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1 Introduction

In Harding (2002) I suggested that there is evidence of neglected seasonality in the Australian national accounts. The purpose of this note is to provide further evidence on these issues. That evidence is in section 2 In section 3 I explain why this neglected seasonality matters.

2 Neglected seasonality in Chain Volume GDP

Let y_t be the logarithm of seasonally adjusted GDP. A useful starting point in testing for seasonality is a simple regression of the growth rate in GDP (Δy_t) on a constant and three seasonal dummy variables viz¹

$$\Delta y_t = \alpha_0 + \alpha_1 S_1 + \alpha_2 S_2 + \alpha_3 S_3 + u_t \quad (1)$$

Where S_1 , S_2 and S_3 are zero/one seasonal dummy variables that relate to the September, December and March quarters respectively. The data is Chain volume GDP seasonally adjusted 1959.1 to December 2001.² Estimation of equation (1) yields the results in Table 1 below. As can be seen from Table 1 for the period 1959.4 to 2001.4 two of the coefficients on the seasonal dummies are statistically significantly different from zero and the F statistic for the joint hypothesis that there is no neglected seasonality ($\alpha_1 = \alpha_2 = \alpha_3 = 0$) takes the value 8.1 with P-value 0.00004 thus we cannot reject the null hypothesis that there is neglected seasonality in the ABS's headline measure of "seasonally adjusted" GDP. The regressions for the two sub periods 1959.4 to 1976.4 and

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¹The omission of lags of Δy_t is justified because Australian GDP is well approximated as a near random walk with seasonally varying drift parameter.

²The data is from row 11 of the AUSSTATS sheet 520601.wks.

1977.1 to 2001.4 show that there is neglected seasonality in the first period $F=11.3$ with $p\text{-value}=0.000005$ but seasonality is removed from the second period $F=0.4$ $p\text{-value}=0.785$. In summary, there is neglected seasonality in the GDP data from 1959.4 to 1976.4.

Table 1: Regression of GDP growth rate on seasonal dummies, various sub periods 1959.4 to 2001.4

	1959.4 to 2001.4		1959.4 to 1976.4		1977.1 to 2001.4	
	α	$t(\alpha)$	α	$t(\alpha)$	α	$t(\alpha)$
α_0	0.003	1.5	-0.003	-0.8	0.007	4.0
α_1	0.008	2.8	0.018	3.4	0.001	0.5
α_2	0.013	4.7	0.029	5.6	0.002	0.7
α_3	0.004	1.3	0.010	1.8	0.000	-0.2
R^2	0.129		0.342		0.011	
F	8.1		11.3		0.4	
$P - Value$	0.00004		0.000005		0.785	

2.1 Neglected seasonality in the 1998.1 vintage of national accounts

One might ask whether this is a new or old problem. The last vintage of data before the introduction of chain volume measure of GDP was released for the March quarter 1998. Table 2 estimates equation (1) on this data for three sub periods. The F statistics show that for the first two sub periods considered the ABS has removed all of the seasonality in the data. But there is some evidence that there was seasonality left in the period 1977.1 to 1998.1 — the F statistic for this hypothesis takes on the value 2.2 with $p\text{-value}$ 0.097.

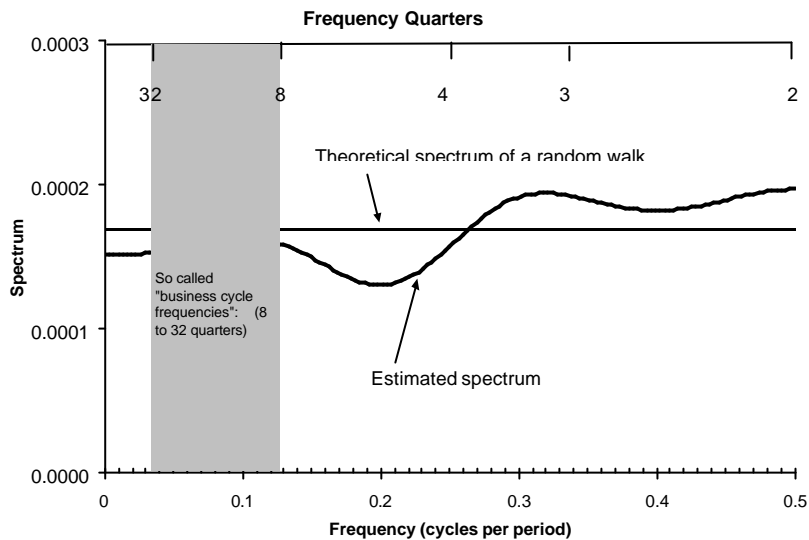
Table 2: Regression of GDP growth rate on seasonal dummies, various sub periods 1959.4 to 2001.4

	1959.4 to 2001.4		1959.4 to 1976.4		1977.1 to 1998.1	
	α	$t(\alpha)$	α	$t(\alpha)$	α	$t(\alpha)$
α_0	0.010	4.5	0.011	3.1	0.009	3.4
α_1	0.002	0.6	0.001	0.3	0.002	0.5
α_2	0.000	0.0	-0.001	-0.2	0.001	0.2
α_3	-0.002	-0.8	0.003	0.6	-0.006	-1.8
R^2	0.012		0.012		0.075	
F	0.6		0.3		2.2	
$P - Value$	0.609		0.846		0.097	

The spectrum for the first difference of the logarithm of the 1998.1 vintage of GDP data is shown in Figure 1. Little evidence of neglected seasonality is seen in the full sample period (1959.4 to 1998.1) for this vintage of data. How-

ever, one worrying feature of the seasonally adjusted data is that a considerable proportion of the variation in Δy_t occurs at the seasonal frequencies.

Figure 1: Spectrum of first difference of logarithm of real Australian GDP, 1959.3 to 1998.1

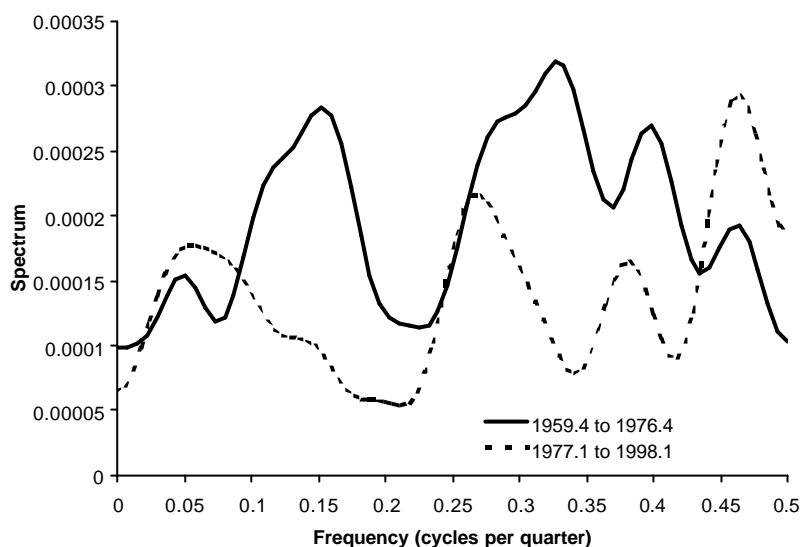


Further information on this latter feature is obtained by inspecting the spectra for the two sub periods 1959.4-1976.4 and 1977.1-1998.1. This information is presented in Figure 2. From this figure we can see that the essentially flat spectrum seen in Figure 1 actually hides important detail that is seen in the two sub periods. What should be of concern here is that the peaks at the seasonal frequencies in the spectrum for the 1959.4 to 1976.4 period line up with the troughs in the spectrum for the 1977.1 to 1998.1 period. Thus the fact that the spectra for the full period (Figure 1) is nearly flat is an artifice rather than evidence that seasonality had been properly removed from the 1998.1 vintage of data.

2.2 Further information on neglected seasonality in the 2001.4 vintage of national accounts

Further information on the nature of the neglected seasonality is furnished by examining the spectrum for the first difference of the logarithm of chain value GDP for the period 1959.3 to 2001.4; see Figure 3. Comparison of figures 3 and 1 indicate that the December 2001 vintage of “seasonally adjusted” GDP has a pronounced peak at the annual frequency (4 quarters per year) and a trough at frequency 5 quarters than the March 1998 vintage of GDP data. This confirms

Figure 2: Spectra of the first difference of logarithm of Australian GDP, two sub periods, 1998.1 vintage



the conclusion reached in Table 1 that the ABS seasonal adjustment procedures have not adequately removed seasonality from the chain volume GDP data.

To investigate the nature of the neglected seasonality Figure 4 compares the spectra for the period 1959.4 to 1976.4 with that for 1984.4 to 2001.4 using the 2001.4 vintage of chain volume GDP. It is evident from the peak's in the spectra at 3 and 4 quarters for the earlier period that this data has not been adequately seasonally adjusted. In short there is residual seasonality in the earlier period.

3 Why does this matter?

The finding of neglected seasonality in GDP is important for three reasons. First, one wants data that is seasonally adjusted on a constant basis since other wise statement made using the data and models estimated on the data will be misleading. The finding that there was evidence of neglected seasonality in the 1998.1 vintage of data as well as the 2001.4 vintage suggests that this may be more than a one off incident. That is problems with the ABS's application of seasonal adjustment procedures may be more widespread. This matter needs urgent investigation to establish how widespread is the problem and to provide users with some indication of how much confidence they should place in the ABS seasonal adjustment procedures.

Second an important policy issue today relates to the causes of the apparent

Figure 3: Spectrum of seasonally adjusted chain volume Australian GDP, 1959.3 to 2001.4

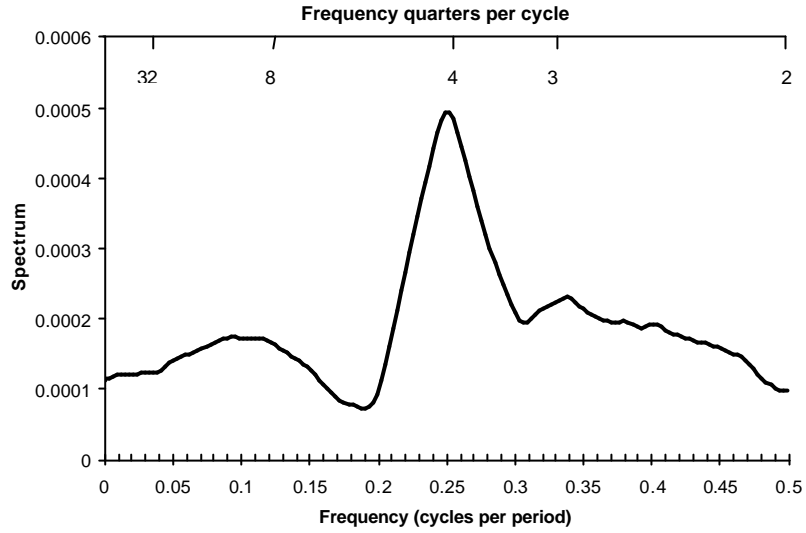
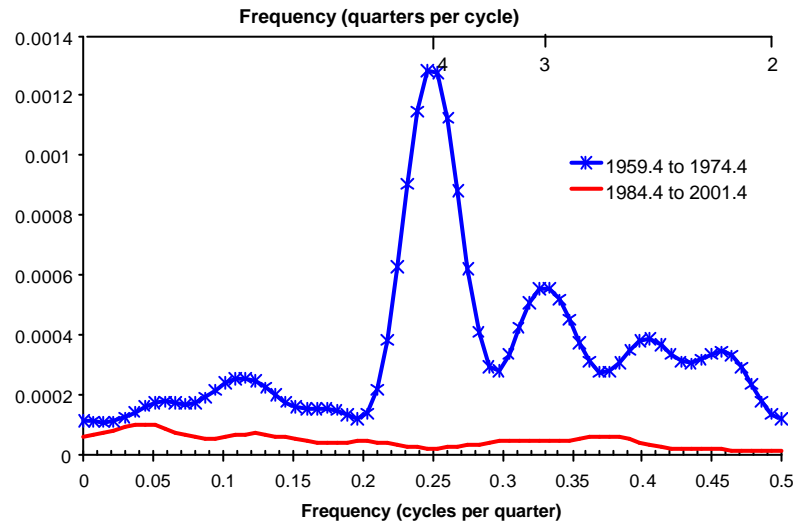
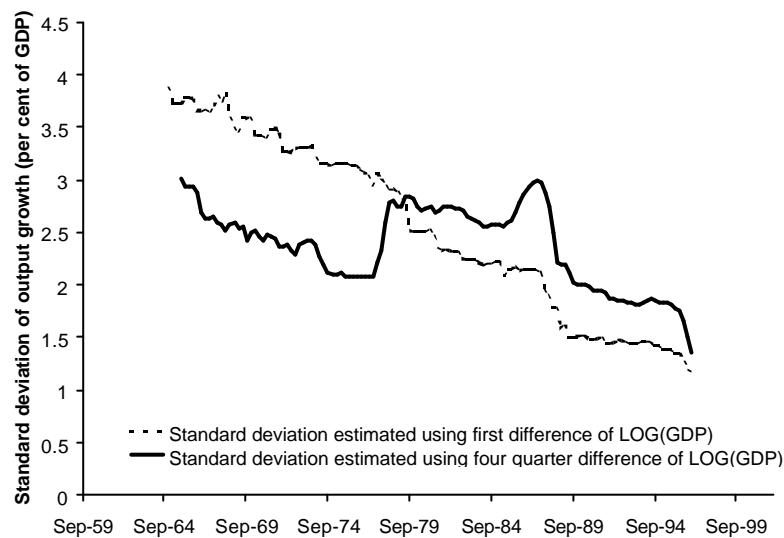


Figure 4: Spectra of first difference of logarithm of chain volume Australian GDP for two sub periods



reduction in the volatility of GDP found by, for example, Simon (2001) at the RBA. Harding (2002) suggests that taking account of the neglected seasonality in GDP modifies Simon's conclusions and suggests that the decline in volatility is less marked than he claims. Evidence for this provided by Figure 5 reports 41 quarter centered moving standard deviations of one quarter GDP growth rates and four quarter GDP growth rates adjusted to be put on the same basis. As can be seen from Figure 5 the neglected seasonality in GDP leads one to overemphasize the extent of any decline in the volatility of GDP.

Figure 5: 41 quarter moving standard deviation of GDP growth, 1959.3 to 2001.4



Third, the ABS allocates a substantial resources to repackaging data that it has already constructed. Two examples of this are its experimental leading indicator and its recent publication *Measuring Australia's Progress* (MAP). In releasing MAP the statistician said that "Measuring a nation's progress is one of the most important tasks that a national statistical agency can take on" true enough. But surely the most basic requirement is that a statistical agency measures and reports GDP accurately. The evidence above suggests that this is not being done.

References

- Harding, D., 2002, "The Australian Business Cycle: A New View", paper presented at Towards Opportunity and Prosperity Conference, 5 April, The University of Melbourne
- Simon, J., 2001, The Decline In Australian Output Volatility, RBA, Research Discussion Paper 2001-01.