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CONTENT

Title and Author/s **Page**

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RESEARCH ON THE IMPACT OF PERCEIVED SERVICE FAIRNESS AND PRICE FAIRNESS ON THE COMPLAINING BEHAVIOUR OF RESTAURANT CUSTOMERS

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ABSTRACT

Purpose -The aim of research is to determine perceptions of service fairness and price fairness of restaurant customers; to measure how perceptions of service fairness and price fairness affect their complaining behaviour.

Methodology - A structured questionnaire technique was used as data collection method. A total of 410 useable questionnaires were collected from customers of 40 restaurants in Karadeniz Ereğli. The data collected was analysed using the factor analysis, regression and correlation analysis.

Findings- There is moderate positive correlation between perceived service fairness and perceived price fairness in restaurant customers in Karadeniz Ereğli. A moderate negative correlation between perceived service fairness and complaining behavior was found. A low negative correlation between perceived price fairness and complaining behavior was found.

Conclusion- The study provides practical implications that provides restaurants decreasing their customers' complaining behaviour and new insight on the relationship between perceived service fairness and perceived price fairness of restaurant customers.

Keywords: Perceived service fairness, perceived price fairness, complaining behaviour, restaurant customers, tourism marketing
JEL Codes: L83, Z31, Z33

1. INTRODUCTION

Customers seek fairness in terms of benefits and services provided to them. As with any profit organizations, the main objective of restaurants is to meet customers' expectations, providing customers a good service and making profit. Pricing is a challenging but a significant managerial decision since the price of a product or service affects customers' behaviour significantly (Chung and Petrick, 2015: 907). Since restaurants are operating in tourism industry and tourism industry which is one of the most important industries in terms of human mobility; restaurants should give importance to service providing and pricing. Customer satisfaction or dissatisfaction from the products and services offered in restaurants has various impacts on complaining behaviour. In fierce competition environment, for their standing, restaurants should focus on the impact of customer perceived price fairness and service fairness on complaining behaviour.

In related literature, there are studies about the effects of perceived service fairness and perceived price fairness on loyalty, on customer satisfaction and consumer behaviour (Çilesiz and Selçuk, 2018; Malc et al., 2016; Xia et al., 2004). This study is considered to be important in terms of presenting the relationship between the variables and the effects of variables on each other effects. In the related literature, there is no study that attempts to discuss the relationship among perceived price fairness and perceived service fairness. In this context, this research is thought to be fulfil this deficiency in the literature.

The aim of the research, in the scale of Karadeniz Ereğli, is to determine perceptions of service fairness and price fairness of restaurants customers; to measure how perceptions of service fairness and price fairness affect their complaining behaviour. In this study, data were collected from 410 restaurant customers in Karadeniz Ereğli and necessary analyses were made. In the direction of the results obtained, this research attempts to contribute both to related literature and to the restaurants in Karadeniz Ereğli about determining the impacts of perceived service fairness and perceived price fairness on complaining behaviour.

2. LITERATURE REVIEW

In this part of the study, the concepts of perceived service fairness, perceived price fairness, complaining behavior and the relationship between these variables are explained.

2.1. Perceived Service Fairness

In service evaluation, service fairness has emerged as a significant concept. Seiders and Berry (1998) defines service fairness as "perception of the customer's degree of fairness related to the service providing of a service company. Customer's perceived service fairness is important in terms of increasing reputation and reliability of the enterprises operating in service industry and consequently gaining competitive advantage (Herbig and Milewicz, 1993).

Characteristics of services such as variability, intangibility and inseparability increase the sensitivity of consumers to the service fairness. Lack of trial before purchasing a service, increases this sensitivity for the potential customers. Therefore, it would be difficult for potential customers to evaluate the service before purchasing (Berry et al., 1994).

On the other hand, the concept of perceived service fairness plays an important role in defining service quality and customer satisfaction (Hui et al. 2007). In this context, the rupture or continuity of the relationship between customers and tourism enterprises is closely related to the perception of fairness. Therefore, to establish and maintain long-term relationships with customers in a business, fair treatment of customers is essential (Berry 1999). Customers value whether the results are fair when evaluating the success of service improvement activities (Hoffman and Kelly, 2000).

In the related literature, equity theory and justice theory were usually mentioned in researchs. Equity theory was developed by Adams (Adams, 1963; Adams, 1965) and has been studied in the researchs in the fields of sociology, psychology and organizational behavior (Oliver and DeSarbo, 1988). Most of the researchers in the field of justice have based their studies on Adams's equity theory (1963) (Goodwin and Ross, 1990; McCollough, 2000). Equity theory consists of three components: distributive fairness, procedural fairness, and interactional fairness (Hoffman and Bateson, 2006). According to this theory, the satisfaction levels of the customers and their future attitudes towards enterprises are depending on whether they feel that they are treated fairly or unfairly (McColl-Kennedy and Sparks, 2003).

The FAIRSERV service fairness model proposed by Carr (2007) is developed as multidimensional model that attempts to measure service fairness and explains consumer reactions to the services (Carr, 2007). Customers evaluate services by comparing services with standards of fairness and the treatment of other customers. In this evaluation, factors such as arrival time of meals and presentation can be counted. As a result, they evaluate service as fair or not. In their study about restaurants, Namkung and Jang (2009) stated that interactional fairness has a direct impact on behavioral intentions.

2.2. Perceived Price Fairness

Price is “the total of all the values that customers leave to get the benefit of having or using a product or service” (Kotler et al., 2005). Price is one of the most important factors affecting the behavior of both enterprises and customers (Hanaysha, 2016). In related literature, there are several definitions made on perceived price fairness. Xia et al. (2004) defined price fairness as a customer’s assessment between a price of a product or service and the price of a comparative other party is reasonable, acceptable, or justifiable (Xia et al., 2004). Frey and Pommerehne (1993) claimed that customers assess fairness as “fair price”. Moreover, Padula and Busacca (2005) defined perceved price fairness as the consumer's subjective judgment as to whether the actual price is “fair” as a result of his/her assessment of the economic value provided by the exchange relationship with the supplier. Campbell (1999) stated that price fairness is a significant factor to consider, as it affects brand image and perceived price may result in negative word of mouth communication and customers may switch to competitors.

When the customer perceive a price as unfair, he/she may withdraw from a purchase, make negative word of mouth or act in a variety of ways to harm the business (Xia et al., 2004). In a study, researchers examined perceived price fairness towards dynamic pricing system newly introduced in the maritime transport industry and impacts of perceived price fairness on consumers’ perception on a company or brand reputation. This study was conducted on the customers of IDO A.Ş. a fast sea transporattion enterprise in Turkey. For this purpose, data were collected from 126 participants, who got ticket from IDO and traveled in intercity lines. Results show that there are relationships between consumer trust, consumers’ percieved price fairness, consumer satistaction, consumer attitudes towards the enterprise and brand reputation (Nacar et al., 2012). In literature, many studies have focused on the determinants that affect the perceived price fairness of customers when enterprises increase the price of a product or service (Kukar-Kinney et al., 2007; Kahneman et al., 1986a; Kahneman et al., 1986b; Bechwati et al., 2005; Bolton et al., 2003; Campbell, 2007).

In the studies, it was stated that perceived price fairness or unfairness is a psychological factor which has a significant impact on the reactions of consumers to prices. Consumers do not want to pay a price when they perceive unfair and they react to this unfairness in a variety of ways, such as less purchases (Campbell, 1999).

2.3. Complaining Behaviour

A complaint refers to feedback of customers from their dissatisfaction (Barlow and Moller, 2008). Acquiring a new customer is more costly in terms of time, energy, and resources (Weinstein, 2002). For this reason, businesses should ensure the continued satisfaction of existing customers. Therefore, it is important for businesses to evaluate complaints in order to resolve unsuccessful services and to maintain relationships with existing customers.

In the act of complaining, customers may employ different methods. In some cases, customers do not take any action which means withdraw from a purchase and switch to a competitor and in some cases they report their complaint in different ways (Day and Landon, 1977). Customers may complain to the manager (Hirschman, 1970), share complaints with other people in consumer associations, media, intermediary organizations (travel agencies, tour operators, etc.) or on the Internet (holidaycheck, şikayetimvar, etc.) (Kılıç and Ok, 2012). In a study, it was found that the number of complainant customers did not complain to the company manager but shared their complaints with their family and friends was more than the number of those who submitted their complaint to the company manager (Barlow and Moller, 2008).

There are many studies in the literature explaining customers complaining behaviour. Studies explaining customers complaining behaviour began in the 1970s and Hirschman (1970) conducted the first research on customers complaining behavior. In literature, there are studies that attempts to explain; how businesses handle customer complaints, organizational factors affecting customer's tendency to complain to an organization, evaluation of customer complaining behaviours in online shopping and customer complaining management (Gökdeniz et al., 2012; Yılmaz et al., 2016; Alabay, 2012). About the behaviours of consumers who are not satisfied about a product or a service, Hirschman (1970) states that some of the customers who felt that they did not benefit from the goods and services they received, claimed that enterprises had to correct their mistakes. On the other hand, some other customers have decided not purchase from that company again.

3. DATA AND METHODOLOGY

The aim of this study is to determine the impacts of perceived service fairness and perceived price fairness on complaining behaviour in restaurants in Karadeniz Ereğli. For this purpose, a quantitative research design was selected and data were collected through structured questionnaire.

For service fairness variable; a cross-sectional scale with multiple items is used which is adopted from Kwortnik and Han (2010). For price fairness variable; a scale created in the light of the information adopted from previous studies by

Srikanjanarak et al. (2009) is used. For the complaining behavior variable; questions developed by Xia et al. (2004) on complaining behavior were adopted.

In the preparation of questions, previous studies in related literature were utilized (Kwortnik and Han, 2010; Srikanjanarak et al., 2009; Xia et al., 2004; Çilesiz and Selçuk, 2018). Five point Likert scale starting from 1 (strongly disagree) to 5 (strongly agree) was used. To determine the content validity of the questionary form, 3 academic staff were interviewed and the expressions that might pose a challenge in the meanings of questions were corrected.

Before the main survey was conducted, a pilot study was conducted on 40 restaurant customers and the questionnarie was finalized accordingly. The purpose was to be able to foresee the possible problems related to the scale used and the variables in the questionnaire (Yüksel and Yüksel, 2004). The questionnaire consists of three dimensions which are perceived service fairness, perceived price fairness and complaining behavior.

3. 1. Hypothesis Development and Research Model

Researches (Lam and Tang, 2003; Kim et al., 2010; Blodgett et al., 1993; Su and Hsu, 2013) take part in literature explainig that perceived service fairness has a negative impact on complaining behavior. Similarly, Blodgett et al. (1994) stated that complaining behavior and negative word of mouth communication do not occur a lot in cases where perceived service fairness is high.

Su and Hsu (2013) conducted a study on Chinese natural heritage tourism. They examined relationships among consumption emotions, satisfaction, service fairness and behavioral intentions. They stated that service fairness is an antecedent of consumption emotions (positive and negative) that, it affects behavioral intentions. Thus, the following hypothesis was formulated:

H_1: Perceived service fairness affects complaining behaviour negatively.

Since price evaluations are based on comparison with the service offered by other enterprises, percived price fairness occurs with price comparisons (Xia and Monroe, 2010). In the related literature, in the majority of perceived price fairness studies, it is found out that “reference price” affects consumer price perceptions (Xia et al., 2004; Maxwell, 2002; Bechwati et al., 2005; Matzler et al., 2006). In previous researches, it was stated that perceived price fairness is an important factor on complaining behavior (Hirschman, 1970; Campbell, 1999; Huppertz et al., 1978; Xia et al., 2004; Namkung and Jang, 2010; Malc et al., 2016). Ferguson and Ellen (2014) examined impacts of procedural and distributive fairness, the main components of perceived fairness, on price fairness. Results of their study demonstrate that procedural fairness and distributive fairness have positive impacts on price fairness. The above researches led to following hypothesis:

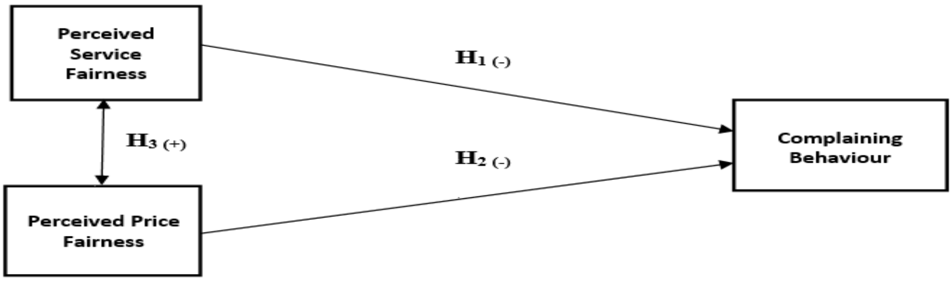
H_2: Perceived price fairness affects complaining behaviour negatively.

According to Bolton et al. (2003), fairness is judging an outcome and the process of achieving an outcome as reasonable, acceptable or fair. It is proved with the studies in literature that there is a relationship between perceived service fairness and perceived price fairness. Srikanjanarak et al. claimed that a reliable measure of price fairness perception, provides a beter understanding of about customers perception on price fairness. The specific knowledge leads managers to design an appropriate price strategy which fits their customer's desires and needs while maintaing a long-term relationship with them. Bolton et al. Examined the determinants that affect the perceived price fairness of customers when enterprises increase the price of a product or service. Hassan et al. (2013) attempted to determine the impact of service quality, service fairness and price fairness perception on customer loyalty and customer satisfaction in the mobile telecom industry of Pakistan. Results of their study show that price fairness perception, service quality and service fairness have validity and reliability for measuring customer satisfaction and loyalty (Hassan et al., 2013). Furthermore, a positive relationship between service fairness, service quality and price fairness perception is obtained. In the context of these studies, the following hypothesis was formulated:

H_3: There is a positive relationship between perceived service fairness and perceived price fairness.

The aim of developing a research model is to demonstrate the linkage of relationship between variables. According to the research model, perceived service fairness affects complaining behaviour negatively. Perceived price fairness affects complaining behaviour negatively. There is a positive relationship between perceived service fairness and perceived price fairness.

Figure 1: Research Model



3.2.Population and Sample of the Research

The research population consists of restaurant customers in Karadeniz Ereğli. Karadeniz Ereğli has remarkable values with regard to art history, archeology, history and tourism disciplines (Oğuzbalaban and Akın, 2017). When the artifacts and existing tourism opportunities of Karadeniz Ereğli are properly handled within the scope of tourism, the existing tourism potential will increase. In addition, the fact that a similar study was not carried out in this destination was effecting the selection of Karadeniz Ereğli as the population. The questionnaires were conducted in February 2019 for restaurant customers in Karadeniz Ereğli. In the study, convenience sampling method a specific type of non-probability sampling method was used as the sampling method. According to Yüksel and Yüksel (2004), since there are many variables that affect the sample, the researcher should reach the size where he/ she can obtain the appropriate data rather than calculating the sample. Sekaran (2003) suggests that sample size of 384 for 95% confidence intervals is sufficent in case of population size about one million and above. Sample study constitutes 410 participants reached in February 2019. To achieve the objective of this research, questionnaires were distributed to 425 restaurant customers but 15 questionnaires were incorrectly completed and rejected. Therefore, a total of 410 useable questionnaires were obtained.

4. FINDINGS AND DISCUSSIONS

4.1. Descriptive Statistics

Acoording to the frequency analysis which was run out for determining demographic characteristics, 40,5 % were male (166) and 59,5 % were female (244). The findings indicate that 36,3% (149) of participants were in the 27-35 age range and 31,5% (129) were in the 18-26 age range. The minority 4,4% (18) were between the ages of 54-62. 51,7% (212) of participants were married and 48,3% (198) were single. Results demonstrate that the majority of participants 54,1% (222) have bachelor degree, 17,6% (72) were postgraduate and the minority 2,7% (11) were primary school graduates. Approximately half of participants have 48,5% (199) 1500-3500 TL monthly income.

Table 1: Demographic Characteristics of Study Sample

Demographic Characteristics	n	%
Gender		
Female	244	59,5
Male	166	40,5
Total	410	100
Age		
18-26 age	129	31,5
27-35 age	149	36,3
36-44 age	72	17,6
45-53 age	42	10,2
54-62 age	18	4,4
Total	410	100
Marital Status		
Single	198	48,3
Married	212	51,7
Total	410	100

Education		
Primary Education	11	2,7
Secondary	51	12,4
Associate degree	54	13,2
Bachelor degree	222	54,1
Postgraduate degree	72	17,6
Total	410	100
Monthly Income		
Less than 1500 TL	34	8,3
1500 TL-2500 TL	96	23,4
2501 TL-3500 TL	103	25,1
3501 TL- 4500 TL	84	20,5
More than 4501 TL	93	22,7
Total	410	100

Acoording to the frequency analysis which was run out for determining demographic characteristics, 40,5 % were male (166) and 59,5 % were female (244). The findings indicate that 36,3% (149) of participants were in the 27-35 age range and 31,5% (129) were in the 18-26 age range. The minority 4,4% (18) were between the ages of 54-62. 51,7% (212) of participants were married and 48,3% (198) were single. Results demonstrate that the majority of participants 54,1% (222) have bachelor degree, 17,6% (72) were postgraduate and the minority 2,7% (11) were primary school graduates. Approximately half of participants have 48,5% (199) 1500-3500 TL monthly income.

4.2. Explanatory Factor Analysis of Variables

Explanatory factor analysis was made for determining dimensional structures of the variables perceived service fairness, perceived price fairness and complaining behaviour and for examinnig reliability and validity.

Table 2: Factor Analysis of Variables and Means

Factors	Factor Loading	Variance (%)	C.Alfa (α)
Perceived Service Fairness x̄: 3,77		40,74	,873
The restaurant provided me with what I asked.	,847		
I was treated respectfully in this restaurant.	,798		
The restaurant served me correctly.	,780		
Restaurant staff treated me flexibly according to my needs.	,765		
The restaurant has fully met my needs.	,751		
Perceived Price Fairness x̄: 3,09		30,19	,843
Generally, this restaurant offers well priced compared to other restaurants.	,868		
The prices charged by this restaurant for food and beverages are reasonable.	,865		
This restaurant offers the best possible price that meets my needs.	,803		
Total Variance: 70,94, **Deductive Method**: Principal Component Analysis**, Spinning Method**: Kaiser Normalization and Varimax, **Number of iterations**: 3 **KMO Conformity Criterion**: 0,783 **Barlett's test of sphericity x^2:** 1652,813 **p:** 0,000			
Factor	**Factor Loading**	**Variance (%)**	**C.Alfa (α)**
Complaining Behaviour x̄: 2,40		69,10	,886
I would complain to the restaurant manager about this restaurant.	,906		
I would complain to the restaurant staff about this restaurant.	,897		

I would ask for an explanation for the prices at this restaurant.	,874		
I would give negative comments about this restaurant to others	,750		
I would warn people not to go to this restaurant.	,709		
Cronbach Alfa: ,886 **Total Variance**: 69,10, **Deductive Method**: Principal Component Analysis, **Spinning Method:** Kaiser Normalization **KMO Conformity Criterion**: 0,766 **Barlett's test of sphericity x²:** 1622,145 p: 0,000			

According to Kaiser Normalization in exploratory factor analysis, factors with eigenvalue greater than 1,0 were considered and it was determined that the scale consisted of 3 factors. The total variance percentage is 70,94 for perceived service fairness and perceived price fairness. The total variance percentage for complaining behaviour is 69,10. According to Scherer et al. (1988), the percentage should be more than 50 % for the validity of the analysis. Therefore, this analysis is valid as these rates are higher than 50 %. In the explanatory factor analysis, common variance (communality) values and the values of the scale statements should not be less than 0,4 (Field, 2000). In this factor analysis, all values were not higher than 0,4. The question of perceived service fairness dimension which is "The amount I paid in this restaurant is reasonable for the service I received" is withdrawn because it is overlaped. The question of perceived price fairness dimension "This restaurant provides a variety of pricing plans" is withdrawn because it's factor loading value is less than 0,4.

As a result of factor analysis, first factor includes 5 statements about perceived service fairness, second factor includes 3 statements about perceived price fairness and third factor includes 5 statements about complaining behaviour. The reliability of all variables was examined, the research indicates that the Cronbach Alpha coefficient of perceived service fairness, perceived price fairness and complaining behaviour were respectively; "0,873"; "0,843" "0,886". According to Nunnally and Bernstein (1994), the reliability of the scale is accepted as good if the coefficient is found equal or greater than 0.70. Hence, the values are showing reliable measures to be used in this study.

The findings indicate that perceived service fairness has the highest average ($\bar{x}$= 3.77), it is followed by perceived price fairness ($\bar{x}$= 3.09) and complaining behavior ($\bar{x}$= 2.40) respectively.

The distribution is normal because it was determined that the skewness and kurtosis values were between -1,5 and +1,5 (Tabachnick and Fidell, 2013). Since the data were distributed normally, Pearson Correlation test was run out.

Table 3: Correlation Analysis

Dimensions	PSF (Perceived Service Fairness)	PPF (Perceived Price Fairness)	CB (Complaining Behaviour)
Perceived Service Fairness	1	,468**	-,436**
Perceived Price Fairness	,468**	1	-,351**

"**p<0.01"

Findings of correlation analysis are demonstrated in Table 3. which demonstrate the relationships among perceived service fairness, perceived price fairness and complaining behaviour. All correlation coefficients between the variables were found positive and significant (p <0.01).

When Pearson Correlation coefficients are examined, it is found out that there is a moderate positive relationship between perceived service fairness and perceived price fairness (r=0,468, p<.001). Thus, this particular finding support the acceptance of H_3 "There is a positive relationship between perceived service fairness and perceived price fairness". Moreover, results reveal that there is a moderate negative relationship between perceived service fairness and complaining behaviour (r=-0,436, p<.001). Furthermore, there is a weak negative relationship between complaining behaviour and perceived price fairness (r=-0,351; p<0,01).

4.3.Hypotheses Testing

To test the model given in Table 3, regression analysis was run out for testing the hypotheses H_1, H_2, H_3.

Table 4: Model of Regression Analysis of Variables

Research Model (Dependent Variable: Complaining Behaviour)			
İndependent Variables	**Beta**	**t**	**P**
Perceived Service Fairness	,348	7,016	,000
Perceived Price Fairness	,188	3,781	,000
R=,467; R^2 =,218; **Adjusted** R^2 =,214; **F=**56,610; **p=** 0.000			

Multiple linear regression analysis was run out to test the impact of perceived service fairness and perceived price fairness on complaining behaviour. Results in Table 4 show the model of regression analysis of variables. It is found out that perceived service fairness has a negative significant effect on complaining behaviour (β=0,348; p=0,000). Thus, this finding support the acceptance of H_1 "perceived service fairness affects complaining behaviour negatively". As shown in Table 4, results show that perceived price fairness has a negative significant effect on the complaint behavior (β=0,188; p=0,000). Therefore, H_2 "perceived price fairness affects complaining behaviour negatively" is accepted. Moreover, it was found that the most effective variable on complaining behavior was perceived service fairness.

In addition, since two different variables were included in the model as independent variables, it was tested for multicollinearity. The values of **VIF= 1,281** and **Tolerance= 0,781** indicate that there is no multiple correlation and auto-correlation between the variables (Field, 2000).

5. CONCLUSION

The aim of this study is to explain the impacts of perceived service fairness and perceived price fairness on complaining behaviour in restaurants. Results of the study show that perceived service fairness affects complaining behaviour negatively. Similarly, perceived price fairness affects complaining behaviour negatively. In addition, there is a positive relationship between perceived service fairness and perceived price fairness.

Results demonstrate that perceived service fairness has the highest average, it is followed by perceived price fairness and complaining behavior respectively. This result indicates that restaurant customers give importance to service fairness. To be treated respectfully by restaurant staff and to be served correctly are important for them. Secondly, results show that restaurant customers care about reasonable prices of food and beverages, and they compare this prices with other restaurants.

When Pearson Correlation coefficients are examined, it is found out that there is a moderate positive relationship between perceived service fairness and perceived price fairness. Moreover, findings indicate that there is a moderate negative relationship between perceived service fairness and complaining behaviour. There is a weak negative relationship between perceived price fairness and complaining behaviour.

Indeed, the researches about this subject support these research results (Lam and Tang, 2003; Kim et al., 2010; Blodgett et al., 1993; Su and Hsu, 2013; Hirschman, 1970; Campbell, 1999; Huppertz et al., 1978; Xia et al., 2004; Namkung and Jang, 2010; Malc et al., 2016). Huppertz et al. (1978) claimed that when consumers perceive inequity, they leave the shop and complain about price or service.

Multiple regression analysis was conducted to test the effects of perceived service fairness and perceived price fairness on complaining behavior. Results demonstrate that, perceived service fairness has a negative significant effect on complaining behaviour. Moreover, it was found that the most effective variable on complaining behavior was perceived service fairness.

In the related literature it has been claimed that perceived service fairness has a negative effect on complaining behavior (Lam and Tang, 2003; Kim et al., 2010; Blodgett et al., 1993; Su and Hsu, 2013). Hirschman, 1970; Campbell, 1999; Huppertz et al., 1978; Xia et al., 2004; Namkung and Jang, 2010; Malc et al., 2016 in their price fairness researchs, they stated that perceived price fairness was an important factor on complaining behavior.

Based on the results and conclusion of the study, the following recommendations can be made:

Customers perceive the service more fairly when restaurants pay attention to treat their customers respectfully, provide the service correctly, they treat their customers flexibly according to their needs. Thus, complaining behaviour will decrease accordingly. In this context; restaurants should treat their customers with respect, provide their services correctly, act flexibly towards customers' needs and fully meet their needs.

If they offer a more favorable price than competing restaurants, set reasonable food and beverage prices and offer the best possible price while meeting the needs of customers, the perception of price fairness will increase and complaining behaviour will decrease. With these improvements, restaurants will increase the perception of price fairness and cause a positive impact on the perception of service fairness.

This study focuses on the impact of perceived service and price fairness on complaining behaviour of restaurant customers, especially in restaurants in Karadeniz Ereğli. In this context, the research is limited with the evaluation of the restaurants in the Karadeniz Ereğli and the local customers in these restaurants. It is recommended that future researchs will be carried out at different destinations with the inclusion of foreign customers. It is thought that future studies on this subject will be carried out in different areas of the service industry and contribute to the literature.

REFERENCES

Adams, J.S. (1963).Toward an Understanding of Inequity. *Journal of Abnormal Psychology.* 67,422-436. DOI: 10.1037/h0040968

Adams, J.S. (1965).Inequity in social Exchange, in: Berkowitz L. (Ed.), Advances in Experimental Psychology, 2., Academic Press: New York: 267-299.

Alabay, M.N. (2012). Müşteri Şikâyetleri Yönetimİ. *Uluslararası Yönetim İktisat ve İşletme Dergisi.* 8(16): 137-157. DOI:10.11122/ijmeb.2014.8.16.320

Barlow, J., Moller, C. (2008). A Complaint is a Gift: Using Customer Feedback as a Strategic Tool. San Francisco, California: Berrett-Koehler Publishers, Inc.

Bechwati, N.N., Sheth, J.N., and Sisodia, R.S. (2005).Consumers' Perceptions of Pricing Unfairness. *Advances in Consumer Research.* 32, 388-389.

Berry, B.B, Parasuraman, and Zeithaml, V.A. (1994).Improving Service Quality in America: Lessons Learned. *Academy of Management*

Executive. 8(2): 32-52. DOI: 10.5465/AME.1994.9503101072

Berry, L.L. (1999). Discover the Soul of Service: The nine drivers of sustainable business success,1st ed. New York: Free Press.

Blodgett, J.G., Granbois, D.H., and Walters, R.G. (1993).The Effects of perceived justice on complaints' negative word-of-mouth behavior and repatronage intentions. *Journal of Retailing.* 69(4): 399-428. DOI:10.1016/0022-4359(93)90015-B

Bolton, L.E., Warlop, L., and Alba, J.W. (2003). Consumer Perceptions of Price (Un) Fairness. *Journal of Consumer Research, 29,* 474-49. DOI:10.1086/346244

Campbell, M.C. (1999). Perceptions of price unfairness: antecedents and consequences. *Journal of Marketing Research*. 36(2): 187-199. DOI:10.1177/002224379903600204

Campbell, M.C. (2007). Says Who?! How the Source of Price Information and Affect Influence Perceived Price (Un) Fairness. *Journal of Marketing Research.* 44(2): 261- 271. DOI:10.1509/jmkr.44.2.261

Carr, C.L. (2007).The FAIRSERV Model: Consumer Reactions to Services Based on a Multidimensional Evaluation of Service Fairness. *Decision Sciences.* 38(1): 107-113. DOI: 10.1111/j.1540-5915.2007.00150.x

Chung, J.Y., James P.F. (2015).Measuring Price Fairness: Development of a Multidimensional Scale. *Journal of Travel & Tourism Marketing.* 32(7): 907-922. DOI: 10.1080/10548408.2015.1063894

Çilesiz, E., Selçuk, G.N.(2018, June 30). Hizmet Adaleti, Fiyat Adaleti ve Güven Algılarının Müşteri Memnuniyeti Üzerindeki Etkisi: Kış Koridorunda Konaklayan Yabancı Turistler Üzerine Bir Araştırma. *Güncel Turizm Araştırmaları Dergisi*. 2(1): 42-78. Retrieved from https://dergipark.org.tr/tr/pub/guntad/issue/38048/419803

Day, R.L., Landon, L. E. (1977).Toward a theory of consumer complaining behavior, in: Woodside, A., Steht, J., Bennet, P. (Ed.), Consumer and Industrial Buying Behaviour, North Holland Publishing Company, Amsterdam: 425-437.

Ferguson, J.L., Scholder, E.P., and Bearden, W.O. (2014).Procedural and Distributive Fairness: Determinants of Overall Price Fairness. *Journal of Business Ethics.* 121(2): 217-231. DOI: 10.1007/s10551-013-1694-2

Field, A.(2000). Discovering Statistics-Using SPSS for Windows. London: SAGE Publication.

Frey, B.S., Pommerehne, W.W. (1993).On the Fairness of Pricing-An Empirical Survey among the General Population. *Journal of Economic Behavior & Organization.* 20(3): 295-307. DOI: 10.1016/0167-2681(93)90027-M

Goodwin, C., Ross, I. (1990).Consumer Evaluations of Responses to Complaints: What's Fair and Why.*Journal of Services Marketing,* 4(3): 53-61. DOI: /10.1108/EUM0000000002575

Gökdeniz, İ., Durukan, T., and Bozacı, İ.(2012, January 31).Müşterinin Firmaya Şikâyet Etme Eğilimini Etkileyen Örgütsel Faktörler Üzerine Uygulamalı Bir Çalışma.*Üçüncü Sektör Sosyal Ekonomi.* 47(2): 30-46. Retrieved from https://dergipark.org.tr/tr/pub/aksarayiibd/issue/22552/240996

Hanaysha, J. (2016).Restaurant Location and Price Fairness as Key Determinants of Brand Equity: A Study on Fast Food Restaurant Industry. *Business and Economic Research*. 6(1): 310-323. DOI:10.5296/ber.v6i1.9352

Hassan, M., Hassan, S., Nawaz, S.M., and Aksel, I. (2013, October).Measuring Customer Satisfaction and Loyalty Through Service Fairness, Service Quality and Price Fairness Perception: An Empirical Study of Pakistan Mobile Telecommunication Sector. *Science International (Lahore).* 25(4): 895-904. Retrieved from https://www.researchgate.net/publication/320566386

Herbig, P., Milewicz, J.(1993).The relationship of reputation and credibility to brand success. *Journal of Consumer Marketing*. 10(3): 18–24. DOI: 10.1108/EUM0000000002601

Herrmann, A., Xia, L., Monroe, K. B., and Huber, F. (2007). The influence of price fairness on customer satisfaction: An empirical test in the context of automobile purchases. *Journal of Product & Brand Management,* 16(1): 49-58. DOI: 10.1108/10610420710731151

Hirschman, A. O. (1970). Exit, Voice and Loyalty Responses to Decline in Firms, Organizations and States. Cambridge: Harvard University Press.

Hoffman, K. D., Kelley, S.W. (2000). Perceived Justice Needs and Recovery Evaluation: A Contingency Approach. *European Journal of Marketing.* 34(3/4): 418-430. DOI: 10.1108/03090560010311939

Hoffman, K. D., Bateson, J. E.G. (2006). Services Marketing: Concepts, Strategies and Cases, 3rd Ed.Thomson: South Western.

Hui, M.K., Au, K., and Zhao, X. (2007). Interactional Justice And The Fair Process Effect: The Role Of Outcome Uncertainty. *Journal of Experimental Social Psychology*. 43(2): 210-220. DOI:10.1016/j.jesp.2006.02.014

Huppertz, J.W., Arenson, S. J., and Evans, R. H. (1978). An Application of Equity Theory to Buyer–Seller Exchange Situations. *Journal of Marketing Research.* 15(2): 250–260. DOI: 10.2307/3151255

Kahneman, D., Knetsch, J., and Thaler, R. (1986). Fairness and the Assumptions of Economics. *The Journal of Business*. 59(4): 285-300. DOI: 10.1086/296367

Kılıç, B., Ok, S. (2012, January 6). Otel İşletmelerinde Müşteri Şikâyetleri ve Şikâyetlerin Değerlendirilmesi. *Journal of Yasar University,* 25(7): 4189-4202. Retrieved from https://dergipark.org.tr/tr/pub/jyasar/issue/19137/203078

Kim, J.H., Chen, J.S. (2010). The Effects of Situational and Personal Characteristic on Consumer Complaint Behavior in Restaurant Services. *Journal of Travel & Tourism Marketing.* 27(1): 96-112. DOI: 10.1080/10548400903539773

Kotler, P., Wong, V. Saunders, J., and Armstrong, G. (2005). Principles of Marketing, 4th Ed. Essex: Pearson Education Limited.

Kukar-Kinney, M., Xia, L., and Monroe, K. B. (2007). Consumers' Perceptions of the Fairness of Price-Matching Refund Policies. *Journal of Retailing,* 83: 325-337. DOI: 10.1016/j.jretai.2007.03.005

Kwortnik, R. J., Han, X. (2010). The Influence of Guest Perceptions of Service Fairness on Lodging Loyalty in China. *Cornell Hospitality Quarterly*. 52(3): 321-332. DOI: 10.1177/1938965511409005

Lam, T., Tang, V. (2003). Recognizing Customer Complaint Behavior: The Case of Hong Kong Hotel Restaurants. *Journal of Travel & Tourism Marketing.* 14(1): 69-86. DOI: 10.1300/J073v14n01_05

Malc, D., Mumel, D., and Pisnik, A. (2016). Exploring price fairness perceptions and their influence on consumer behavior. *Journal of Business Research.* 69(9): 3693-3697. DOI: 10.1016/j.jbusres.2016.03.031

Matzler, K., Würtele, A., and Renzl, B. (2006). Dimensions of Price Satisfaction: A Study in the Retail Banking Industry. *International Journal of Bank Marketing.* 24(4): 216-231.DOI: 10.1108/02652320610671324

Maxwell, S.(2002). Rule-Based Price Fairness and Its Effect on Willingness to Purchase. *Journal of Economic Psychology,* 23(2): 191-212. DOI: 10.1016/S0167-4870(02)00063-6

Mccoll-Kennedy, J.R., Sparks, B. A. (2003). Application of Fairness Theory to Service Failures and Service Recovery. *Journal of Service Research*. 5(3): 251-266. DOI:10.1177/1094670502238918

McCollough, M. A. (2000).The Effect of Perceived Justice and Attributions Regarding Service Failure and Recovery on Post-Recovery Customer Satisfaction and Service Quality Attitudes. *Journal of Hospitality and Tourism Research.* 24(4): 423-447. DOI: 10.1177/109634800002400402

Nacar, R., Polat, V., Geçti, F., and Çiçek, M. (2012). Dinamik Fiyatlandırmada Algılanan Fiyat Adaletinin Marka İtibarına Etkisi: İDO Örneği. Balıkesir. *17. Ulusal Pazarlama Kongresi*. 805-820. DOI: 10.13140/RG.2.1.4641.8004

Namkung, Y., Jang, S. C. (2010). Effects of Perceived Service Fairness on Emotions and Behavioral Intentions in Restaurants. *European Journal of Marketing.* 44(9/10): 1233-1259. DOI: 10.1108/03090561011062826

Nunnally, J., Bernstein, I. (1994). Psychometric Theory, 3rd Ed.New York: McGraw-Hill.

Oğuzbalaban, G., Akın, G. (2017). Karadeniz Ereğlisi'nin Destinasyon Olarak Yer Aldığı Turlar Üzerine Bir Araştırma. *Uluslararası Sosyal Araştırmalar Dergisi.* 10(54): 1108-1113. DOI: 10.17719/20175434679

Oliver, R.L., DeSarbo, W. S. (1988). Response determinants in satisfaction judgments. *Journal of Consumer Research*. 14: 495-507. DOI: 10.1086/209131

Padula, G., Busacca, B. (2005). The Asymmetric Impact of Price-Attribute Performance on Overall Price Evaluation. *International Journal of Service Industry Management*. 16(1): 28-54. DOI: 10.1108/09564230510587140

Scherer, R.F., Wiebe, F. A., Luther, D. C., and Adams, J. S. (1988). Dimensionality Of Coping: Factor Stability Using The Ways of Coping Questionnaire. *Psychological Reports.* 62(3): 763-770. DOI: 10.2466/pr0.1988.62.3.763

Seiders, K., Berry, L.L. (1998). Service fairness: what is and why it matters. *Academy of Management Executive.* 12(2): 8-20. DOI: 10.5465/ame.1998.650513

Sekaran, U. (2003). Research Methods for Business: A Skill-Building Approach, 4th eds. New York: John Wiley High Education Press.

Srikanjanarak, S., Omar, A., and Ramayah, T. (2009, January). The Conceptualisation and Operational Measurement of Price Fairness Perception in Mass Service Context. *Asian Academy of Management Journal.* 14(2): 79-93. Retrieved from https://www.researchgate.net/publication/44035887

Su, L., Hsu, M.K. (2013). Service Fairness, Consumption Emotions, Satisfaction, and Behavioral Intentions: The Experience of Chinese Heritage Tourists. *Journal of Travel Tourism Marketing.* 30(8): 786-805. DOI: 10.1080/10548408.2013.835228

Tabachnick, B.G., Fidell, L.S. (2013). Using multivariate statistics, 6th Eds. Boston: MA: Pearson.

Weinstein, A. (2002). Customer retention: A usage segmentation and customer value approach. *Journal of Targeting, Measurement & Analysis for Marketing*. 10(3): 259-269. DOI: 10.1057/palgrave.jt.5740051

Xia, L., Monroe, K.B., and Cox, J.L. (2004). The price is unfair! A conceptual framework of price fairness perceptions. *Journal of Marketing.* 68(4): 1–15. DOI: 10.1509/jmkg.68.4.1.42733

Xia, L., Monroe, K.B., and Cox, J.L. (2010, July 15). Is a good deal always fair? Examining the concepts of transaction value and price fairness. *Journal of Economic Psychology,*31(6): 884-894. Retrieved from http://isiarticles.com/bundles/Article/pre/pdf/9331.pdf

Yılmaz, V., Arı, E., and Doğan, R. (2016). Online Alışverişte Müşteri Şikâyet Niyetleri ve Davranışlarının Yapısal Eşitlik Modeli ile İncelenmesi. Journal of Yasar University. 11(42): 102-112. DOI:10.19168/jyu.60269

Yüksel, A., Yüksel, F. (2004). Turizmde Bilimsel Araştırma Yöntemleri. Ankara: Turhan Kitapevi.

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DOES BORSA ISTANBUL INCORPORATE HERDING AND CALENDAR ANOMALIES? AN EMPIRICAL EVIDENCE

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ABSTRACT

Purpose- Anomalies and herding rather than individual rational decisions could be detected in capital markets. Such formations' enabling abnormal returns under volatility, may be of interest in respect of Turkish capital markets. This study analyzes the herd behavior and calendar anomalies in Borsa Istanbul (BIST) by generalizing the main index and the sectoral indices.
Methodology- The data set is based on the weekly closing prices, trading volume and the number of contracts of BIST-100 Index and 17 sectoral indices for the January 2012 to December 2016. A symmetric GARCH (1,1) and an asymmetric SAARCH (1,1) models have been employed for a comparative analysis.
Findings- Since GARCH (1,1) findings revealed a quiet weak simultaneous interaction between volatility and return, the research was deepened through employment of the SAARCH (1,1) asymmetric estimation model, which revealed an increase in both trading volume and return when considering negative shocks. Hence, a significant herding in BIST has been confirmed. SAARCH (1,1) model has detected day of the week (DoW) and a significant January effect, as well, while both estimation models have detected Ramadan effects.
Conclusion- It becomes apparent that there is a gap in the Turkish capital market-related combined studies on herding and calendar anomalies. The aim of this study, therefore, is to fill this gap, using analyses of the BIST-100 and sectoral indices. Main indices, consisting of blue-chips, are analyzed frequently; however, abnormal trading behaviors could be detected specifically on sectoral basis.

Keywords: Herding, calendar anomalies, GARCH, SAARCH, panel data analysis.
JEL Codes: G40, G41, G23

1. INTRODUCTION

Considering that individuals are affected by behavioral factors while taking investment decisions, Kahneman and Tversky (1979) developed Prospect Theory. This approach in the finance area contrasts with Fama's (1970) efficient market definition, highlighting irrational investors with heuristics and cognitive biases as against wealth maximization and a rational profile.

For various reasons, the existence of an inefficient market enables abnormal returns. Concordantly, anomalies and herd behavior rather than individual rational decisions can be detected on behalf of investors in capital markets.

Asking whether these anomalies implied profitable trading strategies, Thaler (1987) concluded that this was difficult to ascertain. He also emphasized that anomalies were interesting and worth investigating, even if it was not possible to make money from them. Developing this idea, such formations may be recognized as important for investors seeking abnormal returns by considering volatile structure of Turkish capital markets.

In the academic literature, anomalies are defined as the deviation of returns from the average and analyzed in different dimensions. In this study, calendar (seasonal) anomalies are considered. Calendar anomalies are market anomalies leading to systematically different behaviors of returns related with specific calendar periods. In this context, day of the week (DoW), post-holiday, Ramadan & Zul-Hijjah (month of Eid al-Adha and Pilgrimage), January and December, the days of Federal Reserve (FED) and Central Bank of Turkey (CBT) monetary policy committee meetings, and semester holiday effects are analyzed according to the BIST-100 and BIST sectoral indices.

Herd behavior, an important topic in both finance and behavioral sciences, is also considered. This concept was initially introduced in Dr. Wilfred Trotter's (1916) work, "Instincts of the Herd in Peace and War". Much considered in psychology, herd behavior in the present context is characterized in terms of investors' imitating one another in capital markets rather than independently implementing their own decisions. The occurrence of herd behavior is particularly important for countries with individual investors targeting speculative returns with short-term-based investment horizons.

As it can be seen from the literature survey (below), calendar anomalies and herding are frequently considered separately, both in Turkey and in the international arena generally. This study analyzing these two phenomena in respect of BIST-100 and all sectoral indices has four main sections. Following the introduction, a comprehensive literature review is given in the second part, and a presentation of the methodology and study results comprises the third part, with the last section adding a conclusion.

2. LITERATURE REVIEW

There is a large volume of studies in both the national and international literature on herding and calendar anomalies. In this literature review, herding is covered first, calendar anomalies second, and finally studies involving both effects.

One of the main studies on herding to be made was that of Chan et al. (2000). They detected herd behavior in the US, Hong-Kong, Japan, South Korea, and Taiwan capital markets over periods of between 180 and 420 months, with the time intervals found to vary from country to country. The findings of this analysis led the occurrence of herd behavior to be partially accepted in Japan, an advanced economy with a sophisticated financial sector, and significantly accepted in South Korea and Taiwan, which were treated as emerging countries.

Another comprehensive study, by Chiang et al., 2011 covered Australia, Hong-Kong, Japan, Singapore and the US as developed markets and China, Indonesia, Malesia, South Korea, Thailand and Taiwan as emerging markets. This study included data from 07.02.1997 to 12.31.2008, and herding was detected in both bull and bear market structures, with an impact that varied due to time. Herding was also found to be positively related to stock market performance but negatively related to market volatility.

Messis and Zapranis (2014) analyzed herding in the Athens Stock Exchange, where they identified serious differentiations in investor portfolios during herding periods. Accordingly, herding was found to have a contagiousness affect during crisis periods, with such economic conditions calling the efficacy of international portfolio diversification into doubt. There was also a linear relationship between herding and volatility; thus, herding can be regarded as an additional risk factor. A further study was conducted by Blasco et al. (2010), looking at volatility estimation and the design of investor decision-making processes in terms of herding. In this analysis, volatility was considered in three-dimensions, namely, as historical, realized and, implied. The results showed herding to have a linear impact on volatility even though the intensity is not always the same. Therefore, herding is a key factor in a volatile market during investment-based decision-making process.

It is consequential to identify the relationship between herding and volatility in emerging markets while contemplating their own unstable dynamics. Lao and Singh (2011) confirmed this by analyzing the China and Indian stock markets, underlining that herding is much more significant during periods of high volatility.

Wang (2008) covered 21 stock markets, grouped as developed, emerging Latin American, and emerging Asian. He concluded that there is a higher level of herding in emerging markets than developed markets, and he found the correlation of herding between two markets from the same group to be higher than that between two markets from different groups.

Another issue to be underlined is the association of herding with other capital market-coordinated factors. Cakan et al. (2019) have analyzed the relationship of herding in stock markets with speculative movements in commodity markets. Analyzing this for Russia, Brazil, and Turkey, they detected that speculative movements in global oil markets in Russia and Brazil led to a significant herd behavior among investors in these countries' stock markets. On this basis, they determined that investor behaviors in local markets can be designed and inspected by following commodity markets.

Another factor in the literature related with herding is that of trading volume. BenSaida et al. (2015) tested the US stock market, including all firms listed on Dow Jones Industrial Average, and detected no strong herding effect, but they did find that trading volume triggers herd behavior and that this is a mutual relationship. Boyd et al. (2016) analyzed herding and its resources and effects in the US futures markets by considering big and speculative traders for 2004-2009. They determined that the efficient dissemination of public information among investors suppresses herding. When analyzing the impact of trading systems, they identified a positive relationship between the numbers of investors trading in the open-outcry system and herding behavior. However, the herding relationship with trading volume and electronic trading platform was negative.

Reviewing the Turkish literature, Altay (2008) examined herding in the (old) Istanbul Stock Exchange (ISE) between January 1997 and February 2008 using two different methods. First, a cross-sectional analysis was conducted and no herding detected in the general or sectoral indices. Considering that this was mainly due to nonlinearity between cross-sectional absolute deviation and index-return, the analysis was deepened by analyzing the excessive high/low return rate and cross-sectional variation relationship. The findings for this indicated the relationship to be nonlinear, so this can be evaluated as a proof of herd behavior in the market. Another study in the ISE, made between 2000 and 2010 by Kapusuzoglu (2011), supported Altay's findings.

Kayalidere (2012) scrutinized herding in the ISE between January 1997 and July 2012, classifying his research periods in two sub-periods (1997-2004 old period and 2005-12 recent period). Herding was found to be respectably strong in the first period but declined in the second period, indicating a deeper market structure compared to the former period. Furthermore, it is seen that no herding effect has been detected during bearish market structure. Thus, it has been perceived as an opportunity for portfolio diversification on behalf of risk minimization.

Dogukanli and Ergun (2011) examined herding in the ISE for monthly returns during 2000-10 by considering medium- and long-term trends. No existence of the behavior was detected. In a second study, Dogukanli and Ergun (2015) searched for herding by covering 15 different sectors in the BIST between 4.01.2000 and 28.09.2012, considering daily and weekly stock prices. Again, no herding effect was detected.

Considering behavioral finance and organizational behavior perspectives, Ulusan et al. (2013) analyzed the herd behavior effect on ten banking stocks trading in the BIST between 02.01.2008 and 31.12.2012. While no herding was detected, it was emphasized that this result could be an indication of investors with high locus of control and the existence of a weak-form efficient market structure.

Demir et al. (2014) tested emotional herding over 10 years in the BIST and determined that there is a significant and consistent herding, independent of trading volume and stock return. They also found that the local financial crisis of 2000-01 had led to herding in the BIST and that thereafter there had been a quiet market for a period; however, herd behavior was once again detected toward the end of 2011, due to both internal and external developments.

An interesting study was conducted by Solakoğlu et al. (2016). This study involved the impacts of elections and international Central Bank meetings on herding in the BIST. Analyses of the BIST-30 and Second National Market revealed no herding. However, a weak level of significance of herd behavior was observed in the Second National Market in the day following European Central Bank, Bank of England and Bank of Japan meetings, and it was also revealed that investors in both markets perceived the pre-election period as a market stress. Another study regarding herding during election periods in the BIST was carried out by Can Ergun (2018). The findings, covering the 1997-2017 period, indicated no herd behavior in the BIST, with the result interpreted as investors having no tendency to mimic others during election periods.

Durukan et al. (2017) examined herding in the BIST on behalf of foreign investors during the financial crisis. Their findings indicated herding but its affect among foreign investors had declined related to lower trading volumes during the crisis. It was also revealed that small and lower return offering companies were more affected by herd behavior.

Cimen and Can Ergun (2019), as a novelty, tested herding just after the initial public offering (IPO) in BIST between 2007 and 2017. A total of 101 daily returns of the IPO aftermarket during a 30-day period were used, and no herding was detected.

The literature on calendar anomalies can be classified under two main sub-titles, namely Gregorian and Hijri calendar-based anomalies. Gregorian calendar anomalies involve day-of-the-week, week-of-the-month, month-of-the-year, turn-of-the-month, turn-of-the-year effects while the Hijri Calendar taken as a reference by Muslim countries determines effects in the Islamic months (Ramadan, Zul-Hijjah, Muharram etc), on Mavlid (the birth of the Islamic Prophet Mohammed) and on religious holidays (Eid al-Fitr and Eid al-Adha). Turkey, having the majority of Muslim population, uses the Gregorian calendar but in combination with the major Islamic holy days listed above, making it a supplementary task there to research these Hijri calendar effects for anomalies when studying investor behavior.

The first calendar anomaly study was conducted by Fields (1931), although the findings this yielded were not strong enough to clearly validate the anomaly approach. Some four decades later, Cross (1973) analyzed the S&P Composite Index between 1953 and 1970 and determined that the Monday return was lower and Friday return higher than that of the previous day. Thus, a DoW effect was confirmed. Thaler (1987a, 1987b) and DeBondt and Thaler (1987) made major contributions to the literature when pioneering the behavioral finance approach for the investigation of January, weekend, holiday, turn-of-the-month and intraday effects.

Among international studies that included Turkey, one by Seif et al. (2017) analyzed January, DoW, holiday and week-of-the-year effects in nine countries' stock exchanges over a period ranging across 20 to 40 years and detected anomalies for each of these other than January in all exchanges. Bozkurt (2015) tested DoW, January, Friday the 13th, and full moon effects in 12 developed and developing stock exchanges for 2000-14 by indicating differentiation. The results showed a DoW effect in Brazil, Peru, Poland, UK, and Singapore, a January effect in India and the UK, a full-moon effect in Turkey, Brazil, Poland, Japan, USA, and Canada, and Friday-the-13th effect in Mexico. No relation was revealed between level of development and anomaly.

Another study was designed by Al-Khazali ve Mirzaei (2017). DoW, week-of-the-month, and January effects were analyzed in eight Dow Jones Islamic Indices for 1996-2015 in five sub-periods using the Adaptive Market Hypothesis (AMH). Seasonal effects were verified over time and supported the AMH. Islamic indices achieved greater efficiency over time, particularly during the recent financial crisis. The AMH offered a better explanation of calendar anomalies than did the Efficient Market Hypothesis (EMH). Monday and Friday effects weakened over time, a weekly effect was detected in all sub-periods, and a January effect was found from mid to weak levels.

Irfan et al. (2017) covered four countries with mainly Muslim population, including Turkey, for 2001-14, examining the effects of the Muharram and Ramadan months, the birth of Prophet Mohammed, and Eid al-Adha. They detected Ramadan effect in all markets, but the other anomalies were not observed. However, a Friday effect, similar to DoW in Gregorian calendar, was also found.

Akhter et al. (2015) considered the analysis of calendar anomalies in the stock markets of six countries with mainly Muslim population through a conversion of Gregorian to Hijri calendar dates and researched a Zul-Hijjah effect on return and trading volumes. In terms of volume-based volatility, a negative Zul-Hijjah effect was encountered in Turkish, Moroccan and Egyptian markets; no Zul-Hijjah effect was seen in Malesia, Pakistan or Indonesia, within the context of volatility. Considering returns, a negative Zul-Hijjah effect was detected in Malesia but not in the other markets. Thus, no Zul-Hijjah effect at all was found in Pakistan, while the effect was detected in terms of return and volatility in Indonesia.

As seen from the international studies, Turkey has been included in both Gregorian- and Hijri-calendar-based researches. In line with this, the national literature has also used both of these classifications when studying calendar effects at home only, in Turkey.

Balaban's study (1995) prompted many others to be interested in the field. While confirming the existence of a DoW effect in the BIST, Balaban found the direction and magnitude of the effect to change over time.

Yigiter et al. (2016) considered the DoW effect on the BIST-100 for the period January 2008 to January 2014. Differentiation was found among days of the week but no significant anomaly located. Cengiz et al. (2017) analyzed 289 companies (sectoral classified) for January 2010 to October 2014 seeking to catch any dependency of Monday returns on other days. A Monday dependency was found, varying by sector and generally negative. Tuesday showed the lowest effect, Thursday and Friday the highest. Hence, a DoW effect was detected in the BIST and a non-efficient market structure highlighted.

Karcioglu and Ozer (2017) conducted a study of calendar anomalies in BIST that examined DoW and holiday effects for 2002-16, divided in two (crisis and non-crisis) sub-periods to show the impact of 2008 global crisis. Both DoW and holiday effects were detected in the BIST-100 (on returns and volatility) during both periods. Five sectoral indices in the BIST exhibited negative returns on Monday, while all other indices (except BIST Industrial) showed positive returns on Wednesday. Arı and Yuksel (2017), Oncu et al. (2017) and Toraman et al. (2017) all detected a DoW effect in the BIST. Bilir (2018), meanwhile, tested for a January effect on the BIST-100 and four sectoral indices for 2008-16; four of the five indices exhibited the effect.

A rarely studied topic among Gregorian calendar anomalies is the "Other January Effect". Ozkan and Zeytinoglu (2018) conducted research in the BIST to fill the gap on this topic. They analyzed the January positive/negative returns' power of estimation over other months for the period January 1989 to December 2016. No "Other January Effect" was observed in the BIST; however, "Other February and Other August" effects were caught.

The national studies listed below focused on Hijri calendar-based anomalies in Turkey. Kucuksille et al. (2015) covered Ramadan and all Islamic month effects for 1988 to 2014. They found significant differences in terms of returns but no Ramadan effect. The month of Rajab had highest return, Ramadan was fourth, and Rabee Al-Awwal the lowest.

In another study, designed by Tan (2017), the Ramadan effect on the BIST-100 and 23 sectoral indices was analyzed for January 1997 to December 2015. Findings indicated the effect to be significant and positive for just five sectors, with the average returns of some sectors being relatively higher than those of the BIST-100 during the month. Alsu et al. (2018) found a Ramadan effect in BIST on Islamic markets for the daily returns of the Participation-30 Index between 17.02.2011 and 30.12.2016. Their findings revealed that there has been a decline in the second 10 days of Ramadan, due to investors' devoting themselves to religious rituals. However, the last 10 days of the month exhibited an upward trend related with the preparation for Eid al-Fitr. On the other hand, Ozkan and Akbalik (2018) found no Ramadan effect for 22 stocks between March 2003 and October 2015. However, they did encounter some other Islamic month effects AKENR and KIPA company stock returns, both in positive and negative directions (respectively, for the months of Rabi' al-thani and Rajab and for Rabee Al-Awwal and Jumada al-Awwal).

A further study, covering the Ramadan effect on return and volatility in countries with mainly Muslim population, including Turkey, was carried out by Gunes (2018). Here, the Participation-30 Index of Turkey, Dow Jones (DJ) Islamic Market World Index, MSCI ACWI Islamic Index, S&P Global BMI Sharia Index, Tadawul (Saudi Arabia) and JKSE (Indonesia) indices were analyzed for May 2013 to January 2018, by considering daily prices. No Ramadan effect on returns of Islamic indices was encountered, although there was an increase then in the volatility of return on DJ and MSCI Indices.

A study on the BIST-100 including both Gregorian and Hijri calendar-based effects was designed by Ulusan Polat et al. (2019). This revealed January and Turn-of-the-Month effects (ToM) effects during December 2006 - December 2017 on volatility, when considering trading volume. Furthermore, volatility was shown to decline in bullish markets. Such a determination under asymmetric volatility partially supports the study's evidence of no anomaly detection in forecasting the BIST-100 index.

In the last stage of literature review, works that have investigated both herding and calendar anomalies are listed.

Gavriilidis et al. (2016) focused on investment psychology, herding, and Ramadan effects in seven countries with mainly Muslim population. The findings indicated that investors with positive moods exhibit significant and intensive herding during Ramadan, as compared to other months. However, the levels among countries varied. A further study analyzed herding in relation to Monday irrationality (as a DoW effect) (Brahmana et al. 2012). This research was carried out on the Malesia Stock Exchange for the period 1990 to 2010 and determined that herding is an indicator of Monday irrationality. Batmunkh et al. (2017) covered Hong-Kong, Japan and Singapore for the period 2000-15 by testing significant herding, inclination to herd behavior, and the Chinese New Year effect on investor behaviors. The results showed significant herding and inclination to herd behavior and an impact of the Chinese New Year on investor behaviors.

It becomes apparent from this comprehensive literature survey that there is a gap in the research regarding Turkish capital market-related combined studies on herding and calendar anomalies. The main aim of this, therefore, is to fill this gap, using analyses of the BIST-100 and sectoral indices. It also serves to underline the fact that behavioral finance should be handled through a wide perspective while developing an investor-focused approach.

3. DATA AND METHODOLOGY

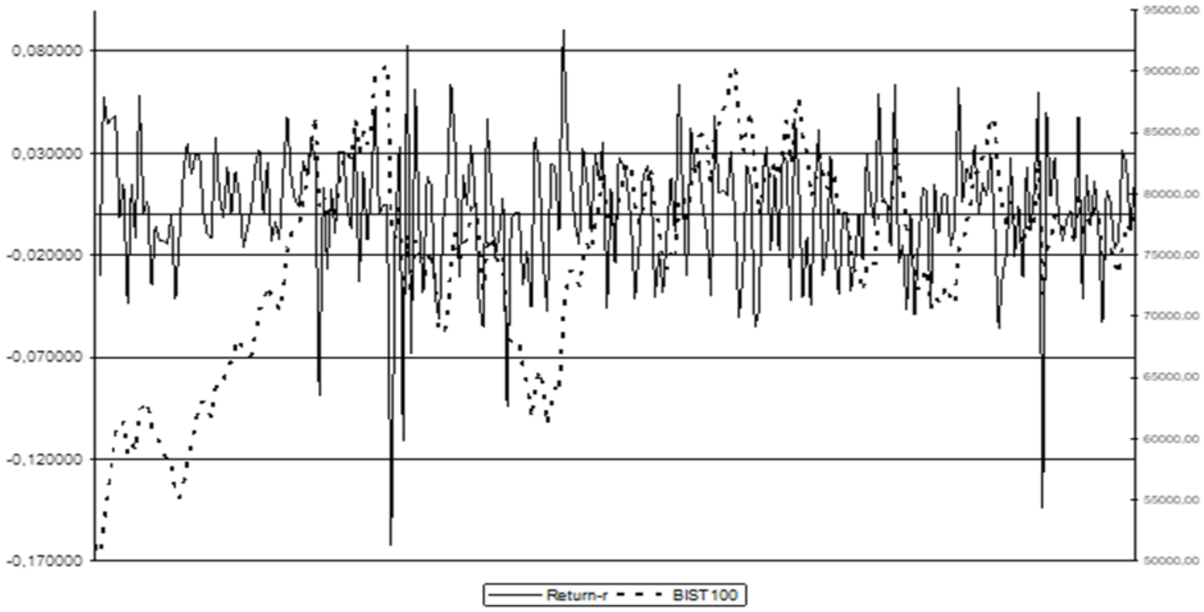
This work attempts to verify the theoretical inductions and above-mentioned findings through the application of econometric models. Accordingly, the autoregressive conditionally heteroskedastic (ARCH) family of models has been used for exploring conditional variance due of the assumed effects on the stock market. The ARCH models have been used to investigate the effects of financial volatility (Engle, 1982; Hayo and Kutan, 2005; Wu and Shea 2011), and are often used with high-frequency data. The ARCH models were designed to capture periods of large and volatile movements followed by normal periods, these being generated either endogenously or exogenously. The relationship of stock market anomalies with calendar and herding effects is ideally be tested over relative long-time period with low frequency (Beaumont et al., 2008).

The study is based on the weekly BIST-100 and other major industry and services indices for January 2012 to December 2016. An emphasis on data frequency in empirical analysis is regarded as important. Frequency changes, period differentiations, or even a variety of softwares might lead to different findings in the same area. Here, the first week's data was missed as the returns were calculated. Thus, the data consisted 260 time-points per five working days, making total of 4680 valid observations. This allowed for the study of a DoW effect. Returns have been calculated as suggested by Urquhart and McGroarty (2014). The changes at the volume were calculated accordingly:

$$r_{i,t} = \ln I_{i,t} - \ln I_{i,t-1}; \quad v_t = \ln V_t - \ln V_{t-1} \tag{1}$$

where $\ln I_{i,t}$ is the natural logarithm of the i^{th} stock exchange index at time point t, and V_t is total stock market volume on the related day. The sequence plot of daily returns can be seen in Figure 1.

Figure 1: Sequence Plot of Daily Returns

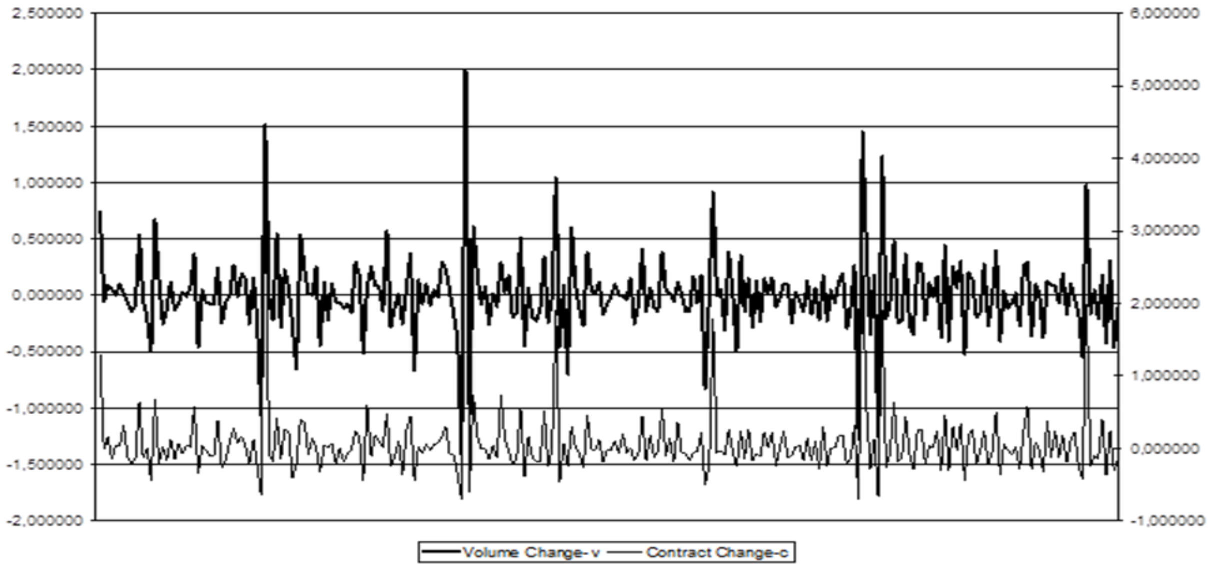


The number of contracts (C_t) might be another indicator of herding and the change of contract number c_t in five days was calculated simply as,

$$c_t = \frac{C_t - C_{t-1}}{C_{t-1}}$$

Figure 2, below, indicates the sequence plot of trading volume and the number of traded contracts.

Figure 2: Sequence Plot of Volume and Contracts



The main descriptive statistics and normality test results are presented in Table 1, with figures given for the BIST100 index, volume and contract number changes. The industry and services sub-indices' statistics had not been statistically analyzed for distributional properties.

Table 1: Descriptive Statistics

Statistics	Return (r)	Volume (v)	Contract (c)
Lower 5% percentile	-0.0485	-0.4996	-0.4002
Upper 5% percentile	0.0491	0.5447	0.6211
Median	0.0043	0.0024	-0.0142
Mean	0.0016	0.0032	0.0784
Standard Dev.	0.0333	0.3740	0.5420
Skewness	-0.9495	0.6721	4.7505
Kurtosis	6.2500	9.0599	35.1605
Shapiro-Wilk normal	0.9513**	0.8919**	0.6016**
Shapiro-Francia normal	0.9477**	0.8855**	0.5932**
Shapiro-Wilk lognormal	0.9513**	0.8919**	0.6016**
Positive changes 5-daily	147	132	124
Negative changes 5-daily	113	128	136

As mean index return, the lower and upper 90% confidence interval seems to be symmetric, although positive changes for five days are 34 times greater in 260 observations. The logarithmic returns are skewed left, indeed, which means extreme falls at prices than gains. The logarithmic change of volume and percent change of contract number have an asymmetric upper 5% percentile. The numbers of positive changes in five days are more than negative ones for logarithmic return and logarithmic volume change. None of these variables are distributed either normally or log-normally according to Shapiro tests. The industries and services index returns are also distributed non-normally.

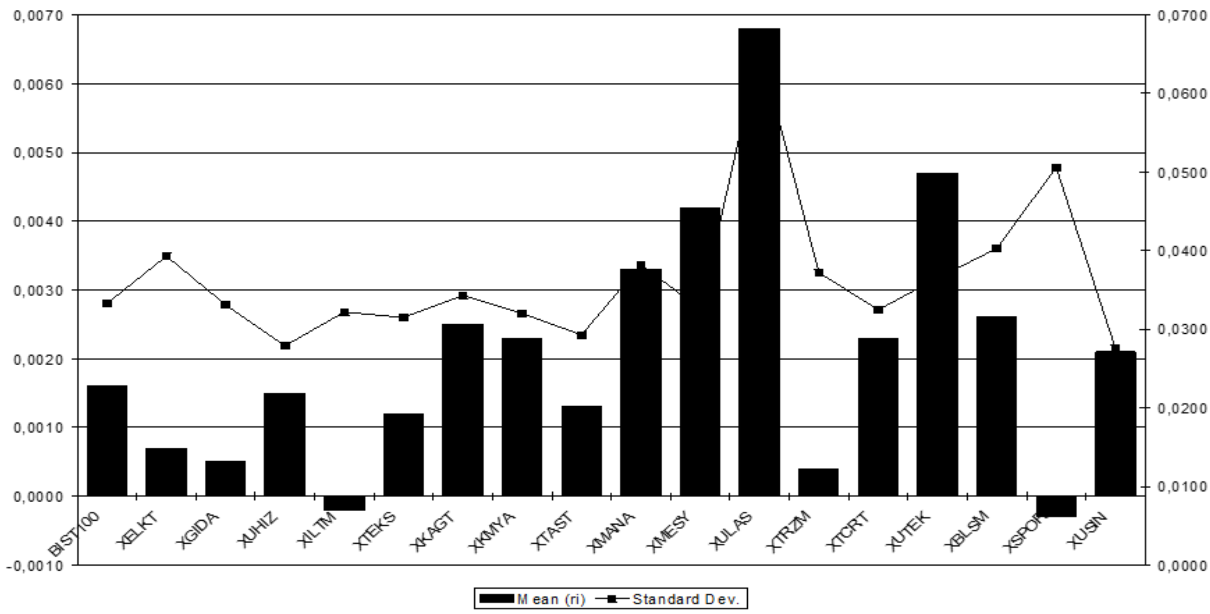
This study assumed that the whole market had to be affected by the herding effect and the calendar dependent anomalies, which were investigated through 15 dummy variables (D_j), nine for calendar and six for herding effects. The collinear dummy variables have been implied as Asteriou and Bashmakova (2013) suggest for determining the mentioned effects. However, the main Istanbul stock market index BIST-100 includes the assets with a relatively lower volatility and of higher scaled companies. Thus, the rule had to be generalized for different industries, trades, and services. The study aimed to investigate the special stock indices simultaneously, leading to the methodology as indicated on panel data, comprising 17 indices. The descriptive statistics can be seen in Table 2.

Table 2: Descriptive Statistics

ISE-Indices	Mean (r_i)	Standard Dev.	Skewness	Kurtosis
BIST100	0.0016	0.0333	-0.9495	6.2500
XELKT-Electricity	0.0007	0.0393	-0.5790	5.4304
XGIDA-Food	0.0005	0.0331	-0.2589	4.9751
XUHIZ-Services	0.0015	0.0279	-0.8306	6.3851
XILTM-Communication	-0.0002	0.0322	-0.5292	4.9913
XTEKS-Textile	0.0012	0.0315	-0.5476	5.4694
XKAGT-Paper	0.0025	0.0343	-0.3918	6.9338
XKMYA-Chemicals, Oil	0.0023	0.0320	-0.4372	3.8724
XTAST-Stone, Soil	0.0013	0.0293	-1.0178	6.2946
XMANA-Metal (main)	0.0033	0.0382	-0.4815	3.9089
XMESY-Metal Com., Machine	0.0042	0.0326	-0.8714	6.7077
XULAS-Transportation	0.0068	0.0659	5.6916	69.1387
XTRZM-Tourism	0.0004	0.0372	-0.8869	6.6171
XTCRT-Trade	0.0023	0.0325	-0.4384	4.4559
XUTEK-Technology	0.0047	0.0365	-1.0436	11.1469
XBLSM-Information Tech.	0.0026	0.0403	0.0909	10.3091
XSPOR-Sport	-0.0003	0.0506	0.1460	6.4560
XUSIN-Industry	0.0021	0.0276	-0.9005	6.2378

The stock index returns were all left-skewed except for the transportation, sports, and information technologies sectors. The communication and sports sector index returns had negative means return through the 2012-16 period. They all had peak distributional curves, meaning that most observations were deviated about the mean but had extreme values and/or also outliers. Nelson (1991) proposed a generalized error distribution for GARCH model error terms to deal with excess kurtosis instead of normal or t-distributed error terms. Therefore, the generalized error distribution (GED) with λ shape coefficient was used in model parameter estimations. The mean and the standard deviations of BIST-100 and other sector indices can be seen in Figure 3.

Figure 3: Mean and Standard Deviations of BIST-100 and Sector Indices



The main problem was in choosing the appropriate estimator from the ARCH models, which depends on the data set. The predictive power of a simple and most robust GARCH (1,1) model challenges others and it is also an often-used model, when there are effects on the data and related to some additional affecting exploratory variables in modeling (Engle, 2001; Lunde and Hansen, 2005)); it also dominates other models and (*p,q*) values, especially for BIST (Çağlayan, 2011; Baklaci and Tütek, 2006). Furthermore, GARCH (*p,q*) models allow one to model the variance as conditional on past variance and error, instead of holding it fixed through the series (Engel and Rangel, 2008; Urquhart and McGroarty, 2014). Larger volatilities are to be expected in emerging markets and low growth economies. This is known as a dampening effect on volatility in the presence of robust economic growth. It moderates wildly swinging asset prices and the need to gather together the expectations of traders in response for the next news. Thus, some combination of present and past movement accounted for the time-varying nature of stock returns.

The maximum lag number should be determined for the vector autoregressive component of the model. Generally, an LR test is used to determine the lag period p, which compares the VAR model with p lags versus the one with p-1 lags. The Akaike Information Criterion (AIC) should minimize discrepancy between the given model and the true one (Amemiya, 1985). The similar criteria, SBIC and HQIC, have theoretical advantages over AIC, as demonstrated by Lütkepohl (2005); choosing p with these provides consistent estimates of the true lag order with a positive probability. Lütkepohl versions of information criteria are;

$$AIC = \ln(|\Sigma|) + \frac{2pM^2}{T}$$
$$SBIC = \ln(|\Sigma|) + \frac{\ln(T)}{T} pM^2 \qquad (3)$$
$$HQIC = \ln(|\Sigma|) + \frac{2\ln[\ln(T)]}{T} pM^2$$

which reduces the constant term as it does not affect the inference. The FPE formula with any constant term and with the implementation of variable drops because the collinearity is;

$$FPE = |\Sigma| \left(\frac{T + \overline{m}}{T - \overline{m}} \right)^M \qquad (4)$$

The log likelihood for a VAR(p) is;

$$LL(l) = -\left(\frac{T}{2} \right) \left[\ln\left(|\hat{\Sigma}| \right) + M \ln(2\pi) + M \right]; l = 1,2,\ldots,p \qquad (5)$$

with M equations. Then, the LR statistics for the lag order l are written as;

$$LR(l) = 2[LL(l) - LL(l-1)] \qquad (6)$$

The error terms of the VAR model satisfy the mean zero and contemporaneous covariance matrix of error terms Σ so that there is no serial correlation in individual error terms across time.

4. FINDINGS AND DISCUSSIONS

A Hadri LM test was employed to detect the unit root stationary logarithmic changes of the return including time trend. The likelihood ratio of variance was assumed as Parzen's kernel function. Several lags were tried to avoid false estimation. The null hypotheses that all panels are stationary was not rejected. Furthermore, the dependent variable return and explanatory variables were investigated with the Levin-Lin-Chu unit-root test using Bartlett kernel function, where panel means were included but cross-sectional means and time trend were removed. The null hypotheses were all rejected, which indicates that the panel contains unit roots. Bartlett kernel function used 20 lags on average for the LR long term variance, which was chosen by LLC. In Table 3, the average lags are reported for ADF regressions with common AR parameters, where lags were chosen by the Bayesian Information Criterion (BIC).

Table 3: Optimum Lags

Lag	Return (trend))	Return (w/o trend)	Volume (w/o trend)	Contracts (w/o trend)
1	-0.2914 (0.615)	-0.5327 (0.703)	-4.3489 (1.000)	-1.7159 (0.957)
2	-0.2186 (0.587)	-0.3317 (0.630)	-4.1579 (1.000)	-1.2408 (0.893)
3	-0.0181 (0.507)	-0.2085 (0.583)	-3.9428 (1.000)	-0.8721 (0.808)
4	0.0878 (0.465)	-0.1490 (0.559)	-3.7169 (0.999)	-0.5711 (0.716)
5	0.1497 (0.441)	-0.1191 (0.547)	-3.4759 (0.999)	-0.3329 (0.630)
Lags		0.17	0.78	0.22
Adj. t		-80.7695	-93.8367	-99.1149
Sig.		0.0000	0.0000	0.0000

The optimum lag was selected for pre-estimation purposes via criteria for vector autoregressive models. The criteria computed in this study sequentially were likelihood ratio tests (df=9 for each panel), FPE, AIC, HQIC and SBIC for a maximum four lags. The null hypothesis of the LR test was that all the coefficients on the p^{th} lag of the endogenous variables would be zero, which should be rejected at the maximum level of p. The main three variables return, volume change and contract number change assumed endogenous variables with a constant exogenous term. The results have been summarized for each panel in Table 4.

Table 4: Results of panel data analysis

Panel	lag	LL	LR	p	lag	FPE	lag	AIC	lag	HQIC	lag	SBIC
X100	3	453.6	19.04	0.025	3	7.3e-6	3	-11.846	2	-11.742	1	-11.599
XELKT	3	-204.4	18.13	0.034	3	1.3e-3	3	-6.706	2	-6.605	1	-6.527
XGIDA	2	128.0	25.86	0.002	2	8.7e-5	2	-9.373	1	-9.292	1	-9.218
XUHIZ	3	425.0	24.59	0.003	3	9.2e-6	3	-11.623	1	-11.537	1	-11.463
XILTM	3	104.4	24.87	0.003	3	1.1e-4	3	-9.118	2	-8.991	1	-8.887
XTEKS	3	126.6	19.20	0.024	3	9.4e-5	3	-9.292	2	-9.187	1	-9.059
XKAGT	1	-133.4	53.01	0.000	1	6.3e-4	1	-7.401	1	-7.351	1	-7.277
XKMYA	3	284.7	20.87	0.013	3	2.7e-5	3	-10.527	1	-10.435	1	-10.360
XTAST	4	125.2	19.30	0.023	2	1.0e-4	2	-9.225	1	-9.160	1	-9.085
XMANA	4	219.2	20.47	0.015	4	4.9e-5	4	-9.945	1	-9.851	1	-9.777
XMESY	2	280.5	23.78	0.005	2	2.6e-5	2	-10.564	1	-10.492	1	-10.417
XULAS	4	43.9	17.45	0.042	2	1.9e-4	2	-8.601	1	-8.507	1	-8.433
XTRZM	2	-72.0	29.10	0.001	2	4.2e-4	2	-7.810	1	-7.717	1	-7.642
XTCRT	4	157.4	25.95	0.002	4	8.0e-5	4	-9.462	2	-9.338	1	-9.258
XUTEK	3	101.2	17.40	0.043	2	1.2e-4	2	-9.096	1	-9.029	1	-8.955
XBLSM	3	47.3	20.50	0.015	3	1.8e-4	3	-8.672	1	-8.597	1	-8.523
XSPOR	3	-354.1	21.10	0.012	3	4.0e-3	3	-5.537	2	-5.424	1	-5.338
XUSIN	3	505.6	21.16	0.012	3	4.9e-6	3	-12.252	1	-12.147	1	-12.073

Note: LL: Log Likelihood; LR: Likelihood Rate Test Statistics; FPE: Final Prediction-Error Criteria; AIC: Akaike Information Criteria; SBIC: Schwarz Information Criteria; HQIC: Hannan-Quinn Information Criteria.

Accordingly, four lags is the maximum lag number of the VAR model assuming all variables were endogenous. They all had to have the same order of integration except when they were all non- stationary. The model of the study investigated the returns. Then, the VAR model was evaluated, with the return as endogenous; volume and contract number changes were exogenous with the constant term. Thus, the lag determination statistics for each panel were studied for vector error correction lag determination statistics with maximum 36 lags. The results are given in Table 5.

Table 5: VAR and VEC Model statistics

	VAR statistics							**VEC Mean Statistics**						
Panel	**lag**	**LR**	**Sig.**	**lag**	**HQIC**	**lag**	**SBIC**	**lag**	**LR**	**Sig.**	**lag**	**HQIC**	**lag**	**SBIC**
X100	14	3.967	0.046	1	-3.93	0	-3.90	34	4.103	0.043	1	-6.77	0	-6.76
XELKT	14	5.301	0.021	0	-3.76	0	-3.73	14	5.151	0.023	0	-6.59	0	-6.59
XGIDA	9	4.803	0.028	1	-3.93	1	-3.89	35	4.345	0.037	1	-6.78	1	-6.77
XUHIZ	15	6.808	0.009	0	-4.27	0	-4.24	15	6.844	0.009	0	-7.11	0	-7.11
XILTM	15	12.152	0.000	0	-3.96	0	-3.94	15	10.576	0.001	0	-6.81	0	-6.81
XTEKS				0	-4.11	0	-4.08				0	-6.95	0	-6.95
XKAGT	1	4.755	0.029	1	-4.11	0	-4.08	1	5.192	0.023	1	-6.96	0	-6.95
XKMYA	1	5.022	0.025	2	-4.16	0	-4.12	33	7.013	0.008	1	-7.01	0	-7.00
XTAST	14	6.446	0.011	0	-4.25	0	-4.23	33	4.349	0.037	0	-7.08	0	-7.08
XMANA	10	7.882	0.005	0	-3.68	0	-3.65	36	5.657	0.017	0	-6.51	0	-6.51
XMESY	15	4.061	0.044	0	-3.97	0	-3.95	12	4.420	0.035	0	-6.80	0	-6.80

XULAS	20	6.500	0.011	0	-2.53	0	-2.51	20	5.207	0.022	0	-5.37	0	-5.37
XTRZM				0	-3.89	0	-3.87	23	4.103	0.043	0	-6.75	0	-6.75
XTCRT	1	7.013	0.008	1	-3.99	1	-3.96	3	3.945	0.047	3	-6.88	0	-6.87
XUTEK	12	4.770	0.029	0	-3.86	0	-3.83	26	5.628	0.018	0	-6.73	0	-6.73
XBLSM				0	-3.84	0	-3.81	26	4.585	0.032	0	-6.76	0	-6.76
XSPOR				0	-3.51	0	-3.49	14	4.045	0.044	0	-6.35	0	-6.35
XUSIN	14	6.002	0.014	1	-4.33	0	-4.30	26	4.567	0.033	1	-7.16	0	-7.16

Note: LL: Log Likelihood; LR: Likelihood Rate Test Statistics; FPE: Final Prediction-Error Criteria; AIC: Akaike Information Criteria; SBIC: Schwarz Information Criteria; HQIC: Hannan-Quinn Information Criteria.

The priming variance values were specified by the error terms of the expected unconditional variance of the model from the mean equation and any ARMA terms.

$$\sigma_{i,t,0}^2 = \frac{\sum_{t=1}^{T} \hat{\varepsilon}_{i,t}^2}{T} \tag{7}$$

The standard errors were optimized by OPG optimization technique. The GARCH(1,1) model was tested as several GARCH(*p,q*) models did not converge by optimization for *p*=1,2,3 and *q*=1,2,3 combinations except *p*=1 and *q*=1. Also, the VAR model pre-estimation suggested a maximum three lags for ARCH in means, and VEC statistics suggested a maximum one lag for error terms. Model comparison information criteria HQIC and SBIC supported this decision. The symmetric and asymmetric GARCH models were estimated separately, which allowed for comparison of the nature of volatility of trading by short-term bullish and bearish trends. Any constraints were assumed by the estimation process, with the stationary to be achieved when the sum of the $\alpha_1+\alpha_2<1$ restriction was satisfied.

$$r_{i,t} = \beta_0 + \beta_1 v_{i,t} + \beta_2 c_{i,t} + \sum_{j=3}^{17} \beta_j D_{i,t,j} + \sum_{h=0}^{3} \psi_h g(\sigma_{i,t-h}^2) + \phi r_{i,t-1} + \theta \varepsilon_{i,t-1} + \varepsilon_{i,t}$$
$$Var(\varepsilon_{i,t}) = \sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon_{i,t-1}^2 + \alpha_2 \sigma_{t-1}^2 \tag{8}$$

Some studies suggest EGARCH or APARCH model estimations for estimation asymmetric error term leverages, assuming that good and bad news have different effects on the financial spot markets. This study first investigated with the Simple Asymmetric ARCH (SAARCH) model estimation in order to test the effects that down and up movements had different on effect magnitudes in the market. The empirical model was written as the following equations. The return model $r_{i,t}$ with ARCH-in-mean and ARMA terms was the same as the GARCH estimation.

$$Var(\varepsilon_{i,t}) = \sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon_{i,t-1}^2 + \alpha_3 \varepsilon_{i,t-1} \tag{9}$$

The Wald test results supported the persistence of the conditional volatility models. The parameter estimations and model fit and significance statistics are presented in Table 6.

Table 6: Wald Test Results for GARCH and SAARCH Models

	GARCH			**SAARCH**		
	ll(model)	**AIC**	**BIC**	**ll(model)**	**AIC**	**BIC**
	11372,1	-22688.1	-22507.36	11355,7	-22655.35	-22474.72
Wald χ^2	227892	(0.0000)	Df=23	1820000	(0.0000)	Df=23

Variable	Coef.	S_e	z-Sig.	Coef.	S_e	z-Sig.
β_1:Vol. v_{it}	0.0043	6.85e-4	0.000	0.0041	6.82e-4	0.000
β_2:Cont. c_{it}	0.0012	2.65e-4	0.000	0.0013	2.62e-4	0.000
β_3:Post-Holiday	-0.0042	6.31e-4	0.000	-0.0043	6.33e-4	0.000
β_4:Ramadan	0.0016	8.04e-4	0.047	0.0016	7.80e-4	0.045
β_5:DOW1	0.0098	7.97e-3	0.218	0.1084	8.55e-3	0.000
β_6:DOW2	0.0080	8.01e-3	0.316	0.1067	8.59e-3	0.000
β_7:DOW3	0.0094	7.98e-3	0.239	0.1082	8.55e-3	0.000
β_8:DOW4	0.0092	8.04e-3	0.252	0.1081	8.57e-3	0.000
β_9:DOW5	0.0121	7.99e-3	0.129	0.1109	8.56e-3	0.000
β_{10}:DJan.	0.0023	7.86e-4	0.004	0.0026	7.59e-4	0.001
β_{11}:DDec.	-0.0018	7.39e-4	0.015	-0.0010	7.46e-4	0.174
β_{12}:Drdown	0.3885	0.01068	0.000	1.7867	8.78e-3	0.000
β_{13}:Drup	0.4246	0.01070	0.000	1.8230	8.79e-3	0.000
β_{14}:Dvdown	-1.4245	0.03212	0.000	2.4482	0.01013	0.000
β_{15}:Dvup	-1.4251	0.03217	0.000	2.4479	0.01011	0.000
β_{16}:Dcdown	3.7599	0.01266	0.000	0.3976	5.76e-3	0.000
β_{17}:Dcup	3.7601	0.01264	0.000	0.3982	5.73e-3	0.000
β_0:Const.	-2.7513	0.03140	0.000	-4.7624	6.86e-3	0.000
ψ_0:ARCHM	11.3586	3.67444	0.002	5.8144	1.52904	0.000
ψ_1:ARCHM	-8.4546	4.61244	0.067	1.2333	0.75689	0.103
ψ_2:ARCHM	-3.4469	4.09794	0.400	-3.2684	0.90544	0.000
ψ_3:ARCHM	2.3038	2.80553	0.412	3.7593	0.88351	0.000
φ:AR(1)	-0.2575	0.30925	0.405	-0.2026	0.20094	0.313
θ:MA(1)	0.2290	0.31186	0.463	0.1584	0.20503	0.440
α_0:Const.	0.00004	8.03e-6	0.000	0.0005	1.72e-5	0.000
α_1:ARCH(1)	0.0368	0.00713	0.000	0.1351	0.02704	0.000
α_2:GARCH(1)	0.8944	0.01856	0.000			
α_3:SAARCH(1)				0.0001	9.43e-4	0.905
ln(λ):GED	-0.1079	0.01515	0.000	-0.1178	0.01323	0.000
λ:GED	0.8977	0.01360		0.8889	0.01176	

Note: AIC: Akaike Information Criteria; BIC: Bayesian Information Criteria.

The GARCH(1,1) model had a relative greater goodness-of-fit according to AIC and BIC criteria than the SAARCH(1,1) model, and the SAARCH(1) coefficient α_3 on conditional volatility was insignificant. As the two models had the same number of parameter estimations, the penalty of over-fitting the model for these two statistics did not play a role. As the study used the dummy variables for herding- and date- oriented positive and negative shocks in the mean model, a symmetric error distribution was expected. The estimated values of ψ_k ($k \neq 0$) in the GARCH model are insignificant at 5 % of the significance level, but the first lag of variance's coefficient is significant at the 10 % level, indicating low evidence for a contemporaneous linkage effect between volatility and stock prices change. The negative coefficient (-8.45) indicates that the decreasing volatility was consistent with the higher price increases. However, these coefficients are significant with two and three weeks lagged linkage effect with asymmetric error term effects in the SAARCH(1,1) model. The positive linkage (ψ_2=0.91 and ψ_3=0.88) implies slow long-run price change during low volatile market trends. These positive coefficients also confirm the importance of the asymmetry in the return volatility. The insignificant coefficients ϕ of AR(1) and θ of MA(1) estimates reveal that the previous period return and error term had no effect on the conditional return mean in both models. The fact that the sum $\alpha_1+\alpha_2$ is fairly close to 1 indicates the persistence of past volatilities in explaining current volatility. The shocks on the conditional variance are followed by a post-shock of approximately 94% in magnitude. The long-run volatility effect α_2 on return changes is much more than is the short-run return change effect α_1. It is as low as 14% in the SAARCH model.

Table 7: The Conditional Means for ARCHM/GARCH and ARCHM/SAARCH Models

	ARCHM/GARCH		**ARCHM/SAARCH**			
Variable	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Minimum**	**Maximum**
Panel r_{it}	0.00208	0.0374	9.872e-4	0.0389	-0.23685	0.76592
Panel v_{it}	0.00371	0.5875	1.994e-3	0.5949	-2.90119	3.44024
Panel c_{it}	0.23603	1.1960	0.23935	1.1585	-0.93688	23.25100

The conditional means are given, above, in Table 7. The coefficients of the conditional mean model are significant except for the DOW effects. There is a down effect in December of about 0.2% and after holidays of 0.4%. The mean returns increase approximately 0.2% in Ramadan and in January. On the other hand, the increasing returns have a naïve greater effect of about 0.4% on return changes over decreasing returns in the same direction. However, the volume has a negative effect on returns of about 142.5%, as volume increase with falling returns, which supports the rational trader assumption of Dow Theory and overpricing response at the end of a bullish trend, caused by the herding effect. The same rational is valid for decreasing volumes. The changes in the number of contracts affect the returns much more than others in the same direction.

5. CONCLUSION

The study has analyzed Borsa Istanbul herding and calendar anomalies during the period January 2012 to December 2016 by considering weekly data of the BIST-100 index and BIST sectoral indices. During this period, three local-based events, incorporating political and social dimensions, had an impact on Turkish economy. These were the Gezi Park Protests (May 2013), political turmoil (December 2013), and a coup attempt (15 July, 2016). These incidents, however, had no permanent effect leading to long-term-based crisis on either the Turkish economy or Borsa Istanbul.

First, the distributions of the BIST-100 Index and 17 sectoral Indices were analyzed. The findings indicate that falls of prices in the BIST are much more severe than rises. It is also shown that there has been a dominant tendency in upward trend in terms of returns and trading volumes, while the trend is downward for number of contracts, when considering five-day-changes. These findings could be associated with "loss aversion" in the context of behavioral finance. It may be that individual investors, in particular, have avoided taking risk and therefore followed a short-tem-based strategy of realizing gains. Hence, there was a decline in number of contracts. By including corporate investors in this trend also, return- and volume-focused movement, triggering speculative market structure, is observed. Such a construction, in general, confirms the occurrence of speculative trading in the BIST.

On the sectoral basis, there is a distribution around the mean, but also the existence of some excess values indicative of herding. Considering the period, there was a volatile structure in the transport, information technologies and sports indices. A decline in oil prices during the time period, along with the impacts of foreign actors in the market, cargo transportation, digitalization, and government subsidies could all be the underlying reasons for these sectors' speculative returns and make it worth analyzing herd behavior in the BIST.

Following these initial determinations, the existence of herding and calendar anomalies in the BIST, in line with the main hypotheses of the research, have been questioned by considering both the BIST-100 and all sectoral indices, as a whole. Therefore, the estimation models GARCH (1,1), a symmetric ARCH family model, and SAARCH (1,1), an asymmetric model to represent volatility of returns, have been employed for a comparative analysis. It has thus been possible to detect the effects of downward and upward market movements with different magnitudes.

From the findings of the GARCH (1,1) model, purged from volatility affect, an inverse relationship between volume and volatility is observed. In line with this model, comprehending negative and positive shocks together, the simultaneous interaction between volatility and return is quiet weak, and therefore it is not possible to talk about a strong herd behavior in the BIST. At this point, the research was deepened through employment of the SAARCH (1,1) asymmetric estimation model, which revealed an increase in both trading volume and return when considering negative shocks. Hence, a significant herding in BIST has been confirmed. Such a finding can be evaluated as expected, in particular for individual investors, by considering asymmetric information dissemination, the level of financial literacy, and the cost of information. Also, herding may be perceived as an indicator of an efficient market structure where past movements do not obviously explain recent market trends.

A further hypothesis of the study involved an analysis of BIST calendar anomalies. From this perspective, the SAARCH (1,1) model has detected a DoW effect. On Friday, as the last day of the week, there is a significant increase in returns compared to other days, while on Tuesdays, returns are comparatively weak. This finding could be explained by a bullish market trend due to weekend profit- taking and an increase in trading volumes upon return, with bearish market trends in line with the use of buying opportunities at the beginning of the week. Considering the post-holiday effect in the context of religious, national, and official holidays, both symmetric and asymmetric models have encountered a significant effect with a downward trend. This data could be perceived as an indicator of a liquidity requirement of investors as the comebacks from relatively long holidays, where markets are officially closed and investors are unengaged in their business lives. In this context, profit-taking could lead to selling pressure and a downward trend in the market.

A significant January effect has been detected in the BIST when purged from asymmetric effects. As the first month of the year, re-purchases following the closed-out positions in December and "opening a clean page" rituals supported by purchases could be the underlying reasons.

Regarding Islamic calendar effects, both models have detected Ramadan effect, in line with the academic literature. Even though Ramadan occurred during the summer months in the period studied, the average returns exhibited an upward trend, confirming investors' strong interest in the BIST. It should be emphasized that foreign corporate investors in particular have contributed to this trend during the Ramadan period.

It is important to analyze these findings and take required measures by capital market actors and legislators, in order to achieve to an efficient capital market structure and a rational investor profile. These outputs, giving priority to investor behaviors, could be the milestones of fairer information dissemination among investors and more stable market structures.

In order to shed more light on this subject through further studies, herding and calendar anomalies could be handled separately for all sub-sectors. Analysis of "Other January Effect" for BIST is also required. Finally, the simultaneous existence of both herd behavior and calendar anomalies are worth investigating in the context of Turkish capital markets to increase efficiency.

REFERENCES

Akhter, A., Sandhu, A., Butt, S. (2015). Islamic Calendar Effect on Market Risk and Return Evidence from Islamic Countries. *Journal of Business & Financial Affairs*, 4(2), 1-5.

Al-Khazali, O. M., Mirzaei, A. (2017). The impact of oil price movements on bank non-performing loans: Global evidence from oil-exporting countries. *Emerging Markets Review*, 31(C), 193-208.

Altay, E. (2008). Sermaye Piyasalarında Suru Davranisi: İMKB'de Piyasa Yonunde Suru Davranisinin Analizi. *BDDK Bankacılık ve Finansal Piyasalar, 2(1), 27-58.*

Alsu, E., Tasdemir, A., Özyurt, H.K. (2018). Türkiye İslami Piyasalarında Ramazan Ayı Etkisi. *Anemon Muş Alparslan Üniversitesi Sosyal Bilimler Dergisi* 2018 6(5) 707–712.

Amemiya, T. (1985). Advanced Econometrics. Cambridge, MA: Harvard University Press.

Ari, A., Yuksel, O. *(*2017). BIST 100'de Haftanin Gunu Anomalisi: Ekonometrik Bir Analiz. *Finans Politik & Ekonomik Yorumlar*, 54(632), 77-89.

Asteriou, D., Bashmakova, Y. (2013). Assessing the impact of oil returns on emerging stock markets: A panel data approach for ten Central and Eastern European Countries. *Energy Economics*, 38, 204-211.

Baklaci, H., Tutek, H. (2006). The Impact of the Futures Market on Spot Volatility: An Analysis in Turkish Derivatives Markets'. Computational Finance and Its Applications II, edited by M. Constantino and C.A.

Balaban, E. (1995). Day of the week effects: new evidence from an emerging stock market. *Applied Economics Letters*, 2(5), 139-143.

Batmunkh, M.U.J, Moslehpour, M., Shieh-Liang, C. (2017). Herding Behavior in Advanced Confucian Markets. *World Affairs* (2) 34(502), 1-26.

Beaumont, P. M., Norrbin, S. C., Yiğit, F. P. (2008). Time series evidence on the linkage between the volatility and growth of output. *Applied Economic Letters*, 15, 45-48.

BenSaida, A., Jlassi, M., Litimi, H. (2015). Volume–herding interaction in the American market. *American Journal of Finance and Accounting*, 4(1), 50-69.

Bilir, H. (2018), Ocak Ayı Etkisinin Turk Sermaye Piyasalarında Farklı BIST Endekslerine Gore Analizi. *Sosyoekonomi*, 26, 145-160.

Blasco, N., Corredor, P., Ferreruela, S. (2012) Does herding affect volatility? Implications for the Spanish stock market. *Quantitative Finance*, 12(2), 311-327.

Boyd, N., Buyuksahin, B., Haigh, M., Harris, J. (2016). The Prevalence, Sources, and Effects of Herding. *The Journal of Futures Markets*, 36(7), 671-694.

Bozkurt, I. (2015). Gelismis ve Gelismekte Olan Piyasalarda Anomali Varliginin Incelenmesi. *Business and Economics Research Journal*, 6(4), 19-37.

Brahmana, R., Hooy, C.W., Ahmad, Z. (2012). Asian Academy of Management. *Journal of Accounting and Finance*, 8(2), 1-20.

Brebbia, Southampton, UK: WIT Press, 237-246.

Can Ergun (2018), The Effect of Herd Behavior on Stock Markets during the Election Times: Evidence from Borsa Istanbul, Würzburg International Business Forum International Business Conference Proceedings, 97-103.

Cengiz, H., Bilen, O., Buyuklu, A. H., Damgaci, G. (2017). Stock market anomalies: the day of the week effects, evidence from Borsa Istanbul. *Journal of Global Entrepreneurship Research*, 7(1), 1-11.

Chang, E., Cheng, J. and A. Khorana. (2000). An examination of herd behavior in equity markets: an international perspective. *Journal of Banking and Finance*, 24(10), 1651-1679.

Chiang, T.,C., Jiandong, L., Tan, L., Nelling, E. (2011). Dynamic herding behavior in PacificBasin markets: Evidence and Implications, Social Science Research Network (SSRN), Retrieved from http://www.cass.city.ac.uk/__data/assets/pdf_file/0006/86622/Chiang.pdf

Cross, F. (1973). The Behavior of Stock Prices on Fridays and Mondays. *Financial Analysts Journal*, 29(6), 67-69.

Caglayan, E. (2011). The Impact of Stock Index Futures. *Journal of Emerging Market Finance*, 10(1), 73-91.

Çakan, E., Demirer, R., Gupta, Marfatia, H. (2019). *Journal of Economics and Finance*, 43(1), 44-56.

Cimen, A., Can Ergun, Z. (2019). Turk Ilk Halka Arz Piyasasinda Suru Davranisinin Ampirik Analizi. *Izmir Iktisat Dergisi*, 34(1), 67-75.

De Bondt, W. F. M., Thaler, R. (1987). Further Evidence on Investor Overreaction and Stock Market Seasonality. *The Journal of Finance*, 42(3), 557-581.

Demir, N., Mahmud, S. F., Solakoglu, M. N. (2014). Sentiment and Beta Herding in the Borsa Istanbul (BIST), *Contemporary Studies in Economic and Financial Analysis,* in Risk Management Post Financial Crisis: A Period of Monetary Easing*,* 96*,* Emerald Group Publishing Limited, 389 – 400.

Dogukanli, H., Ergun, B. (2011). IMKB'de Suru Davranisi: Yatay Kesit Degiskenlik Temelinde Bir Arastirma. *Cukurova Universitesi Isletme Fakultesi Dergisi*, 12(2), 227–242.

Durukan, M. B., Ozsu, H. H., Can Ergun, Z. (2017). Chapter 12 - Financial Crisis and Herd Behavior: Evidence from the Borsa Istanbul, in (ed.) Economou, F., Gavriilidis, K., Gregoriou, G. N., Kallinterakis, V., *Handbook of Investors' Behavior During Financial Crises,* Academic Press, 203-217.

Engle, R. F. (1982). Autoregressive Conditional Heteroskedasticity with Estimates of the Variance of U.K. Inflation. *Econometrica*, 50(4), 987-1008.

Engle, R. F. (2001). GARCH 101: The use of ARCH/GARCH models in applied econometrics. *Journal of Economic Perspectives*, 15(4), 157-168.

Engle, R. F., Rangel, J. G. (2008). The Spline-GARCH Model for Low-Frequency Volatility and Its Global Macroeconomic Causes. *Review of Financial Studies*, 21(3), 1187-1222.

Ergün, B., Doğukanlı, H. (2015). Hisse Senedi Piyasalarında Sürü Davranışı: BİST'te Bir Araştırma. *Journal of International Social Research*, 8(40), 690-699.

Fama, E. F. (1970). Efficient Capital Markets: A review of Theory and Empirical Work. *Journal of Finance*,25(2), 383 – 417.

Fields, M. J. (1931). Stock Prices: A Problem in Verification. *The Journal of Business*, 4, 415.

Gavriilidis, K., Kallinterakis, V., Tsalavoutas, I. (2016). *Journal of Economic Behavior&Organization*, 132, 23-38.

Gunes, H. (2018), Islami Endekslerde Takvim Anomalisi: Ramazan Etkisi. *Finans Politik & Ekonomik Yorumlar*, 55(645), 75-89.

Hayo, B. and Kutan, A. M. (2005). IMF-Related News and Emerging Financial Markets. *Journal of International Money and Finance*, 24, 1126-1142.

Irfan, A., Waheed, A., Namrah, A., Mohammed, M. E. (2017). Impact of Muslim Holy Days on Asian stock markets: An empirical evidence. *Cogent Economics & Finance*, 5(1), 1-10.

Kahneman, D., Tversky, A. (1979). Prospect theory: An analysis of decisions under risk. *Econometrica*, 47, 313-327.

Kapusuzoglu, A. (2011). Herding in the Istanbul Stock Exchange (ISE): A Case of Behavioral Finance. *African Journal of Business Research*, 4(3), 53-67.

Karcioglu, R., Özer, N. (2017). BIST'de Haftanın Gunu ve Tatil Etkisi Anomalilerinin Getiri ve Oynaklık Uzerindeki Etkisinin Incelenmesi. *Karadeniz Teknik Universitesi Sosyal Bilimler Enstitusu Sosyal Bilimler Dergisi*, 7(14), 457-483.

Kayalidere, K. (2012). Hisse Senedi Piyasasında Suru Davranisi: IMKB'de Ampirik bir İnceleme. *Isletme Arastirmalari Dergisi*, 4(4), 77-94.

Kucuksille, E., Ozmutaf, N. M. (2015). Is There Ramadan Effect in Turkish Stock Market?, *Uluslararasi Alanya Isletme Fakültesi Dergisi*, 7(3), 105-110.

Lao, P., Singh, H. (2011). Herding behaviour in the Chinese and Indian stock markets. *Journal of Asian Economics*, 22(6), 495-506.

Lunde, A., Hansen, P. R. (2005). A forecast comparison of volatility models: does anything beat a GARCH (1,1)?. *Journal of Applied Econometrics*, 20(7), 873-889.

Lütkepohl, H. (2005). New Introduction to Multiple Time Series Analysis. New York: Springer.

Nelson, D. B. (1991). Conditional Heteroskedasticity in Asset Returns: A New Approach. *Econometrica*, 59(2), 347-370.

Oncü, M.A., Unal, A., Demirel, O. (2017). The Day of the Week Effect in Borsa Istanbul; A GARCH Model Analysis. *Uluslararası Yönetim Iktisat ve Isletme Dergisi*, 13(3), 521-534.

Ozkan, N., Akbalik, M. (2018). Hicri Takvim Etkisi: Borsa Istanbul Gida-Icecek, Hizmetler ve Ulastırma Endekslerinde Yer Alan Paylar Uzerine Bir Arastırma, Journal of Yasar University, 13(49), 9-21.

Petros Messis Achilleas Zapranis, (2014). Herding behaviour and volatility in the Athens Stock Exchange. *The Journal of Risk Finance*, Vol. 15 Iss 5 pp. 572 – 590.

Seif, M., Docherty, P., Shamsuddin, A. (2017). Seasonal Anomalies in Advanced Stock Markets. *The Quarterly Review of Economics and Finance*, 66, 169-181.

Solakoğlu, M. N., Güvercin, A., Akkaş, M. E. (2016). The Impacts of Elections and Central Banks Meetings on Herding Behavior: Evidence from Borsa Istanbul, 20. Finans Sempozyumu, 19-22 October.

Tan, O. F. (2017). Ramadan Effect: Evidence from Borsa Istanbul. *Marmara Universitesi Iktisadi ve Idari Bilimler Dergisi*, 39(1), 239-256.

Thaler, R. (1987a). Anomalies The January Effect. *Economic Perspectives*, 1(1), 197-201.

Thaler, R. (1987b). Anomalies Seasonal Movements in Security Prices II: Weekend, Holiday, Turn of the Month, and Intraday Effects. *Economic Perspectives*, 1(2), 169-177.

Toraman, C., Öztosun, E., Colakoglu, E. (2017). Testing the Day-of-the-Week Anomaly for Sectoral Turkish Stock Market. *International Journal of Business Management and Economic Research*, 8(1), 862-871.

Trotter, W. (1916). Instincts of the Herd in Peace and War. London, T. Fisher Unwin Ltd, Retrieved from https://archive.org/details/instinctsofherdi00trot/page/n7

Ulusan, M., Hanci, G., Paksoy, M. (2013). Borsa Istanbul'da Ic ya da Dis Denetim Odaklı Bireyler Acisindan Bankacılık Hisseleri Bazında Suru Davranisinin Incelenmesi, 17. Finans Sempozyumu, 23-26 October

Ulusan Polat, M., Cilingirturk, Ah. M., Sumer Gogus, H. (2019). Do Calendar Anomalies Really Exist?: An Evidence from Borsa Istanbul, in (ed.) Pernsteiner. H, Sumer, H., Ulusan Polat, M., *Behaviorial Finance*, Linde Verlag, 249-281.

Urquhart, A., McGroarty, F. (2014). Calendar effects, market conditions and Adaptive Market Hypothesis: Evidence from long-run U.S. data. *International Review of Financial Analysis*, 35, 154-166.

Wang, D. (2008). Herd Behavior towards the Market Index: Evidence from 21 Financial Markets. IESE Business School Working Paper No. 776. Retrieved from https://ssrn.com/abstract=1316783 (Accessed: 04.05.2019).

Wu, H. X., Shea, E. Y. P. (2011). Explaining the China Puzzle: High Growth and Low Volatility in the Absence of Healty Financial Institutions, EcoMod2011 Conference, Azores, Portugal, June 29-July 1.

Yigiter, S. Y., Sari, S. S. (2016). 2008-2014 Yillari Arasinda BIST'de Haftanin Gunu Etkisi. *C.Ü. Iktisadi ve Idari Bilimler Dergisi*, 17(1), 287-301.

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A QUALITATIVE RESEARCH ON SELECTED PERFORMANCE INDICATORS FOR INVESTMENT DECISION PROCESS: A FRAMEWORK FOR FINTECH STARTUPS IN TURKEY

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ABSTRACT
Purpose- The purpose of this study is to help investors in their decision-making process in funding Financial Technology (FinTech) Startups by developing a framework of key performance indicators for effective financial resource allocation. A better understanding of investors' point of view for FinTech Startups is also targeted.
Methodology- The study is conducted as structured face-to-face interviews with a sample of four angel investors and four venture capitals. In the interviews, selected indicators from the literature and finance industry experts' declarations were presented in four groups: Firm, Owner/Founder, Financial or Marketing/Procurement Characteristics. It was asked whether these indicators were used in the decision-making process or were there extra indicators not listed here.
Findings- The widely accepted indicators were found shareholder structure, experience of major decision makers, increase in net sales, existence and amount of VC or other funding, number of clients, serving to consumers or businesses and expected developments in the startup's sector.
Conclusion- Results of this study may help investors in their decision-making process in funding FinTech Startups FinTech startups are also targeted to have a better understanding of investors' point of view. This study contributes to the common understanding on investment dynamics in Turkish FinTech ecosystem, which is expected to have a major role in FinTech industry.

Keywords: Financial technology, venture capital, angel investor, investment decision, performance indicators
JEL Codes: G11, G24, M13

1. INTRODUCTION

FinTech can be defined as "a dynamic segment at the intersection of the financial services and technology sectors' or 'a revolution in the financial services industry, bringing innovation to the products and services currently provided by the traditional financial services industry", or "simply the technology innovations supporting financial services companies and their customers" (Sironi 2016; Arner et al., 2015).

The real rise of FinTech in the world was after 2005, with the acceleration of digitalization and globalization. During this FinTech 1.0 period, there were attempts to improve banks' existing services, as well as attempts to replace banks. After 2010, FinTech 2.0 period came as a collaboration-based era, in which a great deal of visibility was captured at the FinTech. Many banks began to invest in FinTech companies with the funds they organised or created funds to invest as soon as they realised that the dynamic FinTech companies could help themselves. In the FinTech 3.0 period the world has recently realised that financial sector would further improve the diversity and quality of their services by integrating new technologies and solutions such as cloud, artificial intelligence and API into their systems (Canko, 2017).

Global FinTech investment in 2015 grew by 75%, from $9.6 billion to $22.3 billion with an average annual growth pace of %27, according to 2016 Accenture analysis on CB Insight data(2016). Since 2010, more than $50 billion has been invested in FinTech companies (approximately 2500); $5.3 billion being in the first quarter of 2016 with a continuous increase in deal sizes despite the signs of the FinTech industry's tendency to a new level of maturity with some regions cooling-off.

According to the Price Waterhouse Coopers (PwC) 2016 Global FinTech Report: Blurred lines: How FinTech is shaping Financial Services; it is estimated that the global cumulative FinTech investment may exceed $150 billion within the next 3-5 years, and the main trends in FinTech industry lies in cybersecurity, self-directed services, enhancing customer experience and refined data analytics depending on Financial Services segment. Based on PwC Global FinTech Survey with 544 respondents across 46 countries, consumer banking (80%), fund transfer and payments (60%), investment and wealth management (38%) and SME Banking (35%) sectors are expected to be affected by FinTech dramatically in the following 5 years. 75% of the respondents think increased focus on the customer as the most important impact, 83% accepting the risk of losing part of their businesses to FinTech companies, 20% claiming there is a risk that FinTechs dispossess more than 20% of Financial Services business by 2020 (PwC Global FinTech Survey, 2016).

Haddad and Hornuf (2016) investigated the economic and technological determinants inducing entrepreneurs to establish FinTech ventures, and found that when the latest technology is readily available, capital markets are well-developed, where people have more mobile phone subscriptions and which have available labor force, meaning higher availability to enjoy more FinTech startup formations.

Confirming Haddad and Hornuf's investigation, we can speak of four core attributes for a FinTech Ecosystem (E&Y Independent Report, 2016):

- Talent (Technical, financial services and entrepreneurial talent ability),
- Capital (Sufficiency for startup and scale-up financing),
- Policy (Issues related with regulations, tax and sector growth of government policy),
- Demand (Demand of end-users like financial institutions, consumers and corporates).

The purpose of this study is to help investors in their decision-making process in funding FinTech Startups in Turkey and to develop a framework for effective allocation of financial resources by using selected performance indicators. In addition, it is thought that FinTech startups' benefiting from the knowledge of the preferred indicators would assist the development of Turkey resident FinTechs' core attributes such as talent pool, capital structure, corporate governance and demand expansion.

2. LITERATURE REVIEW

2.1. FinTech Ecosystem in Turkey

As of December 2016, there were around 140 FinTech startups in Turkey, operating in 27 different verticals. These include payment systems, personal finance, digital banking, off-line banking, schemes, and money transferring. Some others develop mobile applications and alternative distribution channels solutions (Capital, 2017a). Growth potential for FinTechs in Turkey mainly lies in InsurTech, blockchain technology, contactless payments, IoT and API banking (Yazici, 2017).

Turkey is expected to have a major role in FinTech industry with the help of strengthening foreign banking investments, banking industry's crisis management experience, and high credit/debit card penetration factors (Capital, 2017a). The transaction value in Turkish FinTech ecosystem has become $14.7 billion and it is expected to reach $28.4 billion by 2021 (Statista Capital, 2017b).

ING International survey (2015) states that Turkey has the highest shares of mobile banking users among internet users. Registered customers' total number (with at least one log-in to their account) was 27 million as of September 2016, and 61% of total customers (17 million) used mobile banking services in period of July-September 2016 (BAT, 2016).

Turkey has high percentages of young population, which is keen on internet and mobile use. The readiness of the young (aged 15 to 34) population in Turkey for using financial services (especially mobile payments) is a revealed fact by MasterCard in 2016. Due to the young, diversified, technology-literate and educated manpower including returner worker and students from the US and Europe, Turkey has a good capability in supplying the expanding demand for online ecosystems, new business models and digital media (Belli, 2016).

With its flourishing economy, suitable climate for investment, high-quality resources, infrastructure for business and its strategic location between Asia, Middle East and the Europe, Turkey has the potential to become a regional Information and Communications Technology (ICT) hub (Belli, 2016). In the Turkish National Technology Foresight Program, Vision 2023, the Government has an objective for increasing the sector spending for ICT to 8% of Gross Domestic Product (GDP) (E&Y 2013). FinTech companies may receive grants from the Turkish Government and various public organizations for their R&D projects

(Capital, 2017a). Turkish government also supports collaboration with universities to establish science, technology and business integration via the Centers and Technoparks (i.e. BIST FinTech Technopark, Özyeğin University Istanbul Risk Management Lab). The Istanbul Financial Center Initiative (IFC-I) has been launched by the Turkish Government in 2009, aiming to make Istanbul a global financial center. Turkey is planning to make all transactions with payment systems to become the first country without cash in the world by 2023. However, the state of infrastructures, unbanked population size and the cash usage habits remain as the main pitfalls to become a cashless society (Belli, 2016).

The startup hub of Turkey, Istanbul, is a popular area for Turkish FinTech startups with the advantages of having a young and talented design and development force, having lower labor costs, strength in e-commerce, being closer to the financial center, and its flourishing brand value. Besides the advantages of being in Istanbul, there exist also disadvantages: Not only Turkish FinTech startups, but also Turkish startup ecosystem experience some challenges such as lack of marketing, brand culture and institutional investors. Many entrepreneurs are afraid of failure in Turkey. Main challenges for the sector are existing business standards, regulations, customer relations management, and edifying customers about innovative technologies, which are contributing to business processes (Belli, 2016).

2.2. Turkish Banking Industry's Interest for FinTechs

Thanks to Turkey's transformation into a digital hotspot over the years, the Turkish banking sector has been very innovative, providing latest technology products to customers, such as applications for payment and banking in mobile platform (pymnts.com, 2013 as quoted in Belli, 2016; Drucker, 2013). Banks in Turkey are successful in using new technologies for customer acquisition and engagement or in accepting and using innovative technologies for the first time (i.e. digital wallets, talking ATMs, biometric ATMs, digital banking services and mobile applications, and their apps on multiple platforms, wearable technologies, contactless cards) (Belli, 2016). The Turkish banking sector is a kind of an innovation cluster where one entity's innovation leads others' adoption and moving it forwards. This creates a speedy cycle of innovation within the industry (Ensor, 2012). Sector mainly prefers developing technologies in-house, but major banks in Turkey rethink co-working with the experts in sub-areas with disruptive, agile and innovative FinTech startups for being more competitive and innovative. Some Turkish banks support FinTech firms via FinTech hackathons or strategic alliances. (Belli, 2016).

To be successful in adopting new technologies, the high population and the population's readiness for internet and mobile usage are big advantages for the Turkish banking sector. On the contrary, the high percentage of unbanked and the underbanked population arise as a challenge. Therefore, there is an effort from banks to reach this unbanked population by innovative banking technologies (Belli, 2016).

Regulations for FinTech looks like a bold development area in Turkey. Negotiations to simplify regulations for new technologies' implementation go on between the Turkish banking sector and the regulatory authorities (Belli, 2016). The regulation change that made licensing from Banking Regulation and Supervision Agency (BRSA) compulsory is expected to lower FinTech companies' speed in entering the industry because of the new investment and time requirements it brought. However, this can also catalyze the collaboration between banks and FinTech startups (Capital, 2017a).

2.3. FinTech Companies

For many years, financial technologies served only to back and middle offices, because front offices have been thought as labor-intensive and relationship-based (Boteler, 2014). However, this is not the case nowadays as they cover all. Customer segments have expanded by including small and medium enterprises (SMEs), big companies, advisors, asset managers, and hedge funds (Belli, 2016).

Organizations in global financial services sector can utilize Financial Technologies in mobile and retail banking, transactions and payments, crowd funding, digital wallets, PR practices, digital and alternative currencies, commodities markets, peer-to-peer (P2P) lending, risk and compliance, customer onboarding, foreign exchange (FXT) and trading, privacy and security, risk management, more efficient financial advisory services and insurance. Banks in Turkey demand wallet, beacon and ATM projects as well as mobile banking solutions from FinTech companies (NDRC, 2014).

FinTech companies serve four main customer groups (NDRC, 2014):

- The first group consists of the large and long-established financial services institutions with complex value chains and long sales cycles, which can be identified under business-to-business (B2B) segment.
- The second group contains financial organizations' customers, asset managers, brokers, advisors, corporates and Small and Medium Enterprises (SME) that are also mapped under B2B segment.
- The third group includes alternative seeking small businesses for banking and capital sources, under business-to-consumer (B2C) segment.
- The last group includes best-dealer consumers preferring online banking, and is also identified under B2C segment.

In today's digital economy FinTech startups play a major role in financial technology sector. Many countries try to create environments where they can attract and capture startups from all around the world. Creating a 'FinTech friendly business climate' where startups can flourish easily, countries can also attract investments and create knowledge transfer. Countries like UK, Singapore, USA, Germany, Hong Kong, India, and UAE are amongst the best countries, which can encourage global engagement, and knowledge sharing, as well as building bridges between entrepreneurs and investors. They also invest heavily to become a FinTech Hub by introducing new regulations as well as funding mechanisms.

2.4. Funding of FinTech Startups

FinTechs may obtain funds from various resources, such as venture capital firms, angel investors, government banks and other corporations.

Venture Capital companies are institutions providing funds to the early stage, emerging firms that exhibit growth potential. Venture Capital companies can be organised in the following ways, the limited partnership being the most common form (Rozen, 2015):

- Publicly traded,
- Large bank or corporation's captive subsidiary,
- Small business investor,
- Private limited partnership (Barry 1994 from Rozen, 2015).

Angel Investors are mostly informal, unstructured risk capital providers into new ventures. They exhibit some kind of entrepreneurial-oriented behavior and do not count return on investment as the only factor behind their investment decisions (Karabayır et al., 2012).

Banks and technology firms organise acceleration and incubation programs, which have positive effects on the growth of sector. FinTech specific venture capital companies, acceleration and incubation programs are also widening worldwide, as well as 'sandbox' environments facilitating international testing capability for FinTech products (Yazici, 2017). According to the PwC DeNovo platform companies, FinTech startups have raised $12.2 billion in 2015 in the world, reaching more than two-folds of 2014 number, $5.6 billion (PwC, 2016). Funds for FinTechs mostly come from non-bank sources in the global environment. Although banks are willing to cooperate with FinTechs via alternative ways like hackathons, partnerships or incubation centers, they represent only 4% of total FinTech investments in the world (Cengiz, 2017). In Turkey, VCs and Angels invested nearly $42 million in FinTech startups in the last 5 years, half of it being in 2016. FinTech growth potential is expected to be 10% and 15%, in the world and in Turkey respectively (Capital, 2017b). Top ten FinTech Accelerators worldwide are Dassault Systems, 500 Startups, Anthemis Group, Axel Springer Plug and Play Accelerator, Barclays Accelerator, Citi Ventures, FinTech Innovation Lab, Founder Institute, Fusion, Launchub (360Leaders, 2016; letstalkpayments, 2016). Some of the institutional FinTech investors in Turkey are Revo Capital, 212, Earlybird, MV Holding, Endeavor Catalyst, SpeedInvest, 500 Startups, Nexus Ventures Pahicle Invest, Esor Investments, Mastercard PTS, Primary Door, Smryna Capital, Ribbit Capital, IFC, Beenos, and Mediterra Capital Partners.

2.5. Selected Performance Indicators for Funding: A Literature Review

To gain an insight about the performance indicators emphasized by the investors in evaluating startups, preferably FinTech or related, a short review of literature has been conducted:

MacMillan et al. (1986) tried to determine the criteria they use for the decision to fund a venture based upon interviews with more than a hundred venture capitalists. Åstebro and Bernhardt (2003) were in search for a connection between the bank credits and new small businesses' survival. They used small business survival versus measures for (1) if the firm had bank and/or other loans at time of startup; (2) proxies for human capital; and (3) descriptives for industry and company, using a probit survival model. In the study of Cassar (2004), capital structure determinants and business startups' financing types have been investigated. They used four interrelated capital structure and financing indicators to investigate characteristics for financing of startups empirically: leverage (short and long-term), financing (outside and bank).

Baum and Silverman (2004) investigated VCs' decisions to finance biotechnology startups with the effects of startups' intellectual, human capital and alliance aspects on future startup performance. They questioned VCs by comparing the same characteristics to find out whether they are picking winners or building them. Davila and Foster (2005) investigated a relation between startup performance and management account systems adoption in early stage startup companies in their 2005 study, which is examined for this study by means of the measures of startup performance. Ensley et al. (2006) compared the top management teams of new ventures by means of vertical and shared leadership with respect to their relative influence on the performance of startups. This study is also in our interest by means of performance measures for startups. Csaszar et al. (2006) proposed a decision aid for venture capitalists to improve their decision-making processes, complementing strategic criteria with cognitive ones. Eckhardt et al. (2006) studied selection criteria of VC's from founders' perspective and selection criteria of startups from financiers' perspective and their findings support that the founders' selection of ventures as external finance source is arising from their perceptions of competition in the market and growth of the employment and market. However, funding decisions of financiers are based on verifiable and objective indicators of venture development, like the sales level and the completion of organizing and marketing activities. Parker (2009) explained the determinants of entrepreneurship in his insightful book 'The Economics of Entrepreneurship'. Nofsinger and Wang (2011) examined entrepreneurial firms in 27 countries to find out the markers of the first-stage startup financing by using logit regression mainly on Global Entrepreneurship Monitor (GEM) data. They investigated the responses of informal and institutional investors to three kind of indicators: type of the product (existing vs. new), production technology (existing vs. new), and the entrepreneur's experience. Miloud et al. (2012) tried to explain new venture valuation process of a venture capitalist by important firm performance factors identified in the strategy theories in an integrated theoretical framework using Thomson Financial Securities data. Groenewegen and Langen (2012) studied the factors that are most important for the success of a startup with a radical innovation in the first three years. Chang (2013) compared the selection of portfolio companies between accelerators and venture capitalists. Nanda and Rhodes-Kropf (2013) used multivariate analysis to find out if there existed any systematic difference in the forms of VC-funded startups. Using Dow Jones Venture Source, they studied the venture capital funded firms at the early stage between 1985 and 2004 by means of financial and innovation outcomes. Cusumano (2013) tried to help potential investors and nascent entrepreneurs in evaluating startup ventures more systematically with a short checklist of key items based on his experience and a list published in *The Business of Software* in 2004. Cassar (2014) studied the industry and startup experience influence on the forecast performance of the entrepreneur using the Kauffman Firm Survey and found that industry experience leads to more accurate and less biased entrepreneur expectations, which provide more benefit in high-technology industries. An et al. (2015) used full model regression on AngelList (one of the largest global equity-based crowdfunding investment platform) data. This study investigates the relationship between the amount of funds and the underlying characteristics of early stage startups, the past investors' type, and influence of investors in the context of equity-based crowdfunding. Marion (2016) gave information about a 2015 analysis published by the venture capital firm First Round Capital on venture capital investment success. Wimmer (2016) proposed to use the iterative business model concept to understand the path from the starting point into new ventures. The study investigated how entrepreneurs in the digital space transform vague opportunities. Staniewski (2016) investigated the association between success and selected predictors of organization and found that entrepreneurs having experience in management, with an entrepreneur in his family, his employees or he himself having unique knowledge, express higher mean scores in the general indicators of entrepreneurial success (annual turnover, survival, competitiveness, profitability, future opportunities for business development, liquidity and innovativeness). Nuscheler (2016) aims to solve existing unclearness on signals to attract venture capitalists and proposes a round-specific model, also accounting for moderating effects from repeat investors by using logit model on Crunchbase data. Falik et al. (2016) investigated the impact of startup experience on entrepreneurs' trade-offs between criteria related to resources or to the conditions of the deal.

This focused review was performed to scan the literature about FinTech investment criteria in order to end up with a questionnaire that can be presented to investors and startups. Final aim of this study is to figure out the relationship between investors investment decision and the evaluation process.

3. DATA AND METHODOLOGY

3.1. Determination of Performance Indicators

To determine the performance indicators that can be used in an evaluation process, a literature review has been conducted. According to FinTech 100 report, more than half of the top 50 FinTech 'unicorns' were born after 2010 (FinTech 100 report by KPMG and H2 Ventures, 2016). Therefore, a time frame between January 2010 to December 2016 was chosen for literature review and EBSCO Host Business Source Complete Database was scanned for the key search words listed below (for all fields, results in parenthesis):

a) 'FinTech Assessment Criteria' (5),
b) 'FinTech Evaluation Criteria' (10),
c) 'FinTech Success Factors' (32),
d) 'FinTech Performance Indicators' (22),
e) 'FinTech Scorecard' (0),
f) 'FinTech investment' (8),
g) 'Startup Assessment Criteria' (0),
h) 'Startup Evaluation Criteria' (0),
i) 'Startup Success Factors' (0),
j) 'Startup Performance Indicators' (0),

k) ‘Startup Scorecard’ (4),
l) ‘Startup investment’ (0).

50 out of 72 solutions (9 repeated) were irrelevant or couldn’t have reached in full text by the researchers, so remaining 22 (a) has taken into consideration. g, h, i, j, l searches also brought 33+345+689+7+275= 1349 more results for smart text search and 15 (b) of them taken into consideration for being relevant. Consequently, 37 (a+b) hits were attained as the final pool.

3.2. Preparation of the Survey

Among the 37 articles, a set of indicators were chosen to be included in the draft survey. This draft survey was verified with three finance industry experts, who work in credit allocation, project finance and credit scoring areas, by face-to-face interviews. The selected indicators and their sources can be found in appendix 1.

The selected indicators were classified into the groups. There were also open-ended questions under each group. As a result, the survey has four main groups (number of indicators in parenthesis, 43 indicators total except open-ended questions):

Firm Characteristics (7)

Owner / Founder Characteristics (6)

Financial Characteristics (18)

Marketing / Procurement Characteristics (12)

In each group, the following open-ended questions were included to let the respondents in adding extra indicators or comment on existing indicators:

- Do your answers for the criteria above change according to the stage of start-up? If yes, which of them?
- Do you have other indicators considered when evaluating FinTechs?

The summary of the answers are presented and discussed in Findings and Discussions sections.

3.3. Execution of the Survey

To select the investors who would participate in the survey, data from startups.watch platform and FinTech meetups in Turkey were used as the main sources:

Startups.watch is an online platform, which you can obtain ‘data, insights and reports about Turkish Startup Ecosystem’. In October 2016, 12 venture capitalists, 2 private equities, 1 financial institution and 13 personal investors were registered in startups.watch platform (http://Startups.watch) as ‘invested’ or ‘planning to invest’ in FinTech startups in Turkey. Angel investors weren’t identified in this list and they were remarked as ‘undisclosed angel investor’.

FinTech meetups (namely *FinTech Angels Meetup* and *FinTech Forum 2016* in Istanbul) were also used to reach FinTech investors. New connections were obtained in these meetings by snowball sampling, which is widely used in ‘difficult to access populations’ like angel investors.

Appointments for interviews have been requested from authorities in VCs, Private Equities and angel investors by using convenience sampling. Four angels and four VCs responded to our request. The questions were covered in face-to-face interviews with the decision-maker level people from responding four angels (one of them being a corporate funding officer at the same time) and four VCs.

4. FINDINGS AND DISCUSSIONS

Frequency analysis results for each criteria group can be found in the tables below. According to frequency analyses, it is observed that, some indicators were preferred more by the respondents (The number of respondents, who indicated the criterion as important, is given in “frequency” columns in the following tables).

4.1. Firm Characteristics

For the firm characteristics group, ownership issues like the number of shareholders, the distributions of shares among shareholders and shareholder structure have been identified as important factors for their investment decisions by all interviewees. The sector the company operates in and the rise in the employee expenditures are indicated by six and five out of eight, respectively.

Table 1: Firm Characteristics Indicators

No	Criteria	Frequency	%
1	Shareholder structure, the distribution of shares among shareholders, number of shareholders	8	100%
2	The sector the company operates in (Payment systems? Prepaid card? E-Gov? Wallet? etc.)	6	75%
3	Rise in employee expenditure	5	63%
4	Number of Board or Advisors	4	50%
5	Number of employees	3	38%
6	Rise in the number of employees	3	38%
7	Foundation year	2	25%

These results in Table 1 are in accordance with Miloud et al. (2012) and indirectly with Eckhardt et al. (2006), Groenewegen and Langen (2012). Number of board or advisors has been identified by half of the investors. The number of employees and their rise in numbers have chosen by three out of eight. The least preferred factor was the foundation year by being indicated only twice.

4.2. Owner / Founder Characteristics

For the owner / founder characteristics group, all of the respondents identified the experience of major decision makers as a base for their decisions. Major decision maker's education and number of major decision maker are also widely accepted (Table 2). Supporting these results, MacMillan et al. (1986) found the quality of entrepreneur as the ultimate decision determinant for venture capital community. Chang (2013) indicated that VCs and accelerators stress entrepreneur characteristics in their selection. Miloud et al. (2004) found a positive effect of the founder quality, on funding decisions. Nofsinger and Wang (2011), An, Jung and Hee-Woong (2015), Nuscheler (2016) also mentioned the importance of human capital and experience. Cassar (2014) indicated the benefits of experience on forecast performance. Marion (2016) and Staniewski (2016) claimed experience and graduation from top schools predicted founder success. Major decision maker's age has been indicated as important by half of the interviewees, but they didn't mention whether it is preferable being young or old. So it is hard to claim that this is in accordance with Marion (2016)'s findings of younger entrepreneurs' tendency to be more successful.

Table 2: Owner / Founder Characteristics Indicators

No	Criteria	Frequency	%
1	Experience of major decision maker(s) (Start-up experience (sector), start-up experience (non-sector), salaried experience (sector), salaried experience (non-sector), other)	8	100%
2	Number of major decision maker(s)	7	88%
3	Major decision maker(s)' education, the school they graduated, etc.	7	88%
4	Age of major decision maker(s)	4	50%
5	Marital status of major decision maker(s)	2	25%
6	Gender of major decision maker(s)	0	0%

Major decision maker's marital status have been counted as important only twice, and gender has been indicated by none of the investors in contrary to the claim of Marion (2016), which addresses the existence of at least one female founder in high-performing investments. We can say these findings give rise to a thought for some kind of equal opportunity in investment decision phase. Business network has emerged as an important issue in open-ended questions, in accordance with Miloud et al. (2012) and Falik et al. (2016). The relationship between the founders, their dedication and vision, founder's capability on marketing and sales, and regulations were also emphasized.

4.3. Financial Characteristics

For the financial characteristics group, all respondents indicated increase in net sales, whether it held VC funding and its amount, whether it had other funding sources and their amounts as important factors for their decisions in accordance with Eckhardt et al. (2006) (Table 3).

Table 3: Financial Characteristics Indicators

No	Criteria	Frequency	%
1	Increase in net sales	8	100%
2	VC funding? If yes, the stage it has been taken and the funding amount (TL or FX)	8	100%
3	Other funding sources used? (Family, friends, etc.) If yes, what is the source and the amount? (TL or FX)	8	100%
4	Gross sales	7	88%
5	Net sales	7	88%
6	Operating Margin (Operating Profit / Net Sales)	7	88%
7	Any bank loan? If yes, amount (TL or FX)?	7	88%
8	Earnings Before Interest, Taxes, Depreciation, And Amortization (EBITDA)	6	75%
9	Increase in net income	6	75%
10	Net Income Margin (Net Income / Net Sales)	6	75%
11	Net Cash Flow (Operating Profit + All Non-cash Expense (i.e. Amortisation))	6	75%
12	Net income	5	63%
13	Balance Sheet Asset Size	3	38%
14	Current Ratio (Current Assets / Current Liabilities)	3	38%
15	Leverage Ratio (Total Liabilities / Total Shareholders' Equity)	3	38%
16	Liquidity (Acid Test) Ratio (Current Assets - Inventory) / Current Liabilities)	3	38%
17	EBITDA / Short Term Debts	3	38%
18	Dividend	2	25%

Åstebro and Bernhardt (2003) found bank loan's negative effects on business survival when compared to other sources. Also, one of our angels remarked he doesn't find logical to invest in a FinTech, which used a bank loan. All but one claimed Gross Sales, Net Sales, Operating Margin (Operating Profit / Net Sales), whether it held bank loans and its amount as determinants for funding. An, Jung and Hee-Woong (2015) also underlined the importance of past investors in the startup. Six of the interviewees counted in Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA), Increase in net income, Net Income Margin and Net Cash Flow. Only five expressed Net Income as important. Chang (2013) found that VCs put more weight on 5 to 10 years' financial return, than accelerators did, but such difference weren't observed in this sample.

Balance Sheet Asset Size, Current Ratio, Leverage Ratio, Liquidity (Acid Test) Ratio, EBITDA / Short Term Debts and Dividend are the least favored indicators among our respondents. Cassar (2004) found size and noncurrent assets weigh more than major decision maker's characteristics, but it can't be counted as valid for the sample in this study.

4.4. Marketing / Procurement Characteristics

When it comes to the marketing / procurement characteristics group, all of the respondents counted the number of clients, expected developments in the industry, serving to consumers or businesses (Being B2B or B2C) in as important indicators in their decision-making processes. Our respondents also remarked the differentiation in the importance of the number of clients and other competition issues according to the stage the company belongs (Table 4).

Table 4: Marketing / Procurement Indicators

No	Criteria	Frequency	%
1	Number of clients	8	100%
2	Expected developments in the industry	8	100%
3	Serving to consumers or businesses (Being B2B or B2C)	8	100%
4	Number of competitor firms in the sector the startup is operating in	7	88%
5	Annual growth rate of the competitors (considering sales and income)	7	88%
6	Does the firm present a brand-new product or improve an existing product?	6	75%
7	The distribution of sales among clients (%)	6	75%
8	80% of the sales come from what percentage of the customers?	6	75%
9	The share of the startup in the industry (considering sales)	6	75%
10	The distribution of goods & services obtained from suppliers among total goods & services	5	63%

11	80% of the goods & services obtained from suppliers come from what percentage of the suppliers?	5	63%
12	Does the firm take actions in social responsibility issues?	3	38%

This is in accordance with the findings of Nuscheler (2016). Seven out of eight claimed they mind the number of competitor firms in the sector the startup is operating in and annual growth rate of the competitors (considering sales and income). A significant difference between angels and VCs emphasizing on entering high-growth market with little competition, weren't observed in this study, unlike Chang (2013). Indicators about whether the firm presented a brand-new product or improved an existing product, customer percentage for 80% of the sales, the sales share of the startup in the industry were chosen by six, the distribution of goods & services obtained from suppliers among total goods & services, supplier percentage for 80% of the goods & services were chosen by five, more than half. Only three respondents accepted whether the firm took actions in social responsibility issues as a criterion, whereas one of them implying this as a negative point, which meant spending the money they give for scaling, on another issue; and one of them as the opposite, positive, whether it did any impact on social or environmental issues.

5. CONCLUSION

This research, which might give useful insights to the investors for the indicators to use in FinTech investment decision-making processes in Turkey. FinTech startups may also benefit from the findings to understand the investors' motivation in their search for funding. The major findings of this study can be summarized as follows:

5.1. Firm Characteristics

Shareholder structure and entrepreneur's share in the company are important factors. Low share of an entrepreneur is expected to decrease the motivation of the entrepreneurs. It isn't necessary for Founder to have the major share. The crucial thing is having a solid share amount.

If the company is far from any achievements for a very long time, then it is not suitable for an Angel Investor. As this fact supports, FinTech's up-to-date sales size, API connections, partners, number of employees depending on sector (i.e. for payment systems five people is not enough whereas for budget two is more than enough because there are regulations for the number of employees) were in account besides shareholder structure and distribution of shares.

Regulations play a major role in the FinTech investment. For instance, IT infrastructure's location is considered important according to BRSA regulations. BRSA requires main servers to reside in Turkey.

5.2. Owner / Founder Characteristics

Investors invest in founders' personality, skill, knowledge and business network power. Founders' capability in marketing and sales are quoted as crucial, but comes with a difficulty in measurement. They usually compare entrepreneurs' capabilities with that of his / her competitors when deciding to invest.

Age is not identified as vital, because the key issues, which are responsibility or dedication, have nothing to do with age. However, every age group has its own dilemmas: Some young people may not take things seriously and some old people may turn into a deaf ear on investor's advices. It is implied that the best ages for an entrepreneur is between 27 and 40.

Education loses its importance when the entrepreneur holds the business logic. In addition, homogeneous team composition (i.e. only coders or only bankers) appears as a negative point for FinTechs. Investors add the importance of the balance and sharing of the workload between founders. The relationship is expected to be on mutual trust and understanding.

In a FinTech startup, one of the entrepreneurs' being a software developer and the other's being a financial specialist is highly preferred.

5.3. Financial Characteristics

Investing in a FinTech which used a bank loan is not found as logical. Current EBITDA and Cash Flow are not considered as important, but projections on EBITDA and cash flow are dominating their current values in the minds of investors.

Billing amount per deal is also an indicator. 'How many customers are lost when gaining new customers?' and 'Does sales increase come from promotions or on its own?' are expressed as helpful questions in shaping the investment decision.

5.4. Marketing / Procurement Characteristics

Quality or the characteristic of the product is the key issue, not the firm. The focus is the product that meets the market first. Therefore, product characteristics appear as the critical attribute. What is critical for a product is its fit to the market. Product-market fit is signified with a drawback for brand new products in creating its own market. Sometimes a brand-new product can be risky because of its obligation and hardness to generate its own market. The readiness of the market may determine the survival of the product and the company.

Serving B2B or B2C are outstanding important for different scenarios. The number of the clients and their balanced distribution are crucial factors if the FinTech serves as B2B, because shifting companies from one product to another requires hard work while shifting consumers is far easier. Customer acquisition costs become the most important factor if FinTech serves as B2C. B2B's having lower expenses can be advantageous, but B2B market penetration's being harder can be disadvantageous on the other side.

The number of competitors is important, but the market size may overwhelm the number of competitors if the market is big enough to offer opportunities for more players.

Interviewees were aware of the oddness in 80% of income coming from 20% of the customers, but they consider this as a risk only if those 20% customers were one or two companies. This holds for the suppliers' part. However, this fact does not avoid investors from investing; it leads to taking extra measures.

Involvement in social responsibility projects are not preferred by investors, because it is considered as a concentration disturbing fact for FinTechs due to their being profit driven organizations. The return on investment is measured by the profit gained, not by the allocation to social responsibility issues. Dedication to social responsibility is considered as latter a stage activity.

Outsourcing proportion is crucial for a FinTech company. Investors do have a bad opinion about too much outsourcing. Being dependent to a foreign company or founder is a negative mark for a FinTech startup.

Billing amount per deal, customers' acquisition-retention rates and origin of the sales increase are also important in investment decisions.

The result of this research shows that it is possible to group the decision-making criteria of investors into four categories and some indicators within each category are underlined. The outstanding criteria in the research are also counted as important measures in the literature. Therefore, investors and FinTech entrepreneurs can use this research as a quick list during investment decision process or business modelling activities.

Although this research has a valuable contribution to the Turkish FinTech ecosystem, there exist some limitations in this study as well. First of all, our sample size is limited to a number of eight investors operating in Istanbul. Findings of this study do not represent the whole FinTech Ecosystem in Turkey. It would be enlightening to expand the size and location in sampling for further studies on FinTech investments. Future research may include investigations on FinTech investments by segmenting the clients, service types, startup stages and investor types.

REFERENCES

360Leaders (2016). FinTech Map 2016. Retrieved from http://360leaders.net/wp-content/uploads/2016/09/FinTech-Case-Study_Web_Final.pdf

Accenture (2015, December 5). The Future of FinTech and Banking: Digitally disrupted or reimagined? London: Accenture. Retrieved from

http://www.FinTechinnovationlablondon.co.uk/media/730274/Accenture-The-Future-of-FinTech-and-Banking-digitallydisrupted-or-reima-.pdf

Accenture Report (2016, December 3). FinTech and the evolving landscape: landing points for the industry. Retrieved from

http://www.FinTechinnovationlabapac.com/media/1157/FinTech_Evolving_Landscape_2016.pdf

An J., Jung W., Hee-Woong K. (2015, December 4). A Green Flag over Mobile Industry Start-Ups: Human Capital and Past Investors as Investment Signals. *PACIS 2015 Proceedings, Paper 67*. Retrieved from http://aisel.aisnet.org/pacis2015/67

Anon (2013, December 23). Facebook Banking Takes Off In Turkey. Retrieved from www.pymnts.com/uncategorized/2013/facebook-banking-takes-off-in-turkey

Arner, D.W., Barberis, J., Buckley, R.P. (2015). The Evolution of FinTech: A New Post-Crisis Paradigm?. University of Hong Kong Faculty of Law Research Paper No: 2015/047.

Åstebro, T., Bernhardt, I. (2003). Start-up financing, owner characteristics, and survival. *Journal of Economics and Business*. Volume 55, Issue 4, pp. 303-319.

Baum, J.A.C., Silverman, B.S. (2004). Picking winners or building them? Alliance, intellectual, and human capital as selection criteria in venture financing and performance of biotechnology startups. *Journal of Business Venturing*. 19, pp. 411–436.

Belli, M. (2016). Banking and FinTech: Developing a FinTech Ecosystem in Istanbul Learning Lessons From London. e-book, retrieved from http://bkm.com.tr/wp-content/uploads/2016/02/Banking-and-FinTech.pdf

Boteler, D. (2014, December 4). FinTech: a new definition, What is FinTech?. Grovelands Recruitment. Retrieved from

www.grovelands.co.uk/FinTech/#sthash.J9WKQ6Ft.dpuf

Canko, S. (2017). FinTech Finans Dünyasını Yeniden Şekillendiriyor. *FinTech İstanbul Booklet from Capital Monthly Business and Economics Magazine*. January 2017.

Capital (2017-1). Türkiye FinTech'te Önemli Bir Yer Edinecek, Interview with İhsan Elgin. *FinTech İstanbul Booklet from Monthly Business and Economics Magazine*. January 2017.

Capital (2017-2),. Infographic and Research Tables. *FinTech İstanbul Booklet from Monthly Business and Economics Magazine*. January 2017.

Cassar, G. (2004). The financing of business start-ups. *Journal of Business Venturing.* 19. pp. 261–283.

Cassar, G. (2014. Industry and startup experience on entrepreneur forecast performance in new firms. *Journal of Business Venturing*. 29. pp.137–151.

Cengiz, D.D. (2017). Fintek Hareketi Bir Devrim Mi?. *Fintechtime Finance and Technology Magazine*. N.4. Winter 2016/17. pp. 120-121.

Chang, C. (2013, December 4). Portfolio Company Selection Criteria: Accelerators vs Venture Capitalists. CMC Senior Theses. Paper 566. Retrieved from http://scholarship.claremont.edu/cmc_theses/566

Cornish, D. (2013, December 4). Europe's hottest startup capitals: Istanbul. Retrieved from www.wired.co.uk/magazine/archive/2013/11/european-startups/istanbul

Csaszar, F., Nussbaum M., Sepulveda M. (2006). Strategic and cognitive criteria for the selection of startups. *Technovation*. 26,.pp.151–161.

Cusumano, M.A. (2013). Technology Strategy and management Evaluating a Startup venture. *Communications of the ACM*. Vol. 56. No. 10, pp. 26-29.

Davila, A., Foster G. (2005). Management Accounting Systems Adoption Decisions: Evidence and Performance Implications from Early-Stage/Startup Companies. *The Accounting Review*. Vol. 80. No. 4. pp. 1039–1068.

Drucker, V. (2013, December 4). Global Finance (2013) Special Report: Turkish Banking. December 2013, London: Global Finance. Retrieved from www.gfmag.com/magazine/december-2013/special-report-turkish-banking

Eckhardt, J.T., Shane, S., Delmar, F. (2006). Multistage Selection and the Financing of New Ventures. *Management Science.* Vol. 52, No. 2, pp, 220-232

Ensley, M.D., Hmieleski, K.M., Pearce, C.L. (2006). The importance of vertical and shared leadership within new venture top management teams: Implications for the performance of startups. *The Leadership Quarterly*. 17. pp. 217–231.

Ensor, B. (2012, December 4). Digital Banking Innovation In Turkey. Retrieved from http://blogs.forrester.com/benjamin_ensor/12-09-18-digital_banking_innovation_in_turkey

Ernst & Young (2013). Ernst & Young's attractiveness survey, Turkey 2013: The shift, the growth and the promise. Istanbul: EYGM Limited, EYG no. AU1579.

Falik, Y., Lahti T., Keinonen, H. (2016). Does startup experience matter? Venture capital selection criteria among Israeli entrepreneurs. *Venture Capital*. 18:2, pp. 149-174.

Groenewegen, G., Langen, F. (2012),. Critical Success Factors of the Survival of Start-Ups with a Radical Innovation. *Journal of Applied Economics and Business Research JAEBR.* 2(3). pp. 155-171.

Haddad, C., Hornuf, L. (2016, December 4). The Emergence of the Global FinTech Market: Economic and Technological Determinants. CESifo Working Paper Series No. 6131. Retrieved from http://ssrn.com/abstract=2830124

Independent Report by EY for HM Treasury (2016, December 4). UK FinTech On the cutting edge: An evaluation of the international FinTech sector 24 Feb 2016. Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/502995/UK_FinTech_-_On_the_cutting_edge_-_Full_Report.pdf

ING International (2015). The rise of mobile banking and the changing face of payments in the digital age, Mobile Banking, Social Media and Financial Behaviour. ING International Survey, April 2015, Amsterdam.

Karabayır, M.E., Gülşen, A.Z., Çifci, S., Muzaffar, H. (2012). Melek Yatırımcıların Kararlarında Girişimci Odaklılığın Rolü: Türkiye'deki Melek Yatırımcılar Üzerine Bir Çalışma. *Ankara Üniversitesi Siyasal Bilgiler Fakültesi Dergisi*. Cilt 67. No. 2. s.69-93.

Kłobukowski P., Pasieczny J. (2016, December 4). Business Models Of Startups In Cooperation With Mature Companies – Obtaining Orders And Building A Leading Position On The Market. Zeszyty Naukowe Politechniki PoznańSkiej Nr 68 Organizacja i Zarządzanie. Retrieved from http://zeszyty.fem.put.poznan.pl/

KPMG and H2 Ventures, (2016, December 4). 2016 FİNTECH100 Leading Global FinTech Innovators Report. Retrieved from https://home.kpmg.com/au/en/home/insights/2016/10/FinTech-100-leading-global-innovators.html

Letstalkpayments, (2016, December 4). 22 FinTech Accelerators Fostering Innovation in the Financial Services Industry. Retrieved from https://letstalkpayments.com/22-FinTech-accelerators-fostering-innovation-in-the-financial-services-industry/

MacMillan, I. C., Siegel, R., Narasimha, P. S. (1986). Criteria used by venture capitalists to evaluate new venture proposals. *Journal of Business venturing,* 1(1). pp. 119-128.

Marion, T. (2016). 4 Factors That Predict Startup Success, and One That Doesn't. J. *Harvard Business Review Digital Articles*. 5/3/2016. pp. 2-5.

MasterCard (2016, December 22). MasterCard Mobile Readiness Country Comparisons. Retrieved from http://mobilereadiness.mastercard.com/country-comparisons

McKinsey & Company (2016, December 4). Cutting Through the FinTech Noise: Markers of Success, Imperatives For Banks, Feb 2016. Retrieved from http://www.mckinsey.com/industries/financial-services/our-insights/cutting-through-the-noise-around-financial-technology

Miloud, T., Aspelund, A., Cabrol, M. (2012). Startup valuation by venture capitalists: an empirical study. *Venture Capital* Vol. 14. Nos. 2–3, pp. 151–174.

Munch, J. (2014, December 4). What is FinTech and why does it matter to all entrepreneurs? July 2014. Retrieved from https://www.hottopics.ht/stories/finance/what-is-FinTech-and-why-it-matters/

Nanda, R., Rhodes-Kropf M. (2013). Investment cycles and startup innovation. *Journal of Financial Economics* 110,.pp. 403–418.

National Digital Research Centre (NDRC) (2014, December 4). So what is FinTech? March 2014. Retrieved from www.ndrc.ie/2014/03/FinTech

Nofsinger, J.R., Wang W. (2011). Determinants of start-up firm external financing worldwide. *Journal of Banking & Finance* 35. pp. 2282–2294.

Nuscheler D. (2016, December 4). Regularly change a running system! An analysis of stage-specific criteria for attracting venture capital and changing the likelihood for getting funded. 3IFABS best poster award. Retrieved from http://ifabs.org/assets/stores/1206/userfiles/3IFABS%20Best%20Poster%20Award%20-%20Daniela%20Nuscheler%2C%20TU%20Dortmund%20University%2C%20DE.pdf

Parker, S.C. (2009). The Economics of Entrepreneurship. *Cambridge University Press*. NY USA.

Price Waterhouse Coopers (2016, December 4). Blurred lines: How FinTech is shaping Financial Services. Global FinTech Report, March 2016. Retrieved from http://www.pwc.com/gx/en/advisory-services/FinTech/PwC%20FinTech%20Global%20Report.pdf

Rozen, H. (2015). The Relationship Between Firm Performance and the Market's Trust in Security Estimates: Evidence from the Public Venture Capital Industry. *Journal of Accounting and Finance*. Vol. 15(4). pp.183-195.

Sironi, P. (2016), FinTech Innovation: From Robo-Advisors to Goal Based Investing and Gamification, UK: Wiley.

Staniewski, M. W. (2016). The contribution of business experience and knowledge to successful entrepreneurship . *Journal of Business Research*. 69. pp. 5147–5152.

The Banks Association of Turkey (BAT) (2016, December 4), Internet and Mobile Banking Statistics. Istanbul: BAT September 2016. Retrieved from https://www.tbb.org.tr/tr/bankacilik/banka-ve-sektor-bilgileri/istatistiki-raporlar/59

Wimmer, J.P.J. (2016). Unraveling the entrepreneurial process: Exploring the role of business models in opportunity-creation. Unpublished Masters thesis. Retrieved from http://purl.utwente.nl/essays/69422, March 2016, Uni of Twente, Berlin.

Yazici, S, (2017). Yatırımcıların İlgisi Artıyor, Interview with Selim Yazıcı. *FinTech İstanbul Booklet from Capital Monthly Business and Economics Magazine*. January 2017.

Appendix 1: Investment Criteria and References

Firm Characteristics	**References**
Shareholder structure, the distribution of shares among shareholders, number of shareholders	Groenewegen and Langen (2012) Åstebro and Bernhardt (2003) Nofsinger and Wang (2011) Ensley et al. (2006) Miloud et al.(2012) MacMillan, Siegel and Narasimha (1986) Chang (2013)
The sector the company operates in (Payment systems? Prepaid card? E-Gov? Wallet? etc.)	Davila and Foster (2005) Falik et al. (2016) Parker (2009)
Rise in employee expenditure	Financial Expert Opinion
Number of Board or Advisors	Groenewegen and Langen (2012) Nuscheler (2016) An et al. (2015) Ensley et al. (2006) Cusumano (2013) Miloud et al. (2012)
Number of employees	An et al. (2015) Wimmer (2016) Davila and Foster (2005)
Foundation year	Wimmer (2016) Baum and Silverman (2004) Ensley et al. (2006) Eckhardt et al.(2006) Davila and Foster (2005) Miloud et al. (2012) Nuscheler (2016)
Rise in the number of employees	Davila and Foster (2005) Ensley et al. (2006) Groenewegen and Langen (2012)

Owner / Founder Characteristics	**References**
Number of major decision maker(s)	Davila and Foster (2005)
Experience of major decision maker(s) (Start-up experience (sector), start-up experience (non-sector), salaried experience (sector), salaried experience (non-sector), other)	Csaszar et al. (2006) Groenewegen and Langen (2012) Cassar (2004) Åstebro and Bernhardt (2003) Nuscheler (2016) Nofsinger and Wang (2011) Baum and Silverman (2004) Chang (2013) Staniewski (2016) Cassar (2014) Eckhardt et al. (2006) Davila and Foster (2005) Marion (2016) Cusumano (2013) Miloud et al. (2012) Falik et al. (2016) Parker (2009) MacMillan et al. (1986)
Major decision maker(s)' education, the school they graduated, etc.	Groenewegen and Langen (2012) Cassar (2004) Nuscheler (2016) Nofsinger and Wang (2011) Cassar (2014) Davila and Foster (2005) Marion (2016) Parker (2009) Åstebro and Bernhardt (2003)
Marital status of major decision maker(s)	Parker (2009)
Age of major decision maker(s)	Nofsinger and Wang (2011) Cassar (2004) Cassar (2014) Marion (2016) Falik et al. (2016) Parker (2009)
Gender of major decision maker(s)	Nofsinger and Wang (2011) Cassar (2004) Cassar (2014) Marion (2016) Falik et al. (2016) Parker (2009)

Financial Characteristics	**References**
Increase in net sales	Nuscheler (2016) Cassar (2004) Nofsinger and Wang (2011) Eckhardt et al. (2006) Cusumano (2013)
VC funding? If yes, the stage it has been taken and the funding amount (TL or FX)	Groenewegen and Langen (2012) Nuscheler (2016) An et al. (2015) Davila and Foster (2005) Cusumano (2013) Falik et al. (2016)
Other funding sources used? (Family, friends, etc.) If yes, what is the source and the amount? (TL or FX)	Nofsinger and Wang (2011) Davila and Foster (2005)
Gross sales	Nuscheler (2016)
Net sales	Staniewski (2016) Eckhardt et al. (2006) Davila and Foster (2005)
Operating Margin (Operating Profit / Net Sales)	Financial Expert Opinion
Any bank loan? If yes, amount (TL or FX)?	Nanda and Rhodes-Kropf (2013)
Earnings Before Interest, Taxes, Depreciation, And Amortization (EBITDA)	Financial Expert Opinion
Increase in net income	Ensley et al. (2006) Davila and Foster (2005) Cusumano (2013)
Net Income Margin (Net Income / Net Sales)	Financial Expert Opinion
Net Cash Flow (Operating Profit + All Non-cash Expense (i.e. Amortization))	Baum and Silverman (2004) Csaszar et al. (2006)
Net income	Baum and Silverman (2004) Staniewski (2016) Davila and Foster (2005) Miloud et al. (2012)
Balance Sheet Asset Size	Nofsinger and Wang (2011) Cassar (2004) Baum and Silverman (2004) Chang (2013) Falik et al. (2016

EBITDA / Short Term Debts	Financial Expert Opinion
Dividend	Financial Expert Opinion
Current Ratio (Current Assets / Current Liabilities)	Financial Expert Opinion
Leverage Ratio (Total Liabilities / Total Shareholders' Equity)	Nofsinger and Wang (2011) Cassar (2004)
Liquidity (Acid Test) Ratio ((Current Assets - Inventory) / Current Liabilities)	Staniewski (2016) Cassar (2004)

Marketing / Procurement Characteristics	**References**
Number of clients	Chang (2013) Cusumano (2013) Parker (2009) MacMillan et al. (1986) Csaszar et al. (2006)
Number of competitor firms in the sector the startup is operating in	Åstebro and Bernhardt (2003) Nanda and Rhodes-Kropf (2013) Baum and Silverman (2004) Eckhardt et al.(2006) Cusumano (2013) Parker (2009)
Does the firm present a brand-new product or improve an existing product?	Groenewegen and Langen (2012) Nofsinger and Wang (2011) Chang (2013) Staniewski (2016) Cusumano (2013) MacMillan et al. (1986)
Expected developments in the industry	Cusumano (2013) Parker (2009)
Serving to consumers or businesses (Being B2B or B2C)	Wimmer (2016)
Annual growth rate of the competitors (considering sales and income)	Nuscheler (2016) Miloud et al. (2012) MacMillan et al. (1986)
The distribution of sales among clients (%)	Financial Expert Opinion
80% of the sales come from what percentage of the customers?	Financial Expert Opinion
The share of the startup in the industry (considering sales)	Nuscheler (2016) Chang (2013) Staniewski (2016) Eckhardt et al.(2006) Cusumano (2013) Miloud et al. (2012)
The distribution of goods & services obtained from suppliers among total goods & services	Financial Expert Opinion
80% of the goods & services obtained from suppliers come from what percentage of the suppliers?	Financial Expert Opinion
Does the firm take actions in social responsibility issues?	Financial Expert Opinion

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THE EFFECT OF EXCHANGE RATE VOLATILITY ON ECONOMIC GROWTH IN TURKEY

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ABSTRACT

Purpose - Exchange rate volatility, which is defined as continuous fluctuations in exchange rates, has been frequently discussed in the literature recently due to its effects on developing economies. Exchange rate volatility is costly to the domestic economy through its direct and indirect effects on households and firms. Turkey implied different exchange rate regimes between 1980 and 2019. Also the use of exchange rate as a policy tool for fighting against inflation or current account deficit has increased exchange rate volatility in Turkey. The review of literature on the impact of exchange rate volatility on economic growth provides mixed results. The impact differs from developed to developing countries. The purpose of this study is to examine the impact of exchange rate volatility on economic growth in Turkey between 1998:Q1 and 2019:Q3.
Methodology - This paper uses an Autoregressive Distributed Lag (ARDL) Model to analyze the effect of exchange rate volatility on economic growth in Turkey. Volatility of exchange rate is calculated from the real effective exchange rate by using the GARCH (1,1) model. ARDL model and the bounds testing approach has some advantages over other conventional cointegration approaches. Lagrange Multiplier (LM) test for autocorrelation and Ramsey RESET test for specification error were applied. One last diagnostic test of CUSUM and CUSUMSQ are used to check the stability of the short run and long run coefficient estimates.
Findings- Estimation results of ARDL model show that real effective exchange rate volatility has a negative and highly statistically significant effect on economic growth in Turkey. From the long run coefficients export and investment have a significant positive effect on real GDP, import and exchange rate volatility have significant negative effect on real GDP.
Conclusion- In order to ensure sustainable economic growth, it is necessary to strengthen the fiscal and financial structure and reduce the volatility in exchange rates. Financial deepening and fiscal discipline are very important in this respect. Changing the production structure and investing in education and high technology, increasing the domestic production of intermediate goods are also required for achieving high growth rates.

Keywords: Exchange rates, volatility, economic growth, ARDL.
JEL Codes: F43, O42, E44

1. INTRODUCTION

Exchange rate volatility, which is defined as continuous fluctuations in exchange rates, has been frequently discussed in the literature recently due to its effects on developing economies. In developed and emerging economies, concerns over exchange rate fluctuations have largely arisen due to their impact on exports, employment growth, foreign trade, inflation, investments and growth. Exchange rate volatility can affect investment and growth through different channels. In theory, the sign of the relationship may vary depending on the assumptions. Many studies support the hypothesis that increased volatility in exchange rates leads to a decline in international trade flows and economic growth. Because the traded goods in most international transactions are using the currency of the exporting or importing country. Therefore, unexpected changes and volatility in exchange rates should adversely affect international trade flows and economic growth due to their impact on profits. Obstfeld and Rogoff's (1995) theoretical work reveals that exchange rate volatility is costly to the domestic economy through its direct and indirect effects on households and firms respectively. The former effect is based on the premise that households remain unhappy about exchange rate movements because of the difficulty in consumption smoothening as well as fluctuations in leisure consumption. The indirect effect however assumes that, in an attempt to hedge exchange rate risk, firms set higher prices in the form of risk premium (Alagidede and Muazu, 2016).

On the other hand, there are studies showing that exchange rate volatility has a positive effect on international trade and economic growth. Advocates of this hypothesis say that flexible and more volatile exchange rates enable countries to react to asymmetric shocks, thereby stimulating economic growth. They also assume that volatility also decreases the possibility of speculative attack and prevent financial crises. Given such contradictions, the impact of exchange rate volatility on international trade and economic growth continues to be discussed.

Studies addressing the negative effects of exchange rate uncertainty argue that these effects are realized through the following channels (Demir, 2013): Change the relative cost of production with creative and destructive growth effects, reduce the amount of credits that can be used from the banking system by creating contractionary effects on employment and investment, especially in countries with low levels of financial development decrease productivity growth and aggregate growth, reduce employment and growth by increasing inflation uncertainty, affect growth negatively by increasing interest rates, damage the balance sheets and net worth of the firms and prevent international trade by increasing the transaction risk. In the light of these transmission channels, the effect of exchange rate volatility on growth will depend on firm and country characteristics. For example countries and firms with low risk and high credibility can access to domestic and international capital markets easily and they will not be affected from exchange rate volatility much.

In general, it can be said that exchange rate volatility has a greater impact in developing countries due to defects in fiscal and financial structure. In these countries, low levels of financial market deepening and the lack of financial protection instruments make them vulnerable to the negative effects of exchange rate volatilities. The use of double currencies in contracts and transactions or the indexation of price increases to dollar, which is referred to as dollarization, increases the effects of exchange rate volatility even further.

Flexible exchange rates have been recognized as an important tool for dealing with asymmetrical shocks. The reason for this is that adjustments in the fixed exchange rate regimes are slow and costly due to price and wage rigidities, so that exchange rate adjustments are achieved through relative price and productivity changes. The result is lower growth performance. In contrast, McKinnon (1963) emphasized the benefits of fixed exchange rate regimes for small and open economies against nominal shocks. Since traded goods in small and open economies have a high share in domestic consumption, exchange rate stability also ensures domestic price stability. The welfare effect of fixed exchange rates stems from macroeconomic stability, which provides a favorable environment for investment, consumption and growth. In this respect, monetary and exchange rate policies are seen as the source of uncertainty and volatility in small open economies. We can say that growth will accelerate when exchange rate fluctuations are smoothed.

Turkey implied different exchange rate regimes between 1980 and 2019. The period between 1980 and 1988 is a period in which the real exchange rate is continuously reduced in order to increase the competitiveness of Turkish goods in the international markets and thus to increase exports and reduce imports. During this period, the real exchange rate, was reduced continuously with the devaluation of TL higher than the inflation difference. The production structure of Turkey is dependent on imports of raw materials and intermediate goods. So exports are promoted to decrease the current account deficits. But the most important drawback of using exchange rate to promote exports was to make it harder to combat against inflation. The increase in domestic prices of imported raw materials and intermediate goods with the high depreciation of TL has led to an increase in domestic producer and consumer prices as it has increased production costs. In the late 1980s, the Central Bank began to use the exchange rate as a tool for fighting against inflation due to the risk of rising inflation out of control. So in this period devaluation of TL is kept low and real exchange rate increases.

The real exchange rate increased continuously during the fixed / controlled exchange rate regime between 1994 and 2001. Turkey moved to a floating exchange rate regime in March 2001. In the 2001-2018 period, the real exchange rate followed a rising trend until 2008, which was gradually replaced by a downward trend following the 2008 crisis. Turkey has faced high levels of economic instability including significant exchange rate volatility and two important banking crises in 1994 and 2001. After the big devaluation of Turkish Lira in 1994 crises real exchange rate has decreased to 58 which is its historical bottom. So the use of exchange rate as a policy tool for fighting against inflation or current account deficit has increased exchange rate volatility in Turkey. Under the floating exchange rate regime imbalances in the foreign capital inflows with the changes in the global economic condition also affects the exchange rate volatility in Turkey.

The rest of the study is organized as follows. Section 2 discusses the empirical literature on the causes of exchange rate volatility and its effects on economic growth. Section 3 outlines the empirical model and the method while section 4 presents the empirical results. Section 5 is conclusion which summarizes the main findings and policy implications.

2. LITERATURE REVIEW

A review of literature on the impact of exchange rate volatility on economic growth provides mixed results. The impact differs from developed to developing countries. Several studies have found significant adverse effects on growth. Other studies have found that exchange rate volatility have positive effects on growth.

Schnabl, (2008) analysis the exchange rate volatility and Growth relationship in Emerging Europe and East Asia. To identify the effect of exchange rate volatility on growth, they specify an unbalanced cross-country panel model for 17 Emerging European countries and 9 East Asian countries. The estimation results for Emerging Europe with respect to exchange rate volatility against the euro provide evidence in favor of a negative correlation between exchange rate volatility and growth. The specification for the whole sample with all control variables suggests that exchange rate volatility against the euro has a clearly negative impact on growth.

Demir (2013) employs a firm level dataset to analyze the effects of exchange rate volatility on the growth performances of domestic versus foreign, and publicly traded versus non-traded private manufacturing firms in, Turkey. The empirical results using dynamic panel data estimation techniques suggest that exchange rate volatility has a significant growth reducing effect on manufacturing firms. However, having access to foreign and domestic equity markets is found to reduce these negative effects at significant levels. Yıldız, Ide, and Malik (2016) use Engle-Granger cointegration approach to explore Turkey's economic growth and exchange rate volatility relationship, by using quarterly data for the period 1998:1-2014:4. The results provide evidence for the existence of both short and long term relationship between economic growth and real effective exchange rate. On the other hand there are some studies who find a positive relationship between exchange rate volatility and growth. Kasman and Kasman (2005) investigates the impact of real exchange rate volatility on Turkey's exports to its most important trading partners using quarterly data for the period 1982 to 2001. Their results indicate that exchange rate volatility has a significant positive effect on export volume in the long run. This result may indicate that firms operating in a small economy, like Turkey, have little option for dealing with increased exchange rate risk.

Adeniyi and Olasunkanmi (2019) use ARDL model to examine the impact of exchange rate volatility on economic growth in Nigeria. The results revealed that there is existence of co integration among the variables. The findings also exhibited significant impact of export on Gross Domestic Product while import is insignificant both in the short and the long run. The study established insignificant positive relationship between exchange rate volatility and economic growth in Nigeria. On the other hand Sabina, Manyo, and Ugochukwu (2017) find a negative relationship between exchange rate volatility and economic growth in Nigeria. They employ the Generalized Method of Moments (GMM) in estimating the impact of volatility and economic growth in Nigeria and the result show that volatility and FDI has negative and significant impact on the growth of the Nigerian economy. Government Expenditure and External Reserve has positive and significant impact on the growth of the Nigerian economy for the period under study. The study recommend that government and monetary authorities should design policies that will stabilize the persistence volatility in naira exchange rate. Odili (2015) analyze the impact of real exchange rate volatility and economic growth on exports and imports in Nigeria using a vector error correction model and employ time series data from 1971 to 2012. The study finds that in both the short-run and long-run, Nigeria's trade flows were chiefly influenced by exchange rate volatility, real exchange rates, real foreign income, real gross domestic product, terms of trade and exchange rate policy switch. The findings further reveal that exchange rate volatility depressed trade flows in the long-run.

Ahiabor and Amoah (2019) uses the Fully Modified Ordinary Least Squares (FMOLS) and an annual times series data spanning from 1980-2015 to examine the effect of real effective exchange rate volatility on economic growth in Ghana. Regression results show that real effective exchange rate volatility has a negative and highly statistically significant effect on economic growth in Ghana. In addition, they estimated models with traditional control variables as well as a novel measure of financial market fragility and still have consistent results. Hussain and Farooq (2009) investigate the relationship between economic growth and exchange rate volatility in Pakistan by using an ARDL model. Cointegration relationship between growth, exchange rate volatility, reserve money and manufacturing are detected in the long run except exports and imports. Conclusion suggests that domestic economic performance is very sensitive to the exchange rate volatility in the long-run.

Umaru and Davies (2018) examines the effects of exchange rate volatility on economic growth of West African English speaking countries. The results obtained showed that the independent variable (real exchange rate) is statistically significant and negatively related to the dependent variable (GDP) in West African English speaking countries excluding time-invariant variables. Musyoki, Pokhariyal and Pundo (2012) use Generalized Method Moments (GMM) to assess the impact of the real exchange rate volatility on economic growth for the period January 1993 to December 2009 in Kenya. The study found that RER was very volatile for the entire study period. Kenya's RER generally exhibited an appreciation and volatility trend, implying that the country's international competitiveness deteriorated over the study period. The RER Volatility reflected a negative impact on economic growth of Kenya. Bleaney and Greenaway (2001) estimated investment and growth equations on a reasonably sized panel of annual data from 14 sub-Saharan African countries from 1980 to 1995. Sub-Saharan Africa was selected as a low-income area that is heavily dependent on exports of primary products. They find that real exchange rate volatility has a significant negative impact on investment, and that volatility in the terms of trade has a negative impact on growth.

3. DATA AND METHODOLOGY

Cointegration method is used in the analysis of long term relationships between variables. Engle and Granger (1987), Johansen and Juselius (1990) and Johansen (1991) are the most commonly used tests for testing cointegration. The Autoregressive Distributed Lag (ARDL) model and the bounds testing approach which is developed by Pesaran and Shin (1999) and Pesaran, Shin, and Smith (2001) has some advantages over other conventional cointegration approaches. Unlike the other cointegration methods, there is no limiting assumption that all variables used in the ARDL model should be integrated of the same order. Therefore, I(0) and I(1) variables can be used together. However, as a limiting condition, no variable should be integrated of the second or higher order. With this approach, problems arising from non-stationary series are largely eliminated. In addition, the variables included in the analysis may have different lag lengths which is not possible in the VAR modelling. Another advantage of the ARDL model is that short and long term parameters can be estimated together. By applying linear transformation to the model, it makes possible to obtain an Error Correction Model that combines short-term and long-term relationships without losing long-term information. Another important advantage is that it can be applied to small samples. It gives consistent and reliable results even in samples with limited observations.

$$\ln GDP = \alpha + \beta_1 \ln Exp + \beta_2 \ln Imp + \beta_3 \ln Inv + \beta_4 \ln Volex + \varepsilon_t \quad (1)$$

Where *GDP* is the Real Gross Domestic Product, *Exp* is the exports of goods and services, *Imp* is the import of goods and services, *Inv* is the gross fixed capital formation which represents investment, *Volex* is the volatility of exchange rate which is calculated from the real effective Exchange rate by using the GARCH (1,1) model. If we estimate equation (1) by OLS or any other linear method, we obtain long-run effects of the explanatory variables on the explained variable (GDP). But the error correction modelling approach offers an opportunity to also estimate the short run effects. Moreover Pesaran et al., (2001) bounds testing approach has an advantage of estimating short-run and long-run effects in one step. Because of the mentioned advantages the ARDL model in equation (2) is estimated.

$$\Delta LnGDP_t = \alpha_0 + \sum_{i=1}^{n1} \alpha_{1i} \Delta LnGDP_{t-i} + \sum_{i=0}^{n2} \alpha_{2i} \Delta LnExp_{t-i} + \sum_{i=0}^{n3} \alpha_{3i} \Delta LnImp_{t-i} + \sum_{i=0}^{n4} \alpha_{4i} \Delta LnInv_{t-i} +$$
$$\sum_{i=0}^{n5} \alpha_{5i} \Delta Lnvolex_{t-i} + \lambda_1 LnGDP_{t-1} + \lambda_2 LnExp_{t-1} + \lambda_3 LnImp_{t-1} + \lambda_4 LnInv_{t-1} + \lambda_5 LnVolex_{t-1} + \varepsilon_t \quad (2)$$

The coefficients from λ_1 to λ_5 show the long-run relationship between the variables and the coefficients from α_{1i} to α_{5i} show the dynamic short run relationships among the variables. For example the short-run effects of exchange rate volatility on real GDP are inferred by the estimates of α_{5i}'s. Δ is the first difference operator, α_0 is the constant and ε_t is the white noise error term.

The analysis of short- and long-term dynamics with the ARDL bounds test approach requires a process consisting of several steps. In the first step, Model (2) is estimated by OLS method and an F test is used to examine the long-run relationship between variables and test the coefficients of lagged variables together. The null hypothesis $H_0 : \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = 0$ indicates that there is no long-term relationship or cointegration between variables. The alternative hypothesis states that the lagged coefficients are significant and there is a cointegration relationship among them. The sample value of the calculated F statistic is compared with the critical upper and lower limits created by Pesaran et al., (2001). If the sample value of the calculated F statistic is less than the table lower bound, the null hypothesis stating that there is no cointegration is not rejected. However, if the sample value of the calculated F statistic is greater than the upper bound of the table, the null hypothesis is rejected and the existence of a long-run relationship between the variables in the model is determined. The test is inconclusive if the calculated F statistic is between the upper and lower bound.

After determining the cointegration relationship, in the second step, appropriate lag lengths for the variables are determined by using model selection criteria such as Hannan Quinn Criteria, Akaike Information Criteria (AIC), Schwarz Criteria (SBC). In the third step, by using the information from model (2) the error correction model is estimated.

$$\Delta LnGDP_t = \alpha_0 + \sum_{i=1}^{n1} \alpha_{1i} \Delta LnGDP_{t-i} + \sum_{i=0}^{n2} \alpha_{2i} \Delta LnExp_{t-i} + \sum_{i=0}^{n3} \alpha_{3i} \Delta LnImp_{t-i} + \sum_{i=0}^{n4} \alpha_{4i} \Delta LnInv_{t-i} +$$
$$\sum_{i=0}^{n5} \alpha_{5i} \Delta LnVolex_{t-i} + \varphi ECM_{t-1} + \varepsilon_t \quad (3)$$

The coefficients from α_1 to α_5 are the short term dynamic coefficients that stabilize the model. *ECM* is the error correction term and its coefficient φ shows the speed of adjustment of the model to the long - term equilibrium after a short - term shock. This coefficient should be negative and statistically significant.

For testing the stability of the estimated model, CUSUM and CUSUMSQ tests which are developed by (Pesaran, M. H., Shin, 1999) and (Brown, Durbin, and Evans, 1975) are recommended. CUSUM and CUSUMSQ statistics are recursive estimates and they are marked against breakpoints. Visual inspection of recursive estimates provides information about structural breaks or stability of the model. If the CUSUM and CUSUMSQ statistics are within the critical limits drawn at the 5% significance level, the null hypothesis which states that the model is stable is not rejected.

4. FINDINGS AND DISCUSSIONS

The ARDL model by using quarterly data from Turkey between 1998:Q1 and 2019:Q3 is estimated. Data for real GDP, exports, imports and investment are obtained from The Central Bank of the Republic of Turkey. Volatility measure of the effective exchange rate is generated by using a GARCH approach.

When discussing the volatility of time series, econometricians refer to the 'conditional variance of the data, and the time-varying volatility of asset returns is known as conditional heteroscedasticity. The GARCH Model is an extension of the ARCH model developed by Engle (1982) which considers the variance of the current error term to be a function of the variance of the previous error terms. GARCH allows the variance of the variable of concern to change over time. As mentioned by Bahmani-Oskooee and Xi (2012) it assumes that REER is a random variable which is drawn from a conditional density function $f(REER \mid REER_{t-1})$. The theoretical specification of the GARCH model is as follows:

$$REER = \alpha_0 + \alpha_1 REER_{t-1} + \varepsilon_t \quad (4)$$

$$\varepsilon_t \mid I_{t-1} \sim N(0, h_t^2) \quad (5)$$

$$V(REER_t \mid I_{t-1}) = V(\varepsilon_t \mid I_{t-1}) = h_t^2 \quad (6)$$

$$h_t^2 = \delta + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 \varepsilon_{t-2}^2 + ... + \alpha_p \varepsilon_{t-p}^2 + \beta_1 h_{t-1}^2 + \beta_2 h_{t-2}^2 + ...\beta_q h_{t-q}^2 \quad (7)$$

A GARCH (p,q) model can be written as

$$h_t^2 = \delta + \sum_{j=1}^{p} \alpha_j \varepsilon_{t-j}^2 + \sum_{j=1}^{q} \beta_j h_{t-j} \quad (8)$$

The order of GARCH is determined by the significance of $\alpha 's$ and $\beta 's$ in equation (8). In most instances, a GARCH (1,1) model is sufficient.

$$h_t^2 = \delta + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 h_{t-1}^2 \quad (9)$$

Since a variable is mostly explained by its own past values, a higher value for β_1 and a lower value for α_1 is expected. Volatility is said to be persistent if the coefficient of the GARCH term is large. Bollerslev (1986) identified the condition required for the stationarity of the model as:

$$\sum_{j=1}^{p} \alpha_j + \sum_{j=1}^{q} \beta_j < 1$$

As stated by Sabina, Manyo, and Ugochukwu, (2017) stationarity of the GARCH model ensures that the behavior and properties of the estimators do not change over time and that the persistence of the shock is not infinite.

Table 1: GARCH (1,1) Equation

Variable	Coefficient	Std. Error	z-statistic	Prob
C	20,96682	6.906575	3.035777	0.0024
REER(-1)	0.791750	0.063497	12.46903	0.0000
Variance Equation				
C	9.597075	10.64650	3.035777	0.3674
RESID(-1)^2	0.536468	0.217057	2.471547	0.0135
GARCH(-1)	0.365714	0,093654	3,168452	0,0015

As shown in Table 1, the results of the GARCH (1,1) model show that there is a permanent shock affecting the volatility of the real effective exchange rate. The coefficients of ARCH and GARCH terms are positive and they are significant at %5 significance level. Also the sum of ARCH and GARCH terms are smaller than 1 which means that the estimated GARCH model is stationary. The coefficient of the ARCH term is greater than that of GARCH term indicating that volatility in the exchange rate tends to be more extreme.

Figure 1: Conditional Variance from GARCH (1,1) Model

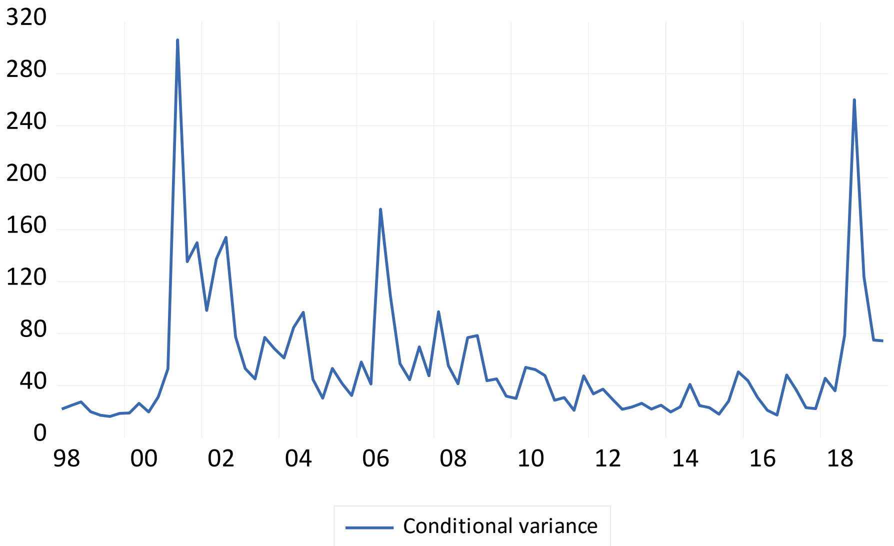


Figure 1 shows that increase in the volatility during the crises years of 2001, 2007 and 2018 can easily be seen from the conditional variance from GARCH(1,1) model.

Before estimating the ARDL model, the stationarity and degree of integration of the series were investigated using Augmented Dickey Fuller (ADF) and Phillips Perron unit root tests. Our purpose is to make sure that none of the series is I (2). Because the critical F values provided by Pesaran et al. (2001) are only valid when the variables are I (0) and I (1). The results of the unit root tests are presented in Table 2.

Table 2: Unit Root Tests

	ADF Test		PP Test	
Variable	Intercept	Trend and Intercept	Intercept	Trend and Intercept
$lnGDP_t$	-0.406189 (8)	-3.421303*(4)	-1.196769 [15]	-7.080832*** [16]
$\Delta lnGDP_t$	-4.684016*** (5)	-3.329880 *(3)	-15.76751*** [13]	-15.63883***[13]
$lnexpo_t$	0.180296 (3)	-3.102096 (4)	-0.392926 [18]	-5.744276 ***[7]
$\Delta lnexpo_t$	-10.16610*** (2)	-10.13316***(2)	-15.01292***[17]	-14.75020***[17]

$lnimp_t$	-1.426599 (5)	-1.501070 (5)	-1.282094 [9]	-2.418790 [3]
$\Delta lnimp_t$	-4.984593*** (4)	-5.085571***(4)	-11.16772***[3]	-11.18377***[4]
$lninv_t$	-1.480220 (8)	-2.930470 (8)	-1.023880 [29]	-4.222210***[8]
$\Delta lninv_t$	-2.910894** (7)	-3.131167** (7)	-15.54330***[7]	-15.45709***[7]
$lnvolex_t$	-3.746864** (0)	-3.760525** (0)	-3.671949***[2]	-3.686273**[2]

1) ****, **,* represents significance at the 1%, 5% and 10% level respectively*
2) *The numbers in ( ) are the lag orders which are determined by Schwarz Info Criteria*
3) *The numbers in [ ] are the bandwidth which are determined by Newey West using Bartlett kernel*

The results of the Augmented Dickey Fuller and Phillips Perron unit root tests show that log of real GDP, exports, imports and investment are not stationary at their levels but they become stationary when their first differences are calculated which means they are I(1). On the other hand exchange rate volatility is stationary at its level which means it is I(0). After confirming that none of the variables is I(2) short run, long run and error correction coefficients of the ARDL model are estimated.

Table 3: Bounds Test

F-Statistic	20.760***	
Critical Values		
Significance Level	Lower Bound	Upper Bound
10%	2.2	3.09
5%	2.56	3.49
1%	3.29	4.37

The results of the bounds test to investigate the cointegration relationship between variables are given in Table 3. The sample value of the calculated F statistic above the upper bounds at all the significance levels. So the null hypothesis of no cointegration is rejected and a cointegration relationship between the variables is observed. After determining the cointegration relationship between the variables, the coefficients of ARDL (4,0,4,0,4) model which is selected according to Akaike Information Criteria were estimated and the results are presented in Table 4.

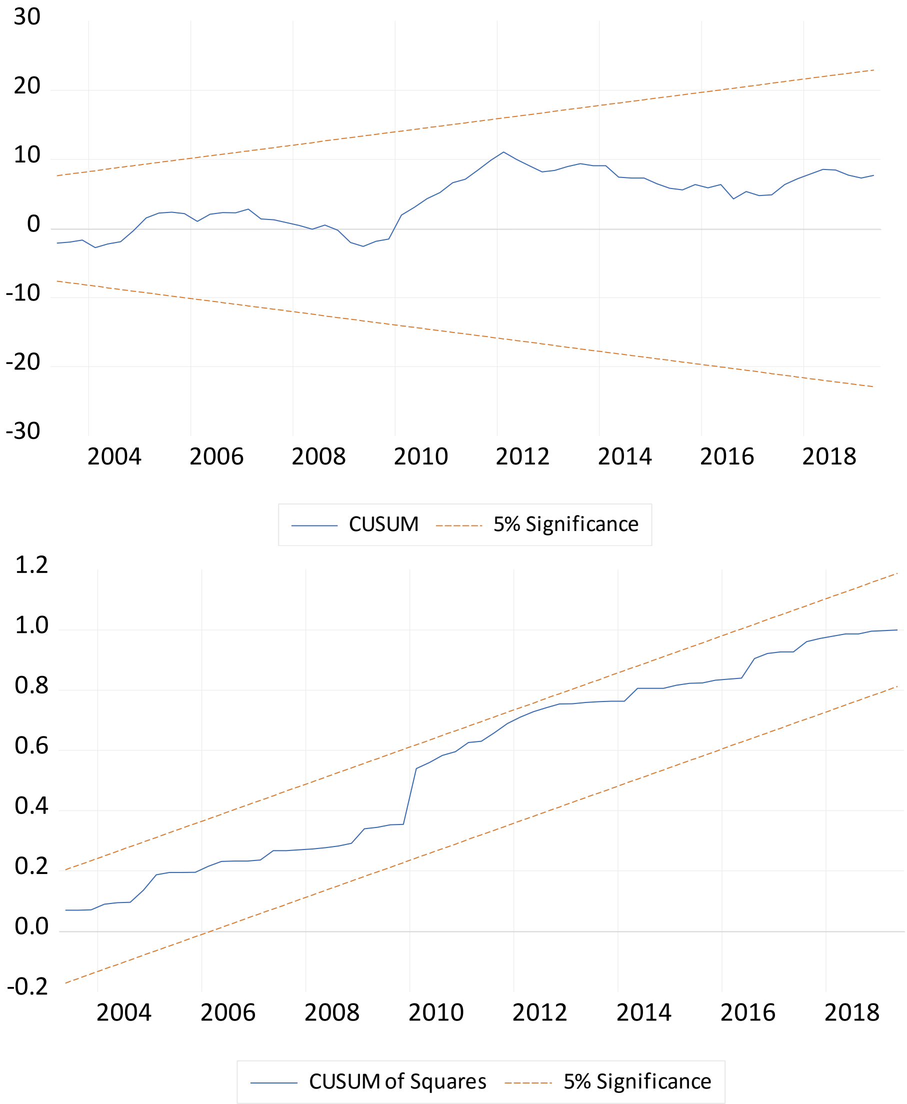
Table 4: Estimation Results and Diagnostic Testing

Panel A: ARDL (4,0,4,0,4) Model					
Lag Order	$lnGDP$	$lnexpo$	$lnimp_t$	$lnvolex$	$lninv_t$
0		0.141	0.061	-0.006	0.235
		(3.642)	(1.686)	(-1.772)	(6.566)
1	0.199		-0.073		-0.039
	(2.159)		(-1.728)		(-0.917)
2	-0.242		0.026		0.095
	(-2.765)		(0.568)		(2.354)
3	0.203		-0.041		(-0.060)
	(2.302)		(-0.882)		(-1.468)
4	0.631		-0.063		-0.120
	(7.366)		(-1.313)		(-3.146)
Panel B : Long Run Coefficients					
$Constant$	$lnexpo_t$	$lnimp_t$	$lninv_t$	$lnvolex_t$	
5.683	0.681	-0.435	0.531	-0.031	
(4.889)	(5.495)	(-2.529)	3.278	(-1.729)	
[0.000]	[0.000]	[0.013]	[0.001]	[0.088]	
Panel C: Diagnostic statistics					
	ECM_{t-1}	LM	RESET		$Adj.\ R^2$
	-0.207	1,456	1.253		0.997
	(-11.58)	[0,374]	[0.267]		

Notes: The numbers in parenthesis are the t ratios; the numbers in brackets are the prob values.

From the long run coefficients export and investment has a significant positive effect on real GDP, import and exchange rate volatility have significant negative effect on real GDP. Coefficient of exchange rate volatility is significant at 10% while the other coefficients from the long run model are significant at 1%. The coefficient of ECM_{t-1} is negative and statistically significant. This shows that the variables adjust towards equilibrium in the long run. Lagrange Multiplier (LM) test for autocorrelation and Ramsey RESET test for specification error were applied. The prob values from both tests are greater than 0.05 which implies that there is no autocorrelation and no specification error in the model. Also the size of the adjusted R^2 shows an excellent goodness of fit.

Figure 2: CUSUM and CUSUM SQUARE Tests



One last diagnostic test is for the stability of the short run and long run coefficient estimates. If the plot of CUSUM and CUSUMSQ stays within the 5% significance level represented by two straight lines, then the coefficient estimates are stable. As can be seen from Figure 2 both plots of CUSUM and CUSUMSQ remains within the 5% level of significance represented by two straight lines, implying that the estimated coefficients are stable.

5. CONCLUSION

This study examines the impact of exchange rate volatility on economic growth in Turkey between 1998:Q1 and 2019:Q3 by using the Autoregressive Distributed Lag (ARDL) Model. Estimation results show that real effective exchange rate volatility has a negative and highly statistically significant effect on economic growth in Turkey. From the long run coefficients export and investment has a significant positive effect on real GDP, import and exchange rate volatility have significant negative effect on real GDP.

Between 1980 and 1988 is a period in which the real exchange rate is continuously reduced in order to increase the competitiveness of Turkish goods in the international markets and thus to increase exports and reduce imports. In the late 1980s, the Central Bank began to use the exchange rate as a tool for fighting against inflation due to the risk of rising inflation out of control. So in this period devaluation of TL is kept low and real exchange rate increases. So the use of exchange rate as a policy tool for fighting against inflation or current account deficit has increased exchange rate volatility in Turkey. Under the floating exchange rate regime imbalances in the foreign capital inflows with the changes in the global economic condition also affects the exchange rate volatility in Turkey. These volatilities in the exchange rate increased the risk and uncertainty in international transactions and negatively affected foreign trade and growth. Due to the production structure which is heavily dependent on the imported inputs, production and growth rate decreased during the high volatility periods.

In order to ensure sustainable economic growth, it is necessary to strengthen the fiscal and financial structure and reduce the volatility in exchange rates. Financial deepening and fiscal discipline is very important in this respect. Changing the production structure and increasing the domestic production of intermediate goods is also required for achieving stable growth rates.

REFERENCES

Adeniyi, A. P., and Olasunkanmi, A. Olasoji. (2019). Impact of Exchange Rate Volatility on Economic Growth in Nigeria. *International Journal Management Studies and Social Science Research*, *1*(4), 43–48.

Ahiabor, G., and Amoah, A. (2019). Examining the Effect of Real Effective Exchange Rate Volatility on Economic Growth : Evidence From Ghana. *Journal of Economics and Economic Education Research*, *20*(1), 1–14.

Alagidede, Paul and Ibrahim, Muazu. (2016). On the causes and effects of exchange rate volatility on economic growth: Evidence from Ghana. 10.13140/RG.2.1.3300.0722..

Bahmani-Oskooee, M., and Xi, D. (2012). Exchange rate volatility and domestic consumption: Evidence from Japan. *Economic Systems*, *36*(2), 326–335. https://doi.org/10.1016/j.ecosys.2011.10.004

Bleaney, M., and Greenaway, D. (2001). The impact of terms of trade and real exchange rate volatility on investment and growth in sub-Saharan Africa. *Journal of Development Economics*, *65*(2), 491–500. https://doi.org/10.1016/S0304-3878(01)00147-X

Bollerslev, T. (1986). Generalised Autoregressive Conditional Heteroscedasticity. *Journal of Econometrics*.

Brown, R., Durbin, J., and Evans, J. (1975). Techniques for testing the constancy of regression relationships over time. *Journal of the Royal Statistical Society*, *37*(2), 149–192. https://doi.org/10.2307/2984889

Demir, F. (2013). Growth under exchange rate volatility: Does access to foreign or domestic equity markets matter? *Journal of Development Economics*, *100*(1), 74–88. https://doi.org/10.1016/j.jdeveco.2012.08.001

Engle, R. F. (1982). Autoregressive Conditional Heteroscedasticity with Estimates of the Variance of United Kingdom Inflation. *Econometrica*. https://doi.org/10.2307/1912773

Engle, R. F., and Granger, C. W. J. (1987). Co-Integration and Error Correction: Representation, Estimation, and Testing. *Econometrica*, *55*(2), 251. https://doi.org/10.2307/1913236

Eteng F.O. and Ijim-Agbor U. (2016). International Journal of Humanities and Social Science Research, 43–48.

Hussain, Z. J., and Farooq, M. (2009). Economic growth and exchange rate volatilityin the case of Pakistan. *Pakistan Journal of Life and Social Sciences*, *7*(2), 112–118.

Johansen, Soren. (1991). Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models. *Econometrica*, *59*(6), 1551. https://doi.org/10.2307/2938278

Johansen, Søren, and Juselius, K. (1990). Maximum Likelihood Estimation and Inference on Cointegration — With Applications to the Demand for Money. *Oxford Bulletin of Economics and Statistics*, *52*(2), 169–210. https://doi.org/10.1111/j.1468-0084.1990.mp52002003.x

Kasman, A., and Kasman, S. (2005). Exchange Rate Uncertainty in Turkey and its Impact on Export Volume. *METU Studies in Development*, *32*(1), 41–53.

McKinnon, R. (1963). Optimum Currency Areas. *The American Economic Review*, *53*(4), 717–725.

Musyoki, D., Pokhariyal, G. P., and Pundo, M. (2012). The Impact of real exchange rate misalignment on economic Growth: Kenyan evidence. *Research Journal of Finance and Accounting*, *7*(1), 59–75.

Obstfeld, M., and Rogoff, K. (1995). Exchange rate dynamics redux. *Journal of Political Economy*. https://doi.org/10.1086/261997

Odili, O. (2015). Real Exchange Rate Volatility, Economic Growth and International Trade in an Emerging Market Economy: Evidence from Nigeria. *International Journal of Academic Research in Business and Social Sciences*, *5*(7), 179–201. https://doi.org/10.6007/ijarbss/v5-i7/1730

Pesaran, M. H., Shin, Y. (1999). An autoregressive distributed lag modelling approach to cointegration analysis. In *Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium.* (pp. 1–31). https://doi.org/10.1017/CCOL521633230

Pesaran, M. H., Shin, Y., and Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*(3), 289–326. https://doi.org/10.1002/jae.616

Sabina, N. E., Manyo, T. S., and Ugochukwu, U. S. (2017). "Exchange Rate Volatility and Economic Growth in Nigeria." *International Journal of Economics, Commerce and Management*, *5*(7), 583–595.

Schnabl, G. (2008). Exchange rate volatility and growth in small open economies at the EMU periphery. *Economic Systems*, *32*(1), 70–91. https://doi.org/10.1016/j.ecosys.2007.06.006

Umaru, H., A, A. N., and Davies, N. O. (2018). The Effects of Exchange Rate Volatility on Economic Growth of West African English-Speaking Countries. *International Journal of Academic Research in Accounting, Finance and Management Sciences*, *8*(4), 131–143. https://doi.org/10.6007/IJARAFMS/v8-i4/5470

Yıldız, H., Ide, G., and Malik, S. T. (2016). The Relationship Between Exchange Rate Volatility and Economic Growth : an Example of Turkey. *International Journal of Arts and Commerce*, *5*(3), 47–61.

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COMPANY STOCK REACTIONS TO BLACK NOISE TWEETS: EVIDENCE FROM STEEL INDUSTRY

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ABSTRACT

Purpose – The purpose of this study is to test the validity of super-fast development of social media and its wide range of use by even professional investors as the new financial contagion which is carried with “Black Noise” tweets. Newly established robotic modern finance environment and various news channels provide the necessary infrastructure to utilize a focused and directed market noise. Measuring the impact of this noise in the financial market volatility is a crucial and important issue.
Methodology - In this study, we investigate the news impact of trade wars and monetary policy news on steel industry of US and its reflection on Turkish markets utilizing 30 minutes high frequency return data. The novelty is this study is the interaction terms that we generated and embedded in the E-GARCH models to test the reactions of steel major listed US steel industry companies such as US Steel, AK Steel, Nucor and the pioneer Turkish company Ereğli in this sector**.**
Findings- Findings of this study highlights that specific news about trade war and monetary policy have a significant impact on steel company returns. For further research papers testing the speculation strength of such tweet can be a beneficial topic for the other researchers.
Conclusion- As a result of this study, being one the major market makers, Trump’s direct messages to the market via Twitter and such, about sanctions, interest rates and monetary policy creates “Black Noise” in financial markets. Even in a durable production industry like steel sector this leads to speculation.

Keywords: EGARCH, news impact curves, black noise, tweet, contaign.
JEL Codes: C58, G14, G15

1. INTRODUCTION

2008 global financial crisis provides us with a wide range of study field on cross-asset contagion mechanisms in the US financial markets. Contagion in the financial markets was one of the most popular research topics in finance literature triggered by Forbes and Rigobon (2001). After a decade of the so-called subprime crisis the impact of market news on asset volatilities increased significantly.

Especially after the US elections and Trump era started, trade wars and sanctions declared by US decision makers fueled cross-asset contagion. The way in which information is disseminated to the masses has evolved with the introduction of social media platforms. During the 2016 presidential election, candidates used the platform to increase their media coverage, especially Donald Trump. His current position empowers his tweets to influence public sentiment, decisions of financial market actors and even the performance of stock returns.

With the increasing influence of social media which fuels the information spillover, even Bloomberg L.P. is incorporating tweets into its data service, which is widely used in the financial industry. Even two of the largest Wall Street banks are trying to measure the market impact of Donald Trump’s tweets. Analysts at JPMorgan Chase & Co. have created an index to quantify what they say are the growing effects on U.S. bond yields. Citigroup Inc.'s foreign exchange team, meanwhile, report that these micro-blogging missives are also becoming "increasingly relevant" to foreign-exchange moves[1].

The point is Trump's tweets are giving the market whiplash which we define as "Black Noise[2] " Black noise is a type of noise where the dominant energy level is zero throughout all frequencies, with occasional sudden rises; it is also defined as silence. Contrary to general consideration, sound and silence are not each other's opposite, but they are mutually inclusive. Silence is used as a verb in western languages with the meaning of "causing to become silent, prohibiting or preventing from speaking". In this context, tweets of Trump, who has the market power as the president of global economy and financial markets driving country, creates noise in financial markets while mutually preventing the other actors or indicators from speaking.

Even by the 1980s even reading Wall Street Journal or the availability of watching TV on the trading floor provided significant information advantage. In modern financial markets taken over by algorithms and passive manager the impact of available information spread out by market makers is uncontrollable. The rise of financial robotization both changes the speed and make-up of the stock market and affects the under economy.

However, humans are not out of the picture entirely since they have a very important role of picking and choosing which data to feed in the machine. So, from one point they teach the algorithm what data to look and then manipulate that data by creating noise in the markets. Super-fast development of social media and its wide range of use by even professional investor now financial contagion is carried even with "Black Noise" tweets. As a result, newly established robotic modern finance environment and various news channels provide the necessary infrastructure to utilize a focused and directed market noise.

2. LITERATURE REVIEW

Previous literature studies focus on firstly to test whether the contagion exits in financial markets after global financial crisis and secondly improve the weakness of Forbes and Rigobon's (2002) methodology. Most researchers focus on cross-country relationships (e.g. King and Wadhwani, 1990; Kodres and Pritsker; 1998; Kaminsky et al. 2003, Dungey et al., 2007) while Guidolin et. al. (2019) focus on cross-asset contagion mechanism. Based on the results of all these studies we accept that contagion exits in the market. Our aim is to question whether the structure of contagion changed recently especially after Trump election and his utilization of social media as a financial market speculation tool.

In this context, recent studies focus on the impact of social media on financial markets, stock returns and company reactions more and more. Zheludev et. al (2014) showed that social media message sentiment can contain statistically significant ex-ante information on the future prices of the S&P 500 Index. Tafti et al. (2016) found a spike in tweets per minute resulted in spike in trading activity in the following forty minutes. In their study they evaluate 96 firms on the NASDAQ over 193 trading days which were statistically compared with Yahoo! Finance data of the related firms. Most of the studies focus on the evaluation of message volumes and retrospective evaluation of trading strategy returns. Cove and Sardy (2019) found that Trump tweets have an impact on financial markets even at the level of daily returns. These findings were limited by the nature of daily S&P 500 returns and there was a gross mismatch between the timing of tweets and daily results. In our study with interaction dummy we were able to more directly see the instantaneous effect of the tweets on the market.

There two types of specific news subjects in this study. Firstly, news about trade wars mainly about sanctions declared by US President to especially China and steel industry is considered. Although export from Turkey does not constitute a significant portion of US import, we also tested the impact of sanction declarations against Turkey via Ereğli stock return volatility models. Jensen (2006) shows that trade dispute over US steel production provides a case to reconsider the role of World Trade Organization (WTO) in settling trade disputes and stabilize the expectations of the market. His study mentions that during the 2002 WTO steel case, the WTO dispute mechanism helped market actors stabilize expectations of future trade policy. In our case Trump's tweets serves quite the opposite of WTO dispute mechanism which does not help the market to stabilize at all. Lo and MacKinlay (1999) argues that stock prices do not fully adjust immediately to new information while Glosten et al. (1993) criticize Efficient Market Hypothesis of Fama (1970) stating that stocks respond asymmetrically to positive and negative news. In our study with interaction dummy variables and using high frequency semi-hourly data we test all these criticisms with relevant volatility models.

Secondly news about monetary policy and FED decisions fueled with the conflicts between Trump and Powell constitutes our second dummy variable.

[1] Our preliminary analysis of this article was announced a week before these studies in Turkish Economy channels and reputable economics news websites

[2] Black Noise term is inspired by a contemporary art exhibition composed of the works of the artists; Burak Arıkan, Servet Cihangiroğlu, Didem Erk, Richard Jochum, Cengiz Tekin, Anna Vasof, Mirko Lazović.

3. METHODOLOGY

One model that allows for asymmetric effect of news is the EGARCH model. One problem with a standard GARCH model is that it is necessary to ensure that all the estimate coefficients are positive. Nelson (1991) proposed a specification that does not require non-negativity constrains.

Consider:

$$\ln(h_t) = \alpha_0 + \alpha_1 \left(\frac{\varepsilon_{t-1}}{h_{t-1}^{0.5}}\right) + \lambda_1 \left| \frac{\varepsilon_{t-1}}{h_{t-1}^{0.5}} \right| + \beta_1 \ln (h_{t-1}) \qquad [1]$$

Equation (3.1) is called the exponential-GARCH or EGARCH model. There are three interesting features to notice about EGARCH model:

1. The equation for the conditional variance is in log-linear form. Regardless of the magnitude of ln(h_t), the implied value of h_t can never be negative. Hence, it is permissible for the coefficients to be negative.
2. Instead of using the value of ε_{t-1}^2, the EGARCH model uses the level of standardized value of ε_{t-1}^2 [i.e., ε_{t-1}^2 divided by $(h_{t-1})^{0.5}$]. Nelson argues that this standardization allows for a more natural interpretation of the size and persistence of shocks. After all, the standardized value of ε_{t-1}^2 is a unit-free measure.
3. The EGARCH model allows the leverage effects. If $\varepsilon_{t-1}^2/(h_{t-1})^{0.5}$ is positive, the effect of the shock on the log of conditional variance is $\alpha_1 + \lambda_1$. If $\varepsilon_{t-1}^2/(h_{t-1})^{0.5}$ is negative, the effect of the shock on the log of the conditional variance is $-\alpha_1 + \lambda_1$.

The trade-off between future risks and asset returns are the essence of most financial decisions. Risk mainly composes of two factors such as volatilities and correlations of financial assets. Since the economy changes frequently and new information is distributed in the markets second moments evolve over-time. Consequently, if methods are not carefully established to update estimates rapidly then volatilities and correlations measured using historical data may not be able to catch differentiation in risk (Cappiello et. all, 2006).

If we consider EGARCH models, the news impact curve has its minimum at $\varepsilon_{t-1}=0$ and is exponentially increasing in both directions but with different parameters. The news impact curves are made up by using the estimated conditional variances equation for the related model as such the given coefficient estimates and with the lagged conditional variance set to the unconditional variance.

Consider EGARCH (1,1)

$$\ln(h_t) = \alpha_0 + \beta \ln(h_{t-1}) + \alpha_1 z_{t-1} + \gamma(|z_{t-1}|) - E(|z_{t-1}|) \qquad [2]$$

where $z_t = {}^{\varepsilon_t}/_{\sigma_t}$. The news impact curve is

$$h_t = \begin{Bmatrix} A exp \left[\frac{\alpha_1+\gamma}{\sqrt{h_t}} \right] & for\ \varepsilon_{t-1} > 0 \\ A exp \left[\frac{\alpha_1-\gamma}{\sqrt{h_t}} \right] & for\ \varepsilon_{t-1} < 0 \end{Bmatrix} \qquad [3]$$

$$A \equiv h_t^{\beta} exp\left[\alpha_0 - \gamma\sqrt{2/\pi}\right] \qquad [4]$$

$$\alpha_1 < 0 \qquad \alpha_1 + \gamma > 0 \qquad [5]$$

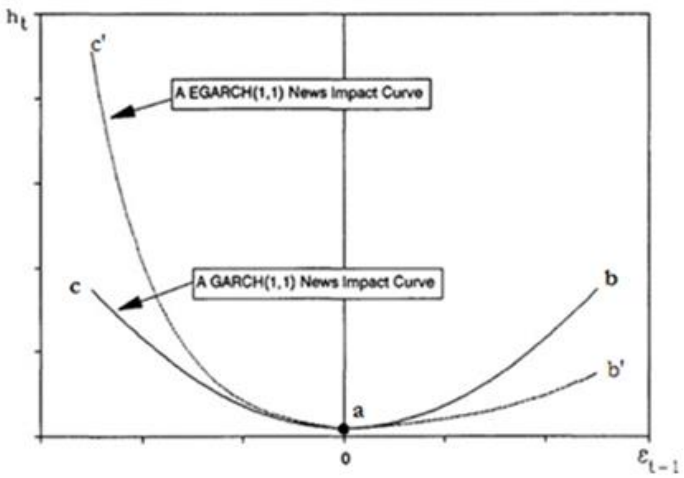
An important characteristic of asset prices is that "bad" news has more persistent impact on volatility than "good" news has. Most of the stocks has a strong negative correlation between the current return and the future volatility. In this context we can define leverage effect as such volatility tends to decrease when returns increase and to increase when returns decrease.

The idea of the leverage effect is exhibited in the figure below, where "new information" is defined and measured by the size of ε_{t-1}. If $\varepsilon_{t-1}=0$, expected volatility (h_t) is 0. Actually, any news increases volatility but if the news is "good" (i.e., if ε_t is positive), volatility rises from point ***a*** to point ***b*** along ab curve (or ab' for EGARCH model). However, if the news is "bad", volatility rises from point ***a*** to point ***c*** along ac curve (or ac' for EGARCH model). Since ac and ac' are steeper than ab and ab', a positive ε_t shock will have a lower impact on volatility than a negative shock of these same magnitude (Figure 1).

Asymmetric volatility models are the most interesting approaches in the literature since good news and bad news have different predictability for the future volatility. Overall, Chen and Ghysels (2010) found that partly good (intra-daily) news decreases volatility (the next day), while both very good news which is unusual high intra-daily positive returns, and bad news which is negative returns increase volatility. However, the latter has a more severe impact over longer horizons the asymmetries fade away.

The news impact curve illustrates the impact of previous return shocks on the return volatility which is implicit in a volatility model.

Figure 1: News Impact Curves



4. DATA AND PRELIMINARY ANALYSIS

The study considers semi-hourly closing prices for Crude Oil (CRUDE), S&P 500 Index (SPX), S&P Metals and Mining Select Industry Index (SPXSMM), Borsa Istanbul 100 Index (XU100), Borsa Istanbul Industrial Index (XUSIN), AK Steel[3] (AKSTEEL), US Steel[4] (USSTEEL), Nucor[5] (NUCOR) and Ereğli[6] (EREGLI) stock prices to explore the impact of trade war, monetary policy and FED decision news on the returns and volatility of steel industry. Semi-hourly data for all assets has been taken from Thompson Reuters Eikon. The time span for the study runs from 16 October 2018 to 16 October 2019 based on the availability of trade war, monetary policy and FED decision news. If we briefly describe the selected companies:

AK Steel Holding Corporation (AK Steel) is a producer of flat-rolled carbon, stainless and electrical steels, and tubular products through its subsidiary, AK Steel Corporation (AK Steel).

United States Steel Corporation (US Steel) is an integrated steel producer of flat-rolled and tubular products with major production operations in the United States and Europe

Nucor Corporation (Nucor) manufactures steel and steel products.

Ereğli Demir ve Celik Fabrikalari TAS (Ereğli) is a Turkey-based company, which is engaged in the production of iron and steel rolled products, alloyed and non-alloyed iron, steel and pig iron castings, cast and pressed products, coke and their by-products

[3] The Company also operates blast furnaces and electric arc furnaces. As of December 31, 2016, its operations included eight steelmaking and finishing plants, two coke plants and two tube manufacturing plants. These operations produce flat-rolled carbon, specialty stainless and electrical steels that it sells in sheet and strip form, and carbon and stainless steel that it finishes into welded steel tubing. It also produces metallurgical coal through its subsidiary, AK Coal Resources, Inc. In addition, the Company operates trading companies in Mexico and Europe that buy and sell steel and steel products and other materials.
[4] US. Steel has annual raw steel production capability of 22.0 million net tons (17.0 million tons in the United States and 5.0 million tons in Europe). According to World Steel Association's latest published statistics, in 2017 U. S. Steel was the third largest steel producer in the United States and the twenty-sixth largest steel producer in the world.
[5] The Company produces direct reduced iron (DRI) for use in its steel mills. It operates in three segments: steel mills, steel products and raw materials. The steel mills segment produces and distributes sheet steel (hot-rolled, cold-rolled and galvanized), plate steel, structural steel (wide-flange beams, beam blanks, H-piling and sheet piling) and bar steel (blooms, billets, concrete reinforcing bar, merchant bar, wire rod and special bar quality).
[6] The Company produces plates, hot and cold rolled, tin, chromium and zinc coated flat steel and supplies basic inputs to automotive, white goods, pipes and tubes, rolling, manufacturing, electrics-electronics, mechanical engineering, energy, heating equipment, shipbuilding, defense, and packaging industries.

Figure 1: Graphs of Selected Companies vs Industry Indices

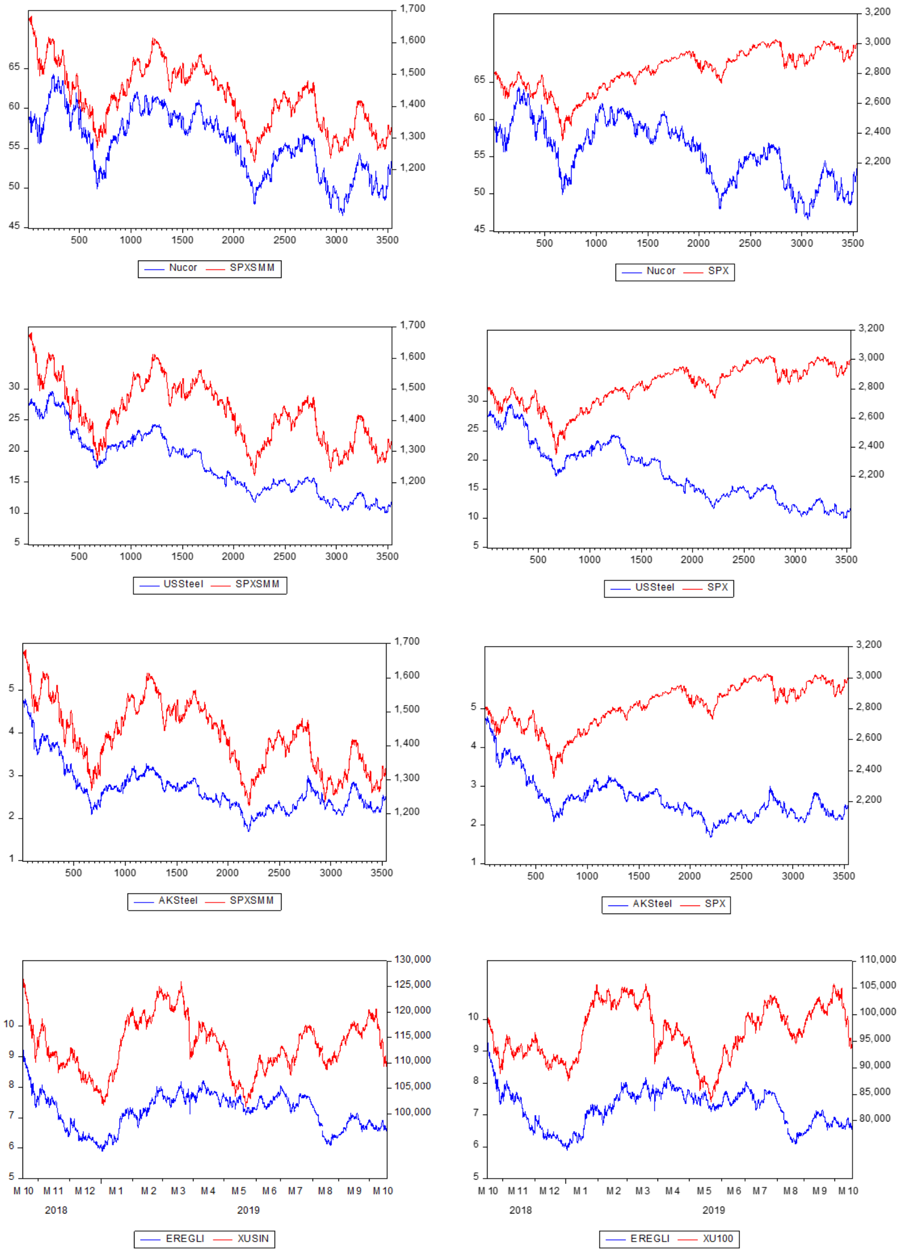


Figure 1 provides plot of selected companies versus industry indices and market indices that they are listed in. The visual inspection of the plot reveals that steel company stocks drives the performance of industry index in US while they diverge from the whole market index time by time. However, in Turkish markets company stock vs industry index and market index behave in them same way.

Table 1 illustrates descriptive statistics of return of the series. As evident from Table 1, returns of all series are negatively skewed and the kurthosis is much higher than 3 for all the cases. This is indicative of the deviation of series from the normal distribution which is also supported with Jarque-Bera statistics. Further the stationarity of the variables has been examined using Augmented Dickey-Fuller (ADF) unit root test. The null hypothesis of the unit root is rejected for all return series. Returns of all series are calculated by taking the first differences of the logarithm of the two successive prices i.e. $r_t = \log(P_t - P_{t-1})$ which are RCRUDE, RSPX, RSPXSMM, RXU100, RXUSIN, RNUCOR, RAKSTEEL, RUSSTEEL, and REREGLI. Time series graphs of the returns have been illustrated which exhibits vividly how volatility has varied in the last one year while we experienced many twitter cases of Trump in Figure 2. It is visible that industry indices (SPXSMM and XUSIN) experience more volatility clustering than the whole market indices (SPX and XU100).

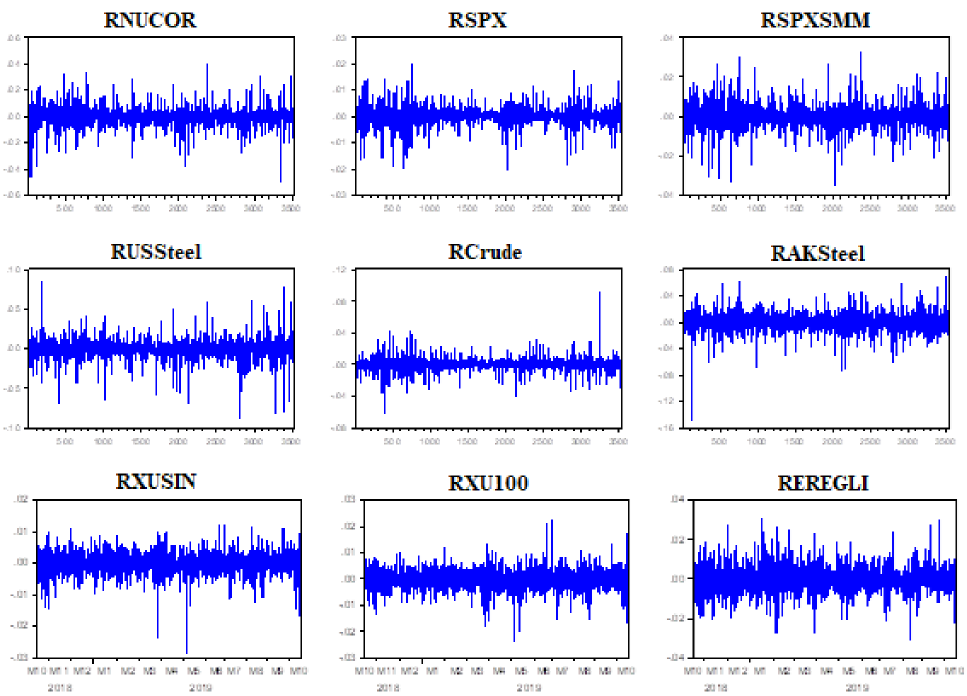
Table 1:
Descriptive statistics of Return Series

	RAKSTEEL	RCRUDE	RNUCOR	RSPX	RSPXSMM	RUSSTEEL	REREGLI	RXU100	RXUSIN
Mean	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Median	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Maximum	0.068	0.092	0.040	0.020	0.033	0.085	0.031	0.022	0.012
Minimum	-0.150	-0.062	-0.050	-0.021	-0.035	-0.088	-0.031	-0.024	-0.029
Std. Dev.	0.011	0.006	0.005	0.003	0.004	0.009	0.005	0.003	0.003
Skewness	-0.817	0.522	-0.392	-0.454	-0.202	-0.699	0.118	-0.455	-1.057
Kurtosis	17.66	29.41	16.89	14.03	12.67	21.63	7.75	10.23	12.55
Jarque-Bera	32064.92	103007	28553.25	18056.09	13813.9	51473.64	4207.938	9896.132	17829.99
Probability	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ADF Test (Level)	-61.970	-59.081	-62.987	-57.762	-59.128	-60.428	-65.254	-64.594	-65.2365
	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]	[0.0001]

Notes: between parantheses: p-values. The number of observations is 3539 for RAKSTEEL, RCRUDE, RNUCOR, RSPX, RSPXSMM, RUSSTEEL and 4417 for REREGLI, RXUSIN and RXU100. JB are the empirical statistics for Jarque-Bera test for normality based on skewness and excess kurtosis.
ADF Test refers to Augemented Dickey Fuller test for the presence of unit root for log differences (returns).

Dummy variables for trade war and monetary policy and FED decision news are created based on 584 individual news about trade war and 88 individual news for monetary policy and FED by matching them semi-hourly asset data one by one. Whenever there is news in the market about trade wars and monetary policy the dummy variables takes the value of "1" and otherwise "0". With the interaction dummy variables we test the impact of cross-asset returns on both return and volatilities of steel industry companies when news about trade war and monetary policy is spread out in the market.

Figure 2: Graphs of Returns of Selected Companies and Market Indices



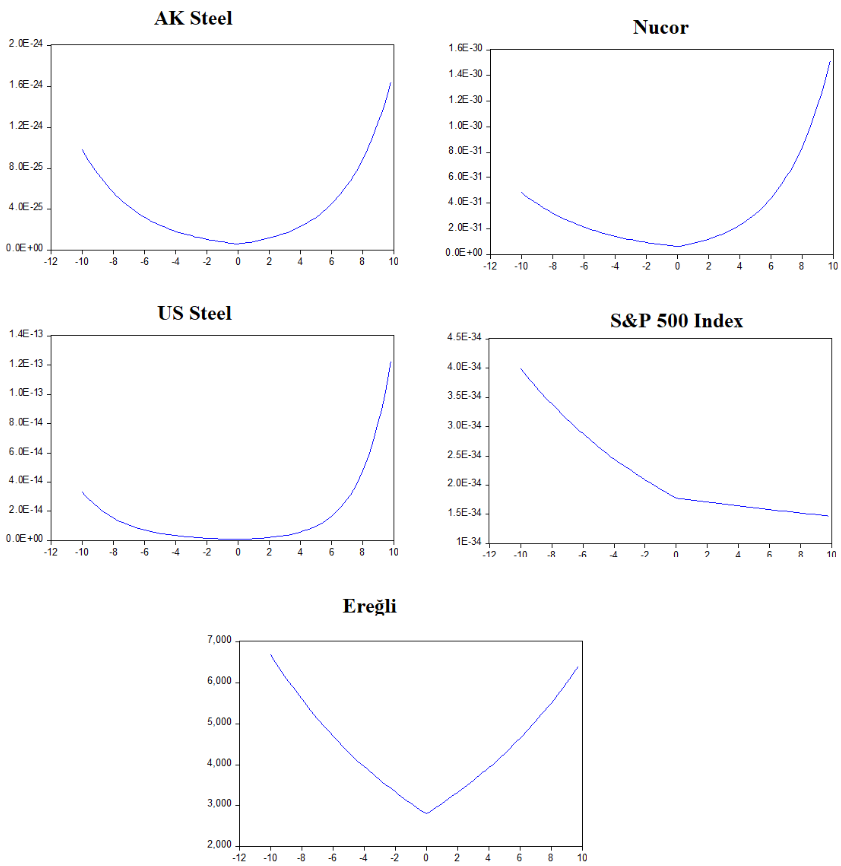
5. EMPIRICAL RESULTS

Having performed unit root tests next step is to run different versions of GARCH models for major steel companies in US, S&P 500 index and Ereğli stocks to test the news spillover impact in Turkish financial markets. In Table 2-Panel A, the results of multivariate GARCH models indicate that coefficients of interaction variables are all positive and significant at %1 significance level in the mean equation. For the variance equation the interaction variables are still valid and significant at %1 level however their volatility varies due to the related asset. We will analyze Panel B results one by one for the selected companies. Results from GARCH models delineate that whenever there is a news about trade wars and FED interest rate decisions or monetary policy of FED in the markets, it is expected to increase the return of AK Steel, US Steel, Nucor and S&P 500. For Ereğli only trade war news seems valid for the same hypothesis.

In Table 3-Panel A results of the multivariate EGARCH models also indicate the same results with Table 2-Panel A with only Ereğli is an exception. Only the sign of tradewar*rereğli interaction term changes in EGARCH models for the mean equations. However, more significant difference is observed in the variance equation in which the impact of interaction terms significantly increased in EGARCH models.

Panel B of Table 2 summarizes the results of GARCH models for the selected companies and S&P 500 index. The sum of the coefficients of the lagged squared error and the lagged conditional variance are close to unity (0.99) for S&P 500 index implying that shocks to conditional variance are highly persistent. For AK Steel, US Steel, Nucor and Ereğli the impact of persistency is lower compared to S&P 500. Interaction terms have a volatility reducing impact for AK Steel, Nucor, and S&P 500 index while for US Steel and Ereğli the interaction terms have a positive impact on volatility.

Figure 3: News Impact Curves of Selected Assets



Hence EGARCH models are important for us to obtain News Impact Curves (NICs) and test the leverage effect (Figure 3). Any news increases volatility however if the news is “good” volatility increases along the right side of the curve. If the news is “bad” volatility increases along the left side of the curve. Since for AK Steel, US Steel and Nucor right side of the NICs is steeper than the left side, a positive ε_t shock will have a bigger effect on volatility than a negative shock of the same magnitude.

For Ereğli stocks the NIC is nearly symmetric which suggests that any news good or bad has the same impact on the volatility of returns. Finally, S&P 500 index, since the left side of the curve is steeper than the right side, a negative ε_t shock will have bigger effect on volatility than a negative shock of the same magnitude which is quite consistent with an approach that S&P 500 index represents the whole financial markets.

Table 2:
GARCH Models

Panel A-Mean Equation Parameters	**GARCH (AK Steel)**	**GARCH (US Steel)**	**GARCH (Nucor)**	**GARCH (Ereğli)**	**GARCH (SPX)**
c	NA*	NA*	NA*	NA*	0.0000 [0.00143]
russteel	0.3265 [0.0000]		0.1082 [0.0000]		
rspxsmm	1.1332 [0.0000]	1.0467 [0.0000]	0.6918 [0.0000]		
tradewarraksteel	0.4872[0.0000]				
monetary*raksteel	0.4798 [0.0000]				
rxusin				1.2819 [0.0000]	
rcrude			0.0418 [0.0000]		0.1240 [0.0000]
tradewar*rnucor			0.2578 [0.0001]		
monetary*rnucor			0.2968 [0.0000]		
raksteel		0.1979 [0.0000]			
tradewar*russteel		0.4476 [0.0000]			
monetary*russteel		0.2923 [0.0000]			
monetary*rpsx					0.7063 [0.0000]
tradewar*rspx					0.8857 [0.0000]
tradewar*reregli				-0.6017 [0.0000]	
Panel B-Variance Equation	**GARCH (AK Steel)**	**GARCH (US Steel)**	**GARCH (Nucor)**	**GARCH (Ereğli)**	**GARCH (SPX)**
ω	0.0000 [0.0006]	0.0000 [0.0000]	0.0000 [0.0000]	0.0000 [0.0000]	0.0000 [0.0000]
α	0.0121 [0.0344]	0.2473 [0.0010]	0.1343 [0.0000]	0.0711 [0.0000]	0.0178 [0.0000]
β	0.5798 [0.0000]	0.0726 [0.0000]	0.1945 [0.0000]	0.5549 [0.0000]	0.9791 [0.0000]
raksteel	-0.0000 [0.0000]	0.0066 [0.0000]			
monetary*raksteel	-0.0032 [0.0000]				
tradewar*raksteel	-0.0010 [0.0031]				
rcrude			0.0000 [0.0000]		
rnucor			0.0000 [0.0000]		
tradewar*rnucor			-0.0002 [0.0000]		
rspxsmm			-0.0000 [0.0000]		
russteel		-0.0004 [0.0013]			
tradewar*russteel		0.0001 [0.0000]			
monetary*rpsx					-0.0003 [0.0000]
tradewar*rspx					-0.0001 [0.0000]
monetary*reregli				0.0008 [0.0000]	
tradewar*reregli				0.0006 [0.0000]	
rxusin				-0.0003 [0.0000]	
R2	0.5231	0.5829	0.6473	0.4902	0.2274
DW	2.2490	2.0872	2.2845	1.9970	1.9318

Notes: Between parantheses: p-values.
NA* refers to the omitted constants in the models since they were statistically insignificant for the related models.

Also when we compare R^2 values, it is clear that the logic of our GARCH models for selected companies are much more successful than S&P 500 index referring that specific news such as trade wars, FED decisions and monetary policy are more significant for individual company stocks.

As a result, we can conclude that tweets and specific news about trade wars and monetary policy as well as FED decisions have an impact on the volatility of steel companies. Since those new shocks are created mostly by the actors who have the market power, their impact should be analyzed more carefully from a market speculation perspective.

Table 3:
EGARCH Models

Panel A-Mean Equation Parameters	EGARCH (AK Steel)	EGARCH (US Steel)	EGARCH (Nucor)	EGARCH (Ereğli)	EGARCH (SPX)
c	0.0004 [0.0003]	NA*	NA*	NA*	0.0000 [0.1594]
russteel	0.3191 [0.0000]		0.1112 [0.0000]		
rspxsmm	1.1464 [0.0000]	1.0344 [0.0000]	0.6957 [0.0000]		
tradewarraksteel	0.4697 [0.0000]				
monetary*raksteel	0.4674 [0.0000]				
rxusin				1.2375 [0.0000]	
rcrude			0.0398 [0.0000]		0.1049 [0.0000]
tradewar*rnucor			0.2399 [0.0000]		
monetary*rnucor			0.2620 [0.0001]		
raksteel		0.2023 [0.0000]			
tradewar*russteel		0.4599 [0.0000]			
monetary*russteel		0.3159 [0.0048]			
monetary*rpsx					0.7400 [0.0000]
tradewar*rspx					0.8897 [0.0000]
tradewar*reregli				0.55060 [0.0000]	
Panel B-Variance Equation	**EGARCH (AK Steel)**	**EGARCH (US Steel)**	**EGARCH (Nucor)**	**EGARCH (Ereğli)**	**EGARCH (SPX)**
ω	-5.2092 [0.0000]	-7.2433 [0.0000]	-7.2713 [0.0000]	-0.3041 [0.0000]	-0.0908 [0.0000]
α	0.3126 [0.0000]	0.4559 [0.0000]	0.2657 [0.0000]	0.0860 [0.0000]	0.0309 [0.0000]
λ	0.0289 [0.0000]	0.0709 [0.0000]	0.0604 [0.0000]	-0.0011 [0.7907]	-0.0502 [0.0000]
β	0.4936 [0.0000]	0.3330 [0.0000]	0.3921 [0.0000]	0.9785 [0.0000]	0.9943 [0.0000]
raksteel	-8.4595 [0.0000]	5.9383 [0.0000]			
monetary*raksteel	-25.701 [0.1229]				
tradewar*raksteel	-13.849 [0.0000]				
rcrude			5.1207 [0.0000]		-1.8468 [0.0000]
rnucor			6.1879 [0.0000]		
tradewar*rnucor			-53.7627 [0.0000]		
rspxsmm			-17.559 [0.0000]		
russteel		-10.543 [0.0000]			
tradewar*russteel		-19.546 [0.0059]			
monetary*rpsx					-43.977 [0.0000]
tradewar*rspx					-19.765 [0.0000]
monetary*reregli				34.838 [0.0000]	
tradewar*reregli				-1.2168 [0.5768]	
rxusin				-14.177 [0.0000]	
R2	0.5212	0.5829	0.6461	0.4908	0.2091
DW	2.2406	2.0871	2.2857	1.9970	1.9309

Notes: Between parantheses: p-values.
NA* refers to the omitted constants in the models since they were statistically insignificant for the related models.

5. CONCLUSION

During his election campaign, Trump made several references to the US steel industry and vowed to protect US steel jobs, which are under threat due to higher imports. After Trump's election in 2016, we saw a rally in equity markets. Trump was expected to protect steel companies from the onslaught of steel imports. Recent trade war news and monetary policy news mainly including Trump and Powell (and/or China) conflicts brought a new dimension to the news effect approach in volatility modeling. As one the major market makers, Trump's direct messages to the market via Twitter and such, about sanctions, interest rates and monetary policy creates "Black Noise" in financial markets. Even in a durable production industry like steel sector this leads to speculation. Although there are recent studies which claim that Trump's tweets carry transitory impact, but it's very short-term and doesn't appear to last, Analysts at JPMorgan Chase have created an index[7] to gauge the impact of Donald Trump's tweets on US interest rates. In order to test this impact more efficiently our approach was to utilize high frequency semi-hourly data and related news but matching them exactly on the time they are announced.

For further research papers testing the speculation strength of such tweet can be a beneficial topic for the other researchers.

[7] Analysts at JPMorgan Chase have created an index to gauge the impact of Donald Trump's tweets on US interest rates

REFERENCES

Cappiello, L., Engle, Sheppard, K., (2006), Asymmetric Dynamics in the Correlations of Global Equity and Bond Returns, Journal of Financial Econometrics, Vol. 4, No. 4, pp. 537–572

Chen, X., Ghysels, E., (2010), News-Good or Bad-and Its Impact on Volatility Predictions over Multiple Horizons, The Society for Financial Studies, Oxford University Press.

Cove, S., College, R., and Sardy, M., (2019), How Presidential Tweets Affect Financial Markets

Fama, E. (1970. Efficient capital markets: A review of theory and empirical work, Journal of Finance, 25(2), 383-417

Forbes, K., J., and Rigobon, F. (2001), Measuring Contagion: Conceptual and Empirical Issues in International Financial Contagion (Eds) Claessens, S., and Forbes, K., New York: Springer, 43-66

Goldstein, J., and Martin, L., L., (2000), Legalization, trade liberalization, and domestic politics: A cautionary note, International Organization, 54(3), 603-632

Jensen, M., Nathan (2007), International institutions and market expectations: Stock price responses to the WTO ruling on the 2002 US steel tariffs, Springer Science+ Business Media, 2: 261-280

Kaminsky, G., L., Reinhart, C., M., Vegh, C., A., (2003), The unholy trinity of financial contagion, The Journal of Economic Perspectives, Vol. 17, No. 4 (Autumn, 2003), pp. 51-74

King, M., A, Wadhwani, S., (1990), Transmission of volatility between stock markets, The Review of Financial Studies, 57(2), 769-799

Kodres, L., E., and Pritsker, M., (1998), A rational expectations model of financial contagion, Finance and Economics Discussion Series 1998-48, Board of Governors of the Federal Reserve System (US).

Lo, A. W., and MacKinlay, A., C., (1999), A non-random walk down wall street, Princeton, NJ: Princeton University Press

M. Guidolin et al. (2019), Cross-asset contagion in the financial crisis: A Bayesian timevarying parameter approach,Journal of Financial Markets 45 (2019) 83-114

Nelson, B., D, (1991), Conditional Heteroskedasticity in Asset Returns: A New Approach, Econometrica, Vol. 59, No. 2., pp. 347-370.

Sensier, M., Van Dijk, D., (2004). Testing for volatility changes in US macroeconomic time series, The Review of Economics and Statistics, 86 (3), 833-839

Stock, J.H., Watson, M.W., (1996). Evidence on structural instability in macroeconomic time series relations, Journal of Business & Economic Statistics, 14 (1), 11-30.

Tafti, A., Zotti, R., Jank, W., (2016), Real-Time Diffusion of Information on Twitter and the Financial Markets, PLos ONE, Vol. 11(8)

https://m.economictimes.com/markets/stocks/news/volfefe-index-to-track-trump-tweet-impact/articleshow/71059008.cms