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Causal Link Between Consumer Prices Index and Producer Prices Index: An Evidence From Central and Eastern European Countries (CEECs)

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Abstract

Consumer price index and producer price index are important indices state that the price changes in goods and services. Central banks observe price changes through these indices. However, generally, central banks tend to examine price changes through the consumer price index. In this study, the relationship between these two indices has been investigated. For this aim, the paper is assessed CPI and PPI nexus for the annual series with data ranging from 1992 to 2017 for Central and Eastern European Countries (CEECs). In this phase, the long-run relationship among variables is analyzed by Panel Cointegration Test and Panel Causality Test. The empirical findings reveal that there is a long run and bilateral causality of the PPI and CPI in CEECs.

Keywords
Consumer Price Index, Producer Price Index, Panel Cointegration, Panel Causality, CEECs

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Tüketici Fiyatları Endeksi ve Üretici Fiyatları Endeksi Arasındaki Nedensellik İlişkisi: Merkez ve Doğu Avrupa Ülkeleri (CEECs) Örneği

Öz

Tüketici fiyat endeksi ve üretici fiyat endeksleri mal ve hizmetlerdeki fiyat değişimlerini ifade eden önemli endeksleridir. Bu endeksler aracılığı ile merkez bankaları fiyat değişimlerini gözlemlemektedir. Ancak genellikle merkez bankaları fiyat değişimlerini tüketici fiyat endeksi üzerinden inceleme eğilimindedir. Bu çalışmada bu iki endeks arasındaki ilişki incelenmiştir. Bu amaçla, Orta ve Doğu Avrupa ülkeleri için 1992-2017 yılları arasında TÜFE ve ÜFE arasındaki ilişki analiz edilmiştir. Analizde değişkenler arasındaki ilişki panel eşbütünleşme ve panel nedensellik testleri ile tahmin edilmiştir. Ampirik bulgular Orta ve Doğu Avrupa ülkeleri için TÜFE ve ÜFE arasında uzun dönemli ve çift yönlü nedensellik ilişkisinin bulunduğunu göstermektedir.

Anahtar Kelimeler
Tüketici Fiyat Endeksi, Üretici Fiyat Endeksi, Panel Eşbütünleşme, Panel Nedensellik, CEECs Ülkeleri

Introduction

There are many price indices used to measure the general price level, such as Consumer Price Index and Producer Price Index. The Consumer Price Index (CPI) is used to measure price changes in goods and services consumed by individuals. The CPI refers to a single index which includes the prices of goods and services purchased by consumer. Producer Price Index (PPI) is used to measure changes in input prices.

The PPI includes three different indices which are crude materials, intermediate goods and finished goods. These goods are used as input for the production chain (Clark, 1995: 25-26). These indices have a significant role in measuring the general condition of the macro economy and forming central bank monetary and fiscal policies. In the case of price targeting, Central banks observe the economy and constitute monetary policies by price indices. At this stage, the relationship between price indices is important. Central banks generally examine price changes via CPI. However, if there is a long-term relationship between price indices, price changes can be examined both consumer-based and producer-based and thus policy objectives can be established.

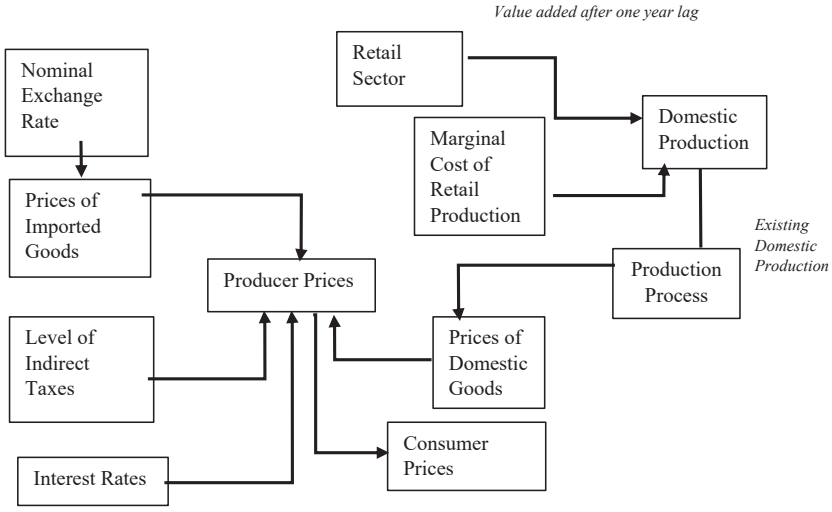
In the previous studies, the relationship between PPI and CPI by empirical models are as follows: causality relationship, cointegration, interactive relationship and transmission relationship (Gao, An & Zhong., 2013: 1). Empirical studies indicate that the four results, which are bidirectional relationship, unidirectional relationship from PPI to CPI, unidirectional relationship from CPI to PPI and no relationship among them.

The producer price index can be used to observe the consumer price index. This causality refers to supply-side developments. The supply-side approach specifies that PPI is the cause of the CPI. According to this approach, producer price index depends on expected future consumer prices. However, consumer prices respond only to past shocks in producer prices. (Cushing&McGarvey, 1990: 1070).

The other approach is demand-side development. Demand-side approach stresses that CPI is the cause of the PPI. Under this assumption, consumer prices affect the producer prices in two ways: 1) consumer prices depend on the current demand, expectation of current demand and future demand. The dynamics of current demand also affect both producer prices and consumer

prices. Therefore, consumer prices affect the producer prices through expected future demand (Cushing&McGarvey, 1990: 1066). 2) Consumer prices have an effect on the producer prices by way of labor supply. According to this, wage earners in the production sector point at maintaining the purchasing power of labor income and this mechanism rely on the expectations and the wage setting process. (Caporale, Katsimi & Pittis, 2002: 705). The relationship between CPI and PPI is shown in Figure 1.

Figure 1. *Transmission from Producer Prices to Consumer Prices*



Source: (Shahbaz, Wahid & Haider., 2010: 538)

Traditional approach stresses that the dynamics of price transmission is from producer process (supply side) to demand side (consumer prices). As stated by Figure 1, the retail sector adds a value to domestic production and it is used as input for domestic production. So, producer prices of the domestic goods are dependent on the indirect taxes, Interest rates and marginal cost of retail production. These factors affect the demand side of price dynamics (Shahbaz, Wahid & Haider, 2010: 538). In addition, consumer prices are determined by the producer prices of the home goods, the exchange rate and the imported good prices (Caporale, Katsimi & Pittis., 2002: 704). Therefore, this mechanism creates relationships among price indices.

Based on the above explanations, the aims of this study are as following: 1) to search the existence of a long-term relationship, 2) the causal link between CPI and PPI 3) to analyze the effect of input prices on final prices. For these purposes, the annual period from 1992 to 2017 is examined to search causality among the variables using the panel data analysis in selected Central and Eastern European Countries (CEECs) including Bulgaria, Croatia, Romania, Czech Republic, Poland, Slovenia, Slovak Republic, and Latvia. These

countries are generally referred to as transition economies. These countries experienced a transition from planned economy to free market economy. The analysis of the variables such as economic growth, unemployment, inflation and exchange rate and the relationships between these variables are important in terms of economic evaluations regarding transition countries.

The contributions of this study to the existing literature are twofold. I) as far as we know, this study is one of the few studies that examine causality between CPI and PPI in CEECs. II) The long run parameters are examined for each individual in the panel. By this method, it can be predicted the policy for each country.

Literature Review

In economics literature, there are some studies associating the PPI and CPI (see for example, Hatanaka&Wallaca, 1979; Colclough &Lange, 1982; Engle, 1978; Gutrie, 1981; Cushing&McGarvey, 1990; Clark, 1995; Caporole &Pittis, 1997, 1999; Caporale, Katsimi & Pittis,2002; Akti Berument & Cilasun., 2006; Ghazali, Yee & Muhammad, 2008; Fan, He & Hu., 2009; Shahbaz, Awan &Nasir, 2009; Sidaoui et al., 2009; Akcay , 2011; Tiwari, 2012a, 2012b; Tiwari&Shahbaz, 2010).

In relevant studies, it is generally found that producer prices mainly affect consumer prices. For instance, Khan et al. (2018) analyze the link between CPI and PPI for Czech Republic with using expenditure-switching model. They found a positive relationship in the short run. Jongwanich, Park and Wongcharoen (2019), examines the determinants of CPI and PPI for Asian counties range from 2000-2015. They indicate that the determinants of prices indices different from each other. External cost-push factors are valid for PPI while demand-pull factor express the consumer prices. In addition to these studies, causality analysis has been estimated for the linking price indices. The unidirectional causality from producer prices to consumer prices is called supply side approach and this approach is supported by many studies. For example, Akçay (2011) indicated that a unidirectional causality from PPI to CPI in Finland and France. Su et al. (2016) studied the causality from PPI to CPI in Slovakia for the period from 1998 to 2016 with using granger full sample causality and the sub-sample rolling window approach. According to Granger full sample causality test results, there is a unidirectional causality among the variables. However, the full sample results are inconsistent with sub-samples results. The results of time-varying rolling approach indicate that bidirectional causality in several sab-samples. In addition to these, they found that PPI has a positive impact on CPI. Finally, these results are indicated following two points: 1) Government can minimize the inflation to control input prices 2) Inflation can be affected internal and external factors. Martinez, Caicedo and Tique (2013) showed that PPI has significant impact

on CPI. On the contrary, some studies investigated the causality from CPI to PPI. This relationship is called as demand side approach. For instance, Ulke and Ergun (2014) found a unidirectional causality from CPI to PPI in Turkey for the period from 2003 to 2013 by using Vector Error Correction Model. Gang, Liping and Jiani (2009) found that CPI has an impact on PPI in China. Hamid, Thirunnavukkarasu and Rajamanickam (2006) studied the relationship between S&P index, CPI and PPI. They found the causality between from CPI to PPI and no causality between S&P index, CPI and PPI.

Furthermore, some studies found the bidirectional causality between PPI and CPI. According to bidirectional approach, demand side and supply side of prices move together and affect each other (Jones, 1986; Saraç & Karagöz, 2010; Gao, An & Zhong, 2013; Belthon&Reichert, 2007). In this direction, Shahbaz, Wahid and Haider (2010), researched the causality between Wholesale Prices and Consumer Prices for the period from 1992 to 2007 for Pakistan and concluded that there exists bidirectional causality among the variables. They also stress that causality is from WPI to CPI and WPI has a notable impact on CPI. On the contrary, Shahbaz, Tiwari and Tahir (2012) examined the causality between WPI and CPI for the period from 1961 to 2010 for Pakistan. They found bidirectional causality among the variables and stressed that CPI granger causes WPI at lower, intermediate, and higher level but on the contrary, WPI is not the cause of CPI. Therefore, they indicated that CPI is significantly important to specify monetary and fiscal policy. Tiwari et al. (2014) explored the cyclical effect between PPI and CPI for Romania using wavelet approach. They imply that the relationship among variables depend on internal and external macroeconomic conditions and so these variables are strongly important to specify domestic monetary policy. Blomberg and Harris (1995) indicated that there is a link among indices in the Short run and in the Long run. In addition, they found that PPI has an impact on CPI strongly. Akçay (2011) found a bidirectional causality among indices for Germany. When there is no long-term relationship among price indices, price stability cannot be observed through a single index. In this case, observing all price indices is important in terms of ensuring price stability. In addition to this, according to Tiwari (2012a), the lack of a causal link between the PPI and the CPI is brought to disregard the PPI as a relevant indicator by the central bank.

In addition, with these opposed findings, some studies argue that there is no causality between PPI and CPI. For example, Akçay (2011) reported no causality for the period from 1995 to 2005 for Netherlands and Sweden. Rajcaniova and Pokrivcak (2013) explored no long-term relationship between the PPI and the CPI.

Methodology

In the study, the relationship between CPI and PPI has been analyzed using panel data approach including unit root, cointegration and causality. The empirical methodology includes four steps. I) the stationary of variables is analyzed with panel unit root tests. II) The long-run relationship is searched with a panel cointegration test. III) The long-run parameters of each variable are examined with panel cointegration parameter estimator (FMOLS and DOLS). IV) The causal relationship among variables is investigated with a panel causality test developed by Dimutrescu-Hurlin Causality (2012).

At the first stage of analysis, IPS unit root test and LLC unit root test is used. IPS unit root test developed by Im, Pesaran and Shin (2003). The hypothesis of IPS are as follows:

H_0: $\beta_i - 0$ for all I

$$H_1: \beta_1 < 0_{,\,1=1,2,\ldots\ldots,\,N_1\,,}\ \beta_i = 0_{\delta} i = N_1 + 1.\, N_1 + 2, \ldots\ldots N \qquad (2)$$

Change in β_i refers to an alternative hypothesis for across groups in the panel. It is assumed that the alternative hypothesis of individual process is different from zero, if IPS model is as follows

$$\Delta\gamma_{it} = \mu_i + p\gamma_{it} -_1 + \Sigma_j^k = 1 \quad a_j \Delta\gamma_{it} -_j + \delta_i t + \theta_t + \varepsilon_{it} \qquad (3)$$

Levin, Lin and Chu (LLC) (2002) imply that there are $i = 1,\ldots\ldots,N$ groups and $i = 1,\ldots\ldots,T$ observation in the model. According to this∨, the constant and time trend take part in the each time series and null hypothesis implies that time series include a unit root for each unit.

LLC Panel unit root test hypothesis is as follows:

$$\Delta\gamma_{it} = \delta\gamma_{it\,-1} + \Sigma_L^{Pi} = 1 \quad \theta_{it} \Delta\gamma_{it} -_L + a_{mt} + \theta_{it}\, m = 1,2,3. \qquad (4)$$

Second stage is constructed using Panel Cointegration Test developed by Pedroni (1999). The long-term relationship among the variables has been estimated in that stage. The Pedroni Cointegration test is written in equation 5.

$$\varepsilon_{it=} \delta_i\ \varepsilon_{it}\,-_1 + \Sigma_k^{Ki} = 1 \quad \delta_{ik} \Delta\varepsilon_{it}-_k + \nu_{it} \qquad (5)$$

In this phase, Kao Cointegration test (1999) is also estimated to specify cointegration of variables. Kao (1999) suggested that the null hypothesis is no cointegration in panel data and derives asymptotic distribution for each

test. The distributions results estimated for DF_p , DF_t and ADF tests. In addition, asymptotic distribution of residual-based tests relies on LSDV estimator ($\hat{\beta}, t_{\beta}, R^2$) from the spurious regression.

The next step is to specify the long-term parameters of variables for all units in the panel. To predict parameters using FMOLS and DOLS developed by Pedroni (2000, 2001) constitutes the third stage of the method. To estimate the panel cointegration parameters, FMOLS (Panel Fully Modified Ordinary Least Squares) $\hat{\beta}_{GFMOLS} = N^{-1}\Sigma_{i}^{N}{}_{=1}\ \beta_{FMOLS}$ and DOLS (Panel Dynamic Ordinary Least Squares) $\hat{\beta}_{GDOLS} = N^{-1}\Sigma_{i}^{N}{}_{=1}\ \beta_{DOLS}$ estimators can be used. β^{*}_{FMOLS} is obtained from the time series FMOLS estimation and β^{*}_{DOLS} is obtained from the individual OLS estimation. Finally, causality between the CPI and PPI is investigated using Dumitrescu and Hurlin (2012) Causality test. The causality is expressed that the predictions of one variable (X) can be estimated by information of over values of another variable (Y). To investigate the causality, Dumitrescu and Hurlin (2012) Causality Test is estimated as follows:

$$\gamma_{i,t} = \alpha_1 + \sum_{k-l}^{K} \gamma_i^{(k)}\ \gamma_{i,t-k} + \varepsilon_{i,t} \qquad (6)$$

According to equation (6), x and y are the stationary variables for N individuals on T periods. Dumitrescu and Hurlin (2012) test has advantages in comparison with Granger Causality test. One of these advantages is that the Wald statistics are clear to calculate. Therefore, the test statistics do not need any specific panel estimation. In addition to this, the test can be easily applied for unbalanced panel with different lag order K.

Data

In the study, the long-term relationship and causality between PPI and CPI are investigated for the period from 1992 to 2017 in CEECs. CPI (CPI 2010 = 100) and PPI (PPI 2010 = 100) data are obtained from IMF-International Financial Statistics Database. The series are included as annual series with their natural logarithmic states. Figure 2 shows the annual movements of the series according to the countries.

Figure 2. *PPI and CPI for Selected CEECs*

Source: (IMF Database 2019)

In Figure 2, when countries are examined in general terms, it is observed that the variables move together for all countries. Co-integration and causality analyzes are tested for the existence of long-term relationships and causality between variables. Moreover, for all countries except Czech Republic and Latvia, negative inflation for consumer prices rates are achieved. Therefore, it can be said that the general price level is reducing and consumer prices get cheaper. So, the production will also decline. According to World Bank Country Reports (2019), these countries have undergone a significant transformation because of changing economic structure. In the first transition, the countries went through a decade of slow growth and the other economic factors. In addition, the 2008 crisis made countries vulnerable to economic shocks. Therefore, the report indicates a sign of political and economic turmoil.

Empirical Test Results

In the first step of the analysis, it is studied the stationary properties of the variables using panel unit root tests and the results are shown in Table 1.

Table 1. Unit Root Test Results

	LLC test				IPS test			
	Constant		Constant &trend		Constant		Constant& trend	
	Statistic	***p*-value**	Statistic	***p*-value**	Statistic	***p*-value**	Statistic	***p*-value**
Level								
InCPI	3.03871	0.9988	-0.74028	0.2296	-0.70667	0.2399	-0.70667	0.2399
InPPI	1.54558	0.9389	-1.13103	0.1290	-1.13103	0.1290	1.54558	0.9389
First difference								
dCPI	-8.60960	0.0000	-40.3859	0.000	-14.7585	0.0000	-8.98433	0.0000
dPPI	-0.29468	0.3841	-2.7041	0.0034	-12.6926	0.0000	-11.0009	0.0000

Empirical results indicate that all series appear to be non-stationary in level. LLC test results show that PPI is not stationary at constant first level; however, it is stationary according to IPS test and LLC test at constant and trend first level. So, all variables are stationary in first differences, that is, all series are integrated at I (1).

Table 2. Panel Cointegration Test Results

	Statistic	***p*-value**
Panel *V*-statistic	-1.079413	0.8594
Panel *P*-statistic	-16.16416	0.0000
Panel PP-statistic	-21.75363	0.0000
Panel ADF-statistic	-20.63547	0.0000
Group *P*-statistic	-1.918446	0.0275
Group PP-statistic	-4.175230	0.0000
Group ADF-statistic	-5.925591	0.0000
Kao Test	-13.69591	0.0000

Table 2 presents the panel cointegration test results developed by Pedroni (1999) and Kao (1999). According to the results, it can be seen that the null of hypothesis, no cointegration, is rejected by six statistics. Similarly, according to the Kao Cointegration Test, there is a cointegration relation among variables. So, the existence of the long-run relationship between CPI and PPI is confirmed for both test results. After determining the long-run relationship among variables, FMOLS and DOLS estimations. The results are presented in Table 3.

Table 3. Panel and Individual FMOLS Estimation Results

CPI=f(PPI)	Estimation Methods	Parameters
Panel	FMOLS	0.949589***
	DOLS	1.025657***
Bulgaria	FMOLS	0.877107**
	DOLS	0.860036**
Croatia	FMOLS	1.028155***
	DOLS	0.963588***
Czech Republic	FMOLS	1.433135**
	DOLS	1.224656***
Hungary	FMOLS	1.234968**
	DOLS	1.275357***
Poland	FMOLS	1.171657***
	DOLS	0.973886***
Romania	FMOLS	0.986402***
	DOLS	1.079097**
Slovak Republic	FMOLS	1.508167**
	DOLS	1.247884***
Slovenia	FMOLS	1.209695***
	DOLS	1.173769***
Latvia	FMOLS	1.088003***
	DOLS	0.969648***

Note: ** and *** indicates the statistical significance at 5 and 1 percent level, respectively.

According to FMOLS, the results of the panel show that a 1% increase in PPI increases CPI by 0.949%. Similarly, a 1% increase in PPI increases CPI by 1.025% by result of DOLS. Moreover, the results of individual are significant and positive. Finally, It is examined the causality between the CPI and PPI using with the Dumitrescu-Hurlin panel causality test and the findings present in Table 4.

Table 4. Dumitrescu-Hurlin Causality Test Results

Null hypothesis	F-stat.	***p*-value**
CPI does not homogeneously cause PPI	4.69488	0.0102
PPI does not homogeneously cause CPI	7.54335	0.0007

According to the causality test results, there is bidirectional causality among variables. The results are similar with Jones (1986), Saraç and Karagöz (2010), Gao, An and Zhong., (2013), Belthon and Reichert (2007). Shahbaz, Wahid and Haider (2010), Shahbaz, Tiwari and Tahir (2012), Tiwari et. al. (2014), Blomberg and Harris (1995) and Akçay (2011). However, it can be said that the results obtained can be changed for using sample, time, and methodology.

Conclusion

There are price indices used to monitor the general situation of the economy and to formulate monetary policies. The most important of these indexes are consumer price index (CPI) and producer price index (PPI). The Consumer Price Index (CPI) is one of the indices that measures the general price level in the economy. It is frequently used in macroeconomic indicators and is the primary function of monetary policy decisions. CPI measures the price changes in goods and services consumed by individuals and temporary changes in annual inflation value. PPI is used to measure changes in input prices. These indices show the general condition of the macro economy. In addition, central banks observe the economy and constitute monetary policies by price indices. The relationship of these indices with each other is also important for the selection of price indices to monitor the economy. If there is a long-term relationship and causality between price indices, price changes can be examined both consumer-based and producer-based and thus policy objectives can be established. The aim of this study is to find possible causal linkages of the CPI and PPI for the period from 1992 to 2017 in CEECs. Therefore, the empirical results show that CPI and PPI have causal linkages with each other. In the literature, there are some studies relevant to the relationship between CPI and PPI. Generally, the results can be changed according to sample, time and methodology. So, it can be said that the results obtained from the studies can be evaluated as per sample and time.

When the evaluated the results, it can be said that there is a long-term relationship between price indices and hence observing any of these indices can be used to achieve price stability targeting. In context with policy implications, it can be suggested that the central bank observe both price index to provide price stability. Also, the findings stress that the increase of input prices can affect the price of final goods strongly.

References

Akcay, S., (2011). The causal relationship between producer price index and consumer price index: empirical evidence from selected European countries. *International Journal of Economics and Finance*, 3, 227–232.

Akdi, Y., Berument, H., & Cilasun, S.M., (2006). The relationship between different price indices: evidence from Turkey. *Physics A 360*, 483–492.

Belthon, W. & Reichert, U., (2007). Inflation Regimes, Core Inflation Measures and The Relationship Between Producer And Consumer Price Inflation. *Applied Economic*s, 29, 1295-1305

Blomberg, B., & Harris, E., (1995). The commodity–consumer price connection: fact or fable? *Federal Reserve Bank of New York Economic Policy Review* 1, 21–38.

Caporale, G.M., Pittis, N. (1997). Causality and forecasting in incomplete systems. *Journal of Forecasting, 16*(6), 425-437

Caporale, G.M., Pittis, N. (1999). Efficient estimation of cointegrating vectors and testing for causality in vector autoregressions . *Journal of Economic Survey 13*(1), 1-35

Caporale, G.M., Katsimi, M., & Pittis, N., (2002). Causality links between consumer and producer prices: some empirical evidence. *Southern Economic Journal,* 68, 703–711.

Clark, T., (1995). Do producer prices lead consumer prices? *Federal Reserve Bank of Kansas City Economic Review*, 80, 25–39.

Colclough, W.G., & Lange, M.D., (1982). Empirical evidence of causality from consumer to wholesale prices. *Journal of Econometrics*, 19, 379–384.

Cushing, M., & McGarvey, M., (1990). Feedback between wholesale and consumer price inflation: a reexamination of the evidence. *Southern Economic Journal*, 56, 1059–1072.

Dumitrescu, E. & Hurlin, C. (2012). Testing for granger non-causality in Heterogeneous Panels. *Economic Modelling. 29*(4), 1450-1460

Engle, R.F., (1978). Testing price equations for stability across spectral frequency bands. *Econometrica*, 46, 869–881.

Fan, G., He, L., & Hu, J. (2009). CPI vs. PPI: Which drives which? *Frontiers of Economics in China, 4*(3), 317–334

Gang, F., Liping, H. & Jiani, H. (2009): CPI vs. PPI: Which Drives which? *Frontiers of Economics in China*, *43*(3), 317-334.

Gao, X., An, H., & Zhong, W. (2013). Features of the Correlation Structure of Price Indices. PLoS ONE 8(4), 1-9

Ghazali, M.F., Yee, O.A., & Muhammad, M.Z., (2008). Do producer prices cause consumer prices? Some empirical evidence. *International Journal of Business and Management,* 3, 78–82.

Guthrie, R.S., (1981). The relationship between wholesale and consumer prices. *Southern Economic Journal*, 47, 1046–1055.

Hatanaka, M., & Wallace, T.D., (1979). Multi collinearity and the estimation of low order moments in stable lag distributions. In: Kmenta, J., Ramsay, J. (Eds.), *Evaluation of Econometric Models. Academic Press*, New York. Price

Hamid, S., Thirunnavukkarasu, A., & Rajamanickam, M., (2006). Transmission Between Djia, S&P 500 Index, PPI And CPI. *CFS Working Paper Series,* 2006-05

IMF-International Financial Statistics Database (2019). https://data.imf.org/?sk=4c514d48-b6ba-49ed-8ab9-52b0c1a0179b&sId=-1 [10.03.2019]

Khan, K., Su, C. W., Tao, R. & Chu, C. C. (2018). Is there any relationship between producer price index and consumer price index in the Czech Republic? *Economic Research-Ekonomska Istrazivanja, 31*(1), 1788-1806

Kao, C., (1999), Spurious Regression and Residual-Based Tests for Cointegration in Panel Data, *Journal of Econometrics*, 90, 1–44

Im, K., Pesaran, M. & Shin, Y. (2003). Testing for Unit Roots in Heterogeneous Panels. *Journal of Econometrics*, 115, 53 – 74

Jones, J.D., (1986). Consumer prices, wholesale prices, and causality. *Empirical Economics*, 11, 41–55.

Jongwanich, J., Park, D. & Wongcharoen, P. (2019). Determinants of Producer Price versus Consumer price inflation in emerging Asia. *Journal of the Asia Pacific Economy, 24*(2), 224-251

Levin, A., Lin, C. & Chu, C-S. J., (2002). Unit Root Tests In Panel Data: Asymptotic and Nite-Sample Properties. *Journal of Econometrics*, 108, 1–24

Martinez, W. O., Caicedo, E. & Tique, E. J. (2013): Exploring the Relationship between the CPI and the PPI: The Colombian Case. *International Journal of Business and Management, 8*(17), 142 – 152.

Pedroni, P., (1999), Critical Values for Cointegration Tests in Heterogeneous Panels with Multiple Regressors, *Oxford Bulletin of Economics and Statistics,* 61, 654–678

Pedroni, P., (2000), Fully Modified OLS for Heterogenous Cointegrated Panels, *Nonstationary Panels, Panel Cointegration, and Dynamic Panels*, 15, 93-130

Pedroni, P., (2001). Purchasing Power Parity Tests in Cointegrated Panels. *Rev. Econ. Stat*. 83, 727–731.

Rajcaniova, M. & Pokrivcak, J. (2013): Asymmetry in Price Transmission Mechanism: the Case of Slovak Potato Market. *Review of Agricultural and Applied Economics, 16*(2), 16 – 23.

Saraç, T. & Karagöz, K. (2010). Türkiye'de Tüketici ve Üretici Fiyatları Arasındaki İlişki: Yapısal Kırılma ve Sınır Testi. *Maliye Dergisi*, 159, 220-232

Shahbaz, M, Awan, U.R & Nasir, M.N. (2009). Producer and Consumer Prices Nexus: ARDL Bounds Testing Approach. *International Journal of Marketing Studies, 1*(2), 78–86.

Shahbaz, M. Wahid, A. & Haider, A. (2010). Empirical Psychology between Wholesale Price and Consumer Price Indices: The Case Of Pakistan, *The Singapore Economic Review*, *55*(3), 537–551

Shahbaz, M., Tiwari, A.K. & Tahir, M.I., (2012). Does CPI Granger-cause WPI? New Extensions from Frequency Domain Approach in Pakistan. *Economic Modelling*, 29, 1592–1597.

Sidaoui, J., Capistran, C., Chiquiar, D., & Ramos-Francia, M., (2009). A note on the predictive content of PPI over CPI inflation: the case of Mexico. *Working Paper. Banco de Mexico*. 2009–14.

Su, C., Khan, K., Lobont, O. & Sung, C-H., (2016). Is There any Relationship between Producer Price Index and Consumer Price Index in Slovakia? A Bootstrap Rolling Approach. *Ekonomický časopis*, *64*(7), 611-628.

Tiwari, A.K. & Shahbaz. M., (2010). Modelling the Relationship between Whole Sale Price and Consumer Price Indices: Cointegration and Causality Analysis for India. *Munich Personal RePEc Archive (MPRA).* 27333

Tiwari, A.K., (2012a). An Empirical Investigation of Causality between Producers' Price and Consumers' Price Indices in Australia In Frequency Domain. *Economic Modelling*, 29, 1571–1578.

Tiwari, A.K., (2012b). Causality between Whole Sale Price and Consumer Price Indices in the India: An Empirical Investigation in the Frequency Domain. *Indian Growth and Development Review, 5*(2), 151–172.

Tiwari A.K., Suresh K.G., Arouri, M. & Teulon, F. (2014). Causality between Cımsumer Price Index and Producer Price: Evidence from Mexico. *Economic Modelling*. *36*, 432-440

Ulke, V. & Ergun, U. (2014): The Relationship between Consumer Price and Producer Price Indices in Turkey. *International Journal of Academic Research in Economics and Management Sciences, 3*(1), 205 – 222.

World Bank (2019). *World Development Indicators database:* https://databank.worldbank.org/source/world-development-indicators# [10.03.2019].

World Bank (2019). *Country Reports:* worldbank.org/en/country. [04.11.2019].