Profitability in Australian Enterprises*

Simon Feeny and Mark Rogers

Melbourne Institute of Applied Economic and Social Research
The University of Melbourne

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Melbourne Institute of Applied Economic and Social Research
The University of Melbourne
Parkville, Victoria 3052 Australia
Telephone **(03) 9344 5288**
Fax **(03) 9344 5630**
Email **melb.inst@iaesr.unimelb.edu.au**
WWW Address **http://www.ecom.unimelb.edu.au/iaesrwww/home.html**

Abstract

This paper analyses profitability in a sample of large Australian companies over the period 1985 to 1996. Various measures of profitability are used and the paper provides a discussion of the theoretical basis for these measures. The key issues investigated are a comparison of the profitability measures, the distribution of profitability between firms, and the persistence of firm profitability. The results are compared to previous studies on firm profitability.

Key words: Profit, rate of return, firm performance

Working papers from the 'Performance of Australian Enterprises' project

Title	Number	Author(s)
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The Definition and Measurement of Productivity	9/98	Rogers
The Definition and Measurement of Innovation	10/98	Rogers
Innovation in Australian Enterprises: Evidence from GAPS and IBIS databases	19/98	Rogers
Productivity in Australian Enterprises: Evidence from GAPS	20/98	Rogers
Profitability in Australian Enterprises: Evidence from IBIS	21/98	Feeny/Rogers
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1 Introduction

This paper describes the nature and extent of profitability in a sample of large Australian companies over the period 1985 to 1996. Several key issues are addressed including: a comparison of profitability measures, the variation of profitability between companies and over time, and whether the same companies are persistently profitable. A company's profits (loses) are normally thought of as a dollar amount which represents a measure of surplus (deficit) generated during a period. Since the dollar value of profits will tend to be higher for large companies, firm profitability can be appropriately measured by considering profits in relation to the size of the company. One such measure is the ratio of profits to total assets. This measure is independent of size and indicates the rate at which companies are able to generate profits for every unit of asset employed. This rate of return measure, generated by companies is of interest to a variety of groups including investors, financial institutions, policy makers, economists, and, of course, the companies themselves. It is possible to calculate various different measures for the rate of return, depending on which measure of profit is used (the numerator) and which measure of assets is used (the denominator). This paper considers two measures: the return on assets and the return on equity.

In addition to these two measures of return, this paper also uses an EBDIT margin (Earnings Before Depreciation Interest and Tax /Total revenue) as a proxy for the price-cost margin (PCM). The price-cost margin is commonly used by economists as an indicator monopoly profits, although under certain conditions it can also be interpreted as a measure of the rate of return on investment. Section 3 contains a discussion of the measures used to assess profitability. Before the discussion of profitability measures, section 2 discusses various problems arising from the use of financial accounts data in economic analysis. Since there is a debate over the appropriateness of accounting information for economic analysis, this discussion is worthwhile. The debate arises from the fact that the rules used by accountants do not directly match the theoretical concepts for assessing rates of return. In summary, the correct way to assess the rate of return for an investment is to compare the present value of the project to the initial cost. A company can be regarded as comprising of a

series of past and current investments that are, hopefully, providing returns. Assessing the present value of all these investments implies that the future stream of net cash flows for each one should be estimated. Company accounts are not prepared on the basis of 'forecasting' expected net cash flows and are instead based largely on historical figures. This means there may be some discrepancy between the rate of return suggested by the company accounts and the true rate of return.

The data source used in this paper – the IBIS large firm database - is discussed in section 4, which also compares the data with ABS data (see Table 4). Section 5 provides a brief summary of previous empirical research. Section 6 gives an overview of the profitability statistics calculated from the data. Section 7 discusses profitability in relation to industry, ownership and firm size. The performance of firms over the business cycle, and persistence in profitability, are discussed in sections 8 and 9 respectively. Section 10 concludes.

2 Accounting profits and rates of return

Company financial accounts normally contain a balance sheet and a profit and loss account. The double entry method of book keeping is designed to ensure that the change in the book value of capital employed by the company (as shown by the balance sheet) exactly equals the profit or loss over the same period. The profit (loss) is the surplus (deficit) of revenue over cost in the period, where, traditionally, cost is recorded at historical values (i.e. the cost when incurred). The level of costs normally includes some measure of the amount of physical capital "used" in that period (i.e. depreciation), even though no actual payment is made. This is because the purchase of physical capital is usually much less frequent that the period of account. The level of profit calculated in this manner can be termed 'accounting profit'. The balance sheet presents a statement of a company's assets and liabilities at a point in time. The method of recording the value of assets and liabilities varies but again, traditionally, the historical value of assets or liabilities are used. For example, the value of physical assets at a certain date would be the historical cost less any depreciation allowances that have been allowed for since purchase (and passed to the profit and loss account). Company financial accounts can therefore be used to calculate a rate of return by dividing accounting profits by total assets. An alternative rate of return can be

calculated using shareholders funds (or equity or net worth) as the denominator (see Gow and Kells, 1998, for a more detailed discussion of these ratios).

Before we consider further how exactly these rate of return ratios should be constructed, it is useful to consider the economic definition of the rate of return. Economists generally agree that the best way to calculate a rate of return on a given investment is to calculate the net present value of the stream of cash flows associated with an investment (using the opportunity cost of funds as the discount rate) and compare this to the initial investment amount. This type of calculation requires knowledge of the entire life of the investment project. If this is not available, as would be the case in trying to decide between a set of investment projects, then the expected net present value should be used. A company at any point in time will have a variety of separate investment projects at different stages of completion (indeed firms may have some "investment" projects that are in some sense ongoing). An accounting measure of the rate of return is an average measure of the firm's rate of return which is based on the firm's specific mix of past and present investment strategy over a given period. The most obvious implication is that a negative rate of return, as calculated from financial accounts, does not necessarily mean that the company has a negative economic rate of return. Instead it may be that the company is in the initial stages of a major investment, which is not expected to provide returns until after some time. If the calculation was based on the expected net present value of future cash flows, the rate of return might be positive. Therefore, since accounts are not based on a forward-looking evaluation of the net present value, they may deviate from economic rates of return.[1]

In summary, the main difference between accounting and economic rates of return is that accounting rates of return associate current profit flows with prior investments, while economic rates of return associate future profit flows with current investments.[2]

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[1] For more discussion of these issues see Edwards et al (1987). The authors have noted that a forward looking valuation of a company's stream of cash flows is provided by the share market valuation of a firm. Bosworth (1996 – MI WP 3/96) discusses this fact.

[2] See Krouse (1990, p422)

A further difference between accounting rates of return and economic rates of return concerns the treatment of depreciation. The inclusion of depreciation – the allowance made for capital utilisation during an accounting period – is important since it tries to provide a clearer view of the rate of return on a project. If rates of return were calculated *ex post*, after all the investment project's cash flows had occurred, the calculation of depreciation would not be an issue. In practice, accountants have to calculate an amount for depreciation for a period within the life of an investment (and in all likelihood, for a set of overlapping investment projects). Accountants have a variety of ways of calculating depreciation but none of these match precisely with the theoretically correct economic method. This would state that the value of assets should always equal the net present value of future cash flows, hence the depreciation amount would equal the change in net present value (see Edwards et al, 1987, or Schmalensee, 1989, for a full discussion). Once again, the theoretically correct method implies that a calculation of depreciation involves the expected future value of cash flows, a calculation method that accountants normally avoid due to its inherent difficulty.

There are also a number of other issues that imply that the level of profits and assets, as calculated by accountants, may be poor proxies for the underlying economic variables. These include the fact that balance sheet assets may fail to correctly account for past investments in human capital, advertising and R&D (see Clarkson and Miller, 1982, Chapter 4, for a discussion). Also, periods of high inflation may bias the assets figures since assets are often recorded at their original (nominal) prices. All of these issues suggest that accounting variables may have substantial biases from the underlying variables of interest.[3] There are two primary responses to this. First, if studies are concerned with comparisons of, say, the rates of return across companies then the important issue is whether the biases introduced by using accounting data vary across companies (or industries). For example, if the (incorrect) treatment of investment in human capital is consistent across companies, and companies rely equally on human capital, then comparisons of performance should not be affected.

[3] See Benson (1985) and Fisher and McGowan (1983) for more detailed critiques of the use of accounting data.

Second, if the accounting data are to be used in subsequent regression analysis, the important issue is not whether accounting data has noise in it, but whether this noise is correlated with explanatory variables investigated. In Schmalense's words,

> While the signal to noise ratio in accounting data is of interest, the more important question is the extent to which the errors in accounting data are correlated (positively or negatively) with independent variables used in regression analysis. (Schmalensee, 1989, p.962)

It is also worth remembering that the use of accounting data, despite its potential problems, has a long history in economics. As Martin (1993) has noted, if economists were to cease using accounting data it would mean not only dramatic changes in empirical industrial organisation but major changes to industrial organisation and macroeconomics. In Martin's words:

> It would mean that industrial economists could not carry out empirical research. It would mean that macroeconomists could not carry out empirical research. It would mean that a wide spectrum of government publications describing economic activity ought to be discontinued, since they are biased on what is, originally, accounting data. (Martin 1993, p.517)

3 Profitability measures used in this paper

This paper focuses on three measures of profitability, namely, the return on assets, the return on equity and the EBDIT margin (also called the price cost margin (PCM)). We have noted above various problems with using accounting data. We can also note that some authors argue that firms take some of their 'profits' in the form of discretionary expenditures, for example a manager or owner may take a larger salary than his contribution would justify. Alternatively, the firm can absorb profit by increasing expenditure on items such as new offices, company cars and generous expense allowances, all affecting the measurement of profit between firms. Full definitions of the profitability ratios are shown in

Table **1** below and follow Gow and Kells (1998).

Table 1 Profitability ratios used in this paper

Ratio	**Definition**
Return on Equity (RoE)	Net profit after tax /Average shareholders funds
Return on Assets (RoA)	EBDIT/Average total assets
EBDIT Margin (PCM)	EBDIT/Total revenue

Note: EBDIT = Earnings Before Depreciation Interest and Tax

Since profits are earned during the course of an entire year, while equity and assets are stocks at a given point in time, the ratios for the return on equity and the return on assets shown in

Table 1 calculate the denominator as the average of the beginning and end year value.[4] This follows a number of other studies Lewis & Pendrill (1991), The Department of Industrial Relations (1987), and Stekler (1963).

The return on assets is a measure of profit generated by the total assets employed by the company, calculated irrespective of how the assets have been financed. The ratio is calculated before interest deductions since these are payments to the debt holders who have financed part of the assets employed. Total assets can be valued at depreciated historical cost, gross historical cost, net replacement cost, gross displacement cost, net realisable value, or net present value. If net assets are used, rather than gross, conventional depreciation methods can give misleading results (Parker, 1984, p.152). In addition to this, advertising and R&D costs are usually classed as expenses rather than assets. Subsequently the rates of returns for firms in industries for which these are high may be biased upwards, since the denominator is

[4] For the initial year the denominator is taken as the end value. This may create some additional "noise" in the ratios, hence, in some of the statistics presented below the initial year of the panel is excluded.

lower than it would be if such costs had been incorporated. This may explain the relatively high manufacturing rates of return found later in the paper.

Return on equity (RoE) measures the rate of return generated by management on the shareholders investment in the business. Net profit after tax is used as the numerator because the ratio should provide an indication of the overall efficiency of management, not just in the operations of the business, but also in the financing and taxation affairs of the company for the benefit of shareholders (Parker, 1984). It is important to note that a firm's return on equity can be manipulated, to some extent, by the firm's choice of financial structure. If profits are in decline for example, a firm might shift the financing of its assets to debt, reducing the equity base, and improving the return on equity ratio.[5] Negative observations in the panels for averaged shareholders' funds were excluded from the subsequent analysis since it is not logical to have a return on negative values for equity. A negative return on equity implies that net liabilities exceed net assets and therefore any profit generated by the firm would be paid to debtors before any return is paid to shareholders. In addition, if net profit after tax and shareholders' equity are both negative, a positive rate of return would be calculated which is clearly misleading.

The EDBIT margin indicates the amount of profit generated from a dollar of revenue and is often termed the Price Cost Margin (PCM). Liebowitz (1982) and other economists compare the PCM to the Lerner measure of monopoly power, L, which is defined as:

$$L \quad \frac{(P - MC)}{P} \qquad [1]$$

where P represents price and MC is marginal cost. If firms possess some degree of monopoly power, profit maximisation will lead the firm to set price above marginal cost. The Lerner index can take on values between 0 and 1, with a value of zero indicating a perfectly competitive market. As the index approaches one, firms gain

[5] The Australian Financial System Inquiry (1982, p.249) stated "firms will try to maintain the return on shareholders' funds by varying the debt/equity ratio to offset changes in basic profitability".

greater market power. If marginal cost is assumed to equal average cost (i.e. constant returns to scale) the above can be modified to:

$$L' = \frac{(P \quad AC)}{P} = \frac{(P \quad AC)}{P} \cdot \frac{Q}{Q} = \frac{TR \quad TC}{TR} = \frac{\pi}{TR} \qquad [2]$$

The far right of equation [2] shows the PCM as used in this paper, hence it can, under certain assumptions, be considered as equaling the Lerner measure of monopoly power. (see Schmalansee, 1989, p.960 or Krouse, 1990, for further discussion)

4 Data

The IBIS Enterprise Database contains information on an annual basis for medium to large firms in Australia over the period 1979 to the present. In total, the database currently has historical data for approximately 6,000 firms. Accounting data is available through the inclusion of each firm's profit and loss statement and balance sheet in the database. Financial variables include revenue, profit, taxation, assets, liabilities, depreciation, and shareholders funds. The profitability ratios used in this paper are calculated from these variables. The database also includes employment information and industry type by ANZSIC code.

Two balanced panels were constructed using the IBIS database. The longer panel covers the period from 1985 to 1996 while the shorter panel covers the period 1990 to 1996. Not all firms provide complete information and each firm must satisfy a data requirement to be included in the panels. Financial information for each of the variables required to calculate all the profitability ratios must be available for every year of the panel. This allows us to make a comparison between the profitability ratios for each panel. The long panel consists of 191 firms and the short panel consists of 671.

Table 2 provides information on the average size of firm in both the long and short panels. Firms in the long panel are, on average, significantly larger than firms in the short panel in terms of revenue, profit, assets and employment.

Table 2 Comparison of the long and short panel (means and medians)

Variable (1996)		Long Panel	Short Panel
Revenue (000s)	Mean	1,659,911	734,526
	Median	579,631	221,565
EBDIT (000s)	Mean	173,302	74,232
	Median	42,205	14,667
Assets (000s)	Mean	4,885,088	1,890,776
	Median	632,770	205,120
Employment (000s)	Mean	6,393	3,011
	Median	1,481	591

Table 3 gives an industry breakdown for the firms in the panels. Manufacturing accounts for the most number of firms. In the long panel, 42% of firms are in manufacturing. This percentage falls to 34% in the short panel with the other major difference between the panels being the rise in the percentage of wholesale firms. Hence, in the short panel the combined wholesale trade and finance and insurance category is as large as the manufacturing category.

Table 3 Industry breakdown of panels

ANZSIC Category	% in Long panel	% in Short Panel
Mining	10.5	7.2
Manufacturing	42.4	34.1
Wholesale Trade	11.5	19.2
Finance and Insurance	15.7	15.1
Property and Business Services	5.2	5.5

The extensive coverage of the IBIS database is highlighted in Table 4. The firms in the short panel account for over a third of Australia's total profit before tax and for over half of the country's total assets.

Table 4 Comparison of short panel with the whole of Australia

	IBIS (Short Panel)	Australia
Employment (1996)	1.72m	8.34m
Profit before tax (1996)	$39,889m	$90,429m
Total assets (1996)	$1,268,711m	$2,042,463m

Source: ABS (Employment for Australia is an average for the year 1996). ABS 8140.0 (Australian data for 1995-96)

5 Previous empirical results

The paper is intended to provide an overview of the nature of profitability in the IBIS data base of large Australian firms and as such it avoids using advanced econometric analysis (which are normally used in other studies). Despite this, it is worthwhile to briefly summarise some of the basic findings of previous research so that the results presented here can be put in perspective. A number of "stylised facts" on firm profitability thus follows;

1. Correlations between different accounting based measures of rates of return are high (Schmalansee, 1989, p.961)

2. Correlations between the EBDIT margin and rates of return are more varied. Amato and Wilder (1995) find a correlation between PCM and the return on assets of 0.27, “suggesting that inadequacies in an individual profit measure cannot be defended by citing a high correlation between measures”. Their results are lower than Liebowitz (1982) who finds correlations of 0.3 to 0.4, and much less than Collins and Preston (1969) who find a correlation of 0.8.

3. The EBDIT margin is less volatile over the business cycle than rates of return. Baldwin (1995, p.331)

4. In general, differences in firm level profits do not persist indefinitely (see Mueller,

1990, Schmalensee, 1989, p.971, and Scherer, 1990, p.442-3).

5. Large firms are more likely than small ones to adopt accounting practices (like accelerated depreciation) that lower current profits and increase rates of return. (see Schmalensee, 1989, p.965).[6]

6 Overview of profitability

This section provides some summary statistics on the profitability ratios discussed above for both the long and the short panel. An important initial issue that must be confronted is the presence of "outliers" (i.e. extreme values) in all the various profitability ratios. The presence of outliers implies that the use of certain statistics can be misleading.[7] As an indication of the presence of outliers, Figures 1, 2 and 3 show a histogram of each of the profitability measures in 1996 (for the long panel). As would be expected, all of the distributions show that the majority of the observations are in the 0 to 20% range. However, each of the distributions shows a number of outliers. The most extreme example is Figure 3 for the return on equity. This has observations with returns on equity that are close to positive and negative 230%. The presence of outliers implies that use of the mean as a measure of central tendency can be misleading. Hence in much of the analysis that follows we focus on the median and the trimmed mean (where the top and bottom 5% of the distribution are discarded).

[6] This stylized fact relates to the concept of "political risk", which refers to the potential loss from government interference with the profitable conduct of large firms. It may be in the interest of large firms to adopt accounting practices that actually lower the true level of profits. For certain reasons, profit maximisation may not always be the objective of the firm.

[7] The presence of outliers may necessitate the use of more advanced econometric techniques.

Figure 1 Histogram of EBDIT margin (n = 191)

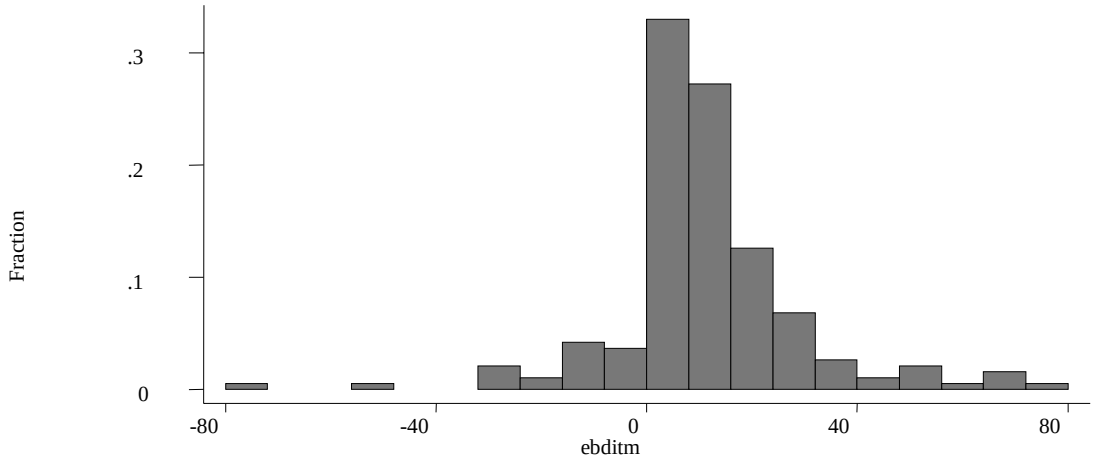


Figure 2 Histogram of return on assets ratio (n = 191)

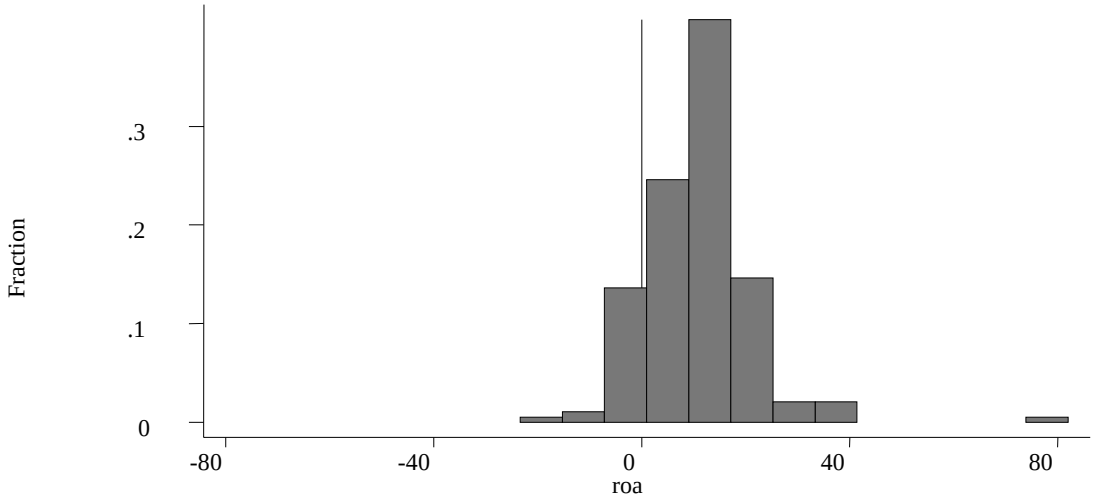


Figure 3 Histogram of return on equity ratio (n = 191)

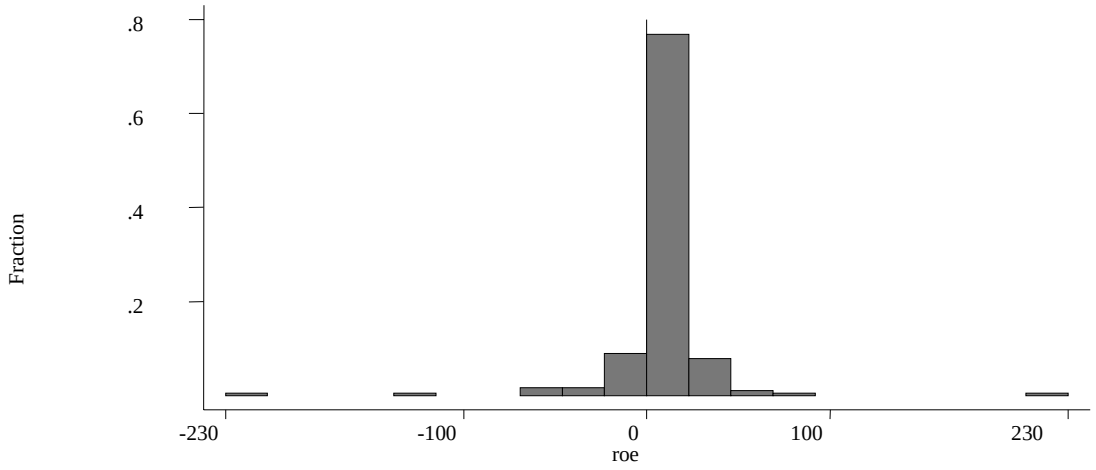


Table 5 provides some summary statistics over time for the profitability ratios used in the long panel. Looking at the trimmed mean and median columns, it is seen that the three ratios follow a similar path through time. The results indicate that the profitability of firms on the IBIS database peaked in 1988 and 1994/1995 and fells to its lowest level in 1991. The standard deviations of these ratios show that the variability in the return on assets is almost always less than either the return on equity or the EBDIT margin. The standard deviations of the return on equity is normally higher that the EBDIT margin, but in some years the reverse is true. The standard deviations suggest that, at the aggregate level at least, profitability across firms varies substantially.

Table 5 Summary statistics for the long panel

Year	Tmean			Median			sd		
	ROA	ROE	EBDITM	ROA	ROE	EBDITM	ROA	ROE	EBDITM
1985	11.4%	11.8%	10.6%	10.9%	11.8%	9.8%	8.6%	10.1%	15.3%
1986	11.8%	11.4%	11.4%	12.0%	11.6%	10.0%	11.3%	23.1%	17.4%
1987	12.2%	11.7%	12.4%	12.3%	11.9%	10.2%	14.6%	26.0%	18.2%
1988	12.8%	13.2%	12.8%	12.7%	12.8%	10.4%	14.3%	13.5%	19.5%
1989	12.5%	13.0%	12.6%	12.9%	12.8%	9.6%	10.9%	16.7%	25.9%
1990	11.4%	9.5%	11.8%	11.9%	10.2%	9.5%	12.1%	23.6%	32.7%
1991	9.3%	5.9%	9.3%	10.0%	8.3%	8.6%	13.1%	34.0%	25.4%
1992	9.9%	6.4%	9.6%	10.6%	7.8%	8.6%	12.4%	30.0%	21.2%
1993	10.4%	8.9%	10.5%	11.1%	9.6%	9.0%	9.4%	20.3%	17.0%
1994	11.2%	12.1%	11.0%	11.7%	11.5%	9.8%	9.8%	21.3%	17.2%
1995	11.3%	12.1%	11.4%	11.3%	11.2%	10.0%	9.5%	38.4%	15.7%
1996	10.4%	10.3%	10.6%	11.5%	9.8%	9.1%	10.1%	29.8%	18.1%

Table 6 shows a similar set of statistics for the short panel. The short panel has significantly more firms – 671 compared to 191 in the long panel. As discussed above, the characteristics of the short panel are different. Comparing the common years between Table 5 and Table 6, we see that the trimmed mean and median for the return on assets and the EBDIT margin are always lower in the short panel. In contrast, the trimmed mean for the return on equity is higher in the short panel from 1993, and the median return on equity is higher in 1994 (although the magnitude of the differences are small). The reasons for these differences may be attributed to the different firm characteristics between the long and the short panel. An obvious hypothesis is that profitability is dependent upon firm size, although the comparison of the return on equity suggests any such relationship may not be stable across profitability measures.

The standard deviations for the short panel are generally higher than the equivalent years in the long panel. Again, one hypothesis from this is that smaller firms have greater variation in profitability within a single year. Note that the standard deviation for return on equity is markedly higher than the other two measures, which may be due to a small number of extreme values in the ratio.

Table 6 Summary statistics for the short panel

Year	Tmean			Median			sd		
	ROA	ROE	EBDITM	ROA	ROE	EBDITM	ROA	ROE	EBDITM
1990	9.6%	7.8%	8.9%	9.6%	8.3%	7.3%	90.2%	94.6%	44.9%
1991	8.2%	4.9%	7.0%	8.6%	6.6%	6.5%	15.3%	84.4%	21.3%
1992	8.8%	5.9%	7.5%	8.7%	7.3%	6.4%	13.4%	44.9%	18.9%
1993	10.0%	9.3%	8.9%	10.1%	9.6%	7.7%	15.7%	114.5%	19.5%
1994	10.9%	13.0%	9.7%	10.8%	11.9%	8.4%	28.3%	145.8%	26.3%
1995	10.6%	12.3%	9.7%	10.8%	11.4%	8.5%	14.6%	33.8%	16.0%
1996	9.9%	10.5%	9.5%	10.1%	10.4%	7.9%	11.0%	46.5%	16.2%

Table 7 and Table 8 show how the correlation coefficients between the three profitability ratios for each of the panels. Two sets of correlation coefficients are shown in each table. The first set is for the full sample and the second set is for a restricted sample (where all observations above 100% and below –100% are omitted, although this is an arbitrary way to restrict the sample, it does allow an indication of the importance of outliers). The long panel results indicate a relatively high correlation between the return on assets and the return on equity (0.61) which is consistent with stylized fact 1. The correlation between the return on assets and the EBDIT margin is lower (0.53), with the lowest correlation being between the return on equity and the EBDIT margin (0.32). Thus for the long panel, the correlations of the EBDIT margin with the rates of return measures are similar to those found by Amato & Wilder (1995) and Liebowitz (1982) for the US. Restricting the sample to exclude extreme values (the right hand block of Table 7) we see that the correlation coefficients are similar in magnitude and sign.

Table 7 Correlations between profitability measures (long panel)

Fullsample				Restricted sample			
	Roa	Roe	Ebditm		Roa	Roe	Ebditm
Roa	1			**Roa**	1		
Roe	0.6093	1		**Roe**	0.5439	1	
Ebditm	0.5282	0.3247	1	**Ebditm**	0.5711	0.2852	1

Table 8 Correlations between profitability measures (short panel)

Full sample				Restricted sample			
	Roa	**Roe**	**Ebditm**		**Roa**	**Roe**	**Ebditm**
Roa	1			**Roa**	1		
Roe	0.104	1		**Roe**	0.6014	1	
Ebditm	0.6968	0.1067	1	**Ebditm**	0.5816	0.2895	1

Table 8 shows the equivalent correlation coefficients for the short panel. The correlation coefficient between the EBDIT margin and the return on assets is higher than in the long panel (0.70), but the two correlations involving the return on equity are substantially lower (around 0.1). After inspecting the data, it appears that the low correlations for the return on equity are due to a number for extreme values in the short panel. The correlations from the restricted sample confirm this, with their magnitudes being strikingly close to those in Table 7. These results suggest that the correlation between profitability measures is highest between the EDBIT margin and the return on assets, lower for the return on assets and the return on equity, and is lowest for the return on equity and the EBDIT margin. As noted in section 5, previous studies of the relationships between measures yielded a wide range of values. These previous studies make no mention of the presence of outliers which, as illustrated above, can dramatically affect the results. These results are close to Collins and Preston (0.8) but are not consistent with Liebowitz who finds much lower correlations (stylized fact 2). There appears to be a low correlation between the PCM (or EBDIT margin) and the return on equity.

7 Industry, ownership and firm size

This section takes a preliminary look at the performance measures by industry and for a number of sub-groups of firms. Industry is taken at the one digit ANZSIC level. The sub-groups we consider are: government versus non-government; foreign versus Australian owned; manufacturing versus non manufacturing; stock market listed versus non-listed; and large and small. These groups are certainly not the only categorisations of interest, but they provide an initial starting point for investigating enterprise performance. Table 9 indicates in which industry the top and bottom 25% performers fall. Ratios are calculated by the percentage of firms in the top/bottom 25% in each ANZSIC category divided by the percentage of firms in each ANZSIC category for the entire sample. If profitability does not vary across ANZSIC categories then we would observe a ratio of 1. Mining related firms comprise the largest proportion of firms in the top 25% with a ratio exceeding 1 for all measures of profitability. The same ratios above were also observed for manufacturing, communication services, property and business services and cultural and recreational services. Health and community services on the other hand, comprise the largest proportion of firms falling in the bottom 25% of performers followed by wholesale trade, accommodation, cafes and restaurants. Finance and insurance is also significantly over-represented in terms of the EBDIT margin and the return on assets for the bottom 25% of firms. It is very difficult to draw any strong conclusions from these results as different industries have different structures and measures such as the return on equity or the return on assets may not be directly comparable.

Table 9 Top and bottom performers by industry (short panel)

ANZSIC Category	Ratio of Top 25% of Performers to All Performers			Ratio of the Bottom 25% of Performers to All Performers		
	EBDITM	ROE	ROA	EBDITM	ROE	ROA
Agriculture, Forestry and Fishing	0.8	0.8	0.6	0.5	1.7	0.6
Mining	3.0	1.0	1.9	0.4	1.1	0.4
Manufacturing	1.0	1.1	1.4	0.4	0.9	0.3
Electricity, Gas and Water Supply	3.6	0.2	0.6	0.0	1.2	0.2
Construction	0.0	0.6	0.7	1.1	1.3	0.7
Wholesale Trade	0.2	1.1	0.6	1.4	1.2	1.1
Retail Trade	0.4	1.2	1.4	0.7	1.0	0.4
Accommodation, Cafes and Restaurants	2.3	0.0	0.0	1.1	1.2	1.1
Transport and Storage	1.9	0.5	1.1	0.3	0.9	0.4
Communication Services	1.5	1.7	2.1	0.0	0.7	0.0
Finance and Insurance	0.5	0.9	0.1	2.9	0.9	3.3
Property and Business Services	1.7	1.1	1.1	0.5	0.9	0.7
Government Administration and Defence	2.5	0.6	0.4	0.2	2.2	1.1
Education	1.1	0.0	0.0	0.7	3.1	2.0
Health and Community Services	0.8	1.0	0.8	2.1	2.6	2.1
Cultural and Recreational Services	2.0	1.1	1.1	0.5	0.7	0.4
Personal and Other Services	1.0	0.3	1.0	0.8	1.6	1.0

Notes: ratio shown is: % of firms from industry in Top 25 (Bottom 25) of all performers / % of firms from industry in entire sample.

We next compare performance between dichotomous groups of firms. The groups chosen are shown in Table 10 Summary statistics by sub-group (long panel). To compare the performance measures for each group, the mean values for each enterprise is taken over time for each sub-group (e.g. for the long panel we find the mean value for the return on assets, the return on equity and the EBDIT margin over the 11 years). The various sub-groups for the long panel are shown in Table and, for the short panel, in Table 11.

Comparing the government with non-government firms, both panels show that government owned firms are the more profitable (in terms of the trimmed means). However, the medians of the return on assets and return on equity ratios indicate results to the contrary. The standard deviations indicate that the variation in government owned firms for the return on equity and the return on assets are much higher that for non-government firms. Thus, the main conclusion about the return on equity and the return on assets for government owned firms is a much larger dispersion of values than in the private sector.

The long panel shows that foreign owned firms are more profitable than Australian owned firms, if measured using the return on assets or the return on equity. In contrast, the short panel shows that Australian firms are always at least as profitable as foreign owned firms, regardless of the profitability measure employed.

Both panels indicate that manufacturing firms are more profitable than non-manufacturing firms for every profitability ratio calculated. Also, in the long panel, the standard deviation of the manufacturing firms is substantially less than non-manufacturing firms. However, this somewhat striking result does not hold for the short panel.

Listed firms are found to be more profitable than non-listed firms for the return on assets and the EBDIT margin ratios. When the return on equity ratio is used, non-listed firms are found to be more profitable in the long panel, however, in the short panel the listed firms have a higher median return on equity.

The results from both panels do not indicate a difference in the profitability of small and large firms. This is inconsistent with stylized fact number 6, which states that large firms are more likely than small firms to adopt accounting practices that lower current profits and increase the rate of return.

A general summary of the sub-group differences is that there are considerable differences between the long and short panel, and also between the measures used. Although such differences mean that simple statements about differences in profitability are not possible, it also means that there is substantial scope for investigating the determinants of profitability at a more micro level.

Table 10 Summary statistics by sub-group (long panel)

Company Type	Tmean			Median			sd		
	ROA	ROE	EBDITM	ROA	ROE	EBDITM	ROA	ROE	EBDITM
Government	11.7%	17.6%	24.9%	8.3%	9.2%	26.5%	26.4%	64.6%	23.8%
Non-government	11.7%	10.0%	11.6%	11.6%	10.9%	9.6%	11.5%	25.3%	20.9%
Foreign owned	12.4%	12.0%	10.2%	12.4%	11.8%	8.9%	12.1%	25.5%	23.3%
Australian owned	10.6%	10.1%	11.6%	11.2%	10.3%	10.2%	11.1%	25.2%	19.4%
Manufacturing	14.8%	11.8%	11.9%	14.3%	11.4%	10.9%	7.5%	14.6%	9.4%
Non-manufacturing	8.5%	9.9%	10.5%	9.0%	10.2%	7.4%	13.4%	30.9%	26.3%
Listed	11.6%	10.4%	12.1%	11.9%	10.5%	10.3%	9.3%	24.2%	22.0%
Non-listed	10.7%	11.3%	9.9%	10.7%	11.2%	8.3%	13.8%	26.4%	19.5%
>1000 employees	11.6%	10.7%	10.5%	11.9%	11.2%	10.0%	10.0%	23.4%	19.0%
<1000 employees	11.8%	10.9%	12.6%	10.5%	9.9%	8.3%	14.2%	28.7%	24.3%

Table 11 Summary statistics by sub-group (short panel)

Company Type	Tmean			Median			sd		
	ROA	ROE	EBDITM	ROA	ROE	EBDITM	ROA	ROE	EBDITM
Government	11.6%	13.5%	18.9%	6.6%	6.1%	13.8%	26.0%	49.0%	30.7%
Non-government	10.8%	9.1%	9.2%	9.9%	9.3%	7.5%	37.7%	89.5%	25.1%
Foreign owned	9.3%	9.0%	6.5%	9.1%	9.3%	5.9%	12.4%	124.7%	16.6%
Australian owned	10.1%	9.1%	11.2%	10.5%	9.3%	9.6%	51.1%	33.7%	30.8%
Manufacturing	13.4%	10.8%	10.3%	13.0%	10.6%	9.6%	58.2%	39.0%	26.2%
Non-manufacturing	7.8%	8.2%	8.0%	7.4%	8.6%	5.5%	19.7%	107.0%	24.5%
Listed	11.6%	9.2%	11.8%	11.9%	9.9%	10.5%	20.7%	32.0%	23.2%
Non-listed	8.7%	9.3%	7.1%	8.3%	8.7%	5.9%	44.2%	108.9%	26.0%
>1000 employees	10.5%	7.9%	9.6%	11.0%	9.0%	8.9%	51.9%	87.8%	29.0%
<1000 employees	11.1%	10.3%	8.0%	8.7%	9.7%	6.1%	15.3%	91.0%	20.8%

8 Firm performance and the business cycle

Section 6 above indicated that the various performance measures vary over time. Figure 4 plots the three profitability measures (for the long panel) against the annual percentage change in GDP (income based) over the period 1985 to 1996. We would

expect that there would be some correlation between the profitability measures and GDP since one of the components of GDP is company profitability. Figure 4 shows that all three profitability ratios move, to some extent, with the business cycle. One exception appears to be the GDP downturn from 1985 to 1987 during which the three profitability measures rose slightly. The 1990/1991 recession is clearly reflected by the downturn of the three profitability measures, with the return on equity showing the strongest downturn.

Return on equity appears to be the measure that is most sensitive to the business cycle. Previous literature has suggested that the EBDIT margin is less volatile (see stylized fact 3 in section 4) and this does appear the case, although the EBDIT margin and return on assets closely follow each other.

Figure 4 Profitability measures and annual percentage change in GDP

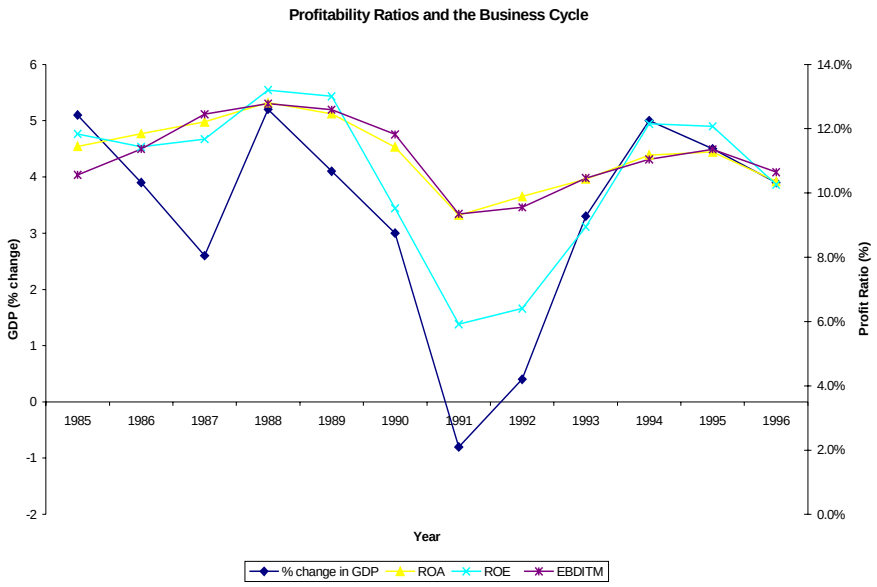
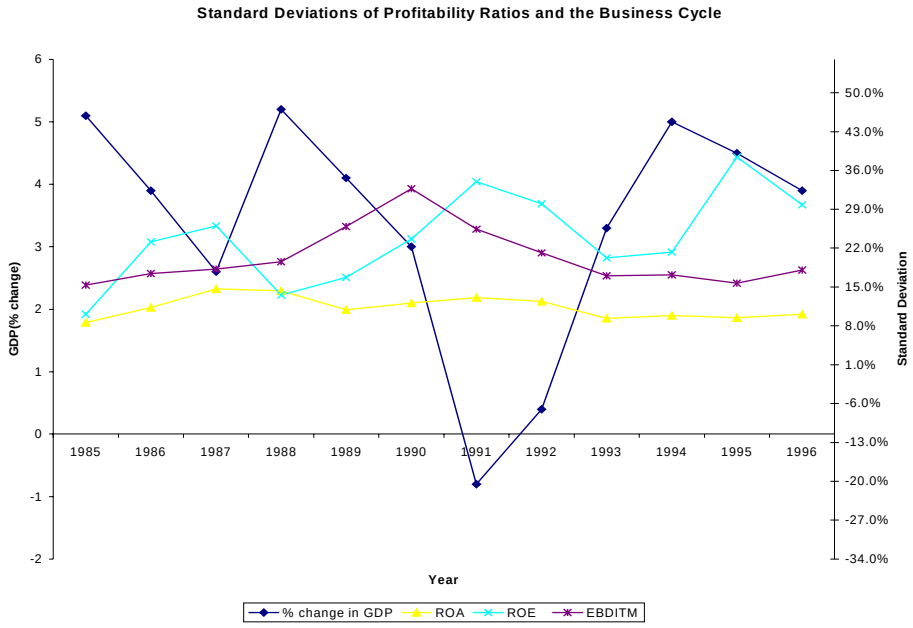


Figure 5 shows the time path of the standard deviation of the three different profitability measures. The standard deviations of the return on assets and the EBDIT margin do not appear to be related to the business cycle. In contrast, the standard deviation for the return on equity exhibits a counter-cyclical relationship.

Figure 5 The standard deviation of profitability measures over time



9 Persistence in firm profitability

An interesting area of research concerns the persistence of firm profitability over time. The extent of persistence in a firm's profitability gives us an insight into the competitive nature of the economy or industry under consideration. Since the essence of competition is the pursuit of profitable opportunities, a firm with high levels of profitability should – in a simple world - attract competitors, and profits should be bid down to a long run competitive level. Obviously, the existence of various barriers to entry mean this is unlikely to always happen. Scherer (1990, p.442) states, "a properly formulated dynamic theory indicates that one should expect to see especially profitable firms' returns decline unless barriers to entry are sufficiently high". Mueller (1990) contains a series of papers that attempt to empirically estimate some formal models of persistence of firm profits. These papers can be thought of as developing the Schumpeterian model of 'creative destruction' where new waves of innovation – new products, processes, etc – create monopolies and, at the same time, destroy existing monopolies. Such a process implies that firm profitability will not exhibit

persistence. In fact, much of the empirical evidence suggests that firm profits do exhibit persistence.[8]

The purpose of this section is to provide some basic evidence of the level of persistence in the IBIS data base for the three measures of profitability. Readers may be disappointed that the analysis is not expanded and fully compared to other studies. However, to undertake such an analysis properly would require a much more detailed analysis using more advanced time series techniques. Such analysis is left for future work.

Table 12 shows one method of forming an assessment of the persistence of firm profitability. The table contains a separate section for each of the profitability measures. Starting with the top section, which considers the return on equity, the four rows represent quartiles of firm performance. The Top 25% quartile represents the firms that were in the top 25% when ranked by the return on equity. The initial column has a 1 in this row, which shows that in 1986 (the year we start tracking this cohort) all the firms were, by definition, in the top quartile. The second column (1987) shows how the top firms in 1986 performed in 1987, 71% of them were still in the top quartile, 21% were in the second quartile, 7% had fallen to the third quartile and none had fallen to the lowest quartile. After two years, the top 25% of firms has dispersed so that less than 50% of firms who were initially in the top 25% remain. By 1991, nearly 30% of them had fallen into the bottom 25% of the firms in the panel. Looking at the final column, we can see that by 1996 the top performers in 1986 had become fairly evenly spread across the quartiles. Therefore, for the return on equity at least, there is little evidence of persistence after 10 years.

The next two sections of Table 12 show similar statistics for the return on assets and the EBDIT margin. Each section traces the top 25% of firms in 1986 through time for each profitability ratio.[9] These profitability measures exhibit a different pattern of

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[8] Scherer (1990, p.443) states, "the bulk of the carefully derived evidence on [the persistence of profitability] suggests that [..] profitability differences among firms tend to persist over long periods of time for the United States and a number of other countries".

[9] In this section we have started the analysis on the second year of data since this has a denominator for RoE and RoA that is an average of two years data.

persistence. Looking over the entire 10 years we can see that the return on assets exhibits stronger persistence than the return on equity, and that the EBDIT margin illustrates stronger persistence than ROA. For the EBDIT margin, of firms in the top 25% in 1986, 65% of them were still there in 1996.[10]

Table 12 Tracking cohort of most profitable firms across time (long panel)

ROE											
	1986	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**
Top25%	1	0.71	0.46	0.42	0.44	0.38	0.38	0.33	0.38	0.33	0.29
Mt25%	0	0.21	0.25	0.21	0.21	0.21	0.21	0.25	0.27	0.21	0.27
Mb25%	0	0.08	0.17	0.17	0.19	0.12	0.15	0.15	0.15	0.21	0.19
Bot25%	0	0	0.12	0.21	0.17	0.29	0.23	0.23	0.17	0.21	0.23

ROA											
	1986	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**
Top25%	1	0.75	0.62	0.58	0.56	0.52	0.5	0.48	0.52	0.5	0.52
Mt25%	0	0.21	0.25	0.23	0.25	0.25	0.29	0.31	0.23	0.31	0.23
Mb25%	0	0.04	0.1	0.08	0.15	0.17	0.15	0.17	0.23	0.15	0.17
Bot25%	0	0	0.02	0.1	0.04	0.06	0.06	0.04	0.02	0.04	0.08

EBDIT Margin											
	1986	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**
Top25%	1	0.81	0.79	0.77	0.75	0.69	0.75	0.73	0.71	0.69	0.65
Mt25%	0	0.15	0.15	0.12	0.17	0.21	0.12	0.15	0.15	0.19	0.17
Mb25%	0	0.04	0.04	0.04	0.06	0	0.04	0.04	0.06	0.04	0.1
Bot25%	0	0	0.02	0.06	0.02	0.1	0.08	0.08	0.08	0.08	0.08

Table 13 produces a similar set of statistics for the six years available in the short panel. Again, we see a similar pattern of results to those for the long panel, with the return on equity being less persistent than the return on assets, which in turn shows less persistence than the EBDIT margin. These results illustrate that persistence varies according to which measure of profitability is used. Furthermore, as might be

[10] Comparing others studies to the results here is problematic since different methods are used. For example, Khemani and Shapiro (1990) conduct a study on Canadian firms using an autoregressive first order equation (i.e. $\pi_t =$ $+ \pi_{t-1}$). The profitability variable is RoA and they analyse the initial and long run profitability values for each firm, finding that "one can state that they are persistence differences in firms" (Khemani and Shapiro, 1990, p.82).

expected, they indicate that firm profitability exhibits some persistence. Further analysis on, for example, how such persistence varies across industries and what are the determinants of high individual firm persistence are questions for further research.

Table 13 Tracking cohort of most profitable firms across time (short panel)

ROE						
	1991	**1992**	**1993**	**1994**	**1995**	**1996**
Top25%	1	0.62	0.5	0.43	0.35	0.38
Mt25%	0	0.23	0.27	0.25	0.31	0.33
Mb25%	0	0.09	0.14	0.19	0.19	0.14
Bot25%	0	0.05	0.09	0.12	0.15	0.14

ROA						
	1991	**1992**	**1993**	**1994**	**1995**	**1996**
Top25%	1	0.74	0.65	0.6	0.54	0.58
Mt25%	0	0.2	0.26	0.29	0.31	0.3
Mb25%	0	0.05	0.06	0.1	0.11	0.11
Bot25%	0	0.02	0.03	0.02	0.04	0.02

EBDIT Margin						
	1991	**1992**	**1993**	**1994**	**1995**	**1996**
Top25%	1	0.82	0.77	0.74	0.72	0.68
Mt25%	0	0.11	0.19	0.21	0.22	0.24
Mb25%	0	0.04	0.02	0.03	0.02	0.05
Bot25%	0	0.04	0.02	0.02	0.04	0.02

An alternative method of describing the extent of persistence is to calculate correlation coefficients for the profitability measures between years. One potential difficulty that was encountered in calculating such correlations was the presence of outliers. Two methods to overcome this problem were used: first, the use of a trimmed correlation coefficient (where the top and bottom 5% of the distribution are omitted) and second the use of Spearman rank correlations (which are less sensitive to outliers).

Table 14 and Table 16 show year-on-year correlations for the return on equity, the return on assets and the EBDIT margin, with the basic correlation coefficient (corr), the trimmed correlation coefficient (corrT), the Spearman rank correlation (Spear) and

the trimmed Spearman rank correlation (SpearT) for the panels. It can be seen that the basic correlation coefficients can vary dramatically (for example the 0.08 value for 1994-1995 for the return on equity). Considering the trimmed correlation coefficients and the Spearman rank correlations, again we see that the return on equity has the lowest year-on-year correlations. Most of the time the correlations for the EBDIT margin are larger than the return on assets (although this is not true for the trimmed correlation coefficients in the 4 years following 1991-1992).

These results can be compared to the results in Baldwin (1995, p.333). Although Baldwin uses industry level data, his results also suggest the PCM is the most persistent with year-on-year correlation coefficients of around 0.9 (only the single year on year correlation for 1972-1973 is reported). Further, Baldwin finds that industry level correlations for the return on equity and the return on assets are much smaller (around 0.5 to 0.6).

Table 15 Year-on-year correlations for the long panel

Year	ROE				ROA				EBDITM			
	Corr	CorrT	Spear	SpearT	Corr	CorrT	Spear	SpearT	Corr	CorrT	Spear	SpearT
8687	0.8	0.67	0.74	0.68	0.68	0.83	0.86	0.83	0.87	0.84	0.91	0.88
8788	0.68	0.5	0.65	0.57	0.92	0.83	0.85	0.81	0.9	0.87	0.9	0.85
8889	0.65	0.53	0.54	0.54	0.47	0.82	0.74	0.76	0.35	0.92	0.82	0.91
8990	0.65	0.43	0.51	0.43	0.82	0.72	0.76	0.7	0.84	0.92	0.85	0.87
9091	0.47	0.42	0.5	0.49	0.66	0.76	0.73	0.75	0.09	0.79	0.75	0.83
9192	0.66	0.59	0.61	0.61	0.8	0.78	0.8	0.79	0.61	0.76	0.86	0.81
9293	0.55	0.48	0.53	0.59	0.77	0.8	0.78	0.79	0.81	0.67	0.83	0.76
9394	0.45	0.42	0.48	0.53	0.79	0.81	0.78	0.79	0.89	0.75	0.84	0.76
9495	0.08	0.54	0.56	0.58	0.82	0.81	0.81	0.79	0.84	0.8	0.82	0.79
9596	0.64	0.6	0.68	0.65	0.84	0.84	0.83	0.84	0.82	0.85	0.87	0.85

Table 16 Year-on-year correlations for the short panel

Year	ROE				ROA				EBDITM			
	Corr	CorrT	Spear	SpearT	Corr	CorrT	Spear	SpearT	Corr	CorrT	Spear	SpearT
9192	0.61	0.49	0.59	0.59	0.52	0.76	0.74	0.77	0.61	0.78	0.78	0.8
9293	0.66	0.46	0.54	0.54	0.72	0.75	0.75	0.76	0.72	0.76	0.79	0.75
9394	0.83	0.43	0.49	0.52	0.51	0.79	0.76	0.79	0.41	0.79	0.81	0.81
9495	0.17	0.5	0.56	0.58	0.15	0.77	0.74	0.77	0.51	0.77	0.8	0.77
9596	0.48	0.46	0.53	0.54	0.58	0.74	0.75	0.74	0.81	0.81	0.84	0.82

10 Comparison with other countries

Finally, although it is not central to this paper, it is of interest to consider Australia's performance compared to other OECD countries. Table 17 shows one profitability measure – the rate of return on capital which is similar to total assets used above for the return on assets measure – for the business sector of five OECD countries. The most startling aspect of the figures is the relatively high rate of return earning by US companies. The table shows an overall increase in the Australian rate of return from 11% in 1985 to over 14% in 1997. This rate of return is higher than that of the UK and of Japan, the latter having experienced a declining rate of return since 1989. The Australian rate of return is marginally below that of Germany, but is significantly below the high and rising rate of return for the US, which approaches 29% in 1997.

Table 17 Comparison of the rate of return on capital

Rate of Return on Capital in the Business Sector: International Comparisons					
	Australia	**Germany**	**US**	**UK**	**Japan**
85	11.01	11.99	21.92	10.17	13.55
86	10.58	12.49	22.08	9.69	14.02
87	11.47	12.28	22.11	10.15	13.82
88	12.58	12.79	22.58	10.15	14.63
89	13.23	13.07	24.06	9.67	14.94
90	12.45	13.7	23.8	9.08	14.92
91	11.91	12.94	23.22	8.87	14.66
92	12.26	12.77	24.44	10	14
93	12.48	12.47	25.25	11.37	13.57
94	13.06	13.33	26.16	12.25	13.08
95	13.47	13.83	26.61	12.1	12.66
96	13.92	14.37	27.68	12.61	13.38
97	14.28	15.25	28.79	12.7	12.54

Source: OECD Economic Outlook. The capital stock estimates which are used to compute the rates of return cover only assets included in non-residential gross fixed capital formation and hence exclude dwellings, inventories, monetary working capital, land and natural resources. The historical capital stock data are obtained from national sources whenever possible. For the projection period they have been extrapolated using the perpetual inventory method, which involves accumulating past investment and dropping out assets at the end of their service lives.

11 Conclusion

This paper has analysed the profitability of two panels of large Australian firms from the IBIS database. The long panel is from 1985 to 1996 and contains 191 firms; the short panel is from 1990 to 1996 and contains 671 firms. Three measures of profitability were used: the return on assets (ROA), the return on equity (ROE) and the earnings before depreciation interest and tax (EBDIT) margin. Perhaps the main conclusion from the paper is that each profit measure can lead to a different conclusion concerning firm performance. This is true even though the three measures are positively correlated to each other. For example, EBDIT margin and ROA have correlation coefficient of between 0.5 and 0.7 (depending on the panel used). Part of the reason for this is the large variation in firm profitability. Furthermore, in every year each of the profitability measures has a number of outliers which can greatly influence any analysis. Return on equity has the largest variation in values with, for example, values range between ± 230% in the long panel of 191 firms. The large variation in the firms' profitability measures appears to be due to both across firm variation and within (i.e. overtime) firm variation – although this point has not be formally investigated.

With the above points in mind, a number of other conclusions can be made. Looking at differences in profitability by industry sector, we find that the 'mining' and 'communications' sectors appear to be consistently high performers, while 'wholesale trade', 'accommodation, cafes and restaurants', and 'health and community services' appear to be consistently low performers (see Table 9). Tables 10 and 11 also compare the profitability of certain sub-groups. Here we find that manufacturing firms are more profitable than non-manufacturing firms (for all measures of profitability) and that listed firms are more profitable than non-listed firms (for ROA and EBDIT margin but not for ROE). In contrast, we find no consistent evidence of a difference in profitability between foreign and domestic firms, government and non-government firms, and large and small firms. By 'consistent' we mean that the results hold for both long and short panel and for all three measures of profitability. This suggests that understanding firm profitability requires more in-depth study of individual firm's

characteristics – a largely expected result – but also that different accounting measures may yield contradictory results.

All of the three profitability measures move with the business cycle, with the return on equity measure showing the greatest volatility. The persistence of firm profitability is also investigated (i.e. do the same firms remain profitable over time). Here we find that year-on-year correlation coefficients of profitability are around 0.4 to 0.6 for ROE, 0.7 to 0.8 for ROA, and 0.7 to 0.9 for EBDIT margin (see Table 14 and 15). However, these results are based on a trimmed sample since outliers in the full sample can lead to much lower coefficients. Table 12 also shows how the cohort of most profitable firms in 1986 (the top 25%) perform over the next 10 years. The results show that the EBDIT margin exhibits the greatest persistence: 65% of the firms in the top 25% in 1986 are still in the top 25% in 1996. In contrast, focusing on ROE we find that only 29% of the top cohort of profitable firms in 1986 are still the most profitable in 1996. At the other extreme, 23% of the top performers by ROE in 1986 are the in the lowest quartile of performers in 1996.

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