Preliminary draft. Comments welcome.

Does a trivial econometric error explain why Andersson and Jonung get different results?*

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Does a trivial econometric error explain why Andersson and Jonung (2014) get different estimates of a Swedish Phillips curve than the very robust estimates that I get in Svensson (2014, 2015)? Yes, their trivial error is not to have done the standard test for weak instruments when using regressions with instrumental variables. Their instruments soundly fail the standard Cragg-Donald F-test. Their instruments are weak and as a consequence *their* estimates of the Phillips curve are unreliable, not mine.

Since Andersson and Jonung insist on using data on annual inflation rather than quarterly inflation, they face an overlapping-data problem with moving-average error terms. In line with the strong conclusion and recommendation of Harri and Brorsen (2009), it would be better to use data on non-overlapping quarterly inflation, as I do in Svensson (2015). A second-best very common alternative with overlapping data is to use OLS with Newey-West errors, as I do in Svensson (2014). Since I get similar results with data on annual inflation in Svensson (2014) as with data on quarterly inflation in Svensson (2015), this indicates that in this case OLS with Newey-West errors works well for annual data, and that my results for the Phillips curve are robust, in line with the other numerous robustness tests I conduct in Svensson (2014, 2015).

But Andersson and Jonung insist on their own solution to the overlapping-data problem, namely to use 2SLS with instrumental variables that are lagged 5 and 6 quarters, so as to be uncorrelated with the error term. This might have worked, if their instruments had been sufficiently correlated with the explanatory variables in the Phillips curve. But if the instruments are weak, that is, they have low correlation with and are bad predictors of the explanatory variables, the predicted values of the explanatory variables will have little variation. Then the estimates of the coefficients of the explanatory variables may be biased, and the coefficients may get large confidence intervals that include zero, meaning that the coefficients are not significantly different from zero.

This seems to be precisely what happens in their 2SLS regressions. Their instruments soundly fail the standard Cragg-Donald F-test and are very weak. And the coefficients of the unemployment terms indeed get large confidence intervals and are not significantly different from zero.

When I started to estimate a Phillips curve for Sweden for the paper Svensson (2015), I was using data on annual inflation myself, but when I became aware of the analysis in Harri and Brorsen (through the advice of Bertil Holmlund, Uppsala University), I shifted to using quarterly inflation. I got similar results regarding the slope of the long-run Phillips curve, but the equation that best fits the data is simpler with quarterly data (the coefficients of lags of quarterly inflation are insignificant), and the slope of the long-run Phillips curve is estimated

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with greater precision. This is consistent with Harri and Brorsen's general conclusion that using non-overlapping data implies using more efficient estimators.

If one nevertheless estimates a Phillips curve with data on annual inflation, the coefficients of lagged annual inflation rates are significant and have explanatory value. As noted in Svensson (2014), a first error of Andersson and Jonung is to have missed this and hence consistently use misspecified equations in Andersson and Jonung (2014).

To see what is going on start from equation (1) in the table below. It is estimated with OLS and Newey-West errors. It is a corrected version of equation (1) in table 3 in Andersson and Jonung (2014) and the same as equation (4) in Svensson (2014). PI denotes annual CPI inflation. The specification of the unemployment terms are here taken to be the same as those used by Andersson and Jonung. They are not necessarily the ones that fit the data best, but to simplify the comparison with their results, I keep it here. UBAR(-1) denotes a 4-quarter average of the unemployment rate, and U-U(-4) denotes the 4-quarter difference of the unemployment rate.

Table 1. Phillips-curve estimates: OLS, and 2SLS with weak instruments

Equation	(1)	(2)
Dep. Var.	PI	PI
Method	OLS	2SLS
Constant	2.018	0.564
	(0.437)**	(-0.762)
UBAR(-1)	-0.210	-0.054
	(0.048)**	(0.080)
U-U(-4)	-0.208	-0.036
	(0.079)*	(0.087)
PI(-1)	1.144	1.438
	(0.175)**	(0.172)**
PI(-2)	-0.498	-0.563
	(0.203)*	(0.116)**
Slope	-0.59**	-0.43
Unemployment increase	1.01	1.39
R^2	0.83	0.79
Adjusted R^2	0.82	0.78
S.E.	0.52	0.58
DW	2.15	2.30
Cragg-Donald F-statistic		0.35

Note: Sample 1997Q4-2011Q4. Newey-West standard errors, lag 4. PI is the annual CPI inflation rate. U denotes the unemployment rate. UBAR is a 4-quarter trailing moving average of the unemployment rate. Slope refers to the slope of the long-run Phillips curve, calculated as the coefficient of UBAR(-1) divided by 1 minus the sum of the coefficients of the lagged inflation terms. The (average) unemployment (rate) increase is calculated as 0.6 divided by the slope of the long-run Phillips curve. The instruments in equation (2) are U(-5), U(-6), U(-7), PI(-5), and PI(-6). Significance at the 1 and 5 percent levels are denoted by ** and *, respectively. Data source: Statistics Sweden and the Riksbank.

With this specification, the slope of the long-run Phillips curve is -0.210 / (1 – 1.144 + 0.498) = -0.59, taking into account the coefficients of the lagged inflation terms. By a Wald test it is significantly different from zero. This is a somewhat flatter, but not significantly different slope than my benchmark estimate with quarterly data in Svensson (2015), -0.75. The increase in the average unemployment rate is the average shortfall of inflation below the target during 1997-2011, 0.6 percentage points, divided by the slope of the long-run Phillips curve. In this case it results in about 1 percentage point. This is somewhat higher than my benchmark estimate with quarterly data, 0.6 / 0.75 = 0.8 percentage points.

Equation (2) shows the result of estimating this equation with 2SLS, with the instruments being the unemployment rate lagged 5-7 quarters and annual inflation lagged 5 and 6 quarters. This is in line with Andersson and Jonung (2014, footnote 18), but without the foreign variables:

> As instruments we use the 5th and 6th lag of the explanatory variables in the models and the 5th and 6th lag of US inflation, euro area inflation, US unemployment and euro area unemployment.

The results are different from those in equation (1), in that the coefficients of the unemployment terms are smaller and the standard errors are larger, and the coefficients are no longer significantly different from zero. The lagged inflation terms are still significant. The point estimate of the slope of the long-run Phillips curve is 0.43, but it is not significantly different from zero. According to this, one would not be able to reject the hypothesis that the long-run Phillips curve is horizontal!

However, the instruments used in equation (2) are very weak. The Cragg-Donald F-statistic is very low, only 0.35. As a benchmark critical value to be exceeded for rejection, one often uses 10. Hence, the null hypothesis of weak instruments cannot be rejected. This means that the estimates of equation (2) are not robust. The difference between equations (1) and (2) is apparently due to the use of weak instruments.

Not testing for weak instruments when using regressions with instrumental variables is a trivial econometric error.

Overall, this illustrates well the main point of Harri and Brorsen (2009): Do not use overlapping data when non-overlapping data is available. Using overlapping data normally implies using very inefficient estimators, including OLS with Newey-West errors, compared to using non-overlapping data. Furthermore, 2SLS with the weak instruments of Andersson and Jonung is obviously an extremely inefficient and unreliable estimator.

References

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