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The Bank Lending Channel and Monetary Policy Rules: Further Extensions

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Abstract

Many channels exist through which monetary policy decisions affect the economy. This paper examines the bank lending channel, which reflects the central bank's actions that affect loan supply and real spending. The main variable that affects loan supply is the monetary policy indicator as it is proxied by the real short-term interest rate. This paper examines how the bank lending channel operates when this short-term indicator is endogenously determined by the target rate the central bank sets through a monetary policy rule. Furthermore, it examines whether different bank-specific characteristics affect the way banks react to a monetary shock. We investigate the effect of such a rule on the bank lending channel in European banking institutions spanning 2000 through 2009. The expectations, concerning both inflation and output, affect the decision of the central bank for the target rate, which, in turn, affect the private sector's expectations - banks- by altering their loan supply.

Keywords: Monetary policy rules, bank lending channel, European banks, GMM methodology

1. Introduction

The monetary transmission mechanism provides a powerful tool for the monetary authorities to affect the real economy. This mechanism includes various channels through which the conduct of monetary policy affects the economy. Two of the main channels include the interest rate channel (money view) and the credit channel (credit view). In the former channel, monetary policy changes affect aggregate demand through interest rates, whereas in the latter channel, monetary policy changes accommodate the transmission of policy decisions by altering the availability and supply of loans (Hernando and Pages, 2001). One sub-channel within the credit view is the bank lending channel, which relates to the supply of credit and "stems from financial market incompleteness and relies on imperfect substitutability" (Gambacorta, 2005, p. 1737), while an alternative sub-channel within the credit view is the balance sheet channel, which relates to the balance sheet and income statements and the informational frictions that alter the external finance premium.

Changes in reserves cause the alteration in banks' loan supply, resulting initially from the decisions of central banks about their target interest rate. This paper examines the effect on the operation of the bank lending

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channel when we employ different measures of the central banks' primary monetary policy instrument (i.e., a target interest rate), which depends on a set of macroeconomic variables. In other words, this paper investigates the effect on the bank lending channel in a number of euro area economies, since most European developed economies rely much more heavily on indirect bank finance rather than direct stock and bond market finance, where we use different interest rate rules as alternative monetary policy indicators. The formulation of these rules depends on timing issues – lagged, current, or forecast values to inform the policy rule. We then compare the results across the different policy rules. The empirical findings show that the bank lending channel operates most robustly to forward-looking monetary policy rules. A limited literature exists on direct econometric estimates of the European Central Bank (ECB) monetary policy rules. Although Hayo and Hoffman (2005) estimate such rules, their empirical analysis does not examine flexible forms of monetary policy rules. We organize the rest of the paper as follows: Section 2 reviews the literature concerning the bank lending channel and interest rate rules. Section 3 presents and analyses the data. Section 4 refers to the methodology used both for the estimation of the different types of rules and the lending channel. Finally, Section 5 reports the findings and Section 6 concludes.

2. Literature

2.1. The bank lending channel

This study investigates the transmission of monetary policy decisions through the economy and how these decisions affect economic activity. The bank lending channel's operation depends mostly on the supply of loans and the factors that determine this supply. In particular, a restrictive monetary policy reduces bank reserves and deposits and, consequently, decreases loan supply. Therefore, businesses and consumers, who depend on bank lending, reduce their purchases of durable goods and capital for investment. Hence, reductions in bank reserves affect output negatively (Golodniuk, 2006). The opposite occurs for an expansionary monetary policy that increases bank reserves and, therefore, output. Three necessary conditions must exist for this channel to exert significant economic power. First, firms should respond differently to different types of finance. That is, they should depend on bank loans and cannot easily replace losses of bank loans with other types of finance (Oliner and Rudenbusch, 1995). Second, the supply of loans should respond to the changes in reserves that the central bank imposes on the system. For instance, when confronted with a restrictive monetary policy, banks cannot easily offset the decrease in funds from deposits by raising funds from other sources. That is, banks face restrictions in issuing uninsured liabilities to replace the shortfall in deposits (Oliner and Rudenbusch, 1995; Disyatat, 2010). Third, some imperfections should exist in the adjustment of the aggregate price level. That is, monetary policy will exert no effect, if prices can adjust proportionally with money supply changes (Golodniuk, 2006). The bank lending channel literature searches for this channel in different economies or in a group of countries. More specifically, it examines whether the effect on lending responds differently, depending on the strength of a bank, which, in turn, responds to variables such as capitalization, asset size, and liquidity. Most studies on euro area economies provide empirical support for the presence of the channel, while the empirical analysis for the US case provides mixed results (Ehrmann *et al.*, 2003; Gambacorta, 2005). Juurikkala *et al.* (2011) also find evidence that supports the presence of the channel in Russia. The empirical evidence also supports the idea that well capitalized and liquid banks experience more insulation from monetary policy changes than banks that exhibit low capital and liquidity ratios. In addition, the majority of studies show that small banks do not exhibit more sensitivity to monetary policy shocks than large banks (Peek and Rosengren, 1995; Gambacorta, 2005; Golodniuk, 2006). Other empirical studies, however, find that large banks, in combination with high capitalization ratios, respond less to monetary policy shocks (Kishan and Opiela, 2000).

Empirical implementation faces an important problem. More precisely, the fact that both output and bank loans decrease after a negative change in monetary policy does not necessarily imply that this change reflects a reduction in loan supply (Oliner and Rudenbusch, 1995; Brissimis *et al.*, 2001). By contrast, such changes may reflect a reduction in loan demand. For instance, a tight monetary policy increases interest rates and, consequently, generates higher costs, which do not favor investment, leading to a fall in loan demand and, therefore, in the volume of loans. To resolve this issue, the literature either analyzes microeconomic data on firms and banks (Kashyap *et al*., 1993), rather than macroeconomic data, or it uses a number of macroeconomic control variables (i.e., GDP and inflation) that affect the demand for loans.

2.2. Monetary policy rules

The central bank chooses its operating targets to optimize its objective function subject to the macroeconomic model of the economy. Hence, they derive central bank reaction functions or monetary policy rules that describe how central banks alter their policy in response to macroeconomic changes. The most frequently used policy instrument is the short-term interest rate and, therefore, "monetary policy rules" typically mean "interest rate rules" (Fourcans and Vranceanu, 2004). Gerdesmeier and Roffia (2003) identify three main reasons for the interest in central bank reaction functions. First, an interest rate rule makes the evaluation of the central bank feasible. Second, a rule provides a good forecasting tool to evaluate the changes that the central bank imposes on the policy instrument. For interest rate rules, changes in the interest rate depend on the deviations of a set of macroeconomic variables, such as the inflation rate and output, from their target values. Taylor (1993) shows that monetary policy in the U.S. conforms to a simple monetary policy rule, in which the short-term interest rate adjusts according to inflation and real output deviations from target inflation and potential output, respectively, and closely follows observed movements in that interest rate. When the inflation rate exceeds (falls below) its target, the rule recommends an increase (decrease) in the interest rate. When the output gap is positive (negative), the Taylor rule recommends an increase (decrease) in the interest rate. Kozichi (1999) notes that the output gap plays a forward-looking role in that a positive gap signals potential increases of the inflation rate in the future. The original form of the Taylor rule yields:

$$i_t = \pi_t + \bar{r} + 0.5(\pi_t - \pi^*) + 0.5x_t \quad (1)$$

where i_t is the target nominal interest rate, π_t is the inflation rate, $\bar{r}$ is the long-run equilibrium real interest rate, assumed to equal 2 percent, π^* is the target for inflation, also assumed to equal 2 percent, and x_t is the output gap. This simple Taylor rule provides a good interpretation of the historical monetary policy actions by the Federal Reserve, as mentioned in Orphanides (2003), suggesting that this rule serves as a "useful organizing device for interpreting past policy decisions and mistakes. However, the adoption of the Taylor-type framework for policy analysis is not insurance that past policy mistakes would not have occurred." (p. 984). Nevertheless, the Taylor rule possesses certain limitations. First, central banks do not know the contemporaneous output and inflation gap when setting the interest rate for a given time. One solution to this problem uses lagged output and inflation gap data (i.e., backward-looking rules). Another solution replaces the current measures of variables with forecasts (i.e., forward-looking rules).

Second, the simple Taylor rule imposes precise weights (i.e., 0.5) that represent the policy responsiveness to deviations of inflation and output from their targets. In addition, no one measure of the inflation rate and the output gap exists and, therefore, we should use other measures, such as the GDP deflator, or other methods for the estimation of the output gap. Third, the simple Taylor rule does not incorporate interest rate smoothing. Observation suggests that central banks smooth interest rate movements, which we can incorporate into the simple Taylor rule (Kozichi, 1999; Woodford, 1999). Gerdesmeier and Roffia (2003) argue that interest rate

smoothing may reflect optimal "monetary policy inertia". Levin *et al.* (1999) and Woodford (1999) argue that policy inertia by affecting expectations of future policy and economic developments influences the ultimate goals, such as real GDP or inflation. Orphanides (2001) suggests that interest rate smoothing may reflect data uncertainty. Furthermore, central banks also want to stabilize financial markets, since abrupt changes in interest rates may disrupt bond and equity markets. This interest in financial market stability as well as the learning process through which central banks behave, leads them to place some weight on the previous level of the interest rate (Woodford, 1999). Woodford (1999) also argues that in the presence of forward-looking inflation expectations optimal policy may adjust the interest rate with some inertia because this smoothing provides leverage with respect to longer-term interest rates, which transmits monetary policy decisions to aggregate demand and the real economy. Finally, Rudebusch (2002) argues that the interest rate smoothing term may compensate for the misspecification of empirical rules that display substantial partial adjustments and that do not take into consideration serially correlated shocks.

The simple Taylor rule conforms to two interpretations: a narrow interpretation (i.e., it's the specific algebraic form mentioned above) or a broader interpretation. As Orphanides (2003) notes, the broad interpretation introduces a degree of flexibility that overcomes the limitations of the simple framework. Taylor also emphasizes that one can interpret the rule as a monetary policy program, which the central bank uses to attain the fundamental policy objectives. In other words, one should not use the rule as a "mechanical formula," but rather as a guiding principle for the monetary authorities. As already mentioned, in addition to the simple Taylor rule, two other modifications exist: backward- and forward-looking rules. A debate exists on which of these rules fits the historical data more accurately and gives better outcomes. Taylor (1999) argues that forecasting rules may exhibit one possible advantage over the simple rule proposed in 1993 -- incorporation of additional variables beyond the inflation and output terms that may improve the forecast. But when applying such forecasting rules, especially the rules suggested by Haldane and Batini (1999), to the interest rate setting by the European Central Bank (ECB) and next comparing them to the simple rules, these rules dominate over the forecasting rules. Taylor (1999) justifies this result by arguing that in fact forecasts use current and lagged data and hence, forward-looking rules are based on current and lagged data as well. By contrast, strong doubt exists over the use of past values, because as Greenspan (1999) notes, the observation of past macroeconomic behavior and its use in the formation of rules embody a "notion" that the future will mimic the past. Meyer (2002) also argues that while forecasts play an important role in the implementation of monetary policy, future values (forecasts) do not play a role in the standard Taylor rule. Hence, we should view monetary policy as a forward-looking process, which ought to take into consideration all available information to form adequate policy rules (Orphanides, 2003). Many argue that central banks behave in a forward-looking manner and, therefore, the policy rule should incorporate such forward-looking behavior. Moreover, since monetary policy transmission operates with at least one lag, it directs the monetary authorities to anticipate inflation and not rely on its current value (Gerdesmeier and Roffia, 2003).

Clarida *et al.* (1998, 2000) follow this approach and replace current and recent outcomes of output and inflation with forecasts of these variables. Fourcans and Vranceanu (2004) also apply this procedure for the ECB's interest rate rule. Their results indicate that the response of the interest rate to deviations of future inflation from its target exerts a stronger effect than if the rule incorporates current inflation. Finally, Fendel and Frenkel (2006) estimate different versions of the forward-looking rule for the case of the ECB, documenting that the ECB applies a Taylor-type rule to its monetary policy. All in all, debate continues about the efficacy of simple, backward-looking, and forward-looking interest rate rules As a result, we shall use all approaches in our econometric analysis that follows.

3. Data

3.1. Interest rate rule data description

For the estimation of the interest rate rule, we collected quarterly data from Datastream and Bloomberg databases. We estimate interest rate rules for three different economies: a European group (i.e., Austria, Belgium, Finland, France, Germany, and the Netherlands, countries using the euro as a common currency), Denmark, and the United Kingdom. Denmark and the U.K., although operating with their own currency, however, follow the monetary policy of the euro zone, but still maintain some degree of autonomy. We did not consider the remaining Eurozone economies due to unavailability of continuous banking data over the time span of the paper. For each country, the rate of change in the consumer price index measures inflation, while we detrend real GDP, using the Hodrick-Prescott filter, to measure potential output and the output gap. We use the following short-term interest rates: The ECB's strategy is primarily based on the EONIA interest rate on main refinancing operation (MRO), which is a short-term open market operation in form of reverse transactions that allows it to control the degree of liquidity in the interbank market, the Danish discount rate of the Danmarks Nationalbank, and the bank rate of the Bank of England. The analysis spans 2000 through 2009, using quarterly data. We construct weighted averages of the Euro-group variables, an approach similar to that recommended by the International Monetary Fund.

3.2. Bank lending channel data description

We collect annual data of total loans as the dependent variable that come from the BankScope database, spanning 2000 through 2009. In particular, we use a sample of 739 European commercial and savings banks. The European countries include Austria, Belgium, Finland, France, Germany, and the Netherlands, which we use as a group, whereas we examine Denmark and the United Kingdom separately. We also obtain the short-term interest rates, which proxy for monetary policy, from the Bloomberg database. Real GDP values and inflation rates for each country come from Datastream to control for demand effects (i.e., to isolate changes in total loans, which are caused by movements in loan demand). We also use bank-specific characteristics in the analysis for the bank lending channel and, therefore, we collect data concerning the strength of a bank from BankScope. More specifically, we use the bank capitalization measured by equity to total assets, bank size measured by total assets, and bank liquidity measured by the ratio of liquid assets to total assets. Finally, we use two more variables to implement robustness checks -- consumption of each country from Datastream and total deposits the BankScope database. We use quarterly data for the estimation of our three different interest rate rules (see Section 4). Since the BankScope data on bank-specific variables only come at the annual frequency, we use the interest rate rules estimated with quarterly data to generate annual forecasts (by choosing the last observation of the fourth quarter) and to combine them with the analysis of the bank-lending channel (in which all variables are set on an annual basis).

4. The econometric approach

4.1. The interest rate rule

We use the methodology from Clarida *et al.* (1998) and, therefore, we borrow in large part their notation. We measure monetary policy by the short-term interest rate. This allows the central bank to choose the level of the interest rate from period to period and conduct policy. More specifically, central banks vary the nominal

interest rate -- the target rate -- to control effectively the real interest rate. We estimate the following target rate rules:

$$i_t = (1-\rho)[\alpha + \beta\pi_{t+1} + \gamma x_t] + \rho i_{t-1} + \varepsilon_t \quad \text{[the forward rule]} \quad (2)$$

$$i_t = (1-\rho)[\alpha + \beta\pi_{t-1} + \gamma x_{t-1}] + \rho i_{t-1} + u_t \quad \text{[the backward rule]} \quad (3)$$

$$i_t = (1-\rho)[\alpha + \beta\pi_t + \gamma x_t] + \rho i_{t-1} + u_t \quad \text{[the Taylor rule]} \quad (4)$$

4.2. The bank lending channel

The second part of the econometric method investigates the presence of the bank lending channel:

$$\Delta \ln L_{ikt} = \alpha_k + \phi_{ik}\Delta \ln L_{ikt-1} + \sum_{j=0}^{n} \beta_j \Delta i_{kt-j} + \sum_{j=0}^{n} \delta_j \Delta \ln GDP_{kt-j} + \sum_{j=0}^{n} \omega_j \pi_{kt-j} + u_{ikt} \quad (5)$$

with k = 1, …, K and t = 1, …, T, where k denotes the country, while k takes the value of six when we estimate the bank lending channel for the Euro-group and the value of one when we estimate the lending channel for Denmark or the United Kingdom, L_{ikt} denotes the loans of the ith bank of country k in year t, i_{kt} denotes the monetary policy indicator of country k in year t, GDP_{kt} denotes the GDP of country k in year t, π_{kt} denotes the inflation rate of country k in year t, and u_{kt} denotes the error term. The monetary policy indicator takes four forms: the actual short-term interest rate (not coming from a rule) and three central bank interest rate rules. That is, this paper examines how loan growth reacts to the actual short-term interest rate as well as the interest rate target coming out of our forward, backward, and contemporaneous interest rate rules. In equation (16), we regress the growth rate of a country's lending (ΔlnL) on GDP growth rates ($\Delta lnGDP$) and on the inflation rates (π) to control for country-specific loan demand changes due to macroeconomic activity. In other words, we isolate shifts in total loans caused by movements in loan demand to identify the supply relationship. The introduction of these two variables also proves important because it isolates the monetary policy indicator, the short-term interest rate and the target interest rates from our three policy rules. Additionally, we include lagged values of the dependent variable, because lagged loans affect current loans in an environment where banks establish a stable relationship with their customers. In other words, the bank acquires "informational monopoly over its clients." Hence, customers encounter large costs to change their banks, because new banks will need to collect costly information about its new customers in the provision of banking services (Golodniuk, 2006). Monetary policy also affects lending with lags, due to long-term contractual commitments. According to the bank lending channel, the negative coefficient on the interest rate causes loans to fall after a monetary tightening. We estimate the model using the panel GMM estimator, suggested by Arellano and Bond (1991), where we only include statistically significant lags in the estimation.

5. Empirical Results

5.1. Interest rate rules results

The results for the interest rate channels appear in Table 1 for the Euro-group, Denmark, and the U.K. The estimates of the coefficients for the backward-looking, Taylor, and forward-looking rules tell a consistent story within and across the Eurogroup, Denmark, and the U.K. An activist monetary policy that stabilizes the

macroeconomy requires a β coefficient, (i.e., the coefficient on the inflation gap) that exceeds one. At the same time, the γ coefficient (i.e., the coefficient on the output gap) should also exceed zero, but with no size requirement. In all rules and countries, the coefficient of the inflation gap exceeds one and the coefficient of the output gap exceeds zero, albeit by a small amount. Both the Eurogroup and Denmark respond vigorously to the inflation gap while the U.K. responds less vigorously. In addition, Denmark responds the most to the output gap and the U.K. the least. Interest rate smoothing plays an important role in each country, and plays the largest role in the U.K. The J-statistics imply that we cannot reject the over identifying restrictions of the models.

5.2. Bank lending channel results

We report the results for the bank lending channel in Table 2. We estimate the models using the panel GMM estimator and the Sargan test indicates valid instruments in all cases. The entries in all tables include the coefficients of the variables and their corresponding p-values estimated for the Eurogroup, Denmark, and the UK by introducing the four different indicators for the estimation of the bank lending channel. Columns 1 and 2 report the findings when we include the European Central Bank (ECB) interest rate in the model for the estimation of the bank lending channel (Model I). Then, columns 3 and 4, 5 and 6, and 7 and 8 record the results when we include the target interest rate derived from the backward-looking rule (Model II), the target interest rate from the Taylor–type rule (Model III), and the target interest rate from the forward-looking rule (Model IV), respectively. The findings for the annual growth rate of lending in the benchmark model expressed in equation (16) appear in Table 2. The coefficients of the monetary policy indicator, showing the effects of the decisions of monetary policy on lending, exhibit the expected negative sign in all four models and for all countries and prove significant at the 5-percent level in each case. This implies that higher interest rates – actual or target – induce lower loan growth. The findings suggest the highest effect for the forward-looking rule and the smallest effect for the actual interest rate, except for the UK, where the Taylor-rule interest rate exerts the smallest effect. The Taylor-rule interest rate exerts its influence contemporaneously whereas the other interest rates generally exert their influence with a lag. The second and third lines in Table 2 for each country report the coefficients and their corresponding p-values for the real GDP growth rate and the inflation rate, respectively, for the four models. The coefficients of real GDP growth exhibit positive and statistically significant effects in all models and for all countries. The coefficients of the inflation rate generally show a positive effect, when significant, except for the significant negative effect for the actual interest rate in Denmark. Overall, the empirical analysis for equation (16) indicates that the bank lending channel operates better if the target interest rate comes from the forward-looking rule, if one considers the magnitude of the effect.

6. Conclusions

Interest rate rules now command significant attention as an interesting aspect of monetary policy, since they provide a convenient way to investigate the behavior of central banks. The bank lending channel also commands significant attention as well, because its operation passes the monetary authorities' decisions into the real economy by altering the loan supply of banks. In this paper, we estimate three types of interest rate rules -- backward-looking, contemporaneous (Taylor-type), and forward-looking rules. We estimate these interest rate rules for three economies: the Euro-group, which consists of selected European countries with the Euro as a common currency, Denmark, and the UK over the period 2000 to 2009. We used these estimates in the second part of the paper to examine the bank lending channel in these economies under four scenarios concerning the interest rate used as a monetary policy indicator -- the central bank interest rate and the three different interest rate targets derived from the backward-looking, the Taylor, and the forward-looking rules.

The bank-lending channel exists in all cases, but differences emerge in the degrees of responsiveness of loan growth to changes in the monetary policy indicator. Thus, the bank-lending channel exerts a stronger effect when we use target rates as indicators rather than the observed central bank interest rates. The strongest effects generally emerge in the models employing the forward-looking rules. This may provide useful implications for the effectiveness of monetary policy, suggesting that the monetary authorities use target interest rate rules, especially a forward-looking rule as the monetary policy indicator. Monetary policy guides, through its actions and announcements, the private sector's (banks') expectations. This paper also examines whether lending differentials depend on the strength of a bank, characterized by capitalization, asset size, and liquidity. The results indicated that large and well-capitalized banks more easily absorb monetary shocks. In most of the cases, the bank lending channel strengthens when we use target rates derived from interest rate rules and, specifically, from the forward-looking rule as the monetary policy indicator, a conclusion that strengthens our initial results. Our empirical findings also show that the significance of the bank lending channel under all alternative monetary policy rules signals the inability of European banks to issue unlimited amounts of CDs or bonds not subject to reserve requirements. Moreover, the same banks cannot easily issue new equity due to the presence of tax disadvantages, adverse selection problems, and agency costs. Our empirical findings highlight the role of the banking sector in providing credit to the real economy, which became important in the recent global financial crisis.

Table 1. Interest rate results

	α	B	Γ	P	Adj. R-squared	J-stat	Prob.
Eurogroup							
Backward	0.0130	3.1828	0.0003	0.5878	0.7545	0.0930	0.2719
Taylor	0.0163	2.7876	0.0005	0.6013	0.8948	0.0000	1.0000
Forward	0.0220	1.6987	0.0009	0.2653	0.7351	0.0000	1.0000
Denmark							
Backward	0.0085	3.9951	0.0011	0.6738	0.7358	0.0000	1.0000
Taylor	0.0199	1.8000	0.0033	0.6663	0.8474	0.0000	1.0000
Forward	0.0171	2.5025	0.0049	0.5102	0.7807	0.0674	0.3568
U.K.							
Backward	0.0308	2.5192	0.0001	0.8796	0.8547	0.0636	0.3838
Taylor	0.0382	1.2969	0.0001	0.8571	0.8992	0.0325	0.6682
Forward	0.0272	1.5126	0.0001	0.8817	0.8741	0.1286	0.1034

Table 2. Bank lending channel results

	Dependent variable: Annual growth rate of lending							
	Monetary policy indicator: ECB rate (Model I)		**Monetary policy indicator: Backward rule (Model II)**		**Monetary policy indicator: Taylor rule (Model III)**		**Monetary policy indicator: Forward rule (Model IV)**	
Eurogroup	**Coef.**	**Prob**	**Coef.**	**Prob**	**Coef.**	**Prob**	**Coef.**	**Prob**
Δi_{kt}					**-0.9710**	0.0010		

Δi_{kt-1}	**-0.5994**	0.0237	**-1.0895**	0.0037			**-3.3783**	0.0000
$\Delta lnGDP_{kt}$			**0.2806**	0.0357	**0.4712**	0.0004		
$\Delta lnGDP_{kt-1}$	**0.1055**	0.0002					**0.2252**	0.0000
π_{kt}					**2.1265**	0.0361		
π_{kt-1}	-0.8394	0.3707	**1.2003**	0.0196			**1.9916**	0.0002
Denmark	**Coef.**	**Prob**	**Coef.**	**Prob**	**Coef.**	**Prob**	**Coef.**	**Prob**
Δi_{kt-1}			**-0.8508**	0.0000	**-1.2620**	0.0000		
Δi_{kt-2}	**-0.6628**	0.0000					**-2.4200**	0.0000
$\Delta lnGDP_{kt-1}$	**0.4532**	0.0000			**0.7084**	0.0000	**0.3122**	0.0000
$\Delta lnGDP_{kt-2}$			**0.3057**	0.0000				
π_{kt}					**2.5152**	0.0000	**0.8266**	0.0000
π_{kt-1}	**-1.6048**	0.0000	**0.9205**	0.0000				
U.K.	**Coef.**	**Prob**	**Coef.**	**Prob**	**Coef.**	**Prob**	**Coef.**	**Prob**
Δi_{kt}					**-0.8684**	0.0000		
Δi_{kt-1}	**-0.8903**	0.0472	**-1.4195**	0.0000				
Δi_{kt-2}							**-2.0646**	0.0100
$\Delta lnGDP_{kt}$			**1.1908**	0.0000	**0.3693**	0.0000		
$\Delta lnGDP_{kt-1}$	**0.8808**	0.0000					**0.8905**	0.0008
π_{kt}	-6.1414	0.0858	1.0730	0.2896	**2.8665**	0.0001	-7.6325	0.0793

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