Fiscal policy rules and public capital formation in Australia

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Abstract

The experience of capital formation by Australian national and sub-national governments is examined before and after their adoption of fiscal policy rules. The Australian governments have generally, though not always, met fiscal constraints imposed by their fiscal policy rules. The absence of penalties for non-compliance may have contributed to the occasional exceptions to this high level of compliance.

The degree of compliance varied with the type of fiscal policy rule. In order, constraints imposed by net debt, followed by net worth and budgetary balance rules were most frequently met. Possible causes include the significantly enhanced information set available to governments after adoption of accrual-based financial reporting networks and the significance attributed by governments to their credit ratings.

The Commonwealth, Victorian, Queensland and Western Australian Governments increased the level, growth rate or output elasticity of their investment after adoption of a fiscal policy rule requiring, at a minimum, maintenance of net worth. The exception is New South Wales. Output is found to be linked with levels of investment. One potential implication of these findings is that the usual macroeconomic assumption of exogeneity of government expenditures may be too strong in circumstances where governments have adopted such fiscal policy rules.

Further, consistent with the literature on supply-side effects of public capital formation, the jurisdictions experiencing increased growth of public capital formation subsequent to adoption of fiscal policy rules are those which have experienced higher growth rates than other jurisdictions. This indicates the existence of a number of interesting directions for further research.

Keywords: Fiscal policy rules, government, public capital formation, investment, macroeconomics, accounting

JEL codes:

H11 - Structure, Scope, and Performance of Government

H30 - General

H54 - Infrastructures; Other Public Investment and Capital Stock

H61 - Budget; Budget Systems
H62 - Deficit; Surplus
H63 - Debt; Debt Management

H72 - State and Local Budget and Expenditures
H74 - State and Local Borrowing

O43 - Institutions and Growth

Introduction

In the context of an emerging literature which investigates the effects on fiscal sustainability of fiscal policy rules and another which links public capital formation to growth of private sector production, it is timely to investigate whether adoption of certain types of fiscal policy rules has an impact on public capital formation. If so, then the effect of fiscal policy rules extends beyond merely the fiscal status of the government and has direct impacts on private production as well.

Fiscal policy rules are forms of agreement, either between governments (as in international treaties such as the Growth and Stability Pact between European Union member countries, also known as the Maastricht Treaty) or between a government and its constituency. Where enshrined in some lasting and authoritative form, an explicitly stated intention of government regarding its future fiscal activities, in a democratic society, represents an agreement of the latter type[1] (Kopits and Symansky (1998), International Monetary Fund (IMF) (2001)).

Fiscal policy rules vary widely in their target variable, institutional coverage and methods of implementation. In addition, local terminology varies, with few governments using the term 'rule'. Despite this, there are major similarities between fiscal policy rules adopted by governments worldwide, enabling identification of several major types of fiscal policies. These are listed in Table 1.

[1] The democratic process provides a means whereby the electorate may exercise its voting power to terminate the agreement should it be found unacceptable. In addition, it is elementary that the existence of this voting power, and the threat of its use, tends to restrict a government to actions that it expects the electorate will find agreeable.

Table 1 Major types of fiscal policy rules

Type of rule	Form
Balanced-budget or deficit rules	Balance between overall revenue and expenditure (that is, prohibition on government borrowing); or limit on government deficit as a proportion of GDP.
	Balance between structural (or cyclically adjusted) revenue and expenditure; or limit on structural (or cyclically adjusted) deficit as a proportion of GDP.
	Balance between current revenue and current expenditure (that is, borrowing permitted only to finance capital expenditure).
Borrowing rules	Prohibition on government borrowing from domestic sources
	Prohibition on government borrowing from the central bank; or limit on such borrowing as a proportion of past government revenue or expenditure.
Debt or reserve rules	A limit on the stock of gross (or net) government liabilities as a proportion of GDP
	Target stock of reserves of extra budgetary contingency funds (such as social security funds) as a proportion of annual benefit payments

Source: Adapted from Kopits and Symansky (1998)

This paper is structured as follows. Section 2 provides background material including fiscal strategies adopted by Australian national and State jurisdictions, the precise targets adopted and reporting frameworks used. The incidence of compliance is reported although it is not possible to determine the degree of intentionality due to the range of possible causal factors not under the control of government.

Section 3 outlines the model used. Firstly, the extent to which variations in output and changes in institutional settings, resulting from adoption of a net worth fiscal policy rule, contribute to explaining variations in public investment is explored. Then, the extent to which the passing of time contributes to explaining variations in public investment is explored, in order to mitigate for the possible effect of political economy influences wherein it is normal for governments to announce increases in fiscal aggregates in each passing year.

Section 4 describes the data including methods used to overcome the problem of structural breaks in the data series arising from a shift from cash-based to accrual-based reporting. Section 5 reports findings. The primary finding is that adoption of net worth fiscal policy rules has, in the Australian context, coincided with changed rates of public capital formation. This implies that adoption of fiscal policy rules may have had an influence on governmental investment decision-making. This is significant when considered in the context of private production elasticities related to public capital stocks and the resulting changes in levels of economic activity.

Section 6 concludes with observations about the possible greater significance of fiscal policy rules than is currently understood for the assumed exogeneity of government and resulting directions for further research.

1. Background

Two interesting developments have recently occurred in the economics and public finance literature. The first is the detailed assessment of the effectiveness of fiscal policy rules in achieving fiscal sustainability by both the IMF and the Organisation for Economic Co-operation and Development (OECD). Kopits and Symansky (1998) for the IMF concluded that fiscal policy rules could provide a useful contribution to the achievement of fiscal sustainability if the rules had certain characteristics and were supported by a complementary program of underlying structural change. The OECD (2003) adopted a similar view.

The second is the emergence of a body of literature that indicates that public capital stocks have important impacts on private production. Gramlich (1994) notes that Aschauer first linked public infrastructure investment and productivity in 1989, and that supporting work by Aschauer and following work by others (e.g. Nourzad (2000), Otto and Voss (1994 and 1996)) has further developed on this theme.

An important research issue arising from the above insights is how fiscal policy rules have affected productivity and growth through their effect on public assets accumulation. This study makes a contribution to exploring this research issue in that it investigates the nature and extent of any relationship between fiscal policy rules and the management of debt and accumulation of public assets in Australia. This general research issue can be further disaggregated into specific elements. One element is the question of how effective rules have been in terms of achievement of their stated targets or constraints. As a logical progression, the next element, in an investigation of the effect of fiscal policy rules on productivity and growth, is how appropriate targets or constraints, established under fiscal policy rules, have been for the purpose of fostering economic growth.

One aspect of the latter is how rules have affected capital formation. While, in an economic sense, capital formation refers to accumulation of real assets, in a financial sense, capital formation refers to accumulation of both assets and liabilities. Past research on the effectiveness of fiscal policy rules has mainly focused on examining how rules have contributed to achievement of fiscal sustainability (which has been interpreted as meaning reductions in debt levels) and on macroeconomic effects via fiscal multipliers. These have varied widely in their coverage, but none have focussed on private capital production elasticities. In other words, the effect of fiscal policy rules on the assets dimension of public capital formation, and thence on private sector production, has not yet been considered, either explicitly or in isolation from other effects. This is the focus of this study.

Fiscal policy rules impact productivity and economic growth in at least four main ways. Firstly, fiscal policy rules determine levels of government outlays in the short run. The impact of government outlays on the economy is the subject of extensive scholarly investigation. Mainstream economics of long standing teaches that government outlays

comprises a part of aggregate demand, and that demand, price and output levels can be manipulated at the aggregate level through fiscal policy. The potential for a 'crowding out' effect of government outlays and the importance of sources of finance (such as use of public debt), in affecting demand for money and interest rates, are also well recognised. New growth theory provides a basis for recognition that the indirect effects of government service provision (e.g. education) may also impact on economic growth.

Secondly, it is also well accepted that fiscal policy rules influence the capacity of government to stabilise output over business cycles by adopting counter-cyclical policies, effected through automatic stabilisers, customised measures or both. Thus government may offset price pressures that threaten continued output growth by adopting a contractionary fiscal policy stance (running a budget surplus, both ex ante and ex post) or may stimulate a sluggish economy by adopting an expansionary fiscal stance (running a budget deficit). The latter requires that the government's fiscal position is sustainable and that capacity exists to finance such a policy position, either by drawing down reserves or by accessing debt, which in turn requires a sufficiently conservative existing debt position to allow for increases without overly burdensome costs. Fiscal sustainability is a major motivator to adoption of fiscal policy rules.

Thirdly, fiscal policy rules affect the use of debt by government to finance their activities. In other words, they affect the *financing decisions* made by governments. Kopits and Symansky (1998) trace the effect of fiscal policy rules on debt levels as an indicator of sustainability. However, some rules go beyond targeting sustainable debt levels, and target very low levels of debt or impose restrictions on the uses to which borrowings may be put. Such rules have been criticised (for example by Buiter (2001) and Quiggin (1995)) as potentially welfare-reducing.

Fourthly, fiscal policy rules affect the composition of government outlays (between consumption expenditure and investment) and hence affect the level of public capital stock. In other words, fiscal policy rules affect the *investment decisions* made by governments.

As previously stated, a literature has recently developed that indicates the importance of public capital formation stocks on private production. For example, Nourzad (2000) notes that, while the textbook version of Keynesian fiscal policy does not distinguish between consumption spending and investment by governments, the two types of spending are likely to have different effects on the economy. Specifically, while government consumption spending affects the economy through its contribution to aggregate demand in the short run, government investment also affects the economy, not only through aggregate demand in the short run, but also, in the longer run, through aggregate supply. This is because government-provided infrastructure is used by firms in their production processes. Use of roads, highways and bridges by private sector transport providers is a common example. This is what Aschauer (2000) calls the direct effect of government investment on private sector output growth, the indirect effect being that the complementary nature of private and public capital in private-sector productive activity is such that an increase in the public capital stock raises the return to private capital, which spurs the rate of growth of private capital stock.

The Commonwealth and all State Australian Governments except the Tasmanian Government adopted fiscal policy rules during the 1990s or early in the new millenium[2]. Most of these governments adopted fiscal policy rules relating to budgetary balance, debt reduction and net worth. Many also adopted other types of fiscal policy rules however this study focuses on these three only.

[2] Territory governments were excluded from the analysis due to their relatively small size in terms of population and economic activity.

Fiscal policy rules are a form of self-imposed constraint on selected fiscal aggregates. Typically, targets are set for these fiscal aggregates, and outcomes for the previous year reported, in budgetary documents. While there is a striking similarity between fiscal policy rules adopted, the measurement approach, and thus targeted fiscal measures, varied between Australian jurisdictions and sometimes over time for a particular jurisdiction. Many of the targeted fiscal measures are products of the Government Finance Statistics (GFS) framework. While description of this framework, and its similarities and differences from general purpose financial reporting (GPFR), is beyond the scope of this study, a detailed coverage is provided by Australian Bureau of Statistics (2000). General purpose financial reporting and accrual accounting generally is the subject of many texts, for example Deegan (2005).

Analysis is complicated by the adoption of an accrual basis to the GFS reporting framework during the period of examination. Where this has resulted in a variation to the targeted fiscal measure, this is noted in the following analysis.

No formal penalties attach to non-compliance with fiscal policy rules adopted by Australian governments although persistent failures to comply would have the potential to generate criticism of the relevant government. Also, where governments fail to comply with net debt rules, this could also contribute to a downgrading of their credit rating[3]. All examined governments assigned particular significance to debt ratings in determining their fiscal strategies and several made reference to a desired specific debt rating to be achieved for its general government debt. This is presumably in response to awareness that credit agencies' debt ratings are effective in determining interest rates on public debt, as reported in Poterba (1996).

[3] Moody's Investors Service and Standard and Poor's Ratings Services evaluate the debt of Australian governments. While the methodologies by which these agencies determine credit ratings are not described in this study, the interested reader can find this information at http://www.moodys.com and http://www2.standardandpoors.com/portal/site/sp/en/us/page.siteselection/site_selection/0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0.html.

Tables 2a, 3a and 4a specify the types of rules and dates of adoption for each jurisdiction. These were derived from examination of budgetary documents for each jurisdiction from the early 1990s onwards. Tables 2b, 3b and 4b detail the relevant fiscal outcomes, providing a basis for determination of the incidence of compliance.

Table 2a Budgetary balance fiscal policy rules

Government	Measure adopted	Target	Relevant Sector	Date of adoption
Commonwealth	1998-99 cash-based *GFS Net Operating Balance (equivalent to accrual-based GFS Net Lending/Borrowing)* 1999-00 to 2003-04 accrual-based *GFS Net Lending/ Borrowing*	Balance over the business cycle	1998-88 budget sector 1999-00 to 2003-04 general government	1998-99
NSW	1996-97 to 1999-00 cash-based *GFS Net Operating Balance (equivalent to accrual-based GFS Net Lending/Borrowing)* 2001-02 to 2003-04 accrual- based *GFS Net Lending/ Borrowing*	Surplus from 1998-99	General government	1996-97
Victoria	*GFPR Operating Result*	Surplus of at least $100M per annum	General government	2000-01
Queensland	Accrual-based *GFS Net Operating Balance*	Balance or surplus	General government	1999-00
SA	Accrual-based *GFS Net Lending/ Borrowing* (excluding depreciation effects)	Balance or surplus (excluding depreciation)	General government	2002-03
WA	Accrual-based *GFS Net Operating Balance*	Surplus	General government and total public	2000-01

Source: Author's own compilation

Table 2b Budgetary balance outcomes (general government sector)

Jurisdiction	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04
	Accrual-based *GFS Net Lending(+)/ Borrowing(-)*					
Commonwealth	4,717	11,814	5,836	-3,515	6,391	6,406
NSW	-13	1,431	667	569	638	6
SA (excludes depreciation)					814	860
	Accrual-based *GFS Net Operating Balance*					
Queensland		1,062	-856	-895	17	3,337
WA			200	229	289	832
	GPFR Operating Surplus (+)/Deficit(-)					
Victoria			1217.1	273.4	235.9	990.1

Sources: ABS Catalogue 5512.0 Government Finance Statistics 2004-05, Victorian Government (2001b), (2002b), (2003b) and (2004)
Note: Shaded areas indicate that this time period is prior to adoption of fiscal policy rules.

Table 3a Net worth fiscal policy rules

Jurisdiction	Measure adopted	Target	Relevant Sector	Date of adoption
Commonwealth	*GFS Net Worth*	Positive rate of change over the medium to long term	General government	1999-00
NSW	*GPFR Net Assets*	Positive rate of change (in real terms)	General government	1996-97
Victoria	*GPFR Net Assets*	Increase of $100M per annum	General government	2000-01
Queensland	*GFS Net Worth*	Positive rate of change	Total public	1999-00
WA	*GFS Net Worth*	Positive rate of change	Total public	2000-01

Source: Author's own compilation

Table 3b Net worth outcomes

Jurisdiction	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04
	GFS Net Worth (general government sector)							
Commonwealth			-31,348	-40,776	-42,664	-44,369	-47,162	-30,322
	GFS Net Worth (total public sector)							
Queensland			58,468	57,775	57,623	58,092	64,891	77,724
WA				31,691	32,197	35,996	38,016	43,747
	GPFR Net Assets (general government sector)							
NSW (nominal)	22,953	31,288	34,896	41,204	43,828	50,337	54,657	56,601
NSW (real)	27,390	36,809	39,121	45,782	47,484	53,210	56,059	56,601
Victoria				14,619	16,570	21,845	23,608	26,279

Sources: ABS Catalogue 5512.0 Government Finance Statistics 2004-05, Victorian Government (2000b), (2001b), (2002b), (2003b) and (2004), New South Wales Treasury (1999), New South Wales Government (1997b), (1997c), (1999), (2001b), (2002b), (2003) and (2004)

Note: As targets were defined in terms of change from a previous period, where available, the relevant measure for the period immediately prior to adoption of fiscal policy rules is made available (in shaded sections) for comparison purposes. Shaded areas that do not contain data indicate that this time period precedes the relevant period.

Table 4a Net debt fiscal policy rules

Jurisdiction	Measure adopted	Target	Relevant Sector	Date of adoption
Commonwealth	*Net Debt*	1998-99 to 1999-00 reduction to 10 per cent GDP by 2000-01	General government	1998-99
NSW	*Net Debt*	Reduction to a 'sustainable level' by 2004-05 and elimination by 2020	General government	1996-97
Victoria	*Net Debt*	Reduction	General government	2000-01
Queensland	*Net Debt*	Maintenance of a negative level	General government	1999-00
SA	*Net Debt*	Reduction	General government	2002-03

Source: Author's own compilation

Table 4b Net debt outcomes (general government sector)

Net debt	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04
Commonwealth			82,935	71,928	54,443	41,189	35,983	27,265	19,610
NSW	10,522	10,834	10,264	13,311	11,703	7,702	5,056	1,587	-209
Victoria					3,076	2,162	1,024	1,297	1,399
Queensland					-10,123	-10,672	-11,609	-11,843	-14,851
SA							1,303	666	224

Source: ABS Catalogue 5512.0 Government Finance Statistics 2004-05
Note: As targets were defined in terms of change from a previous period, where available, the relevant measure for the period immediately prior to adoption of fiscal policy rules is made available (in shaded sections) for comparison purposes. Shaded areas that do not contain data indicate that this time period precedes the relevant period.

Outcomes varied between jurisdictions. The Commonwealth and New South Wales Governments each failed to meet their budgetary balance targets in only one year[4] and the Queensland Government failed to meet its target in two consecutive years. This is a total of four failures, compared with 23 incidences of compliance on an aggregated basis. The success rate of all governments is 23 of 27 or 85 per cent. The success rate of State governments is 18 of 21 or 86 per cent. On balance, governments have mostly, though not always, met the constraints self-imposed by adoption of budgetary balance fiscal policy rules.

The Commonwealth Government succeeded in meeting its net worth fiscal policy rule only in one of the five years examined. The New South Government succeeded in each of the seven years for which comparison is possible. The Victorian Government succeeded in each of four years. The Queensland Government succeeded in three of five years. The Western Australian Government succeeded in each of four years. In total, Australian governments succeeded in meeting constraints imposed by net worth fiscal policy rules in 19 of 25 instances, constituting a 76 per cent success rate. State governments succeeded in 18 of 20 instances, constituting a 90 per cent success rate. Overall, Australian governments enjoyed partial success in meeting budgetary balance fiscal policy rule targets. However, State governments on average enjoyed greater success.

The Commonwealth Government succeeded in meeting its net debt fiscal policy rule in each of the six years scrutinised. The New South Wales Government succeeded in six of the eight years examined. The Victorian Government attained two successes of four. The Queensland and South Australian Governments succeeded in each of five and two years respectively. Overall, Australian governments succeeded in 21 of 25 instances. This is an 84 per cent

[4] The Commonwealth Government deficit in 2001-02 is designated as such because the objective of the medium-term fiscal strategy in the 1997-98 budget was announced to be reduced underlying budget deficits on average over the course of the economic cycle, but with a more stringent target of maintaining surplus while economic growth was 'solid'. Although no definition of the term 'solid' was provided, the forecast economic growth in 2001-02 of 3.5 per cent is considered to meet the usual meaning of such a term.

success rate on an aggregated basis. State governments succeeded 15 of 19 times, constituting a 79 per cent success rate.

2. The model

In the previous section, the relevant fiscal measures of operating balance, net worth and net debt were compared with targets to determine to what extent compliance with adopted fiscal policy rules, whether intentional or otherwise, occurred.

After establishing the extent of compliance, an examination is made of whether the rate of public capital formation changed after adoption of net worth fiscal policy rules. Public capital formation is chosen for examination in light of emerging evidence that public capital stocks have important impacts on private production (see Gramlich (1994), Aschauer (2000) and Otto and Voss (1994 and 1996)) and the subsequent issue of whether fiscal policy rules have affected productivity and growth through their effect on public assets accumulation.

Regression analysis is used to ascertain the degree to which variations in economic activity and fiscal policy rules adoption contribute to variations in public capital formation. The data are then examined for trends that might indicate that increases in public capital formation are explicable by either the passing of time or by governments increasing nominal outlays over time. A finding that a time-based trend is significant would indicate a potential lack of relevance of fiscal policy rules adoption to changes in public capital formation. Alternatively, a finding that the passing of time is not a significant predictor of changes in public capital formation would tend to support findings in the previous analysis.

Investigation of the impact of variations in economic activity is undertaken due to the close relationship between economic activity and government revenues and the posited relationship between government revenues and government outlays. For the Commonwealth Government, there is a broadly accepted correlation between the government's revenue base and economic activity, related to the concept of automatic stabilisers (e.g. see McTaggart, Findlay and

Parkin (2006) page 534). State governments' revenue bases in turn are largely determined by the size of Commonwealth Government revenues as well as by the size of their own revenue base. Most Commonwealth Government revenues were derived from income taxes in the period prior to the adoption of the Goods and Service Tax on 1 July 2000, and from a combination of income taxes and goods and services taxes in the period thereafter. These revenues form the basis for calculation of grants to State governments, which comprise a significant proportion of State governments' revenues. States' own revenues include payroll taxes and stamp duties and a strong correlation typically exists between the business cycle and these revenues (see New South Wales Government (1994) page 1-5).

Additionally, for both Commonwealth and State governments, inclusion of this explanatory variable can be justified in terms of a notional capital-output ratio, where each level of output requires a certain amount of capital, some of which is public capital.

The focus is on rates of growth of public capital formation (or investment) and thus a log-linear model is used. Intercept and slope dummy variables are employed so as to enable separate identification of changes, if any, in the level and rate of change of growth in public capital formation at the time of adoption of net worth fiscal policy rules. Each jurisdiction is investigated separately, for the first time enabling observations to be made regarding the impact of fiscal policy rules on behaviour at the jurisdictional level.

Investigation is then carried out using a trend variable to ascertain the extent, if any, to which changes in the rate of public capital formation are attributable to the passage of time. This is investigated in order to mitigate the possibility of spurious findings in earlier analyses and to further investigate the general observation that the ratio of GFCF to GDP/GSP declines over time for all jurisdictions.

The rationale is that government investment may include a component that is time dependent due to political economy issues related to budgetary size (see Alesina and Perotti (1995)). This is based on an observation that governments frequently announce increased expenditures

as an indication of policy validity. This would indicate that public capital formation in any year was more influenced by public capital formation in the preceding year than by other factors such as existence of fiscal policy rules. Such occurrences could be explainable by factors underlying the so-called 'deficit bias' (assuming constancy of outlays components). This analysis essentially provides a check on the previous regression analysis and investigates whether significant relationships found in those analyses are merely due to such issues of political economy.

Analytical deficiencies include problems of serial correlation in time series data. More important, however, is the difficulty of assigning precise relationships to various causal factors that may influence observed variations in government fiscal behaviour. In the context of multiple possible causes of variations in public capital formation, the analysis in this study cannot be said to indicate conclusively the impacts of fiscal policy rules adoption. This is because, as previously detailed, various other influences (such as adoption of fiscal policy rules relating to other fiscal aggregates and adoption of accrual accounting methodologies) exist simultaneously. As a result, test results may be (in part or whole) the result of these influences rather than (primarily or exclusively) the result of adoption of a net worth fiscal policy rule.

The first method involves regressing the natural log of GFCF on the natural log of Gross Domestic/State Product, an intercept dummy variable and a slope dummy variable. The economic variables are logged, as the investigation focuses on rates of change. Transformation by taking natural logs provides a convenient measure of these. Further, the relevant coefficient (β_2) can be interpreted as an elasticity.

The underlying model is:

$$\mathbf{Y = A.X^{\beta 1}} \qquad \textbf{(1a)}$$

or

$$\mathbf{y = \beta_0 + \beta_1 x} \qquad \textbf{(1b)}$$

where:

y = the natural log of GFCF real per capita and

x = the natural log of real GDP/GSP per capita.

In regression (log-linear) format, and allowing for a structural break, this may be expressed as follows:

$$\mathbf{y = \beta_0 + \beta_1 x + \beta_2 FPR + \beta_3 M + \varepsilon} \qquad \textbf{(2)}$$

where:

FPR = an intercept dummy variable, with a value of 1 when a fiscal policy rule is in place and a value of 0 otherwise and

M = a slope dummy variable, being the product of FPR and x, and having a value of 0 when no fiscal policy rule exists and the natural log of real GDP/GSP per capita when a fiscal policy rule exists.

Thus, β_0 is the original intercept term, while β_1 measures the elasticity of public capital formation with respect to economic activity. Further, β_2 measures the proportional impact on the *level* of public capital formation of the imposition of a net worth fiscal policy rule. It indicates whether the level of GFCF increases at date of adoption of rules and, if so, by how much. By contrast, β_3 measures whether the *elasticity* of public capital formation with respect to economic activity increases at this date.

When a fiscal policy rule exists, Equation 2 becomes:

$$y = \beta_o + \beta_1 x + \beta_2 + \beta_3 x + \varepsilon = (\beta_o + \beta_2) + (\beta_1 + \beta_3)x + \varepsilon$$

in which the intercept term equals $(\beta_0 + \beta_2)$ and the slope equals $(\beta_1 + \beta_3)$.

When no fiscal policy rule exists, Equation 2 is simply:

$$y = \beta_0 + \beta_1 x + \varepsilon$$

in which the intercept term equals β_0 and the slope equals β_1.

Following Pindyck and Rubinfeld (1991) and Seddighi et al (2000), such a specification allows detection of changes in both the slope and intercept of the regression line following adoption of net worth fiscal policy rules. In practice, however, it is not useful to include all three regressors in one calculation due to the presence of multicollinearity. High levels of correlation exist between the multiplicative dummy and GDP/GSP (correlation coefficients in the order of .99 are common). This can lead to spurious results of exceedingly high coefficients of determination but low and unreliable t-statistics.

To address this problem, two separate regressions are carried out, thereby reducing the severity of multicollinearity. The two models are:

$$\mathbf{y = (\beta_0 + \beta_2 FPR) + \beta_1 x + \varepsilon} \qquad \mathbf{(3)}$$

$$\mathbf{y = \beta_0 + (\beta_1 + \beta_3 FPR)x + e} \qquad \mathbf{(4)}$$

The key hypothesis to be tested using the first model is that $\beta_2 \neq 0$, that is, the level of GFCF changes at adoption of a net worth fiscal policy rule. The hypothesis to be tested using the second model is that $\beta_3 \neq 0$, that is, the elasticity of GFCF with respect to GDP/GSP changes at adoption of a net worth fiscal policy rule.

Attention is then focussed on the effects of the passing of time. Ordinary least squares methodology is again used and GFCF is regressed on time, an intercept dummy variable (which has a value of 1 when a fiscal policy rule is in place and a value of 0 otherwise) and a slope dummy variable, which is the product of the fiscal policy rules dummy variable and time.

As previously, the underlying model is initially considered in nonlinear form:

$$\mathbf{Y = A.e^{\beta 1.t}} \qquad \mathbf{(5a)}$$

or

$$\mathbf{y = \beta_0 + \beta_1 t} \qquad \mathbf{(5b)}$$

where:

y = the natural log of GFCF real per capita and

t = years from 1984-85 to 2003-04, designated by sequential numbers 1 to 20.

In regression (log-linear) format, and again allowing for a structural break, this may be expressed:

$$\mathbf{y = \beta_0 + \beta_1 t + \beta_2 FPR + \beta_3 M2 + \varepsilon} \qquad \mathbf{(6)}$$

where:

FPR = an intercept dummy variable, with a value of 1 when a fiscal policy rule is in place and 0 otherwise and

M2 = a slope dummy variable, being the product of FPR and t, and therefore having a value of 0 when no fiscal policy rule is in place and the sequential number of the year when a fiscal policy rule is in place.

Again, β_0 is the original intercept term. β_1 measures the growth rate of public capital formation before the adoption of fiscal rules. β_2 measures whether the *level* of public capital formation increases at date of adoption of rules. β_3 measures whether the *rate of increase* of public capital formation increases at that date.

When a fiscal policy rule is in place, Equation 6 is:

$$y = \beta_0 + \beta_1 t + \beta_2 + \beta_3 t + \varepsilon = (\beta_0 + \beta_2) + (\beta_1 + \beta_3)t + \varepsilon$$

in which the intercept term equals $(\beta_0 + \beta_2)$ and $(\beta_1 + \beta_3)$ measures the slope.

When no fiscal policy rule is in place, Equation 6 is simply:

$$y = \beta_0 + \beta_1 t + \varepsilon$$

where β_0 is the intercept term and β_1 is the slope parameter.

For reasons analogous to those applying to the previous analysis, two models are used. The models are specified (in log-linear format) as follows:

$$y = (\beta_0 + \beta_2 FPR) + \beta_1 t + \varepsilon \quad (7)$$

$$y = \beta_0 + (\beta_1 + \beta_3 FPR)t + e \quad (8)$$

The key hypothesis to be tested using the first model is that $\beta_2 \neq 0$, that is, the *level* of GFCF changes at the date of adoption of a net worth fiscal policy rule. The key hypothesis to be tested using the second model is that $\beta_3 \neq 0$, that is, the *rate of increase* of GFCF changes at that date.

3. The data

GFS Net Operating Balance, *GFS Net Worth* and *GFS Net Debt*[5] data are sourced from ABS Catalogue 5512.0 *Government Finance Statistics 2004-05*. *GPFR Operating Surplus/Deficit* and *Net Assets* data for the Victorian Government are sourced from Financial Reports for the State of Victoria for each of years 2000-01 to 2003-04. *GPFR Net Assets* data for the New South Wales Government are sourced from New South Wales Budget Sector Consolidated Financial Statements July-December 1996, Public Accounts of the New South Wales Public Sector 1996-97, New South Wales Financial Statements for General Government for the twelve months ended 30 June 1999 and New South Wales Report on State Finances 2000-01 to 2003-04. The data are expressed on an historical cost basis which is consistent with nominal terms. *GPFR Net Assets* data for the New South Wales Government have been deflated by application of an implicit price deflator obtained from the ABS Catalogue 5206.0 *Australian National Accounts: National Income, Expenditure and Product* (Table 53 State and Local, General Government GFCF). Use of this deflator is based on an implicit assumption that the rate of price change for State government assets is equivalent to the rate of price change for local government GFCF.

Findings based on this analysis have to be interpreted in light of the extensive range of methodological difficulties that attach to valuation and deflation of most elements of balance

[5] See ABS (2005) or Deegan (2005) for an explanation of these fiscal aggregates.

sheets, particularly public sector balance sheets. In addition, the deflation of balance sheets is complicated by the use of differing asset revaluation practices between jurisdictions.

GFS are derived from jurisdictional accrual accounting data. These data are based on historical cost. However, fixed (mostly physical) assets are revalued periodically in accordance with accounting standards in an attempt to align asset values with current prices and thereby address this issue. Therefore, reported GFS values for public capital suffer from the same difficulties of measurement as do GPFR measures of public assets.

Public GFCF data for the general government sector of the Commonwealth Government is sourced from the ABS Catalogue 5206.0 Australian National Accounts: National Income, Expenditure and Product, Dec 2005, for 1984-85 to 2003-04 inclusive. These original data are chain volume measures.

Public GFCF data for the general government sector of the New South Wales, Victoria, Queensland and Western Australian governments are sourced from the ABS Catalogue 5220.0 Australian National Accounts: State Accounts, for 1984-85 to 2003-04 inclusive. The data are original and presented in nominal terms.

Fiscal policy rules are typically formulated in nominal terms only. An example is that net worth should increase. A literal interpretation of this is that the nominal value of net worth should increase in each year reported[6]. In other words, the relevant fiscal measure is not targeted to increase in per capita or real terms[7]. However, measurement in real terms has the obvious advantage that deflation of nominal measures removes the effects of price changes and allows a closer focus on the level of economic services, encapsulated in public assets, provided by governments over time.

[6] This is unless the rule is formulated in terms of averages over a business cycle. However, the consistent growth experience during the period over which rules have applied renders such a formulation equivalent to a requirement that nominal net worth should increase in each year.
[7] There is one exception to this. The New South Wales Government has adopted target of maintaining and, if possible, increasing its total net worth in real terms.

Similarly, fiscal outcomes reported in response to fiscal policy rules typically are reported in absolute terms only. However, if one adopts an assumption of constant levels of capital productivity[8], and if the intent of those rules was to achieve sustainability of service provision, maintenance of net worth per capita in real terms is necessary to sustain service provision over time. Use of a per capita measure has its basis in the observable fact that many core government services, such as education and health care, are rivalrous in nature. This means that, if public capital productivity is assumed to be stable, no economies of scale and thus constant returns to scale occur and thus capital input requirements for these services increase proportionately with population. (This analysis, of course, is less appropriate when the composition of service provision changes, as may occur for example as a result of significant demographic change.)

Therefore, a fiscal policy rule requiring that net worth be maintained may reasonably be interpreted as meaning that net worth will be maintained in constant, per capita terms. For this reason, public capital formation in constant, per capita terms is investigated.

GFCF State government data are also converted into constant terms by application of implicit price deflators obtained from the ABS Catalogue 5206.0 *Australian National Accounts: National Income, Expenditure and Product* (Table 53 State and Local, General Government GFCF). This again assumes that the rate of price change for State government GFCF is equivalent to the rate of price change for local government GFCF. These data are also calculated in per capita terms using estimated resident population data from the ABS Catalogue 3105.0 *Australian Historical Population Statistics 2006.*

General government sector and government corporations together comprise the total public sector hence use of general government sector data excludes capital formation by government corporations. This approach has the disadvantage that it fails to recognise when governments use dividends from government corporations to achieve desired operating outcomes for the

[8] Relaxation of this assumption to account for increased productivity of technologically more advanced capital inputs is beyond the scope of this paper.

general government sector. Dividends from government owned corporations are reported as revenue in general government sector operating statements. Thus a general government sector operating surplus may be attained by payment of a dividend from a government owned corporation to a general government sector entity. A general government sector operating surplus can occur at the same time as a reduction of total public sector net worth by this mechanism. Such a reduction of total public sector net worth may reduce the ability of government to produce services overall. For example, electricity and water services are commonly provided by government owned corporations – with important implications for private production. These services by government owned corporations are generally provided on a user-pays basis. However, it is in terms of the general government sector that the majority of fiscal policy rules are formulated. Therefore, exploration of general government data most closely accords with the intended coverage of fiscal policy rules. In addition, this approach is adopted to more closely consider investment for provision of public or merit goods, which are mostly provided by the general government sector.

The jurisdictions included are the Commonwealth, New South Wales, Victorian, Queensland and Western Australian Governments on the basis that these governments adopted net worth fiscal policy rules. The South Australian and Tasmanian Governments are not included as it has been determined that these governments did not adopt net worth fiscal policy rules. State jurisdictions are considered due to the preponderance of public capital formation by State governments compared with the Commonwealth Government. The Commonwealth jurisdiction is also considered in order to determine whether behavioural effects, if any, differ between levels of government within the Australian federal system.

GFCF data for the period between 1984-85 and 1997-98 were reported on a cash basis and so excluded *Assets acquired below fair value*, *Assets donated* and *Assets acquired under finance lease*), which are included in the accruals-based data reported for 1998-99 to 2003-04. With the exception of *Assets acquired under finance lease* in New South Wales, these components were subtracted from the latter series in order to provide a single series covering the entire

period on a consistent basis for use in this study. *Assets acquired under finance lease* were retained in the New South Wales data as this component is highly significant, comprising over twenty per cent of the total. In no other jurisdiction are *Assets acquired under finance lease* material to the total.

The data therefore should not be interpreted as indicative of levels but do provide a totally consistent basis for calculating rates of growth, in the assumed absence of a change in rates of usage of finance leases and donations as financing sources.

Annual GDP data are sourced from the ABS Catalogue 5204 *Australian National Accounts: National Income, Expenditure and Product 2005*. Annual GSP data from 1999-00 to 2003-04 inclusive are sourced from the ABS Catalogue 5220.0 *Australian National Accounts: State Accounts 2004-05* (Table 1). Both data sets are original and in chain volume terms. Annual GSP data from 1984-85 to 1999-00 inclusive are backwards extrapolations of the chain volume terms, calculated in accordance with unpublished original data sourced from the Australian Bureau of Statistics (at average 1998-90 prices), in accordance with the ABS' advised splicing methodology[9]. These data are also calculated in per capita terms using estimated resident population data from the ABS Catalogue 3105.0 *Australian Historical Population Statistics 2006*.

4. Results

Regression analyses indicate that, at the time of adoption of fiscal policy rules, there was an increase in the level, or growth rate, or output elasticity of public capital formation (or a combination of these) in the Commonwealth, Victorian, Queensland and Western Australian jurisdictions, but not in the New South Wales jurisdiction. The implication is that adoption of fiscal policy rules may have influenced governmental decision-making pertaining to public capital formation. This is significant when considered in the context of private production

[9] Verbal communication with relevant ABS officers.

elasticities related to public capital stocks and the resulting changes in levels of economic activity.

Tables 5 to 9 inclusive provide results for each jurisdiction for the initial investigation which focuses on whether the rate of public investment changed at the time of adoption of a net worth fiscal policy rule.

Table 5 Commonwealth Government results

Eqn	Adj R2	Prob (F-stat)	Independent variables							
			Constant		ln GDP rpc		FPR (level) dummy		Multiplicative (slope) dummy	
			Coef	Prob	Coef	Prob	Coef	Prob	Coef	Prob
3	0.79	0.00	-9.90	0.04	1.39	0.00	0.30	0.04		
4	0.79	0.00	-9.86	0.04	1.39	0.01			0.03	0.04

According to standard statistical tests, explanatory power of the models for the Commonwealth Government is satisfactory (adjusted R^2 is 0.79 for each) and the models are deemed to be useful (p-value of the F-statistic is very close to zero for each). Each independent variable is significant at the five per cent level of significance (p-values are 0.00 and 0.01 for x, 0.04 for the level dummy variable and 0.04 for the slope dummy variable).

The estimate of β_1 indicates that real public capital formation per capita increased by about 1.4% when the level of economic activity increased by 1%. The coefficients of both dummy variables are positive. It is not possible to determine whether it is more accurate to say that the intercept or slope of the regression line increases. Instead, the two separate regressions indicate that there is a significant and positive relationship between either the level or the output elasticity (or both) of public capital formation and adoption of a net worth fiscal policy rule.

Table 6 New South Wales Government results

Eqn	Adj R2	Prob (F-stat)	Independent variables							
			Constant		ln GSP rpc		FPR (level) dummy		Multiplicative (slope) dummy	
			Coef	Prob	Coef	Prob	Coef	Prob	Coef	Prob
3	0.13	0.14	3.17	0.42	0.27	0.48	0.00	0.99		
4	0.13	0.15	3.23	0.42	0.26	0.49			0.00	0.97

For New South Wales, the explanatory power of the models is very poor (adjusted R^2 equals 0.13 for each) and the models are not useful (p-value of the F-statistic is 0.14 for each). None of the independent variables are significant, even at the ten per cent level of significance (p-values for x are 0.48 and 0.49, 0.99 for the level dummy variable and 0.97 for the slope dummy variable).

The data series omits the anomalous observation represented by the large negative value of GFCF for 1996-97. Thus the data anomaly does not explain these results. Nor does the earlier analysis of compliance provide an explanation. The New South Wales Government complied with its net worth fiscal policy rule in each of the seven years examined, with its net debt fiscal policy rule in six of eight years and with its budgetary balance fiscal policy rule in five of six years. This compliance rate is not strikingly different from that of any other jurisdiction. However, earlier discussion of net worth established that increasing net worth does not necessarily imply increasing real assets. It is possible that the New South Wales Government accumulated financial assets rather than real assets. Such an outcome could explain both the New South Wales Government's success in compliance as well as these results.

Table 7 Victorian Government results

Eqn	Adj R2	Prob (F-stat)	Independent variables							
			Constant		ln GSP rpc		FPR (level) dummy		Multiplicative (slope) dummy	
			Coef	Prob	Coef	Prob	Coef	Prob	Coef	Prob
3	0.41	0.01	1.53	0.73	0.39	0.36	0.26	0.09		
4	0.41	0.01	1.53	0.73	0.39	0.36			0.02	0.09

While explanatory power is not very high (adjusted R^2 is 0.41 for each), the models for the Victorian Government are considered sufficiently useful (p-value of the F-statistic is 0.01 for each). The coefficients of both dummy variables are positive. At the ten per cent level of significance, both the level and slope dummy variables are significant with p-values of 0.09. These results support a conclusion that there is a significant and positive relationship between either the level or the output elasticity (or both) of public capital formation and adoption of a net worth fiscal policy rule by the Victorian Government.

It does not appear, however, that there was a significant relationship between levels of economic activity and public capital formation in Victoria. A possible explanation is the financial arrangements adopted in Victoria where an infrastructure reserve was established in 2000-01 as a source of funding for future capital acquisitions. This would have negated the link between revenue-raising capacity arising from increased economic activity and funding availability for capital acquisitions. Another possible explanation is that GDP/GSP is merely standing in for a time trend, a possibility we shall pursue in the next subsection.

Overall, the analysis supports a conclusion that real public capital formation per capita either increased in level, or began to exhibit a positive relationship with GSP, or both, when the Victorian Government adopted a net worth fiscal policy rule.

Table 8 Queensland Government results

Eqn	Adj R2	Prob (F-stat)	Independent variables							
			Constant		ln GSP rpc		FPR (level) dummy		Multiplicative (slope) dummy	
			Coef	Prob	Coef	Prob	Coef	Prob	Coef	Prob
3	0.36	0.02	20.09	0.00	-1.37	0.02	0.57	0.01		
4	0.36	0.02	20.07	0.00	-1.37	0.03			0.05	0.01

Although the explanatory power of the models is not high (adjusted R^2 is 0.36 for both), the models are considered sufficiently useful (p-values of the F-statistic are 0.02 each). All independent variables are significant at the five per cent level of significance (p-values are 0.02 and 0.03 for x, 0.01 for the level dummy variable and 0.01 for the slope dummy variable).

Surprisingly, the coefficient for x is negative (-1.37), suggesting that public capital formation decreased when levels of economic activity increased. This unexpected result warrants further investigation.

One possible explanation is a tendency by the Queensland Government to increase accumulation of financial assets rather than real assets. Such a tendency could be explained in terms of a decision to accumulate financial assets by which to meet accruing non-debt liabilities such as employee entitlement (including superannuation) liabilities. Both entitlement liabilities and GSP experienced rising trends during this period. Thus, the negative coefficient might reflect a shift from real assets to financial assets, at a time when the latter were growing rapidly to match growing liabilities. The unusually high level of negative net debt of the Queensland Government (reported in Section 5.2.3) provides support for this line of thinking.

Coefficients for both dummy variables are positive. Again, the two regressions indicate that there is a significant and positive relationship between either the level or the output elasticity

(or both) of public capital formation and adoption of a net worth fiscal policy rule by the Queensland Government.

Table 9 Western Australian Government results

Eqn	Adj R2	Prob (F-stat)	Independent variables							
			Constant		ln GSP rpc		FPR (level) dummy		Multiplicative (slope) dummy	
			Coef	Prob	Coef	Prob	Coef	Prob	Coef	Prob
3	0.65	0.00	19.74	0.00	-1.32	0.00	0.48	0.00		
4	0.64	0.00	19.75	0.00	-1.32	0.00			0.05	0.00

Explanatory power is high (adjusted R^2 is 0.65 and 0.64 respectively) and both models for the Western Australian Government are useful (p-values of the F statistic are 0.00 in each case). All independent variables are strongly significant at the five per cent level (p-values are 0.00 in all cases).

Similarly to the case of Queensland, the coefficient for x is negative (-1.32) indicating that public capital formation and economic activity were inversely related in Western Australia. A possible explanation for this, similarly to Queensland, is accumulation of financial assets. While the Western Australian Government did not adopt a net debt rule, it is possible that a focus on accumulation of financial assets to offset accruing liabilities may have contributed to the negative relationship between public capital formation and economic activity. However, investigation of this is outside the scope of this study.

The coefficients for both dummy variables are positive (0.48 for the level dummy and 0.05 for the slope dummy). Again, the two regressions indicate that there is a significant, positive relationship between either the level or the output elasticity (or both) of public capital formation and adoption of a net worth fiscal policy rule by the Queensland Government.

Most jurisdictions show a positive relationship between public capital formation and adoption of net worth fiscal policy rule. Table 10 summarises these results.

Table 10 Summary of results

Jurisdiction	Relationship between ln GFCF rpc and			
	Constant	**Ln GDP/GSP**	**Level dummy variable**	**Slope dummy variable**
Commonwealth	-	+	+	+
NSW				
Victoria			+	+
Queensland	+	-	+	+
WA	+	-	+	+

Note: - indicates a significant, negative relationship,
+ indicates a significant, positive relationship, and
a blank space indicates no significant relationship.

The models adopted are useful for all jurisdictions except New South Wales and were particularly useful for the Commonwealth, Queensland and Western Australian Governments. The investigated relationships between public capital formation and adoption of net worth fiscal policy rules were significant at the five per cent level for the Commonwealth, Queensland and Western Australian Governments and at the 10% level for the Victorian Government. The only jurisdiction where this association was not significant was New South Wales.

The relationship between economic growth and public capital formation was significant and positive only for the Commonwealth Government. While significant, the relationship was negative for the Queensland and Western Australian Governments. The relationship was insignificant for the New South Wales and Victorian Governments.

Overall, these results are consistent with the premise that adoption of fiscal policy rules has coincided with changed governmental fiscal behaviour with respect to public capital formation by a majority of the Australian governments examined. In particular, public capital formation tended to increase, or became more responsive to changes in GDP/GSP, after adoption of net worth fiscal policy rules.

These results could also be interpreted as providing support for the broader, implicit assumption adopted in much of the literature that fiscal policy rules generally are effective in

changing governmental behaviour. However, intentionality or otherwise of compliance, where compliance exists, with constraints imposed by fiscal policy rules, is not determinable in this study.

Similar outcomes are found for the national and three sub-national jurisdictions indicating that, when fiscal policy rules are adopted, level of government is not a predictor of outcomes. This implies that fiscal policy rules may be useful tools of fiscal sustainability for all levels of government, including the local government level, in the Australian and international contexts.

In addition, high levels of constant growth of public capital formation are found for Queensland and Western Australia which are also the highest growth States. Aschauer (1988) and (1989) and Otto and Voss (1994) indicated correlation between high rates of public capital formation and (lagged) economic growth.

These results must be considered in light of a number of qualifications. First, it is recognised that the number of observations available for analysis is very small, with consequences for both the degrees of freedom underlying the various statistical tests and for the power of the tests. Second, the specifications assume constant variance of the error term in the prior and post adoption periods. This is a fundamental qualification, applying to all of these regressions. A priori, it could be expected that the variance of the error term would decrease in the period following adoption of a net worth fiscal policy rule, when the incidence of negative public investment is less likely to occur. However, as previously discussed with respect to net worth, negative investment in real assets may be offset by positive investment in financial assets resulting in an overall increase in net worth. Thus, the assumption is not unacceptable.

Further, the validity of ordinary least squares regression methods relies on correctness of the classical assumptions. Following Hill, Griffiths and Judge (2001), these are (a) the expected value of the random error term e is zero (stationarity of the economic variables); (b) the

variance of e is constant (no heteroskedasticity); (c) uncorrelated values of the dependent variable y, which has zero covariance, based on statistical independence between values of the dependent variables (no serial correlation); and (d) the independent variable x is not random and takes at least two different values. Under these assumptions, least squares estimators b_1 and b_2 have the smallest variance of all linear and unbiased estimators of β_1 and β_2. An additional option assumption, that e is normally distributed, is sometimes made.

As previously discussed, collinearity has been minimised, though not fully removed, by model specification. Heteroskedasticity can be diagnosed by visual inspection of a scatter diagram of the error term plotted against the explanatory variable. Some evidence of heteroskedasticity exists for both equations for the Commonwealth Government. This suggests that the model will be estimated more precisely for lower levels of economic activity than for higher levels. Evidence of heteroskedasticity exists for the Victorian Government, suggesting that the model will be estimated less precisely for lower levels of economic activity than for higher levels (as GFCF varies more at low levels of GSP). No evidence of heteroskedasticity exists for the New South Wales, Queensland or Western Australian Governments.

Visual inspection of graphed errors indicates the presence of positive autocorrelation for the Commonwealth, New South Wales, Victorian and Queensland Governments. Autocorrelation of the errors was not evident for the Western Australian Government. Similar consequences for the least squares estimators as for heteroskedasticity apply.

Additionally, the question of non-stationarity, common in time series data, must be addressed. There is a strong likelihood that both the main economic variables (real GDP/GSP per capita and real GFCF per capita), in either level or log forms, are non-stationary i.e. exhibit deterministic trends. The fact that real GDP/GSP per capita grew over time, and real GFCF per capita exhibited a downward trend over time, lends weight to this expectation. Following Gujarati (2006), popular methods by which to diagnose non-stationarity are the use of either

(augmented or unaugmented) Dickey-Fuller unit root tests or the Box-Jenkins approach, based on visual inspection of the correlogram. Should non-stationarity be detected, a unit root test is usually applied to the residuals of an ordinary least squares regression carried out using the non-stationary variables. If the residuals of that regression are found to be stationary i.e. integrated of order 0, this indicates the existence of cointegration between the economic variables. The significance of this is that the coefficients estimated by the regression are said to represent long term equilibrium relationships between the dependent and explanatory economic variables. Where cointegration is not found, first differences of the economic variables may be used to detrend the series and relationships estimated. However, the brevity of the time series used in this study indicates that unit root tests are not suitable.

Attention is then focussed on the effects of the passing of time. Table 11 provides results for all jurisdictions. As previously, results for New South Wales differ from those of the other jurisdictions. Both models are useful at the five per cent level of significance for all jurisdictions except New South Wales, for which the second model is useful at the ten per cent level of significance.

For the Commonwealth and Western Australian jurisdictions, explanatory power of the model is high, with adjusted R^2 above 0.8 for the Commonwealth and 0.51 (second model) for Western Australia. The first model is less useful for the Western Australia Government, with an adjusted R^2 of 0.29. Explanatory power for the New South Wales, Victorian and Queensland Governments is lower, varying between 0.12 and 0.39.

Table 11 Results of trend analysis

Jurisdiction	Eqn	Adj R2	Prob (F stat)	Independent variables							
				Constant		Trend		FPR		M2	
				Coef	Prob	Coef	Prob	Coef	Prob	Coef	Prob
Commonwealth	7	0.85	0.00	4.26	0.00	0.03	.00	0.27	0.01		
	8	0.86	0.00	4.27	0.00	0.03	.00			0.02	0.00
NSW	7	0.12	0.16	5.93	0.00	0.00	.57	0.04	0.59		
	8	0.19	0.07	5.96	0.00	-0.00	.89			0.01	0.26
Victoria	7	0.25	0.04	5.62	0.00	0.00	.94	0.27	0.06		
	8	0.27	0.03	5.62	0.00	-0.00	.97			0.02	0.04
Queensland	7	0.39	0.01	6.29	0.00	-0.02	.10	0.45	0.00		
	8	0.31	0.02	6.29	0.00	-0.02	.14			0.03	0.01
WA	7	0.29	0.02	6.18	0.00	-0.02	.01	0.30	0.01		
	8	0.51	0.00	6.27	0.00	-0.03	.00			0.03	0.00

There is a significant positive relationship between public investment and the passing of time at the five per cent level of significance for the Commonwealth Government. No significant relationship exists between public investment and the passing of time for the New South Wales or Victorian Governments. There is a significant negative relationship between public investment and the passing of time at the five per cent level of significance for the Western Australian Government and at the ten per cent level of significance for the Queensland Government.

Again, it is not possible to determine whether the intercept or the slope of the regression line increases. Instead, the two separate regressions indicate that there is a significant and positive relationship between either the level or rate of growth (or both) of public capital formation and adoption of a net worth fiscal policy rule for the Commonwealth, Queensland and Western Australian Governments (five per cent level of significance) and the Victorian Government (ten per cent level of significance). Again, no such significant relationship exists for the New South Wales Government. These findings generally are in accordance with previous findings. This was to be expected given the correlation between the passing of time and increases in GDP/GSP.

Adjusted R^2 are compared in order to determine whether economic activity or passing of time, with fiscal policy rules adoption, has greater explanatory power. For the Commonwealth Government, the time trend model discussed in this section provides larger adjusted R^2 (0.85 and 0.86) than those (0.79 for each) for the economic activity model. The opposite is found for the Victorian and Western Australian Governments. Both models provide similar results for the New South Wales and Queensland Governments. These results are not surprising, given the fairly constant growth rates of real economic activity per capita in all jurisdictions over time and the likely resulting strong correlation between the trend and GDP/GSP.

These findings have some significance for the current state of understanding of the usefulness of fiscal policy rules. Of further significance is the potential of these findings for contribution to a new, more detailed treatment of government in macroeconomic theory. An overarching theory of the effects of fiscal policy rules on governmental fiscal behaviour is unavailable as mainstream macroeconomics

does not investigate determinants of government outlays in a detailed manner, the convention being to treat them as exogenous. Analysis of public capital formation after adoption of net worth fiscal policy rules therefore cannot draw upon an existing body of theory and can neither validate nor invalidate such a body of theory.

This study attempts to mitigate the current treatment of government expenditures by making findings regarding variations in public capital formation in the context of fiscal policy rules adoption, without claiming causality between fiscal policy rules adoption and those variations. The importance of pursuing such a line of investigation can be inferred by reference to the developing literature on private production elasticities to public capital formation.

It is interesting to note that those jurisdictions experiencing increased growth of public capital formation subsequent to adoption of fiscal policy rules also have experienced higher growth rates than New South Wales. (While there is an obvious problem of causation here, the very small (and declining) proportion of GDP/GSP represented by GFCF means it is likely that this holds even with GFCF 'stripped out' of the GDP/GSP measures, though such analysis is beyond the scope of this study). This is consistent with the findings of Aschauer (1988 and 1989) and Otto and Voss (1994) that public capital formation has a positive impact on private sector production.

5. Conclusions

This study investigated whether public capital formation by five Australian governments changed at the time of their adoption of net worth fiscal policy rules. In order to investigate this, firstly the degree to which governments complied with the constraints imposed on fiscal measures by adoption of fiscal policy rules was ascertained. Due to the simultaneous existence of multiple identifiable influences on governmental fiscal outcomes, intentionality of compliance where observed cannot be ascertained.

It was found that the examined governments experienced a high level of compliance with fiscal constraints imposed by adoption of fiscal policy rules. Perusal of the institutional arrangements

surrounding rules adoption indicated that the absence of penalties for non-compliance may have contributed to the occasional occurrences of non-compliance.

The degree of compliance varied with the type of fiscal policy rule. Net debt rules were more frequently met than were net worth rules and, in turn, budgetary balance rules. This may be due to the significantly enhanced information set available to governments after adoption of accrual-based financial reporting networks, allowing greater awareness of asset and liability aggregates at the time. Another probable contributing factor was the significance attributed by governments to their credit ratings and, in turn, the focus on net debt by credit ratings agencies in assessing those ratings.

Attention was then focused on the experience of public capital formation and whether it changed at the date of adoption of net worth fiscal policy rules. Regression results indicate that the Commonwealth, Victorian, Queensland and Western Australian Governments increased the level, growth rate or output elasticity of their investment when they adopted a fiscal policy rule requiring, at a minimum, that they maintain their net worth. The New South Wales Government did not. Its investment simply cannot be modelled in this way. Determination of the cause of this is outside the scope of this study although the history of this government's transfer of fixed capital to other levels of government and of capital devaluations may be relevant. The Victorian Government's results require acceptance of a higher level of significance for type II error than do other governments. The Victorian Government's investment experience, while successfully modelled in this way, showed the effects of unique infrastructure financing arrangements which weakened the relationship between economic activity and investment. These findings are confirmed by event analysis which also specifies the years in which the New South Wales and Victorian Governments' investment experiences led to these results.

Importantly, these findings imply that the usual macroeconomic assumption of exogeneity of government expenditures may be too strong in circumstances where governments have adopted such fiscal policy rules. Specifically, it becomes necessary to review the general assumption that only certain elements of government expenditures, those that are related to automatic stabilisers, are business cycle dependent. The remainder of government expenditure, usually considered to be

independent of levels of economic activity, can no longer be considered to be so when certain institutional arrangements, such as fiscal policy rules, exist. Instead, constraints imposed by adoption of fiscal policy rules assume the position of determining upper or lower bounds on certain fiscal measures. However, Chapter 3 establishes that it is a complicating feature of reporting frameworks that increases in net worth do not necessarily lead to increases in public investment but can instead be achieved by increasing financial assets.

This is despite the absence of penalties of a financial or judicial nature. The examined governments possibly incurred reputational penalties only. It is unclear whether these penalties were sufficient to motivate the high rates of compliance that were observed. This is of some significance to the ongoing exploration of the desirability of discretionary versus rules-based fiscal policy regimes, since one of the assumed detractions of fiscal policy regimes is their usual lack of enforceability. The findings of this study provide an indication of the strength of reputational penalties alone. These may not be limited to electoral effects but may also include credit market effects via impacts on fiscal policy validity.

The level of government under consideration is also significant in the context of these findings. The findings hold regardless of the level of government considered i.e. whether it is a national or sub-national government under consideration. As automatic stabilisers are generally seen to affect only national governments, because it is generally the national level of government in a federal system that bears responsibility for transfer payments and collects income-dependent taxes, it has usually been considered that sub-national governments' expenditures are less affected by business cycle stages than are national governments. However, in Australia, there is a strong correlation between State government revenues and the business cycle. Thus it is shown that adoption of certain fiscal policy rules may in part generate a transmission mechanism between levels of economic activity and levels of governmental outlays. Further, this appears to be unrelated to the stringency of any penalties incurred by non-compliance with adopted fiscal policy rules.

This is significant because it indicates the potential of institutional arrangements to foster sustainable fiscal policymaking. It is possible that the potency of the potential sanctions imposable by the credit markets in the form of risk premia on public debt, as well as the potential electoral impact, are the key causes of the findings of this study. Therefore, consideration of the totality of institutional conditions should be made before any decision is taken to adopt fiscal policy rules. In particular, when international agencies such as the International Monetary Fund recommend fiscal policy rules adoption to governments who are potential recipients of financial aid, consideration of such issues should be a part of any assessment of the likely enforceability and thus efficacy of fiscal policy rules.

Further, consistent with the literature on supply-side effects of public capital formation, the jurisdictions experiencing increased growth of public capital formation subsequent to adoption of fiscal policy rules are those which have experienced higher growth rates than other jurisdictions. While this study does not extend to an exploration of the existence and nature of a relationship between public capital formation and economic growth, such further research is recommended in the following section. This is because of the potential significance particularly for governments of developing nations, which typically face continual constraints on expenditure, placing a premium on optimising expenditure decisions as they attempt to improve the living standards of their populations.

This study suffers from data deficiencies. Due to the relatively recent adoption of accrual-based reporting methodologies, it was necessary to transform accrual data into cash-based equivalencies and splice the two datasets to create a series sufficiently long to enable econometric analysis. As a result, the results must be interpreted with caution. In particular, findings cannot be considered to represent e.g. levels of public capital formation although trends and change are ascertainable. In addition, the transformation introduces unavoidable difficulties, being reliant for its validity on the proposition that certain elements of public capital formation, recognizable under an accrual-based methodology, comprised a similarly negligible proportion of total public capital formation before and after the dates of adoption of accrual-based methodologies. A longer accrual-based data series would provide a greater level of comfort with respect both to the transformation and for econometric analysis

generally. Hence, a study completed after the passage of some time would provide greater analytical reliability than is possible to achieve in this study.

This study does not extend to an exploration of the impacts of increased public capital formation on economic growth. However, the study identified that the high-growth states (Queensland and Western Australia) experienced increases in the level or rate of growth of public investment, while the low-growth state of New South Wales did not, and the low-growth state of Victoria did but to a lesser extent. This is an accordance with Aschauer (1988 and 1989) and Otto and Voss (1994) who determined that public capital formation has a positive impact on private sector production. In particular, Otto and Voss (1994) used Australian data, albeit at the national level. No study has yet been carried out at the state level in Australia. An obvious direction for subsequent research is to carry out such an analysis at the state level for the above states.

It was pointed out that, due to the simultaneous existence of multiple identifiable influences on governmental fiscal outcomes, it is not possible to determine with certainty the cause of the observed changes in fiscal behaviour. For example, an information effect may exist i.e. improved information made available by adoption of accrual-based reporting methodologies may have influenced governments' decision-making. Exploration of this issue may produce useful information by which to inform decisions of governments still using cash-based reporting methodologies.

Therefore, it would be useful to examine the impact of fiscal policy rules adoption in jurisdictions, having similar institutional arrangements and fiscal circumstances as Australia, such as New Zealand and Canada. Such studies could cast further light on the likely causes of the Australian experience as well as providing a basis for international comparison. For example, the level of compliance experienced could be considered in the light of any penal arrangements in order to provide an indication of the effectiveness of reputational or other penalties. If public capital formation were found to increase at the time of adoption of accrual-based financial reporting frameworks rather than at the time of adoption of fiscal policy rules that focused on net worth, it could be concluded that the information effect may outweigh the reputational and credit market effects. This would substantially

extend the current level of awareness of the effects of fiscal policy rules adoption on public fiscal outcomes.

Further, the integrated nature of the financial reporting methodologies (by which are measured the financial aggregates upon which fiscal policy rules impose constraints) means that increases in net worth can be achieved by increasing financial assets rather than by increasing capital formation. The high rate of compliance with net debt rules and the emphasis that the examined jurisdictions placed upon achieving favourable credit ratings indicates that a relationship may exist between adoption of net debt rules and the rate of financial assets accumulation or of debt retirement. A fruitful line of enquiry could include exploration of the existence and nature of this relationship.

List of References

Abelson, P. (2003), *Public Economics Principles and Practice*, Applied Economics Australia

Alankar, A.G. (2003), '*Essays in Latent Variable and Event Study Econometrics',* PhD thesis, University of California, Berkeley

Alesina, A. and Perotti, R. (1995), 'The Political Economy of Budget Deficits', *IMF Staff Papers,* Vol. 42, No. 1

Andres, J. and Domenech, R. (2003), 'Automatic Stabilizers, Fiscal Rules and Macroeconomic Stability', *Documento de Trabajo*, n. 0314, Banco de Espana

Aschauer, D. (1988), 'The Equilibrium Approach to Fiscal Policy', *Journal of Money, Credit and Banking,* Vol. 20, pp 41-62

Aschauer, D.A. (1989), 'Is Public Expenditure Productive?', *Journal of Monetary Economics,* Vol. 23, pp 177-200

Aschauer, D. (1997), 'Do States Optimise? Public Capital and Economic Growth'*, Working Paper No. 189,* The Jerome Levy Economics Institute, Annandale-on-Hudson, NY

Aschauer, D.A. (2001), 'Output and Employment Effects of Public Capita', *Public Finance & Management,* Vol. 2, No. 2, pp 135-160

Auerbach, A. and Kotlikoff, L. (1987), *Dynamic fiscal policy*, Cambridge University Press, New York, NY

Australian Bureau of Statistics (2000), '*Information Paper: Accruals-based Government Finance Statistics',* Cat. No. 5517.0, AGPS, Canberra

Australian Bureau of Statistics (2005a), *Government Finance Statistics,* Cat. No. 5512.0, AGPS, Canberra

Australian Bureau of Statistics (2005b), *Australian National Accounts: National Income, Expenditure and Product,* Cat. No. 5206.0, AGPS, Canberra

Baker, H.K. and Mansi, S.A. (2002), 'Assessing Credit Rating Agencies by Bond Issuers and Institutional Investors', *Journal of Business Finance & Accounting*, Vol. 29, Nos. 9 and 10, pp 1367-1398

Barro, R.J. (1984), *Macroeconomics,* John Wiley & Sons, New York, NY

Barsky, R.B, Mankiw, N.G. and Zeldes, S.P. (1986), 'Ricardian Consumers with Keynesian Propensities', *American Economic Review,* Vol. 76, No. 4, pp 676-691

Barton, A. (2003), 'The Department of Defence – Australia's most profitable business?', *Australian Accounting Review,* Vol. 13, No. 2, pp 35-40

Bartos, S (2000), 'The 'whole' truth: The DoFA view', *Australian CPA*, Vol. 70, Iss. 3, pp 67-70

Baunsgaard, T. (2001), 'Fiscal Policy in Nigeria: Any Role For Rules?', *IMF Working Paper,* WP/03/155

Besley, T. and Ghatak, M. (2001), 'Government Versus Private Ownership on Public Goods', *The Quarterly Journal of Economics*, pp 1343-1372

Bhagat, S. and Romano, R. (2002), 'Event Studies and the Law: Part I: Technique and Corporate Litigation', *American Law and Economics Review*, Vol. 4, No. 1, pp 141-167

Bohn, B. (1992), 'Budget deficits and government accounting', *Carnegie-Rochester Conference Series on Public Policy*, Vol. 37, pp 1-84

Bosshardt, D.I. (2003), 'Capital structure, investment unanimity, and public goods: the case for social responsibility', *The Quarterly Review of Economics and Finance*, Vol. 43, pp 239-260

Boxall, P. (1998), 'The Revolution in Government Accounting', *Australian CPA,* Vol. 68, No. 3, pp 18-20

Brunila, A. (2002), 'Fiscal policy: Coordination, discipline and stabilization', *Bank of Finland Discussion Papers,* 7

Buiter, W.H. (1997), 'Generational Accounts, Aggregate Savings and Intergenerational Distribution', *Economica*, No. 64, pp 605-626

Buiter, W.H. (2001), 'Notes on 'A Code For Fiscal Stability'', *Oxford Economic Papers,* 53, pp 1-19

Carne, K. (2004), 'Towards strategic policy rules for public finance', *Proceedings of the Inaugural Conference of the Academy of World Business, Marketing and Development,* July 2004.

Churchill, M. (1992), 'Accrual Accounting in the Public Sector', *Australian Accountant, June*

Commonwealth Government of Australia (2000), *Accrual Uniform Presentation Framework,* Canprint Communications, Canberra

Commonwealth of Australia (1996), *Budget Statement 1, Commonwealth Budget Papers 1996-97,* AGPS, Canberra

Commonwealth of Australia (1997), *Budget Paper No. 1, Commonwealth Budget Papers 1997-98,* AGPS, Canberra

Commonwealth of Australia (1998), *Budget Paper No. 1, Commonwealth Budget Papers 1998-99,* Canprint Communications, Canberra

Commonwealth of Australia (1999), *Budget Paper 1, Commonwealth Budget Papers 1999-00*, Canprint Communications, Canberra

Commonwealth of Australia (2000), *Budget Paper 1, Commonwealth Budget Papers 2000-01*, Canprint Communications, Canberra

Commonwealth of Australia (2001), *Budget Paper 1, Commonwealth Budget Papers 2001-02*, Canprint Communications, Canberra

Commonwealth of Australia (2002), *Budget Paper 1, Commonwealth Budget Papers 2002-03*, Canprint Communications, Canberra

Commonwealth of Australia (2003), *Budget Paper 1, Commonwealth Budget Papers 2003-04*, Canprint Communications, Canberra

Commonwealth of Australia (1996), *Charter of Budget Honesty, Commonwealth Budget Papers 1996-97*, AGPS, Canberra

Courant, P.N., Gramlich, E.M. and Rubinfeld, D.L. (1979), 'The Stimulative Effects of Intergovernmental Grants: Or Why Money Sticks Where it Hits', 'Fiscal Federalism and Grants-in-Aid', *Coupe Papers on Public Economics*, The Urban Institute, Washington

Courant, P.N. and Rubinfeld, D.L. (1990), 'Tax Reform: Implications for the State-Local Public Sector', *Readings in Public Sector Economics,* D C Heath and Company

Creel, J. (003), 'Ranking Fiscal Policy Rules: the Golden Rule of Public Finance vs. the Stability and Growth Pact', *OFCE*, No. 2003-04

Dadgostar, B. and Mirabelli, F. (1998),'Does Government Public Capital Expenditure Matter? Evidence for Canada', *Economic Analysis & Policy,* Vol. 28, No. 2, pp 199-211

Davis, M. (2006), 'Accounting debate divides profession', *The Australian Financial Review,* 4 April, p10

Davis, M. (2006), 'Treasury chiefs revolt over budget rules', *The Australian Financial Review,* 3 April, p3

Deegan, C. (2005), *Australian Financial Accounting 4th edition*, Mc Graw-Hill

Department of Treasury and Finance, Tasmanian Government (2003), '*Accrual Budget and Financial Management Realisation Plan – Phase 4 – Version 3.0'* accessed 6 December 2005 at http://www.treasury.tas.gov.au/domino/dtf/dtf.nsf/LookupFiles/ORP_Phase_4_version_3.0_December_2003.pdf/$file/ORP_Phase_4_version_3.0_December_2003.pdf

Dornbusch, R., Bodman, P., Crosby, M., Fischer, S. and Startz, R. (2006), *Macroeconomics 2nd Edition,* McGraw Hill

Faini, R. (2006), 'Fiscal policy and interest rates in Europe', *Economic Policy Cambridge*, Vol. 21,Issue47,pp443-451

Financial Administration and Audit Act (Qld) (1977)

Financial Management (Financial Responsibility) Act (Vic) (2000)

Gans, J., King, S., Stonecash, R. and Mankiw, N.G. (2003), *Principles of Economics 2nd Pacific Rim Edition,* Harcourt

General Government Debt Elimination Act No. 83 (NSW) (1995)

Glater, J.D. (2003), 'Top Debt Rating Agencies Take a Look at Accounting', *New York Times, Jan 11, (Late Edition) (East Coast),* New York, p C1

Government Financial Responsibility Act (WA) (2000)

Gramlich, E.M. (1994), 'Infrastructure Investment: A Review Essay', *Journal of Economic Literature,* Vol. XXXII, pp 1176-1196

Gujarati, D.N. (2006), *Essentials of Econometrics 3e,* McGraw-Hill/Irwin, New York

Guthrie, J. (1998), 'Application of Accrual Accounting in the Australian Public Sector – Rhetoric or Reality', *Financial Accountability & Management,* 14 (1), pp 1-19

Hakes, D.R. and McCormick, P. (1996), 'Did Smith Address Ricardian Equivalence Before Ricardo?', *Eastern Economic Journal Bloomsburg*, Vol. 22, Iss. 1, pp 57-61

Harris, T. (2004), 'No progress without debt', *Australian Financial Review,* 4 January, p 46

Hemming, R., Kell, M. and Mahfouz, S. (2002), 'The effectiveness of fiscal policy in stimulating economic activity – A review of the literature', *IMF Working Paper*, WP/02/208, December

Hill, R.C., Griffith, W.E. and Judge, G.G. (2001), *Undergraduate Econometrics 2nd Edition,* John Wiley and Sons Inc, NewYork

Hines, J.R. and Thaler, R. (1995), 'Anomalies: The Flypaper Effect', *The Journal of Economic Perspectives,* Vol. 9, No. 4, pp 217-226

H.M. Treasury (1998), *The Code for Fiscal Stability - Pre-Budget Report Publications,* London

Holtz-Eakin, D. (1993), 'State-specific estimates of state and local government capital', *Regional Science and Urban Economics,* Vol. 23, pp 185-209

Huber, B. (1992), *'Time consistency of government financial policy in a small open economy', European Economic Review,* Vol. 36, pp 1545-1555

Inman, R.P. and Rubinfeld, D.L. (1996), 'Designing tax policy in federalist economies: An overview', *Journal of Public Economics,* Vol. 60, pp 307-334

International Monetary Fund (2001), *Manual on Fiscal Transparency* accessed on 21 January 2007 at http://www.imf.org/external/np/fad/trans/manual/sec03a.htm

International Monetary Fund (2004), *Transcript of an IMF Book Forum Washington DC* accessed on 17 January 2005 at http://www.internationalmonetaryfund.org/external/np/tr/2004/tr041006.htm

Johnstone, D. (1999), 'Public-Sector Outsourcing and Charging In-house Bidders for Their use of Capital', *Australian Accounting Review,* Vol. 9, No. 1, pp 33-41

Kaufmann, B. (2002), '*Harmonisation for government reporting', Australian CPA, Vol. 72, Iss. 8*

Kelly, J. and Wanna, J. (2004), 'Crashing Through with Accrual-Output Price Budgeting in Australia - Technical Adjustment or a New Way of Doing Business?', *American Review of Pubic Administration,* Vol. 34, No. 1, pp 94-111

Khalid, A.M. (1996), 'Ricardian equivalence: Empirical evidence from developing economies', *Journal of Development Economics,* Vol. 51, pp 413-432

King, S. (1997), 'National Competition Policy', *The Economic Record,* Vol. 73, No. 222, pp 270-284

King, S. and Pitchford, R. (1998), 'Privatisation in Australia: Understanding the Incentives in Public and Private Firms', *The Australian Economic Review,* Vol. 31, No. 4, pp 313-28

Kneebone, R.D. (2003), *'Past, Current, and Future Fiscal Policy Issues in Canada',* Kohsaka, A. (ed) *Fiscal Policy Issues in the Pacific Region,* Routledge, London

Kopits, G. and Symansky, S. (1998), 'Fiscal Policy Rules', *International Monetary Fund Occasional Paper 162*

Kotlikoff, L.J., Razin, A. and Rosenthal, R.W. (1990), 'A Strategic Altruism Model in Which Ricardian Equivalence Does Not Hold', *The Economic Journal,* Vol. 100, pp 1261-1268

Levtchenkova, S. and Petchey, J. (2000), 'Regional Capital Stock Data for Australia' in *Australian Economic Review*, Vol. 33, No. 2, pp 193-197

Lougheed, A.L. (2001), *'A Negative Fiscal Multiplier?', University of Queensland Discussion Paper* No. 293

Loukoianova, E.,Vahey, S.P. and Wakerly, E.C. (2003), *'A Real Time Tax Smoothing Based Fiscal Policy Rule', Cambridge Working Papers in Economics*, 0235, Faculty of Economics (formerly DAE), University of Cambridge

McCallum, B.T. (1993), 'Unit Roots in Macroeconomic Time Series: Some Critical Issues', *Federal Reserve Bank of Richmond Economic Quarterly,* Volume 79/2, pp 13-41

MacKinlay, A.C. (1997), 'Event Studies in Economics and Finance', *Journal of Economic Literature,* Vol. XXXV, pp 13-39

McTaggart, D., Findlay, C. and Parkin, M. (2006), *Economics 4th Edition,* Pearson

McWilliams, A. and Siegel, D. (June 1997), 'Event Studies in Management Research: Theoretical and Empirical Issues', *Academy of Management Journal,* Vol. 30, Issue 3, pp 626-656

Mikhailitchenko, S., Nguyen, D.T. and Smith, C. (2005), 'Estimates of Capital Stocks for the States and Territories of Australia, 1985-2004', *Economic Analysis and Policy,* Volume 35, Nos. 1 & 2, pp 1-22

Milesi-Ferretti, G.M. (1997), 'Fiscal Rules and the Budget Process', *Centre for Economic Policy Research Discussion Paper, No. 1664*

Moll, J., Humphrey, C. and Chow, D. (2004), 'Questions of Value: An Analysis of Experiences with Whole of Government Accounting in the UK, New Zealand and Australia', *Paper presented at the APIRA 2004 Conference*

Monadjemi, M.S. (1991), 'The interest rate neutrality of fiscal deficits: testing for Ricardian equivalence and capital inflow', *Journal of International Money and Finance,* Vol. 10, pp 541-551

Moody's Investors Service (2004), *Moody's Ratings System* accessed on 9 October 2006 at http://www.moodys.com

Moody's Investors Service (1998), '*Subnational Governments: A Rating Agency Perspective – Rating Methodology'* accessed on 9 October 2006 at http://www.moodys.com

National Commission of Audit (1996), '*Report to the Commonwealth Government (Australia)'* accessed on 9 February 2005 at http://www.finance.gov.au/pubs/ncoa/appg.htm

New South Wales Government (1990), *Budget Paper 2 - Budget Statement 1990-91*

New South Wales Government (1991), *Budget Paper 2 - Budget Statement 1991-92*

New South Wales Government (1992), *Budget Paper 2 - Budget Statement 1992-93*

New South Wales Government (1993), *Budget Paper 2 - Budget Statement 1993-94*

New South Wales Government (1994), *Budget Paper 2 - Budget Statement 1994-95*

New South Wales Government (1996), *Budget Paper 2 - Budget Statement 1996-97*

New South Wales Government (1997a), *Budget Paper 2 - Budget Statement 1997-98*

New South Wales Government (1998), *Budget Paper 2 - Budget Statement 1998-99*

New South Wales Government (1999), *Budget Paper 2 - Budget Statement 1999-00*

New South Wales Government (2000), *Budget Paper 2 - Budget Statement 2000-01*

New South Wales Government (2001a), *Budget Paper 2 - Budget Statement 2001-02*

New South Wales Government (2002a), *Budget Paper 2 - Budget Statement 2002-02*

New South Wales Government (2005a), *Budget Paper 2 - Budget Statement 2005-06*

New South Wales Government (1997b), *NSW Budget Sector Consolidated Financial Statements July-December 1996* accessed on 21 June 2006 at http://www.treasury.nsw.gov.au/pubs/treasure/finstat.htm

New South Wales Government (1995), *NSW Treasurer's Budget Speech 1995-96* accessed on 28 November 2005 at http://www.treasury.nsw.gov.au/bp95/budspch.htm

New South Wales Government (1997c), *Public Accounts of the NSW Public Sector 1996-97* accessed on 21 June 2006 at http://www.treasury.nsw.gov.au/pubaccts.htm

New South Wales Government (2001b), *New South Wales Report on State Finances 2000-01*

New South Wales Government (2002b), *New South Wales Report on State Finances 2001-02*

New South Wales Government (2003), *New South Wales Report on State Finances 2002-03*

New South Wales Government (2004), *New South Wales Report on State Finances 2003-04*

New South Wales Treasury (1999), *General Government Financial Statement for the Twelve Months ended 30 June 1999*

Nourzad, F. (2000), *'The productivity effect of government capital in developing and industrialized countries', Applied Economics,* Vol. 32, pp 1181-1187

Organisation for Economic Cooperation and Development (2002), *Economic Outlook No. 72*, Paris

Organisation for Economic Cooperation and Development (2003), *Economic Outlook No. 74*, Paris

Otto, G.D. and Voss, G.M. (1996), '*Public Capital and Private Production in Australia', Southern Economic Journal, Vol. 62, No. 3*pp 723-738

Otto G and Voss G M (1994), 'Public Capital and Private Sector Productivity', *Economic Record*, Vol. 70, No. 209, pp 121-132

Patell, J.M. (1976), 'Corporate Forecasts of Earnings Per Share and Stock Price Behaviour: Empirical Test', *Journal of Accounting Research,* Vol. 14, No. 2, pp 246-276

Poon, W.P.H. and Firth, M. (2005), 'Are Unsolicited Credit Ratings Lower? International Evidence From Bank Ratings', *Journal of Business Finance & Accounting,* Vol. 32, Nos. 9 and 10, pp 1741-1771

Poterba, J. (1996), 'Do Budget Rules Work?', *Burch Working Paper,* No. B96-12

Queensland Government (1991), *Budget Overview Budget Paper No. 2 1991-92* Goprint Queensland

Queensland Government (1992), *Budget Overview Budget Paper No. 2 1992-93* Goprint Queensland

Queensland Government (1993), *Budget Overview Budget Paper No. 2 1993-94* Goprint Queensland

Queensland Government (1994), *Budget Overview Budget Paper No. 2 1994-95* Goprint Queensland

Queensland Government (1995), *Budget Overview Budget Paper No. 2 1995-96* Goprint Queensland

Queensland Government (1996), *Budget Overview Budget Paper No. 2 1996-97* Goprint Queensland

Queensland Government (1997), *Budget Overview Budget Paper No. 2 1997-98* Goprint Queensland

Queensland Government (1998), *Budget Overview Budget Paper No. 2 1998-98* Goprint Queensland

Queensland Government (1999), *Budget Overview Budget Paper No. 2 1999-00* Goprint Queensland

Queensland Government (2000), *Budget Overview Budget Paper No. 2 2000-01* Goprint Queensland

Queensland Government (2001), *Budget Overview Budget Paper No. 2 2001-02* Goprint Queensland

Queensland Government (2002), *Budget Overview Budget Paper No. 2 2002-03* Goprint Queensland

Queensland Government (2003), *Budget Strategy and Outlook, Budget Paper No. 2 State Budget 2003-04* Goprint Queensland

Queensland Government (2006), *Budget Strategy and Outlook, Budget Paper No. 2 State Budget 2006-07* Goprint Queensland

Queensland Government (2001), *Charter of Social and Fiscal Responsibility* Goprint Queensland

Queensland Government (2003), *Whole-of-Government Approach for Establishing Asset Information Requirements for Asset Financial and Asset Management Reporting and Asset Strategic Planning*

Quiggin, J. (1995), *'Whole-of-Government Accounting and Pubic Sector Net Worth – Submission to Joint Committee on Public Accounts, Parliament of Australia'* accessed on 15 October 2005 at https://mail01.domino.gu.edu.au/mail101/s788195.nsf

Robinson, M. (2002a), 'Accrual Accounting and Australian Fiscal Policy', *Fiscal Studies,* Vol. 23, No. 2, pp 287-300

Robinson, M. (1998), 'Accrual Accounting and the Efficiency of the Core Public Sector', *Financial Accountability & Management,* Vol. 14, No. 1, pp 21-37

Robinson, M. (2002b), 'Financial Control in Australian Government Budgeting', *Public Budgeting & Finance,* pp 80-93

Samuel, S.N. and Gupta, D.B. (1993), *Issues in Applied Economics: An Australian Text,* MacMillan Education Australia Pty Ltd

Selvanathan, A., Selvanathan, S., Keller, G. and Warrack, B. (2004), *Australian Business Statistics 3rd Edition,* Nelson Australia

Sheskin, D.J. (2004), *Handbook of Parametric and Nonparametric Statistical Procedures Third Edition,* Chapman & Hall

South Australian Government (1998), *Budget Statement No. 2 1998-99*

South Australian Government (1999), *Budget Statement No. 2 1999-00*

South Australian Government (2000), *Budget Statement No. 2 2000-01*

South Australian Government (2001), *Budget Statement No. 2 2001-02*

South Australian Government (2002), *Budget Statement No. 2 2002-03*

Standard & Poors (2004), *Credit Ratings – Credit Reports Victoria (State of)*

Standard & Poors (2003), *Victoria's 'AAA' Rating : A Comparative Study of Financial and Economic Performance* McGraw-Hill

Stiglitz, J.E. (1988), *Economics of the Public Sector Second Edition*, W W Norton & Company

Tanner, E. (2004), 'Fiscal rules and countercyclical policy: Frank Ramsey meets Gramm-Rudman-Hollings', *Journal of Policy Modelling,* Vol. 26, pp 719-731

Tanzi, V. (2005), 'Fiscal Policy and Fiscal Rules in the European Union', *CESifo Forum Munchen*, Vol. 6,Iss.3, pp57-64

Tasmanian Government (1998), *Budget Paper No. 1 Budget Overview 1998-99*

Tasmanian Government (1999), *Budget Paper No. 1 Budget Overview 1999-00*

Tasmanian Government (2000), *Budget Paper No. 1 Budget Overview 2000-01*

Tasmanian Government (2001), *Budget Paper No. 1 Budget Overview 2001-02*

Tasmanian Government (2002), *Budget Paper No. 1 Budget Overview 2002-03*

Tasmanian Government (2003), *Budget Paper No. 1 Budget Overview2003-04*

Tridimas, G. (2001), 'The economics and politics of the structure of public expenditure', *Public Choice,* Vol. 106, pp 299-316

Victorian Government (1998), *Budget Statement 1998-99* accessed on 21 September 2004 at http://www.dpc.vic.gov.au/domino/web_notes/budgets/budget98.nsf/9bcce3ea1

Victorian Government (1999), *Budget Statement 1999-2000*

Victorian Government (2000a), *Budget Statement 2000-01*

Victorian Government (2001a), *Budget Statement 2001-02*

Victorian Government (2002a), *Budget Statement 2002-03*

Victorian Government (2003a), *Budget Statement 2003-04*

Victorian Government (2000b), *Financial Report for the State of Victoria 1999-2000*, No. 39, Session 2000, Government Printer for the State of Victoria

Victorian Government (2001b), *Financial Report for the State of Victoria 2000-2001*, No. 90, Session 2001, Government Printer for the State of Victoria

Victorian Government (2002b),*Financial Report for the State of Victoria 2001-2002*, No. 182, Session 1999-2002, Victorian Government Printer

Victorian Government (2003b), *Financial Report for the State of Victoria 2002-2003*, No. 28, Session 2003, Victorian Government Printer

Victorian Government (2004), *Financial Report for the State of Victoria 2003-2004*, No. 91, Session 2003-2004, Victorian Government Printer

Western Australian Government (2000), *2000-01 Budget Economic and Fiscal Outlook*

Western Australian Government (2001), *2001-02 Budget Economic and Fiscal Outlook*

Western Australian Government (2002), *2002-03 Budget Economic and Fiscal Outlook*

Western Australian Government (2003), *2003-04 Budget Economic and Fiscal Outlook* 2

Western Australian Government (1997), *Budget Paper No. 2 1997-98*

Western Australian Government (1998), *Budget Paper No. 2 1998-99*

Western Australian Government (1992), *Budget Speech 1992-93*

Western Australian Government (1993), *Budget Speech 1993-94*

Western Australian Government (1994), *Budget Speech 1994-95*

Western Australian Government (1995), *Budget Speech 1995-96*

Western Australian Government (1996), *Budget Speech 1996-97*

Western Australian Government (1999), *1999-2000 Budget Summary and Financial Strategy*

Williams, R. (2005), '*Fiscal Federalism: Aims, Instruments and Outcomes The 2005 Giblin Lecture given on behalf of ANZAAS Presented at the Conference of Economists, University of Melbourne, 27 September 2005'*

Williamson, J. (1985), 'On the System in Bretton Woods'*, American Economic Review,* Vol. 75, No. 2, Papers and Proceedings of the Ninety-Seventh Annual Meeting of the American Economic Association, pp 74-79

Ylagan, A.H.C. (2005), 'Corporate Watch', *BusinessWorld Manila,* 1 Aug, p1