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Does Minimum Wage Cause Inflation in Iran?

By

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Abstract

This paper presents a brief study on the development of prices and wages in the Iran's economy over the period 1949 – 2013. The Granger causality test is applied to examine causality between change in prices and wage inflation. The application of Granger causality test proves that there is a bidirectional relationship between inflation and wages. We believe that the outcomes of this research will have a crucial impact on the decision makers planning for economic activities in Iran.

Keywords: *Granger Causality test; inflation; Minimum Wage*

1. Introduction

Economic literature focuses on several factors that are significant, inducing price changes. These factors include: rising labor cost, change in exchange rate, supply shocks, excess demand generated by expansionary fiscal and monetary policies, and changes in import prices in an open economy (Metwally and Al-Sowaidi 2004).This article tries to clear whether minimum wage is a cause or an effect of price inflation. in 1959 the minimum wage had been established at 930 riyals but in 2013 it was increased to 4,871,250 riyals, it has been raised several times in part to keep up with rising prices, but in last few years it changes annually.

Theories supporting the view that wage increase leads to price inflation consider wages as a cost factor, whose growth-assuming mark-up pricing will cause price inflation. Alternative theories suggest that inflation results from excess aggregate demand, which exerts pressure on prices to go up. On one hand, employers demand more labor to meet the increase in demand for products, which puts an upward pressure on wages. On the other hand, the increase in prices reduces real wages, urging workers to demand higher wages when bargaining contracts for the following periods. This view supports the hypothesis that price inflation causes wage inflation (Abdel Aziz and Fares, 2011).

2. Literature Review:

The minimum wage is not indexed to the price level. It has been legislatively increased from time to time to make up for the loss in its real value caused by inflation. In nominal (current riyals) terms, the minimum wage has risen steadily from 930 riyals to 4,871,250 riyals.

It is commonly believed that higher wages lead to higher inflation. This view takes its root from the Keynesian theory of cost push inflation which attributes the basic cause of inflation to supply-side factors. Specifically, inflation results from increases in the wage rate. Wages are determined in the labor markets and they are assumed to be dependent on the unemployment rate (i.e., an increase in the unemployment rate reduces the rate of growth of wages). Given the wage rate, firms set their prices by adding a markup which determines their profit margin. Thus, when wages are increasing, firms face higher costs of production and they pass on the higher costs in the form of increased prices (Bridgman and Trehan, 1996).

In the cost-push view of inflation, the wage dynamics is considered exogenous and underlying price movements are strongly influenced by wage developments. The bulk of existing explanations regarding inflation are actually provided by demand-driven theories. These identify in an excessively expansionary monetary policy the exogenous determinant of inflationary pressures. A causal influence of wages on prices could in principle still be observed. As companies compete to hire staff in order to satisfy a growing demand, wages will rise unless labour supply is sufficiently elastic. Note, however, that the direction of causation might just as well be reverted: strong aggregate demand, capacity bottlenecks and aggregate supply shortages may allow companies to increase prices, leading to higher profits. This would in turn push employees to request substantial wage increases. Either way, this view implies that wages are likely to lose their interest as an early indicator for future inflationary trends and that the focus should rather be placed on monetary conditions. Obviously, the different mechanisms that have just been sketched might well be simultaneously at work, allowing for bi-directional influences between wages and prices (Zanetti, 2005).

Inflation Theories

Cost-push Inflation Theory

It is widely believed that if wage costs rise faster than productivity, the price level may rise as firms pass forward increased wage costs in the form of higher product prices. Hence changes in productivity adjusted wages are believed to be a leading indicator of future inflation (Mehra, 2000). The view that systematic movements in wages and prices are related is derived from the expectations-augmented Phillips curve model on the inflation process. If that is true then long run movements in prices and labor costs must be correlated.

The expectations-augmented Phillips curve model can be represented by the following system of equations (Fountas et al. 1999; Mehra 1991; and Ghali 1999)

$\Delta p_t = h_0 + \Delta(w_t - q_t) + h_2 G_t + h_3 S_{pt}$	2.1
$\Delta(w_t - q_t) = k_0 + k_1 \Delta p_t^e + k_2 G_t + k_3 S_{wt}$	2.2
$\Delta p_t^e = \sum j = 1^n \mu \Delta p_{t-j}$	2.3

All variables are expressed in natural logarithms, where p_t is the price level, W_t is the wage rate, G_t is an output gap variable, q_t is labor productivity, p_t^e is the expected price equation, S_{pt} is a supply shock on the price equation and S_{wt} is a supply shock on the wage equation. Equation (2.1) describes price mark-up. Prices are affected by productivity adjusted wages (w-q), excess demand, and an exogenous supply-side shock. Equation (2.2), a Phillips curve, includes the three factors that affect wages: an excess demand variable, expected price level, and a supply shock. Finally, Equation (2.3) is an implication of adaptive expectations where the expected price level is a weighted average of past prices. Import prices and oil prices are used as proxies for the supply shocks, whereas the gap between potential and current GDP (output gap) is a proxy for the excess demand variable.

Meanwhile, there are limitations to this cost-push inflation theory. Wages are definitely an important factor in determining prices since they affect firms' marginal costs. However, one has to be cautious as to why higher wages may not cause inflation. If monetary policy actively tries to stabilize inflation, the effect of higher wages is presumably mitigated. Also, if wage negotiations between labor unions and firms in different sectors of the economy are not coordinated, the relative price of products of different sectors is also affected. This relative price effect will tend to dampen the effect on inflation. Further, even if wage negotiations were coordinated, different labor unions may have different market powers. This may then lead to higher wage increases in sectors with relatively high market power. Regardless of the reasons, as long as wages are less than perfectly correlated, there will be a relative price effect (Jonsson and Palmqvist 2004). It will then be difficult to observe directly the effect of wage inflation on price inflation. This effect will differ from one sector to another, leaving the final effect on prices indefinite.

Demand-pull Inflation Theory

An alternative theory of the inflation process is that it is caused by excess aggregate demand. Such theory argues that expansionary monetary policy increases aggregate demand, putting pressure on prices to go up, companies tend to hire and attract more labor by offering higher wages, and unless labor supply is elastic enough, wages will rise. The increase in prices on the other hand, will lead laborers to bargain for higher wage increase in the following period (classical theory). Under such analysis, wages lose their role as an early indicator for inflation. According to this view, the causation runs from inflation to wage growth, since the resulting increase in prices leads workers to demand higher wages (Mehra, 2000).

3. Empirical Studies

Studies that aimed at investigating the empirical link between wages and price inflation in order to identify causality effects have mostly used a Granger-causality model.

In most cases, empirical evidence showed that prices systematically influence wages whereas the influence of wages on prices is much more sensitive to the choice of the sample period under study. The explanatory power of wages disappears in a low inflation environment (Mehra 2000 and Zanetti 2005).

The consensus in the empirical literature is that higher wage growth does not cause higher inflation. The econometric literature has typically studied whether wage growth Granger-causes inflation. Most studies have not found any strong indications that this is the case (Hess and Schweitzer, 2000). On the other hand Ghali (1999)1 finds strong evidence that wages Granger-cause price inflation. Similar evidence was found in Ireland in the period from March 1975 to March 1992 (Fountas et al. 1999). Aaronson (2001) finds that inflation rise with changes in the wags. But when Cacnio tested a simple Granger causality by using Philippine data, found that causality between wage changes and inflation runs in both directions (Cacnio, 2011). Mehregan and rezaei in 2008 studied this relationship in Iran, Mehregan and rezaei found that inflation is the cause of the minimum wage This finding lends an argument to the view that wage price causality depends as well on the sectors under study. The empirical evidence is thus mixed.

4. Methodology

This method includes the following three stages:

Stage 1: Testing the stationary of the variables using the Augmented Dickey-Fuller (ADF) test. From this we can find whether the variable is I(0) or I(1), or others.

Stage 2: Testing for causality from variable A to variable B (and variable B to variable A) using the Hsiao's Granger.

ADF

Here take y_t as example, ADF test based on H_0: y_t is not I(0) which is given by the following equation(1). If the calculated ADF statistics are less than their critical values from Fuller's table, then the null hypothesis (H0) is rejected and the series are stationary or integrated or I(1).

$$\Delta y_t = a + b y_{t-1} + \sum_{i=1}^{\gamma} c \Delta y_{t-i} + \varepsilon_t \quad 4.1$$

Where Δ is the difference operator, a, b, c are parameters to be estimated, ε_t is white noise, γ is selected.

Hsiao's Granger test

Hsiao's Granger is based on Granger; the results of Granger causality are very sensitive to the selection of lag length. To deal with this problem, Hsiao (1981) has developed a systematic autoregressive method for choosing optimal lag length for each variable in an equation. This method combines Granger causality and Akaike's Final Prediction Error (FPE).

The standard Granger (1969) test states that, if past values of a variable *Y* significantly contribute to forecast the value of another variable X_{t+1} then *Y* is said to Granger cause *X* and vice versa. The test is based on the following regressions.

$$y_t = \alpha_1 + \sum_{i=1}^{m} \beta_i y_{t-i} + \sum_{j=1}^{n} \lambda_j e_{t-j} + v_t \qquad 4.2$$

$$e_t = \alpha_2 + \sum_{i=1}^{m} \gamma_i e_{t-i} + \sum_{j=1}^{n} \delta_j y_{t-j} + \varepsilon_t \qquad 4.3$$

Where y_t and e_t are the variables to be tested,

In equation (4.2), *e* causes y if the current value of *y* is predicted better by including the past values of e than by not doing so. By according to Granger (1986), the test is valid if the variables are not co-integrated. Following the developments of co-integration, for non-stationary variables, if variable is integrated one, equations (4.2) and (4.3) should be written by first difference.

The key of Hsiao's Granger is applying Akaike (1969) Final Prediction Error (FPE) criteria in granger test. Its main function is to confirm the lag length. The lag length is decided by the sample size and economic process. Generally, it is better to select m as large as possible. For example, to test whether *e* causes *y* , one-dimensional autoregressive process is first estimated as equation(4.4), the value of *i* is from 1 to m. Then we can compute the FPE for each equation (m changing), and compute the equation(4.5). The optimal lag length *m** is the lag length which produces the lowest FPE.

$$\Delta y_t = \alpha_1 + \sum_{i=1}^{m} \beta_i \Delta y_{t-i} + v_t \qquad 4.4$$

$$FPE(m) = \frac{T+m+1}{T-m-1} SSE(m)/T \qquad 4.5$$

Where *T* is sample size and *SSE* is sum of squared errors.

According to the above statement, Hsiao's procedure requires two steps. Also taking test whether *e* causes *y* as example.

The first step is according to equations (4.4) and (4.5), we can compute *m**.
The second step is that regressions are estimated with the lags on the other variable (*n*) added sequentially in the same manner used to determine *m**. According to first difference of equation (1) and *m** , we compute FPE for each regression as equation (4.6).

$$FPE(m+2) = \frac{T+m^*+n+1}{T-m^*-n-1} SSE(m+n)/T \qquad 4.6$$

If $FPE(m^* + n^*) < FPE(m^*)$ then *e* Granger causes *y* , whereas *e* does not Granger cause *y* .

5. Empirical Results

The data includes inflation rate and logarithm of minimum wages from 1949 to 2013. The results of our estimations are presented step by step. Granger causality requires that the series have to be covariance stationary, so an Augmented Dickey-Fuller test has been calculated.

Table 1: Unit Root Tests

Variables	ADF Test (Level 5%)			P-P Test (Level 5%)			Result
	Level	ADF-Statistics	P-value	level	P-P Statistics	P-value	
Inflation rate	-3.495295	-3.593486	0.0398	-3.495295	-3.554464	0.0436	I(0)
Log MW	-3.495295	-4.438015	0.0043	-3.495295	-4.324108	0.0060	I(0)

It is worth emphasizing that the two series that we are working with are already growth patterns, therefore we expect them to be I(0).The result reflects the I(0) state of the variables.

Since the series are covariance stationary we can proceed to checking f or the number of lags to input in the model. The Granger causality test is sensitive to this kind of formatting of the model, and it is therefore important to choose and information criterion to base the decision on the number of lags to apply to the two series in the regressions to follow. For this purpose we have analyzed a range of lags that are mentioned in table 2.

Table 2: lag Order Selection Criteria

Lag	FTP	AIC	SC
0	541.8080	11.97065	12.04862
1	15.80535	8.435776	8.669677
2	11.75800*	8.138771*	8.528604*
3	11.96475	8.153530	8.699297

The results showed that the second lag is the optimal one.
After that these requirements have been satisfied, Granger-causality tests are computed. the two steps procedure in testing whether INF causes LMW is as follows. In an initial step, we run unaugmented tests. Regressions take the following form:

$$LMW_t = C_1 + \sum_{i=1}^{2} \alpha_{1i} LMW_{t-i} + \sum_{i=1}^{2} \beta_{1i} INF_{t-i} + \varepsilon_{1t} \qquad 5.1$$

$$INF_t = C_1 + \sum_{i=1}^{2} \alpha_{2i} LMW_{t-i} + \sum_{i=1}^{2} \beta_{2i} INF_{t-i} + \varepsilon_{2t} \qquad 5.2$$

And in the second step, By following the estimations based on equations above, we are able to reach the results of Hsiao's Granger test through Wald test. As reported in table 3.

Table 3: Wald Test

Variable	Independent Variable	H_0	Chi-square	Probability
LMW	INF	$\beta_{11} + \beta_{12} = 0$	2.318052	0.0398
INF	LMW	$\alpha_{21} + \alpha_{22} = 0$	4.837094	0.0279

The results of Hsiao's causality tests indicate that minimum wage causes inflation. On the other hand, inflation is found to be the Granger cause for wage growth. So it's proved that their causal relationship is bidirectional.

6. Conclusions:

The causal relationship between wages and inflation has been widely studied in the literature. While economic theory is able to explain the possible causality between the two variables, the empirical evidences on the effect of wage growth on inflation point to a weak relationship. On the contrary, it is more often observed that price inflation results in wage inflation.

A Hsiao's causality test between wage growth and price inflation was conducted using Iran data for the period 1949-2013. It was found that causality between wage and inflation runs in both directions.

Future research in this area could expand further the analysis to include other variables which can affect wage and inflation (e.g., productivity, money supply growth). Moreover, the wage variable in this article was constructed as an index of the regional minimum wage levels. Empirical studies have shown that the use of different measures of wage and inflation (e.g., unit labor costs for wage; GDP deflator for inflation) can yield varying conclusions. Thus, another possible research extension is on the effect of using different measures of wage and inflation in the causality analysis.

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