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The young researchers in the fields of economics, management and business are permanently facing challenging tasks imposed by the contemporary scientific development. "St. Kliment Ohridski" University -Bitola, the Faculty of Economics-Prilep and the Doctoral Programme in Entrepreneurship and SME Management for the Western Balkan Countries organized an international conference

entitled "Contemporary research issues in economics, management and business" with three main Conference topics:
- Economics including all related sub-disciplines
- Management including all related sub-disciplines
- Business including all related sub-disciplines

Being aware of the fact that the doctoral thesis represents an autonomous scientific paper resulting from an independent scientific work of the candidate and contributes significantly to the development of the respective scientific area, the aim of this conference was to provide possibility for the doctoral students in the fields of economics, management and business to present the results from their research and to initiate debate about the recent policy challenges. Through facilitating the exchange of knowledge among PhD students and supporting the establishment of network of scholars currently undertaking research in this region, our tendency was to overcome the usual academic isolation as a problem that many doctoral students face today. "St. Kliment Ohridski" University - Bitola recognized the relevance of these issues and decided to give the support to the young researchers by publishing all positively reviewed papers in the special edition of the magazine "Horizons".

prof. Marika Baseska –Gjorgjieska

Scientific Board representative

Dear readers, you can afford an access to the newest issue of *Horizons*, the scientific magazine of "St. Kliment Ohridski" University-Bitola but this time it has a new form and a new structure, as well as prepared and published in a new technology. The journal starting with this issue, opens up new horizons, educational scientific and research not only locally but spreading to reach the European higher education area.

This special edition of the scientific magazine Horizons represents a medium through which the research papers of the participants in the International conference "Contemporary research issues in economics, management and business" get international dimension.

What is considered a matter of even greater visibility is the international dimension of the scientific papers submitted for publishing, evident in the large number of papers by authors from abroad. This is in confirmation and enlargement of the promotion function the journal has regarding the scientific-research activity of the young researchers in front of the international auditorium. The University scientific magazine Horizons confirms the role that St.Kliment Ohridski University-Bitola plays in the development of advancement of the scientific thought in Macedonia in a number of scientific fields as a proof of its scientific approach. Thus, this issue of the journal contains papers dealing with topics in the area of economics.

Editorial Board

CONTENT

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CAUSAL RELATIONSHIP BETWEEN WAGES AND PRICES IN R. MACEDONIA: VECM ANALYSIS[1]

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ABSTRACT

This paper presents the testing of the issue of causality between wages and prices in R. Macedonia. OLS relationship between prices and wages is positive; productivity is not significant in determination of prices or wages as well. The standard procedure is used in this paper, such as first OLS estimates, co-integration test in order to determine whether there long run relationship existing between wages and prices and the Vector error correction model has been applied. There is only one co-integration relationship existing according to the co-integration tests. Causation runs from wages to prices, and wages significantly enter in the co-integration relation. As from the OLS estimation results the productivity does not enter statistically significant in the wage neither in the price equation. As a recommendation to the policy makers is to incorporate productivity (standard of living) in the legal acts for establishment of minimal wage. This may be accomplished by regulating the internal wage structures, mandated minimum wages, etc.
Keywords: Granger Causality, Wages, Prices, Co-integration, VECM

JEL classification: C50, E31

[1] original scientific paper

INTRODUCTION

The aim of this paper is to investigate the issue of causality between wages and prices in Republic of Macedonia. For this purpose the standard causality tests along with Toda-Yamamoto test and Vector error correction model have been used. The issue of causality between wages and prices had been extensively discussed in the literature. However, the consensus about the question what is cause and what is effect has not been clearly reached. David Hume (1739) argued that, in seeking to explain any object or event, it is evident but not proven that it's alleged cause was produced and effected on it. Immanuel Kant, Hume's contemporary, also thought that the idea of causality is fundamental category of understanding, and a necessary condition for experience. In the field of economics Haavelmo (1944)[2], was one of the first to contribute to the advancing of the causality analysis. He formulated the economic relationships to be expressed in stochastic terms, but also stated that every theoretical relationship in economics can be tested empirically, and as an example he took stochastic price-quantity relation. In economics, there different approaches to causality exist, one approach may emphasize structure, and other may emphasize structure[3].

Table 1 a summary of some studies, on causality issue

	Structural	**Process**
A priori	Cowles commission, Koopmans (1953), Hood and Koopmans (1953)	Zellner (1979)
Inferential	Simon (1953), Favero and Hendry (1992), Angrist, Krueger (2001)	Granger (1969) Vector autoregressions , Sims (1980)

Herbert Simon (1953) showed that causality could be defined in a structural econometric model, not only between exogenous and endogenous variables, but also among the endogenous variables themselves. The Cowles commission approach, related causality to the invariance properties of the structural model. This approach emphasized the distinction between endogenous and exogenous variables, and the identification and estimation of structural parameters. Zellner opposes Simon and sides with Granger: predictability is a central feature of causal attribution, which is why his option is a process account. On the other hand, he opposes Granger and sides

[2] Haavlemo T. (1944) '*The probability Approach in Econometrics'*, Econometrica, 12, Issue Supplement (July, iii-vi, 1-115.)

[3] Hoover, K.,(2008), Causality in economics and econometrics, From The New Palgrave Dictionary of Economics, Second Edition, 2008 Edited by Steven N. Durlauf and Lawrence E. Blume

with Simon: an underlying structure (a set of laws) is a crucial presupposition of causal analysis, which is why his is an a priori account.

THEORETICAL MODELS OF PRICES AND WAGES REVIEW

A standard model in this framework is New Keynesian Philips Curve (NKPC), which has the following presentation: $\pi = \beta E(\pi_{t+1}) + \alpha(y - \bar{y})$ here π is inflation rate, π_{t+1} is expected inflation, and $\bar{y}$ is the natural output. Actually natural output represents the fitted values, this model has log-log functional form, in order to represent the percentage values of the variables. From a welfare point of view previous model implies that is best for welfare, to stabilize output and stabilize inflation (Blanchard and Gali, 1988)[4]. The stabilizing inflation also stabilizes output gap. According to macroeconomic behavior $\bar{p}Y = M$, here $\bar{p}$ are average prices, M is money supply, and Y is output (Akerloff, Dickens and Perry, 2000)[5]. Because there exist n firms in the economy, that are monopolistically competitive, and they divide aggregate demand, $\frac{M}{\bar{p}}$ by $\frac{1}{n}$. So that aggregate demand for the output of a given firm is given as $\frac{1}{n}\frac{M}{\bar{p}}\left(\frac{p}{\bar{p}}\right)^{\alpha}$ here p is the price charged by the firm on its own product. Now the relation between productivity, wages and unemployment is given by the following equation, $\Pr oductivity = -a + b\left(\frac{w}{w^r}\right)^{\alpha} + cu$, here w^r are the reference wages of the workers, and u is the unemployment rate. And $0 < \alpha < 1$. Reference wage incorporates the following expression, $w^r = \bar{w}_{-1}(1 + \alpha\pi^e)$ so they do incorporate average wages from previous period, and expected inflation. The profit maximization for the firms is given by the following expression, $p_i = m\frac{w_i}{p_i}$, here m is the mark-up over wages and prices, and markup factor is $\left(\frac{\beta}{\beta - 1}\right)$. If we return to the expression, $\frac{1}{n}\frac{M}{\bar{p}}\left(\frac{p}{\bar{p}}\right)^{\alpha}$ here

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[4]Blanchard, O.,Gali, J.(2005), Real wage rigidities and the New Keynesian model,NBER working paper

[5]. Akerlof,G, William T. Dickens & George L. Perry, (2000). "**Near-Rational Wage and Price Setting and the Long-Run Phillips Curve**,"Brookings Papers on Economic Activity, Economic Studies Program, The Brookings Institution, vol. 31(1), pages 1-60

α is defined as $-\eta$, but so that $\eta > 1$. So that each firm has greater revenues as its price falls Akerloff, Yelen (1980)[6].

LITERATURE REVIEW

The debate on the direction of causality between wages and prices is one of the central issues surrounding the literature on the determinants of inflation. There are many studies done in order to test the price-wage relationship. In Table 2 the most relevant studies on this relationship are presented.

Table 2 Summary of some studies, on price, wage and productivity relationship presented in chronological order

Studies	Title	Method
Moschos (1983)	Aggregate price responses to wage and productivity changes: Evidence from the U.S.	Productivity Changes: Evidence from U.S.
Strauss, Wohar (1994)	The Linkage Between Prices, Wages, and Labor Productivity: A Panel Study of Manufacturing Industries	Panel cointegration relationship
Erica L. Groshen Mark E. Schweitzer (1997)	The Effects of Inflation on Wage Adjustments in Firm-Level Data: Grease or Sand?	40-year panel of wage changes
Shik Heo(2003)	The relationship between efficiency wages and price indexation in a nominal wage contracting model	simple nominal wage contracting model
Peter Flaschel, Gäoran Kauermann, Willi Semmler (2005)	Testing Wage and Price Phillips Curves for the United States	Parametric and non-parametric estimation.
Pu, Flaschel and Chihying (2006)	A Causal Analysis of the Wage-Price Spiral	Granger causality. VAR (Vector Autoregressive) Model.
Saten Kumar, Don J. Webber and Geoff Perry (2008)	Real wages, inflation and labour productivity in Australia	Cointegration; Granger causality
Dubravko Mihaljek and Sweta Saxena (2010)	Wages, productivity and "structural" inflation in emerging market economies	Empirical methods ,correlations

[6] Akerlof, G. A. and J. L. Yellen (1985b). A near-rational model of the business cycle, with wage and price inertia, Quarterly Journal of Economics 100, 823—838 with wage and price inertia. Quarterly Journal of Economics 100, 823—838

METHODOLOGY

The presence of bilateral causal relationship between the two variables mentioned above makes the model building more complex. In this context, the OLS regressions produce highly significant parameters, but the presence of autocorrelation raises the question of whether OLS estimates are robust[7]. Next, VECM (Vector error correction model) model is used, which is usually applied in the examining models with more than one endogenous variable. About the theoretical relationship between prices, wages and productivity, policy makers and financial analysts cite wages pressures and productivity as leading factors in explaining inflation. Although cost push inflation has been examined by Mehra (1991, 1993, 2000), indicates that prices cause wages, but such rise in wages does not seem to explain the inflation. Hu and Trehan (1995), also reject the cost push view of inflation. By using Granger-causality tests Ghali (1999) finds that wage growth does help to predict inflation which is supporting the cost-push view. The relationship between productivity and inflation, has been described in the theory but there are not many empirical studies to support this hypothesis, Straus (2004)[8]. Beside wages and productivity, other variables can be used on the models as well. But these big models that include greater number of variables have proven to be failure when trying to capture the dynamic relationship between the variables, due to loss of power. Lütkhepohl and Krätzig (2004) proved that the failure of these big models in explanation of the dynamic relationships, is their insufficient representation of the dynamic interactions in the systems of variables. For the analysis of the causal relationship in this paper, two models OLS regression model and VECM model have been used, in order to obtain statistically robust estimate. Prior to the estimation of these models the respective model selection criteria is examined, for determining the lag order/lagged differences so as the rank of co-integration. Also there Toda, Yamamoto test (1995) have been applied, as well as instantaneous causality test, in order to see the robustness of the causality results. VAR model was used to capture the short run relationship between the variables of interests.

DATA

[7]Although in the presence of autocorrelation the OLS estimators remain unbiased, consistent, and asymptotically normaly distributed, they are no longer efficient (Gujaraty, 2003).

[8] Straus, J.Wohar,E.,M., (2004), **The Linkage Between Prices, Wages, and Labor Productivity: A Panel Study of Manufacturing Industries,** Southern Economic Journal.

For the empirical part of the price-wage causal relationship in Macedonia, quarterly data was used covering the period from **2004 Q1** to **2009 Q4**. The variables that we use are wages, which are represented by the wages (AVERAGE REAL WAGES), index number, quarterly data 2005=100.CPI (prices)consumer prices,index number, quarterly data 2005=100.Productivity is also represented by the quarterly index, (PROD).The sources of the data are IMF IFS and EconStats[TM9].Additionally in this section the stationary properties of the time series data has been analyzed.The plots for both level series of all three variables suggest a trending movement and little evidence of returning to a fixed mean value. Furthermore the plots are inconsistent with the series containing stochastic trends. In contrast, the plots for the differenced series suggest evidence of mean reversion and some evidence that the series may be stationary. As the Table in the Appendix shows, the formal stationary tests, Augmented Dickey –Fuller test (ADF), and Phillips Perron test (PPERRON), in all cases for wages and prices the null hypothesis that the series in levels contains unit root, we cannot reject. But for the productivity variable it is accepted that it is stationary even in levels, and that does not contain unit root. In contrast all of the null hypotheses that the differenced series contain unit root is rejected in all cases for both series. Therefore level series for wages and prices contain unit root, and appears to be characterized by the presence of stochastic trend.

RESULTS

In the first sub-section the results from OLS estimation, whereas in the second sub-section we will analyze the VECM model will be examined.

OLS ESTIMATES

In the Table 3 are presented the results of the OLS estimates. In the columns (2) and (3), prices are regressed on wages and productivity in a log-log functional form, and then first difference estimates are also provided. In the column (6) and (7) wages are regressed on productivity and also in the second part of the columns (denoted in the beginning with Δ**log** symbol)**,** are provided first differenced results. Also from each model autocorrelation tests results, and functional form test results are reported.

Table 3 OLS estimates

Variables	Prices=f(wages, productivity)				Wages=f(prices,productivity)		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
log	LRW	0.35***	0.96***	**log**	LCPI	2.31***	1.04***

[9]The web site for this citation is : http://www.econstats.com/ifs/NorGSc_Mac2_Q.htm

	LPROD	0.015	-0.11***		LPROD	0.002	0.107**
	CONST	3.032***	n.a.		CONST	-6.038***	n.a.
	LM test	0.0024	0.0027		LM test	0.0018	0.0013
	Ramsey test	0.0000			Ramsey test	0.9804	
	ΔLRW	-0.034	0.091		ΔLCPI	-0.19	0.75
	ΔLPROD	-0.0036	-0.002		ΔLPROD	-0.0037	0.021
	CONST	0.0076***	n.a.		CONST	0.025***	n.a.
Δlog	LM test	0.3792***	0.1021	**Δlog**	LM test	0.3524***	0.0431
	Ramsey test	0.0750*			Ramsey test	0.2290***	

Note 1*: ** - significant at 1% level of significance; ** - significant at 5% level of significance; * - significant at10% level of significance.The LM tests indicate the p-value of the Breusch-Godfrey LM test for autocorrelation with H_0: no serial correlation and H_a: H_0 is not true.

The OLS regression in column 2 can be represented in a form:

1. $\hat{lcpi} = \beta_1 lrw + \beta_2 lprod + \beta_0$, where β_0 is intercept, β_1 and β_2 are elasticities that measure elasticity of wages to prices and productivity to prices respectively.
2. Second model in this column is: $\Delta\hat{lcpi} = \beta_1 \Delta lrw + \beta_2 \Delta lprod + \beta_0$ this is the case of first differences of the variables. Autocorrelation in the log model from column I is a serious problem, OLS time series do suffer from serial correlation. While in the second model form this column, first difference model does not suffer from serial autocorrelation.

Functional form in this column is better when first differenced model. That is the change of the variables model is better than their levels model. Models form column (6) can be presented as $\hat{lrw} = \beta_1 lcpi + \beta_2 lprod + \beta_0$, and the second model in this column is, $\Delta\hat{lrw} = \beta_1 \Delta lcpi + \beta_2 \Delta lprod + \beta_0$,first mode in this column do suffer from autocorrelation but the OLS estimates give the predicted *a priori* relationship between the variables of interest. Except that the productivity does not influence the level wages not even their changes (first differences). Models without constant in columns 3 and 7 are also tested. And in these models same as log-log OLS models autocorrelation is a problem, while in a first difference models autocorrelation seems not

to be a problem. Further on some conclusion for the causality based on the OLS estimation will be made.

Table 4 The pattern of causality in Macedonia based on OLS estimates

Model	Log-log	First-differences
Intercept	*cpi* ⇔ *realwages*	*cpi* – *realwages*
No intercept	*cpi* ⇔ *realwages*	*cpi* – *realwages*

Note 2: ⇔ indicates bilateral causality, while – indicates absence of causality.

This evidence suggests that there is bilateral causal relationship between prices and wages in the current models, but not in first differenced models. Additionally, in the log-log models serial correlation was considered as a serious problem, which harms the reliability of the OLS estimates. Nonetheless, it is agreeable that OLS estimates are a good start, as they provide first insight when testing different relationships. On a basis of Ramsey's RESET test it appears that in the case when prices are function of wages, first differenced model suit better, while when wages are function of prices and productivity level model and first differenced model, according to Ramsey's RESET test appear to be well specified. Productivity seems to be significant only in level models, and not in first differenced models. According to the LM test, Breusch-Godfrey test, for autocorrelation, autocorrelation seems to be a problem in a level's models while not when first differenced models[10]. This raises the question whether OLS estimates are statistically robust.

TODA AND YAMAMOTO TEST

Toda and Yamamoto (1995) developed a test, alternative to Granger causality test, irrespective of whether Y_t and X_t are are I(0), I(1), I(2), co-integrated or not co-integrated of an arbitrary order. This is widely known as Toda and Yamamoto (1995) augmented Granger causality. Toda and Yamamoto test is based on the following two equations:

$$LCPI_t = \alpha + \sum_{i=1}^{h+d} \beta_i LCPI_{t-i} + \sum_{j=1}^{k+d} \gamma_j LRW_{t-j} + u_{yt} \quad \textbf{(I)}$$

$$LRW_t = \alpha + \sum_{i=1}^{h+d} \theta_i LRW_{t-i} + \sum_{j=1}^{k+d} \delta_j LCPI_{t-j} + u_{xt} \quad \textbf{(II)}$$

For the first equation;

[10]Null hypothesis in this test is H_0:no serial correlation and H_a: there exists serial correlation in the residuals

Null hypothesis is $H_0 : \sum_{j=1}^{k} \gamma_j = 0$ or X_t does not cause Y_t, alternative hypothesis is, $H_1 : \sum_{j=1}^{k} \gamma_j \neq 0$,or X_t does cause Y_t. For the second equation null hypothesis is; $H_0 : \sum_{j=1}^{k} \delta_j = 0$ or Y_t does not cause X_t, alternative hypothesis is, $H_1 : \sum_{j=1}^{k} \delta_j \neq 0$, or Y_t does cause X_t. Here d is the maximal order of integration, h and k are optimal lag length from the information criteria. AS for this case optimal lag length is 4. From the estimated VAR model.In a small and finite samples like the one presented and like other researchers by whom it is used as well, the F-test is the most appropriate statistics, when doing a Wald tests. The unrestricted models are as follows:

$$LCPI_t = \alpha + \sum_{i=1}^{h} \beta_i LCPI_{t-i} + u_{yt} \quad \textbf{(III)}$$

$$LRW_t = \alpha + \sum_{i=1}^{h} LRW_i X_{t-i} + u_{xt} \quad \textbf{(IV)}$$

Now we calculate the F-statistics for the models. The results are presented in the following sections

F-statistics for the equations (I) and (III) [11]

$$F = \frac{\left(R^2_{UR} - R^2_R\right)/k}{R^2_{UR}/(n-k)} m = \frac{(0.015 - 0.011)/2}{0.015/(20-2)} = \frac{0.001}{0.000083} = 12.04$$

Here R^2_{UR} are the residual sum of squares of the unrestricted model (I), and R^2_R are the residual sum of squares of the restricted model (III). The F-stats for 2 and 18 degrees of freedom is 6.013 .so the null hypothesis that LRW_t does not influence $LCPI_t$, is rejected and the alternative that LRW_t does influence $LCPI_t$ is accepted.

F-statistics for the equations (II) and (IV)

$$F = \frac{\left(R^2_{UR} - R^2_R\right)/m}{R^2_{UR}/(n-k)} = \frac{(0.022 - 0.013)/2}{0.022/(19-2)} = \frac{0.009}{0.0013} = 6.92$$

The F-stats for 2 and 17 degrees of freedom is 6.12, so 6.93>6.12, the null hypothesis that $LCPI_t$ does not cause LRW_t is rejected, and $LCPI_t$ does weakly cause LRW_t. Next the estimated VAR model is being introduced. A

[11] In the F-stat formula, *m* is the number of imposed restrictions

*p*th-order VAR is also called a **VAR with *p* lags**.Following Gordon (1988)[12], the following wage and price equations that constitute the VAR model is specified:

$$\Delta LCPI = \alpha_0 + \sum_{s=1}^{k} \alpha_{1s} \Delta LCPI_{t-s} + \sum_{s=1}^{k} \alpha_{2s} \Delta LRW_{t-s} + \sum_{s=1}^{k} \alpha_{3s} \Delta X_t + \sum_{s=1}^{k} \alpha_{4s} \Delta Z_t + \varepsilon_t^{CPI} \quad \textbf{(V)}$$

$$\Delta LRW = \beta_0 + \sum_{s=1}^{k} \beta_{1s} \Delta LCPI_{t-s} + \sum_{s=1}^{k} \beta_{2s} \Delta LRW_{t-s} + \sum_{s=1}^{k} \beta_{3s} \Delta X_t + \sum_{s=1}^{k} \beta_{4s} \Delta Z_t + \varepsilon_t^{RW} \quad \textbf{(VI)}$$

This equations constitute two equation non-structural vector autoregressive system, (VAR) that can be used to study the short run dynamics of the relationship between prices and wages inflation. But since the series appear to be co-integrated which is late shown in the following tests co-integration tests the long run information in the model that was removed by first differencing the variables will be incorporated. The result is Vector Error correction (VEC) model. This is a common approach to include the lost information, by including the levels of the variables LCP_{t-1} and LRW_{t-1}, by which on would obtain VEC unrestricted model Nourzad,.(2008)[13].

Table 5 var model: lcpi lrw, lags (4)

LCPI	**Coefficient**	**z**	**P>|z|**
L4.LCPI	-0.46	-1.38	0.17
L4.LRW	0.79	4.48	0.00
CONSTANT	3.08	3.96	0.00
LRW	**Coefficient**	**z**	**P>|z|**
L4.CPI	1.69	3.67	0.00
L4.LRW	0.75	3.06	0.00
CONSTANT	-6.58	-6.13	0.00

Next, the Wald tests of the hypothesis that the endogenous variables at the given lag are jointly zero for each equation and for all equations jointly are reported.

Equation: LCPI

lag	χ^2	df	p > χ^2

[12] Gordon, Robert J. (1998) "The Role of Wages in the Inflation process," *American Economic Review*, 78, 276-283

[13] Nourzad,F.(2008), Assessing the Predictive Power of Labor-Market Indicators of Inflation, Applied economic Letters

4	142.4237	2	0.000

Equation: LRW

lag	χ^2	df	p > χ^2
4	629.6134	2	0.000

Equation: All

lag	χ^2	df	p > χ^2
4	766.7447	4	0.000

So the null hypothesis that all endogenous variables at the given lag are zero is reported, because the probability of making Type I error is zero. In the standard VAR process framework the instantaneous causality is being tested by using Wald test for zero restrictions. Granger defines instantaneous causality where current as well past values of x are used to predict y_t[14]. It was proven by the JMULTI test there is instantaneous causality, where pvalue is 0.0760. The granger causality testing otherwise where not in favor of the causal relationship.

VECM ESTIMATES

By analyzing the results from the optimal lag length criteria, according to all of the info criteria, Akaike information criteria (AIC), Hannan-Quinn (HQ) criteria, and optimal lag length is 4 lags.

THE JOHANSEN TEST FOR COINTEGRATION OF THE RANK AND SAIKKONEN AND LÜTKHEPOHL TEST

The co-integration tests were performed between *LCPI* and *LRW* . On the basis of the Johansen trace test analysis with one co-integrating relationship will be continued. This applies only when constant is included in the cointegration test, whilst the test statistic is significant at 1%. , clearly indicating that there is sufficient evidence that the rank of cointegration is zero i.e. $rc(\Pi) = 0$, and accept the alternative hypothesis that $rc(\Pi) = 1$. While in contrast when there is trend and orthogonal trend in the cointegration test, there is insufficient evidence to reject the null hypothesis of $rc(\Pi) = 0$, against the alternative $rc(\Pi) = 1$ .Same results applies when

[14] Schwert, W.G.(1977), Tests of causality the message of innovations, Rochester University

using Saikkonen and Lütkhepohl (1999) test[15], and this test suggests that rank of one is appropriate.

Table 8 Johansen test for co-integration of the rank and Saikkonen and Lütkhepohl test

Variables	Deterministic term	Johansen Trace test			Saikkonen and Lütkhepohl		
		Lag Order	LR-stat	Pvalue	Lag Order	LR-stat	Pvalue
LCPI LRW	Constant	1	13.89	0.0051	1	3.44	0.0758
	Constant and trend	1	4.91	0.6152	1	1.14	0.7554
	Orthogonal trend	1	10.10	0.2784	1	8.98	0.0720

Hence there is sufficient evidence to continue the analysis with one co-integrating relationship $r = 1$. The VECM model was estimated using the *Two Stage procedure (S2S)*, with *Johansen Procedure* being used in the first stage and Feasible Generalized Least Squares (*FGLS) procedure* being used in the second stage. From the model coefficients with $t < 2$, t and statistics lower than two have been eliminated. This is in accordance with the recommendations by Lütkhepohl and Krätzig, 2004[16]; Lütkhepohl and Krätzig, 2005[17].About the ***Loading coefficients,*** their t ratios can be interpreted in the usual way, as being conditional on the estimated co-integration coefficients, (Lütkhepohl and Krätzig, 2004; Lütkhepohl and Krätzig, 2005,).In this case the loading coefficient of the first equation and in the second equation are significant. Their t ratios are respectively 3.973 for the first equation, and 2.398 for the second equation. Thus, based on the presented results, it is debatable that co-integration relation resulting from normalization of co-integrating vector enters significantly in both equations. About the ***Co-integrating vectors***, by selecting $LCPI_{t}$ as the first variable in the model, it means that the coefficient of this variable in the cointegration relation will be normalized to 1 in the maximum likelihood estimation procedure. Nevertheless, by looking at p-value of the coefficient seems that

[15] Saikkonen, P. and Lütkhepohl, H. (1999), 'Local power of likelihood ratio tests for the cointegrating rank of a VAR process', Econometric Theory 15:50-78.

[16] Lütkhepohl, H. and Krätzig, M. (2004), '*Applied Time Series Econometrics'*, Cambridge University Press, October 2004, ISBN 0521 54787 3.

[17] Lütkhepohl, H. and Krätzig, M. (2005), '*VECM Analysis in JMulTi'*, 2005, www.jmulti.de

there is sufficient evidence to suggest that $LCPI_t$ and LRW_t are cointegrated. The model takes this form:

$$ec_t^{EGLS} = LCPI_t - \underset{(0.000)}{1.012} \quad LRW_t \qquad \textbf{(VII)}$$

The number in parentheses is pvalue, when previous equation has been rearranged, the new expression takes this form:

$$LCPI_t = \underset{(0.000)}{1.012} \quad LRW_t + ec_t^{EGLS} \qquad \textbf{(IX)}$$

Considering that the logs of variables have been used, the relation in previous expression expresses the elasticity of prices on wages, hence the coefficient of 1.012 is the estimated price elasticity. If the log wages increases by 1%, it is expected that the log of prices would increase by 1.012 percent. In other words, a 1 percent increase in the log wages would induce a 1.012 percent increase in the log of prices. In addition to this the value of standard deviation is very low, indicating a high efficiency for the estimated parameter. Now, the ***Short-run parameters*** can also be interpreted in the usual way. The estimators of parameters associated with lagged differences of variables may be interpreted in the usual way. Here *t* ratios are asymptotically under this conditions. The coefficient of productivity does not have a statistically significant impact on wages, neither on prices. About the ***Deterministic Terms***, seasonal dummies do not appear to have significant impact neither on first, nor on second equation. In the next table the results for the diagnostic test performed on the VECM model are presented. Testing the model robustness - most of tests rely on the residuals of final VECM, with some applying to the residuals of individual equations and others are based on the full residual vectors, the VECM model statistic indicates that one may not reject the null hypothesis that restricted model has a better representation of Data generating process, compared to unrestricted model. The value is 0.8356 which provides sufficient evidence that no information is lost if restrictions are in some of the short run parameters. ARCH-LM test prove that there is no problem with serial autocorrelation. Non-normality test gives ambiguous results, Lütkepohl (1993) test[18] proves normality in the residuals, whilst Dornik and Hansen (1994) test proves opposite[19].

Table 9 VECM Diagnostic Tests

[18] Lütkepohl (1993), Introduction to Multiple Time Series Analysis, 2ed

[19] Doornik, J.K. and, Hansen, H., 1994, A practical Test for Univariate and Multivariate Normality, Discussion Paper, Nuffield College.

Type of test	p-value	VECM
VECM model statistics	0.8356	√
LM Autocorrelation Test	0.5611	√
Non normality test		
Dornik and Hansen (1994)	0.0000	x
Lütkepohl (1993)	0.5506	√
ARCH-LM		
u1	0.9505	√
u2	0.6531	√

Note: √ - test indicates no problems with diagnostic criteria; x – indicates that there is some problems with the diagnostic criteria.

Finally, based on the evidence, one can argue that they are not so strongly co-integrated, and that, there is sufficient evidence in support of a unilateral causal relationship between prices and wages, running from wages to prices only.

CONCLUSION

As of this literature there are two groups of economists, one that argue that causality runs from wages to prices, and the second group of economists that argue that causality runs in opposite direction. This paper presents a clear evidence that causality runs from wages to prices. The co-integration test proved that some linear combination of the wage and price variable from the Vector Error correction model if the log wages increases by 1%, it is expected that the log of prices would increase by 1.012 percent. From the OLS estimation results productivity does not enter statistically significant in the wage neither in the price equation. So, there is no economic interpretation of the significance of the productivity variable in relation to wages or prices. For the policy matters this may mean that policy maker do not take productivity into account when they set wages and prices. This may cause bias in the sense that wages and prices are not set on their equilibrium levels, i.e. there is a distortion on the markets. As a recommendation to policy makers would be that they may need to incorporate productivity (standard of living) in the legal acts for establishment of minimal wage. This may be accomplished by regulating the internal wage structures, mandated minimum wages etc.

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