Box I-2

The policy interest rate according to the Taylor rule and the effects of revised estimates of the output gap

After the adoption of an inflation target in March 2001, the main objective of the Central Bank of Iceland's monetary policy has been to decide its policy interest rate with the aim of bringing inflation as measured by the twelve-month rise in CPI as close as possible to 2½%. The result has been unsatisfactory so far. Inflation has averaged 4.7%. It reached a high of 9.4% and a low of 1.6%. It would seem, therefore, that the Central Bank's monetary policy has not been sufficiently tight. Economic research has shown that a set of simple monetary policy rules named after John Taylor seems to mirror quite well the approach of central banks that have been successful in combating inflation.[1] This box reviews the policy interest rate path that would have resulted if the Central Bank had followed such a rule since the year 2001.[2] Also considered is the difference between two policy rate paths according to the Taylor rule: one based on the output gap estimate actually used in determining the policy rate, and the other based on the Bank's subsequent revision of the output gap assessment.

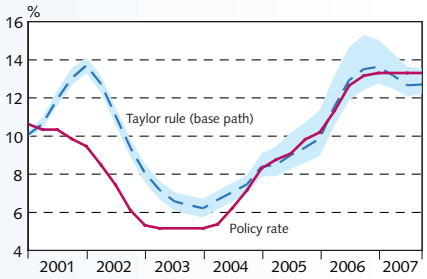
A simple monetary policy rule as frame of reference

The Taylor rule describes in simple fashion how policy interest rates are a function of three key variables:[3] the equilibrium (neutral) real interest rate, the deviation of inflation from the inflation target, and the deviation of output from the economy's potential output – the so-called output gap. According to the rule, the policy interest rate should deviate from its equilibrium level if inflation deviates from target or if an output gap is present in the economy. Also, the so-called Taylor principle requires that the policy rate be raised (cut) more than one-for-one with inflation in order to increase (decrease) the real policy interest rate so as to tighten (ease) monetary policy and thereby ensure price stability.[4]

One of the rule's key advantages is that it systematically links monetary policy formation to current economic conditions in a manner that, on average, yields favourable results. Cecchetti et.al. (2007) show that deviations in the policy rate path of the world's major central banks from that indicated by the Taylor rule have declined significantly since the early 1980s, and they consider this the chief explanation for increased stability of prices and output.

Chart 1

Actual policy rate path compared to Taylor rule path with real-time output gap estimate[1]

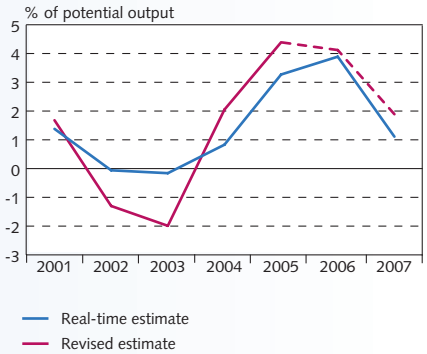


1. Baseline forecast: $R(t) = aR(t\text{-}1) + (1\text{-}a)[(R^* + P^*) + b(P(t) - P^*) + cG(t)]$, where R is the policy rate , P is inflation, and G is the output gap. R^* (neutral real interest rate) = 3.5%, P^* (inflation target) = 2.5%, a = 0.7, b = 1.5 og c = 0.5. The gap shows the various results obtained from applying the Taylor rule using differing values for R^* (3-4%), b (1.5-2.5), and c (0.2-1.0)

Source: Central Bank of Iceland.

Chart 2

Central Bank estimate of the output gap[1]



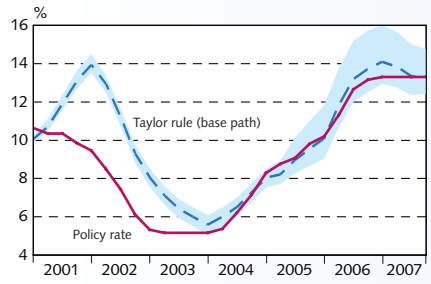
1. The real-time estimate of the output gap for each year is based on the Central Bank's estimate as published in *Monetary Bulletin* during that year. The chart should be interpreted with caution because the Bank's methods for estimating the output gap have changed during the period.

Source: Central Bank of Iceland.

1. See e.g. Taylor, J. B. (1993). "Discretion versus Policy Rules in Practice", *Carnegie-Rochester Conference Series on Public Policy*, 39, 195-214; Taylor, J. B. (ed.) (1999), *Monetary Policy Rules*, NBER Conference Report, University of Chicago Press, Chicago; Cecchetti, S. G., P. Hooper, B. C. Kasman, K. L. Schoenholtz and M. W. Watson, (2007). "Understanding the Evolving Inflation Process", U.S. Monetary Policy Forum 2007. Comments on the Taylor rule can also be found in *Monetary Bulletin* 2002/2, Box 5, pp. 23-25.
2. The conclusions are subject to certain reservations since it is clear that the paths of CPI inflation and the output gap would have been different from the actual ones if the Central Bank's policy interest rate path had in fact been consistent with the Taylor rule. No attempt is made to estimate what the resulting paths might have been.
3. The equilibrium interest rate is a policy interest rate that is consistent with a neutral monetary policy stance, i.e. one that neither dampens nor stimulates national economic activity. It is difficult to make a reliable estimate of this neutral interest rate but its level is probably relatively high in Iceland, where the savings propensity is low and return on capital is high. The low propensity to save reflects the nation's relatively young average age and is manifested in a high level of indebtedness. On the other hand, the high return on capital indicates that the Icelandic economy may not be as deep and efficient as, for example that of the United States, manifested in the economy's ability to support a relatively high level of long-term real interest rates. The Central Bank of Iceland assesses that the equilibrium real interest rate level is probably in the 3-4% range which, when added to the inflation target, indicates a neutral policy interest rate in the 5.5-6.5% range. The statistical procedures in the main text are based on the mid-point, a 6% neutral policy interest rate.
4. Since Taylor's original presentation of the rule (1993), research has shown that its correlation with actual policy interest rate paths is more robust if lagged policy rate variables are also taken into account.

Chart 3

Actual policy rate path compared to Taylor rule path with revised output gap estimate[1]

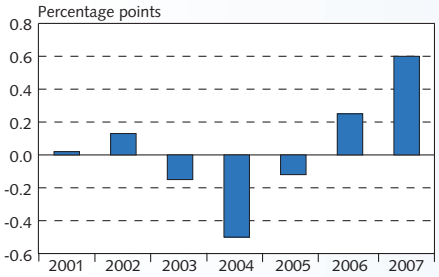


1. Baseline forecast: $R(t) = aR(t\text{-}1) + (1\text{-}a)[(R^* + P^*) + b(P(t) - P^*) + cG(t)]$, where R is the policy rate , P is inflation, and G is the output gap. R^* (neutral real interest rate) = 3.5%, P^* (inflation target) = 2.5%, a = 0.7, b = 1.5 and c = 0.5. The gap shows the various results obtained from applying the Taylor rule using differing values for R^* (3-4%), b (1.5-2.5), and c (0.2-1.0)

Source: Central Bank of Iceland.

Chart 4

Deviations in interest rates according to Taylor rule with revised vs. real-time output gap estimate



Source: Central Bank of Iceland.

Deviations from the Taylor rule always attract attention, and central bank officials often make a point of explaining them.[5] Taylor (1993, 1999) himself has always emphasised that central banks should not follow the rule blindly but rather use it as a frame of reference for their own policy formulation. In comparison with actual policy interest rate decisions, it is also of the essence to take into account that central banks base their policy decisions on imperfect data and uncertain forecasts of near-term economic developments. The output gap and the equilibrium policy rate are subject to considerable uncertainty, and neither variable can be measured directly but must be inferred from other data.

Policy interest rates according to the Taylor rule would have been higher through mid-2004 but very close to actual policy rates thereafter

Chart 1 shows the Central Bank's policy interest rate path according to the Taylor rule from the year 2001, based on the real-time output gap assessments used by the Bank in connection with individual policy rate decisions. If the Bank had used a simple Taylor rule, it is clear that the policy rate would have been considerably above its actual level until mid-year 2004. The inflation path in 2001 and 2002 confirms that the monetary policy stance was not sufficiently tight in those two years. From mid-2004 to the present, however, the policy interest rate path indicated by the Taylor rule is very similar to the one that has in fact been pursued. Therefore, the tightness of the Central Bank's monetary policy stance during the past 3½ years has been approximately on par with practice other central banks might have been expected to conduct under similar circumstances, although outside comments have occasionally suggested otherwise.

If assessments of the output gap had been based on data now available, the Taylor rule would have required a higher policy interest rate path than indicated by actual assessments based on real-time data

Estimates of the output gap are subject to substantial revisions as more dependable national accounts data become available. During the past four years, the output gap has generally been revised upwards from real-time staff estimates (see Chart 2), as a result of considerable upward revision of output growth from preliminary figures. There remains considerable uncertainty with respect to the output gap in both 2006 and 2007. Chart 3 shows the policy interest rate path indicated by the Taylor rule applied to revised output gap estimates based on the most recent data. Data now available suggest that the policy interest rate path since mid-year 2004 has been broadly in line with the Taylor rule, although the larger than previously estimated output gap in 2006 may have led to a policy interest rate somewhat lower than that suggested by the Taylor rule (see Chart 4). According to the rule, the policy interest rate in Q4/2007 should be in the range of 12½-14¾%. Thus the actual policy rate appears to be of the right order of magnitude. Of course, that does not mean that it will appear in the same light in retrospect a few years from now.

5. See e.g. Blinder, A., and R. Reis (2006). "Understanding the Greenspan Standard", a paper presented at a Federal Reserve Bank of Kansas City seminar in Jackson Hole, Wyoming; Poole, W. (2007). "Understanding the Fed", Federal Reserve Bank of St. Louis *Review*, 89 (1), 3-13; Kohn, D.L., (2007), "John Taylor Rules", a speech delivered at a Federal Reserve Bank of Dallas seminar on John Taylor's contribution to monetary economics and policy formulation, held on October 12, 2007.