

## The Investigation of Price Setting Models Compatible With the Iranian Economy

Karami Khoramabadi, H.<sup>1</sup>, Efrani, A.<sup>2</sup>, Tavakolian, H.<sup>3</sup>

### Abstract

In this paper, for evaluating the price setting model compatible with Iran's economy data, sectoral inflations were decomposed into macroeconomic and idiosyncratic shocks using a factor model. Based on the results, there was a significant difference in sectoral price responses to macroeconomic and idiosyncratic shocks. Some initial price setting models such as Calvo model could not explain the heterogeneity price behavior of macroeconomic and idiosyncratic shocks. Two theoretical price-setting models that are able to explain this finding include the rational-inattention model and multiple-sector model with sticky prices. Using the results obtained from the factor model and other statistical characteristics of sectoral inflation, the frequency of price changes has little contribution to explaining the changes in size and the speed of response of prices to macroeconomic shock. Moreover, the idiosyncratic component is negatively correlated with the volatility of the common component. These findings cannot support a multi-sector model with sticky prices. Because this model predicts that the price response to the macroeconomic shock in a sector that has a relatively high frequency of price changes should be greater because the pricing evolution process is performed faster. On the other hand, the results show that among the different sectors, idiosyncratic shocks that are more volatile are less responsive to macro shocks. These findings support the rational inattention model rather than a multi-sector model with sticky prices.

**Keywords:** Price-setting models, Factor model, Impulse response, Frequency of price changes

**JEL Classification:** C11, D22, E31

### 1. Introduction

Are prices sticky or flexible? The answer to this question and understanding how prices are adjusted, in addition to helping to understand the origin of economic fluctuations (business cycles), determine the extent to which monetary policies have an impact on the real sector of the economy.

The real business cycle model of Kydland and Prescott (1982) and the classical monetary model (Cooley and Hansen, 1989) showed that, assuming full flexibility in prices and wages, money is neutral in the short and long term.

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1. PhD student in Monetary Economics, Semnan University **Email:** karami.hooman@gmail.com
  2. Associate Professor, Semnan University **Email:** aerfani@semnan.ac.ir
  3. Associate Professor, Alame Tabatabaee University **Email:** hossein.tavakolian@atu.ac.ir

However, some empirical studies have not confirmed this result and have shown that monetary policy is capable of affecting the real sector at least in the short term (Woodford, 2003, p. 143). In other words, by adding the assumption of price stickiness to such studies, the monetary policy of price level adjustment is not complete in the short term and provides the necessary source for creating real effects.

The first model of price stickiness was introduced based on the studies of Taylor (1980), Rotemberg (1982) and Calvo (1983) and the standard form of the New Keynesian Phillips curve was obtained. Calvo model is more acceptable than other models because of its simplicity in modeling and is widely used in new Keynesian literature. But many studies have pointed to the drawbacks and weaknesses of this model. For example, observing some of the different statistical features at the micro and macro level, such as the persistence of aggregate inflation and the relatively high frequency of price adjustments at the micro level, the slow reaction of prices to common shocks and the rapid response of prices to specific shocks suggest that the Calvo model cannot explain these facts.

In the domestic studies on monetary policy, dynamic stochastic general equilibrium models have been found to mainly use the Calvo model (or menu cost) without any studies of the validity of the pricing model. The main question, therefore, is whether the Calvo model used frequently in domestic studies is consistent with data and price observations.

## 2. An Overview of Empirical Studies

In almost all domestic studies that have used dynamic stochastic general equilibrium models, often without considering the pricing model compatible with the Iranian economy, and, of course, the lack of empirical studies in this regard, Calvo or menu cost models have been often considered as price stickiness models. For example, Erfani et al. (1997) and Fotros and Maboodi (1995) consider Calvo model as a price stickiness model in their studies. Jalali-Naini et al. (1998) and Bahrami Nia et al. take into account price adjustment costs for firms and use the menu cost model (Rotemberg, 1982).

## 3. Method

### 3-1. Data description

In this study, data on the items of the index of prices of goods and services in the monthly consumer basket of urban households was used from 1990:3 to 2017:7. Before estimating the model, the data were prepared in three steps. First, the seasonal effects of item prices were eliminated using the X12 filter. In the second step, the natural logarithm of the previous step data was calculated. Finally, in the third stage, the outliers were first discarded and then the data was standardised.

### 3-2. Statistical model

Following the study by Maćkowiak et al. (2009), Statistical model (1) was used to investigate how prices respond to macroeconomic and idiosyncratic shocks. This model is capable of separating price changes into two types of macroeconomic and idiosyncratic shocks.

$$\pi_{nt} = A_n(L)C_t + B_n(L)S_{nt} \quad (1)$$

In model (1),  $\pi_{nt}$  is the monthly inflation rate of item  $n$  at time  $t$ ,  $A_n(L)$ , and  $B_n(L)$  are polynomials of lag operators, and  $C_t$  is the vector of coefficients extracted from all items. In this paper, Bayesian method was used to estimate the proposed model. The Bayesian method has the advantage that it performs sampling of common factors and model parameters together with the function of late common density.

## 4. Results

### 4-1. Descriptive analysis

Using the data on aggregate inflation as well as the results of the decomposition of inflation into macroeconomic and idiosyncratic shocks, the standard deviation of total inflation is calculated with 1.30%, while the average standard deviation of the sectoral inflation is estimated at 3.71%. The results also showed that the inertia of aggregate inflation (0.80) was higher than the average inertia of sectoral inflation (0.43). The results of the statistical properties of inflation and sectoral inflation show that the price setting behavior of firms depends on the type of shocks inflicted.

### 4-2. Impulse responses of sectoral prices to macroeconomic and idiosyncratic shocks

The results of impulse response of prices to macroeconomic and idiosyncratic shocks show that while firms respond very quickly to idiosyncratic shocks, they respond slowly to macroeconomic shocks. For most of the sectors, idiosyncratic shocks have the most impact on prices in almost two months and firms respond slowly to macroeconomic shocks and it takes approximately 12 months for prices to reach a new equilibrium level after the shock occurs.

### 4-3. Speed of responses of sectoral prices to macroeconomic and idiosyncratic shocks

The speed of response is defined as the ratio of the price response to a shock in the short to long term. The results show that the median of the speed of response to the macro shock is 0.65 while the median of the speed of response to idiosyncratic shock is 0.94. That is, on average, the speed of response of prices to idiosyncratic shock is higher than the macroeconomic shock.

### 4-4. Examination the conformity of pricing models with the stylized facts

The results of regression analysis show that the impulse response to the macroeconomic shock is inversely related to the standard deviation of the sectoral idiosyncratic component; In addition, based on the rational inattention

model, it is expected that there be a direct relationship between the impulse response to the macroeconomic shock and the standard deviation of the sectoral common component of inflation (Kauffman & Leine, 2013, p. 389). The regression analysis results also show that the higher the ratio of idiosyncratic shock to macroeconomic shock volatility, the slower the impulse response to the macroeconomic shock. In other words, the firm is a small relationship between the response of prices to macro-economic shocks and frequency of price changes, which is consistent with the rational inattention model.

### 5. Conclusions

In the present study, in an attempt to evaluate price setting models in the Iranian economy, using a factor model, sectoral inflation was divided into two components: macroeconomic and idiosyncratic shocks. The results showed that prices respond slowly to macroeconomic shocks, while responding much faster to idiosyncratic shocks. The results of this study show that the frequency of price changes has very little contribution to explaining the magnitude and speed of price response to macroeconomic shocks so the hypothesis of multi-sector model with sticky prices was not supported. On the other hand, the results showed that the higher the idiosyncratic shock volatilities in a sector, the lower the response to the macroeconomic shock, which is consistent with the fundamental assumption of a rational inattention model.

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