



Evaluation of Commodity Market Experiences: More Than a Design Issue

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ABSTRACT

Major benefits of the organized commodity markets will be efficient price formation, transparency improvement, decline in transaction cost and accumulation of expertise in the financial and agricultural sectors. An active spot market is one of the major conditions for the success of a derivative market. This paper studies Turkey's decentralized spot agricultural markets as well as derivatives market in comparison with its international peers. Based on the outcomes of the analysis, a framework on admission to membership, product design, risk and collateral management mechanisms and quality of warehouse licensing were highlighted for consideration of commodity exchanges. Lack of price correlation between different markets for the same commodity would also contribute to the development of the commodity market. In this regard descriptive and empirical analysis via regression models were made on US and Turkey wheat and cotton markets in relation to product design and the arbitrage opportunities.

Keywords: Commodity Exchange, Electronic Warehouse Receipts, Commodity Derivatives

JEL Classifications: G10, G23, Q02

¹ The ideas expressed in this paper are the author's own and do not connected to, not represent and not be evaluated as those of the Company she works for.

1. INTRODUCTION

The liberalization and reduction of government support in the agricultural sector provide appropriate environment for the establishment of commodity exchanges where futures and options contracts' trades are executed. Although warehouse receipts are in place for a handful of commodities such as cotton, wheat and a few other grains, experiences of United States of America, Canada, majority of European Union countries, Ukraine, Serbia show warehouse receipts system is beneficial for the agriculture sector (Kovacevic et al., 2016).

Development of warehouse receipts system is also crucial for derivative markets (Coulter and Onumah, 2002). In the absence of licensed warehouse structure before 2005, Turkish commodity

market has developed gradually and hasn't reflected the potential of Turkey yet. Significant developments have been realized in the licensed warehouse sector in recent years and considerable increase in the spot market was realized however almost no transaction has been executed in futures contracts with an underlying of wheat and cotton in the form of electronic warehouse receipts (EWR) in the Borsa Istanbul Derivatives Market.

Turkish specialized spot commodity exchanges named as the commerce exchanges for spot commodity trading is decentralized and provides the relevant trading platforms for spot market in various cities in Turkey. An important step in relation to securitization of the commodity market was realized after the enforcement of the EWR regulatory framework which is the Agricultural Products Licensed Warehouse Act. No. 5300 approved

on February 10, 2005. Turkey's central securities depository (CSD) Merkezi Kayıt Kuruluşu (MKK) is designated as Electronic Registry Agency by the Ministry of Trade for keeping of records on EWR. Takasbank, central clearing house of Turkey, provides the central cash settlement and, security settlement together with MKK. EWRs are categorized as capital market instrument based on the Turkish Capital Market Regulations. First EWR was issued on cotton on March 22, 2013 and on barley and wheat on June 24, 2014 based on MKK web site.

With the EWR structure, agricultural products became securitized and; issuance and post-trade operations have been centralized on a safe and effective infrastructure. Accepted as collateral in the financial system, these EWR are not only traded but also used as collateral by farmers for funding needs. EWRs are also used as pledge for short term loans (Giovannucci et al., 2000).

Regulation on the establishment and operation of the specialized commodity exchange of Turkey was issued by Ministry of Trade on August 10, 2017 and definition of the Exchange in the Regulation is as follows: "Specialized commodity exchange where EWRs and futures contracts with an underlying of EWRs are traded." The Exchange will be in Ankara for spot EWR and derivatives markets with EWR underlyings. This structure will accelerate the commodity market development and value added to the sector in line with the experiences regarding efficiency increase (Mattos and Garcia, 2004) and contribution to price discovery in India and Malaysia (Andersan et al., 2015). Likewise, success of a centralized exchange depends very much on economic order and linking of stakeholders as well as market system infrastructure, quality of licensing, regulatory framework, arbitration mechanism, producers and trade association (Kovacevic et al., 2016). Well-functioning of warehouse receipts system is the integral part of the commodity exchanges (Larson et al., 2004) while commodity exchanges can contribute to strengthening market liquidity and providing price management tool (Black, 1986). However, providing these services should overweight the costs while making farmers and traders' access to well-functioning warehouses, finances and price information (Rashid, 2015).

In this study, we evaluated decentralized structure of current spot EWR markets and derivative contracts with an underlying of wheat and cotton with a physical delivery settlement feature currently traded in the Futures Market of the Borsa Istanbul. As a reference to local structure, we also assessed international practices and compare them with the Turkish markets in order to make recommendations to the newly established Specialized Commodity Exchange of Turkey.

2. EWR MARKET IN TURKEY

2.1. Spot EWR Market in Turkey

Licensed warehousing has significant benefits for commodity markets. Standardization is the backbone of the EWR issued by warehouses and a healthy, well-regulated and supervised warehouse structure is crucial for this. The licensed warehouse system helps to store standardized commodities and financing facilities become available without selling the commodity.

There are 113 commerce exchanges in 61 cities all around Turkey as of September 2018. Among them, 8 of the exchange have electronic warehouse trading, as of end-September 2018. Most active exchanges are Konya and Gaziantep in 2017; although Adana has newly launched trades on EWRs, it realized 15% of the EWRs trading as of 2019 September-end as depicted in the Appendix A.

Table 1 depicts the warehouses issued EWRs and exchanges traded thereof during 2013/03-2018/09. There are many licensed warehouses for barley, wheat and corn which also issue EWRs. For the others, most of the warehouses are specialized on a few product and/or limited number of the warehouses issue EWRs (e.g., Giresun for hazelnut, Bandırma for olive). As shown in the Appendix B; there are 65 licensed warehouses among them 58 are active in EWR business in 2018. Major warehouses in the business are Tiryali and Kainat with 6% shares each in the trading volume; then comes Toprak and Özekizler with 5% shares each as of 2019 September-end trading volume. Transactions are settled bilaterally via delivery versus payment (DvP) settlement model by MKK for EWRs and Takasbank, central clearing house for cash. With the DvP process, when one party fulfills its obligation, then system release its receivables. For settlement purpose, international security identification number (ISIN) is allocated for every EWR. ISINs are allocated by Takasbank, national numbering agency of Turkey, at the beginning of the EWR issue process at the MKK by the application of the licensed warehouse to the Takasbank.

As depicted in the Appendix C; banks clients are dominant in EWR transactions and executed 94% of the volume as of end-September 2018. EWRs are used as a pledge for loans and banks have a natural client portfolio for EWRs trading. Based on Takasbank settlement figures published at its web site; among banks, Ziraat Bank intermediate settlement of 57 licensed warehouses' EWRs. Denizbank followed it with 52 licensed warehouses, İş Bank with 45 and Garanti Bank with 30 warehouses.

2.2. Commodity Derivatives Markets in Turkey

İzmir Derivative Exchange (TURKDEX/VOB) which was established in 2005 was the first organized commodity derivatives exchange where commodity futures with an underlying of cotton and wheat were traded. After the merger of TURKDEX and Istanbul Stock Exchange under the Borsa

Table 1: EWR underlying commodities (22.03.2013-30.09.2018)

Commodity	EWR issuer warehouses	ISINs created since 2013
Barley	34	238
Sunflower	1	2
Wheat	52	1733
Paddy	1	22
Bean	1	8
Hazelnut	1	33
Lentil	2	5
Corn	43	311
Cotton	1	498
Soybean	2	6
Oat	2	3
Olive	1	77

Source: <https://www.takasbank.com.tr/tr/kaynaklar/isin-kodlari/HS?page=834> accessed on 13.10.2018.

Istanbul (BIST); these contracts has continued to be traded with the same features. In 2017, these contracts converted from cash settlement to physical delivery with an agreement in between BIST and Konya Commerce Exchange for wheat physical delivery and İzmir Commerce Exchange for cotton physical delivery.

Both in TURKDEX and BIST, most traded derivatives contracts are financial derivatives contracts such as BIST30 equity index and USD/TRY futures contracts. Cotton and wheat EWR futures contracts are illiquid and almost no transaction has been realized (Table 2). Most of the derivative contracts traded in the BIST are cash settled ones as of October 2018. Only cotton, wheat and single stock derivative contracts are physically delivered. Members of both TURKDEX and BIST Derivatives Market are financial institutions (e.g., banks and brokerage houses).

3. INTERNATIONAL COMMODITY MARKET PRACTICES

The commodity derivative exchanges major functions are price discovery, price risk management, investment venue, physical trade, facilitation of financing and market development. Benefits arising from these exchanges and functions thereof are more efficient formation and effective transfer of price, improved investment environment, generation of accurate and transparent reference prices and enhancing storage and logistics infrastructure as well as quality standard upgrades which will enable bank lending and other financing methods. Market development will be realized with education and capacity building, international

trade facilitation, information technology upgrade and industrial growth (UNCTAD, 2009).

As shown in the Table 3, major commodity exchanges are CME and ICE Group in America; Shanghai, Dalian and Zhengzhou in Asia Pacific and Moscow, ICE Europe and LME in Europe, Middle East and Africa region based on volume, open interest and notional values as of 2017 year-end. More than half of the volume was realized in the Asia Pacific exchanges.

When we analysis the world commodity derivatives trading volume; 37% belongs to energy, 30% belongs to index commodity derivatives and 22% belongs to agriculture based on WFE 2017 figures. Compared to options trading sizes, commodity futures trading is significantly larger size. Commodity options are mostly done in the American exchanges (Appendix D). Future contracts with wheat underlyings have been traded in CME Group Exchange while futures with cotton underlying have been traded in ICE. Similar to BIST derivatives contracts, they are physically delivered. Other than cotton, ICE has derivative contracts with an underlying of canola, coffee, white sugar, cocoa agricultural products. CME has also cash settled Australian wheat and Black Sea wheat futures contracts (Table 4).

Based on WFE 2017 agricultural commodity derivative transactions regional distributions, 65% of them is executed in the Asia-Pacific region while 33% is realized in the Americas (Figure 1).

With the development of information technology, major commodity exchanges have fully electronic trading system. Table 5 presents summary structure of various commodity exchanges.

Table 2: Cotton and wheat futures contract specifications in TURKDEX and BIST

Futures	Settlement	Delivery month	Contract size	Value of price tick
VOB wheat	Cash settled	March, May, July, Sept. Dec.	5.000 kg (5 ton)	TRY2.5/contract
BİST wheat	Physical delivery	Jan. Feb. May. July Sept. Dec.	5.000 kg (5 ton)	TRY2.5/contract
VOB cotton	Cash settled	March, May, July, Oct. Dec.	1.000 kg (1 ton)	TRY5/contract
BİST cotton	Physical delivery	March, May, July, Oct. Dec.	1.000 kg (1 ton)	TRY5/contract

Source: <http://www.borsaistanbul.com/docs/default-source/uue/viop-uygulama-usulu-ve-esaslari.pdf> accessed on 14.10.18

Table 3: Commodity futures trading figures

Exchange	Volume (Full number)		Open interest (Full number)		Notional value (USD millions)	
	2017	2016	2017	2016	2017	2016
Americas						
CME group	975.585.700	906.840.979	21.957.100	24.398.400	49.103.800	40.169.100
ICE futures US	231.800.997	250.241.851	1.542.560	NA	1.713.861	NA
ICE futures Canada	5.391.355	6.245.256	151.861	185.582	43.517	45.700
Total region	1.214.327.376	1.164.719.863				
Asia Pacific						
Shanghai Futures Exch.	1.364.243.528	1.680.771.301	4.061.900	3.768.910	138.004	12.238.792
Dalian Commodity Exch.	1.097.644.470	1.537.479.768	10.059.542	10.519.914	79.803.968	88.433.108
Zhengzhou Com. Exch.	584.537.747	901.240.809	2.653.769	2.696.540	3.278.525	8.559.154
Total region	3.078.358.099	4.148.817.502				
Europe-M.East-Africa						
Moscow exchange	484.658.530	466.782.771	921.298	857.334	282.567	250.548
ICE futures Europe	454.376.258	402.153.516	9.807.460	9.072.480	23.847.245	16.083.849
London metal exchange	149.731.985	149.410.189	2.253.480	2.212.500	12.111.800	9.816.380
Total region	1.131.534.494	1.066.132.345				
WFE total	5.424.219.969	6.379.669.710				

Source: <https://www.world-exchanges.org/> accessed on 30.09.2018

Table 4: Cotton and wheat futures contract specifications in CME (CBOT) and ICE

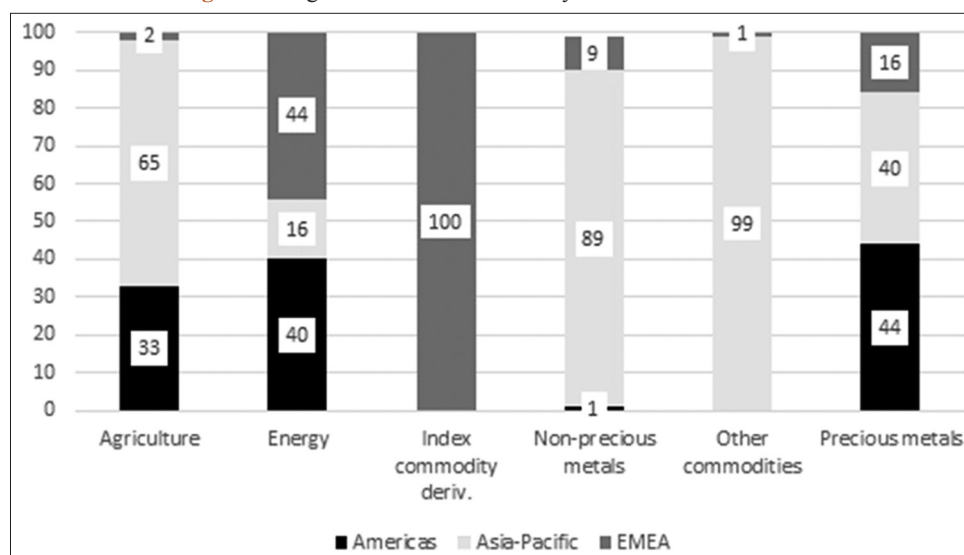
Futures	Settlement	Maturity months	Contract size	Price tick value
Chicago wheat	Deliv.	March May July, Sept.Dec.	5000 bushels, 136 metric ton	\$12.50/contract
Chicago corn	Deliv.	March May July Sept. Dec.	5000 bush.- 127 m.ton	\$12.50/contract
Chicago soybean	Deliv.	Jan, Mar, May, Jul, Aug, Sep, Nov	5000 bushels	\$12.50/contract
ICE cotton	Deliv.	March May July Oct. Nov.	50,000 pounds net	\$5/contract

Source: <https://www.theice.com/products/254/Cotton-No-2-Futures> accessed on 14.10.2018 and <https://www.cmegroup.com/trading/agricultural/> accessed on 14.10.2018, CBOT: Chicago Board of Trade

Table 5: Summary of structured features of exchanges

Exchange	Trading system	Ownership structure	Clearing
BM&F/Brasil	Open outcry & electronic	Membership-owned (but demutualizing)	In-house
DCE/China	Fully electronic, with a physical trading floor	Membership-owned	In-house
MCX/India	Fully electronic	Privately owned	In-house
Bursa Malaysia	Fully electronic	Demutualized, publicly listed	In-house
JSE/SAFEX/S.Afr.	Fully electronic	Demutualized, publicly listed	In-house

Source: UNCTAD (2009)

Figure 1: Regional shares of commodity derivative trades - 2017

Source: <https://www.world-exchanges.org/> accessed on 30.09.2018

4. LITERATURE REVIEW

Organized commodity exchanges dated back to 1700s. In 1730s in Japan, the idea of grain trading had begun to experimenting and the CBOT and the London Metal Exchange were launched in 1864 and 1877, respectively. After the liberalization and information technology developments, commodity exchanges which remained largely within industrialized nations prospered around the world after 1990s (Rashid et al., 2010).

Based on various empirical studies on US markets, an active cash market is the primary condition for the success of a derivative contract (Black, 1986; Bronson and Fofana, 2001) and, cash and derivative markets should link sufficiently for a rich hedging tool (Bollman et al., 2003).

Rejnuš (2002) found the Czechia agricultural commodity exchange not satisfactorily functioning, failed to provide substantial benefit to sector although there was no particular deficiencies in the regulations. With the lack of active market participants, it was

recommended that integration of either exchanges or market participants directly to European Union system will be the appropriate for further development.

However, in relation to the Ethiopian Commodity Exchange (ECX) experience, no evidence that support the popular claims about linking smallholders to markets and increasing export earnings and other developments impact was found (Rashid, 2015). On the contrary, another study reached to a conclusion that ECX contributed to cost reduction and the local markets connected to the EXCX via local warehouses experienced less price dispersion (Andersson et al., 2015).

Some of the lessons learned from the African commodity exchanges and warehouse system experience are: commodity exchanges must be driven by private sector acceptance, use of information and technology is not the critical success factor and if not implemented based on best practices, be a costly factor, commercial sector such as large traders and processors should be targeted since they will bring volumes required for success (USAID, 2010).

In the organized markets, it is important to have an effective price-risk management system. Critical prerequisites of the risk management system can be listed as follows (UNCTAD, 2009): Liquid markets, a regulated, rule-based trading environment, transparent dissemination of market information and clearing houses that act as central counterparties to guarantee the settlement finalization.

Lack of price correlation between different markets for the same commodity would also contribute to the development of the commodity market. Evidences were given from the Malaysian palm oil markets and the CBOT soybean oil futures contract where palm oil futures on the Kuala Lumpur Commodity Exchange traded. Likewise, local coffee prices of Indonesia have been moving in divergence to prices traded in coffee futures markets in New York and London (Hosseini-Yekani and Bakhshoodeh, 2006).

The study on Brazil, China, India, Malaysia and S. Africa by the UNCTAD (2009) concluded that, the exchanges have demonstrated flexibility in responding the specific needs of their market contexts and been at the forefront of fulfilling needs with new and innovative services to upgrade sector performance.

5. DESCRIPTIVE ANALYSIS

As aforementioned, lack of price correlation between different markets for the same commodity would also be an advantage for development of the commodity market (Hosseini-Yekani and Bakhshoodeh, 2006). In this regard we evaluated both wheat and cotton prices of US and Turkey markets.

5.1. Wheat Prices

Our data set consists of monthly wheat prices of US and Turkey for the 2005-2018/09 period. In order to observe FX rate effect,

we also convert local currency prices in to other currency while making our analysis (Figure 2).

The data set consists of 165 monthly observations. Standard deviation is highest (0.24) in TRY/Kg prices in Turkish market. Skewness are positive for all commodity series with the lowest 0.1263 to highest 1.2671. Price range is very wide in TRY series (Table 6).

Based on the analysis on monthly wheat prices of US and Turkey; considering USD/TRY FX rate fluctuations we made the analysis with the same currency base and USD/Kg based series' correlation was observed as 76% while it was 82% in TRY based series (Table 7).

5.2. Cotton Prices

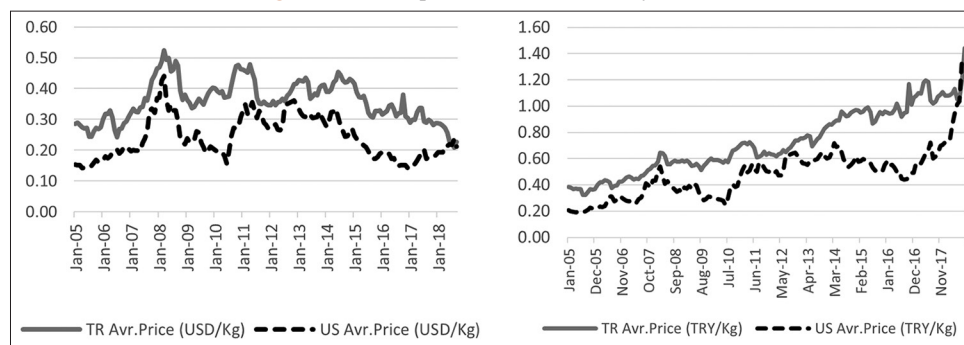
Our data set consists of monthly cotton prices of US and Turkey for the April 2015-September 2018 period. In order to observe FX rate effect, we also convert local currency prices in to other currency while making our analysis (Figure 3).

The data set consists of 42 monthly observations. Standard deviation is highest (2.1) in TRY/Kg prices in Turkish market. Skewness are positive for all commodity series with the lowest 0.1685 to highest 1.3405. Price range is very wide in TRY series (Table 8).

Based on the analysis on monthly cotton prices of US and Turkey; correlation of series in local prices were lower than the same-base series' correlations. USD/Kg based series' correlation was observed as 64% while it was 94% in TRY based series (Table 9).

Both wheat and cotton USD/kg prices have lower correlation than wheat and cotton TRY/kg prices. One factor for this result

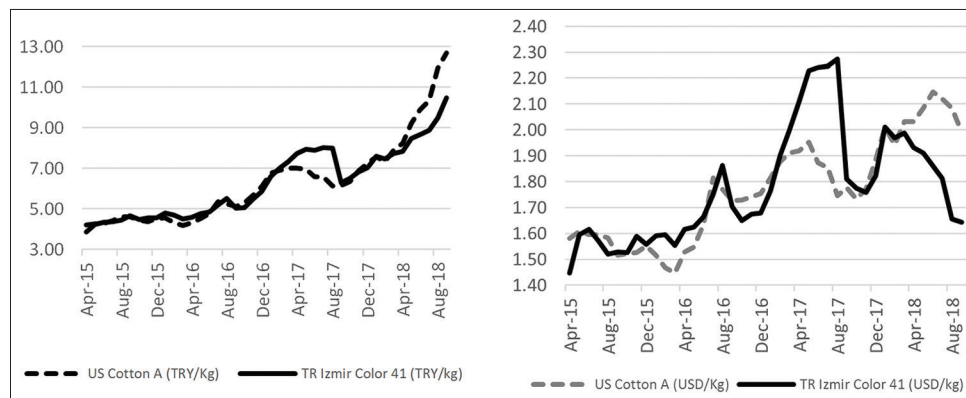
Figure 2: Wheat prices in US and Turkey markets



Source: Left axis TR wheat prices; <http://www.polatliborsa.org.tr/index.php?s=icerikdetay&k=108> and right axis US wheat prices accessed on 07.10.18; <https://www.indexmundi.com/commodities/?commodity=wheat&months=180> accessed on 07.10.18

Table 6: Descriptive statistics for wheat

Statistics	TR wheat (TRY/Kg)	TR wheat (USD/Kg)	US wheat (TRY/Kg)	US wheat (USD/Kg)	USD/TRY
Average	0.7227	0.3592	0.4817	0.2402	2.0943
Median	0.6710	0.3578	0.5016	0.2230	1.7699
SD	0.2431	0.0664	0.1929	0.0685	0.9486
Kurtosis	-0.7954	-0.5826	4.1253	-0.7220	3.0074
Skewness	0.3469	0.1263	1.2671	0.5042	1.6520
Min.	0.3260	0.2088	0.1907	0.1409	11704
Max.	1.4439	0.5229	1.3559	0.4397	6.3700

Figure 3: Cotton prices in US and Turkey markets

Source: <https://itb.org.tr/Sayfa/20-istatistikler> accessed on 14.10.2018

Table 7: Correlation matrix for wheat

Type of wheat	TR wheat (TRY/Kg)	TR wheat (USD/Kg)	US wheat (TRY/Kg)	US wheat (USD/Kg)
TR wheat (TRY/kg)	1.0000			
TR wheat (USD/kg)	-0.0615	1.0000		
US wheat (TRY/kg)	0.8208	-0.0471	1.0000	
US wheat (USD/kg)	-0.0701	0.7645	0.2778	1.0000

Table 8: Descriptive statistics for cotton

Statistics	US cotton A (TRY/kg)	US cotton A (USD/kg)	TR Izmir cotton (TRY/kg)	TR Izmir cotton (USD/kg)	USD/TRY
Average	6.3073	1.7692	6.2783	1.7767	3.4903
Median	6.1233	1.7616	6.0800	1.7273	3.4785
SD	2.0974	0.2001	1.7265	0.2206	0.7893
Kurtosis	1.6973	-1.0933	-0.8597	-0.1655	4.2137
Skewness	1.3405	0.1685	0.4562	0.8162	1.8198
Min.	4.1815	1.4467	3.8600	1.4461	2.6461
Max.	12.6796	2.1457	10.4875	2.2735	6.3700

might be USD/TRY rate changes were not reflected to the prices promptly but with a delay.

5.3. Model for the New Commodity Exchange

In order to achieve overarching goals, design phase of a market has strategic importance. In this regard, all stakeholders' perspectives in considering sector requirements, stakeholders' need and each product features should be carefully addresses during this process. Evaluations and recommendations made below are just a few discussion points brought into stakeholders' consideration while developing commodity derivative market (Figure 4).

5.3.1. Membership

Trading and clearing membership should be segregated and spot commerce exchange account holders might be the trading members. As a requirement for a safe and sound market structure trading membership requirements have significant importance. In this regard, equity and other quantitative and qualitative criteria should be applied.

Financial institutions should also be participant of the exchange if they are eligible for membership criteria. Financial institutions would add value to the market as speculators and liquidity providers. For commerce exchange members which are not financial institutions will require a general clearing member in order to finalize settlement. Only financial institutions are members

of the CSD MKK and provide EWR settlement service to non-financials, as general clearing members.

5.3.2. Account structure

Bilateral transactions are executed in segregated account structure in spot market of EWRs while multilateral netting with the same segregated account structure in derivatives market in Turkey within the current structure. However, segregated portfolio and client omnibus account which facilitates multilateral netting should be more appropriate alternative to consider in order to decrease cost and increase liquidity. At the CSD level, settlement should be segregated at the client level.

There is no online-real time messaging system that controls available EWRs in every account in current structure. In order to improve this structure, it will be better to set up a link in between the exchange and CSD MKK in order to do EWR balance checks in accounts while entering the sell orders, if required.

5.3.3. Product design

Standardization is the very crucial point in EWR business. Based on the EWR trading and relevant derivatives trade figures and experiences depicted in this paper; it will be more appropriate to start with physically delivered wheat and cotton futures contracts. Considering the cost-benefit in development and maintenance of the trading of the platform; a phased approach might be followed

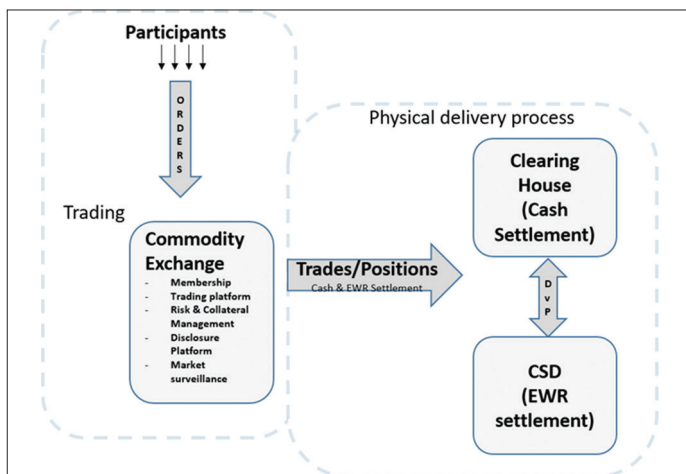
and after launching the spot market, as a second step cotton, wheat, barley, corn, hazelnuts and etc. based futures contracts might be launched for trading. After considering the level of market sophistication and requirements, option contracts might be evaluated in the later phases. Regarding physical delivery, with the new Exchange, having a centralized structure will simplify the physical delivery settlement process. Instead of current one derivative contract-one delivery point, it can easily be one derivative contract- multi delivery points.

5.3.4. Risk, collateral management and default management

Either the exchange or a central clearing house might provide risk and collateral management. In case the exchange will provide this service in-house, there is a need for settlement bank. Based on the collateral types, the settlement bank might safe keep some collaterals (e.g., TRY, USD, bonds and etc.). The exchange should be informed automatically when there is a request for withdrawal from the collateral accounts by the settlement bank. Risk and collateral system of the exchange should evaluate relevant accounts' position and risk profile in order to approve withdrawal requests.

In case the risk and collateral management will be executed by a central clearing house, then the deals should be simultaneously feed into central clearing system. EWRs are already dematerialized that's why it would be more appropriate to utilize the expertise of the central clearing house (Takasbank) which has been already providing spot market cash and EWR settlement since 2013, for the derivative contracts. Having both spot and derivatives markets within the same exchange will simplify the settlement process in the physical delivery of derivatives contracts underlying EWRs via utilizing the same infrastructure used for cash market settlement.

Figure 4: Basic structure for the commodity exchange



*DvP: Delivery versus payment settlement model, CSD: Central securities depository for dematerialized EWRs

Regarding default management, establishment of a default waterfall will support sound and safe trading platform and bring confidence to the market stakeholders. For default cases, establishing a guarantee fund with the contribution of member might be considered.

5.3.5. Public disclosure

Since EWRs are regulated as capital market instruments, public disclosure requirements framework will be determined based on the sector and commodity features together with the Ministry of Trade and Capital Markets Boards in consideration with the disclosure principles and insider information regulations. Inside information framework should be revisited based on the commodity sector features and not only private but also public sector stakeholders market and price-sensitive information should be determined and make available to all parties at the same time in order to eliminate asymmetric information.

6. EMPIRICAL ANALYSIS

In order to evaluate market interactions and whether there is a significant relation regarding price formation in US and Turkish markets, we utilized regression analysis using the data set for wheat and cotton. For this purpose, we first checked whether return series are stationary by performing augmented Dickey-Fuller test using a generalized least squares rationale where the null hypothesis is that the series are non-stationary. The results are presented in Table 10 and the series are stationary since test statistics are smaller than the critical values.

6.1. TRY base commodity market prices

The model for cotton as well as the regression results are as follows and the result depicts that the model is statistically significant at 1% significance level, with 0.87 R². US Cotton variable has positive coefficient with a magnitude of 0.77 (Table 11).

$$TR_{cotton(t)} = \alpha + \beta_1 US_{cotton(t)} + e_{(t)} \tag{Equation I}$$

Where;

$TR_{cotton(t)}$: Dependent variable; TR cotton return (t-(t-1)) in TRY/kg series

$US_{cotton(t)}$: Independent variable; US cotton return (t-(t-1)) in TRY/kg series

α : Constant

β : Coefficient of the independent variable

The model for wheat as well as the regression results are as follows and the result shows that the model is statistically significant at 1% significance level; with 0.67 R². US wheat variable has positive coefficient with a magnitude of 1.03 (Table 12).

Table 9: Correlation matrix for cotton

Type of wheat	TR Izmir cotton (TRY/kg)	TR Izmir cotton (USD/kg)	US cotton A (TRY/kg)	US cotton A (USD/kg)
TR Izmir cotton (TRY/kg)	1.000			
TR Izmir cotton (USD/kg)	0.6765	1.0000		
US cotton A (TRY/Kg)	0.9350	0.3896	1.0000	
US cotton A (USD/Kg)	0.9018	0.6401	0.8831	1.0000

Table 10: Dickey-Fuller test statistics

Type of wheat	Test Stat.	1% critical value	5% critical value	10% critical value
TR cotton TRY/kg	-5.441	-3.648	-2.958	-2.612
TR cotton USD/kg	-5.333			
US cotton TRY/kg	-4.068			
US cotton USD/kg	-5.063			
TR wheat TRY/kg	-11.005	-3.489	-2.886	-2.576
TR wheat USD/kg	-10.710			
US wheat TRY/kg	-10.744			
US wheat USD/kg	-10.021			

Table 11: Regression statistics for cotton In Turkey-US markets (TRY)

Statistics	Coeff.	SE	t-stat	P-value	Low. 95%	Up. 95%
Intercept	1.4240	0.3066	4.6451	0.0000	0.8044	2.0436
US cotton A (TRY/kg)	0.7696	0.0462	16.6676	0.0000	0.6763	0.8630
Multiple R	0.934953397					
R2	0.874137855					
Adjusted R2	0.870991301					
Standard error	0.620131243					
Observations	42					

Table 12: Regression statistics for wheat in Turkey-US markets (TRY)

Statistics	Coeff.	SE	t-stat	P value	Low. 95%	Up. 95%
Intercept	0.2243	0.0292	7.6682	0.0000	0.1665	0.2820
US Wheat Price (TRY/Kg)	1.0346	0.0564	18.3475	0.0000	0.9233	1.1460
Multiple R	0.820827569					
R ²	0.673757899					
Adjusted R ²	0.671756413					
Standard error	0.139294403					
Observations	165					

Table 13: Regression statistics for cotton In Turkey-US markets (USD)

Statistics	Coeff.	SE	t-Stat	P value	Low. 95%	Up. 95%
Intercept	0.5282	0.2384	2.2154	0.0325	0.0463	1.0100
US cotton (USD/kg)	0.7057	0.1339	5.2694	0.0000	0.4350	0.9763
Multiple R	0.640105001					
R ²	0.409734412					
Adjusted R ²	0.394977772					
Standard error	0.171596552					
Observations	42					

Table 14: Regression statistics for wheat in Turkey-US markets (USD)

Statistics	Coeff.	SE	t-stat	P value	Low. 95%	Up. 95%
Intercept	0.1812	0.0122	14.8271	0.0000	0.1571	0.2053
US wheat (USD/kg)	0.7410	0.0489	15.1437	0.0000	0.6444	0.8377
Multiple R	0.764549688					
R ²	0.584536225					
Adjusted R ²	0.581987367					
SE	0.042929455					
Observations	165					

$$TR_{wheat(t)} = \alpha + \beta_1 US_{wheat(t)} + e_{(t)} \quad (\text{Equation 2})$$

where;

$TR_{wheat(t)}$: Dependent variable; TR wheat return (t-(t-1)) in TRY/Kg series

$US_{wheat(t)}$: Independent variable; US wheat return (t-(t-1)) in TRY/Kg series

α : Constant

β : Coefficient of the independent variable

6.2. USD Base Commodity Market Prices

Same regression model and methodology were run for USD/kg return series. The model is statistically significant at 1% significance level, with 0.41 R². US Cotton variable has positive coefficient with a magnitude of 0.71 (Table 13).

Same regression model and methodology were run for USD/kg return series. The model is statistically significant at 1% significance level, with 0.58 R². US Cotton variable has positive coefficient with a magnitude of 0.74 (Table 14).

7. CONCLUSION

Establishment of a specialized commodity exchange dedicated for its purpose will not only contribute to agriculture sector but also metal and other commodities spot and derivative markets development in the long-run. Success of a centralized exchange depends very much on economic order and linking of stakeholders as well as market system infrastructure, membership, quality of licensing, regulatory framework, producers and trade association. Based on the outcomes of the analysis made in this paper, recommendations for the newly established Specialized Commodity Exchange of Turkey are made on design and operation principles in order to ensure an efficient and sound spot and derivatives market interaction which will significantly contribute to food price formation and food supply safety.

The service to be provided by the new exchange should overweight the costs while making farmers and traders' access to well-functioning warehouses, finances and price information. In coordination with the local commerce exchanges and warehouses a low cost and easy managed infrastructure should be developed since performance and high frequency trading is not common feature of the commodity markets.

For the new exchange dedicated for the commodity market, a robust licensed warehouse system should guarantee the physically deliver of what is traded. There should be different delivery points for relevant underlying future contracts. For this purpose, automated linkage among participants, CSD, clearing house and warehouses is required for a safe and state through processing. Based on international experiences, after having a mature spot market, the launch of derivatives markets in the exchange should be considered. Wheat, cotton, barley and corn are most active EWRs and will be convenient nominees for future contracts underlying. Although our analysis result showed that, there is high correlation with the US wheat and cotton prices, with the Turkish market prices, further studies should be executed in relation to the arbitrage opportunities and interactions with its international spot and derivative peers based on the new exchange market data after its launch.

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APPENDICES

Appendix A: EWR trading figures by commodity exchanges

Exchange	2018/09			2017		
	#Transactions	Volume-TRY	Share (%)	#Transactions	Vol.-TRY	Share (%)
Konya	23.865	845.021.469	42	12.205	650.681.159	54
Gaziantep	25.298	754.633.261	37	8.860	452.951.551	37
Adana	5.070	307.970.363	15			0
Polatlı	3.336	64.222.549	3	23	2.433.497	0
Lüleburgaz	1.502	43.168.724	2	3.157	84.745.186	7
Ankara	874	20.620.704	1	494	19.408.984	2
Bandırma	9	505.583	0	24	2.134.863	0
İzmir			0			0
	59.954	2.036.142.653	100	24.763	1.212.355.240	100

Exchange	2016			2015		
	#Transactions	Vol.-TRY	Share (%)	#Transactions	Vol.-TRY	Share (%)
Konya	5.057	248.261.551	61	2.902	103.384.963	67
Gaziantep	4.308	116.425.500	28			0
Adana			0			0
Polatlı	221	8.065.797	2	1.168	18.942.211	12
Lüleburgaz	626	21.802.997	5	1.027	14.853.944	10
Ankara	652	15.641.521	4	1.078	15.562.245	10
Bandırma			0			0
İzmir			0	25	1.354.476	1
	10.864	410.197.366	100	6.200	154.097.840	100

Source: <https://www.takasbank.com.tr/en/statistics/statistical-information-about-electronic-warehouse-receipt-ewr> accessed on 01.10.18

Appendix B: EWR trading figures by warehouses

Warehouse	2018/09			2017		
	#Transactions	Volume-TRY	Share (%)	#Transactions	Vol.-TRY	Share (%)
Tiryaki Tarım	3.533	124.580.737	6	2.269	138.335.078	11
Kainat Tarım	3.709	116.766.740	6	1.493	48.231.426	4
Toprak Tarım	1.320	102.096.946	5	1.826	158.772.570	13
Özekizler Agro	1.435	94.039.826	5	667	35.697.782	3
Nergizler Tarım	1.922	76.378.113	4	798	40.567.925	3
Sandıkçı Tarım	1.543	73.366.536	4			0
Rana Farm	1.047	69.820.521	3	583	46.203.202	4
Mysilo Tarım	3.940	69.690.920	3			0
Trakya Evren	2.186	66.480.855	3	899	42.233.261	3
GK Tarım	2.272	65.969.641	3	562	47.067.107	4
Anadolu Selçuklu	1.750	64.504.262	3	413	41.512.867	3
TK Tarım	2.844	61.908.655	3			0
Grain Tarım	2.011	59.548.307	3			0
Safirtaş Tarım	2.039	59.070.019	3	447	14.860.676	1
Güzel Tarım	2.682	58.132.194	3	288	23.190.066	2
Kayseri Ş. Boğazlıyan	1.368	52.778.279	3	649	18.706.997	2%
Özmen Hububat	1.279	52.336.100	3	822	66.938.123	6
Köseoğlu Agro	582	50.854.088	2	914	62.278.582	5
Lüleburgaz Tarım	1.430	41.328.804	2	1.522	42.728.727	4
Uludağ Tarım	1.318	40.307.098	2	1.023	45.067.532	4
Saraç Hububat	347	40.146.796	2	115	10.833.059	1
Giresun Fındık	190	39.641.687	2	2.192	33.560.340	3
Mardin Tarım	1.079	34.985.674	2	387	19.768.754	2
Cemas Tarım	667	33.463.752	2	526	12.580.984	1
ATB Çukurova	931	29.365.666	1			0
Yalnızlar Agro	1.201	28.711.624	1	347	16.114.010	1
Akgüller Tahıl	473	28.414.684	1	402	21.776.660	2
Unsan Tarım	883	27.635.116	1			0
Ruhbaş Tarım	1.094	25.668.712	1			0
Kızıltepe Agro	750	25.150.993	1			0

(Contd...)

Appendix B: (Continued)

Ptb Tarım	1.251	24.298.502	1			0
Altıntaş Tarım	1.567	21.894.726	2	637	9.180.872	1
TMO-TOBB Ahıboz	874	20.620.704	1	494	19.408.984	2
Polat Agro	997	19.378.568	1			0
Konya Tarım	676	18.979.598	1	252	13.764.892	1
Hekimoğlu Tarım	649	18.862.209	1			0
Ergünler Tarım	408	18.395.072	1			0
Kayseri Şeker Develi	783	17.845.196	1	261	6.961.033	1
Aysan Tarım	41	13.767.586	1			0
Avs Agro	297	13.710.802	1	849	27.275.385	2
Kan Tarım	983	13.334.575	1	21	3.457.670	0
Kayseri Şeker Şarkışla	716	12.275.529	1	741	16.573.910	1
Evlik Tarım	698	11.859.790	1	228	12.717.922	1
Şimala Tarım	470	11.465.411	1			0
Selçuklu Yıldızı	46	11.318.754	1	23	9.356.595	1
Tekbaşlar Tarım	35	10.760.981	1			0
Tezcan Tarım	678	9.998.113	0			0
Yusuf Zengin	155	9.849.114	0			0
Matlı Tarım	28	8.713.878	0	159	22.969.332	2
TMO-TOBB Polatlı	21	8.034.976	0	23	2.433.497	0
Altınagro Tarım	30	7.400.997	0			0
Sivas Lidaş	376	5.789.946	0			0
Şakiroğlu Tarım	51	5.322.009	0	71	7.209.354	1
Konagro Tarım	115	3.700.866	0	20	2.240.282	0
Matlı Tarım Konya	54	1.890.596	0	142	23.568.799	2
Edirne Tarım	72	1.839.920	0	1.622	36.847.458	3
Altılar Tarım	54	1.540.776	0			0
Mutlu Grain	4	150.113	0			0
Çankırı Tarım			0	41	5.133.600	0
Ege Tarım			0			0
Hekimoğlu Tarım			0	21	1.021.016	0
Kayseri Şeker Şarkışla			0			0
Köseoğlu Agro			0			0
Marmarabirlik Tarım			0	1	39.910	0
TMO-TOBB Lüleburgaz			0	13	5.169.000	0
Total	59.954	2.036.142.653	100	24.763	1.212.355.240	100

Warehouse	2016			2015		
	#Transactions	Vol.-TRY	Share (%)	#Transactions	Vol.-TRY	Share (%)
Tiryaki Tarım	280	17.934.932	4	35	5.086.596	3
Kainat Tarım	1.166	30.912.345	8	927	18.790.136	12
Toprak Tarım	1.946	95.494.660	23	1.511	44.928.659	29
Özekizler Agro						0
Nergizler Tarım						0
Sandıkçı Tarım						0
Rana Farm						0
Mysilo Tarım						0
Trakya Evren						0
GK Tarım	742	74.385.683	18	182	20.259.845	13
Anadolu Selçuklu	713	24.675.064	6	247	14.319.726	9
TK Tarım						0
Grain Tarım						0
Safirtaş Tarım						0
Güzel Tarım						0
Kayseri Ş. Boğazlıyan	1.965	34.167.493	8			0
Özmen Hububat	1.244	37.596.460	9			0
Köseoğlu Agro						0
Lüleburgaz Tarım						0
Uludaş Tarım						0
Saraç Hububat	131	4.457.170	1			0
Giresun Fındık						0
Mardin Tarım						0
Cemas Tarım						0
ATB Çukurova						0

(Contd...)

(Continued)

Yalnızlar Agro	168	9.559.902	2			0
Akgüller Tahıl						0
Unsan Tarım						0
Ruhbaş Tarım						0
Kızıltepe Agro						0
Ptb Tarım						0
Altuntaş Tarım						0
TMO-TOBB Ahiboz	652	15.641.521	4	1.078	15.562.245	10
Polat Agro						0
Konya Tarım	118	5.721.191	1			0
Hekimoğlu Tarım						0
Ergünler Tarım						0
Kayseri Şeker Develi	8	340.386	0			0
Aysan Tarım						0
Avs Agro						0
Kan Tarım						0
Kayseri Şeker Şarkışla						0
Evlik Tarım						0
Şimala Tarım						0
Selçuklu Yıldızı						0
Tekbaşlar Tarım						0
Tezcan Tarım						0
Yusuf Zengin						0
Matlı Tarım	14	1.722.000	0			0
TMO-TOBB Polatlı	221	8.065.797	2	1.150	18.494.355	12
Altınagro Tarım						0
Sivas Lidaş						0
Şakiroğlu Tarım						0
Konagro Tarım	59	1.333.536	0			0
Matlı Tarım Konya						0%
Edirne Tarım						0
Altılar Tarım						0
Mutlu Grain						0
Çankırı Tarım						0
Ege Tarım				25	1.354.476	1
Hekimoğlu Tarım						0
Kayseri Şeker Şarkışla	315	4.192.946	1			0
Köseoglu Agro	496	22.193.284	5			0
Marmarabirlik Tarım						0
TMO-TOBB	626	21.802.997	5	1.045	15.301.800	10
Lüleburgaz						
Total	10.864	410.197.366	100	6.200	154.097.840	100

Source: <https://www.takasbank.com.tr/en/statistics/statistical-information-about-electronic-warehouse-receipt-ewr> accessed on 01.10.18**Appendix C: EWR trading figures by intermediary institutions (01.01.-30.09.2018)**

Intermediary	#Transactions	Volume (TRY)
T.C. Ziraat Bankası A.Ş.	95.134	2.865.374.494
Denizbank A.Ş.	15.501	382.183.175
T. Garanti Bankası A.Ş.	1.617	194.081.039
T. Vakıflar Bankası T.A.O.	2.127	169.493.982
Halk Yatırım Menkul Değerler A.Ş.	769	112.326.228
Yapı ve Kredi Bankası A.Ş.	850	95.803.645
Bizim Menkul Değerler A.Ş.	882	94.768.260
T. İş Bankası A.Ş.	2.225	83.348.307
T. Ekonomi Bankası A.Ş.	433	39.119.806
Deniz Yatırım Menkul Kıymetler A.Ş.	168	23.588.957
Ziraat Yatırım Menkul Değerler A.Ş.	122	9.271.266
T. Halk Bankası A.Ş.	77	2.854.898
Anadolubank A.Ş.	3	71.250
Total	119.908	4.072.285.307

Source: <https://www.takasbank.com.tr/tr/istatistikler/elektronik-urun-senedi-islemleri-ile-ilgili-istatistiki-bilgiler> accessed on 01.10.18

Appendix D: Commodity options trading figures

Exchange	Volume (Full number)		Open interest (Full number)		Notional value (USD millions)	
	2017	2016	2017	2016	2017	2016
CME Group	153.435.890	155.743.566	10.091.600	10.298.800	6.530.200	6.265.000
ICE Futures US	53.134.517	52.777.649	955.465	NA	331.722	NA
Americas Total	207.404.130	209.059.563				
Dalian Commodity Exch.	3.635.682	NA	159.370	NA	366	NA
Singapore Exchange	3.009.882	3.283.140	572.197	NA	NA	NA
Zhengzhou Com. Exch.	1.492.393	0	76.741	0	220	0
Asia Pacific total	8.288.334	3.437.364				
ICE Futures Europe	29.163.171	29.129.853	3.838.110	3.816.980	36.298	43.003
London Metal Exchange	7.637.725	7.102.541	507.269	529.548	612.594	464.403
Moscow Exchange	6.695.060	4.601.746	102.274	103.330	3.690	2.334
Euronext	994.987	1.643.378	183.907	192.188	2.423	387
Europe-M.East-Africa Total	44.934.140	43.044.304				
WFE total	260.626.604	255.541.231				

Source: World Federation of Exchanges (WFE) <https://www.world-exchanges.org/> accessed on 30.09.2018