ISTANBUL TECHNICAL UNIVERSITY ★ GRADUATE SCHOOL OF ARTS AND SOCIAL SCIENCES

THE EFFECTS OF THE EXCHANGE RATE VOLATILITY ON TURKISH EXPORTS: A PANEL DATA ANALYSIS

M.A. THESIS

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İSTANBUL TEKNİK ÜNİVERSİTESİ ★ SOSYAL BİLİMLER ENSTİTÜSÜ

DÖVİZ KURU OYNAKLIĞININ TÜRKİYE' NİN İHRACATINA ETKİLERİ: BİR PANEL VERİ ANALİZİ

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Halil İbrahim AKIL, a M.A. student of ITU Graduate School of Arts and Social Scieences, 412131008, successfully defended the thesis entitled “THE EFFECTS OF THE EXCHANGE RATE VOLATILITY ON TURKISH EXPORTS: A PANEL DATA ANALYSIS”, which he prepared after fulfilling the requirements specified in the associated legislations, before the jury whose signatures are below.

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SUMMARY

After the collapse of the Bretton Woods system(1946-1973), most of countries started to adopt the floating exchange rate system. Several research has focused the interaction between volatility of exchange rate and export performance of the countries after this period. Turkish export shows an increasing trend in 2000s with floating exchange rate regime. Literature documents that Turkish export has been significantly affected from volatility of exchange rate. In this paper, I analyze the impact of the exchange rate volatility on Turkish sectoral basis export volume. By considering the regime effect, I only cover the data for the period of 2001-2018, in which floating exchange rate regime adopted in Turkey. I estimate the volatility of exchange rate by following GARCH methodology and use the fixed effect estimator and quantile regression for my panel data estimation. The Turkish sectoral basis export data, spanning in the period 2001Jan-2018Dec, which is classified as ISIC Rev.3 in terms of dollar price was based for the panel data. My estimation reveals that volatility of the exchange rate significantly impedes Turkish export in the sample period. Especially, the impact of volatility becomes in higher magnitudes for the period after recent global crisis. Both fixed effect and quantile regression estimations document the similar evidence. On the other hand I observe that volatility has opposite effect for the lower quantiles in our sample period. Evidently, volatility of exchange rate in higher levels would be an important threat for the firms and Turkey's export oriented growth policies. Therefore policies aiming to lower the volatility of exchange rate would support the growth of export volume and reduce the risks on the export strategies in Turkey.

DÖVİZ KURU OYNAKLIĞININ TÜRKİYE' NİN İHRACATINA ETKİLERİ: BİR PANEL VERİ ANALİZİ

ÖZET

Bu çalışmada Türkiye'de döviz kuru oynaklığının sektörel bazda ihracat hacmine etkisi incelenmektedir. Bretton Woods (1946-1973) sisteminin çöküşünden sonra bir çok ülke dalgalı döviz kuru rejimini uygulamaya başlamıştır. Bu tarihten sonraki dönemde döviz kuru oynaklığı ve uluslararası ekonomik dinamiklerin ilişkisi daha çok sorgulanmaya başlamıştır. Bu konuların en önemlilerinden birisi de döviz kuru oynaklığının ihracat hacmini etkileyip etkilemediği olmuştur.

Türkiye 1980 lerde ihracat odaklı büyüme modeli benimsemeye başlamıştır. Bazı ihracat odaklı politikalar liberalleşme sürecinin bir parçası olarak başarılı bir şekilde hayata geçirilmiştir. Finansal liberalleşme de bu sürecin önemli adımlarından biridir. 1980 yılına kadar Türkiye'de sabit kur rejimi uygulanmıştır. 80 lerden başlayarak 1999 a kadar çıpalı kur sistemi uygulanmıştır. 1999-2001 arası kaygan kur politikası uygulanmış ve 2001 deki kriz sonrasında atılan adımlar gereği dalgalı kur rejimine geçilmiştir.

Türkiye ihracat performansına baktığımız zaman 2000'li yıllarda artış trendi gösterdiği gözlemlenmektedir. İmalat sektöründe yapılan ihracat miktarı 2000'li yıllarda genel eğilime uyarak artış trendi göstermiş ve 2018 yılında 150 milyar $ seviyesinin üzerine ulaşmıştır. 2001 den önce 25 milyar $ seviyelerinde dalgalanmış ve 2008 de çok sert düşüş yasada 2011 yılında 150 milyar $ seviyelerine yakın seyretmiştir. Tarım ve madencilik sektörlerinde ihracat performansı da benzer şekilde 2000 li yıllarda artış trendi göstermiştir. Tarım sektörünün farklı olarak 2008 global krizi sonrası ihracat performansında bir değişiklik olmamıştır. Madencilik ve tarım sektörü ihracat rakamları 1996-2001 yılları arasında sırasıyla 0.4 milyar ve 2 milyar $ seviyelerinde dalgalanırken bu rakamlar 2013 de sırasıyla 4 $ ve 6 milyar $ seviyelerine ulaşmıştır. Balıkçılık ve toptan ticaret sektörünün ihracat rakamları da son 20 yıllık periyot da artış trendi göstermiştir. Bu sektörler 2018 yılında sırasıyla 4 milyar $ 6 milyar $ seviyelerinin üzerinde seyretmiştir.

Clark (1973) ve Eithers (1973)' in çalışmaları döviz kuru oynaklığının ihracat hacmini olumsuz yönde etkilediğini teorik çerçevede ilk olarak ortaya konulduğu çalışmalardır. Bu çalışmayı destekleyen veya aksini ispat eden çeşitli hem teorik hem ampirik çalışmalar devam eden yıllarda ortaya konulmuştur.

Literatürde bu soru bağlamında Türkiye örneği de çeşitli çalışmalarda ele alınmıştır. Bu çalışmanın amacı sektörel bazda panel veri seti kullanılarak 2001-2018 döneminde döviz kuru oynaklığının ihracat hacmine etkisi incelemektir. Literatürde Türkiye verileriyle yapılan bazı çalışmalarda ihracatın döviz kuru oynaklığından istatistiki olarak anlamlı bir şekilde etkilendiği ortaya konulmuştur.

Literatürde ispatlanan döviz kuru rejiminin oynaklığa etkisi göz önüne alınarak bu çalışmada sadece esnek döviz kuru rejiminin benimsendiği period dikkate alınmıştır.(2001-2018) Tahminler kullanılırken 2001-2018 dönemini kapsayan aylık seviyede veriler kullanılmıştır. Döviz kuru oynaklığı GARCH metodolojisi takip edilerek tahmin edilmiştir. Tahmin yapılmadan önce günlük bazda nominal döviz kuru dikkate alınmıştır. Günlük bazda nominal döviz kuru düzeyde durağan olmadığından öncelikle logaritmik farkları elde edilerek durağan hale getirilmiştir. Daha sonra elde edilen logaritmik farkların karesi için kolleogram tablosu elde edilmiş ve burada GARCH metodunun uygulanması için gerekli şartların sağlandığı ortaya konulmuştur. Daha sonra GARCH(1,1) tahmin metodu takip edilmiş elde edilen sonuçların GARCH method takip etmenin koşullarını sağladığı gözlemlenmiştir. GARCH(1,1) tahminiyle elde edilen kalıntılarda artık GARCH etkisinin devam etmediği yine kolleogramla gösterildikten sonra GARCH(1,1) tahmininden "volatilite" (oynaklık) serisi elde edilmiştir. Sonrasında elde edilen oynaklık verisi aylık baza dönüştürülerek regresyon analizlerinde kullanılmıştır.

İhracat verisi için uluslararası endüstriyel sınıflandırma standartlarına(Revision 3) göre 5 ana sektör; imalat, balıkçılık, tarım ve ormancılık, madencilik, toptan ve perakende, baz alınmıştır.

Tahminler Kenen ve Rodrik(1986)'in ihracat modeline göre reel döviz kuru ve ithalatçı ülke gelir düzeyi kontrol değişkenleri ile yapılmıştır. Tahminler öncelikle sadece kontrol değişkenleri ile yapılmış olup sonrasında volatilite değişkeni, bu değişkenden oluşturulmuş kukla değişken ve her ikisinin birlikte olduğu 4 farklı denklem ile yapılmıştır. Tahminle "fixed effect" tahmincisine ek olarak Koenker(2004) tarafından bulunan panel veri "quantile regression with fixed effect" tahmincisi ile yapılmıştır. "Quantile" regresyon bağımlı değişkenin bütün dağılımı üzerinde kovaryansa izin verdiği için standart linear regresyon tahmininden daha geniş ve daha güçlü bir tahmin düzeyi sağlamaktadır.

Ekonometrik metodoloji gereği tahmin yapılmadan önce modeller üzerinde birim kök ve cointegration sınamaları gerçekleştirilmiştir. Panel veri değişkeni için yapılan testlerde sektörler arası yatay korelasyon tespit edildiğinden ikinci nesil birim kök sınaması yapılmıştır. Tahminlerde Westerlund(2008) cointegration prosedürü takip edilmiştir. 1080 gözlemli veri seti ile yaptığımız tahminlere göre test ettiğimiz bütün modellerde cointegration bulunmuştur. Buradan yola çıkarak zaman serileri literatüründe önerdiği üzere modeller düzeyde tahmin edilmiştir.

Tahminlerden elde edilen bulgulara göre döviz kuru oynaklığı baz alınan veri setine göre özellikle 2008 global krizi döneminden sonra Türkiye'nin ihracat hacmini ciddi seviyede olumsuz bir şekilde etkilemektedir. %99 güven aralığı bulgularına göre döviz kuru oynaklığı da %1 lik bir artış kriz dönemi sonrası periyotta Türkiye'nin ihracat hacmini yaklaşık % 0,3 azaltmıştır.

Öte yandan bu etki quantile regresyon sonuçlarına göre kısmen desteklenmektedir. Orta ve üst yüzdelik dilim (50. ve 75. percentile) regresyonlarda kriz sonrası etki anlamsızken alt dilim(25. percentile) için anlamlıdır. Ayrıca tahminler göstermektedir ki döviz kuru oynaklığı kriz sonrası dönem ayrıştırılmadan yapılan bulgulara göre ihracat hacminde bir etkiye sahip olmayabilir. Ayrıca oynaklığın etkisinin farklı yüzdelik dilimler için ters veya farklı oranda olabileceği de tespit edilmiştir.

Bulgularım Özbay(1999), Öztürk ve Acaravci(2002) ve Güloğlu(2008) çalışmalarında bulunan sonuçlarla paralellik arz etmektedir. Çalışmam döviz kuru oynaklığının etkisi incelenirken sektörel düzeyde sınıflandırmanın ve kriz sonrası için oynaklığının ayristirilmasinin öneminin altını çizerek literatüre farklı bir perspektif sunmaktadır. Döviz kuru oynaklığının yüksek seviyelerde seyretmesi ihracat odaklı büyüme politikalarına da firmaların ihracat stratejilerine önemli bir tehdit unsuru oluşturacaktır. Bu sebeple Döviz kuru oynaklığını azaltmayı hedefleyen politikalar ihracat hacminin büyümesinin destekleyebilir ve Türkiye'nin ihracat stratejileri üzerindeki riskleri azaltabilir.

1. INTRODUCTION

In this work, I research the impact of the volatility of exchange rate on Turkish sectoral basis export volume. After the collapse of the Bretton Woods system(1946-1973), most of countries started to adopt the floating exchange rate system. After this time, many questions has arisen from the relationship between international economic dynamics and volatility of exchange rate. One of those issues is whether the volatility of exchange rate impedes the export volume or not, which has been researched for four decades. Even if there has been a huge number of both theoretical and empirical studies in this area there is no any agreed idea among this question until now. In the early 1970s, the theoretical works started reveal that volatility of exchange rate would has a significant impact on export. Clark (1973) and Eithers (1973) papers brought out first theoretical framework with the evidence of that volatility of exchange rate declines the export volume. This question has been subjected and extended by several empirical works focusing different countries export performance. Several studies also documented focusing Turkish export and exchange rate volatility and there is a growing literature about it.

Turkey started to adopt export oriented growth model at beginning of 1980s. Several export-led policies successfully completed as a part of liberalization process by the government. Financial liberalization was another complementary subject of this model. Turkey has been adopted fixed exchange rate regime until 1980. Starting from 1980, Turkey implemented adjustable peg policy to support export oriented growth policies until 1999. Following this policy, Turkish Lira daily adjusted with devaluations during this period and the average rate of depreciation was more than 6 percent particularly between 1980-1988 according to Civcir(1996) and Keyder(2002). In 1999, exchange rate system was changed to crawling peg policy as a consequences of stabilization program directed by International Monetary Fund (IMF). The program was targeting to stable economy with policies focus on inflation and real interest rate. And the policy for exchange rate was aiming to notice the value of exchange rate

basket for a half-year period (CBRT, 2002). But this program was not accomplished since Turkey faced a major financial crisis in February 2001. After the crisis, Turkey decided to shifting floating exchange rate regime.

Turkish export shows an increasing trend in 2000s with floating exchange rate regime. Figures 1.1-1.3 below illustrate export levels in terms of US Dollars in the last two decades for five main sectors; agriculture and foresty, fishing, mining and quarrying, manufacturing and, whole and retail trade. The classification of the sectors was adapted by the International Standard Industrial Classification of all Economic Activities -Revision 3 (ISIC Rev. 3rd).

Figure 1.1 : Export Levels by ISIC, Rev. 3rd

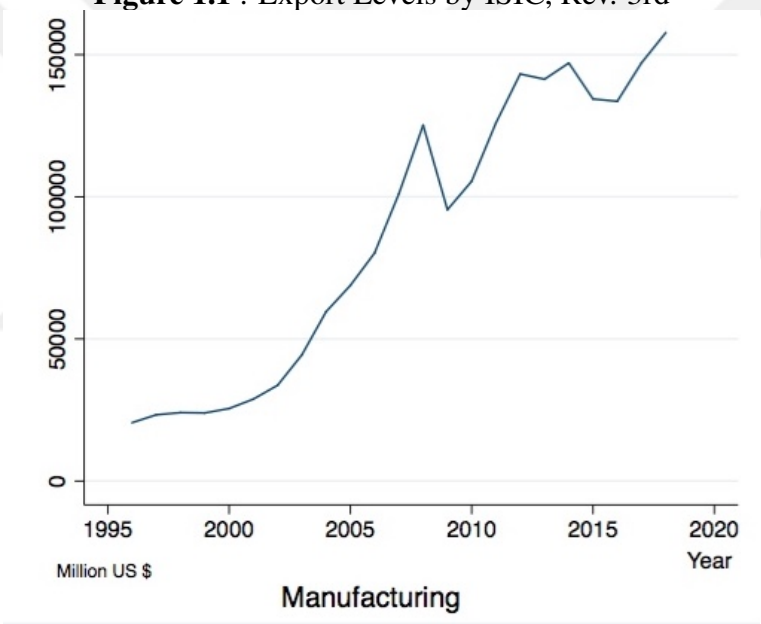


Figure 1.1 shows export level of the manufacturing sector for the period of 1996-2018. The sector performs an increasing trend in 2000s and it picks in 2018 above 150 billion US dollar. While the level of export fluctuated around 25 billion before 2001 and this level became closer to 150 billion after 2011. It could be easily observed that there was a sharp decline (25 billion)in the manufacturing exports after the 2008 global crisis.

Figure 1.2 : Export Levels by ISIC, Rev. 3rd

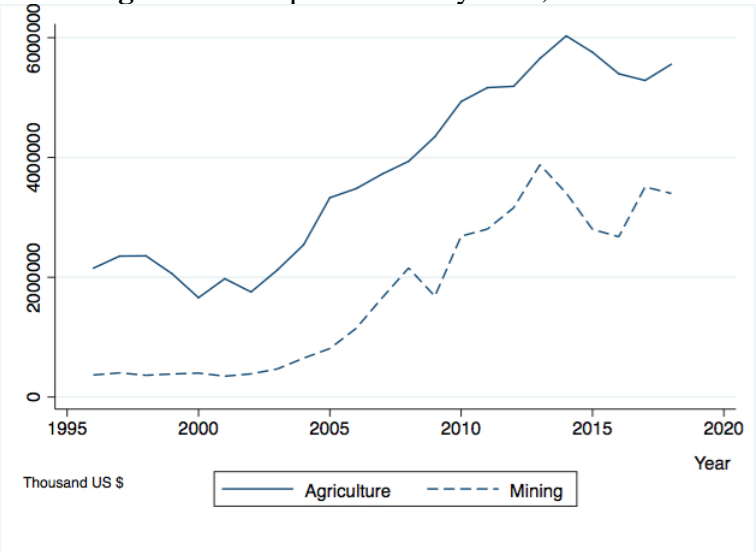


Figure 1.2 illustrates the export level of two sectors, agriculture and mining, for the same period. Both of them performed a stable increasing trend after 2001 until 2014 with just a year break in 2009 for the mining sector. Agriculture sector differently did not decline during the recent global crisis. Levels of export for mining and agriculture sectors fluctuated about 0.4 and 2 billion US dollar before 2001 and both sectors' export performance picked to 4 and 6 billion in 2013 respectively.

Figure 1.3 : Export Levels by ISIC, Rev. 3rd

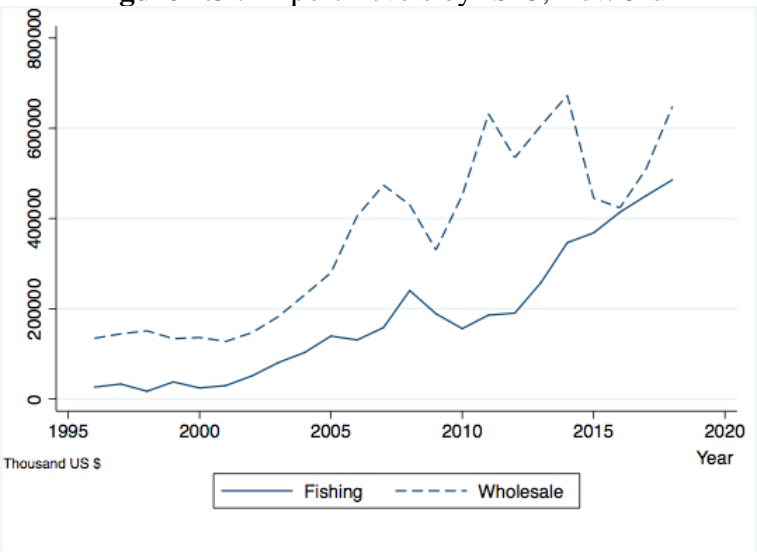


Figure 1.3 above shows the same statistics for the rest two sectors, fishing and wholesale trade. Similar to other sectors export level in the both of them rose during 2000s. While export levels were lower than 2 billion US dollar before 2003, wholesale trade sector fluctuated around 6 billion after 2010 and fishing sector reached above 4 billion US dollar after 2015.

We could see the facts from the figures that all of sectors performs increasing trend after the break in the recent global crisis until 2014. Especially manufacturing and agriculture sectors showed more stable increasing trend and manufacturing sector always has the biggest share in aggregate export volume, which reached above 150 billion US dollar level in 2018. Another fact is that export in the agriculture sector unlike to others did not break during the the recent global crisis. And export performance of the all sectors without fishing, showed a pattern closer to U- shape during the period of 2013- 2018.

In this paper, by considering the export sectors classification as like above (ISIC Rev. 3rd) for Turkey I analyze whether the volatility of exchange rate affects the Turkish export volume or not. Purpose of this work is to document the empirical evidence for this question with a panel data analysis. Some points make this work distinct from the previous studies in the literature. Firstly, by considering the exchange regime effect, as Guloglu(2008) did, I only cover the data for the period when the floating exchange rate regime adopted in Turkey. Because it was documented in the literature that exchange rate regime has significant effect on the volatility. Secondly, I decompose the impact of the recent global crisis on the volatility variable. And I estimate models by using quantile regression for panel data and fixed effect estimators together to document how the impact of the volatility differs across each quantiles of export volume. This perspective also provides comparison of the results for different estimators. On the other hand I use classification of ISIC Revision 3rd for the export sectors in Turkey, which is another point makes this study different from the literature as best of my knowledge. The remainder of the paper structured as follows. The review of the literature and estimation method of the volatility for exchange rate is showed in the following sub-sections. Section 2 presents the export model and section 3 shows econometric method followed for the estimation. Section 4 discusses the empirical results and concludes the paper.

1.1 Literature Review

The relationship between exchange rate volatility and export volume firstly questioned by Clark (1973) and Eithers (1973). Both of present the theoretical framework with the evidence of that volatility of exchange rate declines the export volume. The findings of them were supported by several empirical and theoretical works in the following years (Cushman, 1983; Peree and Steinherr, 1989; Chowdhury, 1993;Caporale and Doroodian, 1994; Arize, 1995; Wolf, 1995). Basic idea supports this result revealed by those studies is that the investors choose a risk averse strategy because of uncertainty on profits. It is implicitly assumed that volatility of exchange rate is perceived as some sources of uncertainty on profits. At this point, availability of developed financial institutions especially hedge markets brings an alternative opportunity to investors to prevent losses sourced by volatility, which might restrain relationship between trade flows and exchange rate volatility (Baron, 1976; Willett, 1986).

On the other hand there is another evidence supported by several works that the trade might benefit from high volatility. De Grauwe(1988), Franke(1991), Viaene and De Vries(1992), Sercu and Vanhulle(1992), are some works provided the evidence positive relationship between volatility of exchange rate and export volume . The main idea supported the evidence is that some firms might have some comparative advantage when the exchange rate volatility rises. Since the rise in the volatility would increase cash flow of some firms based on their positions and change in the volatility of exchange rates would also provide new options for entry- exit strategies to trade for them(Franke, 1991). Therefore their trade volume could benefit from high volatility.
The another perspective in this literature is whether the impact of the volatility would differ for developing and developed countries, which was firstly pointed out by Doroodian(1999). And Doroodian(1999), Chou(2000), Achy and Sekkat(2003) found negative effect of volatility on trade with their works based developing countries, while the research of McKenzie and Brooks(1997) revealed that German-US trade benefited from volatility of exchange rate.

Several studies also documented for the case of Turkey about the relationship between export volume and exchange rate volatility in the literature. Ozbay(1999) firstly

brought the empirical evidence that rise in the exchange rate volatility declines the export volume in Turkey. In this work he used aggregate quarterly data for the period of 1988-1997 and followed cointegration methodology. I provide the list of the works and some details about their methodology in the Table 1.1[1] below:

Table 1.1 : Works Focus on Turkey

Study	Data type	Period	Method	Impact of Volatility
Ozbay(1999)	Aggregate	1988q2-1997q2	Cointegration	Negative
Ozturk and Acaravci(2002)	Aggregate	1989 Jan-2002 Aug	Cointegration	Negative
Vergil(2002)	Bilateral	1990 Jan-2000 Dec	Cointegration	Negative for US, France and Germany; insignificant for Italy
Kasman and Kasman(2005)	Aggregate	1982q1-2001q4	Cointegration	Positive
Guloglu(2008)	Aggregate	1982 Jan-2006 Dec	MS-ARCH	Negative
Ozturk and Kalyoncu (2009)	Aggregate	1982q1-2005q4	Cointegration	Positive
Nazlioglu(2012)	Industry	1980-2009	Cointegration	Positive

Ozturk and Acaravci(2002) found the similar result by following same methodology but he used monthly aggregate data(1989-2002). Another evidence for the negative relationship between volatility of exchange rate and export volume provided by Guloglu(2008) for Turkey. In this work he applied Markow Switching ARCH technique for monthly aggregate data(1982-2006). He also documented the fact that exchange rate regimes would have opposite impacts on the volatility of exchange rate. He showed that floating exchange rate increases the volatility while the crawling peg regime decreases the volatility of exchange rate in Turkey. This finding was my departure to apply my estimation only for the period adopted floating exchange rate regime in Turkey due to availability of data enough for this period now. Vergil(2002) showed that volatility of exchange rate has no impact on Turkey's export to Italy while it negatively affects export to US, France and Germany. He documented this result by following cointegration methodology with bilateral monthly data.

As the evidence documented by Kasman and Kasman(2005), Ozturk and Kalyoncu(2009) and Nazlioglu(2012), exchange rate volatility contributes to Turkish export

[1] Source: Nazlioglu (2012) and updated.

unlike to results of other works above. Nazlioglu(2012) applied a panel data cointegration method for export of 20 industries to important trading countries by using industrial level monthly bilateral data(1980-2009) to avoid aggregation bias problem.

I present the details about the methodologies for volatility estimation of the exchange rate in the literature in the next section.

1.2 Volatility of Exchange Rate

Importance of the exchange rate volatility and its forecasting risen in the last four decades. Understanding the characteristics of volatility of exchange rate has brought questioning the implications of volatility on several macroeconomics dynamics such as international trade, policies and operations on exchange rate market, hedge options of firms. Clearing up volatility of exchange rate and its impact helps us taking away uncertainty by lowering risk on export and import strategies, reducing hedge cost of firms, enabling more efficient operations for central banks and policies for governments. It was revealed by the earlier theoretical works, which is volatility of exchange rate has a significant impact on export. Clark (1973) and Eithers (1973) papers brought out first theoretical framework with the evidence of that volatility of exchange rate impedes export. While many researchers were finding out similar or different results following their work, the methods of modelling volatility also were developed beyond that. In the most recent studies GARCH model has been used to measure the volatility of exchange rate(Dorodion, 1999; Bahmani-Oskooee and Mitra, 2008; Nazlioglu, 2012). Former studies adopted other several methods such as such as standart deviations of percantage change, ARMA, ARCH (Engle, 1983) and linear moment LM model (Antle, 1983). In order to estimate the volatility of exchange rate I simply examined GARCH methodology since it best fits the heteroscedastic dynamics of exchange rate to obtain it (Bollerslev, 1986). I estimate GARCH(1,1) by following Bollerslev(1986)'s general model; let assume that E_t, exchange rate, has following GARCH(1,1)(Bollerslev 1986) property:

$$E_t = \sigma_t \eta_t,\ \eta_t \sim i.i.d.\ N(0,1), \tag{1.1}$$

$$\sigma_t^2 = \omega + \alpha E_{t-1}^2 + \beta \sigma_{t-1}^2, \tag{1.2}$$

where σ_t^2 is conditional variance of E_t, is conditional on the information at $t-1$. By theorem of GARCH, it is necessary that $E_t^2$to have finite unconditional variance, which is controlled by the condition; $\alpha + \beta < 1$.

When the condition is satisfied, $E(E_t)^2 = \frac{\omega}{[1-(\alpha+\beta)]}$ and where $\alpha \neq 0$ is required. I follow this methodology of Bollerslev (1986) by using daily nominal exchange rate data for the period of 2001-2018. Before starting the estimation I check the data if we can follow this methodology. The following table (1.2) shows the correlogram for the square of the return(logarithmic difference) of the series.

Table 1.2 : Correlogram Table

Sample: 1/02/2001 12/31/2018
Included observations: 4530

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.150	0.150	102.56	0.000
		2	0.141	0.121	192.35	0.000
		3	0.027	-0.011	195.55	0.000
		4	0.010	-0.009	196.04	0.000
		5	0.009	0.007	196.42	0.000
		6	0.007	0.006	196.66	0.000
		7	0.008	0.005	196.95	0.000
		8	0.022	0.019	199.15	0.000
		9	0.013	0.006	199.91	0.000
		10	0.031	0.024	204.23	0.000
		11	0.003	-0.007	204.27	0.000
		12	0.003	-0.004	204.30	0.000
		13	0.006	0.007	204.48	0.000
		14	0.005	0.004	204.61	0.000
		15	0.002	-0.001	204.62	0.000
		16	0.002	-0.000	204.64	0.000
		17	0.004	0.004	204.72	0.000
		18	0.006	0.004	204.88	0.000
		19	0.009	0.006	205.22	0.000
		20	0.011	0.007	205.76	0.000
		21	0.042	0.039	213.85	0.000
		22	0.029	0.016	217.58	0.000
		23	0.071	0.057	240.84	0.000
		24	0.082	0.062	271.82	0.000
		25	0.001	-0.035	271.83	0.000
		26	0.008	-0.008	272.11	0.000
		27	0.004	0.008	272.19	0.000
		28	0.015	0.014	273.27	0.000
		29	0.008	0.000	273.56	0.000
		30	0.002	-0.005	273.59	0.000
		31	0.006	0.000	273.73	0.000
		32	0.021	0.018	275.71	0.000
		33	0.009	-0.000	276.06	0.000
		34	0.014	0.005	277.00	0.000
		35	0.007	0.005	277.22	0.000
		36	0.003	-0.002	277.25	0.000

Since the all probability statistics is significant, evidently we can follow the GARCH methodology. I estimate GARCH(1,1) as the theorem above by using daily exchange rate and use the residuals for the volatility series. Then, I obtain the monthly volatility variable by transforming the series. Table 1.3 below shows that data supports using GARCH estimation since the necessary condition that $\alpha + \beta < 1$ is evidently satisfied.

Table 1.3 : GARCH Estimation

Sample (adjusted): 1/03/2001 12/31/2018
Included observations: 4530 after adjustments
Convergence not achieved after 500 iterations
Presample variance: backcast (parameter = 0.7)
GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.004014	0.018160	0.221053	0.8251
Variance Equation				
C	0.228329	0.006683	34.16466	0.0000
RESID(-1)^2	0.207067	0.013307	15.56040	0.0000
GARCH(-1)	0.638665	0.012194	52.37687	0.0000

Table 1.4 below also shows the output of the ARCH LM Test for the residuals of the GARCH(1,1) estimation with my data set. Result gives the evidence that there is no any other GARCH effect in the residuals of the estimation since the probability statistics are insignificant as the test. One detail here is that I estimate nominal exchange rate volatility while some researcher obtained reel exchange rate volatility in their models. Because McKenzie and Brooks(1997) provides empirical evidence that volatility in reel exchange rate resulted by nominal exchange rate volatility and difference between two measurement does not have an important impact in the volatility estimates.

Table 1.4 : ARCH LM Test

Heteroskedasticity Test: ARCH

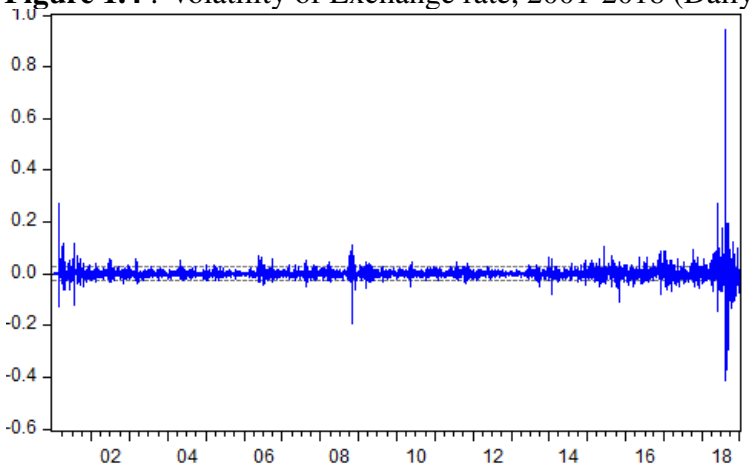
F-statistic	0.002307	Prob. F(20,4489)	1.0000
Obs*R-squared	0.046350	Prob. Chi-Square(20)	1.0000

Test Equation:
Dependent Variable: WGT_RESID^2
Method: Least Squares
Date: 06/13/19 Time: 21:07
Sample (adjusted): 1/31/2001 12/31/2018
Included observations: 4510 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.000337	0.338156	2.958208	0.0031
WGT_RESID^2(-1)	-0.000208	0.014925	-0.013913	0.9889
WGT_RESID^2(-2)	0.000169	0.014925	0.011334	0.9910
WGT_RESID^2(-3)	-0.000629	0.014925	-0.042115	0.9664
WGT_RESID^2(-4)	-0.000980	0.014925	-0.065632	0.9477
WGT_RESID^2(-5)	-0.000557	0.014925	-0.037352	0.9702
WGT_RESID^2(-6)	-0.000592	0.014925	-0.039689	0.9683
WGT_RESID^2(-7)	-0.000690	0.014925	-0.046202	0.9632
WGT_RESID^2(-8)	-0.000296	0.014925	-0.019804	0.9842
WGT_RESID^2(-9)	-0.000447	0.014925	-0.029922	0.9761
WGT_RESID^2(-10)	0.001712	0.014925	0.114726	0.9087
WGT_RESID^2(-11)	-0.000880	0.014925	-0.058964	0.9530
WGT_RESID^2(-12)	-0.000701	0.014925	-0.046971	0.9625
WGT_RESID^2(-13)	-0.000559	0.014925	-0.037420	0.9702
WGT_RESID^2(-14)	-0.000557	0.014925	-0.037336	0.9702
WGT_RESID^2(-15)	-0.000614	0.014925	-0.041158	0.9672
WGT_RESID^2(-16)	-0.000753	0.014925	-0.050453	0.9598
WGT_RESID^2(-17)	-0.000737	0.014925	-0.049399	0.9606
WGT_RESID^2(-18)	-0.000183	0.014925	-0.012229	0.9902
WGT_RESID^2(-19)	-0.000658	0.014925	-0.044068	0.9649
WGT_RESID^2(-20)	0.000808	0.014925	0.054167	0.9568

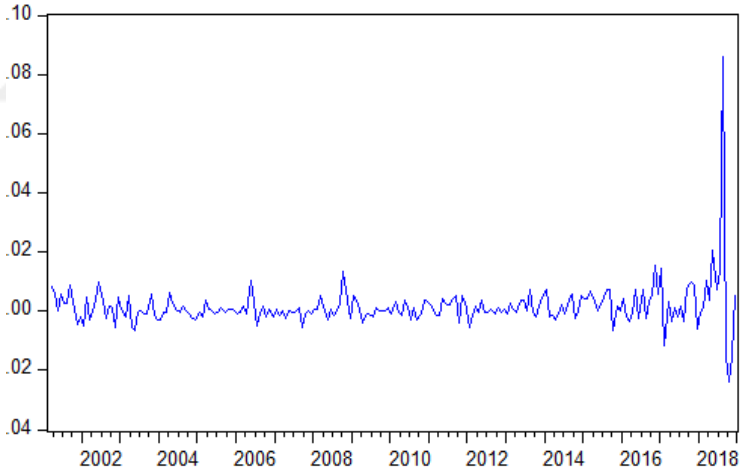
Figure 1.4 below illustrates the daily volatility series obtained based on the methodology above from nominal exchange rate. I use daily nominal exchange rate starting from March 2001 until December 2018 based on daily exchange rates of Turkish Central bank. Vertical axis present the percentage points of the values.

Figure 1.4 : Volatility of Exchange rate, 2001-2018 (Daily)



On the following one; Figure 1.5, shows the monthly volatility series of exchange rate transformed from daily series. It is dated from March 2001 to December 2018. I use software program E-Views to transform the series from daily level to monthly one.

Figure 1.5 : Volatility of Exchange rate, 2001-2018 (Monthly)



2. EXPORT MODEL

In this section I introduce the export model and data set used in the estimations. Section 2.1 presents the export model and 2.2 describes the data set with some details.

2.1 Export Model

In this paper, I focus the empirical analysis for the panel data of 5 export sectors; manufacturing, fishing, agriculture and foresty, mining and quarrying, whole and retail trade based on ISIC Rev.3. Reel exchange rate, foreign income and volatility of nominal exchange rate are explanatory variables included in the estimation. We employed Kenen and Rodriks (1986) basic export model to fit our model, which was also utilized by Bahmani-Oskooee and Payesteh(1993) and many others. In order to point out some issues we forecast 3 different models, two of which are the following ones:

$$lnEX_{it} = \alpha_1 + \beta_1 lnY_t + \beta_2 lnR_t + u_{it} \tag{2.1}$$

$$lnEX_{it} = \alpha_2 + \beta_3 lnY_t + \beta_4 lnR_t + \beta_5 lnV_t + \psi_{it} \tag{2.2}$$

I firstly consider the the model 2.1 then compare with model 2.2, Kenen and Rodrik's(1986), to document the overall volatility effect on the sectoral basis export. Where EX_{it} denotes the export volume, i and t expresses each of 5 sectors and the time period respectively, Y_t denotes income of the OECD countries[1], R_t is reel exchange rate and V_t refers the volatility of exchange rate. We should note that industrial production for OECD countries used as proxy for foreign income and reel exchange rate calculated by $(P^*E)/P$; E is nominal exchange rate and P, P^* are domestic and foreign price index respectively. As result, in the light of the theory we expect that export would have a negative and positive relationship between reel exchange rate and foreign income respectively.

[1]Share of OECD countries in Turkish export was 56 percent in 2018

Then, in order to consider the specific impact of volatility during the period after the recent global crisis(2008), an interactive dummy variable is included and fitted in the models 2.1 and 2.2 :

$$lnEX_{it} = \alpha_3 + \beta_6 lnY_t + \beta_7 lnR_t + \beta_8 lnV_t + \beta_9 lnD_t + \nu_{it} \tag{2.3}$$

$$lnEX_{it} = \alpha_4 + \beta_{10} lnY_t + \beta_{11} lnR_t + \beta_{12} lnD_t + \eta_{it} \tag{2.4}$$

where $D_t = V_t * d; d = 0$ before 2008 Oct. and $d = 1$ for the remaining months, expresses the interactive dummy variable. Figure 2.1 below illustrates the monthly volatility series with its trend. I obtain the trend, illustrated with the red line, by using Hodrick-Prescott filter.

Figure 2.1 : Volatility of Exchange Rate with Trend, 2001-2018 (Monthly)

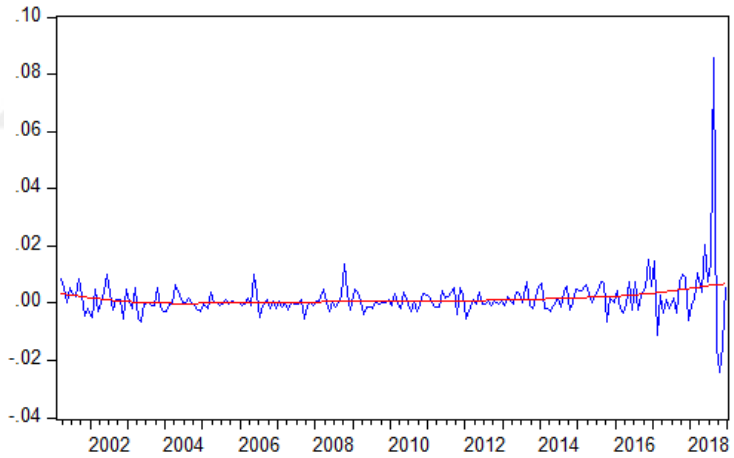
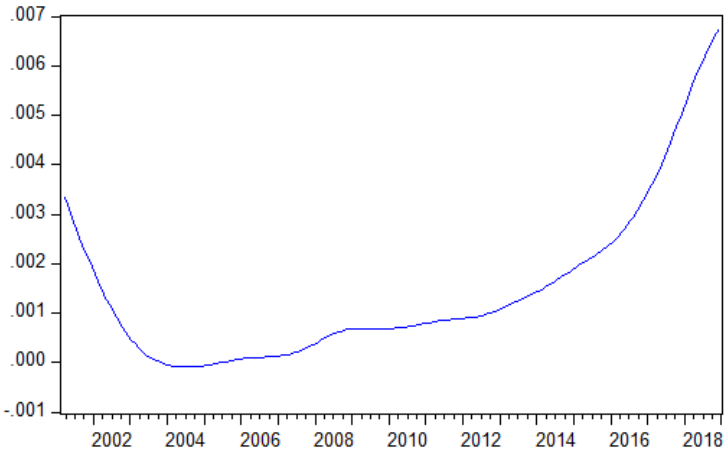


Figure 2.2 below also illustrates the trend of the volatility alone to show it in the more details. As we can clearly observe from the Figure 2.2, trend of the volatility of exchange rate follows a critical rise after 2008. This observation supports us to decompose the impact of volatility variable for the period after 2008.

Figure 2.2 : Trend of Exchange Rate Volatility, 2001-2018 (Monthly)



Before starting the estimation, for overall effect of volatility I expect that it will has a significant impact on Turkish export. Furthermore, I predict that a stronger impact for the period after the recent crisis is probable to happen.

2.2 Data

I use monthly panel data spanning in the period 2001March-2018Dec, in which the floating exchange rate regime adopted as exchange rate system in Turkey. I consider the Turkish sectoral basis export data which is classified as ISIC Rev.3 in terms of dollar price as my sample in this work. The dependent variable export volume was handled by basing 2010's average exchange rate value and deflating the data, got in terms of dollars, with consumer price index. $2010 = 100$ is valid both foreign income, domestic and foreign consumer price index. After estimating volatility variable with the daily nominal exchange rate data by the procedure presented in section 1.2, I transformed it to monthly level for the sample period. Reel exchange rate calculated by $(P^*E)/P$; E is nominal exchange rate and P, P^* are domestic and foreign price index

respectively. Industrial production index was taken as proxy for foreign income in the models. Both industrial production index and foreign consumer price indexes were weighted for all OECD countries. All series were seasonally adjusted and were expressed in terms of natural logarithms. Data were obtained from Turkish Stat, Central Bank of the Republic of Turkey, OECD and US Energy Information Administration.

3. ECONOMETRIC MODEL

In this section I present the econometric methodology followed in the paper. section 3.1 firstly shows the panel data quantile regression model and section 3.2 introduces the unit root tests and cointegration methodology followed in this paper.

3.1 Panel Data Quantile Regression

Each of the models 2.1-2.4 are estimated with the Koenkers(2004) quantile regression model with fixed effect and the basic fixed effect estimators. The model considers tth observations response to the ith sector for the conditional quantile functions of EX_{it}:

$$Q_{EX_{it}}(\tau/x_{it}) = \alpha_i + x_{it}^T\beta(\tau), \;\; t = 1,...,m_i, \;\; i = 1,...,n. \tag{3.1}$$

Based on Koenker's(2004) model, system permits x_{it}, the covariates effects to be dependent upon the quantile τ in the . Since the conditional quantiles of the response in the model is eligible 6 to α has a shift, α's are not permitted to depend upon the quantile τ . Simultaneously estimation of the model is provided by the following function :

$$\min_{(\alpha,\beta)} \sum_{k=1}^{q} \sum_{t=1}^{n} \sum_{i=1}^{m_i} w_k \rho_{\tau_k}(EX_{it} - \alpha_i - x_{it}^{\top}\beta(\tau)) \tag{3.2}$$

While α_i parameter are being estimated, the q quantiles$(\tau_1....,\tau_q)$ relative impact is controlled by w_i, denoting the weights. Discretely weighted L-statistics is the way how the α_i parameters are estimated[1]. Koenker and Bassett(1978) proposes the following piecewise linear function : $\rho_\tau(u) = u(\tau - I(u < 0))$, which is included in model $(8)$for the quantile loss function. Koenker(2004) states that since it is not possible to solve and transform β, dependent and independent variables in quantile regression as like in least squares, transformation has to done with full equation[2].

[1] Koenker(1984), Mosteller(2006) and Koenker(2004); basic arguments about weights, quantiles τ_q and α_i ; whether there is an analogous to the choice of discretely weighted L-statistics or not.

[2] see Koenker(2004)for the strategy of solution with full equation, which he follows.

3.2 Cointegration and Times Series methodology

Before estimating the models we follow cointegration methodology. We report descriptive statistics for all variables in the Table 3.1:

Table 3.1 : Descriptive Statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
Lexport	1080	7.896	2.25	4.496	12.374
Lincome	1080	4.595	0.056	4.524	4.795
Lrealexc	1080	0.619	0.215	0.287	1.362
Lvol	1080	-3.87	18.67	-6.649	0.157

All variables are reported as their natural logarithm in this table. We tested dependent variable with Pescadf and Hadri-Kruzomi unit root tests to decide its integration level. The bias-adjusted *LM* test statistic proposed by Pesaran, Ullah and Yamagata (2008) is shown as following:

$$LM_{adj} = \sqrt{\frac{2}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \frac{(T-k)\hat{\rho}_{ij}^2 - \mu_{Tij}}{\upsilon_{Tij}} \Rightarrow_d N(0,1), N \to \infty$$

(3.3)

Where $i, j = 1....N$ andρ_{ij}^2 the sample estimate of the pair-wise correlation for the residuals. And Pesaran(2007) defines the CIPS statistics as :

$CIPS = \sum_i^N CADF_i$

Where $i = 1....N$ and $CADF_i$ denotes the simple averages for augmented ADF test statistics of each individual cross section. Panel unit root test results are presented in Table 3.2:

Table 3.2 : Panel Unit Root Test Results

	CIPS intercept	CIPS intercept + trend	ZA _SPC intercept	ZA_LA intercept	ZA _SPC intercept+trend	ZA_LA intercept + trend	LM-AD intercept	LM-AD intercept+trend
Lexport	-2,592	-3,405	1,030	1,707	-0,308	-0,025	386.127*	385.842 *

Level of significance: ***<0.01, **<0.05, *<0.1

As we can see from obtained Bias-adjusted LM (LM-AD) test results that there is significant cross correlations between sectors. That means it is convenient to use second generation unit root tests such as *CIPS* test. The *CIPS* test results provide the evidence that we can not reject the null hypothesis that all series are non-stationary. And Hadro Kruzomi test results also weakly support this conclusion. Z_A^{SPC} andZ_A^{LA} test statistics , were obtained with the Hadri-Kuruzomi test developed by Hadri and Kurozumi (2012) following the study of Hadri(2000). They are defined as:

$$Z_A^{SPC} = ST_i^{SPC} = \frac{1}{\hat{\sigma}^2_{\dot{I}SPC} T^2} \sum_{t=1}^{T} (S_{it}^w)^2 , \tag{3.4}$$

$$z_A^{LA} = ST_i^{SPC} = \frac{1}{\hat{\sigma}^2_{\dot{I}LA} T^2} \sum_{t=1}^{T} (S_{it}^w)^2 \tag{3.5}$$

Where $S_{it}^w = \sum_{s=1}^{t} \hat{\varepsilon}_{is}$ and $\hat{\sigma}_i^2$ denotes the estimator of the long-run variance in the equations. Z_A^{SPC} andZ_A^{LA} test statistics indicates that we do not reject the null hypothesis of stationarity. Hence, the variable Lexport is stationary except the case of intercept in the Z_A^{LA}tests.

The Philips- Perron test results are presented in the Table 3.3 table in the next page for the test of stationarity of independent variables. The results in the Table 3.3 below show that all independent variables used in the model are nonstationary. They are stationary in first difference ($I(1)$ variables). Results conclude that dependent and independent variables are integrated in different order.

Table 3.3 : Philips-Perron Test Results

Series	intercept	intercept+trend
Lincome	-1.676	-2.357
LrealExc	-1.560	-1.333
Lvol	-2.031	-3.229

As the cointegration theory it is required that the series must be integrated at the same level in models some method such as Johansen procedure. Since the Westerlund cointegration test (2008) allows series to be integrated in different orders we follow that test's procedures, by considering the minor differences in result for unit root test of Lexport variable for some cases. Table 3.4 presents the panel cointegration test results for this model.

Table 3.4 : Panel Cointegration Test Results

Ln(Y)	X	x	x	x
Ln(R)	X	x	x	x
Ln(V)		x		x
Ln(D)			x	x
DHg---	3.163*	2.149**	3.107*	8.228*
LM:AD	59.880*	47.579*	29.302*	26.808*

Level of significance: ***<0.01, **<0.05, *<0.1

The Bias-adjusted $LM(LMAD)$ test results for contegration illustrate that there is significant cross correlations for the residuals . DH_g denotes durbin- hausman group mean statistic proposed by Westerlund(2008) and is defined as :

$$DH_g = \sum_{i=1}^{n} \hat{S}_i(\tilde{\phi} - \hat{\phi})^2 \sum_{t=2}^{T} \hat{e}_{it-1}^2 \quad \text{and} \quad \hat{S}_i = \frac{\hat{\omega}_i^2}{\hat{\sigma}_i^4}$$

(3.6)

$\hat{S}_i$ denotes the variance ratios. For all model presented on the Table 3.4, DH_g test result rejects the null-hypothesis of no-cointegration. Hence, we can use the level of the series for the estimation from now on.

Before estimating the models I check the occurrence of heteroscedasticity and serial correlation. All models $(2.1 - 2.4)$have the heteroscedasticity and serial correlation problems based on my estimations. Therefore I estimate the models 2.1- 2.4 with Koenker's(2004) 's quantile regression (fixed effects) in addition estimating with fixed effect GLS estimator to avoid the serial correlation and heteroscedasticity problems. I present the empirical results in the next section.

4. EMPIRICAL RESULT AND CONCLUSION

This sections presents the empirical result of the estimations and conclusion of the study. Section 4.1 shows estimation output and introduces the interpretation for it and then Section 4.2 concludes the paper.

4.1 Empirical Results

Empirical results for all models are reported in the Table 4.1. Right side of the Table presents the estimations of the models with Koenker's(2004) quantile regression (fixed effects) and left side presents the estimations with fixed effect GLS estimator. The result in the model (2) tells us that exchange rate volatility has no impact on export volume of Turkey for my sample. And we see that the control variables in the model(2)have statistically significant effect on Turkish export volume. The income of exporter countries has positive elasticity with export volume of Turkey while the elasticity of real exchange rate is negative with the values $1,45$ and $-0,56$ percentage, respectively. While volatility has no impact with fixed effect estimator(2), it is significant in quantile model (2) for all quantiles given. Where the effect of volatility is negative with the lower quantile and it has opposite effects for upper quantiles in the model(2).

When the effect of the period after crisis on the volatility variable is decomposed (model-3) in within model, I observe that exchange rate volatility impedes the export volume for the period after the recent global crisis. Based on the result at %99 confidence interval, a percent rise in volatility of exchange rate decreased the export volume about $0,36$ percent in the post-crisis period in Turkey. On the other hand elasticity of export volume to volatility variable becomes positive for the period until the last quarter of the year 2008. But the magnitude of it is very close to zero with %90 confidence interval. Model-4 with fixed effect estimator, including the volatility only with dummy variable, also supports the findings in the model-3.

Estimations with quantile model 3-4 show that there volatility for the post-crisis has no effect on export volume for upper and mid quantiles($0,75$th and $0,5$th) while it is significant with the negative effect for the $0,25$th quantile. Volatility variable for the period before Oct. 2008 is also statistically significant for all quantiles at %99 confidence interval as like in model 2. And, similarly its impact is negative for $0,25$th quantile contrary to positive effects on quantiles $0,75$th and $0,5$th. crisis dummy is indifferent from zero for 0.5 and 0.75 quantiles. A percent rise in exchange rate volatility is responded with 0.03 percent decrease at 0.25th quantile of export volume and 0.02 percent rise in 0.75th quantile of export volume.

Within Model (FE-GLS)					Quantile Model					
	1	2	3	4		quant.	1	2	3	4
ln(Y)	1,32***	1,45***	1,63***	1,6***	**ln(Y)**	0,25	0,038***	0,02**	0,01	0,024**
	(0,19)	(0,265)	(0,27)	(0,254)			(0,05)	(0,008)	(0,009)	(0,01)
ln(R)	-0,6***	-0,56***	-0,47***	-0,44***	**ln(R)**	0,25	-0,044***	-0,03***	-0,027***	-0,035***
	(0,05)	(0,058)	(0,059)	(0,058)			(0,01)	(0,01)	(0,009)	(0,01)
ln(V)		0,003	0,01*		**ln(V)**	0,25		-0,03**	-0,03***	
		(0,01)	(0,01)					(0,012)	(0,009)	
ln(D)			-0,36***	-0,29***	**ln(D)**	0,25			-0,033**	-0,034*
			(0,08)	(0,067)					(0,015)	(0,018)
					ln(Y)	0,5	0,003	0,003	,0,002	0,002
							(0,003)	(0,012)	(0,011)	(0,01)
					ln(R)	0,5	0,005**	0,007**	0,006**	0,007***
							(0,002)	(0,003)	(0,003)	(0,002)
					ln(V)	0,5		0,006***	0,004***	
								(0,001)	(0,002)	
					ln(D)	0,5			-0,004	-0,004
									(0,002)	(0,003)
					ln(Y)	0,75	0,04***	0,033***	0,032***	0,036***
							(0,009)	(0,007)	(0,004)	(0,006)
					ln(R)	0,75	-0,038***	-0,034***	-0,029***	-0,033***
							(0,013)	(0,013)	(0,01)	(0,01)
					ln(V)	0,75		0,026***	0,02***	
								(0,006)	(0,007)	
R^2	0,30	0,30	0,33	0,32	**ln(D)**	0,75			0,008	0,01
									(0,005)	(0,007)
*** 0,01	** 0,5	* 0,1								

4.2 Conclusion

Turkish export shows an increasing trend in 2000s with floating exchange rate regime. Literature documents that Turkish export has been significantly affected from volatility of exchange rate. In this paper, I analyze the impact of the exchange rate volatility on Turkish sectoral basis export volume. By considering the regime effect, I only cover the data for the period of 2001-2018, in which floating exchange rate regime adopted in Turkey. I estimate the volatility of exchange rate by following GARCH methodology and use the fixed effect estimator and quantile regression for my panel data estimation.

My estimation reveals that volatility of the exchange rate significantly impedes Turkish export in my sample especially for the period after global crisis. And my estimation also shows that there would not be any significant impact of volatility of exchange rate for the 2001-2008 period. Both fixed effect and quantile regression estimations document the similar evidence. On the other hand I observe that volatility has opposite effect for the lower quantiles in our sample period.

My findings are mostly parallel to evidence documented by Ozbay(1999), Ozturk and Acaravci(2002) and Guloglu(2008). Usage of sectoral level classification for the export and decomposition of the period after the recent crisis for the volatility of exchange rate would contribute a different perspective to literature with my findings.

Evidently, volatility of exchange rate in higher levels would be an important threat for the firms and Turkey's export oriented growth policies. Therefore policies aiming to lower the volatility of exchange rate would support the growth of export volume and reduce the risks on the export strategies in Turkey.

References

Achy, L., & Sekkat, K. (2003). The European single currency and MENA's exports to Europe. *Review of Development Economics*, *7*(4), 563–582.

Antle, J. M. (1983). Testing the stochastic structure of production: a flexible moment-based approach. *Journal of Business & Economic Statistics*, *1*(3), 192–201.

Arize, A. C. (1995). The effects of exchange-rate volatility on US exports: an empirical investigation. *Southern Economic Journal*, 34–43.

Bahmani-Oskooee, M., & Mitra, R. (2008). Exchange rate risk and commodity trade between the US and India. *Open Economies Review*, *19*(1), 71–80.

Bahmani-Oskooee, M., & Payesteh, S. (1993). Does exchange rate volatility deter trade volume of LDCs? Journal of Economic Development, 18(2), 189–205.

Baron, D. P. (1976). Fluctuating exchange rates and the pricing of exports. Economic Inquiry, *14(3), 425– 438.*

Bollerslev, T. (1986). Generalized autoregressive conditional heteroskedasticity. Journal of Econometrics, 31(3), 307–327. Retrieved from https://ideas.repec.org/a/eee/econom/v31y1986i3p307-327.html

Caporale, T., & Doroodian, K. (1994). Exchange rate variability and the flow of international trade. *Economics Letters*, *46*(1), 49–54.

CBRT (Central Bank of the Republic of Turkey). 2002. The impact of globalization on the Turkish economy. http://www.tcmb.gov.tr/yeni/evds/yayin/kitaplar/global.doc (accessed December 13, 2010).

Chou, W. L. (2000). Exchange rate variability and China's exports. *Journal of Comparative Economics*, *28*(1), 61–79.

Chowdhury, A. R. (1993). Does exchange rate volatility depress trade flows? Evidence from error- correction models. *The Review of Economics and Statistics*, 700–706.

Civcir, İ.. An Econometric Approach To The Analysis Of The Monetary Sector And Balance Of Payments Problems In Turkey (1996), First Edition, Capital Markets Board publication No.38, Ankara.

Clark, P. B. (1973). Uncertainty, exchange risk, and the level of international trade. *Economic Inquiry*, *11*(3), 302–313.

Cushman, D. O. (1983). The effects of real exchange rate risk on international trade. *Journal of International Economics*, *15*(1–2), 45–63.

De Grauwe, P. (1988). Exchange rate variability and the slowdown in growth of international trade. *Staff Papers*, *35*(1), 63–84.

Doroodian, K. (1999). Does exchange rate volatility deter international trade in developing countries? *Journal of Asian Economics*, *10*(3), 465–474.

Engle, R. F. (1983). Estimates of the Variance of US Inflation Based upon the ARCH Model. *Journal of Money, Credit and Banking*, *15*(3), 286–301.

Ethier, W. (1973). International trade and the forward exchange market. *The American Economic Review*, *63*(3), 494–503.

Franke, G. (1991). Exchange rate volatility and international trading strategy. *Journal of International Money and Finance*, *10*(2), 292–307.

Güloglu, B. (2008). Exports and volatility of exchange rate under alternative exchange rate regimes: The case of Turkey. In *Proc. The International Conference on Policy Modeling, EcoMod, Berlin*.

Hadri, K. (2000). Testing for stationarity in heterogeneous panel data. *Econometrics Journal*, *3*(2), 148– 161. https://doi.org/10.1111/1368-423X.00043

Hadri, K., & Kurozumi, E. (2012). A simple panel stationarity test in the presence of serial correlation and a common factor. *Economics Letters*, *115*(1), 31–34. https://doi.org/10.1016/j.econlet.2011.11

Kasman, A., & Kasman, S. (2005). Exchange rate uncertainty in Turkey and its impact on export volume. *METU Studies in Development*, *32*(1), 41.

Kenen, P. B., & Rodrik, D. (1986). Measuring and analyzing the effects of short-term volatility in real exchange rates. *The Review of Economics and Statistics*, 311–315.

Keyder, N. 2002. Money: Theory, Policy and Application. Fifth Edition, Seçkin Yayıncılık, Ankara.

Koenker, R. (1984). A note on L-estimates for linear models. *Statistics & Probability Letters*, *2*(6), 323– 325.

Koenker, R. (2004). Quantile regression for longitudinal data. *Journal of Multivariate Analysis*, *91*(1), 74– 89.

Koenker, R., & Bassett Jr, G. (1978). Regression quantiles. *Econometrica: Journal of the Econometric Society*, 33–50.

McKenzie, M. D., & Brooks, R. D. (1997). The impact of exchange rate volatility on German-US trade flows. *Journal of International Financial Markets, Institutions and Money*, *7*(1), 73–87.

Mosteller, F. (2006). On some useful "inefficient" statistics. In *Selected Papers of Frederick Mosteller* (pp. 69–100). Springer.

Nazlioglu, S. (2013). Exchange rate volatility and Turkish industry-level export: Panel cointegration analysis. *The Journal of International Trade & Economic Development*, *22*(7), 1088–1107.

Ozturk, I., & Acaravcı, A. (2006). *The effects of exchange rate volatility on the turkish export: an empirical investigation*. Ozturk, I., & Kalyoncu, H. (2009). Exchange rate volatility and trade: An empirical investigation from Cross-country comparison. *African Development Review*, *21*(3), 499–513.

Özbay Özlü, P. (1999). *The effect of exchange rate uncertainty on exports a case study on Turkey*.

Peree, E., & Steinherr, A. (1989). Exchange rate uncertainty and foreign trade. *European Economic Review*, *33*(6), 1241– 1264. Retrieved from http://econpapers.repec.org/RePEc:eee:eecrev:v:33:y:1989:i:6:p:1241-1264

Pesaran, M. H. (2007). A simple panel unit root test in the presence of cross-section dependence. *Journal of Applied Econometrics*, *22*(2), 265–312. https://doi.org/10.1002/jae.951

Pesaran, M. H., Ullah, A., & Yamagata, T. (2008). A bias-adjusted LM test of error cross-section independence. *Econometrics Journal*, *11*(1), 105–127. https://doi.org/10.1111/j.1368-423X.2007.00227.x

Sercu, P., & Vanhulle, C. (1992). Exchange rate volatility, international trade, and the value of exporting firms. *Journal of Banking & Finance*, *16*(1), 155–182.

Vergil, H. (2002). Exchange rate volatility in Turkey and its effect on trade flows. *Journal of Economic and Social Research*, *4*(1), 83–99.

Viaene, J.-M., & De Vries, C. G. (1992). International trade and exchange rate volatility. *European Economic Review*, *36*(6), 1311–1321.

Westerlund, J. (2008). Panel cointegration tests of the Fisher effect. *Journal of Applied Econometrics*, *23*(2), 193–233. https://doi.org/10.1002/jae.967

Willett, T. D. (1986). Exchange-Rate Volatility, International Trade, and Resource Allocation: A Perspective on Recent Research. *Journal of International Money and Finance*, *5*, S101--S112.

Wolf, A. (1995). Import and hedging uncertainty in international trade. *Journal of Futures Markets*, *15*(2), 101–110. https://doi.org/10.1002/fut.3990150202

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