-488.

Herremans, I. M., Nazari, J. A., & Mahmoudian, F. (2016). Stakeholder Relationships, Engagement, And Sustainability Reporting. *Journal of Business Ethics*, *138*(3).

Herzig, C. & Schaltegger, S. (2006). Corporate Sustainability Reporting. An Overview. *Sustainability Accounting And Reporting* kitabı içinde (sayfa. 301-324). Eds. Stefan Schaltegger, Martin Bennett ve Roger Burritt. Springer: The Netherlands.Dordrecht.

Høgevold, N. M., Svensson, G., Klopper, H. B., Wagner, B., Valera, J. C. S., Padin, C. & Petzer, D. (2015). A triple bottom line construct and reasons for implementing sustainable business practices in companies and their business networks. *Corporate Governance*.

Ketschau, T. J. (2017). Social sustainable development or sustainable social development-two sides of the same coin? the structure of social justice as a normative basis for the social dimension of sustainability. *International Journal of Design & Nature and Ecodynamics*, *12*(3), 338-347.

Kolk, A. (2010). Trajectories Of Sustainability Reporting By MNCs. *Journal of World Business*, *45*(4), 367-374.

Kuşat, N. (2012). Organizational sustainability for sustainable corporations and its endogenous determinants. *Afyon Kocatepe University Journal of Economics and Administrative Sciences*, 14(2).

Laskar, N., Chakraborty, T. K. & Maji, S. G. (2017). Corporate sustainability performance and financial performance: Empirical evidence from Japan and India. *Management and Labour Studies*, *42*(2), 88-106.

Lu, W.& Taylor, M. E. (2016). Which factors moderate the relationship between sustainability performance and financial performance? A meta-analysis study. *Journal of International Accounting Research*, *15*(1), 1-15.

Mussari, R. & Monfardini, P. (2010). Practices Of Social Reporting in Public Sector And Non-Profit Organizations: An Italian Perspective. *Public Management Review*, *12*(4).

Nnamani, J.N., Onyekwelu, U.L. &Ugwu, O.K. (2017) Effect of sustainability accounting and reporting on financial performance of firms in Nigeria brewery sector. *European Journal of Business and Innovation Research*, 5(1): 1-15

Reddy, T. L.& Thomson, R. J. (2015). Environmental, social and economic sustainability: implications for actuarial science. *University of the Witwatersrand, School of Statistics and Actuarial Science*.

Rixon, D. (2010) Stakeholder Engagement in Public Sector Agencies: Ascending the Rungs of the Accountability Ladder. *International Journal of Public Administration*, 33(7).

Székely, F. & Knirsch, M. (2005). Responsible leadership and corporate social responsibility: Metrics for sustainable performance. *European Management Journal*, *23*(6), 628-647.

Sumaryati, A., & Rohman, A. (2019). The Influence of Sustainability Reporting on Environmental and Financial Performance. *Calitatea*, *20*(171), 131-134.

Şen, H.; Kaya, A. & Alpaslan, B. (2018). A Historical and Current Perspective on Sustainability. *Journal of Economic Approach*, 29(107): 1-47.

Tarigan, J.& Semuel, H. (2014). Pengungkapan sustainability report dan kinerja keuangan. *Jurnal Akuntansi dan Keuangan*, *16*(2), 88-101.

Van Marrewijk, M. (2003). Concepts And Definitions of CSR and Corporate Sustainability: Between Agency And Communion. *Journal of Business Ethics*, *44*(2-3), 95-105.

World Business Council for Sustainable Development (WBCSD). (2002). "Sustainable development reporting: String the balance". http://docs.wbcsd.org/2002/12/SustainableDevReporting-StrikingTheBalance.pdf (Accessed on 11.12.2019).

World Commission on Environment and Development (WCED). (1987). *Our Common Future*. Oxford University Press: New York, NY, USA.

Weber, O. (2017). Corporate sustainability and financial performance of Chinese banks. *Sustainability Accounting, Management and Policy Journal*, 8(3), 358-385.

Whetman, Lancee L. (2017). The Impact of Sustainability Reporting on Firm Profitability. *Undergraduate Economic Review*, 14(1).

Global Reporting Initiative (GRI), https://www.globalreporting.org/information/sustainability-reporting/Pages/default.aspx (Accessed on. 10.12.2019).

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The Motherhood Experiences of Women Employees: An Interpretive Field Study in Turkey*

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ABSTRACT

Motherhood is an extensive research topic that can be seen in different disciplines. Problems arising from motherhood are the main research questions of this research. Social constructivism has been chosen as a philosophical basis of the research in order to understand subjective motherhood experiences of female employees through their self- expressions. According to social constructivism individuals try to make sense of the world they live in. Social constructivist theory discusses motherhood as a social construct which constructed by members of a particular society or culture, not as a fundamental feature of women or secondary product of social structure.

Phenomenological research approach has been chosen with qualitative research design. Participants of this study consist of 33 married working mothers with 0-6 years old children in Turkey. For sampling method, snowball sampling method was used as a purposive sampling strategy. Qualitative data is gathered by using an unstructured interview form with 13 questions. Qualitative data were analyzed using content analysis method. According to research findings, the first priority of working mothers is motherhood. Keeping a balance between motherhood and work is a real challenge for working mothers. Working mothers also experience various problems.

Keywords: *Motherhood, working mothers, women employees, gender, Turkey*

INTRODUCTION

This research aims to understand motherhood experiences of married women employees with 0-6 years old children in Turkey. The main research problem is to find out how motherhood phenomenon influences women's working life and which problems they experience.

In the motherhood issues, there are limited studies about working mothers` experiences in Turkey (Topgül, 2016; Küçükşen ve Kaya, 2016; Sürgevil-Dalkılıç, 2015; Ünlütürk-Ulutaş, 2015; Metin & Kariman, 2013 Negiz & Tokmakçı, 2011; Gökdemirel et al. 2008; Eken, 2005; Aycan, 2004). According to a qualitative research of Sürgevil-Dalkılıç (2015), working mothers experience bias, psychological pressure, discriminatory behaviors at workplace. Physical conditions are insufficient and they cannot get enough support from the institutions. Therefore this study aims to bring contributions to the field through creating awareness for working mothers' problems. By this means women's work life problems can be understood more easily by their self-expression and find solution to their problems. Accordingly, the needs and expectations of working mothers can be more fulfill by investigating this topic (for instance increasing postpartum maternity leave from four months to six months). Also the study has the potential to provide a basis for further studies in Turkey concerning working mothers.

Arendell (2000) explained that studies dealing with motherhood are concentrated in four areas which are 1. Meanings and identities, 2. Relationships, 3. Experiences and activities, 4. Social locations and structural context. First, the issues in the study of motherhood meanings and identities are; how women feel as being mother, how they make sense of motherhood, how they combine maternity duties and responsibilities

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with their working life, whether they have experienced identity struggles, what they experienced after being mother, how they balance their emotional, relational, economic and health urgent needs and how they perceive mothering activities. Secondly, studies dealing with maternal relations are; mother-child relationship, the relationship between the necessity of mothers and the needs and well-being of children, how maternal power is perceived and experienced and for what purpose it is used and how gender and family policies are generally reconciled. Thirdly, studies dealing with maternal experiences and activities are; mothers' duties and responsibilities, mothers' character in daily life, how mothers performed their child-raising activities, contributing of lived changes to mother and child development, how women are influenced by motherhood and how this influence promotes the growth and development of the child, the maturity and change of the mother, what are all behaviors and attitudes of mothers, how mothers experienced and managed emotional complexity and instability, how biology adapts to maternal activities and experiences. Finally, the topics studied in terms of social position and social context are; how women resist the dominant motherhood and family ideologies, how mothering is adapted to changeable gender politics, how mothering is influenced by increasing global capitalism and local products and service economies, how the region influenced maternal actions, for example, what it means to raise children in rural areas, in big cities, and among immigrants, how women mediate between their children and others, how they act as intermediaries between family units and other institutions, how women cooperate with other people in mothering activities and get support from others, how women make room for men about motherhood and what are the activities of motherhood and mothering in terms of political economy (Arendell, 2000, pp.1201-1202).

According to TUIK (2017) (Turkish statistical institute) labor statistics data in Turkey, in terms of actively participate in the labor market, the employment rate for women in 2017 was 29% while the employment rate was 65.6% for men. The employment of women by occupational groups in 2017 those who work in jobs that do not require qualification came first in 20.6%. Managers are in the last place with 2.4% in female employment. Economic and social factors that create obstacles to the employment of women are gender based wage gap, education, women-men business phenomenon, patriarchal structure, family responsibilities, child care and marriage (Özcan, 2019). According to research by İlkkaracan (2010) in Turkey, there are no kindergarten facilities for children under 3 years of age. In Turkey, the proportion of working mothers who take care of their children under 6 years of age is 28% and the rate of grandmothers is 17% (Kapucugil-İkiz, 2015). According to Turkey Demographic and Health Survey (2014) (TNSA) results, the ratio of working women who leave work because of pregnancy or child care is 14%.

In this study it is found that married working mothers experience various problems and difficulties at work and family life. As Sürgevil-Dalkılıç (2015, p.409; Seçer, 2010) explained working mothers tries to adapt to the intensive motherhood ideology of the society and fulfill the requirements of working life organized by male employees.

CONCEPTUAL FRAMEWORK

In conceptual framework of the study, motherhood phenomenon and working mothers will be explained and following intensive motherhood ideology will be discussed. In this study social-constructivist approach constitutes theoretical framework. According to social-constructivism, individuals develop subjective meanings to their experiences. Meanings are shaped in interaction and relationship process (Creswell, 2014).

Motherhood phenomenon

The concept of motherhood is defined as having a dynamic structure that can change with social interactions and relationships. Motherhood is also associated with negative concepts such as stress, depression, anxiety and pressure imposed on women as well as happiness and self-realization feelings in terms of social roles, because of increased workload and economic factors (Arendell, 2000, pp.1193-1196).

Becoming a mother is a primary responsibility for the fulfillment and needs of a child coming to the world and a role prepares the child for emotional, intellectual and social life (McMahon, 2004; Ridgeway & Correll, 2004). Although both parents are responsible for the child's cognitive, emotional and personality development, the responsibility is often borne by their mothers (Holden & Edwards, 1989). In traditional gender-based division of labor, childbearing, child rearing and dealing with housework are accepted as women's duties. Working in the market and earning money is considered the main duty of men (Özer & Biçerli, 2003). According to Metin & Kariman (2013), in Turkey working hours are not flexible, leave policies are insufficient and child care services are inadequate

and inaccessible for women employees. Paid paternity leave is new development and only ten days in Turkey for men employees. (Kapucugil-İkiz, 2015). As stated by Koray's study (2009), the patriarchal social structure and work and role distribution reveal inequalities in working life. Difficulties in working life, discrimination, obstacles in family life can have negative consequences for women participating in employment. New understanding and policies should be developed on child care with the increase in the family structures of female and male dual income. Even in the most developed countries, housework and childcare are largely women's responsibility. Women are expected to take these roles and women make self-sacrifices in working life (Koray, 2009).

Feminist perspectives criticize the view that the division of labour has biological basis, on the grounds that there is no natural or inevitable task sharing in society. According to feminists, there is no biological basis that prevents women from having a work and people are socialized according to the roles expected from them culturally. Feminist theories explain gender inequalities through social processes such as sexism, patriarchy and capitalism within society (Giddens, 2012, p.517). It is stated in the feminist approach that child care and housework roles and responsibilities should be shared between men and women thus a more equitable situation can be provided (Eken, 2005; Giddens, 2012).

Feminist constructors have also explored the ideology of motherhood. Feminists focus on the relationship of interest between mother and child. In fact, this relationship of interest is formed not only between mother and child, but also in all social domains and relationships (Arendell, 2000).

The feminist researcher, Nancy Chodorow (1978) uses the psychoanalytic framework to investigate the complex role that women play as a mother in society in her theoretical explanation on "The Reproduction of Mothering" book. Chodorow (1978) argues that motherhood is not of biological origin. Women as mothers are important actors in the field of social reproduction. Psycho-social factors (gender identity development, different socio-relational experiences with mother during infancy, mothering instinct, nature of femininity) are the main factors leading women to become mothers. In terms of psycho-social factors, maternity does not occur unless the woman has a sense of seeing herself as a mother.

Intensive motherhood ideology

According to Hays (1996), intensive motherhood is a completely child-oriented, personal and time-consuming concept and it requires sensuality. Within the scope of this ideology, the woman is a good mother by devoting herself to her child and pushing her wishes and needs into the background. Mothers should spend more time, physical and emotional energy and money compared to fathers in child-raising (Beets, Liefbroer, & De Jong Gierveld 1997). While ideology is changing toward a less traditional way, it is still expected that women will work less outside the home and have more intensive motherhood at home (Pas, Peters, Eisinga, Doorewaard, & Janssen, 2011, p.490). In addition, ideology assumes and strengthens traditional gender-based division of labor. Arendell (2000, p.1194) discussed that there are two approaches to intensive motherhood ideology: Universalist approach (maternal practices/activities) and another particularistic approach. The Universalist approach is based on maternal practices and activities. Motherhood is stated as a combination of individual and intercultural forms of action (Arendell, 2000; Phoenix, Woollett, & Lloyd, 1991; Ruddick, 1994). Another intensive motherhood ideology approach is a particularistic approach. Motherhood is not a universal relationship between women and children, but an individual, special, fundamental activity that must be considered separately from economic conditions (Arendell, 2000). This study is discussed within the scope of intensive motherhood ideology.

Working mothers

Dillaway & Pare (2008, p.444) explained working motherhood as an alternative to intensive motherhood ideology. Working mothers became popular in the ideological sense at the beginning of the 1970s, early 1980s and was considered feminist ideal. It refers to a mother who evokes a female image of career-oriented (lawyer, doctor, CEO) and works 40 hours or more per week outside the home despite various difficulties.

There is an opinion comparable to the "ideal employee" profile for working mothers in the business world. In male-dominated working conditions of the business world, an ideal worker is defined as a person who works full-time, continues his career until his retirement after completing the training process and does not allow to conflict family responsibilities with work. Working mothers do not fully comply with this ideal employee profile because of their interruption work even after a short period of time and sometimes cannot prevent

their family life from getting ahead of business life. Additionally, while the working woman tries to meet social expectations of the mother by reducing continuous and full-time working conditions she is also accused on account of the fact that she is not committed to work and has experienced declines in productivity (Correll, Benard, & Paik, 2007).

Working mothers have difficulties in establishing work-family balance (Negiz & Tokmakçı, 2011, Küçükşen & Kaya, 2016). As a result of research by Özmete & Eker (2013) in public sector, individuals mostly use the strategy of making a good business plan in order to cope with work-family life conflict. Getting paid help for the child-care is the most common strategy. The research revealed that age and number of children determine the strategies used to cope with work-family conflict. According to the results of Topgül's (2016) research with women bank employees, long working hours may be problem in the balance of work-family life. In the care of young kids support of relatives plays important role in work-family balance for women.

RESEARCH METHOD

In this study, qualitative research was considered as the most suitable method in terms of research topic and questions. According to Creswell (2014, p.4), qualitative research is an approach to understand and discover the meaning of individuals or groups to social or human problems. Features of qualitative research method as questions and procedures shape in the research process, data are usually collected in the environment of participants, qualitative data analysis is inductive to reach general theme, researcher interpret the meaning of data and focus on individual meanings and finally, the research report has a flexible structure.

Creswell (2014) explains four different philosophical points of views that may be essential to qualitative research: post-positivism, structuralism (constructivism), transformative and pragmatism (utilitarianism). The researcher intends to understand and interpret the meaning of the world of others. According to social-constructivist approach individuals develop subjective meanings to their own experiences. Meanings are shaped in interaction and relationship process with others. Social-constructivist approach constitutes a theoretical framework and philosophical assumption in this research.

The main problem of this research is to find out how being a mother influences working life of women. The basic research question is "How are women's experiences of motherhood in private and working life?"

Research design

In this research phenomenological approach was chosen as a qualitative research design from Creswell's (2007) five strategies. Phenomenological research explores the meanings of experiences which a large group of individuals experiences with a concept or phenomenon. It aims to reach a similar understanding from individual experiences and defines "what they experience" and "how they experience" (Creswell, 2007). The Phenomenological method may not produce definitive and generalized results in accordance with the nature of qualitative research. Within this framework in this study, how working women experience with motherhood and how they experience it are examined.

Participants

An in-depth, face to face interview was conducted with 33 (3 pilot studies) married working mothers with children aged 0-6 years in this research. Data were collected by using a snowball sampling method from purposeful sampling types frequently used in qualitative researches. According to Polkinghorne (1989), in phenomenological research by in-depth interviews with 5 to 25 participants who have experienced the same phenomena are sufficient for sample size. For example Gökdemirel et al. (2008) interviewed 10 working mothers to examine the working mothers breastfeeding experiences and the influence of employer attitudes in an university hospital in Istanbul. For this purpose, by considering working mothers with small children are rich sources of data because of their more problems and difficulties in working lives, they were included in this study. All of the participants are married working mothers. Participants working mothers ages are from 28 to 49 years old. Out of 33 participants 28 are working in public sector while only 5 participants are workers for the private sector. Most public employees are academicians in a university. The job experience of the public employees ranges from six months to twenty five years. Professions of participants are academician, teacher, officer, operation assistant, project manager, business associates specialist, administrative specialist, sales manager, computer manager, health technician.

Data collection procedure

Face to face and in-depth individual interviews were conducted as a data collection method. Based on relevant literature and research purpose, an unst-

ructured interview form consisting of 13 open-ended questions was formed. According to Creswell (2007, p.61), in-depth interviews with participants and using open-ended questions are an appropriate method for phenomenological research. Interview form begins with explanations and consists of 7 questions about motherhood perception and experiences in private life, 6 questions about motherhood experiences in working life and finally demographic questions. A pilot study with 3 participants was carried out between August and September to ensure functionality of interview questions before research. Interviews were conducted from October to March for 5 months with 33 participants (including 3 pilot studies) in order to obtain rich and diverse data sources. Each of the interviews took approximately 30-45 minutes. All interviews were recorded with permission for voice recording to ensure the validity of the research and records were transcribed. After the interview, a total of 216 pages of the raw data set was acquired. Researcher got an appointment from all participants before the interview and volunteer participation was provided. Interview questions were asked verbally to each participant in the same way. All interviews were conducted once with each participant by the same researcher because of the working environment and working hours.

Qualitative data analysis

Data analysis in qualitative research means diversity, creativity, and flexibility. At the same time, every qualitative research has different characteristics and requires new approaches in data analysis (Yıldırım & Şimşek, 2013, p.253).

Creswell (2014, p.197) generally explained data analysis in qualitative research step by step as follows:

- Raw data (transcripts, field notes, images)
- Preparing and organizing data for analysis
- Reading all of the data
- Encoding of data (by hand or computer program)
- Reaching the themes and descriptions
- Associating themes and descriptions (grounded theory, case study)
- Interpretation of the meaning of themes/ descriptions. In addition in all these processes, accuracy and validity of the data must be ensured.

This qualitative study is conducted with content analysis. Through content analysis, it is tried to identify the data and to reveal the facts that may be hidden in the data (Yıldırım & Şimşek, 2013, p.259). According to Creswell (2014) philosophical points of views, social-constructivist approach constitutes a theoretical framework and philosophical assumption to better understand married working mothers experiences.

Limitations of the study

Limitations of the study are inexperience of the researcher's in qualitative study, due to the nature of qualitative research results cannot be generalized and limited only to responses of participants, difficulty in reaching participants, practical difficulties and barriers of communication, small sample size, interviewing participants in their work environment and during work hours.

Validity and reliability of study

According to Creswell (2007), validity in qualitative studies is an attempt to assess the accuracy of the findings. It is also a way to ensure validity to spend a long time in the field, to make detailed descriptions and researcher's intimacy to the participants. However, voice recordings and transcripts are used to provide reliability. Importance of perceptions and sensitivity of the natural environment the main features of qualitative research causes problems about reliability. Besides human behavior is not static, it has changeable and complex nature. For this reason, regardless of the method, research on social events is not possible to reinvestigate. In the qualitative approach, a different interpretation of the same data by different researchers is usual (Yıldırım & Şimşek, 2013, p.293). Creswell (2014) stated that in phenomenological research multiple approaches are used to ensure the validity of findings and multiple perspectives and expressions of participants are included.

Within this framework, strategies to ensure the validity and reliability of this study are by voice recordings, accuracy of transcripts and participant expressions, data collection by long period of time in field, participants' expression with comprehensive descriptions, social constructivist philosophical approach, in-depth interviews, different expressions and interpretations, qualitative data analysis and results by expert confirmation, similar data collection processes, purposeful sampling method.

FINDINGS OF THE STUDY

In this study, based on the research and interview questions, content analysis was carried out from quali-

tative data analysis methods. 2*2 matrices were created for each interview question and important expressions of participants to interview question were included in the matrices to compare the expressions of participants. By examining similarities and differences of expressions, the most frequently cited by participants to interview questions were coded. Themes were set on the basis of interview questions. The content and meaning of the important expressions reflecting the essence of the motherhood experiences of participants were coded and these codes were grouped according to their similarities. In terms of research ethics, participants were coded as P1, P2, P3 P33 and their expressions were included by these codes.

The findings of the study are addressed in 3 upper themes as main titles: Findings of participant profiles, findings of motherhood perception and experiences in private life, findings of maternal experiences in working life. For detailed description all themes as a table form and participant expressions for each theme are presented.

1. Findings of participant profiles

According to participant profile based on demographic information, from 33 participants (included 3 pilot studies) consisted of 30 married working mothers live in Ankara/Turkey, 3 married working mothers live in other cities in Turkey with 0-6 years old children. Most of participants (28 out of 33) work in public institutions. Participants' ages are in the range of 28-49 years. Most of participants have one child and participants have various professions for example academician, sales manager, officer.

2. Findings of motherhood perception and experiences in private life

Findings related to motherhood perception and experiences in private life which determined on the basis of interview questions were thematized 7 sub-themes as meaning of being mother, life priority, internal-external support in child care, motherhood responsibilities, social culture, work-family balance, influences of working mother on child, in terms of married working mothers in Turkey.

Theme 1. Meaning of being mother

In the interview questions about the meaning of being mother, the most frequently expressed meaning by participants is "very nice feeling" (22 out of 33 participants) and "responsibility" (11 participants out of 33). Each participant has her own unique motherhood expressions and they have multiple different meaning to her motherhood.

P17: "Being a mother is a very nice feeling. First I want to say it. It's very pure, but incredibly difficult because of their responsibilities. Children are like a part of your life, you are interested in everything related to them. There are material and spiritual difficulties according to old, but it is very nice how it is told, if the children are injured you will feel very sorry, I say so".

Table 1: Meaning of Being Mother

Meaning of being mother	Participants	Frequency
Very nice feeling	*P2,P3,P4,P5,P8,P9,P11,P12,P14,P17,P19,P20,P22,P23,P24,P25,P26,P27,P29,P31,P32,P33*	22
Responsibility	*P2,P7,P9,P11,P14,P15,P18,P24,P27,P28,P33.*	11
Indefinable	*P2,P3,P17,P20,P22,P23,P31,P32,P33.*	9
Anxious and difficult	*P6,P7,P8,P9,P15,P17,P24*	7
Happiness	*P6,P10,P14,P15,P25,P26,P28.*	7
The meaning of life	*P6,P13,P21,P22,P23,P25,P30.*	7
Incomparable	*P4,P5,P10,P20,P29,P32.*	6
Love	*P5,P7,P9,P24,P29.*	5
Self- sacrifice	*P1,P6,P9,P18,P21.*	5
Maturing and developing	*P2,P6,P8,P15.*	4
Feeling every woman should have	*P22,P23,P29,P31.*	4
Natural process	*P19,P25,P30.*	3
Living and learning	*P3,P5.*	2
Understanding your own mother	*P3,P5.*	2
Patient	*P4,P5.*	2
Complex	*P16*	1

Theme 2. Life priority

Within the scope of the research question, mothers were asked whether their life priority was working women or mothering. 21 out of 33 participants mostly indicated that their priority was to be a mother.

P6: "So I try to balance two, but of course the priority is to be a mother, my child is in front of everything. But of course, this does not mean that I have left my work life behind as a working woman or do not care about my job. To be a mother is the priority but as a working woman, I also fulfill my responsibilities. But necessarily motherhood gets ahead of work".

Table 2: Life Priority

	Participants	Frequency (N=33)
Mothering	*P1,P2,P3,P4,P5,P6,P7,P10,P11,P12,P13,P15,P20,P21,P22,P25,P26,P27,P28,P30,P31.*	21
Prioritization, both	*P8,P9,P17,P19,P23,P29,P33.*	7
Maternity, but the obligation of the working mother	*P14,P16,P18,P24,P32.*	5

Theme 3. Internal-external support in child care

In interview question for internal and external support in child care and housework, all participant working mothers explained that they have received support from family members, pre-school, daycare center and caregiver for child care. Participants get the most (31 out of 33) support from their family members (such as grandmothers) then daycare center and finally caregiver support. Participants emphasized that daycare center are more reliable than caregivers and day care center are better in terms of childhood socialization and development. As a result, support from the internal and external environment is very substantial for working mothers.

P19: "I get a lot of support, both of my children are already in pre-school, there are caregivers, school support, relatives and there are my parents. I think they are very important in child care and so we need extensively support from all of them. So it influences widely the quality of your life. Maybe you need to be close to your family for their support. I really get great support from outside and I'm very satisfied. I think it is nice to have the opportunity to get support".

Table 3: Internal-External Support in Child Care

	Participants	Frequency
Support from a family member	*P1,P2,P3,P4,P6,P7,P8,P9,P10,P11,P13,P14,P15,P16,P17,P18,P19,P20,P21,P22,P23,P24,P25,P26,P27,P28,P29,P30,P31,P32,P33.*	31
Daycare center or preschool	*P1,P2,P5,P6,P7,P8,P10,P11,P12,P13,P14,P16,P17,P18,P19,P20,P22,P23,P24,P28,P29,P30,P33.*	23
Caregiver	*P2,P7,P9,P14,P15,P16,P19,P20,P21,P25,P26.*	11
Help in housework	*P5,P6,P8,P9,P10,P11,P18,P20,P23,P24.*	10

Theme 4: Motherhood responsibilities

The majority of participants (19 out of 33) stated that they can cope with their motherhood responsibilities. Working mothers feel good for their motherhood responsibilities by establishing a good balance of responsibility, taking the job on the second plan, setting priorities well, getting support from family members.

P25: "Of course it's hard to be a working mother but I get certain support to fulfill my responsibilities. There is grandmother support, caregiver support, my husband is working less intensely than me so I think I can cope with my mothering responsibilities by the support. The most important thing is to give love to the child and to spend quality time with him/her. I think I can do these things".

Table 4: Motherhood Responsibilities

	Participants	Frequency (N=33)
Coping with maternal responsibilities	*P1,P4,P5,P6,P10,P11,P12,P13,P14,P15,P16,P18,P19,P20,P22,P23,P25,P27,P33.*	19
Unable to cope with maternal responsibilities	*P2,P3,P7,P8,P9,P17,P21,P24,P26,P28,P29,30,P31,P32.*	14

Theme 5: Social culture

In the context of the social culture in Turkey, when asked participants whether social culture supports

mothering or working in Turkey, most of them (24 out of 33) emphasized that in Turkey social culture supports mothering. Participants stated that mothering was supported more in Turkish culture because of patriarchal/male-dominated social construction and priority responsibilities of motherhood. Participants also expressed that generally employers do not prefer women employees who are pregnant and mother.

P5: "I think with the patriarchal mentality we support mothering more as a society. So the majority of people priorities are motherhood I think, no matter how your career and job is high level. I mean, it seems to me that to neglect your motherhood responsibilities and to make a very good career and have a good job is not very acceptable in Turkish society. The first responsibility of a woman is motherhood and expectation from both wife and society is mothering than working".

Table 5: Social Culture

	Participants	Frequency (N=33)
Motherhood is supported	*P4,P5,P6,P7,P8,P9,P10,P11,P12,P14,P15,P16,P19,P20,P22,P23,P24,P25,P26,P29,P30,P31,P32,P33.*	24
Being a working woman is supported	*P17,P18,P21.*	3
Both are supported	*P13,P27,P28.*	3
Pilot study	*P1,P2,P3.*	3

Theme 6: Work-family balance

The majority of participant mothers (19 out of 33) stated it is difficult to balance between work and family life. In order to balance participants pointed out that they get support from family members, try to better manage time, try not to reflect work to home, make self-sacrifice, try to be planned and organized, determine their responsibilities and priorities well and try to spend quality time with their families.

P27: "I think my husband is very important to balance between work and family life. It would be more beneficial if the husband supports you both in your family and business life. To balance, of course, the work environment is also very important. I think there is a considerable influence on working in a peaceful way. Because it is important not to get tired of coming to work from home or not to get tired of coming home from work. Sometimes in the house, small children have sleep insomnia at night and this can reflect to work. It is hard to balance but in a way, we have to balance between work and family life".

Table 6: Work-Family Balance

	Participants	Frequency (N=33)
Work-family balance is difficult	*P1,P4,P5,P6,P7,P8,P9,P10,P11,P12,P13,P14,P15,P16,P17,P20,P25,P27,P28*	19
Work-family balance is easy	*P2,P3,P18,P19,P21,P22,P23,P24,P26,P29,P30,P31,P32,P33*	14

Theme 7: Influences of working mother on child

Related to positive and negative influences of working mothers on the child, 33 participants explained that in the first years working mothers will have a negative influence on the child but in the coming years they will have a positive influence on child development.

P6: "The negative influence of working mothers on a child may be not to find mother close for the child. I have difficulties with limited time, but I think it can be adjusted to mother's job. Of course, the profession is very important here. But I think working mothers are better role models for their children. Because in front of a child there is a strong mother, a mother standing on her own feet can raise a child better. This does not mean that housewives cannot raise, I just look at myself as a working woman. So working mothers are more aware of what is happening in society and the world also they have better improved themselves therefore, I think that having such a conscious, they can also reflect this conscious to the child and they can raise a child with this consciousness. In addition, I think they can spend quality time for their children. There is also much more financial opportunities for mothers to offer their child."

3. Findings of maternal experiences in working life

Findings related to maternal experiences in working life which are determined on the basis of interview questions were thematized 6 sub-themes as complex feelings, motherhood's influence on work, workplace discrimination, legal rights of working mothers, institutional support mechanisms, difficulties and problems

in the workplace in terms of married working mothers in Turkey.

Theme 1: Complex feelings

Of the 33 participants, 24 working mothers expressed complex feelings while 9 participants stated not to have complex feelings. The most frequently emphasized expression by most participant mothers is time complexity.

P5: "Now, especially when I first started work, a few months ago, for example, I was feeling serious remorse. So I had to send kindergarten, child was about eighteen months old that it was too small when the kindergarten began. Especially during the first few weeks, it was very difficult, the first separation from the child was very difficult. He always in my mind, what did he do? Did you get there? Separated from me, so far the first time, what does he feel? Is he mad at me? How will he react when he gets home? So I had a conscious punishment. Therefore, the first thing I experienced was the conscience at that time. Surely I saw him happily, so I started to be happy. He gets ill in kindergarten since he is a small age and it is the first year, so now we have the worries about it too. That's the way it is, the child is getting always frontal. But on the one hand, you have your job here and you like your job too, maybe I do not need financially work, but so working is psychologically satisfies me, something that makes me happy. But I have complexity feelings. Obviously, we are questioning ourselves".

Table 7: Complex Feelings

	Participants	Frequency (N=33)
Experience complex feelings	*P1,P2,P4,P5,P6,P7,P9,P10,P12,P13,P14,P16,P18,P20,P21,P22,P23,P24,P25,P27,P28,P30,P31,P33.*	24
Not experience complex feelings	*P3,P8,P11,P15,P17,P19,P26,P29,P32.*	9

Theme 2: Motherhood's influence on work

Most of the participant mothers (15 out of 33) expressed that motherhood has a positive influence on their working life. Among the positive influences, the most frequently expressed influences are increasing in empathy ability, more efficient use of time, more regular and disciplined, positive personality development.

P30: "I guess my motherhood's influence is probably positive. I'm working in a student-centered institution and I look at students with empathy as if I'm their parents. I always think in the future my child will become a student. I always try to make them positive with a smiling face. I think it is such a contribution to my motherhood. Maybe if I were not a mother, maybe I could not look like that".

Table 8: Motherhood's Influence on Work

	Participants	Frequency (N=33)
Favorable	*P2,P6,P11,P16,P17,P20,P21,P22,P25,P26,P27,P28,P29,P30,P33.*	15
Unfavorable	*P5,P7,P12,P19,P31,P32.*	6
Neutral	*P4,P8,P13,P14,P15,P23,P24.*	7
Both favorable and unfavorable	*P1,P3,P9,P10,P18.*	5

Theme 3: Workplace discrimination

When 33 participants were asked whether they experienced discrimination positive or negative (prejudices, talentless, less work commitment) in the workplace, they explained that 13 participants did not experience any discrimination, 14 participants experienced positive (supportive) discrimination and 6 participants experienced negative discrimination. The majority of participants explained positive discrimination in the workplace.

P16: "No, there was not negative discrimination, on the contrary, in my workplace, our old department chair had two little babies, so my department chair never had trouble with me on maternity leave and when my baby got ill, so I always take his support".

Table 9: Workplace Discrimination

	Participants	Frequency (N=33)
Not experience discrimination	*P1,P2,P11,P13,P14,P18,P19,P20,P24,P25,P26,P28,P29.*	13
Negative discrimination	*P4,P17,P22,P23,P30,P31.*	6
Positive discrimination	*P3,P5,P6,P7,P8,P9,P10,P12,P15,P16,P21,P27,P32,P33.*	14

Theme 4: Legal rights of working mothers

The legal rights of Turkish working mothers are addressed by maternity leave, unpaid leave, breastfeeding leave, and maternity allowance as stated in the Civil Servants Law No.657 and the Labor Law No.4857 in Turkey.

Working mothers are in the opinion of the legal maternity leave of 4 months is insufficient in Turkey. It is stated that the legal maternity leave period should be extended because of the necessity of breastfeeding for the first 6 months and in terms of secure attachment between mother and child, also it is an important issue for children social and physical development. Working mothers in the public sector are more advantageous in terms of legal rights.

30 participants (out of 33) explained that they could benefit from their legal rights. However, 3 participants did not use their legal rights enough. According to 31 working mothers legal rights are insufficient in Turkey. Working mothers emphasized that postnatal maternity leave must be increased to at least 8 months. At the same time, working mothers are not able to use the one-year unpaid leave enough.

P32: "So I used this period (maternity allowances) for one week before birth and five weeks after birth. I broke up a week before birth, I gave birth a week later so the rest was postpartum. I have not had a problem, I'm already getting enough support in breastfeeding leave. Of course, legal rights are not enough. When we compare with Europe it is certainly never enough. At least a paid leave or part-time work can be improved. But I think that especially kindergartens could be supported more in institutions, legal rights must be at the same level as Europe."

Table 10: Legal Rights of Working Mothers

	Participants	Frequency (N=33)
Insufficient legal rights	*P1,P2,P3,P4,P5,P6,P7,P8,P10, P11,P12,P13,P14,P15,P16,P17,P18,P19,P20,P21,P22,P23, P24,P25,P26,P28,P29,P30,P31,P32,P33.*	31
Sufficient legal rights	*P9, P27.*	2

Theme 5: Institutional support mechanisms

Institutional support mechanisms are flexible working patterns, leave policies and child care support. Flexible working patterns consist of part-time work, remote work, compressed work week, shift work, temporary work, and job sharing. Leave policies can be maternity leave, breastfeeding leave, unpaid leave, and necessity leave. And finally, child care supports are daycare center in institutions, contracted daycare centers, financial support for childcare costs and lactation room (Translated by Çakmak-Otluoğlu, 2015, p.82). In this context, according to all participant mothers institutional support mechanisms are insufficient in the workplace. The most frequent expression is that it is absolutely necessary to have a day care center in the workplace.

P8: "Now I think that our institution is quite backward about these issues. There is no support mechanism for working mothers at our institution. If we think of the university as a place with ten thousand employees, women employees are half of the total as five thousand, they always take care of mothering experience on their own, unfortunately. Obviously, I have not seen any support mechanism for working mothers of the institution. It must be a lactation room for women to breastfeed their children. In this sense, that is to say, the provision of on-campus care facilities, daycare center can be at least a good regulation for supporting. Kindergarten is between the ages of three and six, a kindergarten is thought to be zero to three years old, but it was unfortunately not possible. Women find their childcare solutions as informal by looking at their mothers-in-law, by holding a caretaker or sending them to the kindergartens in their neighborhood".

Theme 6: Difficulties and problems in the workplace

When 33 working mothers were asked about difficulties and problems caused by being a mother in the workplace, 25 participants stated that they had various difficulties and problems and 8 participants did not have any difficulties and problems. The most frequently problem expressed by participants is a restricted time.

P25: "The difficulty arising from being a mother is timelessness. I work very hard so I cannot spend too much time with my children during the week. Because the difficulty is that a very busy company anyone does not put pressure to keep you here, but because you are an international company and the nature of the business is very intense and exhausting, you are obliged to spend a great time here. So this also causes you to spend less time during the week with your child".

Table 11: Institutional Support Mechanisms

Support mechanisms	Participants	Frequency
Flexible Working Patterns		
Flexible time	*P2,P7,P9,P10,P11,P12,P13,P14,P18,P19,P20,P21,P23,P24,P25,P26,P29,P31*	18
Teleworking	*P5,P6,P11,P14,P20,P25,P26,P27*	8
Part-time working	*P2,P7,P10,P22,P23,P24,P29,P31*	8
Leave Policies		
Maternity leave	*P1,P4,P7,P17,P19,P20,P25,P31*	8
Breastfeeding leave	*P1,P4,P7,P12,P16,P19,P20,P25,P32*	9
Unpaid leave	*P1,P2,P4,P7,P11,P12,P19,P33*	8
Child Care Support		
Daycare center in the workplace	*P1,P3,P5,P6,P7,P8,P9,P10,P11,P13,P14,P15,P16,P17,P21,P22,P23,P24,P25,P26,P27 ,P28,P29,P30,P31,P32,P33*	27
Financial support for childcare costs	*P1,P2,P4,P5,P6,P8,P9,P12,P14,P15,P17,P22,P23,P24,P27,P28,P29,P31,P32,P33*	20
Lactation room	*P1,P5,P6,P8,P15,P17,P19,P25,P26,P27,P28,P30*	12

Table 12: Difficulties and Problems in the Workplace

	Participants	Frequency (N=33)
Experience difficulty and problem	*P1,P2,P3,P4,P6,P7,P8,P10,P11, P12,P14,P16,P17,P18,P20,P22, P24,P25,P26,P28,P29,P30,P31, P32,P33*	25
Not experience difficulty and problem	*P5,P9,P13,P15,P19,P21,P23,P27.*	8

CONCLUSION AND DISCUSSION

The study aims to examine maternal experiences of women employees in Turkey. In this framework, the research is designed with phenomenological pattern in qualitative research methods and social constructivism constitutes philosophical basis of the study. In social constructive approach, individuals try to make sense of the world in which they live and work. Through an interview form consists of 13 open-ended questions based on the literature, individual, in-depth, face-to-face unstructured interviews were conducted with 33 married working mothers in Turkey.

The first result of the study is that working mothers make sense different ways to their motherhood. Each participant has different and multiple meanings for her mothering experience. As McMahon (1995) pointed out, working women have multiple and differential meanings and emotions to motherhood.

According to the result of the study, the priority in life is motherhood. Similarly, Hays (2011) in his qualitative research by conducting interviews with working and non-working mothers concluded that mothers' priority and fundamental concerns are still their children even though they work. According to qualitative research by Maher (2005), motherhood and working women's roles do not conflict, although the child is a priority, it does not need to completely exclude working life. In a qualitative study of Read, Crockett, & Mason (2012), it was emphasized that mothers had to spend time and energy on the child. Children become the center of their lives after maternity.

According to the result of the study, it is found that if working mothers do not get internal and external support for child care, they will not be able to balance both work and family life. The most important support is getting from grandparents because of their trustworthiness. Daycare centers are useful in terms of socializing children and acquiring necessary skills, training and are more reliable support than caretakers. Similarly, Alonso-Almeida (2014) explained that spouses, family members, and state should also provide support to mothers at the same time so that working mothers can decrease the stress they experienced in fulfilling the requirements of work and family life. Likewise, Uttal (1996) showed that in in-depth interviews with working mothers, the dominant cultural motherhood

ideology did not reflect the working woman's reality. It is a necessity to share childcare responsibilities with family and outside.

As the study result, the majority of participants (19 out of 33) can cope with motherhood responsibilities by taking support and putting work to the second plan. Dedeoğlu (2010) stated that motherhood was constructed socially and it was a natural instinct from the biological nature of woman. Women should take on all work related to motherhood and give primary responsibility to mothering. According to Holden & Edwards (1989), both parents are responsible for cognitive, emotional and personality development of the child as well as for the majority of the responsibility for mothers.

According to the result, the study revealed that social culture gives more support to maternity in Turkey. In terms of work life, patriarchal mind based on male domination, employers usually prefer single and childless women. Within the context of social gender-based roles, it is expected that men will be more active in their work life and women will be more active in their home life. The institutional support provided for working mothers in business life is inadequate. Indeed, as Hays (2011) pointed out, culturally the appropriate behavior expected from a woman is to be more interested in the child. Uta Garey (2009) argued that fertility characteristics and maternal activities of women cause social reproduction of gender and women to remain in the second position. Motherhood is able to acquire the characteristic of a social institution which causes hierarchy in the family and working life by creating differentiation based on gender (Walzer, 2007).

The study revealed that working mothers have difficulty balancing work and family life. The Eurofound (2013) work-life conflict assessment study found that while working women and men have problems in work-life balance, working women experience more problems than men. According to a study by Bianchi (2000), in order to balance work and family life women can reduce working hours, try to part-time work and incorporate husband more into child caring activities. Every woman often suspects about the style of motherhood. Women are trying to do their best for children and themselves.

According to the participants of the study, working mother could influence the child negatively in the first years. However, working mothers will have more positive contributions to the child in coming years for the long term. As a matter of fact, Baum (2003) research found that when the child was younger working mother had a negative influence on the child's socio-emotional development. In first years working of the mother is related to weaker attachment, greater behavioral problems of child and less social skills. According to Chang's (2013) study, full-time working mothers' positive attitudes towards work positively influence child as socio-developmental. If work is a source of stress for mother and reduces the quality of mother-child relationships, it will adversely affect the child.

In the study, it is found that working mothers experience complex feelings related to work in their life. According to Parker (1994), in terms of psychoanalysis, motherhood is related to ambivalence and emotion complexity. This constitutes a natural part of motherhood and shows an unacceptable face of motherhood. Instability is a dynamic fluctuation experienced by mothers at different times of child development and varying among different children. Mothers are experiencing overwhelming feelings of freedom being lost. Although they love their children, sometimes they can live to regret about motherhood (Donath, 2015). In qualitative research by Crowley (2013), it is stated that working mothers have experienced emotional confusion, patience, and conflict as their reactions to the perceptions of discrimination in the workplace. According to qualitative research conducted by Hays (2011), although working mothers meet the needs of their children, they had a feeling of complexity about working outside the home.

According to the result of the study, being a mother influences working life positively. Brown's (2010) study of perceived realities and perceptions of Professional development after maternity showed that there is a great conflict between work and family life, although there are supportive and family-friendly policies in the workplace. Motherhood had a great and challenging influence of the mother in Professional career development. Most working mothers also choose to slow down their career even if employer policies are supportive. The study by McIntosh, McQuaid, Munro, & Dabir-Alai (2012) concluded that motherhood has a detrimental influence on woman career development. Working mothers with children at younger ages are more adversely influenced by their career progression. Nevertheless, Duncan & Edwards (1999) revealed that working mothers who persisted in traditional gender-based role beliefs experienced substantially stress and role conflict. The most important meaning of the role of a

working woman is to have a job and to support the family and this gives positive satisfaction to mothers. The qualitative study by Laney, Carruthers, Hall, & Anderson (2014) showed that to be a mother provides growth and development in personal, relational, generational and Professional sense to woman.

The study revealed that in respect of workplace discrimination, the majority of working mothers experience positive discrimination. Crowley (2013)'s qualitative research with 54 working mothers revealed that women have had various experiences characterized as discrimination in work life. These discrimination perceptions are not to be seen as employees who have ideal performance standards with their mother status, but also as not being skilled as non-mother employees. The most frequent reaction to discriminatory experiences is to be endurance or patience. According to the results of Correll et al. (2007), working mothers are considered more inadequate %10 in terms of talent and 15% in terms of commitment compared to non-mothers in the workplace. Ridgeway & Correll (2004) stated that the maternal status of women is a major negative impact on performance and talent perceptions at the workplace and working mothers need more flexible time.

According to the study result, the majority of women are aware of their legal rights and are able to take advantage in Turkey. However, legal rights are insufficient and especially postpartum maternity leave periods have to be increased to at least 8 months for working mothers. Scandinavian countries are in the first in terms of legal rights recognized by working mothers. Sweden and Germany rank first with 47-week "paid maternity leave". Norway provides 44 weeks, Greece 34 weeks, Finland 32 weeks, Canada 29 weeks maternity leave. While Japanese provides 26-week period maternity leave, Switzerland is in 24 weeks and the United States is in the last order with 14-week maternity leave. In Turkey, like 8 weeks prenatal and 8 weeks postnatal total of 16 weeks maternity leave is provided to working mothers (Tuaç, 2015, p.125).

The study found that there are no supportive mechanisms for working mothers in the institutions and mechanisms are inadequate in Turkey. The most frequently needed support mechanism is institutional daycare centers.

Supports provided by organizations for child care of working mothers to work-family balance are *daycare centers in the workplace* (Beauregard & Henry, 2009; Glass & Riley, 1998; Meurs, Breaux, & Perrewe, 2008; Veiga, Baldridge, & Eddleston, 2004), affordable access to *contractual daycare centers* (Fowler, Gudmundsson, & Whicker, 2006), providing *financial support for childcare costs* (Beauregard & Henry, 2009; Glass & Riley, 1998) and providing *lactation rooms* (Çakmak-Otluoğlu, 2015, p.85). Similarly, research by Albrecht (2003) showed that the support mechanisms called "family-friendly workplace policies" do not adequately support working mothers. Costa et al. (2012) concluded that when working women return to work they are expecting flexibility at all stages of their motherhood adventure in managing their maternal responsibilities. Organizational support and employer flexibility facilitate the transition to motherhood process also, increase the organizational commitment of women following maternity leave and help them to balance maternal and employee identities. Study by Pas et al. (2011) found that the effectiveness of family-friendly regulations such as the possibility of part-time employment, flexible working hours and on-site care facilities is due to support for integrating work-family life and value cultures within the organizations.

Women and their working life problems are generally considered insignificant. Working women were either considered as being different from men or considered as bringing various problems (Translated by Ayyıldız-Ünnü, 2015, p. 229). According to research conducted by Gatrell (2014) in England, employers consider pregnancy and maternity as an objectionable, difficult, different, disorganized, complex and terrible situation in the workplace. In a traditional organizational culture, working mothers are less committed to their jobs and organizations. Working mothers who take a break by using maternity leave are considered unfavorable in the workplace (Çakmak-Otluoğlu, 2015, p. 87).

To sum up, the results of the research revealed that working mothers are following the intensive motherhood ideology of Hays (1996). In this ideology, the married working mother cares for her child intensively, her own desires and needs are of secondary importance, the child becomes a priority of the woman. According to ideology, working mothers spend more emotional and physical energy and spend more time with their children compared to their parents. As Hagelskamp, Hughes, Yoshikawa, & Chaudry (2011) pointed out, the most important means of working for women is to have a job and support the family. Also, working gives positive satisfaction feeling to women so this is reflected positively to the child. It is suggested that

the study can be expanded with working mothers in private sector (for example women bank employees) and using different research methods (for example mixed method).

REFERENCES

Albrecht, G.H. (2003). How friendly are family friendly policies?. *Business Ethics Quarterly, 13(2),* 177-192.

Alonso-Almeida, M.M. (2014). Women (and mothers) in the workforce: Worldwide factors. *Women's Studies International Forum, 44,* 164-171.

Arendell, T. (2000). Conceiving and investigating motherhood: The decade's scholarship. *Journal of Marriage and the Family, 62(4),* 1192-1207.

Aycan, Z. (2004). Key success factors for women in management in Turkey. *Applied Psychology: An International Review, 53 (3),* 453-477.

Ayyıldız-Ünnü, N.A. (2015). Yönetim erkeklerin yönetimi mi? Yönetim bilimlerine eleştirel bir yaklaşım. In Sürgevil-Dalkılıç, O. (Ed.), Çalışanne: kadın akademisyenlerin kaleminden çalışma yaşamında annelik (pp.215-246). Ankara: Nobel Yayıncılık.

Baum, C.L. (2003). Does early maternal employment harm child development? An analysis of the potential benefits of leave taking. *Journal of Labor Economics, 21,* 409-448.

Beauregard, T.A. & Henry, L.C. (2009). Making the link between work-life balance practices and organizational performance. *Human Resource Management Review, 19(1),* 9-22.

Beets, G.C.N., Liefbroer, A.C. & De Jong Gierveld, J. (1997). Combining employment and parenthood: A longitudinal study of intentions of Dutch young adults. *Population Research and Policy Review, 16(5),* 457-474.

Bianchi, S.M. (2000). Maternal employment and time with children: Dramatic change or suprising continuity?. *Demography, 37(4),* 401-414.

Brown, L.M. (2010). The relationship between motherhood and Professional advancement: Perceptions versus reality. *Employee Relations, 32(5),* 470-494.

Chang, Y.E. (2013). The relation between mother's attitudes toward maternal employment and social competence of 36-month-olds: The roles of maternal psychological well-being and sensitivity. *Journal of Child and Family Studies, 22,* 987-999.

Chodorow, N. (1978). *The reproduction of mothering: Psychoanalysis and the sociaology of gender.* Berkeley: University of California Press.

Correll, S.J., Benard, S. & Paik, I. (2007). Getting a job: Is there a motherhood penalty?. *American Journal of Sociology, 112(5),* 1297-1338.

Costa, B.M., Walker, A., Zinkiewicz, L., Berman, H., Cartledge, A.& Nheng, S. (2012). The maternity journey in an organisational context: A case study. *The Australian and New Zealand Journal of Organisational Psychology, 5,* 43-49.

Creswell, J.W. (2007). *Qualitative inquiry & research design: Choosing among five approaches* (2nd ed.). Thousand Oaks, California, CA: SAGE Publications.

Creswell, J.W. (2014). *Research design: Qualitative, quantitative and mixed methods approaches* (4th ed.). USA: SAGE Publications.

Crowley, J.E. (2013). Perceiving and responding to maternal workplace discrimination in the United States. *Women's Studies International Forum, 40*, 192-202.

Çakmak-Otluoğlu, K.Ö. (2015). İnsan kaynakları yönetimi ve çalışan anneler: Aile dostu işyeri uygulamaları çalışan annelere neler sunuyor? In Sürgevil-Dalkılıç, O. (Ed.), Çalışanne: kadın akademisyenlerin kaleminden çalışma yaşamında annelik (pp.73-109). Ankara: Nobel Yayıncılık.

Dedeoğlu, A.Ö. (2010). Discourses of motherhood and consumption practices of Turkish mothers. *Business and Economics Research Journal, 1(3),* 1-15.

Dillaway, H. & Pare, E. (2008). Locating mothers: how cultural debates about stay-at-home versus working mothers define women and home. *Journal of Family Issues, 29(4),* 437-464.

Donath, O. (2015). Regretting motherhood: A sociopolitical analysis. *Signs: Journal of Women in Culture and Society, 40(2),* 343-367.

Duncan, S. & Edwards, R. (1999). *Lone mothers, paid work and gendered moral rationalities.* London: Macmillan.

Eurofound (2013). *Caring for children and dependants: Effect on careers of young workers.* Background Paper, Ireland. Retrieved from https://www.eurofound.europa.eu/sites/default/files/efpublication/field ef document/ef1344en0.pdf

Eken, H. (2005). *Toplumsal cinsiyet olgusu temelinde mesleğe ilişkin rol ile aile içi rol etkileşimi: Türk Silahlı Kuvvetlerindeki Kadın Subaylar.* Doktora tezi, Hacettepe Üniversitesi, Ankara.

Fowler, J., Gudmundsson, A. & Whicker, L. (2006, September). Work/family balance: HRM policy and practice in Australia. In Thorpe, R., McHugh, M. & Leitch, C. (Eds.), *Conference Proceedings 2006: British Academy of Management: Building International Communities Through Collaboration*, Belfast, UK.

Gatrell, C.J. (2014). Monstrous motherhood versus magical maternity: An exploration of conflicting attitudes to maternity within health discourses and organizational settings. *Equality, Diversity and Inclusion: An International Journal, 33(7),* 633-647.

Giddens, A. (2012). *Sosyoloji* (C.Güzel ve diğerleri, Çev.). Ankara: Kırmızı Yayınları.

Glass, J.L. & Riley, L. (1998). Family responsive policies and employee retention following childbirth. *Social Forces, 76(4),* 1401-1435.

Gökdemirel, S., Bozkurt, G., Gökçay, G. & Bulut, A. (2008). Çalışan annelerin emzirme sürecinde yaşadıkları: Niteliksel bir çalışma. Çocuk Dergisi, 8(4), 221-234.

Hagelskamp, C., Hughes, D., Yoshikawa, H. & Chaudry, A. (2011). Negotiating motherhood and work: A typology of role identity associations among low-income, urban women. *Community, Work & Family, 14(3),* 335-366.

Hays, S. (1996). *The cultural contradictions of motherhood.* New Heaven, CT: Yale University Press.

Hays, S. (2011). The mommy wars: Ambivalence ideological work and the cultural contradictions of motherhood. In Skolnick, A. & Skolnick, J. (Eds.), *Family in transition* (6th ed.) (pp.41-60). Boston: Pearson.

Holden, G.W. & Edwards, L.A. (1989). Parental attitudes toward child rearing: Instruments, issues and imlications. *Psychological Bulletin*, *106(1),* 29-58.

İlkkaracan, İ. (2010). *Emek piyasasında toplumsal cinsiyet eşitliğine doğru: İş ve aile yaşamını uzlaştırma politikaları.* İTÜ BMT-KAUM, Kadının İnsan Hakları Yeni Çözümler Derneği.

Kapucugil-İkiz, A. (2015). Dünyada ve Türkiye'de istatistiklerle çalışan anneler. In Sürgevil-Dalkılıç, O. (Ed.), Çalışanne: Kadın *akademisyenlerin kaleminden çalışma yaşamında annelik* (pp.149-213). Ankara: Nobel Yayıncılık.

Koray, M. (2009). Görünmez kılınan ve değersizleşen kadın emeği karşısında sosyal devlet. *Türk-İş, 383,* Ocak-Şubat.

Küçükşen, K. & Kaya, Ş.D. (2016). Yönetici pozisyondaki akademisyen kadınlarda aile-iş-özel yaşam dengesi. *Akademik Sosyal Araştırmalar Dergisi, 4(37),* 662-674.

Laney, E.K., Carruthers, L., Hall, M.E.L. & Anderson, T. (2014). Expanding the self: Motherhood and identity development in faculty women. *Journal of Family Issues, 20(10),* 1-25.

Maher, J. (2005). A mother by trade: Australian women reflecting mothering as activitiy, not identity. *Australian Feminist Studies, 20(46),* 17-29.

Mayatürk-Akyol, E. (2015). Toplumsal yaşamda ve çalışma hayatında kadın ve anne kimlikleri: Kuramsal bir bakış. In Sürgevil-Dalkılıç, O. (Ed.), Çalışanne: kadın akademisyenlerin kaleminden çalışma yaşamında annelik (pp.1-30). Ankara: Nobel Yayınları.

McIntosh, B., McQuaid, R., Munro, A. & Dabir-Alai, P. (2012). Motherhood and its impact on career progression. *Gender in Management: An International Journal, 27(5),* 346-364.

McMahon, M. (1995). *Engendering motherhood: Identity and self-transformation in women's lives.* New York: Guilford Press.

McMahon, M. (2004). Motherhood: Social and cultural aspects. In Smelser, N.J. & Baltes, P.B. (Eds.), *International encyclopaedia of the social and behavioural sciences* (pp.10089-10093) Retrieved from http://www.elseiver.com/

Metin, Ş. & Kariman, R.A. (2013). *Her alandaki kadın istihdamının artırılması ve çözüm önerileri komisyon raporu.* TBMM Kadın Erkek Fırsat Eşitliği Komisyonu Yayınları No:12. Retrieved from http://tbmm.gov.tr/komisyon/kefe/docs/komisyonraporu2014 1.pdf

Meurs, J.A., Breaux, D.M., & Perrewe, P.L. (2008). The family and HRM in North America: How demographic and social changes are shifting the way work-family issues are managed by organizations and employees. *The International Journal of Human Resources Management, 19(8),* 1455-1471.

Negiz, N. & Tokmakçı, E. (2011). Çalışma yaşamında kadının tükenmişliği: Aile-iş sosyal yaşam açısından tükenmişlik (Süleyman Demirel Üniversitesi Örneği). *Journal of Yaşar University, 24(6),* 4041-4070.

Özcan, M. (2019). *AB katılım sürecindeki Türkiye'nin kadın istihdamı karnesi*, İktisadi Kalkınma Vakfı Yayınları: İstanbul. Retrieved from http://www.ikv.org.tr

Özer, M. & Biçerli, K. (2003). Türkiye'de kadın işgücünün panel veri analizi. *Anadolu Üniversitesi Sosyal Bilimler Dergisi, 3(1),* 55-85.

Özmete, E. & Eker, I. (2013). İş-aile yaşamı çatışması ile başa çıkmada kullanılan bireysel ve kurumsal stratejilerin değerlendirilmesi. *Sosyal Güvenlik Dergisi, 1,* 19-49.

Parker, R. (1994). Maternal ambivalence. *Winnicott Studies, 9,* 3-17.

Pas, B., Peters, P., Eisinga, R., Doorewaard, H. & Janssen, T.L. (2011). Explaining career motivation among female doctors in the Netherlands: The effects of children, views on motherhood and work-home cultures. *Work, Employment and Society, 25(3),* 487-505.

Phoenix, A., Woollett, A. & Lloyd, E. (1991). *Motherhood: Meanings, practices and ideologies.* Newbury Park: CA: Sage.

Polkinghorne, D.E. (1989). Phenomenological research methods. In Valle, R.S. & Halling, S. (Eds.), *Existential-phenomenological perspectives in psychology: Exploring the breadth of human experience* (pp.41-60). Newyork: Plenum Press.

Read, D.M.Y., Crockett, J. & Mason, R. (2012). It was a horrible shock: The experience of motherhood and women's family size preferences. *Women's Studies International Forum, 35,* 12-21.

Ridgeway, C.L. & Correll, S.J. (2004). Motherhood as a status characteristic. *Journal of Social Issues, 60(4),* 683-700.

Ruddick, S. (1994). Thinking mothers/conceiving birth. In Bassin, D., Honey, M. & Kaplan, M.M. (Eds.), *Representations of motherhood* (pp.29-46). New Haven: CT: Yale University Press.

Seçer, Ş. (2010). Çalışan anneler ve çalışan annelere yönelik ayrımcılık. İzmir: Altın Nokta Yayınevi.

Sürgevil-Dalkılıç, O. (2015). Annelerin öykülerinden açığa çıkanlar: Annelik ve çalışan anneliğe yüklenen anlamlar, çalışma hayatından örnek olaylar, ihtiyaçlar ve beklentiler (Ed.). ÇalışAnne: Kadın akademisyenlerin kaleminden çalışma yaşamında annelik (pp.407-466). Ankara: Nobel Yayınları.

TNSA (2014). *2013 Türkiye nüfus ve sağlık araştırması.* Hacettepe Üniversitesi Nüfus Etütleri Enstitüsü, Ankara: T.C. Kalkınma Bakanlığı ve TÜBİTAK.

Topgül, S. (2016). İş ve aile yaşamı dengesizliğinin kadın çalışanlar üzerindeki etkileri. *Yönetim ve Ekonomi, 23(1),* 217-231.

Tuaç, P. (2015). Çalışan annelerin hukuki olarak sahip oldukları haklar: Hamilelik, lohusalık ve analık dönemlerine ilişkin yasal düzenlemeler. In Sürgevil-Dalkılıç, O. (Ed.), Çalışanne: Kadın akademisyenlerin kaleminden çalışma yaşamında annelik (pp.111-147). Ankara: Nobel Yayınları.

TUIK (Türkiye İstatistik Kurumu). (2017). *2017 yılı işgücü istatistikleri.* Retrieved from http://www.tuik.gov.tr

Uta Garey, A. (2009). Motherhood. In O'Brien, J. (Ed.), *Encyclopedia of gender and society,* California: Sage Publications. Retrieved from http://www.sage-reference.com/gender/Article n290

Uttal, L. (1996). Custodial care, surrogate care and coordinated care: Employed mothers and the meaning of child care. *Gender & Society, 10(3),* 291-311.

Ünlütürk-Ulutaş, Ç. (2015). İş ve aile yaşamını uzlaştırma politikaları: Türkiye'de yeni politika arayışları. *Ankara Üniversitesi SBF Dergisi, 70(3),* 723-750.

Veiga, J.F. Baldridge, D.C. & Eddleston, K.A. (2004). Toward understanding employee reluctance to participate in family-friendly programs. *Human Resources Management Review, 14(3),* 337-351.

Walzer, S. (2007). Motherhood. In Ritzer, G. (Ed.), *Blackwell encylopedia of sociology*. Blackwell Reference: Blackwell Publishing Retrieved from http://www.blackwellreference.com/subscriber/tocnode

Yıldırım, A. & Şimşek, H. (2013). *Sosyal bilimlerde nitel araştırma yöntemleri* (9th.ed.). Ankara: Seçkin Yayıncılık.

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Designing Port Services Via Fuzzy Quality Function Deployment

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ABSTRACT

The objective of this study is to develop a proposal for developing port services that can improve the service quality by accurately satisfying the customer requirements. In this study, a four-stage process was identified. In the first stage, data envelopment analysis (DEA) was used for measuring the efficiency of the container terminals. In the second stage, the requirements of the port customers were identified, and confirmatory factor analysis was applied for satisfying these requirements. Further, in the third stage, the consistency of the binary comparison matrices which consist of customer requirements was evaluated using the analytic hierarchy process (AHP). In the final stage, the fuzzy analytic hierarchy process (FAHP) and fuzzy quality function deployment (FQFD) were jointly used for designing the port services. According to results, the resources requirement is considered to the most important criterion among the main criteria to improve the service quality of the port. Further, FQFD was used for designing of P1 port's service. FQFD was concluded that the quality of the equipment, facilities, and technological infrastructure have to be improved for increasing the service quality of P1 port.

Keywords: Fuzzy Analytic Hierarchy Process, Fuzzy Quality Function Deployment, Confirmatory Factor Analysis, Port Service Design, Data Envelopment Analysis

JEL Classification Codes: M11, M39, N74

1. INTRODUCTION

The ports that form the backbone of maritime transport and their efficiency are considered the main factors that affect the performance of maritime transport. The ports that do not contain any docks, warehouses, and/or storage spaces that are suitable for different cargo and vessel types have no and/or poor connection to other forms of transportation, have technologically outdated equipment, fail to employ skilled labor, are inaccurately designed, or are not professionally managed are obstacles in obtaining favorable results in maritime transport. In the current competitive business environment, port operators must optimally use their scare resources and, simultaneously, adopt a professional, innovative, and proactive management approach for achieving their targets and objectives (Tahar and Hussain, 2000). This entails the design and presentation of the port services and all areas related port services in a manner that focuses not only on the port efficiency but also on customers (the port services should be responsive to the customer requirements) as well as the improvements.

However, this study focuses on the design of port services in accordance with the customer requirements. At this time, the following basic questions have to be answered: What are the customers' expectations from a port? How can these expectations be identified? How can the services be designed or improved to satisfy these expectations? This study searches for the answers to such questions. Further, this study intends to come up with a proposal for designing and developing port services that are capable of satisfying the customer requirements using Fuzzy Quality Function Deployment (FQFD). Subsequently, an existing questionnaire was

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used to identify the expectations of the customers, and confirmatory factor analysis (CFA) was applied to this questionnaire. The questionnaire was finalized after this analysis was completed, and the revised questionnaire was used for determining the importance ratings and weights of customer expectations using the Fuzzy Analytic Hierarchy Process (FAHP). The efficient operation of a port was the key consideration for determining the port at which this study could be conducted and its rivals. Further, data envelopment analysis (DEA) was used for performing the efficiency analysis, and the efficient and inefficient ports were identified. One of the inefficient ports was selected for conducting this study. After these stages, the basic steps of FQFD were performed, and a service design proposal was obtained for the selected port.

The following sections in this study address the literature review, the basic issues related to the concept of port, data and used methodology, analysis and findings, and conclusions.

2. LITERATURE REVIEW

In this study, an extensive literature search was carried out to build up a strong theoretical background and to identify method and/or methods. Firstly, studies focused on port services design in the literature has been investigated in order to build up a strong theoretical background of this study. In line with this purpose, studies related to the subject have been researched through keywords by using online databases and internet search engines, especially EBSCO Discovery Service (On 22.05.2020). The distribution of the studies reached as a result of the search by keyword groups is shown in Figure 1. Due to the limitation of the page, these studies could not be included in detail.

As can be seen in Figure 1, among these studies, it is seen that those who are related to "port", "transport" and "design" issues are more numerous than others. The topics and methods of the studies examined with the literature research have not been elaborated since they are not "directly related" to the subject of this study.

In addition to determining the gap regarding the design of port services, the literature research also allowed us to determine what kind of problems are sought and which methods are used in the studies related to ports. In this context, the majority of the studies proposed solutions various network design problems with the help of mathematical models. Another issue that was emphasized as much as the network design was the measurement of the emission caused by the ships and the ports as a whole, and the analysis of their impact on the environment. Moreover, the studies that examine the negative effects of maritime transport, ports and ships on the environment and coastline through chemical analyzes are also remarkable. The methods used in these studies mentioned in Figure 2 are grouped under general headings.

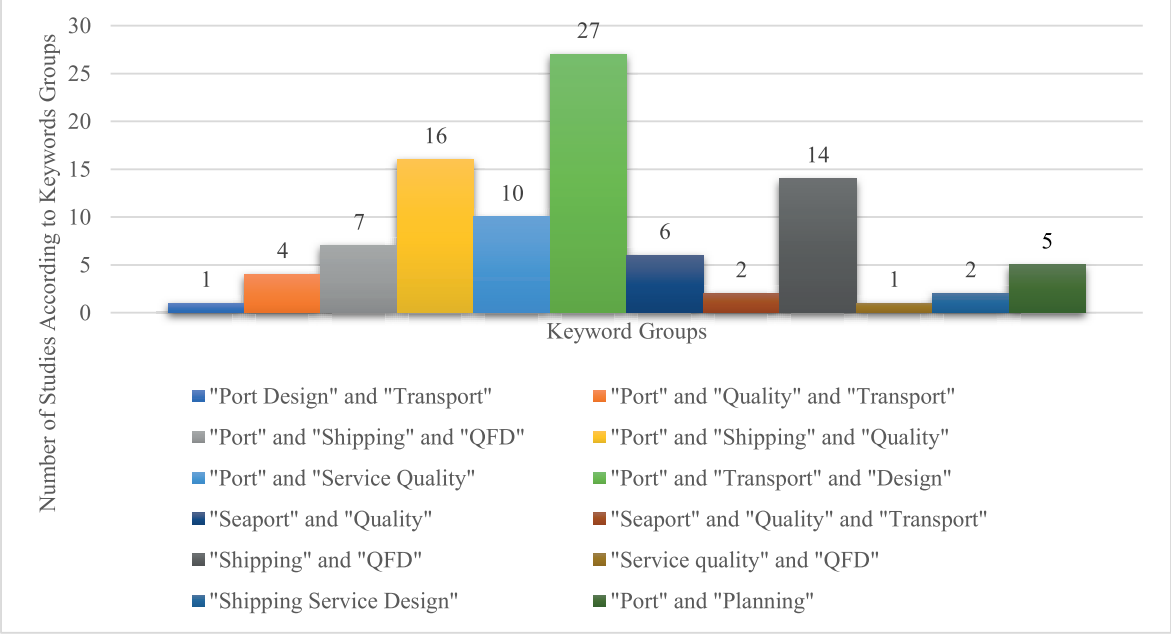

Figure 1: Distribution of studies reached through literature research by keywords

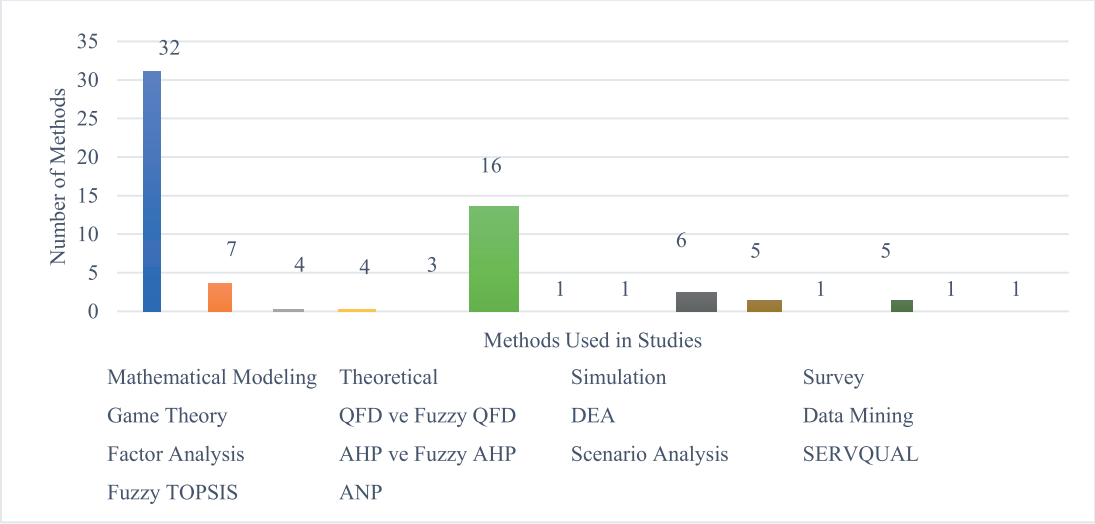

Figure 2: Distribution of the methods used in the studies reached by the literature research

As seen in the Figure 2; mathematical models, methods such as QFD and FQFD are used more than other techniques. Although methods such as QFD and FQFD seem to be the most preferred after mathematical models, the problems discussed in the studies in which these methods are used differ from the structure of the problem addressed and sought in this study.

In the current literature review, there are a limited number of studies focused on similar problem and methods used in the study. In this context; Ding (2009) used the FQFD method to define Kaohsiung Port's service delivery system (SDS) solutions from the perspective of customers and Duru et al. (2013) used the QFD method to determine the needs of both the customers and port operators. Hsu (2013) determined the service activities at the container terminals from a customer perspective by using the QFD method. Huang et al. (2015) also used the QFD method to improve the service quality of ship freight companies; Razik et al. (2015) used QFD and factor analysis together for improvement activities in dry cargo terminals from a customer perspective. In another study on service quality, Huang et al. (2019) used QFD and FAHP methods together to improve the service quality of large shipping companies.

In this study, unlike the studies examined with the literature research, port services were handled from a more holistic perspective. Different from current literature, the port services were evaluated from the perspective of customers for port authorities and it was aimed to present a proposal for the improvement of the services. Since the studies related service quality improvements at ports from consumer perspective are limited in number in the literature.

While there are studies that have investigated the product and service design using the FQFD, only a few studies have investigated the usage of quality function deployment (QFD) and/or FQFD for the design of port services; further, no study has been conducted in Turkey as of the date of the present study. In this context, this study will contribute to the literature related to study's subject in terms of its scope and methodology and encourage further studies.

3. BASIC ISSUES RELATED TO THE CONCEPT OF PORT

Ports include structures comprising several sections that can be referred to as terminals (Mangan et al., 2008) and perform the following five basic functions: *serve as shelter for vessels; maintain, repair, and construct vessels; possess suitable infrastructure for handling, stowing, storing, and checking the loading operations; possess a suitable environment for the expansion of industry and commerce; and ensure the effectiveness of the transportation operations by connecting different transportation points* (Branch, 1986). Based on these functions, the ports may be classified as state, municipal, private, and autonomous ports (Baird, 1995). However, the ports can also be classified as first, second, third (UNCTAD, 1992) and fourth generation according to the scope of the services which they offer (Esmer and Cetin, 2016).

The differentiation of ports in terms of their capacities and the services that they offer makes it difficult to develop a standard approach that is applicable to every port with respect to the measurement of the efficiency and service design. The factors that affect the performance and efficiency of a port include its

geographic location, the availability of transportation modes, its technological infrastructure, its potential for expansion, the automation systems, its work load, the duration of cargo's stay in the port, its storage spaces and the manner in which these spaces are used, the number and adequacy of the handling equipment, its operation times, the capabilities of the crane operators, the professional qualifications and the training levels of the staff, the occurrence of natural disasters, and the persons or organizations related to the port.

Currently, to ensure efficient operation of ports, to ensure customer satisfaction, and to become larger than their rivals, the port operators must recognize the changes in the customer requirements of global trade and take the lead in undergoing transformation before being forced to transform or to become innovative. The increase in global trade volume and cargo traffic, changes in customer expectations, introduction of heavy tonnage ships, technological advancements, and increased competition (TURKLIM, 2010); the competition rules, taxation systems, working conditions, security services, and regulations concerning customs and environmental protection (World Bank, 2007); the climate change, rising sea levels, storms, and natural disasters; (Becker et al., 2011) and several other factors make transformation inevitable for port operators.

4. RESEARCH AND METHODOLOGY

The objective of this study is to make a proposal for facilitating the improvement of the services that are provided at a port in accordance with the customer requirements. In this context, the first problem that should be solved is to identify the port at which the study has to be conducted. The efficiency score obtained using DEA was considered an evaluation criterion for selecting the port, a literature review on ports has been performed, and the input and output variables that can be used for performing efficiency analysis have been identified. The port having the lowest efficiency score in the analysis was selected for conducting this study. For the service design work to be conducted on the selected port, FQFD was used because it allowed the customers to be indirectly included in the design and the service production process. Subsequently, the AMOS 20 software package was employed to conduct CFA for verifying the validity and reliability of the service quality scale used to determine the customer requirements in FQFD. Further, to determine the importance rating of the customer requirements, the FAHP method was used, and a design proposal was created for the selected port by performing FQFD.

The research model has been presented in Figure 3 for a clear presentation of the aforementioned stages.

4.1. Data Collection

The data required for performing the efficiency analysis in the first stage of the application were collected from the Ministry of Transport, Maritime Affairs, and Communications and the websites of the 14 designated ports. DEA was performed using the data from 2014 because the accessible and reliable data on the ports originated in that year. The data that were required for determining the customer requirements were collected using the questionnaire forms. While preparing these questionnaire forms, a previously developed scale was used for measuring the service quality of the port operators. To verify the validity and reliability of this scale, 400 questionnaire forms were administered to port customers, and 337 valid questionnaire forms were collected. FAHP was employed for determining the importance rating of the customer requirements. This constitutes the first stage of FQFD. To obtain the data that were required at this stage, the questionnaire forms, which were prepared according to the hierarchy of goals and the main and sub-criteria, were given to 119 port customers by contacting them in person or via phone or e-mail, and the forms were taken back using the same method. Among the 93 questionnaire forms that were returned, 64 were observed to be usable. The data required for the creation of the planning matrix in the second stage of FQFD were obtained by handing over the questionnaire forms to 320 port customers by contacting them in person or via phone or e-mail, receiving 292 usable questionnaire forms in return. Further, a quality team comprising seven people who were experts in port services was formed, and the technical requirements of the ports were identified based on their opinions. To measure the degree of relation between the identified technical requirements and customer requirements, a relation matrix was created by consulting the quality team. Further, 16 experts who worked in the ports and who were knowledgeable about the port evaluated the questionnaire forms that were designed to determine the importance rating of technical requirements and to identify the target values. In the final stage, a correlation matrix was created to measure the relations among various technical requirements.

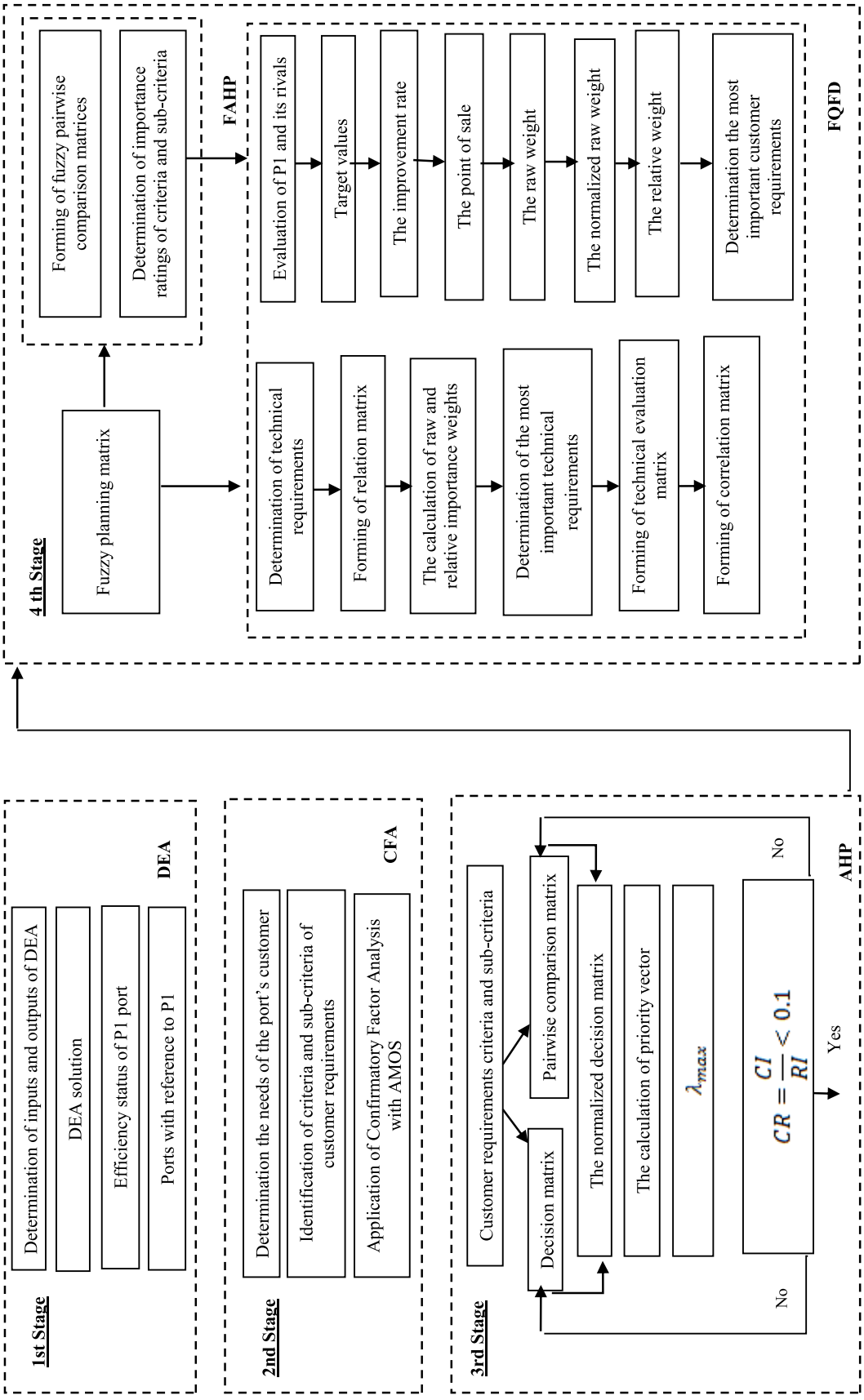

Figure 3: Model research

4.2. Research Methods

This section is devoted to the descriptions of the DEA, CFA, fuzzy logic, FAHP, and FQFD methods that have been used in the application.

4.2.1. Data envelopment analysis

DEA is a data-driven analysis that is used for measuring the effectiveness of the decision-making units (DMUs) that convert multiple inputs into multiple outputs (Cooper et al., 2004). The DEA models are typically grouped into radial and non-radial models. The most commonly used non-radial DEA models are the additive model, slacks-based measure, hybrid measure, and Russell measure. However, the radial DEA models are categorized into constant returns to scale (CRS) and variable returns to scale (VRS). Based on the assumption of CRS, the CCR (Charnes-Cooper-Rhodes) model is used; further, based on the assumption of VRS, the BCC model is used; CCR and BBC models can be solved as being input- and output-oriented (Cooper et al., 2007). The objective of the input-oriented DEA models is to use the minimum input for obtaining a particular output, whereas the objective of the output-oriented DEA models is to create the maximum output using a particular amount of input (Charnes et al., 1994).

The data envelopment analysis includes six stages such as the selection of DMUs, determination of inputs and outputs, identification of the appropriate DEA model, assignment of the reference set, calculation of the potential improvement rates for ineffective DMUs, and the assessment of the results. DMUs should have similar inputs and outputs because their selection affects the results of analysis. Further, the DMUs should perform similar activities to achieve similar targets, should operate under similar market conditions, (Golany and Roll, 1989) and should be in adequate numbers (Bakirci, 2006). In the literature, there are various recommendations that can be used for determining the number of DMUs. In this context, the number of DMUs should be greater than or equal to the product of the number of used inputs with the number of outputs greater than or equal to three times the sum of the numbers of inputs and outputs according to (Cooper et al. (2001), whereas it should be no less than the sum of the numbers of the inputs and outputs according to Bakirci (2006); From (Boussofiane et al., 1991); further, it should be at least twice the product of the numbers of inputs and outputs according to Dyson et al. (2001).

Because the number of input and output variables that should be used in DEA is as important as the number of DMUs, all the inputs and outputs that affect the effectiveness of the DMUs should be identified. If there are too many inputs and outputs, various methods should be used for determining the most important inputs and outputs and for reducing their number. The inputs are the resources that are used by the DMUs, and the outputs are the beneficial results of the activities of the DMUs. For obtaining meaningful results, a reasonable number of inputs and outputs should be included for performing the analysis. Because the increased number of inputs and outputs will increase the number of DMUs, it is important to accurately determine the inputs and outputs (Ramanathan, 2003). In DEA, the efficiency values of the DMUs will vary between 0 and 1, where the DMUs whose efficiency score is 1 can be considered to be efficient while those having effectiveness scores of smaller than 1 can be considered to be inefficient (Weber, 1996).

4.2.2. Confirmatory factor analysis

Factor analysis is a type of multivariate analysis that allows the presentation of data in a meaningful and concise manner based on the relations among a group of variables (Nakip, 2013), and it is classified as explanatory and confirmatory. Exploratory factor analysis (EFC) is designed for cases in which the relations between the observed and latent variables are unknown or tentative (Byrne, 2010). However, CFA has been developed for verifying the validity of factor structures. In CFA, there are certain fit indices for verifying the consistency of the model. The most commonly used indices include the chi-square test statistics, root mean square error of approximation (RMSEA), standardized root mean square residual (SRMR), normed fit index (NFI), comparative fit index (CFI), goodness of fit index (GFI), and adjusted goodness of fit index (AGFI) (Schermelleh-Engel et al., 2003).

4.2.3. Fuzzy logic and fuzzy numbers

Fuzzy logic was initially introduced as a concept by L. A. Zadeh in his book, Fuzzy Sets, published in 1965. Fuzzy logic considers uncertainty, and it can be used to solve the problems without considering definite borders and values (Chamzini and Yakhchali, 2012). Further, Zadeh developed the theory of fuzzy sets because of the perception differences or uncertainties that are associated with human thought. In fuzzy logic, the linguistic variables are mathematically expressed (Ertugrul and Karakasoglu, 2008). Each element in a fuzzy set can take values ranging from 0 to 1 (Chan and Kumar, 2007). Further, the membership function

for the fuzzy set *A* can be expressed as $\mu_{\tilde{A}}(x) \rightarrow [0,1]$. In literature, the triangular and trapezoidal fuzzy numbers are considered to be the most extensively used fuzzy numbers, and $\mu_{\tilde{A}} = (l, m, u)$ is a triangular fuzzy number, where l denotes the smallest possible value, m denotes the possible value, and u denotes the greatest possible value (Chang, 1996). The linguistic variables that are used in this study and the triangular fuzzy numbers that correspond to them are presented in Table 1 (Rao, 2008).

4.2.4. Fuzzy analytic hierarchy process

Fuzzy logic is suitable for solving real-life problems; this has led to the usage of fuzzy logic along with the traditional multiple-criteria decision-making methods. FAHP began to be used in the literature because of the aforementioned developments (Huang et al., 2008; Deng, 1999). In this study, the FAHP that was proposed by Chang (1996) was used, and its stages were shown below (Chang, 1996; Kahraman et al., 2004):

According to the order analysis conducted by Chang (1992), where $U = \{u_1, u_2, \dots, u_m\}$ denotes the object set and $X = \{x_1, x_2, \dots, x_n\}$ denotes the target set, (g_i) is applied to each order analysis. Therefore, m order analysis values are obtained for each object.

$$M_{gi}^{j}: M_{gi}^{1}, M_{gi}^{2}, \dots, M_{gi}^{m} \qquad i = 1,2, \dots, n \tag{1}$$

1st Stage: The calculation of the fuzzy synthetic order value for value i.

$$S_i = \sum_{j=1}^{m} M_{gi}^{j} \otimes \left[\sum_{i=1}^{n}\sum_{j=1}^{m} M_{gi}^{j}\right]^{-1} \tag{2}$$

Here, to calculate $\sum_{j=1}^{m} M_{gi}^{j}$ in Equation 2, the addition of the m order analysis value is performed as follows:

$$\sum_{j=1}^{m} M_{gi}^{j} = \left(\sum_{j=1}^{m} l_j, \sum_{j=1}^{m} m_j, \sum_{j=1}^{m} u_j\right) \tag{3}$$

Further, to obtain the value of $\left[\sum_{i=1}^{n}\sum_{j=1}^{m} M_{gi}^{j}\right]$, the addition to the value M_{gi}^{j} $(j = 1, 2, \dots, m)$ is performed.

$$\left[\sum_{i=1}^{n}\sum_{j=1}^{m} M_{gi}^{j}\right] = \left(\sum_{i=1}^{n} l_i, \sum_{i=1}^{n} m_i, \sum_{i=1}^{n} u_i\right) \tag{4}$$

Subsequently, the Equation 5 is obtained by taking inverse of Equation 4.

$$\left[\sum_{i=1}^{n}\sum_{j=1}^{m} M_{gi}^{j}\right]^{-1} = \left(\frac{1}{\sum_{i=1}^{n} u_i}, \frac{1}{\sum_{i=1}^{n} m_i}, \frac{1}{\sum_{i=1}^{n} l_i}\right) \tag{5}$$

2nd Stage: The degree of likelihood for the state $M_1 = (l_1, m_1, u_1) \geq M_2 = (l_2, m_2, u_2)$ can be given as follows:

$$V(M_1 \geq M_2) = sup_{x \geq y}\left[\min(\mu_{M_1}(x), \mu_{M_2}(y))\right] \tag{6}$$

In other words:

Table 1: Importance Scale in AHP and Its Fuzzy Corresponding

AHP		FAHP	
Degree of Importance	**Definition**	**Fuzzy Numbers**	**Corresponding Numbers**
1	Equally important	(1, 1, 3)	(1/3, 1, 1)
3	Weakly important	(1, 3, 5)	(1/5, 1/3, 1)
5	Essentially important	(3, 5, 7)	(1/7, 1/5, 1/3)
7	Very strong important	(5, 7, 9)	(1/9, 1/7, 1/5)
9	Absolutely important	(7, 9, 9)	(1/9, 1/9, 1/7)
2	Intermediate values	(1, 2, 3)	(1/3, 1/2, 1)
4	Intermediate values	(3, 4, 5)	(1/5, 1/4, 1/3)
6	Intermediate values	(5, 6, 7)	(1/7, 1/6, 1/5)
8	Intermediate values	(7, 8, 9)	(1/9, 1/8, 1/7)

$$V(M_2 \geq M_1) = hgt(M_1 \cap M_2) = \mu_{M_1}(d) = \begin{cases} 1, & m_2 \geq m_1 \\ 0, & l_1 \geq u_2 \\ \dfrac{l_1 - u_2}{(m_2 - u_2) - (m_1 - l_1)}, & other \end{cases} \quad (7)$$

Here, *d* denotes the ordinate of the highest intersection point between the points μ_{M_1} and μ_{M_2}, as depicted in Figure 4. To compare the values of M_1 and M_2, both the values of $V(M_1 \geq M_2)$ and $V(M_2 \geq M_1)$ should be known.

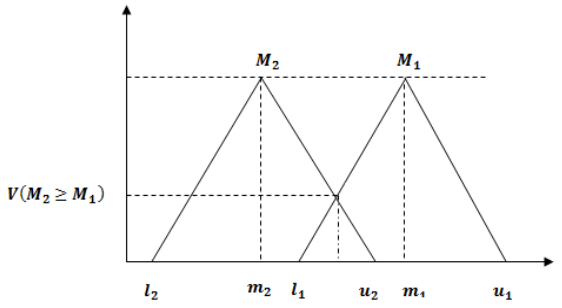

Figure 4: The Intersection Between of M_1 and M_2

3rd Stage: The likelihood degree that a convex fuzzy number will be M_i $(i = 1,2, \dots, k)$ greater than the convex fuzzy number k;

$V(M \geq M_1, M_2, \dots, M_k) = V[(M \geq M_1)$ and $(M \geq M_2)$ and ….and $(M \geq M_k)]$

$$min\, V(M \geq M_i), \quad i = 1,2,3, \dots, k \quad (8)$$

$$d'(A_i) = min\, V(S_i \geq S_k) \quad k = 1,2,3, \dots, n; k \neq i \text{ for } W'.$$

In equation 8 and 9, *W'* is weighting vector which consists of n elements,

$$W' = \left(d'(A_1), d'(A_2), \dots, d'(A_n)\right)^T, A_i (i = 1,2, \dots, n) \quad (9)$$

4th Stage: The calculation of the normalized weight vector (*W*).

$$W = \left(d(A_1), d(A_2), \dots, d(A_n)\right)^T \quad (10)$$

Here, the vector W is not a fuzzy number. Defuzzification was also used in this study even though it is not one of the basic stages of AHP. While $\tilde{A} = (l,\ m,\ u)$ is a triangular fuzzy number, the formula presented in Equation (11) was used for performing the defuzzification (Bottani and Rizzi, 2006; Bevilacqua et al., 2012).

$$A = \frac{l + 2m + u}{4} \quad (11)$$

4.2.5. Fuzzy quality function deployment

The first stage of FQFD is the creation of the house of quality, similar to that in QFD. While creating the house of quality, the expert opinions are used for determining the customer requirements and the performances and technical requirements of the firm (organization, facility, port, product, service etc.) and its rivals. Because the expression of these opinions via linguistic variables creates uncertainty, fuzzy numbers are used to eliminate uncertainty and to reach definite conclusions (Buyukozkan et al., 2007; Khoo and Ho, 1996). FQFD, which can be used for designing new services or for improving the existing services, consists of several matrices. The resulting structure can be referred to as the house of quality because it resembles a house. In the house of quality, the horizontal matrices denote the customer requirements, whereas the vertical matrices denote the technical requirements.

The most important stage of the house of quality is the determination of the customer requirements that are located to the left of the house of quality. The columns of the planning matrix, which is located to the right of the house of quality, may change depending on the QFD teams. In general, the planning matrix contains the columns of the importance ratings of customer requirements, the status of the studied firms and its rivals, the target, the improvement rate, the point of sale, and the raw weight and relative weight scores (Costa et al., 2001; Jeong and Oh, 1998). Further, the importance ratings of the customer requirements are calculated by identifying the most important requirements; subsequently, the importance ratings are converted into numerical values; they are quite important because they are used in other stages of the house of quality. The column of the status of the firm and its rivals denotes the performance of the firm and its rivals in satisfying the customer requirements. The remaining columns in the planning matrix are the target column that denotes the achievable target values of the firm, the raw and relative weight column (Akbaba, 2005), and the point of sale column, where

the customer requirements that may directly interfere with a sale are evaluated (Liu, 2009).

The technical requirements matrix depicts the manner in which the firm will satisfy the customer requirements. There should be at least one technical requirement corresponding to each customer requirement. Further, the suitable technical requirement can be identified by the QFD team using different methods. Because the number of technical requirements determines the number of columns in the matrix, the number of columns in the matrix increases along with the increasing number of such requirements, which further complicates the solution process and escalates the number of decisions that have to be made.

After the customer requirements and technical requirements are identified, each customer requirement is compared with the technical requirements to find the relation between them; further, the technical requirements are transferred to the production stage (Day, 1998). After the relation matrix is created, all lines of the matrix should be checked to remove the lines without any relation symbol or with only a weak relation symbol from the matrix.

The upper part of the house of quality is the roof or the correlation matrix, which denotes the relations among technical requirements. This matrix is important for observing the design process from which the bottleneck(s) may originate (Ficalora and Cohen, 2010). While the creation of the matrix of technical requirements in which the relation of priority or posteriority among technical requirements is described, the QFD team should take into consideration the technical requirements of both the firm and its rivals. After this stage, the targeted technical requirements for the firm as well as raw and relative importance weights should be determined (Han et al., 2001; Jeong and Oh, 1998).

4.3. Determining The Port Through Data Envelopment Analysis

As noted above, the first question that should be answered is the port in which the port service design will be performed. However, the distinct characteristics of ports complicate the quest for an answer to this question. In this context, we have investigated the similarities among the ports in Turkey. When the criterion of container handling was considered, we obtained a higher number of ports than what we obtained from the remaining criteria. Therefore, the port for the application was selected from among 14 ports that exhibited container-handling capability (referred to as P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13, and P14 for the sake of anonymity). By considering the studies in the literature, the dock length, number of cranes (total number of gantry cranes and mobile cranes), depth, and storage spaces were considered to be inputs for performing the efficiency analysis, and the number of handled containers was used as the output. In the study that benefited from the output-oriented CCR model, the analysis was performed using the Frontier Analyst package program, and the results are presented in Table 2.

According to Table 2, among the 14 container ports, three containers (P6, P8, and P9) were efficient while the efficiency values of the remaining 11 ports (P1, P2, P3, P4, P5, P7, P10, P11, P12, P13, and P14) were lower than 1.000. It was observed that P1 was the port with the lowest efficiency of 0.0885 and that P1 had to consider P8 as a reference to ensure efficiency. Consequently, it was decided that the service design application should be made at P1 and that P8, which P1 considered to be a reference, should be considered to be the first rival and P13, which is closely located to P1, should be considered to be the second rival.

Table 2: The Results of Efficiency Analysis

Port	CRS Eff.	CRS Ref. Set	CRS Ref. Num.	Port	CRS Eff.	CRS Ref. Set	CRS Ref. Num.
P1	0,0885	P8		**P8**	1,0000	P8	9
P2	0,4567	P6 and P8		**P9**	1,0000	P9	1
P3	0,6529	P6		**P10**	0,6241	P6 and P8	
P4	0,5173	P6 and P8		**P11**	0,6976	P6	
P5	0,4163	P6 and P8		**P12**	0,3145	P6	
P6	1,0000	P6	10	**P13**	0,1902	P6	
P7	0,3809	P6 and P8		**P14**	0,3121	P6 and P8	
Average= 0,5465							

4.4. Testing The Validity and Reliability of The Port Service Quality Scale

Because the diverse locations of the port's customers made it difficult to conduct face-to-face interviews in terms of time and costs, the scale prepared by Thai (2008), which is widely accepted in literature for improving the service quality of maritime transport, was used to determine the customer requirements. Before beginning to create the house of quality, the validity and reliability of the scale in question had to be verified. In this context, the data obtained from the questionnaire forms were tested using the SPSS and AMOS 20 package programs, and Cronbach's alpha value was estimated to be 0.971, indicating the high reliability of the scale. Further, the criterion of image was eliminated from the analysis because it adversely affected the validity of the CFA. The last version of the customer requirements scale is presented in Table 3.

Using CFA, the fit indices of RMSEA, AGFI, CFI, GFI, NFI, SRMR, and X2/df were observed to be 0.066, 0.857, 0.951, 0.888, 0.920, 0.030, and 2.471, respectively. The fit indices that were obtained were within acceptable limits. It was also observed that R3 and O6 had a factor weight of 6.675 and 0.696, respectively, while other variables had factor weights varying between 0.754 and 0.850.

4.5. Determining the Priorities and Weights of Customer Requirements

In this phase, the objective was to define the requirements of the port's customers and to identify their importance ratings. The scale, developed by Thai (2008) and comprising 5 main and 23 sub-criteria, was used for collecting the required data. The collected data were used to create the pairwise comparison matrices that formed the very basis of the FAHP method. While creating these matrices, the consistency rates of the matrices that were initially formed in the AHP form were calculated; further, after the matrices were observed to be consistent, they were converted to the FAHP form using triangular fuzzy numbers. The analytic hierarchy process and the matrices that have been organized in the FAHP form are presented in Tables 4, 5, 6, 7, 8, and 9.

Table 3: Customer Requirements

Main Criteria	Sub-Criteria
Resources (R)	• The accessibility of port equipment and facilities **(R1)**
	• The availability and adequacy of port equipment and facilities **(R2)**
	• The assurance of stability in port fees **(R3)**
	• Ability to track for loading in port operations **(R4)**
	• The adequacy of physical infrastructures of the port **(R5)**
Outputs (O)	• The realization speed of services at the port **(O1)**
	• The timely loading/unloading of cargo in the port **(O2)**
	• Consistently provision of port services **(O3)**
	• Ensuring the safety and security against loss and damage of loads **(O4)**
	• The error-free conduct of operations in the port **(O5)**
	• Suitability of the provision of services in terms of time and place **(O6)**
Process (PR)	• The attitudes and behaviors of port personnel in meeting customer requirements **(PR1)**
	• Ability to respond quickly to customers' questions **(PR 2)**
	• The knowledge of customer needs and requirements **(PR 3)**
	• The ability to use information technologies, such IT and EDI in customer service **(PR 4)**
Management (M)	• The ability to use information technologies, such IT and EDI in port operations, **(M1)**
	• The efficiency of the port operator and management **(M2)**
	• The level of knowledge and skills in doing business of port managers and employees **(M3)**
	• Understanding customers' needs and requirements **(M4)**
	• The reception of feedback from customers **(M5)**
	• The continuous and customer-oriented improvement of work processes **(M6)**
Social Responsibility (SR)	• Demonstrating socially responsible behaviors and concerns for human safety **(SR1)**
	• Port activities done in a environmentally conscious **(SR2)**

Table 4: Pairwise Comparison Matrix for Main Criteria

Pairwise Comparison Matrix of AHP						Pairwise Comparison Matrix of FAHP					
	R	**O**	**PR**	**M**	**SR**		**R**	**O**	**PR**	**M**	**SR**
R	1	3	3	2	3	**R**	(1, 1, 1)	(1, 3, 5)	(1, 3, 5)	(1, 2, 3)	(1, 3, 5)
O	1/3	1	2	2	2	**O**	(1/5, 1/3, 1)	(1, 1, 1)	(1, 2, 3)	(1, 2, 3)	(1, 2, 3)
PR	1/3	1/2	1	2	2	**PR**	(1/5, 1/3, 1)	(1/3, 1/2, 1)	(1, 1, 1)	(1, 2, 3)	(1, 2, 3)
M	1/2	1/2	1/2	1	3	**M**	(1/3, 1/2, 1)	(1/3, 1/2, 1)	(1/3, 1/2, 1)	(1, 1, 1)	(1, 3, 5)
SR	1/3	1/2	1/2	1/3	1	**SR**	(1/5, 1/3, 1)	(1/3, 1/2, 1)	(1/3, 1/2, 1)	(1/5, 1/3, 1)	(1, 1, 1)

Table 5: Pairwise Comparison Matrix for Sub-criteria of Resources

Pairwise Comparison Matrix of AHP						Pairwise Comparison Matrix of FAHP					
	R1	**R2**	**R3**	**R4**	**R5**		**R1**	**R2**	**R3**	**R4**	**R5**
R1	1	2	2	1	2	**R1**	(1, 1, 1)	(1, 2, 3)	(1, 2, 3)	(1, 1, 3)	(1, 2, 3)
R2	1/2	1	2	2	2	**R2**	(1/3, 1/2, 1)	(1, 1, 1)	(1, 2, 3)	(1, 2, 3)	(1, 2, 3)
R3	1/2	1/2	1	2	2	**R3**	(1/3, 1/2, 1)	(1/3, 1/2, 1)	(1, 1, 1)	(1, 2, 3)	(1, 2, 3)
R4	1	1/2	1/2	1	2	**R4**	(1/3, 1, 1)	(1/3, 1/2, 1)	(1/3, 1/2, 1)	(1, 1, 1)	(1, 2, 3)
R5	1/2	1/2	1/2	1/2	1	**R5**	(1/3, 1/2, 1)	(1/3, 1/2, 1)	(1/3, 1/2, 1)	(1/3, 1/2, 1)	(1, 1, 1)

Table 6: Pairwise Comparison Matrix for Sub-criteria of Outputs

Pairwise Comparison Matrix of AHP							Pairwise Comparison Matrix of FAHP					
	O1	**O2**	**O3**	**O4**	**O5**	**O6**		**O1**	**O2**	**O3**	**O4**	**O5**
O1	1	1	2	1	1	2	**O1**	(1, 1, 1)	(1, 1, 3)	(1, 2, 3)	(1, 1, 3)	(1, 1, 3)
O2	1	1	2	2	2	2	**O2**	(1/3, 1, 1)	(1, 1, 1)	(1, 2, 3)	(1, 2, 3)	(1, 2, 3)
O3	1/2	1/2	1	2	2	2	**O3**	(1/3, 1/2, 1)	(1/3, 1/2, 1)	(1, 1, 1)	(1, 2, 3)	(1, 2, 3)
O4	1	1/2	1/2	1	2	3	**O4**	(1/3, 1, 1)	(1/3, 1/2, 1)	(1/3, 1/2, 1)	(1, 1, 1)	(1, 2, 3)
O5	1	1/2	1/2	1/2	1	2	**O5**	(1/3, 1, 1)	(1/3, 1/2, 1)	(1/3, 1/2, 1)	(1/3, 1/2, 1)	(1, 1, 1)
O6	1/2	1/2	1/2	1/3	1/2	1	**O6**	(1/3, 1/2, 1)	(1/3, 1/2, 1)	(1/3, 1/2, 1)	(1/5, 1/3, 1)	(1/3, 1/2, 1)

Table 7: Pairwise Comparison Matrix for Sub-criteria of Process

Pairwise Comparison Matrix of AHP					Pairwise Comparison Matrix of FAHP				
	PR1	**PR2**	**PR3**	**PR4**		**PR1**	**PR2**	**PR3**	**PR4**
PR1	1	1	1	2	**PR1**	(1, 1, 1)	(1, 1, 3)	(1, 1, 3)	(1, 2, 3)
PR2	1	1	1	1	**PR2**	(1/3, 1, 1)	(1, 1, 1)	(1, 1, 3)	(1, 1, 3)
PR3	1	1	1	2	**PR3**	(1/3, 1, 1)	(1/3, 1, 1)	(1, 1, 1)	(1, 2, 3)
PR4	1/2	1	1/2	1	**PR4**	(1/3, 1/2, 1)	(1/3, 1, 1)	(1/3, 1/2, 1)	(1, 1, 1)

Table 8: Pairwise Comparison Matrix for Sub-criteria of Management

	Pairwise Comparison Matrix of AHP					
	M1	**M2**	**M3**	**M4**	**M5**	**M6**
M1	1	1	2	2	2	2
M2	1	1	2	1	2	2
M3	1/2	1/2	1	2	1	2
M4	1/2	1	1/2	1	2	2
M5	1/2	1/2	1	1/2	1	1
M6	1/2	1/2	1/2	1/2	1	1
	Pairwise Comparison Matrix of FAHP					
	M1	**M2**	**M3**	**M4**	**M5**	**M6**
M1	(1, 1, 1)	(1, 1, 3)	(1, 2, 3)	(1, 2, 3)	(1, 2, 3)	(1, 2, 3)
M2	(1/3, 1, 1)	(1, 1, 1)	(1, 2, 3)	(1, 1, 3)	(1, 2, 3)	(1, 2, 3)
M3	(1/3, 1/2, 1)	(1/3, 1/2, 1)	(1, 1, 1)	(1, 2, 3)	(1, 1, 3)	(1, 2, 3)
M4	(1/3, 1/2, 1)	(1/3, 1, 1)	(1/3, 1/2, 1)	(1, 1, 1)	(1, 2, 3)	(1, 2, 3)
M5	(1/3, 1/2, 1)	(1/3, 1/2, 1)	(1/3, 1, 1)	(1/3, 1/2, 1)	(1, 1, 1)	(1, 1, 3)
M6	(1/3, 1/2, 1)	(1/3, 1/2, 1)	(1/3, 1/2, 1)	(1/3, 1/2, 1)	(1/3, 1, 1)	(1, 1, 1)

Table 9: Pairwise Comparison Matrix for Sub- criteria of Social Responsibility

Pairwise Comparison Matrix of AHP			Pairwise Comparison Matrix of FAHP		
	SR1	**SR2**		**SR1**	**SR2**
SR1	1	1	**SR1**	(1, 1, 1)	(1, 1, 3)
SR2	1	1	**SR2**	(1/3, 1, 1)	(1, 1, 1)

The consistency rates that were calculated using both Excel and the Super Decisions 2.8 package program are presented in Table 10. The consistency rates of higher than 0.1 indicated that the matrices were consistent.

Table 10: The Consistency Rates of Pairwise Comparison Matrix

Main Criteria	Solution of Excel	Solution of Super Decisions
R	0,0719	0,0703
O	0,0668	0,0661
PR	0,0537	0,0536
M	0,0227	0,0227
SR	0,0370	0,0353

After evaluating the matrices, the fuzzy matrices were created for the relevant criteria and sub-criteria using triangular fuzzy numbers. Further, Chang's order analysis method was employed to determine the importance ratings and weights of the criteria, and the observations are presented in Table 11.

According to Table 11, resources are considered to be the most important criterion among the main criteria. It was followed by the outputs, processes, management, and social responsibility criteria. The most important sub-criteria are the "accessibility of port equipment and facilities", "availability and adequacy of port equipment and facilities," and "ensuring stability in port fees."

4.6. Port service design with fuzzy quality function deployment

After the importance ratings of the customer requirements are determined using the FAHP, the planning matrix that is located to the right of the house of quality should be created. The planning matrix contains columns denoting the status of satisfaction of the customer requirements for P1 and its rivals, P8 and P13, their target values, improvement rates, points of sale, raw weights, and normalized raw and relative weights. After this stage, the technical requirements that were required for satisfying the requirements of each customer were identified using the quality team. Further, 23 customer requirements and 26 technical requirements on which the quality team agreed are presented in Table 12.

Table 11: Weight of Criteria

Main Criteria	Sub -Criteria	Local Weight	Global Weight	Ranking
R (0,281)	R1	0,248	0,070	1
	R2	0,240	0,067	2
	R3	0,211	0,059	3
	R4	0,180	0,051	6
	R5	0,121	0,034	13
O (0,222)	O1	0,188	0,042	9
	O2	0,205	0,045	8
	O3	0,182	0,040	11
	O4	0,182	0,040	11
	O5	0,141	0,031	15
	O6	0,102	0,023	17
PR (0,194)	PR1	0,284	0,055	5
	PR2	0,256	0,050	7
	PR3	0,284	0,055	5
	PR4	0,176	0,034	13
M (0,191)	M1	0,213	0,041	10
	M2	0,202	0,038	12
	M3	0,178	0,034	13
	M4	0,171	0,033	14
	M5	0,132	0,025	16
	M6	0,105	0,020	18
SR (0,112)	SR1	0,500	0,056	4
	SR2	0,500	0,056	4

Further, the relation matrix was created for connecting the customer requirements with technical requirements, and the priority status of technical requirements was determined. After the raw and relative importance weights of technical requirements were calculated, the present status of the ports in terms of technical requirements was evaluated, and the target values were specified. Finally, the correlation matrix was created, and positive or negative relation levels were identified among the technical requirements. All parts of the house of quality that have been described so far are presented in Figure 5.

Table 12: Technical Requirements

Customer Requirements		Technical Requirements
R	**R1**	Connection with transport modes of port (Highway, airway, railway, waterway and pipelines) (TR1)
	R2	Standards-compliant facilities and equipment (TR2)
	R3	Ceiling and floor price application in port fees (TR3) Connecting to contract of port fees (TR4)
	R4	Automation system suitable to load diversity and adequacy of system (TR5)
	R5	Dock structure and number in port (TR6)
O	**O1**	Competence and sufficiency of employees (TR7) Information and processing speed between units (TR8)
	O2	Planning of load handling operations (Docks, equipment, workforce planning) (TR9)
	O3	Standardization of services (Regulating of service standards) (TR10)
	O4	An effective security system (TR11) Insurance system (TR12)
	O5	An effective inspection and control system (TR13)
	O6	24 hours service (TR14)
PR	**PR1**	Training in customer relations of employees (TR15) Internal customer satisfaction (TR16)
	PR2	Accessibility to authorized personnel (TR17)
	PR3	Customer relationship management (Collection of customer information, consideration of complaints and suggestions) (TR18)
	PR4	An effective information technology infrastructure (TR19)
M	**M1**	An effective information technology infrastructure (TR19)
	M2	Efficient use of land, lobar, tools, etc. resources of port (TR20)
	M3	All managers and employees have the necessary experience and professional qualifications (TR21)
	M4	The activities carried out with the customers (TR22)
	M5	Service quality and satisfaction surveys (TR23)
	M6	Continuous improvement and total quality management (TR24)
SR	**SR1**	Corporate social responsibility activities (TR25)
	SR2	Green Port (Eco Port) certificate and ISO 14001 environmental management systems (TR26)

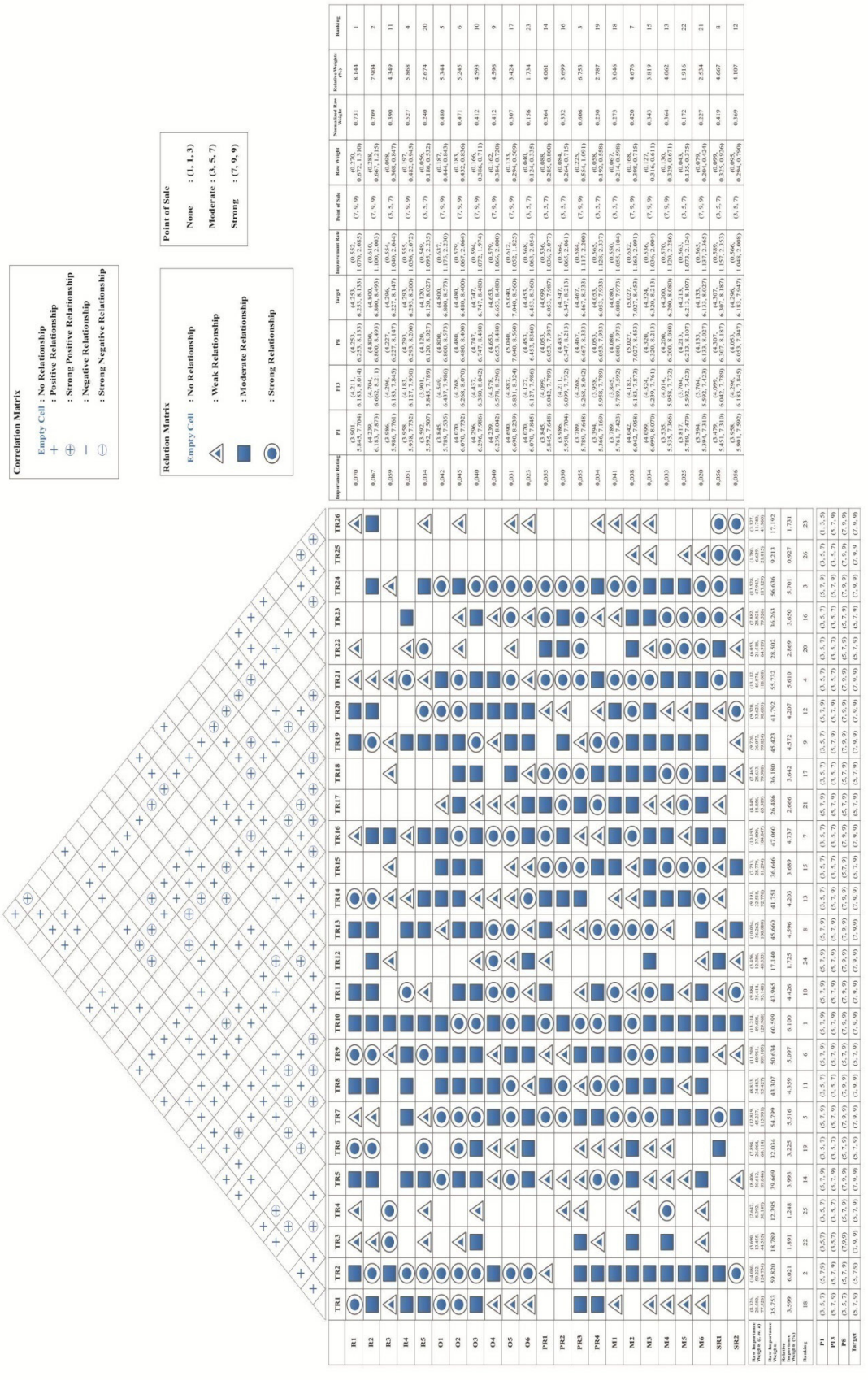

Figure 5: House of Quality

According to Figure 5, *the accessibility of port equipment and facilities, the availability and adequacy of port equipment and facilities, and the assurance of stability in port fees* are the customer requirements with the highest level of importance while *the continuous and customer-oriented improvement of work processes* is the customer requirement with the lowest level of importance. According to the planning matrix, the initial three most important requirements that would ensure customer satisfaction are *the accessibility of port equipment and facilities, the availability and adequacy of port equipment and facilities, and the knowledge of customer requirements* while the requirements with the lowest level of importance are listed as *suitability of the provision of services in terms of time and place, the reception of feedback from customers, and the continuous and customer-oriented improvement of work processes*. Based on the planning matrix, P13 exhibited a low performance with respect to *the reception of feedback from customers*, and the P13 and P8 ports performed better than the P1 port in terms of all the other requirements.

The observations have demonstrated that P1 failed to satisfy the customer requirements. The most important reasons for this failure were observed to be *the shortcomings regarding the accessibility of port equipment and facilities, the availability and adequacy of port equipment and facilities, and the knowledge of customer requirements*; further, the most important requirements that would ensure customer satisfaction were identified to be *the standardization of services, standard-compliant facilities and equipment, and continuous improvement and total quality management*. In accordance with these observations, the improvement rates and target values were determined for P1, and P1 was also evaluated in terms of each technical requirement. When compared to P13 and P8, P1 was lower than the target values in all technical requirements except for the *standards-compliant facilities and equipment, the planning of cargo handling operations*, and *the availability of authorized personnel*.

The relation matrix of the house of quality in Figure 5 indicates that the technical requirement that was most frequently associated with customer requirements was *the error-free conduct of operations in the port*. This technical requirement was followed by *the timely loading/unloading of cargo in the port, the attitudes and behaviors of port personnel in meeting customer requirements, the ability to use information technologies, such IT and EDI, in port operations, and the efficiency of the port operator and management*. In the technical evaluation matrix of the house of quality, each port among P1, P13, and P8 was separately evaluated against each technical requirement, and the target values were identified by comparing the current status of P1 with that of P13 and P8. In this context, P1 was found to achieve target values for the technical requirements for *standards-compliant facilities and equipment, the planning of cargo handling operations, and the availability of authorized personnel* but failed in terms of all other technical requirements. According to the correlation matrix that formed the final stage of the house of quality, positive and strongly positive relations were identified among the technical requirements, and it was concluded that the technical requirements supported each other.

5. CONCLUSION

The maritime transport sector should be treated from a holistic perspective to elicit its benefits, particularly because a significant proportion of global trade is performed through it. Because the port operators form the backbone of the maritime transport and, at the same time, are major players in this sector, the factors, such as adequacy, quality, effectiveness, and the efficiency of the services that are provided by them, are becoming increasingly important. Ineffective and inefficient port activities may lead to increased costs, loss of competitive edge, and customer dissatisfaction. The ports operating in national and international markets must adapt to the changes in economic, social, and cultural life and improve the quality of their services to survive. In this context, the port operators should consider the service design and presentation that considers the customer requirements to be essential.

To support the port operators for change and self-improvement, this study has developed a customer-oriented service design proposal for the inefficient port P1. The observations indicated that the port in question performed poorly in satisfying the customer requirements and achieving the target values when compared to its rivals. To provide quality services, P1 should make improvements in terms of its equipment, facilities, technological infrastructure, handling operations, and skilled personnel and comply with the green port standards for minimizing the environmental and noise pollution, harmful gas emissions, accidents, and other such adversities that may emerge during operations.

Further, the limitations of this study should be considered to accurately construe its results in a beneficial manner. The first limitation is that a perceived service

quality scale that is extensively accepted in national and international literature has been used to identify the customer requirements; further, the statements in this scale were considered to be customer requirements. Another limitation is that only the most important technical requirements were included in the study. Indeed, the inclusion of all the technical requirements would result in large matrices, further complicating the decision-making processes. The third limitation is that part of the data that were used in the methods employed by this study relied on the subjective opinions of customers and experts. Therefore, it should be remembered that another study in another port may yield different results depending on the selected experts and customers. The final limitation is that this study was performed in a port having the lowest efficiency rating because of cost and time restrictions; further, the results cannot be generalized for other port operators.

In this study, the requirements of the port customers was determined by using Thai (2008)'s service quality scale. However, consumer requirements can be determined by other methods. Also, a consumer requirements scale can be developed instead of the using a preset scale. Further, the port service should be designed by using all the stages of QFD. Besides numerous service design techniques such as Failure Mode and Effects Analysis (FMEA), Service Mapping (SM) and Creative Problem Solving (CPS) including FQFD can be used in the further studies.

References

Akbaba, A., 2005. The quality function deployment (QFD) approach in customer focused service production: An application study for hospitality industry", Anatolia, Journal of tourism Research, 16,1, 59-81.

Baird, A.J., 1995. Privatisation of trust ports in The United Kingdom: Review and analysis of the first sales. Transport Policy. 2, 2, 135-143.

Bakirci, F., 2006. Üretimde etkinlik ve verimlilik ölçümü, veri zarflama analizi teori ve uygulama. İstanbul: Atlas Yayınları, 1. Baskı.

Becker, A., Inoue, S., Fischer, M., Schwegler, B., 2011. Considering climate change: A survey of global seaport administrators. CIFE Working Paper WP128, Stanford University, 1-69.

Bevilacqua, M., Ciarapica, F.E., Marchhetti, B., 2012. Development and test of a new fuzzy- QFD approach for characterizing customers rating of extra virgin olive oil. Food Quality and Preference. 24, 75- 84.

Bottani, E., Rizzi, A., 2006. Strategic management of logistics service: A fuzzy QFD approach. International Journal of Production Economics. 103, 585-599.

Branch, A. E., 1986. Elements of port operation and management. London, Chapman and Hall.

Buyukozkan, G., Feyzioglu, O., Ruan, D., 2007. Fuzzy group decision-making to multiple preference formats in Quality Function Deployment. Computers in Industry. 58, 392- 402.

Byrne, B.M., 2010. Structural equation modeling with AMOS, basic concepts, applications and programming. Taylor Francis Group, 2. Edition, LLC.

Chamzini, A.Y., Yakhchali, S.H., 2012. Tunnel boring machine (TBM) selection using fuzzy multicriteria decision making methods. Tunnelling and Underground Space Technology, 30, 194-204.

Chan, F.T.S., Kumar, N., 2007. Global supplier development considering risk factors using fuzzy extended ahp-based approach. Omega The International Journal of Management Science. 35, 417-431.

Chang, D.Y., 1996. Applications of the extent analysis method on fuzzy AHP. European Journal of Operational Research. 95, 649-655.

Charnes, A., Cooper, W.W., Lewin, A.Y., Seiford, L.M., 1994. Data envelopment analysis: Theory, methodology and application. Springer Science +Business Media, LLC.

Cooper, W.W., Li, S., Seiford, L.M., Tone, K., Thrall, R.M., Zhu, J., 2001. Sensitivity and stability analysis in DEA: Some recent developments. Journal of Productivity Analysis. 15, 217-246.

Cooper, W.W., Seiford, L., M., Tone, K., 2007. Data envelopment analysis, A comprehensive text with models, applications, references and DEA-solver software. Springer Science, Business Media, LLC. Second Edition.

Cooper, W.W., Seiford, L.M., Zhu, J., 2004. Handbook on data envelopment analysis, Kluwer Academic Publishers.

Costa, A.I.A., Dekker, M., Jongen, W.M.F., 2001. Quality function deployment in the food industry: A review. Trend in Food Science & Technology. 11, 306-314.

Day, R.G., 1998. Quality function deployment: Integration of a company with its customers. ASQC Quality Press Milwaukee, Wisconsin.

Deng, H., 1999. Multicriteria analysis with fuzzy pairwise comparison. International Journal of Approximate Reasoning. 21, 215-231.

Ding, J. F., 2009. Applying fuzzy quality function deployment (QFD) to identify solutions of service delivery system for port of Kaohsiung, Qual Quant, 43, 553-570.

Duru, O., Huang, S. T., Bulut, E., 2013. Multi-layer quality function deployment (QFD) approach for improving the compromised quality satisfaction under the agency problem: A 3D QFD design for the asset selection problem in the shipping industry, Qual Quant, 47, 2259–2280.

Dyson, R.G., Allen, R., Camanho, A.S., Podinovski, V.V., Sarrico, C.S., Shale, E.A., 2001. Pitfalls and protocols in DEA. European Journal of Operational

Ertugrul, I., Karakasoglu, N., 2008. Comparison of fuzzy AHP and fuzzy TOPSIS methods for facility location selection. Int. J. Adv. Manuf Technol. 39, 783-795.

Esmer, S., Cetin, C.K., 2016. Liman işletme yönetimi, in: Güldem Cerit, Ali Deveci ve Soner Esmer (eds.), Denizcilik İşletmeleri Yönetimi. Beta Basım A.Ş., İstanbul: 2.Basım, 377-416.

Ficalora, J.P., Cohen, L., 2010. Quality function deployment and sıx sıgma: A QFD Handbook, Pearson Education. Inc, Second Edition, Boston.

Golany, B., Roll, Y., 1989. An application procedure for DEA. Omega. 17, 3, 237-250.

Han, S.B., Chen, S.K., Ebrahimpour, M., Sodhi, M., 2001. A conceptual QFD planning model. International Journal of Quality & Reliability Management. 18, 8, 796-812.

Hsu, W. K. K., 2013. Improving the service operations of container terminals, The International Journal of Logistics Management, 24, 1, 101-116.

Huang, C.C., Chu, P.Y., Chiang, Y.H., 2008. A fuzzy AHP application in government-sponsored R&D project selection. Omega. 36, 6, 1038-1052.

Huang, S.T., Bulut, E., Duru, O., 2015. Service quality assessment in liner shipping industry: an empirical study on Asian shipping case, Int. J. Shipping and Transport Logistics, 7, 2, 221-242.

Huang, S.T., Bulut, E., Duru, O., 2019. Service quality evaluation of international freight forwarders: an empirical research in East Asia, Journal of Shipping and Trade, 4, 14,1-16.

Jeong, M., Oh, H., 1998. Quality function deployment: An extended framework for service quality and customer satisfaction in the hospitality industry, hospitality industry. Hospitality Management. 17, 375-390.

Kahraman, C., Cebeci, U., Ruan, D., 2004. Multi-attribute comparison of catering service companies using fuzzy AHP: The case of Turkey. Int. J. Production Economics. 87, 171-184.

Khoo, L., P., Ho, N.C., 1996. Framework of a fuzzy quality function deployment system. Int. J. Prod. Res. 34, 2, 299-311.

Liu, H.T., 2009. The extension of fuzzy QFD: From product planning to part deployment. Expert Systems With Applications. 36, 11131-11144.

Mangan, J., Lalwani, C., Fynes, B., 2008. Port- Centric Logistics. The International Jounal of Logistics Management. 19, 1, 29- 41.

Nakip, M., 2013. Pazarlamada araştırma teknikleri. Ankara: Seçkin Yayıncılık, 3. Baskı.

Ramanathan, R., 2003. An ıntroduction to data envelopment analysis: A tool for performance measurement, New Delhi: Sage Publications.

Rao, R.V., 2008. Evaluating flexible manufacturing systems using a combined multiple attribute decision making method. International Journal of Production Research. 46, 1, 1975-1989.

Razik, M. A., Tahar, R. M., Hasrulnizzam, W., Mahmood, W., Rozar, N., M., 2015. Integrated Quality Function Deployment (QFD) Model for Dry Bulk Terminal Improvements (DBTI) in Malaysian Ports, Journal of Economics, Business and Management, 3, 4, 413-416.

Schermelleh-Engel, K., Moosbrugger, H., Müller, H., 2003. Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. Methods of Psychological Research. 8, 2, 23-74.

Tahar, R.M., Hussain, K., 2000. Simulation and analysis fort he Kelang container terminal operations. Logistics Information Management. 13, 1, 14-20.

Thai, V.V., 2008. Service quality in maritime transport: Conceptual model and empirical evidence. Asia Pacific Journal of Marketing and Logistics. 20, 4, 493-518.

TURKLIM, Türkiye Liman İşletmecileri Derneği 2010. Türk Limancılık Sektörü Raporu. 1-182.

UNCTAD, United Nations Conference on Trade and Development 1992, Review of Maritime Transport, available at: http://unctad.org/en/PublicationsLibrary/rmt1992_en.pdf (accessed 9 May 2016).

Weber, C.A., 1996. A data envelopment analysis approach to measuring vendor performance. Supply Chain Management. 1, 1, 28-39.

World Bank 2007. Port reform toolkit, module 3, alternative port management structures and ownership models. available at: https://ppiaf.org/sites/ppiaf.org/files/documents/toolkits/Portoolkit/Toolkit/pdf/modules/03_TOOLKIT_Module3.pdf (accessed 17 February 2017).

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Granger Causal Relationship Between Bond Yield Changes and Equity Returns Through Wavelets Analysis: The Case of Turkey*

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ABSTRACT

This paper re-examines the stock-bond relationship in Turkey by using weekly price observations of stock indices and interest rates over a sample period between 2005-04-01 and 2016-12-30. Considering heterogeneity investment periods, we employed both standard and wavelets methods to provide a deeper understanding. The findings suggest the presence of unit roots in our variables at the level and reveal evidence of the cointegration and a one-way causal relationship in the long-run. Given that the conventional time-domain tests document insignificant results, we employed causality tests on the decomposed series to unearth the true dynamics of causal linkages. Furthermore, the empirical results support the presence of bi-directional causality between the fluctuations in bond yields and equity returns, i.e. they are significant predictors of each other in the medium and long time horizons. The empirical results pertinent to asymmetric causality tests show a one-way causality from the negative shocks in stock prices to the positive shocks in interest rates. Specifically, the results of frequency causality test reveal that the predictive power of the financial index returns on the interest rate changes intensifies across frequencies.

Keywords: Wavelets, symmetric, asymmetric, and frequency causality

1. Introduction

Although it has been long debated, the stock-bond relationship is of great interest because bond yield is one of the major factors for asset valuations, particularly for stock and bond prices. The related literature has produced ambiguous and contradictory results regarding the cointegration and Granger causality of the stock-bond relationship due to the period and variables chosen and methodology employed by researchers. In other words, whether bond yields and equity prices move in the same or the reverse direction is hypothetically unclear since the current literature offers differing opinions on this association. This analysis has been a chief issue in economics and finance since it has significant practical implications for market agents for their asset allocation, risk management, and economy policy decisions. Therefore, our main objective is to study this relationship both at the aggregate and sectoral levels, including both financial and nonfinancial indices, since their valuations are also affected by interest rate movements even though interest rates have varying impacts and significance on their valuations.

In finance theory, many researchers have documented a significantly negative association between the bond yields (short- and long-term) and the equity prices, and it is widely explained by the dividend discount theory in Lynge and Zumwalt (1980), Campbell (1987) and Flannery and James (1984). Along with the correlation, the stock-bond relationship is also investigated in terms of cointegration and causality test using time- and frequency-domain tools. For examples, empirical studies that report causality from bond yields to equity prices are Rahman and Mustafa (1997), Erdem et al. (2005), Gan et al. (2006), Kasman et al. (2011), Jawaid and Ul Haq (2012), Tiwari (2012), and Chia and Lim (2015). The papers that find causality from stock

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prices to interest rates are Wong et al. (2006), Acikalin et al. (2008), Mohanamani and Sivagnanasithi (2012), and Özer and Kamisli (2015). Furthermore, Wongbangpo and Sharma (2002), Çifter and Özün (2008), Jammazi et al., (2017), and Hui et al. (2017) reveal causality in both directions. However, Muradoglu et al. (2000), Bhattacharya and Mukherjee (2002), Türkyilmaz and Özata (2009), Forson and Janrattanagul (2014), Coşkun et al. (2016), and Alam and Rashid (2014) report no causality in neither direction. On the other hand, the studies that include cointegration results are Chan et al. (1997), Das (2005), and Humpe and Macmillan (2009). Chan et al. (1997) document insignificant cointegration results and assert that the tactical allocation strategy holds since the debt and capital markets do not move in tandem in the long-term.

This study stems from the necessity to offer a deeper understanding of the stock-bond relationship given that the current literature has produced ambiguous and contrasting results regarding the cointegration and causality of the two variables using only time-based methods. Specifically, we investigate whether or not a significant relationship exists over different time scales, and if so, measure the contribution of these time horizons to the overall causal interaction. The existence of the frequency-based relationship across different time horizons requires the need for active portfolio management and tactical asset allocation to minimize the portfolio's risk but maximize its return, and it is therefore of importance to implement both time and frequency domain analysis of the stock-bond linkages for their optimal portfolio decision. The findings reveal that our variables have a unit root with the conventional tests, whereas six out of them become stationary with the test of Lee and Strazicich (2003) at log-level. According to the Hatemi-J (2008) test, it is found that the null of a long-run relationship between the bond yields and equity indices cannot be rejected. Further, the findings of the VECM test provide significant unilateral short-run causality from the bond yields to BIST Holding and Investment, and one-way long-run causalities to BIST Financials, BIST Holding and Investment, BIST Textile Leather, BIST Tourism, and BIST Transportation indices. The results of the conventional causality approach demonstrate that the changes in bond yields are a reliable indicator of future growth in the stock indices in the time domain, but the wavelet-based findings reveal that the Granger causality goes in both directions in the higher scales, i.e., mid- long-term. Similarly, the findings of Breitung and Candelon (2006) method yields significant results that the changes in interest rates seem to appear Granger-causes both financial and nonfinancial stock index returns at significance level. Unsurprisingly, stock indices that have the most consistent significant power on the movement at different frequency intervals in interest rates are the financial indices. In addition, we find that the positive shocks from the interest rates Granger-cause the negative shocks in the financial indices and the negative shocks of twenty out of twenty-five index returns cause positive innovations in the bond yields. Overall, our empirical findings not only mostly consistent with the current theory and evidence on the equity-bond relationship but also provide a reliable time scale interpretation of the interaction, which is not achievable with standard analyzing tools.

This study proceeds as follows. In section 2, we give a brief literature overview of the equity-bond relationship. Section 3 introduces wavelets and unit root, cointegration, and causality tests, respectively. Section 4 presents the summary statistics for weekly variables from April 1, 2005, to December 30, 2016, and the empirical findings for Turkey. Lastly, section 5 offers concluding remarks for investors and policymakers and recommendations on future studies.

2. Literature Review

Çifter and Özün (2008) investigate the causal impacts of bond rate movements on equity prices using wavelets for Turkey. The sample period starts on January 2, 2003 and ends on February 22, 2006, of which sample size is 760 daily observations. The findings show that both variables in Turkey move in tandem in the long-run, and a one-way causal connection running from the equity prices to the bond rates over time exists. Applying causality tests to the decomposed series; however, they (2008) reveal that also a causal link from the bond rate changes to the share returns emerges. At shorter investment horizons corresponding to [1-8] days, the null hypothesis of no causation cannot be rejected; however, at medium and long scales, the changes in interest rates were found to lead the stock price movements beyond the third scale. Their empirical evidence, overall, showed that the bond rates had considerable long-term impacts on the equity prices, and market agents are recommended to follow the bond market volatilities for their investment and risk management decisions. In a different paper, Özün and Çifter (2006) assert a significant cointegration between the interest rates and stock index, XBANK, using 1145 daily observations for Turkey. The findings showed evidence of significant short- and long-term

causality running from the interest rates to the banking index. By decomposing prices into different time scales, the null hypothesis of no short- and long-term causality strongly rejected at scales of d1, d2, d3, and d6.

In his paper, Tiwari (2012) analyzes the causal relationships between monthly equity prices and bond rates through the wavelet coherence approach in India over the sample period between 1990-M01 and 2009-M03. The results reveal that the interest rates have reciprocal causal relations with the Indian stock market, which intensifies over frequency and periods. Kumar and Puja (2012) report that the VECM results support the existence of unilateral long-run causality from the interest rate to the equity price over the sample period 1994M04–2011M06 in India. In a related paper, Andrieş et al. (2014) found significant connections among the monthly observations of stock prices, interest, and exchange rates (REER) in India through the wavelet coherence approach. The paper presents evidence of a significant relationship, i.e., both the bond and exchange rate fluctuations lead the equity price movements.

To study the dynamic equity-bond comovement, Jammazi et al. (2015) employ a time-varying DCC-GARCH model. The data set includes 16 developed countries and covers the sample period between January 1993 and April 2013. The findings of this paper provide a time-dependant stock-bond comovement pattern for most countries, i.e., the association switches sign from positive (in the 1990s) to negative since early 2006, implying a flight-to-quality fact. However, an affirmative bond-stock relationship is detected since late 2009 as a consequence of the debt crisis in Europe. Furthermore, they (2015) find out that the stock-bond comovement is the same both in the bearish and bullish markets, therefore, propose investors and portfolio managers to consider the time-varying character of the bond-equity relationship for their risk and portfolio management decisions.

By using monthly observations, Jawaid and Ul Haq (2012) investigate the effects of the exchange and bond rates on the volatilities of the equity market over the sample period 2004:01 and 2010:12. They (2012) report evidence of significant cointegration and unidirectional causality between the short-term bond yields and the equity price in Pakistan. Investors are suggested to follow the fluctuations in the foreign exchange and the short-term bond rates before investment decisions on the banking industry since these two variables are influential factors in predicting future stock returns. The findings of the Barakat et al. (2015) paper, on the other hand, provide bidirectional causal relationships between the bond rates and equity prices in Tunisia and Egypt.

The objective of Amata et al. (2016) paper is to investigate the association between macroeconomic variables, investor herding behavior, and equity market volatility over the sample period 2001:01 and 2014:12, for a total of 167 monthly observations. They (2016) found significant support of the effect of the T-bill rate on the equity market volatility to be significantly positive. The finding of VECM presents evidence of short-term causality between the bond rates and the volatility in the NASI index at a 10% significance level. They (2016) recommend a strict monetary policy and control of factors causing significant variations on the inflation rate and suggests a closely following the interest rate policy.

Coşkun et al. (2016) examine the macroeconomic variables–stock price relationship through impulse response function and causality test. The whole sample includes a total of 129 monthly observations of the interest rate, the exports, the imports, exchange rate, index of industrial production, gold price, and stock prices and covers the period 2005M01–2015M09. Evidence published in the paper purports unidirectional linear causalities running from XU100 to the industrial production, the exports, and imports, whereas a unique direction of causality running from the exchange rate to XU100 is indicated. There is no, however, a definitive pattern of interaction between XU100 and the interest rates. Furthermore, a one standard deviation shock to the interest rates (XU100) causes significant decreases in XU100 (the interest rates) for three periods.

Sensoy and Sobaci (2014) examined the dynamic relationship between the interest rates, exchange rates, and stock market in Turkey using daily observations data. The data covers the period from 2003-01-02 to 2013-09-05. The authors (2014) found out a significantly negative relationship between the stock market returns and the interest rate changes, supporting the theory of discounting dividends in stock price calculations. Besides, they (2014) revealed that its domestic problems did not cause the source of the upward volatility shifts observed in Turkey, indicating that the markets in Turkey were not immune to global political, economic, and financial conditions. Therefore, there was no need to take any reaction by the policymakers to prevent a long run contagion between the capital and money markets since the result with or without unexpected and severe interventions would be the same. The

empirical results of Li et al. (2017) report a significantly negative relationship between stock prices and real interest rates in the long run in Malaysia. They (2017) identify a two-way short-run causal relationship between stock prices and real interest rates as well as portfolio investment flows and real interest rates, indicating that there exists a strong affiliation between the stabilities of the stock market and the interest rate.

The aim of Poyraz and Tepeli (2014) paper was to study the relationship between macroeconomic variables including inflation, money supply, gold prices, bond yields, and industrial production and stock prices over the period December 1995 to November 2011, for a total of T = 192 monthly observations for each variable. They (2014) provided evidence of bidirectional linear causalities between XU100 and interest rates at lags of 1 and 9 at the 10% significance level. Further, the paper found a unidirectional causal relationship running from the stock returns to the interest rate changes at 3, 6, and 12 monthly lags, i.e., share returns were found to exert significant lagged influences on the interest rates. Similar results are obtained by Aktaş and Akdağ (2013), who found strong evidence of the bidirectional causality between the deposit interest rate and the capacity utilization rate with stock market prices. Besides, the current value of inflation rate, exchange rates, and consumer confidence index was found to predict the future directions of the stock prices but not the other way around.

Özer and Kamisli (2015) investigated the causal relationship between the weekly data of macroeconomic factors and stock market index, XU030, over the sample period 2003-2015 using both the time and frequency-domain method for Turkey case. The empirical findings pertinent to the Breitung and Candelon (2006) frequency causality test show that there exists a unilateral causal relationship between medium and long-term. As dictated by the authors (2015), the reasons behind the no causality from interest rates to stock market are (i) phenomenal over-subscription of new issues, (ii) the booming stock market and (iii) controlling the interest rates, of which have significantly negative impacts on liquidity.

With the wavelet method, Moya-Martínez et al. (2015) studied the stock-bond market relationship at the industry level over the period 1993:01–2012:12 for Spain. The empirical findings reveal that the stock indices, particularly the regulated and highly indebted industries, are influenced significantly but negatively and at varying magnitudes from the movement interest rates. The results also report a scale-dependent causality between the share returns and the interest rate changes, i.e., the association is weak at shorter, but it becomes stronger and significant at the higher scales. Based on the Granger causality test, the movements in interest rates could be used to predict the stock returns of Technology and Telecom at scales of d1 and d6; Industrials at scales of d5 and d6; Chemicals and Paper at scales of d4, d5, and d6; and Food and Beverages at scales of d3, d4, d5, and d6. The reverse causal relationship holds for Technology and Telecom at scales of d4 and d6; Industrials at scales of d1 and d6; Chemicals and Paper at scales of d5 and d6; and Food and Beverages at scales of d1, d2, d3, and d4. Similarly, the changes in interest rates Granger cause Banking and Financial Services at the lowest frequency (d6), whereas the causality runs in the reverse direction for Banking at scale d4 and d6 and Financial Services at the highest scales. They (2015) suggest that their findings are, in overall, in line with their prior expectations and have substantial theoretical soundness, namely, long-term investors are more likely to follow macroeconomic fundamentals than short-term investors for their investment and risk management decisions, proving that interest rates are one of the key driving force of stock markets.

3. Methodology and Data

This section describes the methodological aspects of the paper, and it begins by presenting a brief review of the wavelets and goes on by a general discussion of the econometric approaches employed in the empirical analysis. To conserve space, however, we discuss only wavelets and the Breitung and Candelon (2006) frequency causality test.

3.1. Wavelets

One of the methodologies used for the paper is wavelets, which enable us to study the causal relationship of bond-stock markets for different time scales, i.e., in the short-, medium-, and long-run. Due to their versatility and convenience of being able to offer both time and frequency information of the underlying data or signal simultaneously, they have received tremendous attention from researchers in recent years. Wavelets, however, are introduced to overcome the limitations of Fourier analysis, of which does not require stationarity, an assumption not valid for most financial and macroeconomic variables, of data and local both in time and frequency through dilatations and translations, respectively. As the name advocates, wavelets are short

or small waves, their admissible function integrates to zero, and grow and die out in the short-time because of having a finite length and oscillatory behavior (Soman et al., 2010).

Ramsey (2014) states that there are two basic wavelets: father $\phi(t)$ and mother $\psi(t)$ wavelet. The latter wavelet (known as the wavelet function) basically is squeezed (dilated) and shifted (translated) to capture the frequency and time information from the underlying time series, namely, it captures all deviations from the trend. This wavelet represents the detailed (high-frequency) parts and integrates to zero. Conversely, the former wavelet (known as the scaling function) integrates to one and reconstructs the smooth and trend (low-frequency) part of the data, namely, it extracts low-frequency components from the raw data. The approximating wavelet functions depending on normalization rules can be expressed as follows

$$\psi_{j,k}(t) = 2^{-\frac{j}{2}}\psi\left(\frac{t-2^j k}{2^j}\right) \quad \& \quad \phi_{J,k}(t) = 2^{-\frac{J}{2}}\phi\left(\frac{t-2^j k}{2^j}\right) \tag{1}$$

where k and $j = 1, \ldots, J$ index the translation and the scale, therefore, $2^j k = a$ and $2^j = b$ are defined as the translation parameters and the measure of the scale, respectively. It is known that the dilation factor b controls the length of the window while a is a measure of the location.

As stated by Gencay et al. (2002), one can disentangle the causal relation on a scale by scale basis which enables us to determine which time scales are contributing to the overall relation through the wavelet analysis in the context of multiresolution analysis (MRA) introduced by Mallat (1989). The MRA analysis gives a chance to obtain a scale-invariant interpretation of the underlying time series by shifting the window from low scales to high scales; therefore, it is possible to see the finest and coarsest details, in a manner of speaking, both the trees and the forest, respectively (Graps, 1995). Daubechies (1992) demonstrate that the transformation process of the MRA is performed through the pyramid (cascade) algorithm. The multiresolution approximation building up an underlying $X(t)$ variable from the coarsest scale downwards up to scale J can be written by the following expression

$$X(t) = S_J(\mathrm{t}) + \sum_{j=1}^{J} D_j(\mathrm{t}) = D_1(t) + \cdots + D_{J-2}(t) + D_{J-1}(t) + D_J(t) + S_J(t) \tag{2}$$

where $D_j = \sum_k d_{J,k}\,\psi_{J,k}(t)$ and $S_J = \sum_k S_{J,k}\,\phi_{J,k}(t)$ with $j = 1, \ldots, J$.. The detailed D_j parameters provide the increments at each resolution level while the parameter, S_J, represents the smooth long-term component (Ramsey, 2014).

In order to obtain wavelet coefficients, the stationary observations are decomposed into several wavelet scales applying the MODWT with the Daubechies [LA(8)] wavelet filter through the R package waveslim introduced by Whitcher (2005). For our study, the MODWT is preferred four this study instead of DWT since, as noted by Percival and Mofjeld (1997), it can handle any sample size, i.e., whether the sample size is dyadic or not, it is translation-invariance, it offers more asymptotically efficient wavelet variance estimator and increased resolution at higher scales due to oversampling the data. The achievable level of MODWT is $9 \leq \log_2(604)$, but the optimal integer decomposition level for the study is determined as *J = 5* since the number of feasible, non-boundary effected, wavelet coefficients decline gradually as scale increases. It should be firmly noted that the multiresolution coefficients generated by the MODWT MRA function are equal to the sample size at each decomposition level. With the periodic boundary condition, it provides five levels of detail components d1+d2+d3+d4+d5 and one smooth component s5 for MODWT MRA and five levels of wavelet components w1+w2+w3+w4+w5 and one scaling component s5 for MODWT. They are corresponding to [2–4) weeks for d1 (w1), [4–8) weeks for d2, [8–16) weeks for d3, [16–32) weeks for d4, [32–64) weeks for d5, and [64<) weeks for s5.

3.2. Breitung and Candelon (2006) Frequency Causality Test

The papers of Granger (1969), Geweke (1982), and Hosoya (1991) are among the pioneers to study the causal relation in the frequency-domain in the last century. Building on these papers, Breitung and Candelon (2006) developed a frequency-domain causality test based on

imposing linear restrictions on the parameters of the bivariate vector autoregressive (VAR) model.

Let $z_t = [x_t, y_t]'$ be a two-dimensional vector of data and $= 1, 2, 3, \ldots, T$. It is also assumed that z_t has a finite-order VAR representation of the following form

$$\Theta(L)z_t = \epsilon_t \;\; \& \;\; \Theta(L) = I - \Theta_1 L - \Theta_2 L^2 - \cdots - \Theta_S L^S \tag{3}$$

where $\Theta(L)$ in Equation (3) is a 2 x 2 lag polynomial with the condition of $L^k z_t = z_{t-k}$. Additionally, the error vector ϵ_t is supposed to be white noise with $E(\epsilon_t) = 0$ and $E(\epsilon_t \epsilon_t') = \Sigma$, where Σ is positive definite.

The linear measure of frequency-based causality relationship at frequency point (ω) as proposed by Geweke (1982) and Hosoya (1991) can be defined as

$$M_{x\to y}(\omega) = \log\left[\frac{2\pi f_X(\omega)}{|\mathcal{F}_{11}(e^{-i\omega})|^2}\right] = \log\left[1 + \frac{|\mathcal{F}_{12}(e^{-i\omega})|^2}{|\mathcal{F}_{11}(e^{-i\omega})|^2}\right] \tag{4}$$

where $M_{x\to y}(\omega)$ and $f_X(\omega)$ is a sign of the causality at a frequency (ω) and spectral density of X_t, respectively. If the condition of $|\mathcal{F}_{12}(e^{-i\omega})| = 0$ holds, then $M_{Y\to X}(\omega)$ measure becomes zero, namely, at frequency point of (ω), x_t, does not cause y_t.

Breitung and Candelon (2006) state their method is based on the linear restriction in the following Equations

$$\sum_{k=1}^{S} \Theta_{12,k} \sin(k\omega) = 0 \qquad \& \qquad \sum_{k=1}^{S} \Theta_{12,k} \cos(k\omega) = 0 \tag{5}$$

Next, the necessary VAR Equation for the variable, y_t, is written as

$$y_t = \mu_1 y_{t-1} + \cdots + \mu_k y_{t-k} + b_1 x_{t-1} + \cdots + b_k x_{t-k} + \epsilon_{1t} \tag{6}$$

Holding the following conditions

$$b = [b_1, b_2, \ldots, b_k]'$$

$$M(\omega) = \begin{bmatrix} \cos(\omega) & \cos(2\omega) & \cos(3\omega) & \cos(4\omega) & \cdots & \cos(k\omega) \\ \sin(\omega) & \sin(2\omega) & \sin(3\omega) & \sin(4\omega) & \cdots & \sin(k\omega) \end{bmatrix}$$

Then, the null hypothesis $M_{x\to y}(\omega) = 0$ being equal to the linear restriction can be described as

$$H_0: M(\omega)b = 0 \tag{7}$$

For the linear restrictions entailed by Equation (7), the authors (2006) assert that the null hypothesis of non-causality at (ω) point is tested by employing a standard F test approximately distributed as $F(2, N - 2k)$ for $\omega \in (0, \pi)$ for .

3.3. Data

Our data consist of Turkey two-year government bond yields (TR2YGB) and the aggregate stock market (Bist100, XU100); the financials (BIST Financials, XUMAL, BIST Banks, XBANK, BIST Leasing & Factoring, XFINK, BIST Real Estate Investments Trusts, XGMYO, BIST Holding and Investment, XHOLD, and BIST Insurance, XSGRT); the industrials (BIST Industrials, XUSIN, BIST Food Beverage, XGIDA, BIST Wood Paper Printing, XKAGT, BIST Chemical Petrol Plastic, XKMYA, BIST Basic Metal, XMANA, BIST Metal Products Machinery, XMESY, BIST Nonmetal Min. Product, XTAST, and BIST Textile

Leather, XTEKS); the services (BIST Services, XUHIZ, BIST Electricity, XELKT, BIST Telecommunication, XILTM, BIST Sports, XSPOR, BIST Wholesale and Retail Trade, XTCRT, BIST Tourism, XTRZM, BIST Transportation, XULAS), the technology (BIST Technology, XUTEK and BIST Inf. Technology, XBLSM), and the BIST Investment Trust (XYORT) indices. The data on prices for the sample period was obtained from the CBRT Bloomberg Terminal and the Borsa Istanbul A.Ş database, EVDS, and the sample period starts in the 1st week of April 2005 and ends in the 4th week of December 2016, with a total of 605 observations.

For our analysis, all variables are converted into natural logarithms to remedy potential heteroskedasticity problems. The weekly continuously compounded returns are calculated as $r_t = \log(F_t/F_{t-1})$ where F_t is the weekly closing price. Table 1 reveals the summary statistics results for the underlying data.

Table 1: Descriptive Statistic for Return Series

Variables	Mean	SD	Min	Max	Skewness	Kurtosis	JB	n
RTR2YGB	-0.0010	0.0339	-0.1361	0.1953	0.7012	6.9793	447.99***	604
RXU100	0.0018	0.0380	-0.1927	0.1576	-0.4538	5.1638	138.56***	604
RXUMAL	0.0017	0.0447	-0.2169	0.2035	-0.3100	5.1215	122.94***	604
RXBANK	0.0017	0.0487	-0.2059	0.2151	-0.1724	4.6049	67.81***	604
RXFINK	0.0021	0.0463	-0.3598	0.2466	-0.7402	12.3350	2248.23***	604
RXGMYO	0.0008	0.0382	-0.1955	0.1109	-0.9653	5.8977	305.10***	604
RXHOLD	0.0015	0.0420	-0.2450	0.1967	-0.5723	6.4615	334.52***	604
RXSGRT	0.0025	0.0438	-0.2885	0.1648	-1.0315	8.9631	1001.97***	604
RXUSIN	0.0022	0.0328	-0.2012	0.1182	-1.0299	6.8019	470.54***	604
RXGIDA	0.0022	0.0375	-0.1720	0.1201	-0.3345	4.9350	105.49***	604
RXKAGT	0.0010	0.0388	-0.2297	0.1343	-0.5219	5.8779	235.86***	604
RXKMYA	0.0024	0.0385	-0.1772	0.1616	-0.4629	5.1143	134.07***	604
RXMANA	0.0028	0.0471	-0.2442	0.2092	-0.6311	6.0115	268.34***	604
RXMESY	0.0026	0.0398	-0.2664	0.1462	-1.0675	7.8306	701.96***	604
RXTAST	0.0016	0.0316	-0.1592	0.1128	-0.7356	4.9985	154.99***	604
RXTEKS	0.0020	0.0360	-0.2255	0.1102	-0.9645	6.8707	470.69***	604
RXUHIZ	0.0021	0.0305	-0.1310	0.1573	-0.3166	4.9074	101.64***	604
RXELKT	0.0004	0.0491	-0.3515	0.3541	-0.3333	12.2637	2170.90***	604
RXILTM	0.0008	0.0397	-0.1422	0.1426	-0.1267	3.9193	22.88***	604
RXSPOR	0.0014	0.0509	-0.4580	0.2246	-1.0546	16.3996	4630.60***	604
RXTCRT	0.0036	0.0369	-0.2351	0.2793	-0.0189	10.9406	1586.87***	604
RXTRZM	0.0003	0.0480	-0.2237	0.1844	-0.4723	5.4039	167.89***	604
RXULAS	0.0028	0.0524	-0.2973	0.2029	-0.4437	5.6122	191.53***	604
RXUTEK	0.0032	0.0400	-0.1958	0.1345	-0.6553	5.0615	150.17***	604
RXBLSM	0.0020	0.0421	-0.1875	0.1786	-0.4018	5.9064	228.83***	604
RXYORT	0.0007	0.0317	-0.1923	0.0950	-1.1748	7.7277	701.44***	604

***, **, and * signify 1%, 5%, and 10% significance levels, respectively.

Table 2: The Lee and Strazicich (2003) Unit Root Test Results

Variable	Model A				Variable	Model C			
	LM test	Lag	BP1	BP2		LM test	Lag	BP1	BP2
LTR2YGB	-2.3437	5	2009-12-31	2013-05-24	LTR2YGB	-4.2394	12	2009-06-12	2013-09-13
LXU100	-3.1904	17	2007-12-28	2009-11-25	LXU100	-5.0486	17	2008-08-08	2009-11-25
LXUMAL	-3.1054	17	2008-05-16	2009-11-25	LXUMAL	-4.9351	17	2008-08-08	2009-11-25
LXBANK	-3.1023	17	2008-11-21	2014-09-05	LXBANK	-4.7853	17	2008-07-25	2009-11-25
LXFINK	-2.5776	16	2007-08-10	2009-02-13	LXFINK	-4.3673	16	2008-05-02	2010-04-16
LXGMYO	-2.7537	11	2009-01-16	2010-05-07	LXGMYO	-5.4543*	17	2008-08-08	2009-12-31
LXHOLD	-3.0897	15	2007-08-10	2009-02-06	LXHOLD	-4.9003	15	2008-07-25	2009-10-02
LXSGRT	-2.9718	14	2008-05-02	2009-10-23	LXSGRT	-5.1396	14	2008-05-02	2009-09-04
LXUSIN	-3.4393	15	2008-01-11	2009-03-06	LXUSIN	-5.5427*	15	2008-08-08	2009-11-25
LXGIDA	-2.4913	17	2008-10-10	2015-07-15	LXGIDA	-4.5719	17	2008-10-10	2013-05-31
LXKAGT	-3.0025	17	2007-02-23	2012-01-20	LXKAGT	-4.6471	17	2008-08-01	2012-12-07
LXKMYA	-3.5965*	15	2008-01-11	2009-03-06	LXKMYA	-5.3102*	17	2008-08-08	2009-12-31
LXMANA	-3.4763	13	2009-03-06	2011-11-18	LXMANA	-4.9679	17	2007-06-01	2008-10-24
LXMESY	-2.8542	15	2007-08-10	2009-02-06	LXMESY	-6.488***	17	2008-08-01	2009-10-02
LXTAST	-2.4616	15	2009-02-13	2013-12-20	LXTAST	-4.0229	15	2008-05-02	2010-01-22
LXTEKS	-2.5865	15	2010-05-07	2011-08-19	LXTEKS	-5.0309	15	2008-08-01	2011-01-14
LXUHIZ	-2.8762	17	2008-11-21	2015-03-06	LXUHIZ	-3.8998	15	2008-07-25	2013-01-25
LXELKT	-3.7587*	14	2008-11-21	2011-11-18	LXELKT	-4.7971	13	2009-07-24	2011-11-18
LXILTM	-3.9727**	1	2007-09-28	2015-04-03	LXILTM	-5.6186*	0	2008-05-02	2014-12-05
LXSPOR	-1.6754	16	2008-06-27	2012-05-11	LXSPOR	-4.2604	15	2010-08-20	2013-09-13
LXTCRT	-3.0529	14	2008-11-21	2010-05-07	LXTCRT	-4.4331	17	2008-09-26	2010-04-30
LXTRZM	-2.6056	15	2009-02-06	2011-11-18	LXTRZM	-3.7178	15	2007-07-06	2009-10-02
LXULAS	-2.2568	15	2008-07-25	2012-01-27	LXULAS	-3.4186	15	2009-07-03	2015-10-30
LXUTEK	-2.2573	18	2007-02-23	2013-09-13	LXUTEK	-4.4592	18	2008-05-09	2009-12-31
LXBLSM	-2.4369	18	2007-06-01	2009-02-20	LXBLSM	-3.4794	18	2008-05-02	2010-01-22
LXYORT	-2.6979	17	2007-06-01	2010-02-26	LXYORT	-4.9629	17	2008-05-16	2010-01-22

***, **, and * signify 1%, 5%, and 10% significance level, respectively. BP1 and BP2 denote the first and the second breakpoint.

The weekly mean growth rate for the stock indices was positive while it was negative for the benchmark government bond rates, indicating a poor performance for the bonds. The average stock return varied between -0.2318 and 0.1744, while the growth rate for bond varied between -0.161 and 0.1953, with a standard deviation of 0.0410 and 0.0339, respectively. This result suggested that investors were not compensated for a higher risk premium when holding stock instruments in Turkey. During the same period, the stock indices that experienced the highest (0.3541) and lowest (-0.4580) weekly return was RXELKT and RXSPOR, with a standard deviation of 4.91% and 5.09%. The third moment indicates that the distributions of all of the stock returns were negatively skewed while the distribution of the interest rate changes, [0.7012], was positively skewed. Furthermore, the fourth moment specifies that the distributions of all of the financial variables showed a leptokurtic behavior; that is, they had fat tails and peakedness. Those and the Jarque–Bera test findings, therefore, reveal no normality in the data at a 1% significance level.

4. Findings and Discussions

4.1. Empirical Results

Non-stationarity of time series is a critical and primary pre-condition before testing cointegration and causal relationship between variables. As suggested, we use both the conventional and modern unit root tests to explore non-stationarity. For brevity, however, we report only the non-stationarity test results employing the Lee and Strazicich (2003) method, as given in Table 2. Our empirical evidence shows that only three out of twenty-six variables, LXKMYA, LXELKT, and LXILTM, are stationary for Model A and five variables, LXGMYO,

LXUSIN, LXKMYA, LXMESY, and LXILTM, are *I*(0) at log-level for Model C. All variables are integrated of the first order, i.e., *I*(1) using both unit root test approaches.

Table 3 reports the empirical findings of the cointegration tests with two endogenous breaks, proposed by Hatemi-J (2008), for all combinations that include nonstationary variables, *I*(1). It is quite apparent that the null hypothesis of no cointegration could be only rejected for five out of nineteen models when the log of equity price is treated as an explained variable. Since their critical values are at least lower than the critical value, -5.653 at a 10% level of significance, LGB2 has long-run relationships with LXUMAL, LXHOLD, LXTEKS, LXTRZM, and LXULAS, implying that the government bond rate move in tandem with those indices in the long-term. However, this test is unable to reject the null hypothesis for the reverse cointegration relation for all combinations except for the LGB2~LXUHIZ model at a 10% level of significance, suggesting only one significant relationship for the dependent variable, LGB2. It is noteworthy also that the structural breaks selected by the Hatemi-J (2008) approach are corresponding to the recent global and the eurozone crisis.

Table 4 illustrates the short- and long-run causality test results. As shown, there is only one significant causal link running from the interest rate, LTR2YGB, to the equity prices, LXHOLD, in the short-run. When looking at the second column, the null hypothesis of no causation relationship cannot be accepted for all models in the long term, suggesting that interest rates are found to exert significant lagged impacts on LXUMAL, LXHOLD, LXTEKS, and LXULAS indices and LXTRZM at 1% and 5% significance level, respectively. Conversely, the speed of the adjustment, ECT_{t-1}, parameter reveals that the disequilibrium between variables is corrected in 27.8 [=1/-0.036] weeks for LXUMAL; 52.6 weeks for LXHOLD; 58.8 weeks for LXTEKS; 76.9 weeks for LXTRZM and 90.9 weeks for LXULAS sector indices.

Table 3: Hatemi-J (2008) Cointegration Test

Model			Modified ADF Test [C/S Model]			Model			Modified ADF Test [C/S Model]		
			Stat	BP1	BP2				Stat	BP1	BP2
LXU100	~	LGB2	5.25	2008-08-29	2012-01-06	GB2	~	LXU100	4.87	2008-09-26	2011-11-04
LXUMAL	~	LGB2	-5.75*	2008-08-29	2010-08-06	LGB2	~	LXUMAL	-4.76	2008-08-08	2011-12-23
LXBANK	~	LGB2	-5.54	2008-08-29	2010-08-13	LGB2	~	LXBANK	-4.54	2008-09-26	2011-11-25
LXFINK	~	LGB2	-5.37	2008-05-23	2008-10-03	LGB2	~	LXFINK	-4.38	2008-06-20	2013-01-11
LXGMYO	~	LGB2	NA			LGB2	~	LXGMYO	NA		
LXHOLD	~	LGB2	-5.84*	2008-08-29	2011-12-02	LGB2	~	LXHOLD	-5.07	2008-08-15	2011-12-16
LXSGRT	~	LGB2	-5.37	2008-08-29	2011-01-07	LGB2	~	LXSGRT	-5.31	2008-09-19	2011-07-29
LXUSIN	~	LGB2	NA			LGB2	~	LXUSIN	NA		
LXGIDA	~	LGB2	-4.84	2008-11-28	2010-02-05	LGB2	~	LXGIDA	-4.94	2009-05-08	2011-11-11
LXKAGT	~	LGB2	-5.41	2008-10-17	2010-07-30	LGB2	~	LXKAGT	-5.39	2009-02-13	2011-11-04
LXKMYA	~	LGB2	NA			LGB2	~	LXKMYA	NA		
LXMANA	~	LGB2	-4.35	2007-04-20	2012-04-27	LGB2	~	LXMANA	-5.01	2009-05-08	2011-12-09
LXMESY	~	LGB2	NA			LGB2	~	LXMESY	NA		
LXTAST	~	LGB2	-5.36	2008-08-01	2008-08-08	LGB2	~	LXTAST	-4.39	2008-06-20	2013-01-25
LXTEKS	~	LGB2	-5.77*	2008-06-13	2008-10-31	LGB2	~	LXTEKS	-4.51	2009-05-08	2011-12-09
LXUHIZ	~	LGB2	-4.95	2007-02-09	2011-11-04	LGB2	~	LXUHIZ	-5.66*	2009-05-15	2011-11-04
LXELKT	~	LGB2	NA			LGB2	~	LXELKT	NA		
LXILTM	~	LGB2	NA			LGB2	~	LXILTM	NA		
LXSPOR	~	LGB2	-4.23	2008-01-04	2010-09-03	LGB2	~	LXSPOR	-4.81	2009-06-12	2011-11-25
LXTCRT	~	LGB2	-4.93	2008-12-05	2011-11-04	LGB2	~	LXTCRT	-5.38	2009-04-24	2011-11-25
LXTRZM	~	LGB2	-6.42**	2008-06-13	2010-02-05	LGB2	~	LXTRZM	-4.83	2009-06-12	2011-11-25
LXULAS	~	LGB2	-5.8*	2008-08-08	2011-10-27	LGB2	~	LXULAS	-5.57	2009-04-24	2011-11-25
LXUTEK	~	LGB2	-4.2	2008-10-24	2012-05-18	LGB2	~	LXUTEK	-4.92	2008-09-12	2011-11-25
LXBLSM	~	LGB2	-3.92	2008-08-01	2013-01-25	LGB2	~	LXBLSM	-4.59	2008-09-12	2009-06-05
LXYORT	~	LGB2	-5.35	2008-03-07	2010-02-26	LGB2	~	LXYORT	-5.22	2008-10-03	2011-12-09

***, **, and * signify 1%, 5%, and 10% significance level, respectively. BP1 and BP2 denote the first and the second breakpoint.

Table 5 reports the empirical findings of the symmetric causality test of Hacker and Hatemi-J (2006), using raw returns and decomposed series. We find that the causality seems to be running from RTR2YGB to stock returns, with the exceptions for RXKAGT, RXILTM, RXSPOR, RXULAS, and RXUTEK, and not the other way around in the time domain. Applying this approach to the decomposed series, the null hypothesis that RTR2YGB does not lead the share returns cannot be accepted at scale d3 for only RXHOLD, RXGIDA, RXMESY, and RXBLSM. However, regarding the causal relation from equity returns to interest rate fluctuations, the findings are not significant for any cases in the time domain. Using the wavelets, we found that the dynamic causal relations intensify over time for some stock returns beyond the second-level time scale. For example, RTR2YGB is Granger-caused by RXU100, RXHOLD, RXSGRT, RXKMYA, and RXTCRT at scale d3 and d5 scales, by RXKAGT and RXTRZM at scale d2 and d3, [4-16) week periods.

Table 6 reports the findings of the asymmetric causality test of Hatemi-J (2012). The left side presents the positive and the negative shocks of interest rates to stock prices during the period. Unsurprisingly, there are high strengths of Granger-causality running from the positive shocks in interest rates, LTR2YGB, to the negative shocks in stock prices, LXELKT and LXMESY at 10%; LXU100, LXUMAL, LXBANK, LXHOLD, and LXULAS at 5% and LXMANA at 1% significance level. Further, the negative shocks of LTR2YGB are found to exert significant lagged influences on the positive shocks in LXFINK and LXKAGT. Our paper also suggests that there exist significant causal links between the same components; for instance, the predictability of the positive (negative) shocks in LXTRZM can be improved through using the positive (negative) shocks in LTR2YGB at significance level in the short-run. It can be concluded that the impact of shocks stemming from LTR2YGB on stock prices is less pronounced for our paper.

The right side of Table 6 shows the effects of shocks arising from stock prices on interest rates. Our findings demonstrate that the null hypothesis that the shocks in equity price, LXSGRT, do not lead the interest rate shocks in LTR2YGB could be rejected for all the combinations of cumulative price shocks. The decreasing stock prices, LXU100, cause both the falling and increasing bond yields, LTR2YGB, namely, interest rates in Turkey negatively and positively respond to stock price decreases, suggesting that falling stock price is regarded by the bond market participants as a negative and affirmative signal. Similarly, the falling stock prices of LXUMAL, LXBANK, LXHOLD, LXKMYA, and LXULAS can be perceived as a negative and positive impact on interest rates. As noted by Hatemi-J (2012), the possibility of reaching systematic opportunities for excess yields from the stock prices, excluding LXMANA, LXUHIZ, LXELKT, and LXILTM, is ruled out in the bond market.

Table 4: Standard Granger Causality – VECM

Dependent	~	Independent	LTR2YGB ⇏ LX	
			χ^2 $statistics$[Short]	ECT_{t-1} [Long]
LXUMAL	~	LTR2YGB	0.96	-0.036***
LXHOLD	~	LTR2YGB	6.806*	-0.019***
LXTEKS	~	LTR2YGB	0.619	-0.017***
LXTRZM	~	LTR2YGB	0.553	-0.014**
LXULAS	~	LTR2YGB	3.083	-0.012***
LTR2YGB	~	LXUHIZ	0.505	-0.001

***, **, and * signify 1%, 5%, and 10% significance level, respectively.

Table 5: Hacker and Hatemi-J (2006) Symmetric Causality Test by Scale

Model	**RLTR2YGB** does not Granger Cause **DLX**						**DLX** does not Granger Cause **RLTR2YGB**					
	Return	d1 [2-4]	d2 [4-8]	d3 [8-16]	d4 [16-32]	d5 [32-64]	Return	d1 [2-4]	d2 [4-8]	d3 [8-16]	d4 [16-32]	d5 [32-64]
RXU100	6.93**	0.724	0.307	0.628	0.445	0.19	0.198	0.028	0.05	3.24*	0.002	6.725**
RXUMAL	7.309**	0.783	0.038	0.726	0.763	0.434	0.211	0.066	0.207	2.512	0.128	7.158***
RXBANK	8.198***	0.977	0.157	0.248	0.404	0.301	0.167	0.1	0.34	1.358	0.033	6.762***
RXFINK	17.485***	0.066	0.002	0.6	0.802	0.03	0.569	0.737	0	2.277	1.083	1.419
RXGMYO	4.178**	1.054	1.152	2.434	2.022	1.207	0.881	0.495	0.34	4.382**	0.439	0.157
RXHOLD	3.529*	0.08	0.14	3.546*	3.736	1.184	0.108	0.024	0.05	5.804**	1.263	6.706**
RXSGRT	8.501***	1.611	0.603	0.011	2.07	2.317	0.014	0.302	0.047	5.663**	0.74	4.393**
RXUSIN	7.193**	0.344	0.722	0.771	0.436	0.121	0.146	0.037	3.666*	3.234*	0.022	3.965**
RXGIDA	4.318**	1.043	0.704	5.762**	0.541	0.191	2.077	1.413	10.593***	1.467	0.126	2.65
RXKAGT	1.784	1.411	0.095	0.065	1.066	0.012	0.642	0.29	3.889**	5.421**	0.148	1.313
RXKMYA	7.079***	0.469	1.023	0.006	0.276	0.078	0.11	0.346	0.145	3.822*	0.052	7.41***
RXMANA	10.069***	0.002	0.001	0.024	0.701	0.074	0.066	0.011	1.878	0.264	0.001	1.859
RXMESY	4.212**	0.023	0.104	3.907**	0.114	0.519	0.152	0.157	1.847	9.041***	0.001	2.284
RXTAST	7.884***	0.02	0.017	0.532	0.03	0.541	0	0	0.572	1.684	0	0.01
RXTEKS	12.005***	1.226	0.004	0.023	0.478	0.119	0.197	0.269	1.167	2.333	0.101	1.912
RXUHIZ	4.756**	0.047	0.028	0.427	1.533	1.318	0.068	0.258	0.638	4.028**	0.473	2.335
RXELKT	10.279***	3.017	0.36	1.245	0.484	0.33	0.201	2.219	0.176	1.504	0.472	0.016
RXILTM	2.126	0	0.412	0.007	1.209	2.227	0.001	0.523	1.501	1.162	0	1.441
RXSPOR	1.545	0.184	0.008	0.886	0.563	0.058	0.426	0.915	0.637	2.864*	0.355	0.004
RXTCRT	8.156***	0.267	0.28	0.049	0.458	0.251	0.401	1.296	0.018	3.284*	1.957	3.203*
RXTRZM	5.034**	0.637	0.461	0.012	0.671	1.505	0.247	0.541	2.586*	2.844*	0.865	0.011
RXULAS	1.436	0.857	0.576	2.529	0.243	0.077	0.478	0.682	0.673	5.481**	0.207	1.264
RXUTEK	2.234	1.122	0.213	0.117	0.012	0.241	0.394	0.755	0.875	0.968	1.088	1.43
RXBLSM	4.672**	0.499	0.299	3.081*	0.112	0.095	0.008	0.363	0.585	1.148	0.217	0.514
RXYORT	9.658***	0.278	1.31	0.283	0.419	0.542	0.204	1.067	0.104	2.442	0.003	0.179

***, **, and * signify 1%, 5%, and 10% significance level, respectively. All variables are in first log-differenced.

Table 6: Hatemi-J (2012) Asymmetric Causality Test Results

MODEL			**LTR2YGB** does not Granger Cause **LX**				MODEL			**LX** does not Granger Cause **LTR2YGB**			
			$T^+ \nRightarrow X^+$	$T^+ \nRightarrow X^-$	$T^- \nRightarrow X^-$	$T^- \nRightarrow X^+$				$X^+ \nRightarrow T^+$	$X^+ \nRightarrow T^-$	$X^- \nRightarrow T^-$	$X^- \nRightarrow T^+$
LXU100	~	LTR2YGB	2.647	5.172**	0.427	0.077	LTR2YGB	~	LXU100	3.668	0.195	2.883*	15.385***
LXUMAL	~	LTR2YGB	5.167*	7.461**	0.268	0.015	LTR2YGB	~	LXUMAL	4.776	0.266	4.256**	20.23***
LXBANK	~	LTR2YGB	4.421	7.219**	0.297	0.02	LTR2YGB	~	LXBANK	4.664	0.6	4.51**	18.449***
LXFINK	~	LTR2YGB	1.052	0.925	4.749	4.815**	LTR2YGB	~	LXFINK	0.882	5.662	2.791	34.091***
LXGMYO	~	LTR2YGB	2.059	0.345	1.66	0.945	LTR2YGB	~	LXGMYO	0.182	1.069	1.801	26.353***
LXHOLD	~	LTR2YGB	9.149**	5.485**	0.032	0.2	LTR2YGB	~	LXHOLD	3.002	0.347	2.907*	20.509***
LXSGRT	~	LTR2YGB	3.116	2.228	0.567	1.091	LTR2YGB	~	LXSGRT	7.052**	16.418***	2.817*	34.273***
LXUSIN	~	LTR2YGB	1.408	2.234	1.008	0.251	LTR2YGB	~	LXUSIN	1.657	0.597	0.651	9.868**
LXGIDA	~	LTR2YGB	0.81	0.325	0.492	0.115	LTR2YGB	~	LXGIDA	0.796	3.188	0.351	8.31**
LXKAGT	~	LTR2YGB	4.669	0.355	0.465	3.499*	LTR2YGB	~	LXKAGT	3.048	4.02	0.827	20.93***
LXKMYA	~	LTR2YGB	0.069	1.267	0.442	0.659	LTR2YGB	~	LXKMYA	0.5	0.059	2.77*	9.268***
LXMANA	~	LTR2YGB	2.918	8.37***	0.584	0.075	LTR2YGB	~	LXMANA	1.018	1.497	0.09	3.166
LXMESY	~	LTR2YGB	9.052**	3.661*	1.761	1.034	LTR2YGB	~	LXMESY	2.198	0.659	1.835	17.277***
LXTAST	~	LTR2YGB	0.75	0.044	1.446	0.109	LTR2YGB	~	LXTAST	0.254	0.63	0.832	11.755***
LXTEKS	~	LTR2YGB	4.473	0.006	1.957	0.735	LTR2YGB	~	LXTEKS	4.365	3.539	0.159	22.202***
LXUHIZ	~	LTR2YGB	2.687	0.567	1.217	0.778	LTR2YGB	~	LXUHIZ	0.639	0.782	0.961	2.915
LXELKT	~	LTR2YGB	0.837	3.068*	1.902	1.418	LTR2YGB	~	LXELKT	2.128	1.713	2.607	1.663
LXILTM	~	LTR2YGB	2.673	0.032	0.763	0.424	LTR2YGB	~	LXILTM	0.264	0.242	1.491	1.542
LXSPOR	~	LTR2YGB	0.146	0.33	0.029	1.395	LTR2YGB	~	LXSPOR	1.21	1.692	0.074	14.983***
LXTCRT	~	LTR2YGB	0.322	1.818	3.149*	0.114	LTR2YGB	~	LXTCRT	0.495	10.661**	4.757**	2.763
LXTRZM	~	LTR2YGB	9.533**	0.21	4.265**	0.013	LTR2YGB	~	LXTRZM	0.89	0.181	0.525	5.098*
LXULAS	~	LTR2YGB	6.8*	4.403**	0.004	0.655	LTR2YGB	~	LXULAS	0.765	0.259	3.148*	11.001***
LXUTEK	~	LTR2YGB	3.848	0.694	0.369	0.01	LTR2YGB	~	LXUTEK	2.115	0.378	0.703	11.788***
LXBLSM	~	LTR2YGB	7.567**	0.042	1.318	0.771	LTR2YGB	~	LXBLSM	0.473	0.488	0.385	12.357***
LXYORT	~	LTR2YGB	3.365	0.682	2.962*	0.341	LTR2YGB	~	LXYORT	0.981	0.647	2.006	12.594***

***, **, and * signify 1%, 5%, and 10% significance level, respectively. BP1 and BP2 denote the first and the second breakpoint.

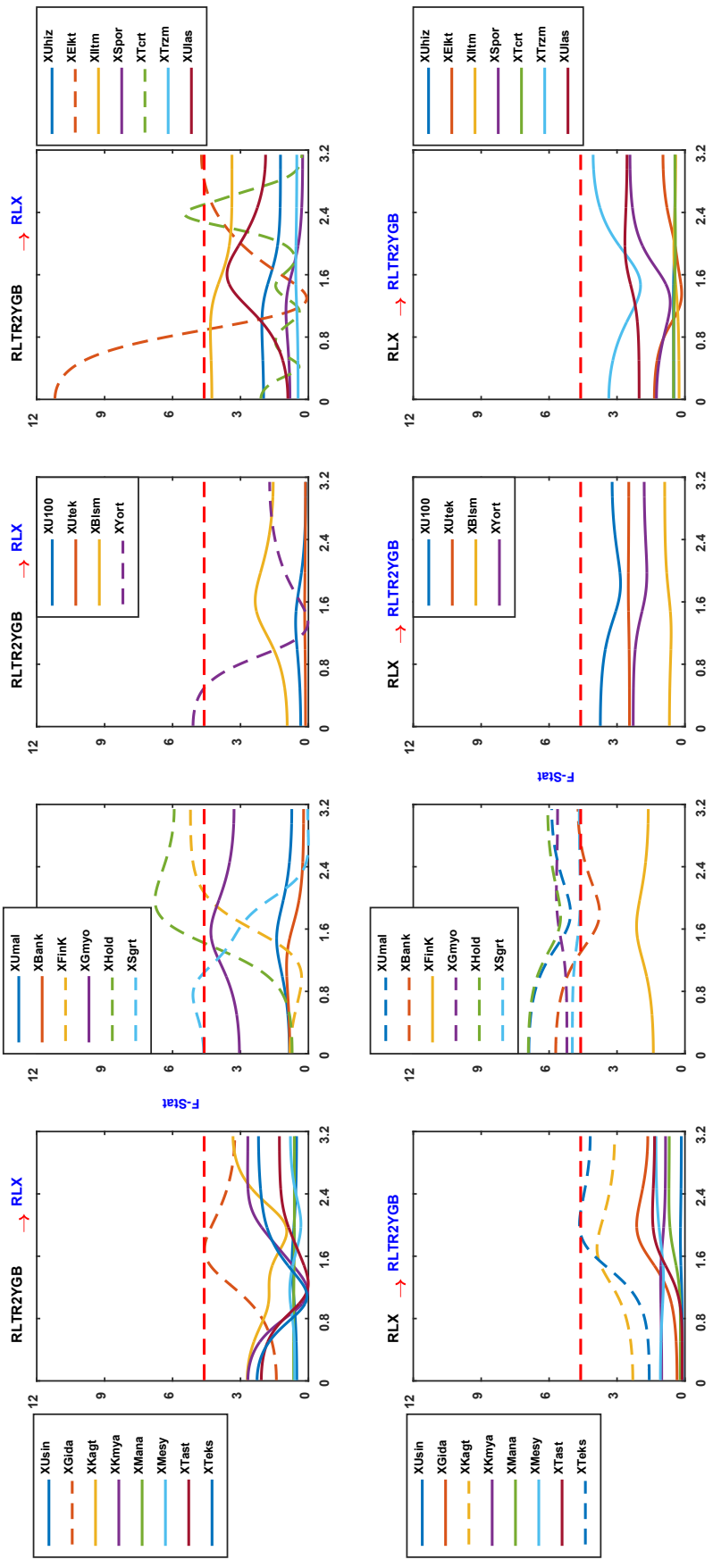

Figure 1: Breitung and Candelon (2006) Frequency Causality Test Results

We present the frequency domain causality test, proposed by Breitung and Candelon (2006) results in Figure 1**.** The upper panel illustrates the causality from innovations in interest rates to stock index returns, and the bottom depicts the relationship in the reverse direction. The RXHOLD and RXSGRT indices are the two variables that have bidirectional causalities with the RTR2YGB in the underlying period at different frequency intervals.

The figure shows that there exist significant causal relations running from RTR2YGB to RXELKT at $[0.01 \leq \omega \leq 0.89$ and $2.82 \leq \omega \leq 3.14$, RXFINK at $[2.07 \leq \omega \leq 3.14]$, RXTCRT at $[2.28 \leq \omega \leq 2.50]$, and RXYORT at $[0.01 \leq \omega \leq 0.49]$ frequency intervals. At the bottom panel, the RXUMAL, RXGMYO, and RXHOLD appear to Granger-cause the RTR2YGB at all the levels of frequencies, $[0.01 \leq \omega \leq 3.14]$, reflecting short-, intermediate-, and long-run cycles. Moreover, there is disputed evidence on the existence of causal relations running from RXBANK to RTR2YGB at $[0.01 \leq \omega \leq 1.30$ & $2.72 \leq \omega \leq 3.14$ corresponding to holding periods between $4.83 - 628$ and $2.31 - 2$ weeks, suggesting that index returns can indeed predict the future movements of the bond yields while the reverse does not hold. A perusal of Figure 1 reveals that the null hypothesis of no significant causal association between RTR2YGB and the aggregate stock index, RXU100, cannot be rejected.

4.2. Discussion

In the paper, we find that Turkish stock markets seem to show more volatile behaviors than bond markets, concurring with the result from Moya-Martínez et al. (2015), who investigate stock-bond markets at both the aggregate and sectoral level relationships in Spain. Further, the findings purport long-run relationships between bond markets and several stock indices, implying that these markets cannot be used as a way of portfolio diversification for long-term investors, but be used for short-term investors. Our findings are partially in accordance with the empirical evidence documented in Evrim-Mandaci et al. (2011), Akbas (2013), and Yildiz (2014), suggesting that the tactical allocation strategy in managing both investment assets for portfolio diversification holds when both markets do not move in tandem in the long-run.

The results regarding causality test of Hacker and Hatemi-J (2006) show one-way causal relationship from the bond yield changes to the stock returns, suggesting that market agents may monitor changes in bond yield to predict movements stock returns as using the lagged bond yields movements is useful in predicting stock market changes in Turkey. These findings are fully consistent with the empirical evidence reported in Özer et al. (2011) and Yildiz (2014) for Turkey and partially in line with Rahman and Mustafa (1997), Erdem et al. (2005), Gan et al. (2006), Kasman et al. (2011), and Herve et al. (2011) for bidirectional causality in the time-domain. By employing wavelets, however, the study uncovers decomposed significant associations that being hidden over medium and long-term horizons from stock markets to bond markets. Our results are consistent with the findings of Özün and Çifter (2006), Çifter and Özün (2008), and Moya-Martínez et al. (2015) in the frequency domain. These authors revealed that the linkages become statistically significant and stronger at the longer horizons, suggesting abnormal return opportunities for only short-term investors.

5. Conclusions

In this empirical study, we aimed to reexamine the stock-bond association using weekly observations of government bond yields and industry returns from April 1, 2005, through December 30, 2016. Implementing wavelet methodology, we offer a deeper understanding of this relationship by considering both the aggregate and industry level to market participants, since each agent has a different investment period, degree of risk aversion, and reacts differently to the same information.

Test findings reveal positive weekly average returns for the stock returns and negative returns for the bond yields. Further, as expected and in common in existing literature, the stock market, i.e. the vast majority of stock indices, is found to be more volatile than the bond market, confirming the result of Moya-Martínez et al. (2015) for Spain case. On the other hand, the findings suggest the presence of cointegration and a one-way causal relationship between two markets in the long-run. The results regarding wavelets uncover the true dynamics of causal linkages and show that the two markets are significant predictors of each other in the medium and long time horizons. There is also evidence of asymmetrical causal relationships, namely, the test report a one-way causality from the negative shocks in stock prices to the positive shocks in interest rates. The frequency causality test, proposed by Breitung and Candelon (2006), reveals that the predictive power of the financial index returns on the interest rate changes intensifies across frequencies.

The findings in our study offer some suggestions for stock and bond market participants. For investors, our test findings reveal that the relationship between variables is weak and insignificant at high frequencies, but it turns out to be significant at low frequencies, implying some form of feedback mechanism at longer periods. The absence of causal relationships at shorter horizons, however, indicates that they may consistently gain abnormal returns regardless of stock indices at high frequencies since bond and stock markets are a major driving force of each other's performance in the long-run. Our findings also show that both instruments can be used as hedging tools since they are perfect substitutes for investors for risk management, asset allocation, and portfolio management in the case of market turbulences. From the policy-making standpoint, regulators should take into account the time and frequency based relationships before implementing policy rate decisions and should be patient for their consequences to secure the resiliency and durability of the financial system. Lastly, further studies should consider the possible impacts of firm-specific and macroeconomic factors on this relationship by using wavelet coherence or nonlinear approaches.

References

Acikalin, S., Aktas, R., & Unal, S. (2008). Relationships between stock markets and macroeconomic variables: an empirical analysis of the Istanbul Stock Exchange. Investment Management and Financial Innovations, 5(1), 8-16.

Akbas, Y.E. (2013). Borsa getiri orani ve faiz orani arasindaki ilişkinin doğrusal olmayan yöntemlerle analizi: Türkiye örneği. Business and Economics Research Journal, 4(3), 21-40.

Aktaş, M., & Akdağ, S. (2013). Türkiye'de ekonomik faktörlerin hisse senedi fiyatlari ile ilişkilerinin araştirilmasi. International Journal of Social Science Research, 2(1), 50-67.

Alam, Z. & Rashid, K. (2014). Time series analysis of the relationship between macroeconomic factors and the stock market returns in Pakistan. Journal of Yaşar University, 9(36), 6361-6370.

Amata, E.O., Muturi, W., & Mbewa, M (2016). Relationship between macro-economic variables, investor herding behavior and stock market volatility in Kenya. International Journal of Economics, Commerce and Management, 4(8), 36-54.

Andrieş, A. M., Ihnatov, I., & Tiwari, A. K. (2014). Analyzing time–frequency relationship between interest rate, stock price and exchange rate through continuous wavelet. Economic Modelling, 41, 227-238.

Barakat, M. R., Elgazzar, S. H., & Hanafy, K. M. (2015). Impact of macroeconomic variables on stock markets: Evidence from emerging markets. International Journal of Economics and Finance, 8(1), 195.

Bhattacharya, B., & Mukherjee, J. (2002). The nature of the causal relationship between stock market and macroeconomic aggregates in India: An empirical analysis. In 4th annual conference on money and finance, Mumbai (pp. 401-426).

Breitung, J., & Candelon, B. (2006). Testing for short-and long run causality: A frequency-domain approach. Journal of Econometrics, 132(2), 363-378.

Campbell, J. Y. (1987). Stock returns and the term structure. Journal of financial economics, 18(2), 373-399.

Chan, K. C., Norrbin, S. C., & Lai, P. (1997). Are stock and bond prices collinear in the long run? International Review of Economics and Finance, 6(2), 193-201.

Chia, R. C. J., & Lim, S. Y. (2015). Malaysian stock price and macroeconomic variables: autoregressive distributed lag (ARDL) bounds test. Kajian Malaysia: Journal of Malaysian Studies, 33(1), 85-103.

Çifter, A. & Özün, A. (2008). Estimating the effects of interest rates on share prices in turkey using a multi-scale causality test. Review of Middle East Economics and Finance, 4(2), pp. 68-79.

Coskun, M., Kiraci, K., & Muhammed, U. (2016). Seçilmis Makroekonomik Degiskenlerle Hisse Senedi Fiyatlari Arasindaki Iliski: Türkiye Üzerine Ampirik Bir Inceleme. Finans Politik & Ekonomik Yorumlar, 53(616), 61.

Das, A. (2005). Do stock prices and interest rates possess a common trend?. Recherches Économiques de Louvain/ Louvain Economic Review, 71(4), 383-390.

Daubechies, I. (1992). Ten lectures on wavelets. Philadelphia: Society for Industrial and Applied Mathematics, 61, 198-202.

Erdem, C., Arslan, C. K., & Sema Erdem, M. (2005). Effects of macroeconomic variables on Istanbul stock exchange indexes. Applied Financial Economics, 15(14), 987-994.

Evrim-Mandaci, P., Kahyaoglu, H., & Cagli, E. C. (2011). Stock and bond market interactions with two regime shifts: evidence from Turkey. Applied Financial Economics, 21(18), 1355-1368.

Flannery, M. J., & James, C. M. (1984). The effect of interest rate changes on the common stock returns of financial institutions. The Journal of Finance, 39(4), 1141-1153.

Forson, J., & Janrattanagul, J. (2014). Selected Macroeconomic Variables and Stock Market Movements: Empirical evidence from Thailand. Contemporary economics, 8(2), 154-174.

Gan, C., Lee, M., Yong, H. H. A., & Zhang, J. (2006). Macroeconomic variables and stock market interactions: New Zealand evidence. Investment Management and Financial Innovations, 3(4), 89-101.

Gencay, R., Selçuk, F., & Whitcher, B. J. (2002). An introduction to wavelets and other filtering methods in finance and economics. Academic Press.

Geweke, J. (1982). Measurement of linear dependence and feedback between multiple time series. Journal of the American Statistical Association, 77(378), 304-313.

Granger, C. W. (1969). Investigating causal relations by econometric models and cross-spectral methods. Econometrica: Journal of the Econometric Society, 424-438.

Graps, A. (1995). An introduction to wavelets. IEEE Computational Science and Engineering, 2(2), 50-61.

Hacker, R. S., & Hatemi-J, A. (2006). Tests for causality between integrated variables using asymptotic and bootstrap distributions: theory and application. Applied Economics, 38(13), 1489-1500.

Hatemi-J, A. (2008). Tests for cointegration with two unknown regime shifts with an application to financial market integration. Empirical Economics, 35(3), 497-505.

Hatemi-J, A. (2012). Asymmetric causality tests with an application. Empirical Economics, 1-10.

Herve, D. B. G. H., Chanmalai, B., & Shen, Y. (2011). The study of causal relationship between stock market indices and macroeconomic variables in Cote d'Ivoire: Evidence from error-correction models and Granger causality test. International Journal of Business and Management, 6(12), 146.

Hosoya, Y. (1991). The decomposition and measurement of the interdependency between second-order stationary processes. Probability Theory and Related Fields, 88(4), 429-444.

Humpe, A. & Macmillan, P. (2009) Can macroeconomic variables explain long-term stock market movements? A comparison of the US and Japan. Applied Financial Economics, 19(2), 111-119.

Jammazi, R., Ferrer, R., Jareño, F., & Hammoudeh, S. M. (2017). Main driving factors of the interest rate-stock market Granger causality. International Review of Financial Analysis, 52(1), 260-280.

Jammazi, R., Tiwari, A. K., Ferrer, R., & Moya, P. (2015). Time-varying dependence between stock and government bond returns: International evidence with dynamic copulas. The North American Journal of Economics and Finance, 33, 74-93.

Jawaid, S. T., & Ul Haq, A. (2012). Effects of interest rate, exchange rate and their volatilities on stock prices: Evidence from banking industry of Pakistan. Theoretical & Applied Economics, 19(8).

Kasman, S., Vardar, G., & Tunç, G. (2011). The impact of interest rate and exchange rate volatility on banks' stock returns and volatility: Evidence from Turkey. Economic Modelling, 28(3), 1328-1334.

Kumar, N.P. & Puja, P. (2012). The impact of macroeconomic fundamentals on stock prices revisited: An evidence from Indian data. MPRA paper No. 38980, available at http://mpra.ub.uni-muenchen.de/38980/

Lee, J., & Strazicich, M. C. (2003). Minimum Lagrange multiplier unit root test with two structural breaks. The Review of Economics and Statistics, 85(4), 1082-1089.

Li, Y. H., Hwa, G. H., & Hong, T. S. (2017). The nexus of capital flows, real interest rate and stock price performance: evidence from Malaysia. Advanced Science Letters, 23(4), 2671-2675.

Lynge, M. J., and Zumwalt, J. K. (1980). An empirical study of the interest rate sensitivity of commercial bank returns: A multi-index approach. Journal of Financial and Quantitative analysis, 15(3), 731-742.

Mallat, S. G. (1989). A theory for multiresolution signal decomposition: the wavelet representation. IEEE transactions on pattern analysis and machine intelligence, 11(7), 674-693.

Mohanamani, P., & Sivagnanasithi, T. (2012). Indian stock market and aggregates macroeconomic variables: Time series analysis. IOSR Journal of Economics & Finance, 3(6), 68-74.

Moya-Martínez, P., Ferrer-Lapeña, R., & Escribano-Sotos, F. (2015). Interest rate changes and stock returns in Spain: A wavelet analysis. BRQ Business Research Quarterly, 18(2), 95-110.

Muradoglu, G., Taşkın, F., & Bigan, I. (2000). Causality between stock returns and macroeconomic variables in emerging markets. Russian & East European Finance and Trade, 36(6), 33-53.

Özer, A., Kaya, A., & Özer, N. (2011). Hisse senedi fiyatları ile makroekonomik değişkenlerin etkileşimi. Dokuz Eylül Üniversitesi İİBF Dergisi, 26(1), 163-182.

Özer, M., & Kamisli, M. (2015). Frequency domain causality analysis of interactions between financial markets of Turkey. International Business Research, 9(1), 176. DOI: https://doi.org/10.5539/ibr.v9n1p176

Özün, A., & Çifter, A. (2006). Bankaların hisse senedi getirirlerinde faiz oranı riski: Dalgacıklar analizi ile Türk bankacılık sektörü üzerine bir uygulama. Bankacılar Dergisi, 59, 3-15.

Percival, D. B., & Mofjeld, H. O. (1997). Analysis of subtidal coastal sea level fluctuations using wavelets. Journal of the American Statistical Association, 92(439), 868-880.

Poyraz, E., & Tepeli, A. G. Y. (2014). Seçilmiş makro ekonomik göstergelerin borsa İstanbul XU100 endeksi üzerindeki etkisinin analizi. Paradoks Ekonomi, Sosyoloji ve Politika Dergisi, 11(2), 102-128.

Rahman, M., & Mustafa, M. (1997). Dynamic linkages and Granger causality between short-term US corporate bond and stock markets. Applied Economics Letters, 4(2), 89-91.

Ramsey, J. B. (2014). Functional representation, approximation, bases and wavelets. In Wavelet Applications in Economics and Finance (1-20). New York: Springer International Publishing.

Sensoy, A., & Sobaci, C. (2014). Effects of volatility shocks on the dynamic linkages between exchange rate, interest rate and the stock market: The case of Turkey. Economic Modelling, 43, 448-457.

Soman, K. P., Ramachandran, K. I., & Resmi, N.G. (2010). Insight into wavelets: from theory to practice (3rd Edition). India: PHI Learning Pvt. Ltd.

Tiwari, A. K. (2012). Decomposing time-frequency relationship between interest rates and share prices in India through wavelets. MPRA paper No. 2692, available at http://www.iei1946.it/RePEc/ccg/TIWARI%20515_531.pdf

Türkyilmaz, S. and Özata, E. (2009). Türkiye'de Para Arzi, Faiz Orani ve Hisse Senedi Fiyatlari Arasindaki Nedensel İlişkilerin Analizi. Sosyal Ekonomik Araştırmalar Dergisi, 8(16), 490-502.

Whitcher, B. J. (2005). Waveslim: Basic wavelet routines for one-two-and three-dimensional signal processing. R Package Version, 1(3).

Wong, W. K., Khan, H., & Du, J. (2006). Do money and interest rates matter for stock prices? An econometric study of Singapore and USA. The Singapore Economic Review, 51(01), 31-51.

Wongbangpo, P., & Sharma, S. C. (2002). Stock market and macroeconomic fundamental dynamic interactions: ASEAN-5 countries. Journal of Asian Economics, 13(1), 27-51.

Yildiz, A. (2014). BIST100 endeksi ile alternatif yatırım araçlarının ilişkisi. Süleyman Demirel Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 19(2).

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Living Arrangement and Mothers' Employment in Japan*

Aysenur AYDINBAKAR[1]

ABSTRACT

This paper tests the effect of living arrangement on the probability of mothers' employment status in Japan using micro-data from a household survey. The analysis was conducted for grandmothers by focusing on distinguishing between grandmother and in-law. The father being the eldest son and the mother being the eldest daughter are used as instruments in bivariate probit models. The findings show that co-residing or proximate-residing grandmother (-in-law) increases the probability of mothers being in employment. That being said, Japanese mothers still need to get help from grandmothers to work. Other important findings indicate that mothers whose husbands are the eldest son tend to live with grandmother-in-law. This confirms that the Japanese norm still stands in modern Japan.

Keywords: Living Arrangement, Grandmothers, Childcare, Eldest Daughter, Eldest Son,

Labor Force, Japanese Norm

JEL classification: J08, J21, Z13

Japan is facing a rapidly aging population and falling birthrate. In spite of the fact that these issues shape the future of Japan, sustainable growth in Japan that considerably depends on raising labor productivity and using all human resources efficiently is maintained by improving the working environment for the elderly, the young, and women (Japan Revitalization Strategy, 2014). The Japanese government, aiming to increase female labor participation with the policies of Prime Minister of Japan, Mr. Shinzo Abe in early 2013, increased the support for childcare centers in the mid-1990s to help families balance the responsibility of being a member of the family and an employee as a response to the declining birthrate (Fukai, 2017). Despite these actions, long waiting lists for childcare facilities have not been solved yet. President Abe stated in his speech that childcare arrangements will have been prepared by 2020 to eliminate the wait for childcare (Abe, 2017). In addition to the unsolved childcare problem that causes an increase in the burden of married Japanese women, they are responsible for home production as well. A potential solution for lessening these responsibilities is to apply informal care, which is to receive help from relatives, particularly grandparents or grandparents-in-law.[1]

According to the Sixth Longitudinal Survey of Newborns in the 21st Century, designated by the Ministry of Health, Labour and Welfare in 2006 and 2007, the caregivers of 97% of children in Japan are nurses and kindergarten teachers and 23.7% of children are looked after by their grandparents.[2] Furthermore, as the ratio of children that the grandmother takes care of is 13%, 10.9% of children's caregivers are grandmother-in-law.

Receiving assistance from grandparents (-in-law) or helping them is easy if couples live with or near them. Co-residence with the relatives in Japan is commonly accepted on account of Japanese culture, pointing that the eldest son maintains the family line, takes care of the grandparents and inherits some assets of the family (Wakabayashi & Horioka, 2009). Couples, when sharing their house with the aged, could compensate the majority of childcare expenses, get some financial help as well as housekeeping, and solve other potential problems in modern Japan (Morgan & Hirosima, 1983;

*** This study is composed out of the author's thesis.**

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Raymo, Mencarini, Iwasawa, & Moriizum, 2010). Thus, married women's employment status can remain stable, even after having a baby (Morgan & Hirosima, 1983; Retherford & Ogawa, 2006, p. 14).

In addition to the advantages of living with grandparents, there are a few disadvantages, such as a loss of privacy and generational conflict. The norm defined above often affects the happiness of wives and makes them less comfortable. Kumagai (2015) states that the Japanese tradition is a burden on caretakers especially if the elderly are sick, which causes married women to lose their independence. Moreover, a conflict between a married woman and motherin- law may arise (Kumagai, 2015). Oishi and Oshio (2006) address feelings women have about losing privacy when they live with grandparents-in-law, stating that wives often feel more comfortable when living close to their families.

Grandmother and grandmother-in-law are assumed that they tend to generate advantages and disadvantages by playing a dominant role as a helper. This study focuses on the effect of living with or near grandmother and grandmother-in-law on the probability of mothers' employment in Japan using the National Family Survey 2008 (in Japanese, *Kazoku ni tsuiteno Zenkoku Chousa*). This paper contributes to the literature in regards to emphasizing the difference of grandmother and grandmother-in-law. Unlike the previous studies in Japan which is close to this study, the role of grandmothers (-in-law) is compared with formal childcare services by considering only mothers. Further, this paper extends the definition of co-residence by considering close-proximity, which captures the more realistic living arrangement that Japanese couples and relatives adapted.

Moreover, there is much less literature considering potential endogeneity between employment and living arrangement in Japan. Thus, it is addressed that how the Japanese tradition influences couples' lives as well as the working behavior of mothers.

Two studies in Japan, Sasaki (2002) and Oishi and Oshio (2006) have so far considered endogeneity for this topic using instrumental variables, such as being the eldest daughter and eldest son. The father being the eldest son and the mother being the eldest daughter are used as instruments in this study. It is assumed that if a father is the eldest son, the possibility of living with or close to grandmother-in-law will increase because of the tradition. The first-born child (the eldest daughter in this study) moves closer to grandparents to prevent the second-born child from receiving help in case grandparents would rather help the nearest child (Kureishi & Wakabayashi, 2010).[3] The effect of being eldest daughter on co-residence with her mother is also stated in the study of Kojima (1993).[4] Logically, the probability of getting married and having a child of the eldest daughter is expected to be higher than the second-born child. It is also important to express that individuals tend to choose their families as compared to in-law because of altruistic feelings or being grateful (Yamada, 2006), so couples might avoid living with or near the spouse's mother. Accordingly, living apart might be the best option for couples.

This estimation result shows that co-residing or proximate-living grandmothers help the mother to work. The finding also points out that childcare facilities have a positive effect on the mother's employment status. That is, the grandmother's help is the complement of a nursery school. Other results reveal that living with or close to grandmother-in-law leads to a higher probability of mothers being in employment. Unlike the grandmother, the grandmother-inlaw's help is the only source of the mother for childcare. The estimation results from bivariate probit models indicate that the living arrangement is significantly affected by birth order of the mother and the father. As the grandmother is more likely to live with or close to her eldest daughter, the grandmother-in-law tends to live with or close to her eldest son.

The paper is structured as follows: Section 2 is theoretical framework. Section 3 reviews the relevant literature. Estimated methods and models used for the analysis are reported in Section 4. In Section 5, data sources, sample selection, and descriptive statistics are described. Estimation results are discussed in Section 6. Section 7 concludes the paper.

Theoretical Framework

Utility is a function of consumption (C) and leisure (l). Mother maximizes her utility, $U(C, l)$, subject to:

$$C = y + w.t_w \ , \quad (1)$$

$$l = T - t_w - t_h \ , \quad (2)$$

where y is mother's non-labor income, e.g. husband's income; w is mother's wage if she is employed; T is total time; t_w is the time mother spends at work; t_h" is the time she spends on unpaid work, such as housework, childcare. Consumption (C) depends on non-labor income and income of the mother. Leisure (l) is the

time left after the time spent for a paid work and an unpaid work.

This study assumes that co-residing or proximate-residing grandmother (-in-law) significantly reduces the mother's involvement in household chores and childcare. Thus, mothers who get help from the grandmother or the grandmother-in-law have more time to spend at work. Similar to Albuquerque and Passos (2010), this paper also assumes that mothers with grandmother (-in-law) in close proximity which includes co-residence and proximateresidence are more likely to be part of labor market. As noted before, togetherness and closeness lead to privacy problem, in particular the problem between mothers and grandmothers-in-law, and more frequent contact which might be undesirable for the couple. Accordingly, the higher the privacy problem is, the lower the utility gets, but the important point is that this disadvantage that mothers face might motivate women for working

Literature Review

Various approaches have been proposed to test the effect of living arrangement of the aged parents on women's labor participation in the U.S., Europe, and Asian countries. Some researchers examine the effects of living with the elderly on women's labor supply by ignoring childcare issue while a considerable amount of studies focuses on either the effect of coresiding with grandparents or the impact of having at least one living grandparent on mothers' labor supply.

Ogawa and Ermisch (1996) analyze the crucial factors determining the wage and employment patterns of Japanese married women by survey data in 1990, managed by Mainichi newspapers. Their results indicate the significant effect of co-residence on women's labor force participation. Nagase (1997) sets a logit model with the data of The Occupational History and Mobility Survey 1983 to examine the wage differentials and labor supply of Japanese married women. The finding reveals that the probability of co-residing Japanese women's labor supply with the grandmother is almost 15 percent higher than that without the grandmother. Nakamura and Ueda (1999) examine the labor supply behavior of Japanese married women by Employment Status Survey in 1992. The finding shows that co-residence with grandmothers, which is the alternative option for a nursery school, leads to a higher probability of women being in employment. Tsuya, Bumpass, and Choe (2000) examine employment and housework in the United States, South Korea and Japan on samples of national family surveys. They found that co-residence or proximate-residence positively affects wives being in employment as well as their working hours per week. Kenjoh (2005) investigates the employment status of mothers after the birth of the first child in the United Kingdom, German, the Netherlands and Japan. The result shows the positive effect of coresiding grandparents on full-time, part-time and family employment of the mothers.

Kumagai and Kato (2007) test prime factors motivating Japanese women to participate in the labor market by the data of the National Family Research of Japan survey data in 1998. They found that co-residing women with grandparents-in-law are 1.5 times more likely to enter into the labor force than those who do not live with any grandparents. Mano and Yamamura (2011) examine the effect of grandmother and grandmother-in-law along with grandfather and grandfather-in-law on Japanese women's labor force participation and earnings. Estimation results, obtained by using the Japanese General Social Survey conducted in every part of Japan between 2000 and 2002, show that co-residence with grandmother and grandmother-in-law has a positive impact on women's labor participation. Asai, Kambayashi, and Yamaguchi (2015) estimate the relationship between childcare availability and mother's employment using the Japanese quinquennial census 1990-2010. The results suggest that any change in formal childcare availability does not affect the mother's employment from three-generation households.

Only two studies about Japan to the best of my knowledge have addressed the endogeneity problem. The first study, Sasaki (2002) estimates the causal effect of co-residence with grandparents (-in-law) on Japanese women's labor force participation by a Japanese microlevel data set from the Panel Study on Consumption and Living 1993. The possible endogeneity due to the interrelation between the decision of labor force participation and the choice of living with the grandparents or in-law is controlled by instrumental variables such as birth order of wife and husband, number of siblings and housing information. The main results of the study show that Japanese married women who live with grandparents (-in-law) have more chances to enter into the labor force. The second study, Oishi and Oshio (2006) analyze the factors affecting married couples to live with husband's parents and wife's parents, and Japanese women's decision to work by using Japanese microdata from Twelfth Japanese National Fertility

Survey in 2002, Part I: Survey on Married Couples, conducted by the National Institute of Population and Social Security Research. The result suggests that living with grandparents and grandparents-in-law leads to a higher probability of women to work.

Much work on co-residence, childcare and female labor force participation has been carried out outside Japan. Floge (1989) provides evidence for the effect of childcare availability on the employment of mothers with pre-school children in New York. The result indicates that women who live in large households or live with another woman are more likely to be employed. Dale and Holdsworth (1998) test the determinants of working mothers in Britain and Spain. No effect of co-residence with grandparents in both countries was detected, however, the positive effect of proximate-residence in Spain was found by the extended model. Using Chinese population data from 1982 to 2000, Maurer-Fazio, Connelly, Chen, and Tang (2011) estimate the effect of co-residence with grandparents, grandparents-in-law, or a person whose age is more than 75 on prime-aged women's employment. The result shows that co-residence has a positive effect on labor force participation. The study of Compton and Pollak (2014) found that proximate-living grandmother and grandmother-in-law affects the labor force of married women with young children positively in the U.S.. Another study of Compton (2015) tests the determinants of proximity and its effect on women's labor force participation and working hours in Canada. The findings show that co-residing childless women are less likely to work compared to proximate-living women. Further, women with proximate-living grandmothers work 15 percentage points more than those who live farther away. Based on the Chinese Longitudinal Healthy Longevity Survey in 2002, Shen, Yan, and Zeng (2016) analyze the effect of co-residing or proximate-living grandparents on female labor supply in China. By 2SLS estimation, they conclude that either living in the same village or living together influences women's labor supply positively, and the effect of living in the same neighborhood (34.9%) is more than the effect of living with grandparents (27.9%). Yang, Fu, and Li (2016) estimate the effects of family structure on labor force participation using the data set of China Health and Retirement Longitudinal Study in 2011. Interestingly, co-residing or proximateliving grandparents have a negative impact on female labor force participation. Garcia-Moran and Kuehn (2017) analyze the impact of childcare provided by grandparents on mothers' labor force participation and fertility by pooling data of German Socio-Economic Panel. The estimation result reveals that mothers living close to grandparents (-in-law) tend to work. It is also revealed that proximate-living grandparents (-in-law) decrease the hourly wages women earned. Landmann, Seitz, and Steiner (2017) examine the effect of co-residence on female labor supply in Kyrgyzstan in 2011. Surprisingly, it is found that co-residence affects the labor supply negatively.

Aside from the result of the studies that examine the link between living arrangement and mothers' labor force participation, many studies have been addressed the positive effect of grandparental support on women's employment (Aassve, Arpino, & Goisis 2012; Arpino, Pronzato, & Tavares 2014; Del Boca, 2002; Dimova & Wolff, 2008, 2011; Du, Dong, & Zhang 2019; Li, 2017; Pagani & Marenzi, 2008; Posadas & Vidal-Fernández, 2013). Contrary to the studies above, Abendroth, Van der Lippe, and Maas (2012) who look into 23 European countries show the insignificant effect of family support.

Estimation Model And Method

This study tests how living arrangement affects mothers' employment status by considering potential endogeneity. The following equations are estimated:

$$Y = 1[a_1 x + a_2 L + v_1 > 0] \quad , \tag{3}$$

$$L = 1[b_1 x + b_2 Z + v_2 > 0] \quad , \tag{4}$$

where Y represents the outcome variable. The outcome variable is a binary variable taking value 1 if the mother has an income-earning job at the time of the 2008 survey, 0 otherwise. L is treated as a treatment variable which equals 1 if the mother lives with (co-residence) or near (proximate-residence) grandmothers (-in-law).[5] Living with or near covers mothers living with grandmothers (in-law) in the same building (shared or separate front entrances), in the detached house or near 15 minutes. If the mother lives far away from both grandmother and grandmother-in-law, a treatment variable equals 0. x is a vector of control variables. Disturbance terms, v_1 and v_2 are assumed to be distributed as bivariate normal random variables with zero means, unit variances (Wooldridge, 2010, p. 594).

In Equation (3), living with or near grandmother (-in-law) (L) could be correlated by the disturbance term (v_1) because of unobservable factors. Ignoring these factors make coefficients biased and inconsistent because of the correlation between disturbance term and omitted variable (Wooldridge, 2010, p. 513). In this

study, if mothers are highly motivated or have positive preferences to work, having a higher employment status, or in a love match, they will be opposed to sharing their houses with the grandmother (-in-law) (Aassve et al., 2012; Martin & Tsuya, 1991). Formal childcare would be preferred by these mothers instead of informal care. Sasaki (2002) stated that if market alternatives are available and cheap, mothers who want to work will choose to them without sharing their houses with someone.

Mothers fearing the loss of their privacy tend to live far away from any grandmother, especially grandmother-in-law (Oishi & Oshio, 2006).[6] However, if mothers are not eager to work and follow the tradition, they will choose to stay at home and lean towards living with or near grandmother (-in-law) (Sasaki, 2002). Under these circumstances mentioned above, the living arrangement's effect will suffer from a negative bias. On the contrary, if mothers behave like a self-seeker, preferring to work, receiving help from the grandmother (-in-law) for childcare and housework will be preferred in the case of unavailable market alternatives to childcare. Another possibility is that mothers prefer to raise their own children and do housework by themselves without working or living with or near their grandmother (-in-law) (Aassve et al., 2012). In this case, the impact of living arrangements will suffer from a positive bias.

Endogeneity of Y and L is detected by $Corr(v_1, v_2) = \rho$. ρ is the correlation coefficient of error terms. If $\rho \neq 0$, probit estimation is inconsistent for a_1 and a_2 (Baum, 2006, p. 271-272; Greene, 2003, p. 712; Wooldridge, 2010, p. 594-595). In the case of endogeneity, it is better to use a bivariate probit model instead of a probit model. To deal with the endogeneity problem, living arrangement (L) is instrumented by being the eldest daughter and son (Z). The mother being the eldest daughter is a dummy variable, taking value 1 if the mother has only female younger sibling(s) or if she is the only daughter, and the father being eldest son equals 1 if the father does not have any older brother(s) or if he is the only son, 0 otherwise.

Vector of following control variables represented by x is added: mother's age; income of father (in logarithm); the last education level of mother and father; age of the youngest child; city size mother lives in; the ratio of childcare capacity per pre-school child in each prefecture.

Data Source And Sample Selection

This study uses micro-data from the 2008 "National Family Survey (in Japanese, *Kazoku ni tsuiteno Zenkoku Chousa*, Japanese Society of Family Sociology)" which was conducted in January 2009 and provided by the Social Science Japan Data Archive, Center for Social Research and Data Archives, Institute of Social Science, The University of Tokyo. 9,400 samples aged between 28 and 72 from all over Japan were selected by stratified two-stage random sampling and the responses were collected by leave and pick-up method. The survey presents detailed responses of 5,203 respondents (response rate is 55.4 percent) about respondents and their families. The number of childcare facilities' capacities in each prefecture in 2008 was obtained from Survey of Social Welfare Institutions, conducted by the Ministry of Health, Labour and Welfare. The number of pre-school population in 2008[7] is taken from current population estimates of Statistics Bureau, Ministry of Internal Affairs and Communications to calculate the ratio of childcare facilities per pre-school child in each prefecture.

The advantages of the data are that it provides all necessary information to get crucial variables. To specify living arrangements, it is necessary to sort the exact distance of houses of both grandmother and grandmother-in-law. Gender and birth order of the siblings are also required to determine whether the mother is the eldest daughter or the father is the eldest son. These information obtained make setting models and estimating them possible. One of the disadvantages of the data might be the date of the survey. Even though it could be claimed that the year, 2008 is old, co-residence or being close to relatives is still a phenomenon even after the date of the survey. More precisely, the report of OECD (2015) indicates that other types of private households such as three-generation households are common in Latvia, Korea, Poland, Japan and the United States. Furthermore, the statistics of Comprehensive Survey of Living Conditions, conducted by Ministry of Health, Labour and Welfare in 2016 show that the ratio of co-residing individuals aged 65 and over with their children was 42.2 in 2010 and 38.4 in 2016. These examples point out that Japan keeps its position among countries where two/threegeneration families are common. Despite the year of the data, the estimation result helps capturing the effect of living arrangement on couples' lives.

The samples are selected as seen in Figure 1. First, married respondents are selected, and couples who are the first spouse of each other are considered to avoid confusion due to the fact that having past marriage experience, being divorced or widowed might affect

couples' decisions in terms of living arrangement and labor participation (Oishi & Oshio, 2006). Second, the data are restricted by selecting women aged between 28 and 50. Third, respondents who have no child are eliminated from the sample as well as those with both dead grandmothers and grandmothers-in-law. Fourth, respondents who live with or near both grandmother and grandmother-in-law are dropped because this paper focuses on the effect of only grandmothers and only grandmothers-in-law on mothers. If the mother lives with or near both grandmothers, her situation will be affected by this closeness of both grandmothers. Lastly, all unavailable information is dropped.[8] After all elimination, 968 respondents remain. Group 1 includes 198 mothers living with or near grandmother only and 406 mothers living far away from both grandmothers (total size of the group 1 is 604). Group 2 consisting of 770 observations includes 364 mothers living with or near grandmother-in-law only and 406 mothers living far away from both grandmothers.

Descriptive statistics of the variables in terms of the living arrangement are shown in Table 1. According to the table, while 68% of co-residing mothers with grandmother or grandmother in-law work, 56% of mothers who live far away from both grandmothers have a job. The percentage of non-working mothers who are away from both grandmothers (44%) is higher than those living with or near any grandmothers (32%). As most of the mothers living near grandmothers or living away from both grandmothers have graduated from the vocational school, mothers living near grandmother-in-law are the least educated women. The percentage of highly educated mothers living apart from both grandmothers (23.65%) is higher than those living near any grandmothers. Fathers living near any grandmothers (-in-law) are low educated individuals while 53.70% of fathers living apart from both grandmothers have at least a university degree. The child of the couple with co-residing or proximate-living grandmother in-law is older than others. The average of nursery school per pre-school child is high for mothers who live with or close to grandmother-in-law. While most of the mothers living with or near grandmothers dwelt in the city, around 40% of those living with or close to grandmother-in-law live in the city and other areas. The ratio of mothers who are not the eldest daughter is quite high in all types of living arrangements, but 30% of mothers that grandmothers live with or near them are the eldest daughter compared to those living near grandmother-in-law or living apart from both of them. More than half of fathers are the eldest son in all types of living arrangements, but the percentage is high for fathers who live with or near grandmothers-in-law (own mother of husband).

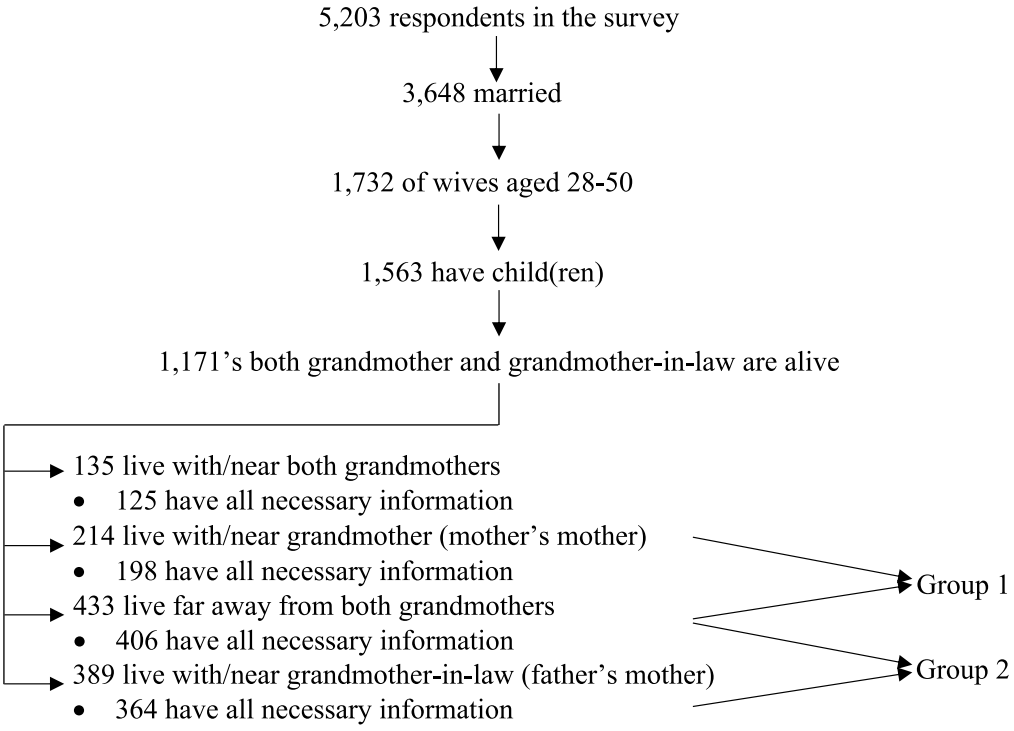

Figure 1: Sample Selection

Estimation Results

Table 2 shows the marginal effects of living with or near grandmother and -in-law on mothers' employment status. Marginal effects from the probit model in column (1) provide a positive effect of the grandmother who lives with or close to the mother. In other words, mothers living with or near grandmothers typically work more by 7% compared to those who do not live with or near any grandmothers. In addition, the higher education level and income fathers receive, the lower probability mothers work. The child getting older affects mothers to work positively. Furthermore, an increase in the percentage of childcare facilities has a positive impact on the probability of mothers being in employment. The results from the probit model in column (1) show that grandmothers are a complement to the nursery school because the marginal effect of the nursery school is higher than the effect of grandmothers who live with or near their daughters.

In column (2), grandmothers who live with or close to the daughter affect her employment positively, but the effect is not significant. Moreover, it is found that an increase in income of fathers leads to a lower probability of mothers to work. The positive effects of the age of the youngest child and the ratio of childcare facilities per pre-school child on mother's employment are found. Considering the results from the bivariate probit model in column (2), only childcare facilities have an impact on the mother's employment status unlike the findings from the probit model in column (1). ρ value from the bivariate probit model is insignificant, as seen in the bottom of column (2). Endogeneity in bivariate probit estimation could not be found, so the results of the probit model are considered. Equation 4's result listed in column (2) shows that if mothers are the eldest daughter, the probability of living with or near grandmother increases. On the other hand, the marginal effect of the father being the eldest son is negative. Moreover, the increased level of income husbands earn and the higher education mothers receive decrease the probability of living with or near the grandmother. The marginal effects of living with or near the grandmother-in-law on the mother's employment status are reported in columns (3)-(4) of Table 2. In column (3), the effect of the grandmother-in-law on the probability of mothers being in employment is positive, but the effect is insignificant.

Table 1: Descriptive Statistics

	Living together/ near grandmother	Living together/near grandmother-in-law	Living far away from both grandmothers
	Percentage	Percentage	Percentage
Working mother	67.17	68.41	55.67
Non-working mother	32.83	31.59	44.33
Mother's age*	39.37 (6.07)	40.21 (6.01)	39 (6.32)
Education level of mother Mother's high school or lower (ref.)	39.39	46.70	31.28
Mother's vocational school	46.47	40.93	45.07
Mother's university or higher	14.14	12.36	23.65
Education level of father Father's high school or lower (ref.)	42.42	42.58	33.25
Father's vocational school	17.68	18.13	13.05
Father's university or higher	39.90	39.29	53.70
Father's income (ten thousand Yen)*	567.60 (272.71)	534.71 (239.68)	649.48 (298.33)
Age of the youngest child	7.94 (6.11)	9.52 (6.61)	7.71 (6.16)
% of childcare facility per pre-school child*	0.21 (0.10)	0.24 (0.11)	0.21 (0.09)
City size Large city (ref.)	24.77	19.51	33.99
City	43.94	39.84	41.38
Other area	31.31	40.66	24.63
Mother is the eldest daughter	30.30	17.03	21.68

Table 1: (Cont'd). Descriptive Statistics

	Living together/ near grandmother	Living together/near grandmother-in-law	Living far away from both grandmothers
	Percentage	Percentage	Percentage
Mother is not the eldest daughter	69.70	82.97	78.32
Father is the eldest son	53.54	81.32	67.24
Father is not the eldest son	46.46	18.68	32.76
Number of observation	198	364	406
(%)	32.78		67.22[1]
(%)		47.27	52.73[2]

Source: National Family Survey 2008 (Kazoku ni tsuiteno Zenkoku Chousa)
Notes: * shows the mean of the variables. Standard deviations are shown in parentheses.
[1] In group 1, 67 percent of mothers live far away from both grandmothers and also grandmothers-in-law.
[2] In group 2, 53 percent of mothers live far away from both grandmothers and also grandmothers-in-law.

As the higher education fathers receive and the increased amount of income they earn negatively affect mothers' employment, kids becoming older and the increased ratio of childcare facilities affect working mothers positively. In column (4), the marginal effect of the grandmother-in-law is positive and statistically significant in the bivariate probit model with instrumental variables. The probability of being employed increases by 37% in the case that mothers live with or near grandmothers-in-law. Additionally, the higher education mothers receive, the more likely they are to work. Other findings suggest that an increase in educational level and the amount of fathers' income lead to a lower probability of mothers being in employment. The age of the youngest child has a positive impact on the probability of mothers working. The positive and significant effect of childcare facilities on the mother's employment is observed in the results from the probit model in column (3) while grandmother-in-law is the only source of the mother to work as seen in column (4). This result is consistent with the finding of Asai et al. (2015) suggesting that the employment of mothers living in the threegeneration household is not affected by any changes in childcare availability since the grandparent's care is used as a substitute for formal childcare services.

In column (4), ρ is found significant, showing that endogeneity appears. The instruments (being the eldest daughter and the eldest son) produced expected signs. The mother being the eldest daughter affects on living with or close to grandmother-in-law negatively in contrast with the father being the eldest son. The higher level of education mothers receive and the salary husbands earn decrease the probability of living with or near grandmother-in-law. The positive and significant marginal effect of the age of the youngest child and the ratio of childcare facilities on living with or near grandmother-in-law are observed. Another important finding is that mothers living in other areas tend to live with or near grandmother-in-law. The positive effect of the ratio of childcare facilities on living near grandmother-in-law might be sourced by living in rural, referred by other areas, because individuals in rural have already decided their living arrangement through the Japanese norm, and the ratio of childcare facilitates are high in rural.[9] Asai et al. (2015) state that even though childcare facilities are available in both large and small prefectures, the growth of them is slow in the large prefecture.

Table 2: Marginal Effects of Living Arrangement on Mother's Employment

Outcome variable: Y	Group 1		Group 2	
Mother's employment=1	**Probit (1)**	**Bivariate (2)**	**Probit (3)**	**Bivariate (4)**
Living together/near	0.068*	0.029	0.024	0.374***
	(0.040)	(0.25)	(0.032)	(0.049)
Mother's age	0.004	0.004	0.005	0.004
	(0.005)	(0.005)	(0.005)	(0.004)
Mother's vocational school (=1)	0.015	0.014	-0.031	0.004
	(0.044)	(0.044)	(0.037)	(0.031)
Mother's university or higher (=1)	0.062	0.059	0.039	0.079*
	(0.058)	(0.063)	(0.048)	(0.041)
Father's vocational school (=1)	-0.043	-0.042	-0.089*	-0.096**
	(0.059)	(0.059)	(0.051)	(0.044)
Father's university or higher (=1)	-0.078*	-0.080	-0.110***	-0.081**
	(0.047)	(0.049)	(0.040)	(0.035)
Father's income(log)	-0.197***	-0.201***	-0.169***	-0.083*
	(0.046)	(0.048)	(0.043)	(0.043)
Age of the youngest child	0.023***	0.023***	0.023***	0.014***
	(0.005)	(0.005)	(0.005)	(0.005)
% of childcare facility per pre-school child	0.679***	0.677***	0.391**	0.168
	(0.206)	(0.208)	(0.169)	(0.152)
City (=1)	0.015	0.018	0.020	-0.009
	(0.044)	(0.049)	(0.040)	(0.034)
Other area (=1)	0.014	0.017	0.031	-0.039
	(0.053)	(0.058)	(0.044)	(0.039)
Outcome variable: L		(2)		(4)
Group 1: Living with/near grandmother=1 Group 2: Living with/near grandmother-in-law=1 Father being the eldest son (=1)	-0.111***			0.130***
	(0.037)			(0.039)
Mother being the eldest daughter (=1)	0.097**			-0.078**
	(0.042)			(0.036)
Mother's age	0.007			0.003
	(0.005)			(0.005)
Mother's vocational school (=1)	-0.021			-0.067*
	(0.045)			(0.039)
Mother's university or higher (=1)	-0.101*			-0.123**
	(0.058)			(0.056)
Father's vocational school (=1)	0.021			0.100*
	(0.060)			(0.053)
Father's university or higher (=1)	-0.040			0.003
	(0.048)			(0.043)
Father's income(log)	-0.085*			-0.150***
	(0.044)			(0.039)
Age of the youngest child	-0.004			0.008*
	(0.005)			(0.005)
% of childcare facility per pre-school child	-0.019			0.343**
	(0.218)			(0.175)
City (=1)	0.071			0.062
	(0.045)			(0.043)
Other area (=1)	0.085			0.161***
	(0.053)			(0.049)
Number of observation	604	604	770	770

Table 2: (Cont'd). Marginal effects of living arrangement on mother's employment

Outcome variable: Y	Group 1		Group 2	
Mother's employment=1	**Probit (1)**	**Bivariate (2)**	**Probit (3)**	**Bivariate (4)**
ρ		0.072		-0.774***
Log likelihood	-355.285	-717.456	-426.066	-901.914
Pseudo R-squared	0.129		0.169	

Notes: Marginal effects are calculated on average. Delta-method standard errors are shown in parentheses. *, ** and *** are statistical significance of the variables at the 10%, 5% and 1% levels, respectively. Reference level of variables related to education is a high school or lower. Large city is taken as a reference level of city size.

Conclusion

This study examines the effect of living arrangement on mothers' employment in Japan. Living arrangements are analyzed with regard to living with or near grandmother and grandmother-in-law separately. Following the Japanese norm, the father being the eldest son is used as the first instrument in the bivariate probit model. The mother being the eldest daughter, who exploits her age priority, is chosen as the second instrument. The estimation results show that living with or near grandmother and grandmother-in-law has a positive impact on mothers' employment. In light of the results, the general findings of this study are consistent with other studies in Japan. Apart from the main result, the increase in the ratio of childcare facilities per pre-school child increases the probability of mothers being in employment even in the case of having a co-residing or proximate-living grandmother. In other words, grandmothers provide a complement to childcare facilities. It can be said that an altruistic grandmother gives a chance to her daughter to decide how to raise a kid and support her doing other duties, such as picking up grandchildren from school, preparing meals, shopping. The effects of both co-residing or proximate-residing grandmother-in-law and childcare facilities are positive, but the impact of facilities is insignificant. In contrast with grandmother's case, it seems likely that grandmothers-in-law are one of the key decision-makers in raising grandchildren as long as they live with or close to their daughters-in-law, and formal childcare services are substituted by grandmothers-in-law. Furthermore, the considerable effect of living with grandmothers-in-law could be attributed to the difference between mothers and grandmothers-in-law in terms of ideas. Mothers may choose to avoid generational conflict by working and taking advantage of the grandmother-in-law's availability to care for their children.

Even though the reason for no endogeneity between living with or near the grandmother and the decision to work has been a puzzle, a potential explanation is that mother has already adapted to the grandmother's support if she has been receiving it for a long time. This study also suggests that the Japanese norm must be considered to understand the reasoning behind living with or near grandmothers-in-law.

Needless to say, mothers need formal or informal support to go to school, look for a job, or work. Japanese policymakers have implemented constructive policies that encourage mothers to work. The main solution is to deal with the insufficient childcare facility problem. Thus, mothers do not have to take many years off or quit their jobs to raise their kids. Even though informal help seems to be a decent alternative to a nursery school, mothers may not have the option to receive help from grandparents or grandparents-in-law, especially grandmothers (-in-law). Moreover, many grandparents (-in-law) still want to work. Considering the population and life expectancy in Japan, the number of elderly cannot be underestimated; if they provide care for their grandchildren or housework, they are not able to keep working. This study suggests that policymakers should support grandparents (-in-law) who are eager to assist their children and provide a way for mothers to work.

NOTES

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[1] In this study, the mother and the father refer to the wife and the husband. The grandparent and the grandparent-in-law refer to the parent of the wife and the husband, respectively.

[2] Respondents were allowed to select as many answers as they like.

[3] Daughters without sibling(s) are assumed as the eldest daughter in this study. Kureishi and Wakabayashi (2010) found that the only son is more likely to be close to grandparents but the coefficient of the only daughter is not significant. However, their t-tests show that there is no significant difference between the first son with only younger sibling(s) and the only son and the first-born daughter with only younger sister(s) and the only daughter.

[4] In the study of Kojima (1993), it is assumed that only married child lives with grandparents.

[5] Residence place of grandfather and grandfather-in-law and whether they are dead or alive are completely ignored in this paper. Grandmother and grandmother-in-law are assumed as a primary helper.

[6] It is mentioned as "grandparents" and "grandparents-in-law" in the study of Oishi and Oshio (2006).

[7] Following Kureishi and Wakabayashi (2010, p. 165), the sum of children whose ages are between 0 and 5 and one-half of the number of 6-year-old children are used for the number of pre-school population in 2008.

[8] Respondents defining the last school they or their spouses attended as "other" are dropped because this response does not specify any education level.

[9] The survey used in this study also shows that the percentage of childcare facilities in the rural area are 26% as this ratio is 17% and 23% in large cities and cities, respectively. The calculation is done after the sample selection.

References

Aassve, A., Arpino, B., & Goisis, A. (2012). Grandparenting and mothers' labour force participation: A comparative analysis using the generations and gender survey. *Demographic Research*, 27:53.

Abe, S. (2017). Policy speech by Prime Minister Shinzo Abe to the 195th session of the diet. Retrieved from The Government of Japan, https://japan.kantei.go.jp/98_abe/statement/201711/ _00006.html.

Abendroth, A.K., Van der Lippe, T., & Maas, I. (2012). Social support and the working hours of employed mothers in Europe: The relevance of the state, the workplace, and the family. *Social Science Research*, 41(3), 581–597.

Albuquerque, P. & Passos, J. (2010). Grandparents and women's participation in the labor market. Working Paper No.16, School of Economics, Technical University of Lisbon.

Arpino, B., Pronzato, C. D., & Tavares, L. P. (2014). The effect of grandparental support on mothers' labour market participation: An instrumental variable approach. *European Journal of Population*, 30(4), 369–390.

Asai, Y., Kambayashi, R., & Yamaguchi, S. (2015). Childcare availability, household structure, and maternal employment. *Journal of the Japanese and International Economies*, 38, 172–192.

Baum, C. F. (2006). An introduction to modern econometrics using Stata. Stata press.

Compton, J. (2015). Family proximity and the labor force status of women in Canada. *Review of Economics of the Household*, 13(2), 323–358.

Compton, J. & Pollak, R. A. (2014). Family proximity, childcare, and women's labor force attachment. *Journal of Urban Economics*, 79, 72–90.

Dale, C. & Holdsworth, A. (1998). *Working mothers in Great Britain and Spain: A preliminary analysis*. Cathie Marsh Centre for Census and Survey Research.

Del Boca, D. (2002). The effect of child care and part time opportunities on participation and fertility decisions in Italy. *Journal of Population Economics*, 15(3), 549–573.

Dimova, R., & Wolff, F. C. (2008). Grandchild care transfers by ageing immigrants in France: Intra- household allocation and labour market implications. *European Journal of Population/Revue européenne de Démographie*, 24(3), 315–340.

Dimova, R., & Wolff, F. C. (2011). Do downward private transfers enhance maternal labor supply? Evidence from around Europe. *Journal of Population Economics*, 24(3), 911– 933.

Du, F., Dong, X. Y., & Zhang, Y. (2019). grandparent-provided childcare and labor force participation of mothers with preschool children in urban China. *China Population and Development Studies*, 2(4), 347-368.

Floge, L. (1989). Changing household structure, child-care availability, and employment among mothers of preschool children. *Journal of Marriage and the Family*, 51(1), 51– 63.

Fukai, T. (2017). Childcare availability and fertility: Evidence from municipalities in Japan. *Journal of the Japanese and International Economies*, 43, 1–18.

Garcia-Moran, E., & Kuehn, Z. (2017). With strings attached: Grandparent-provided child care and female labor market outcomes. *Review of Economic Dynamics*, 23, 80–98.

Greene, W. H. (2003). Econometric analysis. Pearson Education India.

Japan Revitalization Strategy (2014). Japan revitalization strategy (revised in 2014)- Japan's challenge for the future. Retrieved from The Government of Japan, http://www.kantei.go. jp/jp/singi/keizaisaisei/pdf/honbunEN.pdf.

Kenjoh, E. (2005). New mothers' employment and public policy in the UK, Germany, the Netherlands, Sweden, and Japan. *Labour*, 19, 5–49.

Kojima, H. (1993). Sibling configuration and coresidence of married couples with an older mother in Japan. *International Journal of Japanese Sociology*, 2(1),1–16.

Kumagai, F. (2015). *Demographic changes in japan. In Family Issues on Marriage, Divorce, and Older Adults in Japan,* 11–38. Springer.

Kumagai, F., & Kato, A. (2007). Factors facilitating Japanese married women entering the labour force. *Current Sociology*, 55(4), 561–577.

Kureishi, W. and Wakabayashi, M. (2010). Why do first-born children live together with parents? *Japan and the World Economy*, 22(3), 159–172.

Landmann, A., Seitz, H., & Steiner, S. (2017). *Patrilocal residence and female labour supply* (No. 10890). Institute for the Study of Labor (IZA).

Li, Y. (2017). The effects of formal and informal child care on the mother's labor supply— Evidence from urban China. *China Economic Review*, 44, 227-240.

Mano, Y., & Yamamura, E. (2011). Effects of husband's education and family structure on labor force participation and married Japanese women's earnings. *Japanese Economy*, 38(3), 71–91.

Martin, L. G., & Tsuya, N. O. (1991). Interactions of middle-aged Japanese with their parents. *Population Studies*, 45(2), 299–311.

Maurer-Fazio, M., Connelly, R., Chen, L., & Tang, L. (2011). Childcare, eldercare, and labor force participation of married women in urban China, 1982–2000. *Journal of Human Resources*, 46(2), 261–294.

Ministry of Health, Labour and Welfare (2007). Sixth Longitudinal Survey of Newborns in the 21st Century. https://www.mhlw.go.jp/english/database/db-hw/newborns6th/index.html

Ministry of Health, Labour and Welfare (2016). Comprehensive Survey of Living Conditions. https://www.mhlw.go.jp/english/database/db-hss/cslc-report2016.html

Morgan, S. P., & Hirosima, K. (1983). The persistence of extended family residence in Japan: Anachronism or alternative strategy? *American Sociological Review*, 269–281.

Nagase, N. (1997). Wage differentials and labour supply of married women in Japan: Part-time and informal sector work opportunities. *The Japanese Economic Review*, 48(1), 29–42.

Nakamura, J., & Ueda, A. (1999). On the determinants of career interruption by childbirth among married women in Japan. *Journal of the Japanese and International Economies*, 13(1), 73–89.

OECD (2015). OECD Family Database. https://www.oecd.org/els/family/SF_1_1_Family_ size_and_composition.pdf

Ogawa, N., & Ermisch, J. F. (1996). Family structure, home time demands, and the employment patterns of japanese married women. *Journal of Labor Economics*, 14(4), 677–702.

Oishi, A. S., & Oshio, T. (2006). Coresidence with parents and a wife's decision to work in Japan. *The Japanese Journal of Social Security Policy*, 5(1), 35–48.

Pagani, L., & Marenzi, A. (2008). The labor market participation of sandwich generation Italian women. *Journal of Family and Economic Issues*, 29(3), 427–444.

Posadas, J., & Vidal-Fernández, M. (2013). Grandparents' childcare and female labor force participation. *IZA Journal of Labor Policy*, 2(1), 1-14.

Raymo, J. M., Mencarini, L., Iwasawa, M., & Moriizumi, R. (2010). Intergenerational proximity and the fertility intentions of married women: A Japan-Italy comparison. *Asian Population Studies*, 6(2), 193–214.

Retherford, R., & Ogawa, N. (2006). "Japan's baby bust: Causes, implications, and policy responses," in F. R. Harris (ed.), *The Baby Bust. Who Will Do the Work? Who Will Pay the Taxes*? Lanham, MD: Rowman & Littlefield Publishers, 5–47.

Sasaki, M. (2002). The causal effect of family structure on labor force participation among Japanese married women. *Journal of Human Resources*, 37(2), 429–440.

Shen, K., Yan, P., & Zeng, Y. (2016). Coresidence with elderly parents and female labor supply in China. *Demographic Research*, 35(23), 645–670.

Tsuya, N. O., Bumpass, L. L., & Choe, M. K. (2000). Gender, employment, and housework in Japan, South Korea, and the United States. *Review of Population and Social Policy*, 9, 195–220.

Wakabayashi, M., & Horioka, C. Y. (2009). Is the eldest son different? The residential choice of siblings in Japan. *Japan and the World Economy*, 21(4), 337–348.

Wooldridge, J. M. (2010). *Econometric Analysis of Cross Section and Panel Data*. The MIT Press.

Yamada, K. (2006). Intra-family transfers in japan: Intergenerational co-residence, distance, and contact. *Applied Economics*, 38(16), 1839–1861.

Yang, C., Fu, H., & Li, L. (2016). The effect of family structure on female labor participation: Empirical analysis based on the 2011 China health and retirement longitudinal study. *Asian Social Work and Policy Review*, 10, 21–33.

Zamarro, G. (2011). *Family labor participation and child care decisions: The role of grannies*. RAND Working Paper Series WR- 833.

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Mean Reversion in International Equity Markets*

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ABSTRACT

Mean reversion is a phenomenon that has been consistently observed and refuted in several studies over the last decades. This study first aims at shedding further light on this unsettled issue by assessing mean reversion on recent data in a broad range of international equity markets including developed and emerging markets and international indices provided by MSCI. Variance ratio computations and a novel distribution-free statistical tests based on randomization are used on dollar denominated nominal, real and excess returns of these equity markets. The results indicate that mean reversion exists in both developed and emerging countries, albeit its statistical significance is occasionally dubitable. Moreover, firm size and return type exhibit significant effects on the degree of mean reversion.

Keywords: International Equity Returns; Market Efficiency; Mean Reversion; Variance Ratio

JEL Classification: G1; G14; G15; C14

1. Introduction

Movements of stock prices have been a crucial part of the finance literature for decades and probably will continue to be so for decades to come. Practitioners and academics alike have been trying to understand how stock prices move since the early days of modern financial markets in the eighteenth century. There are numerous theories and published papers trying to explain how stock prices change over time. What makes it such a hot topic is that it has the possibility of opening doors to endless economic gains. For example, if we can prove that a certain stock's price has a cyclical behavior (a.k.a. mean reversion) and if we can identify certain properties of that behavior such as the half-life, we can buy that stock when it's at its lowest level and sell it when it's at its highest. There is certainly some degree of randomness in stock prices, therefore we might not be as successful as we'd like in our predictions. Yet it is undeniable that understanding the patterns of stock prices presents us with an incomparable opportunity for profits.

The most dominant theory regarding stock returns is the random walk theory. This theory maintains that holding period returns of a stock are independent from each other. According to this theory, stock prices have no memory; therefore, historical prices have no practical use to us. Advocates of the random walk theory believe it is not possible to outperform the market without bearing any additional risk. Burton Malkiel (1973, p.24), who is credited with popularizing the idea, claims: "a blindfolded monkey throwing darts at a newspaper's financial pages could select a portfolio that would do just as well as one carefully selected by the experts". Assuming he was talking about the risk adjusted returns, what he said would be true if prices were following a random walk.

The popularity of the random walk theory had a dramatic increase with the introduction of the Efficient Markets Hypothesis (hereafter EMH) in the 1960s. In general terms, EMH holds that in an efficient market, "prices fully reflect available information" (Fama, 1970, p.384). Although they are not exactly the same, it is clear that EMH makes a strong case for the random walk theory.

If prices do not follow a random walk and serial correlations between holding-period returns are not

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zero, it means there is a certain degree of predictability in stock prices. Positive serial correlations point towards a trend in stock prices, whether it be increasing or decreasing. This means the stock price in the next period will likely move in the same direction it moved in the last period. This is called momentum and investment strategies based on this idea are called momentum strategies (Jegadeesh and Titman, 1993; Rouwenhorst 1998; Patro and Wu, 2004). Momentum strategies typically involve buying stocks that performed well in the past and short selling stocks that performed poorly in the past.

In contrast, if serial correlations are negative; stock prices tend to fluctuate around a certain mean or trend. This is called mean reversion (Lo and Mackinlay, 1988; Poterba and Summers, 1989; Richards, 1997; Chaudhuri and Wu, 2003; Gropp, 2004). Investment strategies based on this phenomenon are called contrarian strategies. Contrarian strategies look to buy stocks that have performed poorly in the past and short sell stocks that have performed well in the past. Both of these investment strategies aim to outperform the market by following two diametrically opposite routes.

Coexistence of the two opposing views can be explained by the fact that serial correlations can have different signs for different holding periods or different lags. There might be momentum in the short-term and mean reversion in the long-term or vice versa. In this case, a more sophisticated investment strategy involving both momentum and contrarian perspectives may be adopted (Balvers and Wu, 2006).

If EMH and random walk theory are considered as the traditional paradigm in explaining stock returns, financial market anomalies are the empirical patterns that are in violation of these central ideas. There are numerous empirical anomalies documented over the decades capturing both cross-sectional and time-series patterns in returns of securities. Mean reversion and aversion occupy important places on the list of anomalies violating EMH, even though there are some differences of opinion in the literature.

Fama and French (1988, p.299) argue that serial correlations may be the result of "time varying equilibrium expected returns generated by rational investor behavior". Moreover, Conrad and Kaul (1988) find evidence in favor of a stationary expected return process, which substantiates the earlier statement. Since there is no consensus as to even their existence, we deem it is worthy of further study to explore these phenomena.

Therefore, this study investigates if international equity indices, both developed and emerging, show any signs of these anomalies on recent data using a robust and novel methodology. Even though this subject has been under constant scrutiny for the last three decades, there aren't many studies that look at both developed and emerging markets. Aside from the novelties of our sample set, we also explore the effect of return type and firm size on return predictability. We feel we can make a useful contribution to the literature by comprehensively examining both fronts, through a methodology that does not rely on any assumptions made about the distribution of variance ratios.

Rest of the paper is organized as follows: Section 2 reviews the extant literature on mean reversion and momentum. Section 3 explains the methodology followed throughout the paper and characteristics of the data set. Section 4 discusses the empirical results. Section 5 includes a summarization of the results and some concluding remarks.

2. Literature Review

Mean reversion in finance, although observed and discussed for long, came to be rigorously analyzed since 1970's. Vasicek (1977) proposed a mean-reverting Ornstein-Uhlenbeck process to model stochastic interest rates. This extension of continuous time models that have been popularized in the 70's found a natural application in interest rates, as it was long perceived that interest rates exhibit mean reversion in empirical observations. Mean reversion in stock prices, however, was first investigated by DeBondt and Thaler (1985) under the name of price reversals. They formed winner and loser portfolios by ranking all the stocks in the New York Stock Exchange with respect to their past returns. Their findings were remarkable. They found that on average, the loser portfolios earned 24.6% more than the winner portfolios in the subsequent test period. To show that the difference in returns cannot be explained solely by the difference in risk, they also calculated CAPM betas for winner and loser portfolios for each of the formation period. Surprisingly, not only loser portfolios were outperforming winner portfolios, they were also significantly less risky. They interpreted these findings as the result of overreaction of investors and concluded that this is a violation of weak-form market efficiency. This study paved the way for other researchers to explore this new phenomenon and gain more insight on how stock prices move.

Chan (1988) challenged DeBondt and Thaler's (1985) results by claiming that their method of measuring the betas of winner and loser portfolios was biased. He suggested an alternative method for measuring risk which involves calculating different betas for the formation and test periods. He repeated the same procedure as DeBondt and Thaler (1985) with the new betas and he found only weak evidence of price reversals. According to his results, abnormal returns to the contrarian strategy were very small, and probably economically insignificant, considering transaction costs and various other factors that can erase that small profit margin.

French and Roll (1986), while investigating the difference in the volatility of stock prices between trading and non-trading hours, reported negative serial correlations in daily returns in all lags up to 13 except lag 1. Although they used these results for a different purpose, these negative auto correlations can still be regarded as significant evidence in favor of short-term mean reversion. The way they calculated these variance ratios is very similar to that of Cochrane (1988), whose methodology was taken as the basis by the likes of Poterba and Summers (1989) and Lo and MacKinlay (1988). Even though they were not concerned with mean reversion at all, they provided substantial evidence for future researchers to move forward with, nonetheless. In fact, this simple idea provided the foundation to test random walk and efficient market hypothesis without being tied to an asset pricing model, a problem which led the academics to question the aforementioned studies.

Lo and MacKinlay (1988) used variance ratios to explore whether or not stock prices follow random walk. They found significant evidence of positive autocorrelations in the weekly data and therefore rejected the random walk hypothesis. They discovered that positive autocorrelations get larger, thus the rejection of random walk stronger, as the firm size decreases.

Fama and French (1988) assumed stock prices consist of two separate AR (1) processes, a permanent component which follows a random walk and a transitory component which is mean reverting. While they did not observe any apparent pattern in industry portfolios, the decile portfolios demonstrated clear patterns that suggest mean-reverting components in prices. The effect of the mean-reverting component diminished however, as the firm size increased.

Poterba and Summers (1989) compared the methods of Fama and French (1988) and Lo and MacKinlay (1988) with respect to their power in detecting mean reversion and concluded that variance ratio method used by Lo and MacKinlay (1988), although not nearly powerful enough, is much more powerful than the method of Fama and French (1988). Therefore, they used variance ratio tests to investigate if there was long-term mean reversion in stock prices. They test their hypothesis on US as well as a range of international markets. They reported variance ratios separately for nominal, real and excess returns for the value-weighted as well as the equal-weighted indices. Their results suggested positive serial correlation in stock prices in horizons shorter than one year and negative serial correlation in horizons longer than one year. This, together with the results of Lo and MacKinlay (1988), makes a strong case for momentum strategies in the short-term, while advocating for contrarian strategies for the longer horizons.

Kim, Nelson and Startz (1991) criticized the findings of previous studies and went on to perform more robust tests on the issue. In order to test their results, they created empirical distributions of variance ratios and regression coefficients by randomization. To put it simply, they shuffled their data 1000 times and calculated the same statistic for every shuffle to come up with an empirical distribution for their test statistic. The merits of this approach come from the fact that it requires no assumptions about the distribution of the test statistic. This separates them from other researchers who use asymptotic approximations. After testing their results, Kim et al. (1991) concluded that mean reversion was a pre-war phenomenon, hence a statistical fluke of its time. McQueen (1992) also investigated long-term mean reversion in the U.S. market by generalized least squares estimators and could not reject the random walk hypothesis with the GLS method.

Richards (1997) studied winner-loser reversals in international markets and found a momentum effect in horizons shorter than one year and contrarian effect at 3 and 4-year horizons. Balvers, Wu and Gilliland (2000) built a parametric model in which price of a certain index is determined by its deviations from a reference index. With this model, not only they could test the hypothesis of mean reversion, they were also able to find the half-life of mean reversion, if there was any. With a focus on international markets, they could not reject the random walk hypothesis for most of the countries separately. However, when they pooled the data for all 18 countries to gain more statistical power; they were able to reject the random walk hypothesis

at the 1 percent significance level. Chaudhuri and Wu (2003) also reported strong evidence of mean-reversion in international markets. Gropp (2004) looked for mean reversion in industry stock returns in the USA with a panel approach above and found strong evidence of mean-reversion in contrast with other US-based studies cited above.

Given the earlier evidence supporting both return continuation and mean reversion, Balvers and Wu (2006) developed a trading model that combined momentum and contrarian strategies. They believed that although the mean reversion effect seemed stronger than momentum effect, a single asset could demonstrate both at different holding periods. Their joint strategy outperformed separate momentum and contrarian strategies as well as a pure random walk strategy. Mukherji (2011) revisited the issue of mean reversion with a more recent data. In order to surmount the small sample barrier, he utilized bootstrapping which involved pulling 10-year samples from the original data set 1000 times with replacement. As predicted, he observed a greater tendency for mean reversion in small company stocks. He concluded that although it had weakened in the last decades, mean reversion was still present in the U.S. data; especially for small company stocks.

Spierdijk, Bikker and van den Hoek (2012) tested mean reversion across 18 OECD countries with a data set covering the 1900-2009 period. They were able to reject the null hypothesis of random walk in favor of mean reversion for only 8 countries out of 18. They conducted a rolling-window test with 27 year-long windows, in which they allowed the speed of mean reversion to be different in each window. According to their results, speed of mean reversion tends to fluctuate a lot over time and it is usually higher in periods of economic instability. This study shows how much the results of such an analysis depend upon the choice of data sample.

Shaik and Maheswaran (2018) presented evidence of mean reversion in the Indian stock market by using expected lifetime range ratios which they claim to be more robust in detecting mean reversion compared to conventional variance ratios.

Jegadeesh (1990, 1991) explored the possibility of seasonality in the predictability of stock prices. He found evidence of mean reversion in the U.S. stocks but discovered that the month January was solely responsible for this result. These findings cast a shadow upon the results of Poterba and Summers (1989) and many others and called most of the evidence provided in favor of mean reversion into question.

Although the main focus of this paper is mean reversion, adverting some of the articles on momentum would be helpful in presenting a more comprehensive literature review. Jegadeesh and Titman (1993) tested different momentum-based strategies for the U.S. market over the 1965-1989 period. Their results contributed to the earlier evidence in favor of the general rule of momentum in the short-term/mean reversion in the long-term. Carhart (1997, p.79) claimed "buying last year's top-decile mutual funds and selling last year's bottom-decile mutual funds yields a return of 8 percent per year". Rouwenhorst (1998, p.283) looked at 12 European countries and found that "an internationally diversified portfolio of past winners outperformed a portfolio of past losers by about 1 percent per month". Chan, Hameed and Tong (2000) implemented momentum strategies on international stock markets and found statistically and economically significant returns. Jegadeesh and Titman (2001) asserted that momentum effect continued to persist in U.S. market in the 1990s, more specifically in the eight years subsequent to Jegadeesh and Titman (1993). Lewellen (2002) provided further evidence on momentum by investigating the role of industry, size and book-to-market factors. He showed that even the well-diversified size and book-to-market portfolios exhibited a considerable degree of momentum. Patro and Wu (2004) tried to shed further light on momentum and examined 18 developed markets for the period 1979-1998. They rejected the random walk hypothesis with daily and weekly data for most of the countries. They also noted that these equity indices displayed significant return continuation in the short-term. By analyzing 38 country indices, Bhojraj and Swaminathan (2006) inferred that after the portfolio formation, winners outperformed losers in the first 3 to 12 months, but underperformed losers in the subsequent 2 years.

3. Data and Methodology

In order to assess mean reversion, we follow the main methodology of Poterba and Summers (1989) which relies upon variance ratios, with more robust statistical tests based on randomization. There are several reasons behind this selection. There are other ways of detecting mean reversion such as the expected lifetime range ratio method of Shaik and Maheswaran (2018) but that method is relatively new and it hasn't

stood the test of time. Variance ratio on the other hand, is a model-free test method reliably used over the past decades. Furthermore, it has an easy and intuitive interpretation when coupled with a robust statistical test. Usage of a randomization method to conduct statistical tests frees us from relying on an asset pricing model or a specific distribution, hence yields more unbiased results.

If the return series of a stock follows random walk, the variance of its k-period return must be k times the variance of its 1-period return, assuming we use continuously compounded returns.

$$R_k = r_1 + r_2 + \cdots + r_k \quad (1)$$

Here, R_k is the k-period return and returns on the right-hand side are 1-period returns. If we want to get the variance of R_k:

$$Var(R_k) = \sum_{i=1}^{k} \sum_{j=1}^{k} Cov(r_i, r_j) \quad (2)$$

If the series follows a random walk, returns must be independent from each other. In this case, the equation reduces to:

$$Var(R_k) = k \times \sigma^2 \quad (3)$$

This proves that under the strict assumptions of random walk, the variance of holding period returns is proportional to the length of the holding period itself. The variance ratio statistic is defined as:

$$VR(k) = \frac{Var(r_t^k)}{Var(r_t^1) * k} \quad (4)$$

where r_t^k and r_t^1 are k-period and 1-period returns respectively. From Equation (3), we can see that this statistic has to be in unity for a random walk. Poterba and Summers (1989) used a variation of this statistic in their analysis which is:

$$VR(k) = \frac{Var(r_t^k)/k}{Var(r_t^{12})/12} \quad (5)$$

In other words, they took 12 months as the base period instead of 1 month. This method draws a clear line between short-term (less than 1 year) and long-term (more than 1 year) and makes it easier to make separate inferences about both.

Cochrane (1988) showed that variance ratios can also be expressed as a linear combination of sample autocorrelations:

$$VR(k) \cong 1 + 2 \sum_{j=1}^{k-1} \frac{(k-j)}{k} \hat{\rho}(j) \quad (6)$$

where $\hat{\rho}(j)$ is sample autocorrelation at lag j. From this equation we can see that for k >1, positive autocorrelations lead to a variance ratio bigger than 1 and negative autocorrelations lead to a variance ratio smaller than 1. If autocorrelations at all lags are 0, which is the case for a perfect random walk, the variance ratio has to be at unity. We can also see that as we go up to higher lags, weights of the autocorrelations decrease, which means lower lag autocorrelations have a larger impact on the variance ratio.

Visual inspection of the variance ratios can give clues to the overall behavior of our time series. If the variance ratios are significantly smaller than 1, that will lead us to infer that the time-series in question is mean-reverting. On the contrary; if variance ratios are larger than 1, it is implied that the series is a mean-averting one.

When Poterba and Summers (1989) applied Cochrane's (1988) results to their version of the variance ratio formula, they reached the formulation:

$$VR(k) \cong 1 + 2 \sum_{j=1}^{11} j \left(\frac{k-12}{12k}\right) \hat{\rho}(j) + 2 \sum_{j=12}^{k-1} \frac{k-j}{k} \hat{\rho}(j) \quad (7)$$

The most important practical difference between (6) and (7) is that in the latter; for k < 12, variance ratios smaller than 1 imply positive autocorrelation and variance ratios larger than 1 imply negative autocorrelation, whereas it is the opposite for (6). However, for k > 12, it is the same for both formulas. In this version, absolute weights of the autocorrelations increase up to lag 11 and start to decrease after lag 13, forming an inverted V shape.

Kendall and Stuart (1976) showed that under the null hypothesis of serial independence;

$$E[\hat{\rho}(j)] = -1/(T-j) \quad (8)$$

where is the sample autocorrelation at lag j and T is the sample size. This creates a downward bias in variance ratios, pushing them below unity. To avoid this, Poterba and Summers (1989) made a bias correction by calculating the expected value of the variance ratio under the null hypothesis of serial independence and dividing the variance ratios estimated from the sample by this value.

$$E[VR(k)] = \frac{12+5k}{6k} + \frac{2}{k} \sum_{j=1}^{k-1} \frac{T-k}{T-j} - \frac{1}{6} \sum_{j=1}^{11} \frac{T-12}{T-j} \quad (9)$$

Variance ratios reported in the results section follow this corrected method to compute the variance ratios for holding periods between 1 month to 120 months in overlapping periods over the entire sample period.

Although variance ratios convey very useful information, the null hypothesis of random walk should be statistically tested in order to reach a conclusive result. There are different ways of testing variance ratios. However, most of these methods rely heavily upon several assumptions made about the distribution of stock returns and variance ratios, which may or may not hold in real life. Hence, we use a more robust testing method proposed by Kim et al. (1991) which does not make any assumptions about the underlying distribution.

Kim et al. (1991) utilize a method called randomization which involves creating an empirical distribution of variance ratios by shuffling the data set 1000 times and calculating the variance ratios for each shuffle. By changing the order of returns, shuffling removes any autocorrelation present in the data set, making it as close to random walk as possible. This allows the null hypothesis of random walk or the null hypothesis that the variance ratio equals to 1, to be tested by comparing the actual variance ratio to the empirical distribution of variance ratios obtained with randomization. If the variance ratio lies below or above a certain percentile (which also serves as the significance level) of the empirical distribution, the null hypothesis can be rejected. If not, it means there is no statistical proof of mean reversion or aversion in the data set.

The data set consists of 16 MSCI (Morgan Stanley Capital International) value-weighted equity indices. Among these 16 indices, 6 of them are developed (USA, UK, France, Germany, Japan and Australia) and 6 of them are emerging (Brazil, Mexico, Turkey, South Africa, China and India) market indices. Obtaining a well-diversified set which includes major developed and emerging markets was the primary aim when choosing the countries. Remaining 4 are World, Emerging Markets, ACWI (All Country World Index) and Frontier Markets indices. World index consists of 23 developed markets and Emerging Markets (hereafter EM) index consists of 24 emerging markets. ACWI index brings together the World and EM indices and covers a total of 47 countries. Lastly, Frontier Markets (hereafter FM) index is composed of 29 frontier markets. Figure 1 shows the list of countries covered by each international index, where each index is tracking the countrywide stock performance by including a subset of stocks in index calculations.

The available data set covers different time periods for different indices. For World, EM and ACWI indices, the data dates back to 1988. However, the range of the FM index is much shorter and it is only offered since 2002. Developed market indices go back to 1970; Brazil, Mexico and Turkey begin in 1988; South Africa, China and India coverage begins in 1993. The data is obtained from Reuters Datastream up until 2018. All indices are denominated in U.S. dollars rather than local currencies because it is very difficult to find reliable inflation and risk-free interest rate data for all of the listed countries. Furthermore, our unreported preliminary tests on nominal returns denominated in local currencies yielded extreme mean-averting results in some emerging markets, which we attribute to high levels of inflation in those countries.

For the purpose of a detailed analysis; we calculate nominal, real and excess monthly returns on both total return (dividends reinvested) and price indices. The CPI data of U.S. Bureau of Labor Statistics and 1-month Treasury bill rates from WRDS (Wharton Research Data Services) have been used to calculate real and excess returns. Furthermore, small-cap, mid-cap and large-cap World, EM, ACWI indices have also been extracted to investigate any possible size effect. These indices however, begin only in 1994. FM index is not included here because MSCI does not offer large and mid-cap versions of this index.

Using MSCI data makes the entire analysis more reliable, standardized and consistent, since the same methodology has been used to calculate all of the indices. This brings all of the countries to even ground and makes them more comparable to each other.

4. Results

Upon inspection of the summary statistics of returns reported in Table 1, emerging markets' average return of 0.68% is significantly higher than the developed markets' average return of 0.46%, which is to be expected since their volatility is also considerably higher with 6.68% standard deviation compared to the 4.25% of developed markets. We can see that the ACWI index is dominated by developed markets as its average return and standard deviation is almost identical to those of the World index. Surprisingly, frontier markets sit between developed and emerging markets in terms of both metrics. In fact, the average return and standard deviation of frontier markets are very close to their developed counterparts.

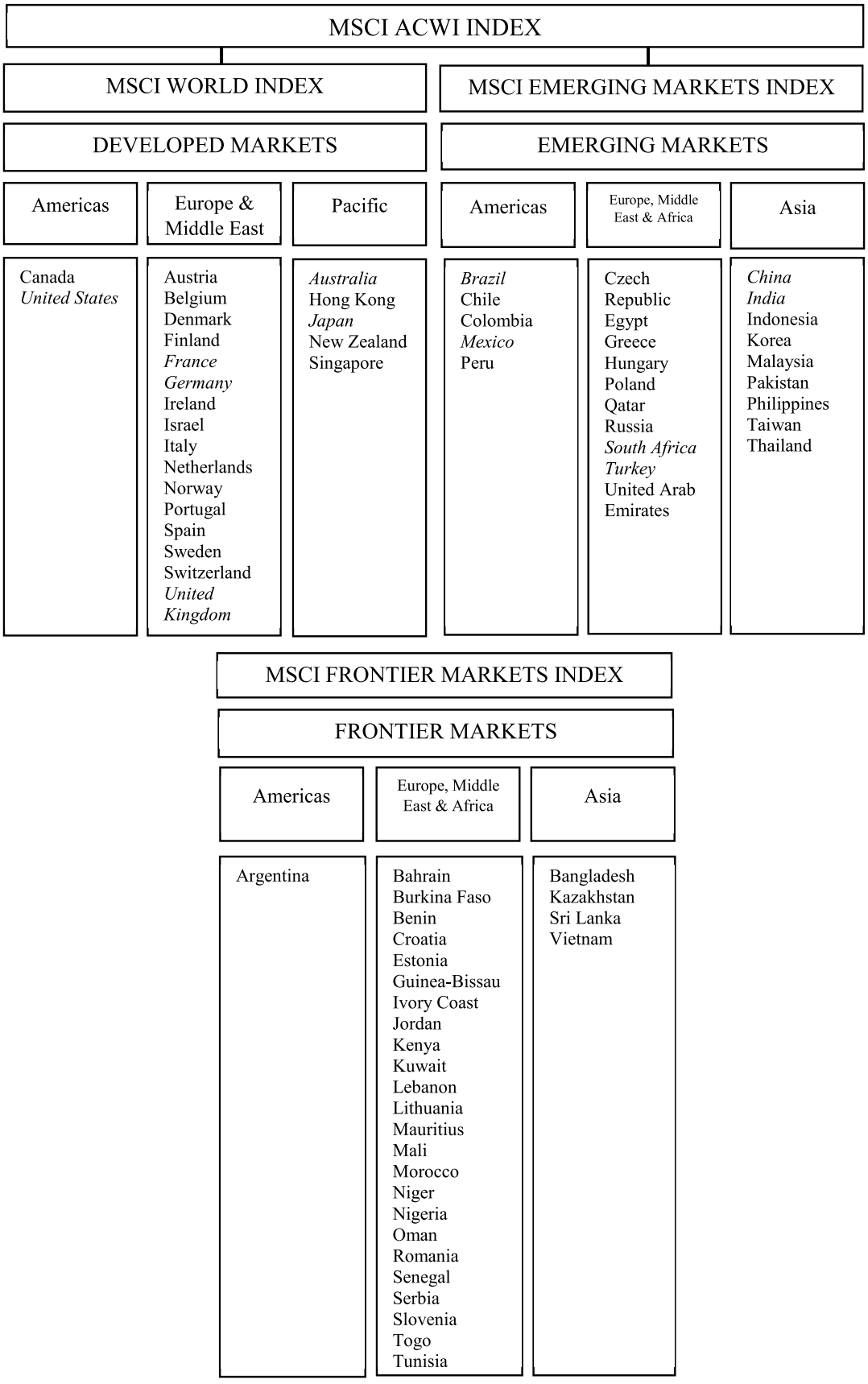


Figure 1: Breakdown of the MSCI Indices.

We can see the differences between developed and emerging markets in more detail in the second panel of Table 1. None of the emerging markets has a lower volatility than any of the developed markets, as expected. However, this trend does not fully extend to average returns. Some of the emerging markets have lower average returns than developed markets, such as Turkey with 0.4% average return and China with -0.04% average return. China's results are particularly interesting since it does not provide a positive return for a substantial amount of risk. Moreover, Australia has the lowest average monthly return among all the developed markets with 0.37%, despite being the most volatile with 7.11% standard deviation.

On the other hand, these results are obtained with returns that are denominated in USD rather than local currencies and standard deviation is not the only measure of risk, nor the most accurate one. Therefore, Table 1 only gives us a rough idea about the characteristics of our data set and serves as a starting point for our analysis.

4.1. International Results

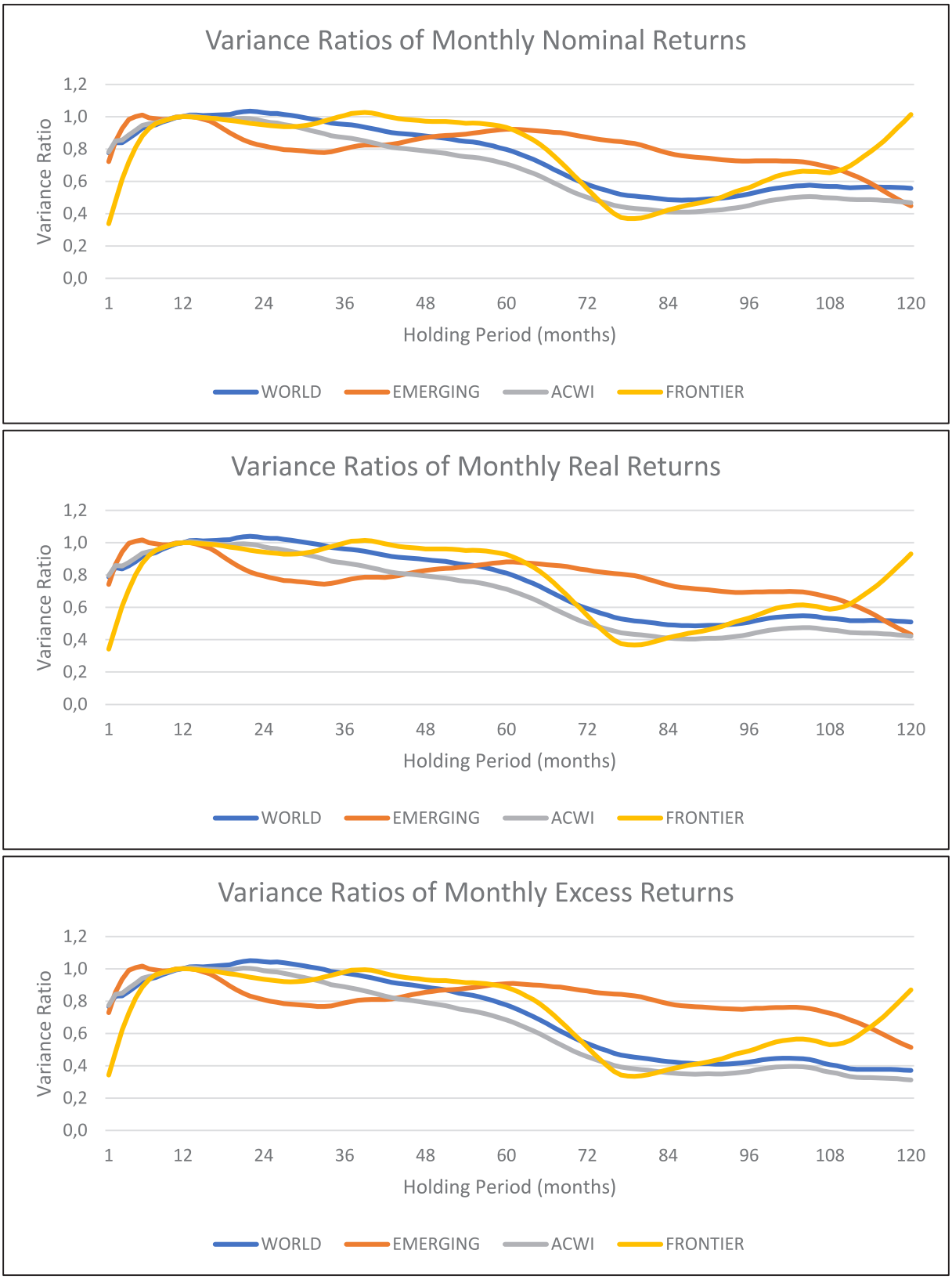
As a starting point of our analyses, we report below the variance ratios for broad international indices, namely World, EM, ACWI and FM indices for nominal, real and excess monthly log-returns, respectively. There aren't any drastic differences between the three plots and all four indices exhibit some degree of mean reversion in all of them. World and ACWI indices seem to be going hand in hand, which further proves that companies in the former dominate the ACWI index.

Interestingly, World index shows stronger mean reversion than the EM index in all return types for holding periods longer than 5 years. However, for holding periods shorter than 5 years, EM index is below the others in terms of variance ratios, by a big margin. FM index stays close to World and ACWI indices until around 80 months and then jumps ahead and starts to approach unity which is the hallmark of random walk. Moreover, there are signs of mean aversion, or momentum, in holding periods up to 1 year in all four indices, with FM index being the strongest. In this broad overlook, there doesn't seem to be any significant difference in variance ratio patterns between different return types and further investigation is needed to gain more insight into this matter.

Table 1: Summary Statistics of Monthly Index Returns.

Index	Average Return (per month)	Standard Deviation of Returns (per month)
World	0.46%	4.25%
EM	0.68%	6.68%
ACWI	0.45%	4.33%
Frontier	0.48%	5.32%
USA	0.56%	4.37%
UK	0.44%	6.05%
France	0.51%	6.43%
Germany	0.55%	6.31%
Japan	0.61%	5.93%
Australia	0.37%	7.11%
Brazil	0.84%	14.43%
Mexico	1.10%	8.66%
Turkey	0.40%	14.95%
South Africa	0.60%	7.74%
China	-0.04%	9.51%
India	0.60%	8.34%

This table reports summary statistics of the monthly nominal log-returns of all MSCI equity indices considered in this study.



These figures display the variance ratios of monthly nominal, real and excess log-returns, respectively, for MSCI World, EM, ACWI and FM indices from 1 month to 120 months holding periods.

Figure 2: Variance Ratios for International Indices Across Different Holding Periods.

Table 2 reports the actual variance ratios for several holding periods, as well as the p-values obtained against the distribution of randomized ordering of returns for all return types and all four indices. Since the p-values are obtained from an empirical distribution via randomization, it is free from the shortcomings of assuming a standard distribution like normal.

According to Table 2, although there was an obvious and consistent trend of mean reversion in Figure 2; we cannot statistically reject the null hypothesis of random walk with conventional significance levels for holding periods larger than 1 year. This is true for all indices and for all return types. However, we can reject the null hypothesis of random walk for EM and FM indices for the 1-month holding period with a significance level of 10% on all return types. Same is true for World and ACWI indices too, except for the real returns. Sheer size of the p-values show that mean aversion is the strongest in frontier markets and weakest in developed markets.

In summary, we observe statistically significant results signaling strong momentum effect in emerging and frontier markets and moderate momentum effect in developed markets in very short holding periods. But we cannot find any substantial statistical evidence of mean reversion for any holding period in any of the indices.

Table 2: Variance Ratios and Statistical Tests of Significance for the International Indices.

		1 month	6 months	24 months	36 months	48 months	72 months	96 months	120 months
PANEL A: NOMINAL RETURNS									
WORLD	Variance Ratio	0.777	0.928	1.024	0.953	0.881	0.582	0.522	0.558
	P-value	0.088	0.223	0.572	0.466	0.415	0.213	0.250	0.367
EM	Variance Ratio	0.722	1.010	0.819	0.803	0.870	0.873	0.726	0.449
	P-value	0.038	0.487	0.168	0.278	0.437	0.529	0.464	0.265
ACWI	Variance Ratio	0.782	0.946	0.971	0.871	0.788	0.502	0.451	0.469
	P-value	0.090	0.289	0.455	0.354	0.325	0.144	0.168	0.266
FM	Variance Ratio	0.338	0.880	0.949	1.008	0.973	0.555	0.562	1.013
	P-value	0.000	0.173	0.489	0.588	0.605	0.355	0.456	0.673
PANEL B: REAL RETURNS									
WORLD	Variance Ratio	0.789	0.916	1.030	0.962	0.895	0.593	0.509	0.510
	P-value	0.129	0.232	0.602	0.546	0.520	0.330	0.345	0.421
EM	Variance Ratio	0.742	1.018	0.794	0.767	0.829	0.831	0.694	0.434
	P-value	0.060	0.528	0.113	0.204	0.373	0.481	0.426	0.248
ACWI	Variance Ratio	0.796	0.935	0.974	0.874	0.794	0.503	0.433	0.422
	P-value	0.114	0.243	0.479	0.358	0.328	0.162	0.188	0.239
FM	Variance Ratio	0.343	0.873	0.942	0.998	0.962	0.550	0.533	0.931
	P-value	0.000	0.084	0.388	0.539	0.525	0.182	0.254	0.637
PANEL C: EXCESS RETURNS									
WORLD	Variance Ratio	0.767	0.923	1.043	0.972	0.887	0.538	0.422	0.371
	P-value	0.076	0.198	0.633	0.513	0.447	0.173	0.143	0.141
EM	Variance Ratio	0.728	1.016	0.808	0.789	0.855	0.862	0.752	0.514
	P-value	0.038	0.540	0.128	0.230	0.402	0.496	0.455	0.317
ACWI	Variance Ratio	0.773	0.941	0.988	0.888	0.791	0.457	0.366	0.312
	P-value	0.075	0.269	0.487	0.367	0.323	0.107	0.100	0.105
FM	Variance Ratio	0.343	0.887	0.935	0.980	0.932	0.515	0.491	0.870
	P-value	0.000	0.163	0.487	0.635	0.621	0.362	0.367	0.567

This table reports variance ratios and their respective p-values obtained through randomization of monthly nominal, real and excess log-returns of MSCI World, EM, ACWI and FM indices for several holding periods.

In order to see if the results are swayed by dividend payments in equity markets, we conduct tests with index values that include only capital gains against those with total returns including dividend payments. This comparison is made for all four indices and with nominal, real and excess monthly log-returns. In unreported results, we observe that the results are almost identical for price and total return indices and the impact of dividend adjustments was negligible. Hence, it can be argued that dividend payments do not constitute a significant difference for the purpose of variance ratio analysis.

In order to test the impact of size on mean reversion, we conduct tests with size-based indices. Figure 3 and Table 3 compare the variance ratios of large-cap, mid-cap, and small-cap versions of World, EM, and ACWI indices. FM index has been excluded from this part of the analysis because it only had the small-cap index. Again, this analysis is carried out for nominal, real and excess monthly log-returns separately. Since the results are very similar, only the results of nominal returns are reported here for brevity.

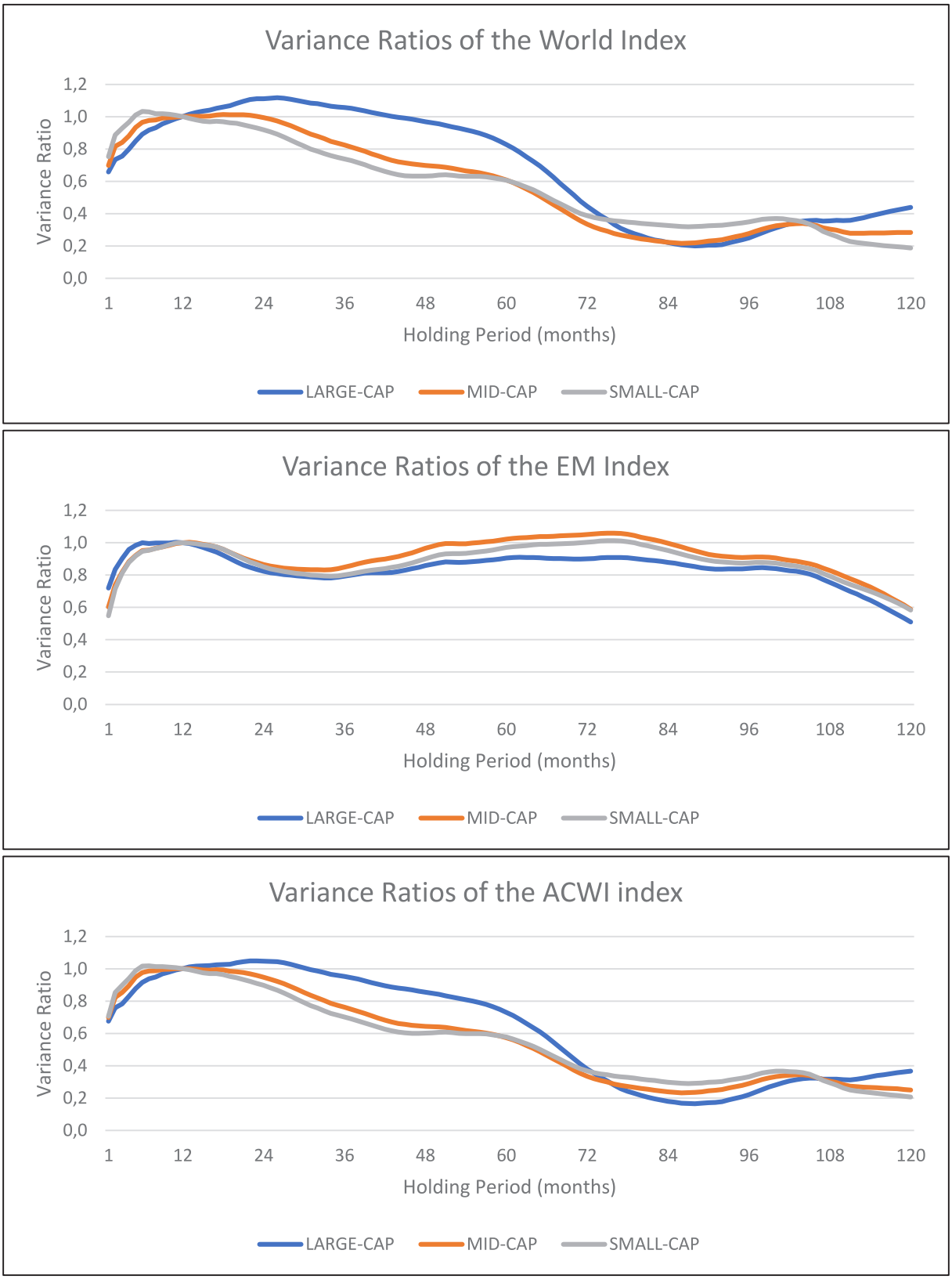
Figure 3 shows that World and ACWI indices are still very similar in terms of size-based comparison. Between 12 and 60 months, small-cap index shows the strongest mean reversion, followed by mid-cap and large-cap indices respectively. Small and mid-cap indices are very close to each other, especially for ACWI, whereas the large-cap index is further separated from the other two, even going beyond unity at certain holding periods. However, second halves of these plots are much more complex and harder to interpret.

EM indices seem to be mean reverting until around 30 months, after which variance ratios start to increase. In terms of the degree of mean reversion, large-cap index is in the lead while the other two are closer to unity, or random walk. Variance ratios start to decrease again after 8 years, which is a very long holding period.

In holding periods shorter than 1 year, all the indices exhibit mean aversion, or momentum; but the sorting is different compared to long-term. For World and ACWI; large-cap index has the strongest momentum, followed by mid-cap and small-cap indices; which means size has an opposite effect here. In the long-term, as the firm size gets bigger; return series approaches random walk whereas in the short-term larger size leads to stronger momentum. On the other hand, large-cap index of the emerging markets shows the weakest momentum in the short-term compared to mid and small-cap indices which have almost identical variance ratios.

In summary, in the long-term, smaller size seems to be resulting in stronger mean reversion for developed markets and somewhat weaker mean reversion for emerging markets. On the contrary, in the short-term, smaller size leads to weaker momentum for developed markets and stronger momentum for emerging markets.

Table 3 reports the results confirming these results with numerical p-values, although they do not allow for rejection of the random walk hypothesis except for very short holding periods.



These figures display the variance ratios of monthly nominal returns for MSCI World, EM and ACWI large-cap, mid-cap and small-cap indices, respectively, from 1 month to 120 months holding periods. Since the results for excess and real returns are qualitatively similar, they are not reported here for brevity.

Figure 3: Variance Ratios for Size-Based International Indices Across Different Holding Periods.

Table 3: Variance Ratios and Statistical Tests of Significance for the Size-Based International Indices.

		1 month	6 months	24 months	36 months	48 months	72 months	96 months	120 months
PANEL A: LARGE-CAP									
WORLD	Variance Ratio	0.658	0.892	1.112	1.057	0.969	0.446	0.251	0.439
	P-value	0.014	0.134	0.779	0.645	0.561	0.150	0.054	0.317
EM	Variance Ratio	0.720	1.000	0.823	0.794	0.858	0.901	0.841	0.510
	P-value	0.067	0.488	0.199	0.302	0.447	0.548	0.556	0.377
ACWI	Variance Ratio	0.676	0.916	1.046	0.953	0.854	0.380	0.221	0.366
	P-value	0.031	0.199	0.648	0.514	0.458	0.101	0.033	0.219
PANEL B: MID-CAP									
WORLD	Variance Ratio	0.698	0.965	0.994	0.824	0.699	0.336	0.278	0.283
	P-value	0.044	0.350	0.545	0.324	0.259	0.063	0.061	0.118
EM	Variance Ratio	0.602	0.952	0.866	0.849	0.965	1.051	0.910	0.589
	P-value	0.008	0.358	0.260	0.368	0.554	0.653	0.623	0.457
ACWI	Variance Ratio	0.698	0.977	0.948	0.761	0.644	0.335	0.290	0.250
	P-value	0.049	0.395	0.435	0.243	0.204	0.055	0.058	0.065
PANEL C: SMALL-CAP									
WORLD	Variance Ratio	0.753	1.033	0.920	0.739	0.633	0.388	0.349	0.189
	P-value	0.083	0.601	0.367	0.213	0.188	0.083	0.125	0.028
EM	Variance Ratio	0.549	0.947	0.850	0.802	0.901	1.003	0.875	0.584
	P-value	0.002	0.289	0.237	0.326	0.493	0.645	0.613	0.463
ACWI	Variance Ratio	0.706	1.015	0.897	0.701	0.601	0.368	0.332	0.206
	P-value	0.043	0.504	0.338	0.195	0.176	0.090	0.124	0.038

This table reports variance ratios and their respective p-values obtained through randomization of monthly nominal log-returns of large-cap, mid-cap and small-cap versions of MSCI World, EM and ACWI indices for several holding periods. Since the results for excess and real returns are qualitatively similar, they are not reported here for brevity.

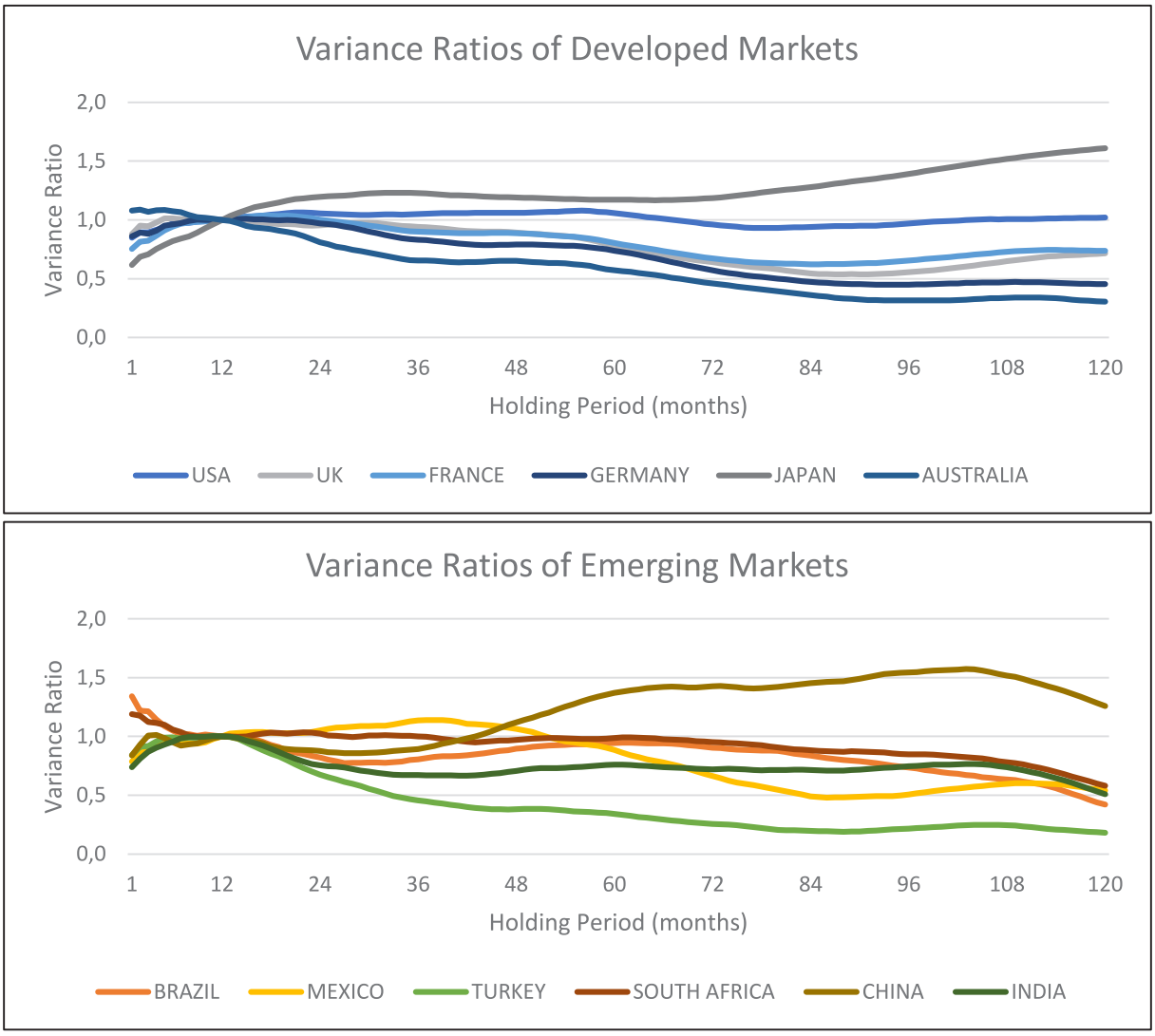
4.2. Country Based Results

Since, the international indices did not yield conclusive statistical results on the existence of mean reversion, we carried on testing the individual countries to assess if less diversified single country equity indices display any significant violation of random walk. Figure 4 plots the variance ratios of the monthly nominal log-returns of all 12 national indices. The results suggest that there is a wide spread of behavior patterns across countries, confirming the need to delve into individual countries to explore the results further.

Among the developed markets, Japan stands out as the only country which shows mean-averting behavior, especially for holding periods more than 6 years. Its variance ratios even go beyond 1.6 at the higher end. USA's variance ratios fluctuate around unity, which is an indication that it follows more or less a random walk. The rest; namely UK, France, Germany and Australia display various degrees of mean reversion. Australia seems to be the strongest in this regard, followed by Germany. Variance ratios of UK and France are very close and they show weaker tendencies for mean reversion compared to Australia and Germany.

Emerging markets are more dispersed compared to developed markets, with a wider range of variance ratios and more complicated trends. Turkey is undoubtedly the most mean-reverting country here, with a sizable difference in variance ratios between her and others. Its variance ratios go even below 0.2 at certain holding periods. Although not as dramatic as Turkey, India also exhibits mean-reverting behavior, especially between 12 and 48 months.

Brazil displays varying behavior throughout the range of holding periods. Its variance ratios are on a downward slope between 12 and 24 months, which is a sign of mean reversion, but they start to increase after that point, reaching almost unity at 60 months. Then they start to decrease again and continue to do so until the end of the range. South Africa seems to follow a random walk in holding periods between 12 and 60 months but its variance ratios start to decline after that point, pushing it towards the mean reversion zone.



These figures display the variance ratios of the monthly nominal log-returns of 6 MSCI developed market indices (USA, UK, France, Germany, Japan and Australia) and 6 MSCI emerging market indices (Brazil, Mexico, Turkey, South Africa, China and India) for holding periods from 1 month to 120 months.

Figure 4: Variance Ratios for Nominal Returns of Country Indices.

Mexico and China have the most interesting results among the emerging markets. Mexico seems to be mean-averting between 12 and 48 months and mean-reverting for longer holding periods, forming an S shape. China on the other hand, starts out as a mean-reverting country after 12 months but surpasses unity at around 40 months and becomes a mean-averting country. A quite strong one as well, with variance ratios reaching almost 1.6. In the short-term, Brazil show a quite strong tendency for mean reversion and South Africa follows it with a slightly weaker one, while the rest seem to exhibit mean-averting behavior.

Table 4 displays the actual variance ratios and their p-values of the time series in Figure 4 for certain holding periods. When the statistical evidence is taken into consideration, there is almost no significant statistical proof to most of the inferences made from Figure 4. However, there are some exceptions to this: Turkey and Australia have substantial proof of mean reversion in several holding periods. Turkey's p-values are especially small, proving its mean-reverting behavior beyond any reasonable doubt. Japan's mean aversion also has some merit, since the null hypothesis of random walk can be rejected in holding periods up to 24 months.

Aside from that, there is also proof that France violates random walk in very short holding periods but that is as far as it goes with a significance level of 5%. If a significance level of 10% is used, this list can be extended to a few more countries and holding periods.

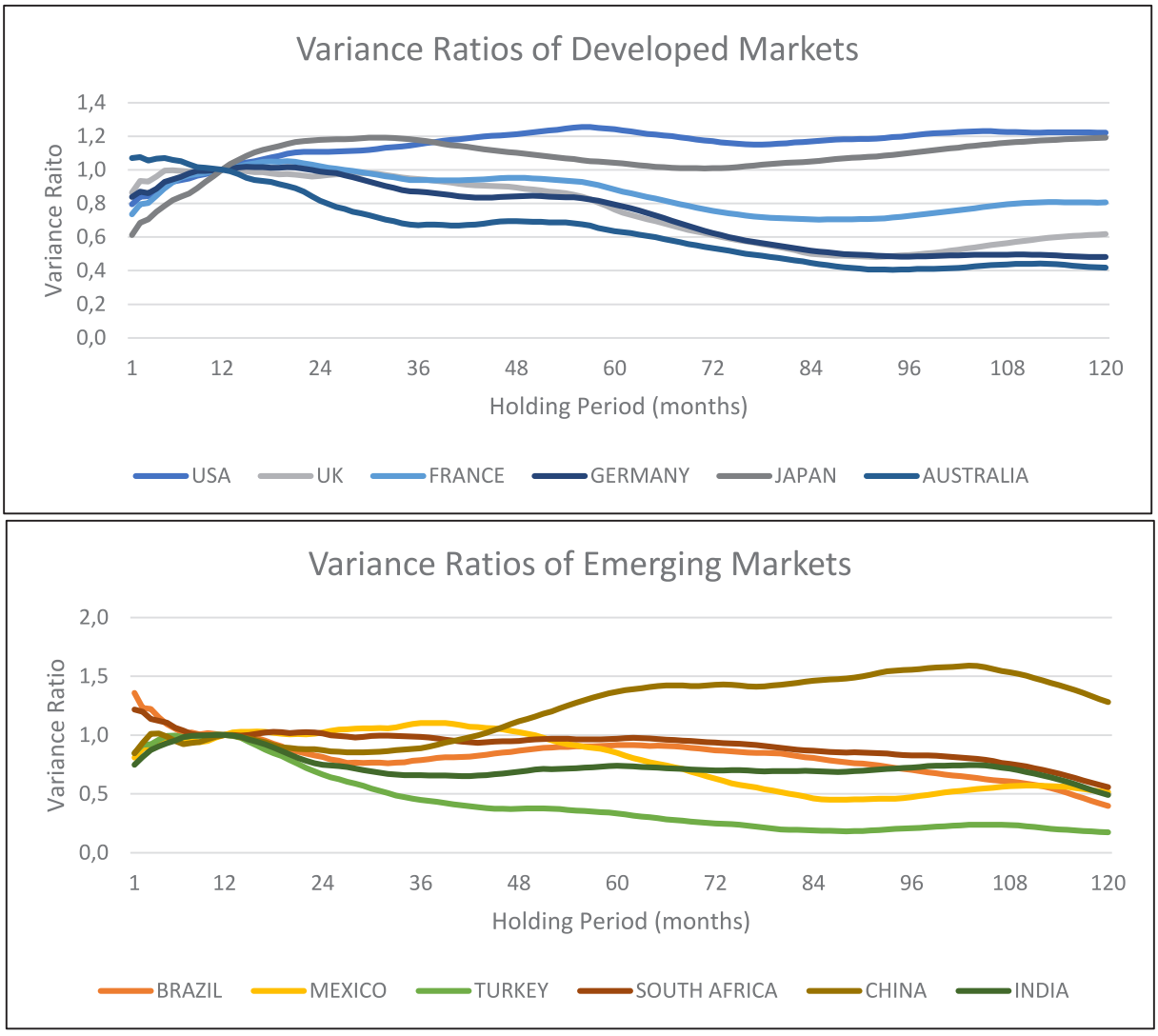
Table 4: Variance Ratios and Statistical Tests of Significance for Nominal Returns of Country Indices.

		1 month	6 months	24 months	36 months	48 months	72 months	96 months	120 months
PANEL A: DEVELOPED MARKETS									
USA	Variance Ratio	0.850	0.969	1.055	1.051	1.060	0.961	0.968	1.019
	P-value	0.123	0.340	0.708	0.666	0.657	0.541	0.561	0.614
UK	Variance Ratio	0.878	1.013	0.954	0.941	0.892	0.640	0.555	0.715
	P-value	0.177	0.523	0.402	0.447	0.409	0.185	0.170	0.390
FRANCE	Variance Ratio	0.754	0.942	1.002	0.901	0.887	0.674	0.655	0.738
	P-value	0.029	0.217	0.534	0.344	0.383	0.193	0.250	0.385
GERMANY	Variance Ratio	0.860	0.962	0.970	0.831	0.790	0.572	0.449	0.454
	P-value	0.154	0.310	0.437	0.220	0.249	0.104	0.076	0.132
JAPAN	Variance Ratio	0.618	0.820	1.196	1.228	1.192	1.186	1.391	1.610
	P-value	0.001	0.002	0.955	0.891	0.799	0.749	0.839	0.897
AUSTRALIA	Variance Ratio	1.079	1.073	0.810	0.654	0.651	0.460	0.316	0.305
	P-value	0.662	0.779	0.065	0.031	0.088	0.049	0.019	0.034
PANEL B: EMERGING MARKETS									
BRAZIL	Variance Ratio	1.340	1.051	0.822	0.806	0.895	0.904	0.737	0.420
	P-value	0.912	0.680	0.150	0.256	0.453	0.549	0.465	0.217
MEXICO	Variance Ratio	0.785	0.971	1.049	1.136	1.063	0.664	0.507	0.542
	P-value	0.092	0.384	0.630	0.713	0.614	0.290	0.232	0.348
TURKEY	Variance Ratio	0.840	0.992	0.675	0.456	0.381	0.256	0.216	0.182
	P-value	0.155	0.445	0.021	0.007	0.009	0.007	0.007	0.007
SOUTH	Variance Ratio	1.188	1.059	1.025	1.001	0.969	0.952	0.848	0.581
AFRICA	P-value	0.737	0.657	0.593	0.558	0.551	0.607	0.586	0.415
CHINA	Variance Ratio	0.840	0.951	0.876	0.893	1.120	1.425	1.543	1.257
	P-value	0.184	0.321	0.284	0.423	0.698	0.842	0.873	0.815
INDIA	Variance Ratio	0.739	0.954	0.753	0.671	0.707	0.720	0.745	0.510
	P-value	0.069	0.338	0.103	0.143	0.277	0.411	0.516	0.383

This table reports variance ratios and their respective p-values obtained through randomization of monthly nominal log-returns of 12 MSCI equity indices for several holding periods. Panel A reports the results for developed market indices and Panel B reports the results for emerging market indices.

Figure 5 and Table 5 show the results of the same analysis done with real returns. They are qualitatively similar to the results for nominal returns. USA constitutes the biggest difference between the two. It has gone from being the most prominent random walk among all 12 markets to having the highest variance ratios among developed markets. However, it is still a random walk from a purely statistical perspective since none of its p-values are below 0.05.

Moreover, Australia's mean reversion is toned down in real returns as its variance ratios and p-values are higher. In result, null hypothesis of random walk can be rejected for fewer holding periods. In addition to that, Japan's mean aversion is also weaker compared to nominal returns but we couldn't reject the null hypothesis to begin with, so it is not a major concern. The impact of inflation is visible in certain countries, yet not to the extent to change the statistical significance of the results.



These figures display the variance ratios of the monthly real log-returns, as computed by the difference between the monthly nominal return and monthly US inflation, of 6 MSCI developed market indices (USA, UK, France, Germany, Japan and Australia) and 6 MSCI emerging market indices (Brazil, Mexico, Turkey, South Africa, China and India) for holding periods from 1 month to 120 months.

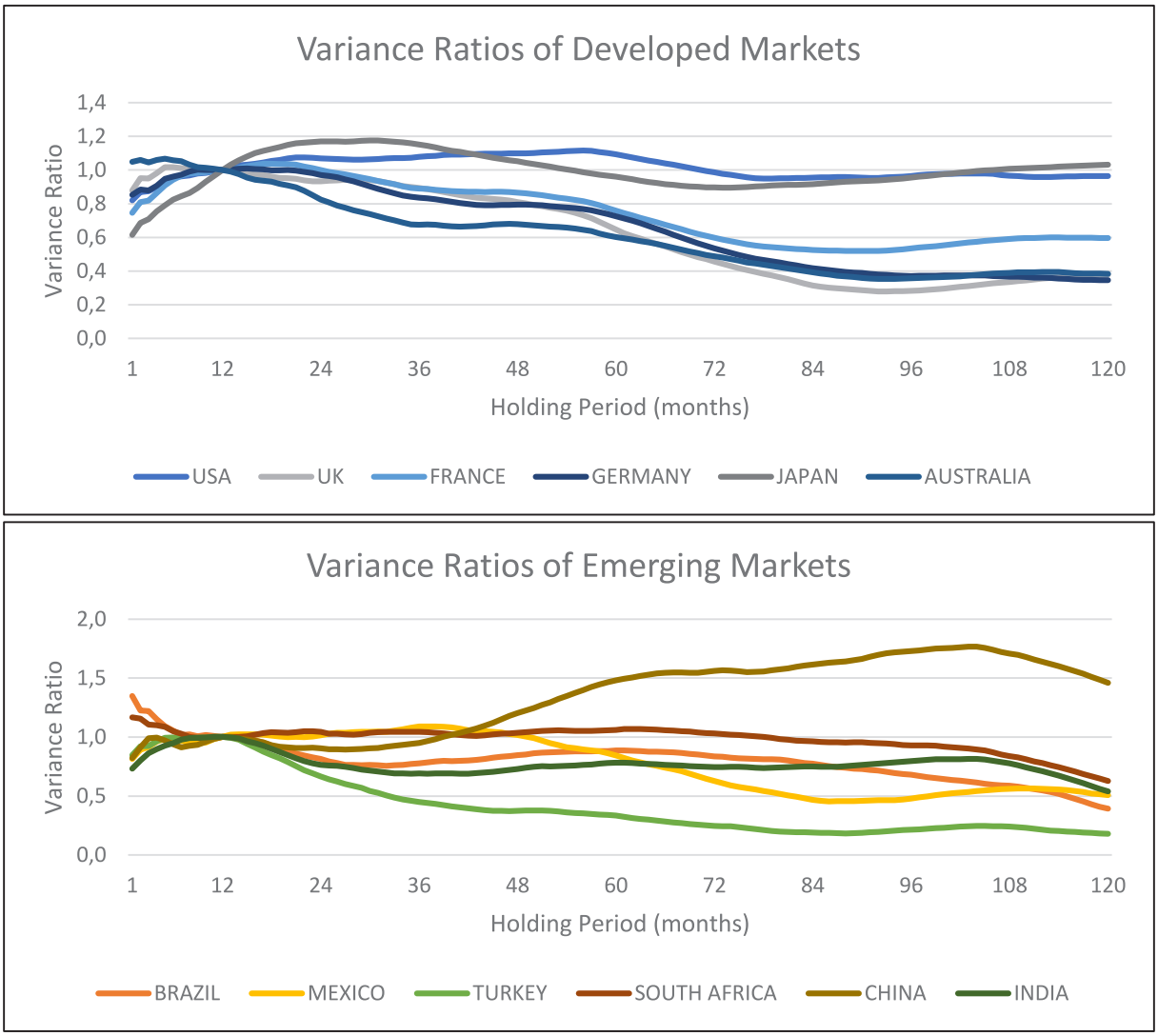
Figure 5: Variance Ratios for Real Returns of Country Indices.

Table 5: Variance Ratios and Statistical Tests of Significance for Real Returns of Country Indices.

		1 month	6 months	24 months	36 months	48 months	72 months	96 months	120 months
PANEL A: DEVELOPED MARKETS									
USA	Variance Ratio	0.795	0.929	1.107	1.152	1.212	1.170	1.202	1.221
	P-value	0.063	0.190	0.804	0.778	0.797	0.706	0.722	0.742
UK	Variance Ratio	0.865	0.997	0.963	0.945	0.894	0.613	0.493	0.618
	P-value	0.158	0.451	0.407	0.450	0.401	0.142	0.105	0.267
FRANCE	Variance Ratio	0.735	0.926	1.021	0.939	0.952	0.757	0.726	0.806
	P-value	0.017	0.152	0.578	0.416	0.483	0.284	0.325	0.442
GERMANY	Variance Ratio	0.839	0.943	0.991	0.869	0.843	0.625	0.483	0.481
	P-value	0.118	0.233	0.510	0.289	0.326	0.173	0.108	0.163
JAPAN	Variance Ratio	0.613	0.819	1.178	1.176	1.102	1.010	1.099	1.191
	P-value	0.000	0.003	0.933	0.814	0.692	0.587	0.676	0.727
AUSTRALIA	Variance Ratio	1.070	1.059	0.815	0.671	0.695	0.533	0.408	0.419
	P-value	0.661	0.738	0.076	0.049	0.130	0.086	0.057	0.101
PANEL B: EMERGING MARKETS									
BRAZIL	Variance Ratio	1.359	1.055	0.814	0.788	0.868	0.871	0.705	0.399
	P-value	0.916	0.648	0.128	0.251	0.424	0.505	0.418	0.200
MEXICO	Variance Ratio	0.809	0.981	1.023	1.101	1.025	0.630	0.474	0.516
	P-value	0.124	0.437	0.562	0.682	0.601	0.248	0.191	0.306
TURKEY	Variance Ratio	0.847	0.995	0.666	0.449	0.374	0.249	0.209	0.173
	P-value	0.172	0.429	0.012	0.003	0.006	0.003	0.005	0.007
SOUTH AFRICA	Variance Ratio	1.218	1.062	1.015	0.984	0.951	0.936	0.828	0.559
	P-value	0.769	0.664	0.572	0.532	0.547	0.596	0.571	0.422
CHINA	Variance Ratio	0.847	0.951	0.873	0.890	1.117	1.427	1.555	1.280
	P-value	0.234	0.326	0.239	0.384	0.683	0.827	0.852	0.789
INDIA	Variance Ratio	0.748	0.954	0.748	0.659	0.689	0.699	0.725	0.490
	P-value	0.067	0.308	0.098	0.125	0.266	0.388	0.495	0.353

This table reports variance ratios and their respective p-values obtained through randomization of monthly real log-returns, as computed by the difference between monthly nominal returns and monthly US inflation rate, of 12 MSCI equity indices for several holding periods. Panel A reports the results for developed market indices and Panel B reports the results for emerging market indices.

Lastly, Figure 6 and Table 6 show the results of the same analysis done with excess returns. When excess returns are used, variance ratios of USA decline a significant amount and approach to their initial levels. But it is still a contender for the most mean-averting developed market. Japan's mean aversion is further weakened and its variance ratios go below unity in holding periods between 5 and 8 years. It now seems like a market which is very close to random walk and whose variance ratios fluctuate around unity. UK has become much more mean-reverting and it has the lowest variance ratios among all developed markets when excess returns are used. This is reflected in its p-values which allow us to reject the null hypothesis of random walk in holding periods longer 5 years.



These figures display the variance ratios of the monthly excess log-returns, as computed by the difference between the monthly nominal return and monthly US risk-free rate of return, of 6 MSCI developed market indices (USA, UK, France, Germany, Japan and Australia) and 6 MSCI emerging market indices (Brazil, Mexico, Turkey, South Africa, China and India) for holding periods from 1 month to 120 months.

Figure 6: Variance Ratios for Excess Returns of Country Indices.

A comparison among nominal, real and excess return results yields that developed markets are visibly more affected by the choice than the emerging markets. This can be seen in Table 7 which reports bigger absolute average percent changes in every return type for the developed markets.

A reasonable explanation for this might be the fact that we are using dollar denominated prices for all markets. Inflation and interest rates are usually much higher in emerging countries and when dollar denominated prices are used instead of prices denominated in local currencies, this might cause the effects of inflation and interest rates to be understated.

Another thing to note is the sign differences. Changing the return type has opposite effects for developed and emerging markets no matter which return types are used. For example, switching from nominal returns to real returns causes the variance ratios to increase for developed markets while it causes the variance ratios to decrease for emerging markets. Deciding on which return type to use for this type of analysis requires a more detailed investigation and it partly depends on investor profile and preference. It could be an excellent focal point for a future research paper on this topic.

Table 6: Variance Ratios and Statistical Tests of Significance for Excess Returns of Country Indices.

		1 month	6 months	24 months	36 months	48 months	72 months	96 months	120 months
PANEL A: DEVELOPED MARKETS									
USA	Variance Ratio	0.821	0.957	1.069	1.078	1.099	0.988	0.965	0.965
	P-value	0.107	0.302	0.714	0.686	0.686	0.556	0.556	0.582
UK	Variance Ratio	0.878	1.017	0.933	0.893	0.810	0.457	0.283	0.381
	P-value	0.183	0.565	0.328	0.345	0.278	0.041	0.011	0.087
FRANCE	Variance Ratio	0.746	0.942	1.000	0.891	0.866	0.599	0.534	0.597
	P-value	0.016	0.193	0.540	0.348	0.368	0.133	0.151	0.243
GERMANY	Variance Ratio	0.852	0.960	0.971	0.836	0.794	0.536	0.371	0.347
	P-value	0.135	0.294	0.418	0.223	0.252	0.086	0.035	0.052
JAPAN	Variance Ratio	0.615	0.824	1.169	1.151	1.052	0.896	0.955	1.031
	P-value	0.002	0.005	0.922	0.792	0.621	0.456	0.552	0.620
AUSTRALIA	Variance Ratio	1.048	1.057	0.825	0.674	0.679	0.488	0.358	0.385
	P-value	0.574	0.709	0.087	0.052	0.109	0.047	0.029	0.078
PANEL B: EMERGING MARKETS									
BRAZIL	Variance Ratio	1.349	1.056	0.815	0.778	0.847	0.837	0.680	0.393
	P-value	0.913	0.681	0.113	0.198	0.364	0.437	0.380	0.175
MEXICO	Variance Ratio	0.815	0.992	1.014	1.088	1.016	0.629	0.479	0.508
	P-value	0.144	0.462	0.579	0.661	0.574	0.257	0.205	0.313
TURKEY	Variance Ratio	0.846	0.997	0.665	0.449	0.374	0.248	0.214	0.180
	P-value	0.169	0.443	0.018	0.005	0.010	0.009	0.008	0.012
SOUTH AFRICA	Variance Ratio	1.168	1.049	1.043	1.044	1.035	1.030	0.929	0.629
	P-value	0.716	0.630	0.648	0.634	0.630	0.641	0.626	0.458
CHINA	Variance Ratio	0.822	0.940	0.905	0.952	1.203	1.560	1.728	1.460
	P-value	0.162	0.292	0.322	0.477	0.746	0.872	0.899	0.856
INDIA	Variance Ratio	0.731	0.949	0.765	0.691	0.730	0.744	0.795	0.539
	P-value	0.058	0.301	0.106	0.158	0.308	0.444	0.565	0.385

This table reports variance ratios and their respective p-values obtained through randomization of monthly excess log-returns, as computed by the difference between monthly nominal returns and monthly US risk-free rate of return, of 12 MSCI equity indices for several holding periods. Panel A reports the results for developed market indices and Panel B reports the results for emerging market indices.

Table 7: Impact of Return Types on Variance Ratios.

	REAL-NOMINAL	EXCESS-NOMINAL	EXCESS-REAL
PANEL A: DEVELOPED MARKETS			
USA	14.63%	0.69%	-11.55%
UK	-4.43%	-22.60%	-19.86%
FRANCE	7.23%	-8.42%	-14.18%
GERMANY	5.47%	-7.06%	-11.68%
JAPAN	-11.59%	-17.55%	-7.26%
AUSTRALIA	13.78%	6.93%	-5.51%
Average	4.18%	-8.00%	-11.68%
PANEL B: EMERGING MARKETS			
BRAZIL	-2.78%	-4.96%	-2.26%
MEXICO	-3.78%	-4.02%	-0.24%
TURKEY	-2.24%	-1.72%	0.55%
SOUTH AFRICA	-1.65%	5.87%	3.32%
CHINA	-1.65%	5.87%	3.32%
INDIA	-2.12%	3.33%	5.60%
Average	-2.37%	0.73%	1.71%
WORLD AVERAGE	0.90%	-3.64%	-4.98%

This table reports the average percent differences in variance ratios (1 month through 120 months) between different return types for all 12 countries in the data set.

5. Conclusion

This study was performed to shed some light on the times series behavior of international equity indices and to see if they show any signs of anomalies such as mean reversion or aversion. While all of the indices appear to have some degree of one or the other, most of them fail to show strong statistical significance to reject random walk hypothesis. This could be related to power of the test, which can be improved with more data; or simply the choice of data sample, as pointed out by Spierdijk et al. (2012).

For the data set subject to the analysis in this study, there was no evidence against the random walk for the international indices in the long-term, but there was evidence that EM and FM indices exhibit momentum in the short-term. Among the national indices, Turkey and Australia were proven to have mean reversion in the long-term while Japan was proven to have mean aversion in the short-term, although it is somewhat weakened when real or excess returns are used. Australia's mean reversion was also much stronger when nominal returns were used. Furthermore, there was evidence of mean aversion for France in the short-term and mean reversion for UK in the long-term, although the latter was only in excess returns.

The effect of dividends on the variance ratios was deemed negligible by the price-total return index comparison. On the other hand, size seems to be an important factor as there were significant differences in variance ratios between large, mid and small-cap equity indices. However, its impact varies quite a bit with respect to holding period and the market type. In the long-term, smaller size seems to push the variance ratios downwards for developed markets and upwards for emerging markets whereas in the short-term, it weakens the effect of momentum for developed markets and amplifies it for emerging markets.

Finally, changing the return type has a greater impact on developed markets than it has on emerging markets. This could be due to the high levels of inflation and interest rates in the emerging markets. Aside from the magnitude, the outcome of changing the return type is also different for developed and emerging markets. Going from one return type to the other, variance

ratios always go opposite ways; upwards for developed markets and downwards for emerging markets or vice versa.

Our findings are consistent with the literature to a large extent. We observed momentum for short holding periods and mean reversion for long holding periods, just like Poterba and Summers (1989), Richards (1997) and many others. Unfortunately, the second part of that observation turned out to be difficult to prove. In that sense, our paper also resembles the likes of Chan (1988) and Kim, Nelson and Startz (1991) who same as us, could not reject the null hypothesis of random walk. Moreover, size-based comparisons of long-term variance ratios for developed markets support the findings of Fama and French (1988) while the same comparisons made for short holding periods contradict Lo and Mackinlay (1988) who claim the rejection of the random walk hypothesis gets stronger as size decreases. However, it should be noted that the data sets and in most cases methodologies of these papers are vastly different than ours. Therefore, these statements should be treated with caution and viewed only as a rough guide.

Overall, the results of this study were complicated, yet intriguing. It is clear that international equity returns display either mean aversion or reversion on a consistent basis across different holding periods. However, the statistical significance remains elusive, at least for the highly diversified international indices and country indices. It is also apparent that the different parts of the world behave differently, so do the equities with different sizes. A further study might explore individual style portfolios, industries or securities across countries, possibly denominated in the local currency, to make more accurate deductions. Such a detailed analysis would provide more information and possibly offer the elusive statistical significance for more conclusive results.

References

Balvers, R., Wu, Y., & Gilliland, E. (2000). Mean Reversion Across National Stock Markets and Parametric Contrarian Investment Strategies. *The Journal of Finance*, *55*(2), 745-772. doi:10.1111/0022-1082.00225

Balvers, R. J., & Wu, Y. (2006). Momentum and Mean Reversion Across National Equity Markets. *Journal of Empirical Finance, 13*(1), 24-48. doi:10.1016/j.jempfin.2005.05.001

Bhojraj, S., & Swaminathan, B. (2006). Macromomentum: Evidence of Predictability in International Equity Markets. *The Journal of Business, 79*(1), 429-451. doi:10.1086/497416

Carhart, M. M. (1997). On Persistence in Mutual Fund Performance. *The Journal of Finance, 52*(1), 57-82. doi:10.1111/j.1540-6261.1997.tb03808.x

Chan, K. C. (1988). On the Contrarian Investment Strategy. *The Journal of Business*, *61*(2), 147-61. doi:10.1086/296425

Chan, K., Hameed, A., & Tong, W. (2000). Profitability of Momentum Strategies in the International Equity Markets. *The Journal of Financial and Quantitative Analysis, 35*(2), 153. doi:10.2307/2676188

Chaudhuri, K., & Wu, Y. (2003). Mean Reversion in Stock Prices: Evidence From Emerging Markets. *Managerial Finance, 29*(10), 22-37. doi:10.1108/03074350310768490

Cochrane, J. H. (1988). How Big Is the Random Walk in GNP? *Journal of Political Economy, 96*(5), 893-920. doi:10.1086/261569

Conrad, J., & Kaul, G. (1988). Time-Variation in Expected Returns. *The Journal of Business, 61*(4), 409. doi:10.1086/296441

DeBondt, W. F. M., & Thaler, R. H. (1985). Does the Stock Market Overreact? *The Journal of Finance*, *40*(3), 793-805. doi:10.1111/j.1540-6261.1985.tb05004.x

Fama, E. F. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. *The Journal of Finance, 25*(2), 383. doi:10.2307/2325486

Fama, E. F., & French, K. R. (1986). Common Factors in the Serial Correlation of Stock Returns. *UCLA: Finance*. Retrieved from https://escholarship.org/uc/item/2jf8r7n7

Fama, E. F, & French, K. R. (1988). Permanent and Temporary Components of Stock Prices. *The Journal of Political Economy*, *96*(2), 246-273. doi:10.1086/261535

French, K. R., & Roll, R. (1986). Stock Return Variances. *Journal of Financial Economics, 17*(1), 5-26. doi:10.1016/0304-405x(86)90004-8

Gropp, J. (2004). Mean Reversion of Industry Stock Returns in the U.S., 1926-1998. *Journal of Empirical Finance, 11*(4), 537-551. doi:10.1016/j.jempfin.2004.04.002

Jegadeesh, N. (1990). Evidence of Predictable Behavior of Security Returns. *The Journal of Finance, 45*(3), 881-898. doi:10.1111/j.1540-6261.1990.tb05110.x

Jegadeesh, N. (1991). Seasonality in Stock Price Mean Reversion: Evidence from the U.S. and the U.K. *The Journal of Finance, 46*(4), 1427-44. doi:10.1111/j.1540-6261.1991.tb04624.x

Jegadeesh, N., & Titman, S. (1993). Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency. *The Journal of Finance, 48*(1), 65-91. doi:10.1111/j.1540-6261.1993.tb04702.x

Jegadeesh, N., & Titman, S. (2001). Profitability of Momentum Strategies: An Evaluation of Alternative Explanations. *The Journal of Finance, 56*(2), 699-720. doi:10.1111/0022-1082.00342

Kendall, M. G., & Stuart, A. (1976). *The Advanced Theory of Statistics* (3rd ed.) London, England: Griffin.

Kim, M., Nelson, C. R., & Startz, R. (1991). Mean Reversion in Stock Prices?: A Reappraisal of the Empirical Evidence. *The Review of Economic Studies*, *58*(3), 515-528. doi:10.2307/2298009

Lewellen, J. (2002). Momentum and Autocorrelation in Stock Returns. *The Review of Financial Studies, 15*(2), 533-563. doi:10.1093/rfs/15.2.533

Lo, A. W., & MacKinlay, C. (1988). Stock Market Prices Do Not Follow Random Walks: Evidence from a Simple Specification Test. *The Review of Financial Studies, 1*(1), 41-66. doi:10.1093/rfs/1.1.41

Malkiel, B. G. (1973). *A Random Walk Down Wall Street : The Time-Tested Strategy for Successful Investing* (1st ed.). New York, NY: W.W. Norton.

McQueen, G. (1992). Long-Horizon Mean-Reverting Stock Prices Revisited. *The Journal of Financial and Quantitative Analysis, 27*(1), 1-18. doi:10.2307/2331295

Mukherji, S. (2011). Are Stock Returns Still Mean-Reverting?. *Review of Financial Economics, 20*(1), 22-27. doi:10.1016/j.rfe.2010.08.001

Patro, D. K., & Wu, Y. (2004). Predictability of Short-Horizon Returns in International Equity Markets. *Journal of Empirical Finance, 11*(4), 553-584. doi:10.1016/j.jempfin.2004.02.003

Poterba, J., & Summers, L. H. (1989). Mean Reversion in Stock Prices: Evidence and Implications. *Journal of Financial Economics, 22*(1), 27-59. doi:10.1016/0304-405X(88)90021-9

Richards, A. J. (1997). Winner-Loser Reversals in National Stock Market Indices: Can They Be Explained? *The Journal of Finance, 52*(5), 2129-44. doi:10.1111/j.1540-6261.1997.tb02755.x

Rouwenhorst, K. G. (1998). International Momentum Strategies. *The Journal of Finance. 53*(1), 267-284. doi:10.2139/ssrn.4407

Shaik, M., & Maheswaran, S. (2018). Expected lifetime range ratio to find mean reversion: Evidence from Indian stock market. *Cogent Economics & Finance, 6*(1), 1475926. doi:10.1080/23322039.2018.1475926

Spierdijk, L., Bikker, J. A., & van den Hoek, P. (2012). Mean reversion in international stock markets: An empirical analysis of the 20th century. *Journal of International Money and Finance, 31*(2), 228-249. doi:10.1016/j.jimonfin.2011.11.008

Vasicek, O. (1977). An Equilibrium Characterization of the Term Structure. *Journal of Financial Economics, 5*(2), 177-188. doi:10.1016/0304-405x(77)90016-2

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