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A simple cost-benefit analysis of using monetary policy for financial-stability purposes *

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Should monetary policy be used for financial-stability purposes? Should monetary policy, as suggested by the Bank for International Settlements (2014), "lean against the wind" – for instance against increases in housing prices and household debt – in an attempt to promote financial stability?

Jeremy Stein (2013) has put forward what is arguably the strongest argument in favor of leaning against the wind for financial stability purposes: "While monetary policy may not be quite the right tool for the job, it has one important advantage relative to supervision and regulation – namely that it gets in all of the cracks [of the financial system]."

However, when one thinks about this argument, I believe one must admit that a modest policy-rate increase would most likely barely fill the bottom of these cracks. In order to fill the cracks, the policy rate may have to be increased so much that it would kill the economy.

This observation points to the need for a cost-benefit analysis of using monetary policy for financial-stability purposes. If monetary policy should deviate from its mandate – for instance, from the Federal Reserve's objectives of price stability and maximum sustainable employment – it should be the case that the expected benefits exceed the costs of deviating from the objectives.

For instance, tighter monetary policy might limit the growth of housing prices and household debt somewhat. This might in some situations reduce the probability and/or the severity of a possible future financial crisis. Because a financial crisis would most likely imply too low an inflation rate

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and too high an unemployment rate, tighter policy might then have the benefit of a better expected future macro outcome. But tighter policy will lower inflation and increase unemployment during the next few years. It may thus have costs in terms of a worse macro outcome over the next few years, with too low an inflation rate and/or too high an unemployment rate. For a tighter policy to be justified, the expected benefits should exceed the expected costs. For policy to be optimal, it should be adjusted such that the expected marginal benefits equal the expected marginal costs.

The Swedish Riksbank's policy during 2010-2011 provides a clear example of leaning against the wind because of concerns about household debt. As discussed in Svensson (2010, 2015c), in June 2010, the Riksbank's forecast for CPIF inflation was below the inflation target and the unemployment rate and the forecast for unemployment were far above the Riksbank's estimate of a long-run sustainable rate of unemployment.[1] Nevertheless, the Riksbank increased the policy rate from 0.25 basis points in June 2010 to 2 percent in July 2011, because of concerns about possible risks associated with rising housing prices and household debt. After this rapid rate increase, inflation fell to around zero, far below the target, and unemployment stayed up around 8 percent, far above any reasonable estimate of its long-run sustainable rate. In response to this, the Riksbank only slowly brought the policy rate down during 2012 and 2013. From the summer of 2014, the policy rate was brought down more quickly. In March 2015 it was lowered to minus 0.25 percent.[2]

The dramatic policy tightening in 2010-2011 was done without any previous analysis of the impact of monetary policy on any risks associated with household debt. It was arguably a seat-of-the-pants policy, justified by a gut feeling that the benefits must exceed the costs and disregarding existing evidence of small effects of the policy rate on debt and financial stability (Svensson 2010). Later, in July 2013, the Riksbank would present a framework that might justify its policy (Sveriges Riksbank 2013). According to this framework, tighter policy, by limiting household

[1] The Riksbank's inflation target is 2 percent for annual inflation measured by the CPI, the Consumer Price Index. The Riksbank uses forecasts of inflation measured by the CPIF as a guide to achieve the inflation target for the CPI. CPIF inflation differs from CPI inflation in that homeowners' housing costs are calculated with mortgage rates held constant.

[2] I served as a deputy governor and member of the executive board at the Riksbank during May 2007-May 2013. My colleague Karolina Ekholm and I consistently dissented against the Riksbank policy, first against the policy tightening of 2010–2011 and then in favor of a rapid lowering of the policy rate. We argued that easier policy would improve target achievement for inflation and resource utilization and that the effects of the policy rate on any risks associated with household debt were too small to justify the tight policy. See, for instance, my speech in November 2010, Svensson (2010). My lessons from six years of practical policy making are discussed more extensively in Svensson (2013b).

indebtedness, would reduce the probability and severity of a future financial crisis and its associated bad macro outcome. This way, the worse macro outcome over the next few years from the tightening could be seen as an insurance premium paid to ensure a better expected macro outcome in future. But no numbers or estimates were published that would justify its policy.

However, in early 2014 the Riksbank presented its own estimates of the impact of the policy rate on household real debt and the debt-to-income (DTI) ratio (Sveriges Riksbank 2014a). The Riksbank also regularly published, in its *Monetary Policy Report*, its estimates of the impact of alternative policy-rate paths on inflation and unemployment (for instance, in Sveriges Riksbank 2014b).[3] This makes it possible to assess the relative costs and benefits of the Riksbank's leaning against the wind, using the Riksbank's own estimated numbers together with estimates of the effect of real debt growth in the probability of a financial crises in Schularick and Taylor (2012) and the effect of the DTI ratio on the depth of the recent crisis in Flodén (2014).

The unemployment cost of a higher policy rate

Let me for simplicity express the cost and benefits of a higher policy rate in terms of unemployment (see Svensson (2015c) for details). A higher policy rate results in a higher unemployment rate. According to Sveriges Riksbank (2014b, figures 2:13 and 2:15), a 1-percentage-point higher policy rate during four quarters leads to about a 0.5-percentage-point higher unemployment rate during the next few years (Svensson 2015c, figure 4).[4] This increase in the unemployment rate then represents the *cost* of a higher policy rate, to be compared with any benefits of a higher policy rate.

The benefits of a higher policy rate

According to the Riksbank's framework, a higher policy rate should reduce household indebtedness. The reduced indebtedness would lower the *probability* of a future crisis, with its associated bad macroeconomic outcome, including low inflation and high unemployment. The reduced indebtedness would also, conditional on a crisis occurring, reduce the *severity* of a crisis – for instance, it would reduce the increase in the unemployment rate. The reduced probability of

[3] In more recent *Monetary Policy Reports*, the Riksbank has stopped showing the effect of alternative policy-rate paths.

[4] This number is constructed from the numerical data for Sveriges Riksbank (2014b, figures 2:13 and 2:15). The effect on the unemployment rate of a 0.25-percentage-point higher policy rate during four quarters has been multiplied by 4 to correspond to the effect of a 1-percentage-point higher policy rate during four quarters.

a crisis and the reduced severity of a crisis would constitute the *benefits* of a higher policy rate. What, then, are the benefits of a higher policy rate, according to the Riksbank's own estimates?

The effect of a higher policy rate on the probability of a crisis

What is the expected effect of a higher policy rate on the *probability* of a crisis? First, regarding the probability of a crisis, Sveriges Riksbank (2013) refers to Schularick and Taylor (2012). According to that paper, lower growth of real debt reduces the probability of a crisis occurring. More precisely, according to the authors' summary of their results, a 1-percentage-point lower annual growth of real debt for five years (that is, 5 percent lower real debt in five years) would, everything else equal, reduce the probability per year of a crisis by about 0.4 percentage points.[5]

Second, according to the Riksbank's own estimate, a 1-percentage-point higher policy rate during four quarters would result in 0.25 percent lower real debt in five years (see Svensson (2015c, figure 5) and Sveriges Riksbank (2014a, figure A20) for quarter 20).[6]

Altogether, this implies a reduction of the probability per year of a crisis by 0.25*0.4/5 = 0.02 percentage points, a very small reduction of the probability.

If one makes an assumption of how much higher unemployment would be in a crisis, the benefit of a lower probability of a crisis can be expressed in terms of expected lower unemployment. Sveriges Riksbank (2013, figure A10) assumes a crisis scenario where the unemployment rate becomes about 5 percent higher. I will use that assumption.

If the probability of a crisis falls by 0.02 percentage points, that is, by 0.0002, the expected future unemployment rate will then fall by 0.0002*5 = 0.001 percentage points, that is, by 0.1 *basis* point. This is thus the benefit expressed in terms of lower expected future unemployment because of a lower probability of a crisis. It is clearly very small compared to the cost of a 0.5 percentage points higher unemployment rate during the next few years.

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[5] See Schularick and Taylor (2012, table 3, "Sum of Lag Coefficients," column 1 to 3). I believe the coefficient 0.4 might be too high, because data for a number of reasonable control variables are not available. This means that "good" credit growth and "bad" credit growth cannot be distinguished. A lower coefficient would result in an even less effect of the policy rate on the probability of a crisis. Preliminary estimates by an IMF team on data for advanced countries since 1970 result in a corresponding coefficient equal to 0.11, only about a fourth of the Schularick and Taylor coefficient.

[6] The source of this number is the numerical data for Sveriges Riksbank (2014a, figure A20) with the opposite sign. Figure A20 also reveals that the effect on real debt is not statistically significantly different from zero and may be of the opposite sign.

Furthermore, according to Sveriges Riksbank (2014a, figure A20) and Svensson (2015c, figure 5), the policy rate has *no long-run effect on real debt* and thus no long-run effect on risks associated with real debt.

The effect of a higher policy rate on the severity of a crisis

What is then the expected effect of a higher policy rate on the *severity* of a crisis? First, according to a note by Riksbank deputy governor Martin Flodén (2014, table 1, column 2), a 1-percentage-point lower DTI ratio might, all else equal, result in the increase in the unemployment rate in a crisis being 0.02 percentage points lower. Second, according to Sveriges Riksbank (2014a, figure A22) and Svensson (2015c, figure 6), a 1-percentage-point higher policy rate during four quarters would lead to a 0.44-percentage-point lower DTI ratio in five years. [7]

Altogether, this means that the increase in the unemployment rate might be 0.44*0.02 = 0.009 percentage points lower, that is, 0.9 basis points lower, if the crisis occurs with certainty. If the crisis occurs with the probability per year of 4 percent (the average probability of a crisis according to Schularick and Taylor (2012), corresponding to a crisis, on average, every 25 years), the expected lower increase in unemployment is only 0.04*0.9 = 0.036 basis points. Let me here assume a higher probability of a crisis, 10 percent per year. Then the expected lower increase in unemployment is still only 0.1*0.9 = 0.09 basis points, very small compared to the cost of a 0.5 percentage point higher unemployment rate during the next few years.

Furthermore, according to Sveriges Riksbank (2014a, figure A22) and Svensson (2015c, figure 6), the policy rate has *no long-run effect on the DTI ratio* and thus no long-run effect on risks associated with the DTI ratio.

Adding up cost and benefits in terms of unemployment

Adding up the two benefits of a higher policy rate, from a lower probability of a crisis and from a less severe crisis, we get an expected lower future unemployment rate of 0.1 + 0.09 = 0.19 basis points. This is, of course, completely insignificant in comparison with the cost of a higher policy rate: a 0.5-percentage-point (that is, 50-basis-point) higher unemployment rate during the next few years. The benefit is only about 0.4 percent of the cost, instead of the more than 100 percent required to justify the policy of leaning against the wind. Put differently, the cost is about 250

[7] Sveriges Riksbank (2014a, figure A22) and Svensson (2015c, figure 6) also reveal that the change in the DTI ratio is not statistically significant from zero and may be of the opposite sign.

times the benefit, two orders of magnitude larger than the benefits. The cost and benefits are summarized in table 1.

Table 1 Cost and benefit in unemployment of a 1-percentage-point higher policy rate during four quarters

Cost: Higher unemployment during the next few years, basis points	50
Benefit: Lower expected future unemployment, basis points	
1. From of lower probability of a crisis, basis points	0.1
2. From a smaller increase in unemployment in a crisis, basis points	0.09
Total benefit, basis points	0.19
Total benefit as a share of the cost, percent	**0.38**
Cost-benefit ratio	**263**

There is, of course, considerable uncertainty about the Riksbank, Schularick and Taylor, and Flodén estimates that I have used, and there is also considerable uncertainty about the point estimate of the cost-benefit ratio that I have calculated from them. Nevertheless, there has to be extremely one-sided errors to result in a total error corresponding to two orders of magnitude.

A quadratic loss function

The above specifies the tradeoff between the increase in the unemployment rate over the next few years and the associated possible reduction in the expected future unemployment rate. It can be seen as a simple linear calculation of the costs and benefits measured in unemployment. It has the advantage that it is independent of the initial conditions of the economy, in the sense that it does not depend on whether initially unemployment is above or below its long-run sustainable rate.

However, for monetary policy purposes, costs and benefits are usually expressed in terms of a quadratic loss function, for instance, a weighted sum of squared inflation deviations from an inflation target and squared unemployment gaps (deviations from its long-run sustainable rate). Let us consider losses in terms of a squared unemployment gap. Given the initial unemployment gap together with assumptions about the future unemployment gap before a crisis, we can

calculate the cost and benefit in terms of the increased loss in the next few years and the expected reduction in the future loss from a reduction in the probability and severity of a crisis. The increased loss in the next few years is, of course, quite sensitive to whether the initial unemployment gap is positive, zero, or negative.

Assume that the initial unemployment gap is 2 percentage points and that the future unemployment gap in the absence of a crisis is zero.[8] For a one-percentage-point increase in the policy rate, the benefit (in the form of a reduction in the expected future loss from a lower probability and severity of a crisis) can be shown to be 0.38 percent of the cost (in the form of an increase in the loss because of a higher unemployment rate the next few years). That is, the cost-benefit ratio is about 250.[9]

As mentioned, the quadratic loss depends on the assumed initial unemployment gap. If the initial unemployment gap is zero, the benefit is 3.4 percent of the cost, with a cost-benefit ratio of about 30, still much above 1.[10] Thus, even if the Swedish economy had had a zero unemployment gap in June 2010, a policy-rate increase of 1 percentage point could according to these calculations not be justified (the actual policy-rate increase from June 2010 to July 2011 was a full 1.75 percentage points).

This calculation of the quadratic cost and benefit can be extended to include the quadratic costs due to inflation deviations from target. It can be extended to include the sum of future costs and benefits, taking into account the expected length of a crisis and any discounting. It can be refined to take into account the precise time-series properties of the Schularick and Taylor (2012) estimates rather than using the effect of the 5-year average growth rate of real debt. But because the expected future unemployment rate reduction is less than 1 percent of the unemployment rate increase during the next few years, it is clear that the result of a more complete cost-benefit

[8] In June 2010, the Swedish unemployment rate was about 8.5 percent and according to Sveriges Riksbank (2010, figure B23) the Riksbank's estimate of the long-run sustainable rate was 6.5 percent.

[9] With a 2 percentage point initial unemployment gap, the quadratic cost for a 1-percentage-point increase in the policy rate is $(2+0.5)^2 - 2^2 = 2.25$. The expected benefit is $0.0002*5^2 + 0.04*(5^2 - (5-0.009)^2) = 0.005 + 0.00352 = 0.00852$ (where I have used Schularick and Taylor's average crisis probability, 4 percent, in the calculation of the expected benefit from a 0.01 basis points lower increase in unemployment rate in a crisis).

[10] With a zero initial unemployment gap, the quadratic cost for a 1-percentage-point increase in the policy rate is instead $(0.5)^2 - 0^2 = 0.25$, a ninth of the loss with a 2 percent unemployment gap, with the same expected benefit. Then the net benefit is $0.00852/0.25 = 0.034 = 3.4$ percent of the cost.

analysis is unlikely to be much different from the simple calculations reported here. Svensson (2015a) pursues these issues further.[11]

The effect of inflation below expectations

The calculation of costs and benefits above disregards the effect on real debt of actual inflation falling substantially below previous inflation expectations, which in Sweden have been at or a bit above the target expect very recently. Because the Riksbank's leaning against the wind has led to inflation much below not only the target but also below household inflation expectations over the past few years, the real value of nominal debt has become higher than expected and planned for. As discussed in Svensson (2015c), the real value of any mortgage held at the end of 2011 has in the spring of 2015 become about 6.5 percent larger than if inflation had equaled the inflation target of 2 percent. This is a much larger effect on real debt than the ones discussed above. Given this effect, Riksbank policy has almost certainly increased real debt and actually been counterproductive; the Riksbank has consequently made any problem and risks with household indebtedness worse. A more complete analysis of the costs and benefits of leaning against the wind should also increase the effects of this "Fisherian" effect on the real debt burden of an inflation rate below inflation expectations (Svensson 2013a).

Conclusions

According to this simple cost-benefit analysis of the Riksbank's policy of leaning against the wind for financial-stability purposes, the benefits are tiny, less than 1 percent of the cost, so the cost is two orders of magnitude larger than the benefits. The reason for this result is that the policy rate has a very small and indirect effect on the probability and severity of a crisis but a sizable more direct effect on the unemployment rate during the next few years. Furthermore, because leaning against the wind has led to an inflation rate much below households' inflation expectations over the past few years, the real value of household debt has become substantially higher than expected and planned for. The net effect of the policy has almost certainly been to increase real debt and actually been counterproductive; the policy has most likely made any problem and risks with household indebtedness worse.

[11] Ajello, Laubach, López-Salido, and Nakata (2015) examine optimal interest-rate policy in a model with the probability of a crisis depending on a credit conditions. In a conference discussion of that paper, I found that a cost-benefit analysis using the numbers and estimates from that paper gives similar results as those reported here (Svensson 2015b).

If the purpose is to limit the probability and severity of a financial crisis, this cost-benefit analysis indicates that tighter monetary policy is not the right tool (Bernanke 2015). The possible impact on the probability and severity of a financial crisis is simply far to weak compared to the sizeable negative impact on inflation and unemployment. Macroprudential policy has much more direct and targeted effects on the probability and severity of a crisis, at apparently much lower costs. Macroprudential policy should, of course, also be subject to a cost-benefit analysis, but it seems very unlikely to me that such an analysis would not in most cases be quite favorable to it. In Sweden, the Financial Supervisory Authority (FSA) has taken several macroprudential actions that should reduce the probability and severity of a future crisis. These include a loan-to-value (LTV) cap of 85 percent introduced in 2010, after which the average LTV ratio of new mortgages have stabilized around 70 percent, leaving a substantial 30 percent of average equity for new mortgages. The FSA has also increased banks' risk weights on mortgages to 25 percent and systemically important banks' capital requirements to 16 percent of risk-weighted assets. In this context, it is of interest that preliminary results by an IMF team indicate that, with 15–20 percent bank capital relative to risk-weighted assets, about 85 percent of the banking crises in advanced countries since 1970 might have been avoided. It is hard to see that these policy actions by the FSA would have any costs in Sweden comparable to those of a tight monetary policy.

Generally, the Swedish experience points to the importance of doing a thorough cost-benefit analysis before monetary policy is tightened for financial-stability purposes, especially in a weak economy, but also with more balanced initial conditions. Even if the Swedish economy had not been weak in June 2010 but the unemployment gap had been closed, the simple cost-benefit analysis presented here indicates that the expected benefits of leaning against the wind would still been much smaller than the costs. It remains to be seen whether such a cost-benefit analysis for other countries would give the same clear result as in the Swedish case. To me, it seems rather unlikely that conditions in other countries would be so different that a higher policy rate would be a cost-effective measure to affect the probability and severity of a financial crisis. These issues are pursued further in Svensson (2015a).

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