Economic Watch
Europe

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Economic Analysis

Financial Scenarios Unit

Europe Unit

Optimal policy and the ECB´s forward guidance

- **Forward guidance has revamped the question about the optimality of monetary rules under commitment**
- **Optimality dictates that the ECB should commit to a low refi rate for a prolonged period of time**
- **Under stronger commitment, gains in output would be substantial**
- **Financial fragmentation calls for the strengthening of forward guidance**

In recent years, major central banks have reshaped their policy framework to effectively combat what has been named the Great Recession. They have moved from a traditional one-instrument approach (the control of short-term interest rates) to a multidimensional view which includes unconventional measures such as quantitative easing, targeted purchases and forward guidance (1). These new policies were born out of need: central banks would had continued easing their policy if it were not for the fact that rates had reached near-zero levels, a bound that no policy can breach.

The use of unorthodox policies has not merely widened the scope of feasible monetary instruments; it has implied a change in paradigm. Up until the bankruptcy of Lehman Brothers, monetary policy rested on a simple premise first put forward by Milton Friedman in the 1960s and later (1980s) applied in most central banks around the world: only unexpected inflation can have a real impact on the economy, with monetary policy needing to surprise markets in order to be effective. Accordingly, central banks avoided any pre-commitment that could restrain them further down the road and that, according to Friedman, would eventually render monetary policy inconsequential. Central banks' hard-earned credibility was built on the adoption of this premise together with a fierce and unequivocal defense of low inflation rates. In 1993 John Taylor empirically showed that, under such a paradigm, central banks´ policy response could be portrayed by one simple equation (aka Taylor Rule) in which policy rates depended on both inflation expectations and the output gap.

1: See "Q&A about QEs", Economic Watch July 26th

However, the use of unconventional tools in the aftermath of the 2008-2009 financial crisis has put that paradigm on hold. In particular, central banks have curbed the yield curve by recurring to forward guidance, that is to say, not by reducing close-to-zero rates in the present, but by committing to lower rates in the future. Yet there is a caveat to such strategy: for it to effectively work, central banks need to commit to rates that are lower than what markets had been previously expecting, i.e. to rates lower than the ones associated to each central bank´s Taylor Rule. As markets know that current rates cannot be lowered any further, the only option left is to commit to lower-than-expected rates after the end of the easing cycle. In other words, central banks should commit to postpone their first rate hike well past their traditional comfort zone.

Under such strategies, two interrelated questions arise: Why would central banks keep their word once the easing cycle ends, putting at risk their hard-earned credibility in the inflationary front? If there is no convincing answer to the question above, why would markets believe and react to forward guidance communication in the first place? As a way to effectively respond to the first question, and dissipate the challenge posed by the second one, the Fed has revamped an old paradigm: optimal policy under commitment.

What does optimal policy under commitment mean? How far is the ECB from achieving it? (ECB vs. Fed and BoE)

An optimal policy under commitment is the result of an optimization problem, where the intertemporal loss function2 of the monetary authority is minimized subject to the dynamics of the economy. Its implementation consists on proposing and mechanically setting the policy path to the optimal one, just making sure that all (rational) economic agents understand and believe the strategy being proposed.

In the above somehow-technical definition, there is an important element missing: the optimization problem is solved only once, at the present time, and the central bank does not re-optimize its loss function ever again. If the central bank were to reoptimize its utility at any time in the future, the optimization problem would need to be subjected to an additional constraint: any chosen path would need to be optimal when revisited at any time along its execution. In practice, it is hard to think that this constraint can be lifted, as central banks are always called to apply the best policy available at every given period of time; it would be hard for a central bank to justify a dovish action (such as letting inflation rise above its comfort zone) on grounds that it is the optimal decision when looked through the optics of a time long past. Such need to reoptimize would in turn be anticipated by rational agents as they act on their expectations, thus eroding the feasibility of any rule not subjected to such consideration. This new constraint, called "dynamic consistency", is the one that central banks have been trying to lift by implementing forward guidance and by "tying their hands" though asset purchases. If this constraint were effectively lifted, it would be feasible for central banks to implement an optimal policy under commitment.

In what follows, we apply to the ECB and the eurozone the analytical framework posed by English et al (2013), in a paper by the Fed that looks at optimal policies under different restrictions. Assuming a simple dynamics for the economy in the eurozone, we analyze the best monetary rules under three different scenarios: under commitment (meaning that the ECB can credibly commit to the path it chooses in the present, without deviating to what may be later perceived as a better option), under discretion (i.e., adding the restriction of dynamic consistency) and under "simplicity" (meaning the best rule under discretion among those with a simple functional form, a la "Taylor Rule"). The latter restriction is not analyzed only because the solution is simpler to deduce, but because in practice it gives a rule that is easier to communicate to the markets – an important consideration on which hinges the viability of most

2: The function usually takes the form of a sum over all future periods of a discounted loss function that depends on contemporaneous inflation and output gap.

monetary policies. Moreover, it serves as a good benchmark, as it proxies the strategy used by most central banks until the start of the crisis.

The model, explained in greater detail in the annex, sheds light on some interesting difference between the aforementioned policy paradigms when applied to the ECB:

1. **Under commitment (forward guidance), the refi rate would be held near its lower bound for a prolonged period of time. This is in line with the ECB´s current forward guidance strategy: the ECB meeting of March 2014 anchored policy rates to the output gap, an economic variable that is expected to remain negative for an extended period of time.**

   In contrast, as shown in Graph 1, policy rates implemented under discretion rise at a more rapid pace as the economy starts hinting its recovery. Moreover, both of these paradigms imply that rates will start rising relatively late when compared to the start of the tightening cycle under a "simple" optimal rule, i.e, optimal Taylor Rule.

2. **Under commitment, gains in output are substantial.**

   Under forward guidance, output ends higher than under the other policy paradigms. Moreover, GDP is characterized by an initial overshooting past its long-run equilibrium output. ON the other hand, the optimal policy under discretion accumulates a net loss in output (relative to that obtained under commitment), yet in this scenario output reverts back to its long-run equilibrium output faster than in any other case (see Graph 2).

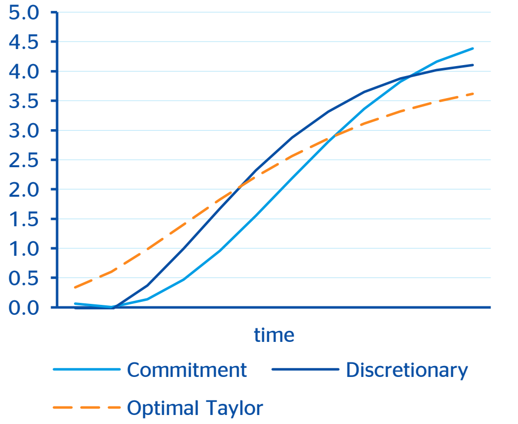
3. **The gain in output when implementing the optimal policy under commitment comes at the expense of the ECB´s accepting slightly higher-than-normal inflation rates in the medium term.**

   Nonetheless, as observed in Graph 3, inflation would remain under control, standing "above target" only for a while (coinciding with the overshooting in output). On the other hand, the risk of a deflationary spiral is higher under the Taylor Rule and under discretionary policies (not modeled here, yet associated to keeping a low inflation rate for a prolonged period of time). In the current context of deflationary angst, the risk of deflation in the two latter strategies seems more relevant than the small inflationary risk observed under the "commitment" strategy.

4. **Financial fragmentation calls for the strengthening of forward guidance.**

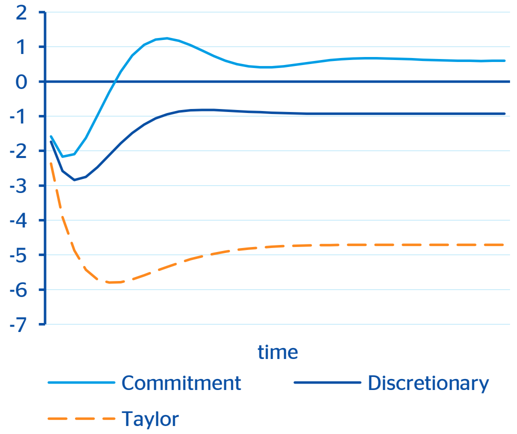
   Given the simplicity of the model considered, we simulate the issue of financial fragmentation by reducing the output elasticity of interest rates in the IS curve. As observed in Graph 4, commitment gives the necessary room to postpone rate hikes if fragmentation is high, effectively reducing the aforementioned risk of deflation.

Chart 1
Interest rate under different policy strategies



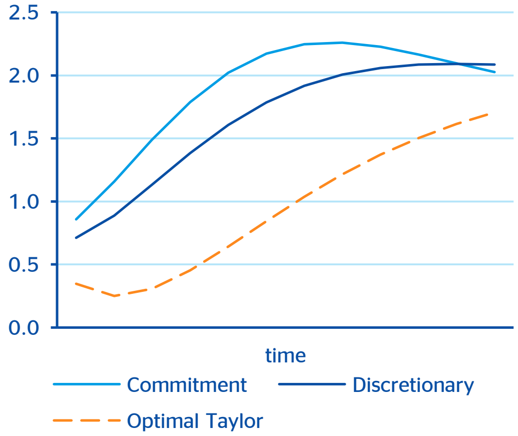
Source: BBVA Research

Chart 2
Output gains/losses under different policy strategies (cumulative, relative to equilibrium)



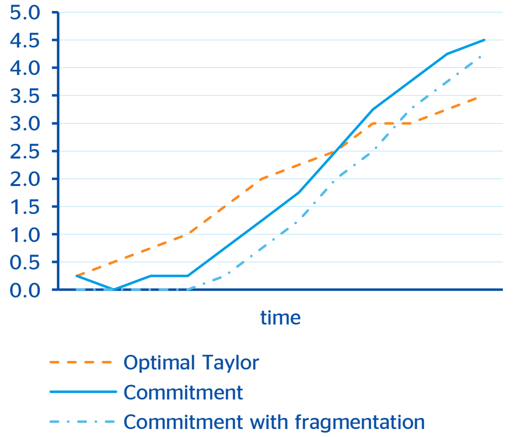
Source: BBVA Research

Chart 3
Inflation under different policy strategies



Source: BBVA Research

Chart 4
Interest rates under different policy strategies with and without fragmentation



Source: BBVA Research

Annex

We start from the baseline model proposed by Clarida et al. That is, a dynamic general equilibrium model based on the idea that temporary nominal price rigidities provide the key friction that give rise to non-neutral effects of monetary policy (traditional Keynesian IS/LM approach of stressing nominal price rigidities). The aggregate behavioral equations evolve explicitly from optimization by household and firms. Therefore, the current economic behavior depends critically on expectations of the future decision of monetary policy, as well as on current policy. Rather than working through the details of this standard derivation, we only present the key aggregate relationships. For convenience, the model abstracts from investment and capital accumulation, however, this does not affect any qualitative conclusions.

The model is as follow:

Let y_t and z_t the stochastic components of output and the natural level of output, respectively. The difference between actual and potential output define the output gap, x_t.

$$x_t \equiv y_t - z_t \qquad (1)$$

In addition, let π_t be the period t inflation rate and let i_t the nominal interest rate. Each variable is similarly expressed as a deviation from its long run level.

It is then possible to represent the baseline model in terms of two equations: an "IS" curve that relates the output gap inversely to the real interest rate; and a Phillips curve than relates inflation positively to the output gap.

$$x_t = -\varphi\ i_t - E_t\pi_{t+1}\ + E_t x_{t+1} + g_t \qquad (2)$$

$$\pi_t = \lambda x_t + \beta E_t \pi_{t+1} + u_t \qquad (3)$$

where g_t and u_t are disturbances terms that obey, respectively:

$$g_t = \mu g_{t-1} + g_t \qquad (4)$$

$$u_t = \rho u_{t-1} + u_t \qquad (5)$$

where $0 \leq \mu$, $\rho \leq 1$ and where both g_t and u_t are i.i.d. random variables with zero mean and variances σ_g^2 and σ_u^2 , respectively.

Equation (2) is obtained by log-linearizing the consumption Euler equation that arises from households´ optimal saving decision, after imposing the equilibrium condition that consumption equals output minus government spending. The result differs from the traditional IS curve mainly because current output depends on expected future output as well as the interest rate. As a result, higher expected future output raises current output, because individual prefer to smooth consumption. The negative effect of the real rate on current output reflects intertemporal substitution of consumption. The disturbance g_t is a function of expected changes in government purchases relative to expected changes in potential output. Since g_t shifts the IS curve, it is interpretable as a demand shock. Finally, adding investment and capital to the model alters some details in equation (2), but does not change its fundamental qualitative aspects (output demand depends inversely on the real rate and positively on expected future output).

Most interesting, by iterating equation (2) forwards, one obtains:

$$x_t = E_t \sum_{i=0}^{\infty} -\varphi\ i_{t+1} - \pi_{t+1+i}\ + g_{t+i} \qquad (6)$$

This equation highlights that the output gap depends not only on the real rate and demand shock in the present period, but also on the expected future paths of these two variables. To the extent monetary policy has some leverage over the short-term real rate (due to nominal rigidities), equation (6) suggests that expected as well as current policy actions affect aggregate demand.

Equation (3) is the Phillips curve that evolves from staggered nominal price setting, stemming from the loglinear approximation about the steady state of the aggregation of the individual firm pricing decision in order to maximize profits. The equation relates the inflation rate to output gap and expected inflation, as a traditional expectations-augmented Phillips curve, but the implications of entering expected future inflation are critical. Iterating equation (3) forwards, we obtain:

$$\pi_t = E_t \sum_{i=0}^{\infty} \beta^i \left(\lambda x_{t+i} + u_{t+i} \right) \qquad (7)$$

In contrast to the traditional Phillips curve, there is no arbitrary inertia or lagged dependence in inflation. Rather, inflation depends entirely on current and expected future economic conditions. Roughly speaking, firms set nominal prices based on the expectations of future marginal costs. The variable x_{t+i} captures movements in marginal costs associated with variation in excess demand. The shock u_{t+i}, which we refer as “cost push”, captures anything else that might affect expected marginal costs. We allow for the cost push shock to enable the model to generate variation in inflation that arises independently of movement in excess demand.

To close the model, the nominal interest rate is taken as the instrument of monetary policy, thus it is no necessary to specify a money market equilibrium condition.

Though simple, the model has the same qualitative core features as more complex model, such as the empirically based frameworks used for policy analysis (Fed FRB-US model from English et al). Temporary nominal rigidities play a critical role, as by varying the nominal rate, monetary policy can effectively change the short-term real rate, while beliefs about how central bank will set future interest rates also matter, since both households and firms are forward looking.

Finally, we allow for endogenous persistence in output and inflation, in line with other models used for applied macroeconomics analysis (the primary justification is empirical). By appealing to some form of adjustment costs, it may be feasible to explicitly motivate the appearance of x_{t-1} within the IS curve. Motivating the appearance of lagged inflation in the aggregate supply curve, however, is a more of a challenge. Some frameworks do so by effectively appealing to costs associated to a change in the rate of inflation.

$$x_t = -\varphi \left(i_t - E_t\pi_{t+1} \right) + \theta x_{t-1} + (1-\theta) E_t x_{t+1} + g_t \qquad (8)$$

$$\pi_t = \lambda x_t + \phi \pi_{t-1} + (1-\phi) \beta E_t \pi_{t+1} + u_t \qquad (9)$$

We also consider that the monetary authority prefers to smooth interest-rate adjustments in order to maintain the stability of the financial system, and thus incorporated in its objective function. In addition, we also include the following equation:

$$dr_t = r_t - r_{t-1} \quad (10)$$

In order to set up the optimization problem, the central bank objective function translates the behavior of the target variables into a welfare measure to guide the policy choice. We assume, following much of the literature, that this objective function is over the target variables x_t and π_t, and takes the form:

$$\max -\frac{1}{2} E_t \sum_{i=0}^{\infty} \beta^i \left(\alpha x_{t+i}^2 + \pi_{t+i}^2 \right) \qquad (8)$$

where the parameter α is the relative weight on output deviations. Since $x_t \equiv y_t - z_t$, the loss function takes the potential output z_t as the target. It also implicitly takes zero as the target inflation, but there is no cost in terms of generality since inflation is expressed as percent deviation from trend.

As we discuss above, given the reduced room for monetary policy, policymakers face constraints when considering strategies to provide additional stimulus. We simulate the implications of the three optimal strategies: one under commitment, another one under discretion, and a third one under a "simple Taylor rule specification". To compute these optimal policies, we assume that policymakers place more weight on penalizing squared deviation of inflation from a target of 2% (weight = 0.55) than on keeping the output close to its long-run equilibrium output (weight = 0.35), or minimizing any changes in the refi rates (weight = 0.10).