Gıda Fiyatlarının Ötesinde: Alt Endeksler Üzerine Bir Analiz

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Öz

Son dönemde gıda fiyatları küresel olarak artmaktadır.Bu makalenin hedefi gıda fiyatlarının dinamiklerini analiz etmektir. Bu araştırmada analiz edilen gıda kategorileri et, süt ürünleri, tahıl, bitkisel yağlar ve şekerdir. Bu çalışmada kullanılan gıda fiyat endeksi verisi Birleşmiş Milletlerin tarım organizasyonu tarafından sağlanan verileri içermektedir. Bu çalışmanın araştırma periyodu 1990-2021 olarak belirlenmiştir. Kritik araştırma sorularından biri gıda kategorilerinin birbiriyle ilişkilerinin incelenmesidir. Et, süt ürünleri, tahıl, bitkisel yağlar ve şeker alt kategorilerinin analizi bu kategoriler arasındaki ilişkilerin anlaşılmasına yardımcı olmaktadır. Araştırma sonuçları gıda fiyatlarının alt endeksleri arasında uzun vadeli ilişkiler olduğunu göstermektedir. Etki tepki analizi sonuçlarına göre bir standart sapmalık şokun kaybolması 4-6 ay zaman almaktadır. Granger nedensellik analizi sonuçlarına göre şeker fiyatları tahıl fiyatlarına, tahıl fiyatları da bitkisel yağ fiyatlarına neden olmaktadır. Bu makalenin bulgularına göre tahıl fiyatları gıda fiyatlarının istikrarı için önemlidir. Bu sonuç literatürdeki diğer çalışmalar ile uyumludur. Bulgular planlı tarım politikası, düşük gelirli ailelere sübvansiyonlar ve enerji fiyatlarında sübvansiyonların önemine işaret etmektedir.

Anahtar kelimeler: Tahıl, gıda fiyatları, granger nedensellik, bitkisel yağlar, alt endeksler, etki tepki analizi

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Beyond Food Prices: An Analysis on Sub-Indices

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Abstract

Food prices have increased globally recently. The goal of this article is to analyze the dynamics of food prices. Food categories analyzed in this research are Meat, Dairy, Cereals, Oils, and Sugar. Food index data which is provided by Food and Agricultural Organization of United Nations is used for the period 1990-2021. One of the critical research questions is whether these food categories are correlated with each other. A critical analysis on dairy, meat, cereals, oils and sugar sub-indices helps to understand the relationships between the categories. The results of this study show that there are long term links between sub-indices of food prices. The results of the impulse response analysis indicate 4-6 months is required for a standard deviation of shock to diminish. Granger causality results indicate that the price of sugar is affecting the price of cereals, whereas cereals are affecting sugar. The price of cereals is therefore important for food price stability according to the results of this article This result is also consistent with the previous literature.The findings show the need for a planned agricultural policy, subsidies for low income households, and subsidies on energy prices.

Keywords: Cereals, food price, granger causality, oils, sub-indices, impulse response analysis.

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Introduction

Food prices have social and political implications. Bellemare(2014) shows that rises in food prices cause social unrest and riots. The research in this field is therefore crucial for society. There is always need to increase agricultural technology and food supply to obtain low food prices.

There are many studies in the literature which show that rises in food prices lead to reduction in food consumption. Lyu et al. (2015) is a comprehensive study in this field. They show that rising food prices adversely affect nutrition levels. The effect is mostly visible in poor households and countries. The consumptions decrease in all food categories and poor people especially reduce meat consumption. Cornelsen et al. (2015) argue that cereals is the most important food category for low-income countries. Another aspect of the issue is the fiscal interventions on unhealthy food. Sin taxes are common on these goods .

The purpose of this research is to analyze food price dynamics. In particular, food price categories are studied. The food price index is a weighted average of sub-indices based on export trade volumes. The categories available in this research are meat, dairy, cereals, oils and sugar. Long run and short run relationships are analyzed.

The literature in this field primarily consists of the relationship between food prices and food consumption. There are also works that focus on the effect of energy prices on food prices. The literature is limited however on the sub categories of food prices. This research is therefore important for the researchers and policy makers in this field.

The data used in this research is provided by Food and Agricultural Organization of United Nations. The indices FAO Cereal Price Index, FAO Vegetable Oil Price Index, FAO Dairy Price Index, FAO Meat Price Index and FAO Sugar Price Index are used in this research. The variables are analyzed with Vector Autoregression and Vector Error Correction Models. Cointegration , impulse response and Granger causality analysis provide crucial information on the price dynamics of the sub categories of food comodity prices.

The remainder of this research is organized as follows. The next section is a summary of some of the important works in the literature. The third section is the methodology in which the data and some of the tests are given. More important part of the empirical analysis is in the findings section. Finally, some remarks and suggestions are available in the discussion and conclusions section.

Theoretical Framework

The index analyzed in this research is provided by Food and Agricultural Organization of United Nations. This index is an indicator of global food commodity prices. The major index is the FAO Food Price Index. (FFPI) Monthly and annual data is available for this index. This is calculated by the price change in the international food commodity markets. This index is a weighted average of five sub indices which are analyzed in this research. The sub indices of FAO Food Price Index are FAO Cereal Price Index, FAO Vegetable Oil Price Index, FAO Dairy Price Index, FAO Meat Price Index and FAO Sugar Price Index. The weights of the sub-indices in FFPI is determined by the average export shares of each index during the period 2014-2016.

Meat price index is calculated by the market prices of 35 products from 10 markets. The products represent bovine, pig, poultry and ovine meat categories. The export prices are determined as the weighted average of the relative trade volumes of the representative markets.

Dairy price index is determined by the prices of 8 products from 2 markets. The products are selected from the butter, cheese, skimmed milk powder and whole milk powder categories. The weights are determined according to relative export shares of the markets.

Cereals price Index is computed with International Grains Council wheat, maize, barely, sorghum export price and FAO all rice price index. There are 10 wheat products, 4 maize products, 5 barely products, and 21 rice export prices in the index. Weights of the products are calculated according to their trade shares.

Vegatable oil index is an indicator of 10 oil products. The weights of each product is determined by their relative export shares.

Finally, sugar price index is determined according to international sugar contract prices by using 2014-2016 data as a base. (Food and Agricultural Orgnaization of United Nations)

Literature Review

There are few studies which focus on the relationships between sub-indices of food commodity prices. Roman et al. (2020) study the relationships between crude oil and food indices. (Dairy, meat, oils, cereals and sugar) They apply cointegration, Vector Auto Regression (VAR) model and Granger causality techniques. The research period is between 1990 and 2020. The results show long term relationships between crude oil and meat and short term relationships between crude oil and cereal and oil.

There are studies in the literature on meat prices. Kopytets et al. (2020) focus on the dynamics of meat prices. They emphasize that consumers' purchasing power is an

important factor in the prices of livestock products. The data is taken from the Ukrainian market. The results show that the prices in the local market is determined by the global market. They also indicate that exchange rate, production and export volumes should be considered.

Some unexpected events in the market often result in serious effects in meat prices. Ramsey et al. (2021) study the effects of COVID 19 on meat prices. They use weekly data on whole-sale and retail prices in United States. They analyzed beef, pork, and poultry prices. They applied Auto Regression (AR) and Vector Error Correction (VEC) models. Accordingly, there are unexpected price movements in April and May 2020. The prices then return to expected levels. This shows that the market is stable in the long run.

There are also studies on the prices of milk and dairy market products. Borawska et al. (2021) study the price changes in European Union (EU). The study includes a GARCH model. The variables butter, milk powder, Cheddar, Edam, and Gouda can be explained by the previous period returns. The variables with the largest price changes are whey powder, and skim milk powder.

COVID 19 has also effects on dairy markets. Liu and Rabinowitz (2020) analyze the effects of COVID 19 on dairy markets by using weekly data from United States. Regression discontinuity design results indicate that the prices of all dairy products decreased by 8% during pandemic. The results vary when sub categories of dairy products are analyzed. Prices of some products didn't decrease in this period.

Passthrough is an important factor in the price mechanism of food. Guo and Tanaka (2020) study the global and local passthrough effects in cereal markets. The research includes data of wheat, rice and maize prices. They used GARCH models. The results show that a there is a substitution effect in wheat and maize but not rice. The authors think that self-sufficiency and food security are important to avoid passthrough effects from global markets.

There are many factors that contribute to increases in food prices such as energy prices. Gardbroek and Hernandez (2013) show correlation in US oil and corn markets. It is therefore important to create good supervision, energy subsidies for producers, and have a diversified portfolio of food in agricultural planning.

Crop productivity is an important element of food prices. Thompson et al. (2019) attempt to measure the amount of price change due to change in crop yields. There are short run and long run models in the study. The study highlights the importance of yields. Food security, income, population, dietary patterns and climate change are some other factors to be considered.

Vegetable oils are another food category that is analyzed in this research. Destiarni and Jamil (2021) investigate the relationship between crude oil and vegetable oils. The vegetable oils available in the study are palm oil, soybean oil, sun flower oil, and rapeseed oil. The study confirms short run and long run relationships. More specifically, palm oil prices affect crude oil and other vegetable oil prices.

The prices of food are found to be globally determined in many researches. Azam et al. (2020) analyze the co-movement of world vegetable oil prices. The research period is between 2003 and 2018. Wavelet approach is used in the study. Accordingly, contagion effect is available however, the markets are not perfectly integrated. Palm oil is not correlated with other oils. However, soybean and rapeseed oils are correlated.

Last category available in the research is sugar. Amrouk and Heckelei (2020) study contains information on sugar price dynamics. Bayesian moving average is used in the study. The results indicate that the factors that affect sugar prices are past own prices, staple food prices, sugar production costs and macroeconomic data.

Financial market volatility is also a factor in explaining food prices. Kotyza et al. (2021) investigate the changes in the relationship between financial market uncertainty and sugar prices. The structural changes which are analyzed in the research are COVID 19 pandemic and global financial crisis. The results indicate structural changes in global financial crisis but not in COVID 19 pandemic.

Method

The data used in this research are sub-indices of the FAO Food Price index. (FFPI) The data is provided by Food and Agriculture Organization of United Nations. (FAO) The sub-indices used in the research are FAO Meat Price Index (“meat”), FAO Dairy Price Index (“dairy”), FAO Cereal Price Index (“cereals”), FAO Vegetable Oil Price Index (“oils”) and FAO Sugar Price Index (“sugar”).

The research analyze the long run and short run relationships between the sub-indies of FFPI. The data is between January 1990 and October 2021. Monthly data is used in the study. The number of data is 382 for each variable. Logarithmic conversion is used for variance stationarity. The logharithmic series are then checked for constant and trends. The results are presented in Table 1.

Table 1. T-statistic for Constants and Trends

T-Statistic	Lmeat	Ldairy	Lcereals	loils	lsugar
Constant	-0,23	0,32	-0,13	0,31	-0,56
Trend	0,76	0,21	0,74	0,43	0,71

Augmented Dickey Fuller ("ADF") and Philips Perron ("PP) Tests are used for stationarity checks. The results are given in Table 2. The goal of stationarity tests is to investigate whether a Vector Autoregression model can be developed. The results indicate that the variables are stationary.

Table 2. Tests for Stationatity

	Critical Value 1%	ADF	PP	P-value
lmeat	-2.571078	-10.40980	-15.29600	0
ldairy	-2.571062	-13.84316	-14.99162	0
lcereals	-2.571062	-12.16245	-12.12825	0
loils	-2.571062	-13.33158	-13.37741	0
lsugar	-2.571062	-14.67919	-14.42222	0

A Vector Autoregression model ("VAR") is developed wih all of the variables. Lag length is determined as 1 due to principle of parsimony. The number of lags is suggested by Schwarz and Hannan-Quinn. Lag length criteria results are available in Table 3.

Table 3. Lag Length Criteria

Test	Suggested Lag
LR	8
Final Prediction Error	2
Akaike	2
Schwarz	1
Hannan-Quinn	1

VAR formulas indicate long term relationsips between a variable and lagged values of other variables including itself. VAR model with substituted correlations is given below:

LCEREALS = 0.40*LCEREALS(-1) + 0.01*LDAIRY(-1) - 0.07*LMEAT(-1) - 0.05*LSUGAR(-1) + 0.08*LOILS(-1) + 0.11

LDAIRY = 0.05*LCEREALS(-1) + 0.28*LDAIRY(-1) + 0.03*LMEAT(-1) - 0.005*LSUGAR(-1) + 0.12*LOILS(-1) + 0.10

LMEAT = 0.08*LCEREALS(-1) + 0.03*LDAIRY(-1) + 0.21*LMEAT(-1) - 0.01*LSUGAR(-1) - 0.007*LOILS(-1) + 0.05

LSUGAR = 0.10*LCEREALS(-1) + 0.07*LDAIRY(-1) + 0.10*LMEAT(-1) + 0.25*LSUGAR(-1) + 0.07*LOILS(-1) - 0.02

LOILS = 0.15*LCEREALS(-1) + 0.10*LDAIRY(-1) - 0.001*LMEAT(-1) - 0.03*LSUGAR(-1) + 0.29*LOILS(-1) + 0.22

AR Roots Graph is given in Figure 1. The results confirm stability of the model.

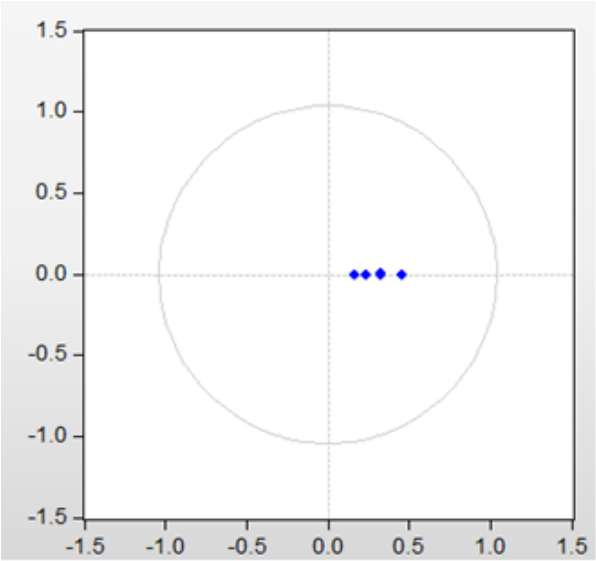

Figure 1. AR Roots Graph for VAR

Vector Error Correction Model("VECM) is also developed with the data. The model is applicable when the variables are cointegrated. The purpose of this model is to analyze the short run relationships between variables. VECM formulas indicate long term relationsips between a variable and lagged values of other variables including itself. The model with substituted coefficients is given below.

D(LCEREALS) = - 0.11*(LCEREALS(-1) + 0.38*LDAIRY(-1) + 0.15*LMEAT(-1) + 0.006*LSUGAR(-1) - 1.33*LOILS(-1) + 0.17 - 0.19*D(LCEREALS(-1)) - 0.03*D(LDAIRY(-1)) - 0.01*D(LMEAT(-1)) - 0.05*D(LSUGAR(-1)) - 0.03*D(LOILS(-1)) + 0.01

D(LDAIRY) = - 0.07*(LCEREALS(-1) + 0.38*LDAIRY(-1) + 0.15*LMEAT(-1) +0.006*LSUGAR(-1) - 1.33*LOILS(-1) + 0.17 + 0.02*D(LCEREALS(-1)) 0.49*D(LDAIRY(-1)) + 0.01*D(LMEAT(-1)) - 0.005*D(LSUGAR(-1)) + 0.02*D(LOILS(-1)) + 0.07

D(LMEAT) = - 0.01*(LCEREALS(-1) + 0.38*LDAIRY(-1) + 0.15*LMEAT(-1) + 0.006*LSUGAR(-1) - 1.33*LOILS(-1) + 0.17 + 0.04*D(LCEREALS(-1)) - 0.02*D(LDAIRY(-1)) - 0.47*D(LMEAT(-1)) - 0.02*D(LSUGAR(-1)) - 0.06*D(LOILS(-1)) - 0.01

D(LSUGAR) = 0.07*(LCEREALS(-1) + 0.38*LDAIRY(-1) + 0.15*LMEAT(-1) + 0.006*LSUGAR(-1)- 1.33*LOILS(-1)+0.17+0.03*D(LCEREALS(-1)) + 0.05*D(LDAIRY(-1)) + 0.16*D(LMEAT(-1)) - 0.31*D(LSUGAR(-1)) + 0.12*D(LOILS(-1)) - 0.01

D(LOILS) = 0.59*(LCEREALS(-1) + 0.38*LDAIRY(-1) + 0.15*LMEAT(-1) + 0.006*LSUGAR(-1) - 1.33*LOILS(-1) + 0.17) - 0.27*D(LCEREALS(-1)) - 0.07*D(LDAIRY(-1)) - 0.007*D(LMEAT(-1)) - 0.03*D(LSUGAR(-1)) + 0.17*D(LOILS(-1)) + 0.02

The stability is confirmed also for this model. The model is reliable as the roots are inside the unit circle.The results are given in Figure 2.

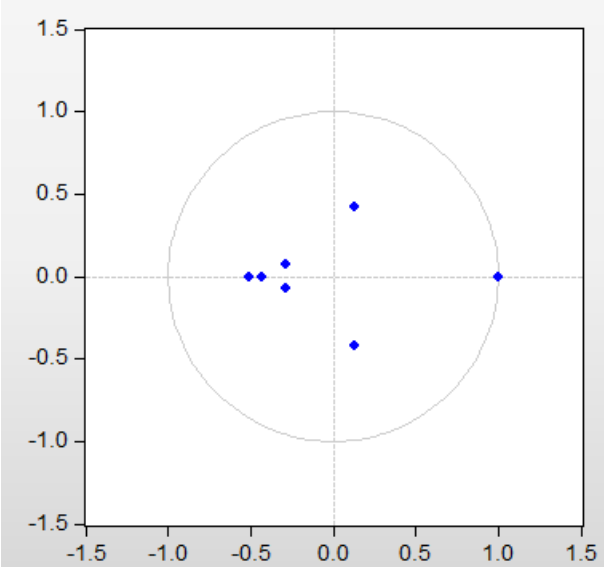

Figure 2. AR Roots Graph for VECM

Findings

The findings of the study is based on Cointgration and Granger Causality Analysis. Long term relationship is analzed with cointegration. The results are given in Table 4. These result show that 5 cointegrating vectors are available according to both Trace and Max-Eigenvalue tests. These results confirm the long run relationship between variables.

Table 4. Cointegration Results

Test	Number of Cointegrating Vectors	Probability
Trace	5	0.0001
Max-Eigenvalue	5	0.0001

Another test applied on the data is impulse response analysis. This test show whether shocks in variables diminish over time. Table 5 shows the results of the analysis. The results show that one standard deviation shock in variables results shocks in other variables for 4-6 months until the effects diminish.

Table 5. Impulse Response Results

Impulse/Response	lmeat	ldairy	lcereals	loils	lsugar
Lmeat	4	4	4	5	4
Ldairy	4	4	5	5	4
Lcereals	5	5	5	6	5
Loils	4	6	4	4	4
Lsugar	4	5	4	4	4

Short term relationship is based on Granger Causality Analysis. The results are given in Table 6. According to the results, lsugar granger causes lcereals, and lcereals granger causes loils. The directions of Granger Causality are from lsugar to lcereals and lcereals to loils.The rest of the results are statistically insignificant.

Table 6. Granger Causality Result

Dependent/Independent	lmeat	ldairy	lcereals	loils	lsugar
Lmeat	-	0,4249	0,2483	0.0524	0,0686
Ldairy	0.8763	-	0.5923	0.6095	0.8018
Lcereals	0.8415	0.4707	-	0.3665	0.0208
Loils	0.9290	0.1737	0.0001	-	0,2470
Lsugar	0.2397	0.5288	0.7459	0.1973	-

Discussion and Conclusions

This research has empirical evidence on the relationships between sub-indices of food prices. First of all, according to the data, the food categories meat, dairy, cereals, oils and sugar have long term relationship.

This is important for policy makers and researchers in this field. The result is also consistent with the literature. Guo and Tanaka (2020) also found passthrough effects in cereal markets. The results emphasize the need for a strategical approach in agriculture.

The results indicate the need to have a planned systematic approach in agriculture to reduce food prices. In particular, the price of cereals needs to be controlled. We know from the literature that cereals mostly affect low income countries and households. Therefore subsidies may be needed. The most important factors to be considered are planned agricultural policies on sub-indices, subsidies for those who need food and producers, and subsidies on energy. Many examples are available in the literature that link food and energy prices.

According to the results of the impulse response analysis, one standard deviation shock in variables result in shocks for 4-6 months until the effects diminish. To reduce these effects, governments can also be active in providing storage for food.

When short term relationship is analyzed, it is found that sugar granger causes cereals and cereals granger cause oils. Cereals are therefore important for food price stability according to the results of this article. This finding is consistent with the literature. Cornelsen et al. (2015) also found that cereals are the most important food category especially for developing economies. Derivative products may be used to overcome the short term passthrough effects.

The research is based on global data provided by United Nations. Further studies may focus on the differences between developed and developing economies. The effects of extreme events such as financial and political problems might also be studied.

Makalenin Araştırma ve Etik Beyanı Bilgileri	
Yazarın Çıkar Çatışması Beyanı	Araştırmaya konu olan durum, olgu veya kurum ile yazar arasında herhangi bir çıkar çatışması bulunmamaktadır.
Yazar (lar) Katkı Oranı Beyanı	Çalışmanın tamamlanmasında yazarın katkı oranı %100'dür.
Etik Kurul Onay Belgesi	Araştırma/inceleme sırasında etik kurul onay belgesi gerektiren herhangi bir bilimsel yöntem kullanılmamıştır.

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Gıda Fiyatlarının Ötesinde: Alt Endeksler Üzerine Bir Analiz

Genişletilmiş Özet

Amaç ve Önem

Geçmişteki gıda fiyat hareketleri incelendiğinde, yoksullukla ilişkiler bulunmaktadır. Farklı ülkelerde faklı sonuçları olsa da konu araştırma açısından önemlidir. Bu kapsamda yerel fiyatlarn global fiyatlara kıyaslanarak değişimi incelenmektedir. Gıda fiyat artışlarının bazı gıda ihracatçısı olan ülkelere faydası bulunmaktadır. Öte yandan negatif etkenler pozitiflere göre ağır basmakta olup; gıda fiyat artışı yoksulluğa neden olmaktadır.

Gıda fiyatının sosyal ve politik sonuçları da bulunmaktadır. Geçmişte gıda fiyat artışlarının sosyal huzursuzluklara ve eylemlere neden olduğu görülmüştür. Bu kapsamda tarım teknolojileri ve gıda arzı düşük gıda fiyatları için önemli hususlardır.

Gıda fiyat artışları gıda tüketiminde düşüşlere neden olmaktadır. Bu etkinin daha çok yoksul hane halkarı ve ülkelerde görüldüğü belirtilmelidir. Sağlıksız gıdalara yönelik mali müdahalelerle sıklıkla karşılaşılmaktadır. Bu vergi yoluyla gerçekleştirilebilir. Düşük gelirli ülkeler için en önemli gıda kategorisi tahıldır.

Bu araştırmanın amacı gıda fiyat dinamiklerini incelemektir. Özellikle gıda fiyat kategorileri incelenmektedir. Araştırmada bulunan kategoriler et, süt ürünleri, tahıl, bitkisel yağlar ve şekerdir. Alt endeksler arasındaki kısa ve uzun vadeli ilişkiler incelenmektedir.

Literatür temelde gıda fiyatları ve gıda tüketimi arasındaki ilişkilere odaklanmaktadır. Enerji fiyatları ve gıda fiyatları arasındaki ilişkilere yol açan çalışmalar da mevcuttur. Öte yandan gıda fiyatlarının alt kategorileri üzerine yapılan çalışmalar literatürde sınırlıdır.

Yöntem

Bu araştırmada kullanılan veriler, FAO Gıda Fiyat Endeksi (FFPI) Birleşmiş Milletler tarafından yayınlanan verileri içermektedir. Veriler kapsam olarak alt endeksler FAO et, süt, tahıl, bitkisel yağlar ve şeker çalışmada kullanılmıştır.

Araştırma verileri zaman serisi olarak Ocak 1990 ve Ekim 2021 arasındadır. Çalışmada aylık veri kullanılmıştır. Her değişken için 382 adet veri yer almaktadır. Veriye varyans durağanlığı için logaritmik dönüşüm uygulanmıştır.

Verinin sabit ve trendleri analiz edilmiştir. Durağanlık analizleri için ADF ve PP uygun görülmüştür. Tüm değişkenleri içeren VAR modeli uygulanmıştır. Gecikme süresi Schwarz ve Hannan-Quinn kriterlerinin önerdiği 1 olarak belirlenmiştir. Otoregresif kök grafiği de modelin anlamlılığını doğrulamaktadır.

Vektör Hata Düzeltme Modeli de veri için oluşturulmuştur. Bu modelinin anlamlılığı için de otoregresif köklere bakılmıştır.

Bulgular

Bu çalışmanın bulguları eşbütünleşme ve Granger nedensellik analizi sonuçlarına dayanmaktadır. Uzun vadeli ilişkiler eşbütünleşme ile gösterilmektedir. Trace ve Max-Eigenvalue sonuçları 5 vektör olarak verilmektedir. Etki tepki analizi sonuçları ise 1 standart sapma şokun etkisinin değişkenlerde 4-6 ay arasında sürdüğü ve sonrasında etkilerin kaybolduğu görülmüştür.

Kısa vadeli ilişkiler ise Granger nedenselliği ile açıklanmaktadır. Sonuçlara göre şeker verisinin logaritmik dönüştürülmüş hali tahıl verisinin logaritmik dönüştürülmüş haline neden olmaktadır. Öte yandan tahıl verisinin logaritmik dönüştürülmüş hali, bitkisel yağların logaritmik dönüştürülmüş haline neden olmaktadır. Diğer sonuçlar istatiksel olarak anlamlı değildir.

Tartışma ve Sonuç

Araştırmanın en önemli sonuçlarından biri gıda artışı ile tetiklenen yoksulluğun engellenmesidir. Bu kapsamda korunma saikiyle türev piyasalarda pozisyon alınabilir. Tarımda verimlilik, planlama, gıdaların depolanması ülkelerin uygulayabileceği politikalar arasındadır. Devletlerin gıda fiyat artışlarında hamile ve çocukları öncelikli olarak yoksul ailelerin desteklenmesi ile sağlıklı nesillerin gelişimine katkı yapacağı görülmektedir.

Enerji fiyatları gibi birçok faktör, gıda fiyatlarını arttırmaktadır. Bu nedenle iyi bir denetim oluşturmak, üreticiler için enerji destekleri ve tarım planlamasında çeşitlendirilmiş bir gıda portföyüne sahip olmak uygulanabilir.

Sonuçlar tarımda sistematik ve planlı yaklaşımların gıda fiyatlarını düşürebileceğini göstermektedir. Özellikle tahıl kontrol edilmelidir. Literatürden tahılın özellikle düşük gelirli ülke ve hane halklarını etkilediği bilinmektedir.

Araştırma verileri ve analiz sonuçları, Birleşmiş Milletler tarafından yayınlanan global veriye dayanmaktadır. Bu alanda gelecekte yapılacak olan çalışmalarda gelişmiş ve gelişmekte olan ülkeler arası farklılıklar değerlendirilebilir. Finansal ve politik problemler gibi uç olayların etkisi de çalışılabilir.