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An explanation for the price puzzle: Asymmetric information and expectation dynamics

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ABSTRACT

Using theoretical and empirical analyses, this paper shows that the expectation dynamics induced by information asymmetry between the Central Bank (CB) and the public can cause the price puzzle. The signalling and learning dynamics between the CB and a representative private-sector agent under asymmetric information is investigated. Inflation positively reacts to contractionary monetary policy because the change in the interest rate is perceived as a signal of the CB's private information about higher future inflation and output by the public. The empirical section of the paper validates this theoretical argument using a VAR specification about the US economy. Besides providing an explanation for the price puzzle, the results of this paper has practical implications about transparency and monetary policy. The theoretical and empirical findings indicate that asymmetric information causes significant frictions in the transmission mechanism of monetary policy. These frictions induce short-run undesired effects like increase in expected inflation and actual inflation as a response to contractionary monetary policy which is identified as "the price puzzle".

> "The Federal Reserve slashed its benchmark interest rate [...] at an unscheduled policy meeting. That Ben Bernanke was moved to act just a week before (the scheduled meeting) will raise the suspicion that *the Fed knows something that markets don't.*"
>
> The Economist, January 22, 2008 from the article Desperate Measures

1. Introduction

Many empirical studies that examine the effects of monetary policy innovations on the economy use identified VARs. The empirical analysis of monetary transmission mechanism based on the identified VARs concluded puzzling results for different countries. Among many puzzles, the price puzzle is the most investigated puzzle in the literature. The price puzzle can be described as the positive response of the price level to a monetary policy tightening. This is a counterintuitive result since a monetary contraction would reduce nominal aggregate demand, lowering output and price level.

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This paper argues that the expectation dynamics caused by the asymmetric information between the Central Bank (CB) and the public can induce the price puzzle. An increase in the CB interest rate causes inflation expectations to increase instead of decreasing. When there is asymmetric information the rise in the interest rate is perceived as a signal of the private information of the CB that inflation will be higher in the next periods. This study argues that the "price puzzle" is not a puzzle but a natural response of prices to a monetary policy shock when the CB possesses private information about future inflation and output.

Several studies provide explanations for the price puzzle. First explanation is the inadequate description of the central bank's reaction function by the econometrician which argues that inclusion of additional variables (commodity prices) in the VAR system would solve the price puzzle.[1] Hanson (2004) conducts an extensive analysis of alternative indicator variables proposed in the literature and concludes that most indicators, including commodity prices, cannot resolve the price puzzle. Second explanation is the asymmetric information between the central bank and the public.[2] If the central bank has private information about future inflation and output than contractionary monetary policy shocks will be followed by seemingly anomalous increases in prices. This paper focuses on this explanation. Third, Carlstrom et al. (2009) present that the lack of contemporaneous effect of monetary policy shock on macroeconomic variables dictated by the Cholesky identification might cause the price puzzle. Finally, Barth and Ramey (2001) argue that the cost channel of monetary policy[3] causes prices and nominal interest rates move in the same direction after a monetary policy shock. Rabanal (2007) constructs a DSGE model with cost channel and the empirical analysis shows that the cost channel can not produce the price puzzle.

Recent studies like Castelnuovo and Surico (2006, forthcoming) which investigate the effect of monetary policy on inflation in the US and UK conclude that the positive response of prices to a monetary policy shock is historically limited to the subsamples correspond to the pre-Volcker period for the US and the period prior to the introduction of the inflation targeting framework for the UK. These periods coincide with higher levels of asymmetric information between the CB and the public in these countries. Also, Saizar and Chalk (2008) employ a Panel Vector Auto Regression approach to examine the empirical evidence about the impact of monetary policy in 21 emerging countries. The Fig. 2 of their paper display that in 7 of these countries the reaction of inflation to a contractionary monetary policy is positive. Hanson (2004) conducts SVAR regressions with monthly data for the 1982:11-1998:12 period (Fig. 10, p. 1408). He concludes that the significant positive response of inflation exits for the first three months. Thus, the price puzzle persists in the studies about other countries that employ recent data. Also, the short-run effect still exists in the US. As a result, an alternative investigation of the price puzzle is needed as conducted in this paper.

The theoretical argument of this paper is based on the private information of the CB about future macroeconomic variables. It has been empirically shown by Romer and Romer (2000), Ellingsen and Söderström (2001) and Sims (2002) that the Federal Reserve Bank (the Fed) has superior information about future inflation and output.[4] The Greenbooks which contain the Fed's forecasts and hence a form of the Fed's private information, are made available to the public only with a five-year lag. Thus, the only way that the public can observe or deduce the Fed's private information is by interpreting the Fed's actions (changes in the Federal Funds rate).

The source of the private information of the Fed has been debated extensively. Romer and Romer (2000) argues that the Fed's private information is caused by the fact that "the Federal Reserve commits far more resources to forecasting than even the largest commercial forecasters." Sims (2002) indicates that the Fed has private information of its future actions. This gives an advantage to the Fed in forecasting the future evolution of the US macroeconomy. Faust et al. (2004) agree with Sims (2002) by arguing that "the (monetary) policy surprise conveys information not about the state of the economy, but rather about the future course of policy, for which the FOMC has a natural advantage." Peek et al. (1999) indicate the Fed has private access to datasets about the banking sector and has private information about the health of the banking sector. To sum up, the Fed has several resources that it can use to gather information that is not available to the private sector. Using these resources the Fed can forecast inflation and output much better than the private sector.

[1] For example, Gordon and Leeper (1994) and Christiano et al. (1996) proposed adding a commodity price index as a proxy for inflationary expectations in the VAR system. Bernanke and Boivin (2003) incorporates richer information sets in the analysis of Fed policymaking since the Fed has access to a wide range of economic time series. Strongin (1995) and Bernanke and Mihov (1998) use different measures to identify monetary policy shocks based on estimates of the central bank's operating procedures other than the federal funds rate. Brissimis and Magginas (2006) show that augmenting a standard VAR with two forward-looking variables: the federal funds futures rate and a composite leading indicator of economic activity is successful in solving the price puzzle featuring in monetary VARs for the US. Giordani (2004) argues that the output gap rather than the level of output should enter a VAR to solve the price puzzle. Castelnuovo and Surico (2006) uses three different measures of output gap to analyze the price puzzle in the US and the UK. They find that price puzzle still persists after using the output gap in the VAR analysis.

[2] Goto and Valkanov (2002) show that despite applying the proposed solutions, in the short run, a monetary policy shock is followed by an increase in the price level. They provide two economic explanations for the price puzzle: supply side effects of monetary policy and asymmetric information.

[3] Cost channel indicates that when the central bank increases interest rates, the borrowing (financing) costs of cash-constraint firms increase.

[4] Faust, Swanson and Wright (2004) find little evidence that Federal Reserve convey superior information about the state of the economy. But, they argue that "...the policy surprise conveys information not about the state of the economy, but rather about the future course of policy, for which the FOMC has a natural informational advantage." Thus, the central bank still has private information which the private-sector agent would like to deduce. Since, future actions of the central bank will affect future inflation and output, it will also affect the expectations of the public. In a forward-looking model this will also affect the current inflation and output through the expectations of the public. I believe that findings of Romer and Romer (2000) and Sims (2002) and natural informational advantage of the central bank about its future actions provides the necessary motivation and evidence about asymmetric information between the Fed and public.