SCHOOL OF FINANCE AND ECONOMICS

UTS:BUSINESS

WORKING PAPER NO. 110 **JANUARY, 2001**

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ISSN: 1036-7373
http://www.business.uts.edu.au/finance/

The Effects of Inflation and the Business Cycle on Revisions of Macroeconomic Data

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Abstract

Although national accounts data provide the most comprehensive overview of economic activity, preliminary estimates are subject to much revision before they are regarded as reliable indicators. Oddly enough, the market acts on the preliminary estimates as though they were final and complete. Even though there exists a considerable international literature on the statistical properties of these revisions, little attention has been devoted to the effects of inflation and the business cycle on the size and direction of these early revisions. The aim of this paper is to provide the first known examination of these effects and to identify an optimal policy strategy to ensure the highest quality of data collection. This paper finds the optimal strategy to be a policy of low inflationary economic growth with an inflation target between 0 and 5%.

Keywords: inflation, business cycles, revisions, national accounts

JEL Classification: E31, E32.

I Introduction

The National Accounts provide the most thorough and comprehensive means by which governments, when formulating policy, and business, when undertaking investment decisions, evaluate current economic conditions and forecast the future course of the economy. However much of this data undergoes a process of revision as more accurate information comes to hand. Consequently much of the preliminary estimates are significantly revised. Surprisingly though, the market reads the preliminary estimates very closely as though these estimates are final and complete.

Data revisions have been discussed at some length in the literature, particularly for the construction of growth rates (see Paterson and Heravi, 1992; and Lim, 1985), for econometric model building (see Barrow and Hercowitz, 1980; and Holden and Peel, 1982), for the money supply (Milbourne and Smith, 1989), for the current account (Brooks *et al.* 1998), for industrial production (Boucelham and Terasvirta, 1990), and for forecasting (see Howery, 1978; and Stekler, 1987). Although many recent studies have discussed whether preliminary estimates of GDP growth rates are efficient and unbiased (see for example, De Leeuw, 1990; and Young, 1993) this paper provides the first known estimate of the effects of inflation and the business cycle on the quality of GDP data. Our findings suggest that during economic expansions and inflationary pressures, preliminary estimates of GDP are more unreliable predictors of the final estimates than are the preliminary estimates during periods when the economy is contracting and prices are falling. Further, our findings also suggest that inflation dominates in distorting the quality of the preliminary estimates and only in periods of inflation of 5% or less are the estimates a reasonable indicator of the final estimates.

II The Effect of the Business Cycle and Inflation on Revisions

Revisions to national accounts data are generally the result of the accumulation of up-to-date information which was unavailable at the time the preliminary estimates were published (ABS, 1990). The preliminary estimates are often inadequate as a result of a number of factors including, the use of incomplete survey data, interpolations and extrapolations used when the frequency of the data is not adequate, new data sources which become available but where not available at the time the estimates were made, and from major conceptual changes. However it is not these factors in which we are interested but rather to know whether there are any distortions arising from inflationary and economic pressures. The government has substantial control on the latter but very little on the former.

The question of how the economic cycle and inflation may systematically influence the behaviour of the preliminary estimates is important for many reasons. First, it is of considerable policy interest to have accurately measured economic data because these are intended to provide not only a comprehensive and systematic summary of economic activity, but also a resource from which to gauge economic policies. Second, the market's immediate reactions to the release of preliminary data does introduce inefficiencies in the economy, particularly so when the preliminary estimates are significantly biased.

We conduct this analysis for Australia using the growth rates of two measures of output, namely the expenditure measure, GDP(E), and the income measure, GDP(I).[1] The latter has generally been preferred as an accurate indicator of economic activity in Australia and for this reasons it is the variable of most interest in this paper. Growth rates rather than levels data have been used for a number of reasons. First, growth rates minimise the impact from conceptual changes in the data which may take place over time and second, growth rates are more interesting to users of statistics (York and Atkinson, 1997). Consequently revisions are also calculated in terms of growth rates.

Estimates of GDP and their components are prepared by the Australian Bureau of Statistics and published on a quarterly basis. Traditionally most of the attention has been on preliminary estimates from which growth rates are calculated. This data is never final and is subject to a further eight revisions as more accurate and timely information becomes available. However rarely do these early estimates provide an accurate indication of the true final values (see Brooks *et al.* 1998).[2] In Table 1 we compare annual growth rates of GDP over a number of revisions. In column 1 we calculate the annual growth rate using the preliminary estimate of the level series, measured in real per capita terms, and the fourth revised estimate of the level in the corresponding quarter one year earlier. In column 2 we repeat using the subsequently revised preliminary estimate with the fifth revised estimate in the corresponding quarter one year earlier and so on for the remaining four columns. We observe in the top half of the table that there are substantial changes to the average growth rates over 5 quarters of revisions. The effect appears more dramatic if we take 1983 as specific example. Although there are significant swings in annual growth rates for GDP, preliminary estimates may provide a misleading impression on the state of economic affairs. For example the annual growth rate using preliminary values for September 1983 was negative (-1.5%) but the final growth rate five revisions later was positive (0.1%).

In Table 2 we report the frequency of measurement bias for both GDP(I) and GDP(E). Measurement bias may take two forms: *(i) upward bias*, which implies that a revision is greater than that which is necessary to adjust the preliminary estimates to the final estimates and *(ii) downward bias*, which occurs when a revision is greater in absolute terms than that necessary to adjust the preliminary to the final estimate. The frequency of bias in GDP(I) is four times less than that of GDP(E) across all revisions. Although there does not appear to be a monotonic decline in bias across revisions, there is much greater variability in the frequency of bias for GDP(E) than for GDP(I).

In Table 3 we report the frequency of direction errors for the two measures of GDP. A direction error may take two forms: *(i) positive*, the revision is positive when in fact the revision should have been negative; and *(ii) negative*, the revision is negative when in fact the revision should have been positive. Across revisions there does not appear to be a monotonic decline in direction errors. In fact we find as many direction errors in the early stages of revisions as we do in the later stages. However there are a larger proportion of direction errors in GDP(I) than GDP(E). In approximately 42% of all revisions to GDP(I) a revision went in the wrong direction. This contrasts with only 27% for GDP(E).

With the exception of CSO (1985) and York and Atkinson (1997) there appears to be no studies which have empirically tested for a relationship between the business cycle, inflation and the extent of revisions. CSO (1985) found that preliminary growth rates in the UK are over-estimated when inflation is high and under-estimated when inflation is low. York and Atkinson (1997) found for number of countries some mild evidence that quarter-to-quarter growth rates are under-estimated when the economy is contracting and over-estimated when the economy is expanding. In this paper we examine whether the same holds true for Australian data and whether the effect may be due to either inflation, the business cycle or some combination of the two, and if so, which of the two effects dominate.

We begin by comparing the size of average revisions for GDP(I) and GDP(E) with the first difference in the rate of inflation ($\Delta\pi$). We divide $\Delta\pi$ into two components: *(i)* $\Delta\pi^+$ for $\Delta\pi > 0$ to measure the effects of revisions from increases in the rate of inflation and *(ii)* $\Delta\pi^-$ for $\Delta\pi < 0$ to measure the effects of revisions from falls in the rate of inflation. For each we calculate the average revision and the results are reported in Table 4. For both GDP(I) and GDP(E) average revisions are much larger when $\Delta\pi > 0$ than when $\Delta\pi < 0$. However average revisions are much larger for GDP(E) than for GDP(I). The inflation rate however appears to affect earlier revisions much more than later ones, evident by the consistent monotonic decline in average revisions.

Next we compare the size of the average revisions with business cycle expansions and contractions. We calculate the output gap by first extracting the trend using a Hodrick and Prescott (1971) filter.[3] We divide the output gap (Y) into two components: *(i)* Y^+ for $Y > 0$ to measure expansions and *(ii)* Y^- for $Y < 0$ to measure contractions. For each we calculate the average revision. The results are reported in Table 5. For both measures of GDP, average revisions are much larger when $Y > 0$ than when $Y < 0$. However the average revisions are much larger for GDP(E) than for GDP(I). The output gap also appears to affect earlier revisions much more than later ones, evident by the consistent monotonic decline in average revisions.

These results suggest that preliminary growth rates are over-estimated when inflation is high and the economy is expanding and under-estimated when inflation is low and the economy is contracting although the extent of the upward bias is much more significant. It also appears that there is a greater effect on the expenditure measure of economic activity than on the income measure from changes in the rate of inflation and the business cycle, which may justify the preference for GDP(I) as an more accurate indicator of economic activity. However GDP(I) too is affected by the extent of inflation and the stage of the business cycle. To test the significance of inflation and the business cycle on the nature of revisions for GDP(I) we estimate the following model [4]

$$R_{9-i,t} = \beta_0 + \beta_1 \pi_t + \beta_2 Y_t^{+} + \beta_3 Y_t^{-} + \beta_4 R_{9-i,t-1} \quad (1)$$

where

R_{9-i} = revision to the annual growth rate of GDP(I) calculated by subtracting the growth rate of the i^{th} revision from the final (or 9^{th}) estimated growth rate.

In equation (1) the threshold level for GDP(I) is set to zero along the trend growth path. By definition this model is capable of capturing responses to revisions from business cycle expansions and contractions. To test how revisions respond to changes in economic conditions we test the following two hypothesis: [1] To determine whether Y^{+} has any effects on revisions we test the null hypothesis $H_0 : \beta_2 = 0$ against the alternative $H_0 : \beta_2 \neq 0$; and [2] to determine whether Y^{-} has any effects on revisions we test the null hypothesis $H_0 : \beta_3 = 0$ against the alternative $H_0 : \beta_3 \neq 0$. As a priori we expect that β_2 to be positive and β_3 to be negative if business cycle expansions induce upward bias and contractions induce downward bias respectively. The results are reported in Table 6.

In each of the eight columns, most of the coefficients for output gap have the right sign. The Ramsey (1969) RESET test shows no indication of mis-specification at the 1% level. Furthermore the specifications do not appear to exhibit autocorrelated [Durbin and Watson (1951)] or heteroscedastic [Breusch and Pagan (1979)] disturbances.[5] The adjusted R^2 falls over time (or across revisions) as expected. When little information is available to compile the preliminary estimates, the Australian Bureau of Statistics (ABS) makes use of interpolation and extrapolation techniques. In periods of rapid economic growth and rising inflation such techniques could introduce significant bias to the measurement of these preliminary estimates and explains why the R^2 may be high. Less reliance on interpolation and extrapolation is required when more information is at hand and consequently similar economic conditions are less likely to affect for subsequent estimates. This explains why the R^2 falls over revisions.

The coefficients in Table 6 for Y^+ (Y^-) are generally positive (negative) suggesting incidences of upward (downward) bias in revisions during expansions (contractions) in economic activity. The significance of these coefficients on the extent of revisions appears not to be long lasting. In fact, expansionary economic activity appears to affect significantly the magnitude of revisions for only two quarters after the release of the preliminary estimates while contractions do not appear to downward bias the estimates at all.

Inflation appears to have a greater impact on the extent of revisions than does the business cycle. The coefficient on inflation is significant for the first four revisions following the release of the preliminary data. We can test whether increases and decreases in the rate of inflation have significant effects on the size of revisions in combination with business cycle fluctuations by alternatively specifying equation (1) as follows

$$R_{9-i,t} = \delta_0 + \delta_1 \Delta\pi_t^+ + \delta_2 \Delta\pi_t^- + \delta_3 GDP_t^+ + \delta_4 GDP_t^- + \delta_5 R_{9-i,t-1} \qquad (2)$$

To examine how revisions respond to changes in the inflation rate we test the following two hypothesis: [1] To determine whether $\Delta\pi^+$ has any effects on revisions we test the null hypothesis $H_0 : \delta_1 = 0$ against the alternative $H_0 : \delta_1 \neq 0$; and [2] to determine whether $\Delta\pi^-$ has any effects on revisions we test the null hypothesis $H_0 : \delta_2 = 0$ against the alternative $H_0 : \delta_2 \neq 0$. As a priori we expect that δ_1 to be positive and δ_2 to be negative if inflationary pressures induce upward bias and deflationary pressures induce downward bias respectively . The results are reported in Table 7.

In each of the eight columns the coefficients have the expected signs. There appears to be no evidence of autocorrelation, heteroscedasticity and the adjusted R^2 values decline over time for reasons already discussed. The coefficients on $\Delta\pi^+$ ($\Delta\pi^-$) are positive (negative) suggesting incidences of upward (downward) bias in revisions during increases (decreases) in rate of inflation. The significance of these coefficients on the extent of revisions appears to be lasting for $\Delta\pi^+$. In fact, rapid growth in inflation appears to affect significantly the magnitude of revisions while declines in the growth in inflation do not appear to downward bias the estimates at all. These results appears somewhat consistent with those of the business cycle discussed in Table 6 and suggests that growth rates are over-estimated when inflation is high and the economy is expanding but not so when the price level is falling and the economy is contracting.

In Table 8 we report the bias in the revision process arising from increases in the rate of inflation. In particular we distinguish between three levels of inflation: *(i)* between 0 and 5%; *(ii)* between 5 and 10%; and *(iii)* between 10 and 15%. We find that rising prices in each of *(i)*, *(ii)* and *(iii)* introduces distortions to the preliminary data, and the distortions from *(iii)* and greater than from *(i)*. For example, when inflation is between 0 and 5%, price increases will on average over-estimate the growth rate of the preliminary GDP by 0.68%. For similar price increases, but when inflation is between 10 and 15%, the preliminary growth rate is over-estimated by an average of 1.74%. This implies that if inflation is between 10 and 15%, the average upward bias to the preliminary estimate can be as large as 2.6 times the bias when inflation is between 0 and 5%. Although there is a monotonic decline in the bias from inflation across revisions, it is clear nevertheless that a higher rate of inflation (10-15%) introduces more bias than does a lower rate of inflation (0-5%) into the national accounts. We find that even a rate of inflation less that 3% is likely on average to produce an upward bias in the preliminary estimate in the growth rate of GDP to the same extent as inflation between 3 and 5%. For this reason we suggest an inflation target of 5% or less to ensure maximum efficiency in the preliminary estimates.

In Table 9 we examine the impact of a 10% increase in the output gap and the rate of growth of inflation within each of the inflation band possibilities *(i)*, *(ii)* and *(iii)*. We find that increases in inflation introduces a greater bias in the estimates than increases in the output gap. For example, a 10% increase in the output gap, when inflation is between 0 and 5% *(10 to 15%)*, introduces an upward bias in the preliminary estimates on average of 1.04% *(1.72%)*, while a 10% increase in the inflation rate introduces an upward bias of 2.08% *(2.87%)* on average. It appears from the evidence reported Table

9, as well as in Tables 6 & 7, that inflation has a much longer lasting effect on the preliminary estimates than does expansions in economic activity. In fact, by the 7th revision, an expansion in economic activity does not introduce distortions while inflation continues to do so up until the 8th revision. As the bias is least when inflation is below 5%, even though the economy may be expanding, the results suggest that the government should target inflation below 5% while actively promoting a policy of low inflationary economic growth. Doing so will ensure that more accurate data used in gauging future economic policies will be available.

III Conclusion

Inflation, rather than a rapidly growing economy, is found to be the explanation for the significant distortions in preliminary data published in the national accounts. In particular our results suggest that during periods of economic growth and rising inflation, the quality of preliminary economic data is upward biased. Examining the extent of distortions arising from inflation we find that the adverse effects are minimal if inflation is kept below 5%. The implications of this are clear: to ensure that preliminary economic data is as accurate as possible the government should support a policy of low inflationary economic growth with an inflation target of less than 5%. Allowing inflation beyond this level will distort the quality of national economic data and subsequently affect the quality of economic policies which are gauged on this preliminary data.

Tables

Table 1 - *Comparing Annual Growth Rates of GDP Across Revisions*

	Average Annual Growth Rates after					
	4 quarters	**5 quarters**	**6 quarters**	**7 quarters**	**8 quarters**	**9 quarters**
March	1.8	1.7	2.2	1.9	2.1	2.0
June	1.7	2.3	1.8	1.9	1.8	2.2
September	1.9	1.6	1.6	1.5	2.0	1.6
December	1.7	1.7	1.6	2.0	1.6	1.8
	Annual Growth Rates for 1983 after					
	4 quarters	**5 quarters**	**6 quarters**	**7 quarters**	**8 quarters**	**9 quarters**
Mar 1983	-3.6	-2.9	-3.3	-1.4	-2.5	-2.7
Jun 1983	-3.0	-2.5	-0.1	-2.2	-2.5	-2.5
Sept 1983	-1.5	1.6	0.1	-0.5	-0.8	0.1
Dec 1983	8.0	5.5	4.6	4.5	5.5	4.7

Table 2 - *Frequency of Measurement Bias Across Revisions*

	Measure of Bias [GDP(I)]							
	R1	**R2**	**R3**	**R4**	**R5**	**R6**	**R7**	**Average**
Upward Bias	1%	3%	1%	3%	2%	0%	1%	**2%**
Downward Bias	3%	0%	2%	2%	0%	0%	0%	**1%**
	Measure of Bias [GDP(E)]							
	R1	**R2**	**R3**	**R4**	**R5**	**R6**	**R7**	**Average**
Upward Bias	5%	5%	11%	3%	9%	6%	19%	**8%**
Downward Bias	4%	2%	5%	3%	6%	7%	3%	**4%**

Table 3 - *Frequency of Direction Errors Across Revisions*

	Direction Error [GDP(I)]							
Type of Change	**R1**	**R2**	**R3**	**R4**	**R5**	**R6**	**R7**	**Average**
Positive	21%	28%	22%	19%	25%	23%	19%	**22%**
Negative	25%	20%	16%	20%	20%	14%	20%	**19%**
Total	46%	48%	38%	39%	45%	37%	39%	**42%**
	Direction Error [GDP(E)]							
Type of Change	**R1**	**R2**	**R3**	**R4**	**R5**	**R6**	**R7**	**Average**
Positive	22%	29%	23%	27%	25%	21%	15%	**23%**
Negative	3%	4%	6%	8%	8%	8%	2%	**6%**
Total	25%	33%	29%	35%	23%	29%	17%	**27%**

Table 4 - *Inflationary Effects on Average Revisions*

	Mean Revisions			
	$\Delta\pi^+$		$\Delta\pi^-$	
	GDP(E)	**GDP(I)**	**GDP(E)**	**GDP(I)**
Revision 1	1.92	1.07	1.39	1.04
Revision 2	1.34	0.93	1.04	0.74
Revision 3	1.04	0.87	0.92	0.59
Revision 4	0.85	0.77	0.74	0.47
Revision 5	0.77	0.57	0.59	0.34
Revision 6	0.51	0.43	0.47	0.22
Revision 7	0.33	0.33	0.65	0.15
Revision 8	0.19	0.21	0.13	0.02
Average	**0.81**	**0.65**	**0.74**	**0.45**

Table 5 - *Business Cycles Effects of Average Revisions*

	Mean Revisions			
	Business Cycle Expansion (Y^+)		Business Cycle Contraction (Y^-)	
	GDP(E)	GDP(I)	GDP(E)	GDP(I)
Revision 1	1.79	1.27	1.50	0.83
Revision 2	1.31	1.09	1.06	0.56
Revision 3	1.07	0.90	0.89	0.54
Revision 4	0.86	0.76	0.72	0.46
Revision 5	0.68	0.51	0.67	0.37
Revision 6	0.38	0.38	0.60	0.25
Revision 7	0.42	0.22	0.58	0.25
Revision 8	0.15	0.08	0.17	0.13
Average	**0.83**	**0.66**	**0.77**	**0.42**

Table 6 - *Measuring Inflation and Business Cycle Effects on Revisions: A*

	GDP(I)							
	Rev9-1	Rev9-2	Rev9-3	Rev9-4	Rev9-5	Rev9-6	Rev9-7	Rev9-8
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
β_0 (const)	-0.42	-0.19	-0.09	-0.16	-0.17	-0.03	-0.04	-0.06
	(1.68)	(0.85)	(0.43)	(0.89)	(0.93)	(0.15)	(0.26)	(0.61)
β_1 (π)	7.99	5.74	5.50	4.25	3.84	3.00	2.22	2.78
	(2.84)**	(2.35)**	(2.20)**	(2.07)**	(1.96)	(1.63)	(1.49)	(2.51)**
β_2 (Y+)	35.49	19.76	10.63	13.33	13.29	2.10	1.29	-0.77
	(3.20)**	(2.03)**	(1.07)	(1.67)	(1.72)	(0.28)	(0.21)	(0.17)
β_3 (Y-)	-21.13	-2.55	1.05	-2.48	-3.83	3.96	-1.92	1.89
	(1.97)	(0.27)	(0.11)	(0.32)	(0.52)	(0.56)	(0.33)	(0.43)
β_4 (lag dep)	0.48	0.55	0.51	0.59	0.49	0.46	0.38	-0.10
	(6.06)**	(6.87)**	(6.01)**	(7.71)**	(5.85)**	(5.15)**	(4.24)**	(1.02)
R^2 (Adj)	0.44	0.44	0.35	0.47	0.35	0.24	0.16	0.03
DW	2.06	1.91	2.04	1.89	1.92	1.85	1.77	1.98
RESET(2)	1.16	0.42	1.79	2.78	3.03	1.76	1.58	1.28
RESET(3)	0.92	0.52	1.49	2.38	2.56	1.16	0.77	0.86
RESET(4)	0.73	1.26	1.11	2.06	2.26	0.88	1.80	0.66
White Het	1.23	0.44	1.51	2.20*	7.56*	0.86	0.94	0.28

Table 7 - *Measuring Inflation and Business Cycle Effects on Revisions: B*

	GDP(I)							
	Rev9-1	Rev9-2	Rev9-3	Rev9-4	Rev9-5	Rev9-6	Rev9-7	Rev9-8
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
λ_0 (const)	-0.23	-0.08	-0.04	-0.19	-0.13	0.02	0.05	-0.01
	(1.08)	(0.47)	(0.23)	(1.31)	(0.90)	(0.13)	(0.41)	(0.08)
λ_1 ($\Delta\pi$+)	48.13	40.92	49.92	44.60	30.44	23.65	12.20	18.96
	(2.99)**	(3.00)**	(3.60)**	(4.02)**	(2.70)**	(2.21)**	(1.37)	(2.90)**
λ_2 ($\Delta\pi$-)	-22.99	-19.21	-16.05	-22.59	-19.14	-11.62	-2.33	-9.85
	(1.43)	(1.42)	(1.18)	(2.10)**	(1.77)	(1.12)	(0.27)	(1.55)
λ_3 (Y+)	36.40	20.25	11.86	15.02	14.55	2.94	1.68	-0.09
	(3.27)**	(2.10)**	(1.23)	(1.96)	(1.90)	(0.40)	(0.27)	(0.02)
λ_4 (Y-)	-19.69	-1.30	1.49	-2.24	-3.45	4.19	-1.90	2.28
	(1.84)	(0.14)	(0.16)	(0.31)	(0.47)	(0.59)	(0.32)	(0.52)
λ_5 (lag dep)	0.52	0.59	0.54	0.60	0.50	0.47	0.40	-0.05
	(6.81)**	(7.84)**	(6.95)**	(8.73)**	(6.12)**	(5.45)**	(4.54)	(0.53)
R^2 (Adj)	0.44	0.45	0.38	0.54	0.36	0.25	0.15	0.04
DW	2.14	1.92	2.13	1.84	1.89	1.80	1.75	1.99
RESET(2)	0.92	0.09	0.27	0.05	0.49	1.52	0.98	0.36
RESET(3)	0.89	0.52	0.58	0.17	1.01	1.08	0.64	1.51
RESET(4)	1.87	0.48	0.93	2.06	2.06	1.00	2.32	1.67
White Het	0.66	0.86	1.67	0.99	4.79*	0.97	0.77	0.28

Table 8 - *Distortions to the Measures of GDP Growth From Price Changes within Various Inflation Brackets - (% changes)*

	Category 1 $0 < \pi \leq 5$	Category 2 $5 < \pi \leq 10$	Category 3 $10 < \pi \leq 15$
Rev9-1	0.68	0.96	1.74
Rev9-2	0.47	0.75	1.54
Rev9-3	0.40	0.61	1.42
Rev9-4	0.27	0.50	1.35
Rev9-5	0.23	0.38	0.95
Rev9-6	0.15	0.27	0.67
Rev9-7	0.16	0.20	0.42
Rev9-8	0.05	0.07	0.17
Average	**0.30**	**0.47**	**1.03**

Table 9 - *Distortions to the Measures of GDP Growth From Changes to Inflation and Output Gap Within Various Inflation Brackets - (% changes)*

	Measure of Upward Bias	Category 1 $0 < \pi \leq 5$	Category 2 $5 < \pi \leq 10$	Category 3 $10 < \pi \leq 15$
Rev9-1	**Output gap**	1.04	1.47	1.72
	Inflation (π)	2.08	2.94	2.87
Rev9-2	**Output gap**	1.33	2.13	0.65
	Inflation (π)	2.67	4.26	2.60
Rev9-3	**Output gap**	1.64	2.50	0.70
	Inflation (π)	3.28	5.00	2.82
Rev9-4	**Output gap**	2.00	3.70	0.74
	Inflation (π)	4.00	7.41	2.96
Rev9-5	**Output gap**	2.63	4.35	1.05
	Inflation (π)	2.63	4.35	3.16
Rev9-6	**Output gap**	3.70	0.00	1.49
	Inflation (π)	5.00	6.67	2.38
Rev9-7	**Output gap**	0.00	0.00	0.00
	Inflation (π)	5.00	6.25	2.38
Rev9-8	**Output gap**	0.00	0.00	0.00
	Inflation (π)	7.14	10.00	11.76
Average	**Output gap**	**1.54**	**1.77**	**0.79**
	Inflation (π)	**3.98**	**5.86**	**3.87**

Acknowledgments

I would like to thank Timo Teravirta, Ross Milbourne, and Graham Voss for their comments and suggestions. Naturally, any errors and omissions are my own.

Notes

[1] Recently the ABS implemented the *System of National Accounts* (SNA93) into the Australian National Accounts. While significantly contributing to an improvement in the measurement of national output, the changes have only had a small impact on the movement of GDP (ABS, 1998). The alternative measures of calculating GDP are no longer explicitly published, replaced now by a single measure. To ensure that the components do balance, the statistical discrepancy is now allocated to each of the components based on information from input-output tables. As it is possible to reconstruct these measures, it is only appropriate that each side of the national accounts be assessed of its quality. For this reason we do not work with the single measure of GDP.

[2] However revisions themselves do not provide a basis for assessing the accuracy of the data. In fact if a series undergoes little or no revision it may be the result of an unrevised data source (ABS, 1986).

[3] The results are robust to various methods of detrending used in extracting the trend component (see Canova, 1994)

[4] The results for GDP(E) are similar to those for GDP(I) and for this reason they are not reported here.

[5] There appears to be some evidence of heteroscedasticity in the models reported in columns 4 and 5.

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