The Cash Hoarding Behaviour of Australian Firms

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There are two practical issues in testing Jensen's free cash flow theory; first, constructing an appropriate proxy for free cash flow and secondly, identifying firms with free cash flow. Thus, in addition to the cash holdings used by most of previous studies in the examination of free cash flow theory, this study employs three flow measures based on operating cash flows. Our results reveal that the stock and flow measures of free cash give rise to quite different lists of cash rich firms. Investigations of the characteristics of free cash flow firms are also conducted on those firms identified as "robustly cash rich". Results show that robustly cash rich firms have significantly stronger growth opportunities compared to the rest of sample firms, indicating that the cash is likely to have been reserved for financing future investment opportunities and this argument is supported by the finding that most robustly cash rich firms show an increase in capital expenditures in the subsequent year to being identified as robustly cash rich. Moreover, we find that nearly half of the robustly cash rich firms have made a takeover attempt within three years of being identified as robustly cash rich.

Field of Research: free cash flow, cash holdings, agency problem

1. Introduction

The discretion that managers have in employing liquid assets has been the subject of much debate as liquid assets held by corporations are large in total and often constitute a substantial portion of a firm's total assets. This study finds that over the period between 1992 and 1999, Australian companies held, on average, 14.2% of their total assets as cash. One explanation for the observed high level of corporate cash holdings in Australia is the high proportion of resources firms. As resource firms often have high start-up and development costs, they have greater incentives to hold more cash.

Apart from the differences in industry mix, why do Australian firms hold such large amounts of cash? From a shareholder's perspective, are large cash balances value-adding or value-destroying? Agency theory implies that cash held in excess of normal requirements is value-decreasing; however, an alternative perspective is that "excess" cash is a value-increasing response to capital market imperfections, in particular, the information asymmetry between the market and the firm (Myers & Majluf, 1984). To test which of the two perspectives is most relevant to the Australian market requires that we determine the cash generating and hoarding behaviour of Australian companies. This is the first objective of this study. The second objective is

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to identify those firms that are cash rich and thus most likely to be free cash flow firms in Jensen's sense, i.e., firms that are likely to make value-decreasing capital investments for shareholders.

Harford (1999) finds evidence consistent with Jensen's (1986) free cash flow hypothesis based on a sample of US firms over the period 1950-1994. Harford reports that cash rich firms are more likely to make takeover attempts and carry out diversifying acquisitions. Schwetzler and Reimund (2004) examine the cash holdings of German firms also find evidence supporting the free cash flow hypothesis. They find that compared to a sample of firms matched on industry and firm size, firms with persistent excess corporate cash holdings over a three-year period have significantly lower operating performance. However, there is also evidence against the free cash flow theory. For example, Gregory (2005) tests the free cash flow hypothesis by examining the long-run abnormal performance of UK acquirers and finds that acquirers with high free cash flow outperform acquirers with low free cash flow, contrary to the predictions of the free cash flow hypothesis.

Thus, this paper is motivated by the fact that one difficulty in testing the free cash flow theory is the development of a measure that corresponds with Jensen's (1986) free cash flow definition. Accordingly, in addition to the cash holdings used by most of previous studies in the examination of free cash flow theory [e.g. Harford (1999); Pinkowitz (1988)], this study employs three flow measures based on operating cash flows, including free cash flow, modified free cash flow, and accounting cash flow. Another motivation for this study is that there is a lack of understanding about the cash hoarding behavior of Australian firms and the extent to which agency costs of free cash flow are prevalent in Australian companies. Thus, in this study, we first present the level of cash holdings and cash flow held by ASX-listed companies. From this, we identify companies that are cash rich and provide in-depth analyses of firms identified as "robustly cash rich". Robustly cash rich firms are firms that are cash rich under all four measures of cash.

This study proceeds as follows. Section 2 reviews the literature on why firms have different cash holdings with a particular focus on the market imperfections-based explanations. The sample selection procedures are discussed in Section 3, and in Section 4, four measures of cash are developed. Section 5 presents the descriptive statistics on aggregate and industry levels of cash holdings and cash flow. In Section 6 and 7, cash rich firms and robustly cash rich firms are identified and analysed, respectively. Lastly, in Section 8, conclusions from our findings are provided.

2. Literature Review: What Explains Differences in Cash Holdings?

The free cash flow hypothesis suggests that firms with cash flow in excess of that required to fund positive NPV projects face greater conflict of interests between shareholders and managers, thereby leading to higher agency costs. Since there is a lack of understanding about the cash hoarding behavior of Australian firms and that there has been contradictory evidence on the free cash flow hypothesis as outlined in the previous section, the aim of this study is to examine whether Australian companies suffer from high agency costs of free cash flow. In this section, we provide a review of the variables that have empirically been found to be significant in explaining firms' cash holdings.

2.1 Asymmetric Information and Financial Distress Costs

In their seminal paper, Myers and Majluf (1984) note that asymmetric information between firms and investors makes it costly for firms to raise external finance because investors are not able to distinguish high quality firms from low quality firms. Thus, firms that hold more cash than is required for their current needs may enhance the value of the firm since they run less risks of passing up positive NPV projects.

Large firms are argued to have less information asymmetry problems than small firms (Brennan & Hughes, 1991) in part because large firms have more borrowing capacity relative to small firms and enjoy economies of scale in raising external capital. Hence, the cost of external financing is smaller for large firms.

In addition, Myers and Majluf (1984) argue that firms whose value depends on growth opportunities are more vulnerable to asymmetric information problems. This is because growth firms constantly need cash injections to fund profitable projects. Since information asymmetry makes external financing more expensive than internal financing, firms with greater investment opportunities are expected to hold more cash to avoid missing out on valuable investment opportunities.

Moreover, the ratio of total debt to total assets is sometimes used as a proxy for the cost of financial distress. When the debt ratio is large, it implies that further debt financing is expensive (Baskin, 1987) and that the firm has already accessed the debt market (Faulkender, 2003). For both reasons, firms are likely to hold less liquid assets. On the other hand, firms' leverage and cash holdings may be positively related because firms with a large amount of debt may find it difficult to raise additional funds from the debt market as creditors will demand higher compensation for the perceived higher default risk involved. Hence, they hold more cash to reduce financial distress.

Furthermore, R&D expenditures have been used as a measure of firms' financial distress costs because R&D typically involves large cash outflows (Faulkender, 2003). Thus, firms with large future R&D expenses are likely to hold more liquid assets to avoid financial distress. Although Faulkender (2003) and Opler et al. (1999) adopt different measures of R&D expenditures, both report a positive relationship between R&D and firms' cash holdings.

2.2 Cash Flow Variability and Cash Substitutes

Cash flow variability measures how likely firms will experience a shortage of cash, which can be costly as they may have to forgo profitable investments. Hence, firms with greater cash flow variability are expected to hold more cash to avoid unexpected cash constraints. Also, non-cash liquid assets can provide another source of fund. Thus, firms with high levels of liquid assets besides cash can afford to hold less cash.

In addition, cash flow from operations provides a source of liquidity for firms to meet their debt payments and operating expenditures (Kim *et al.*, 1998). Therefore, firms with high levels of operating cash flow can hold a lower level of cash holdings.

Moreover, net working capital excluding cash provides a measure of the ease of converting non-cash liquid assets into cash. Accordingly, a negative relationship

between the balance of working capital and the level of cash holdings is expected. Studies of large public firms by Opler et al. (1999) and Ozkan and Ozkan (2003) confirm the above prediction. However, Faulkender (2003), who focuses on small firms, reports a positive relationship between the balance of net working capital and the level of cash holdings. Faulkender (2003) argues that for small firms, a high working capital may indicate a low cash conversion cycle and hence small firms are likely to hold more cash to avoid a cash shortage.

3. Sample Selection

The sample for this study consists of companies listed on the Australian Stock Exchange (ASX) over the eight-year period between 1992 and 1999, obtained from the Aspect Financial database. Aspect Financial aims for complete coverage of all companies listed on the ASX; however, the database includes both surviving and non-surviving listed firms only from 1997 onwards. Thus, data prior to 1997 are subject to survivorship bias. The direction and significance of any survival related bias in the findings is unknown because firms can delist for a variety of reasons including being subject to a takeover or poor performance.

The initial sample contains the set of all firms for which accounting information is available on the Aspect Financial database. Initially, 7,686 firms are identified based on the free cash flow measure for the period 1992-1999, and 7,677 firms for the accounting cash flow measure. As different accounting information is required for cash and cash flow measures, the final sample requires accounting data to be available for calculating all four cash measures. Therefore, after excluding companies with incomplete accounting information, the final sample includes 7,376 firms over the period 1992-1999. The information on initial public offerings (IPOs) and secondary equity issues (SEOs) is obtained from SDC Platinum database (SDC) and this information is used in the discussion on "robustly cash rich" firms' characteristics. Information on market capitalisation is obtained from the SPPR Database.

4. Methodology: The Cash Measures

To test the free cash flow theory, previous studies have mostly adopted the cash holdings measure [e.g. Harford (1999); Pinkowitz (1988)]. In order to develop a measure that corresponds more closely with Jensen's (1986) free cash flow definition, this study employs three additional flow measures based on operating cash flows. Thus, in this section, we describe and justify the operational definitions for the four measures of cash used in this study: cash holdings, free cash flow, modified free cash flow and accounting cash flow.

4.1 Cash Holdings (CASH)

Following previous studies, this study defines cash holdings, denoted by CASH, as cash and short-term deposits deflated by total assets. One advantage of this measure is that this information can be easily obtained. Measuring a firm's level of cash holdings is a quick way of assessing its holdings of liquid assets. However, as this is a stock measure taken at the balance date, this measure does not reflect the cash generated from operations.

4.2 Free Cash Flow (FCF)

To overcome the drawback of the CASH measure, this study adopts three additional measures of cash flow, aimed at capturing different dimensions of cash richness. The first flow measure is called free cash flow (FCF), defined as operating cash flow less ordinary dividends, preference dividends, and capital expenditures divided by total assets.

4.3 Modified Free Cash Flow (MFCF)

An issue with the operational definition of free cash flow is that managers have, to varying degrees, discretion over the declaration of ordinary dividends, and the timing, purpose and extent of capital expenditures. This implies that FCF may understate firms' cash richness and their attendant agency problems. Thus, a modified free cash flow (MFCF) measure is derived. MFCF is defined as FCF with ordinary dividends and capital expenditures added back and divided by total assets. In other words, MFCF is measured by operating cash flow less preference dividends divided by total assets.

4.4 Accounting Cash Flow (ACCCF)

Operating cash flows are not necessarily indicative of firm performance. A company may have high net operating cash inflows, and yet perform poorly. The rationale for accrual accounting is that it revises recognition of revenues and expenses to reflect economic reality more accurately (Dechow, 1994). If managers' discretion in using cash is related to how well the company is performing, then accounting cash flow (ACCCF) may be a more appropriate measure for assessing cash richness. The ACCCF is defined as earnings after interest paid, tax paid and dividend paid but before depreciation divided by total assets. This measure of cash flow is, in essence, earnings not tied to claimants.

5. Cash Hoarding Behaviour of Australian Companies

In this section, we examine the cash hoarding behaviour of Australian companies over time. We also investigate if cash hoarding behaviour differs across industries.

5.1 Aggregate Level Summary Data

Table 1 provides summary statistics for annual measures of cash and cash flow over the period 1992-1999. One interesting finding from Table 1 is that while the median values for both CASH and ACCCF remain positive in each sample year, Panel B shows that FCF is always negative; the highest median value of FCF being -2.7% in 1992 and the lowest median value being -5.8% in 1998. If the operational definition of FCF is an accurate proxy for firms' "true" free cash flow, these results suggest that shareholders of most firms need not be too concerned about the agency costs of free cash flow because, on average, firms do not have much free cash.

To explore the relationship between measures of cash holdings and cash flow, Table 2 reports the Pearson and Spearman-rank correlation matrix. Both tests yield the same results in terms of the direction of relationship: CASH is significantly negatively correlated with flow measures. As cash flows are a source of liquidity to meet

imminent demands for cash, firms with high cash flows can be expected to hold less cash.

Table 1: Descriptive Statistics for CASH, FCF, MFCF and ACCCF over the Sample Period 1992-1999

	1992	1993	1994	1995	1996	1997	1998	1999	1992-1999
Panel A: CASH									
Mean	0.123	0.140	0.164	0.130	0.137	0.149	0.138	0.153	0.142
Median	0.053	0.059	0.073	0.054	0.056	0.066	0.054	0.055	0.059
Std. Deviation	0.179	0.193	0.212	0.187	0.196	0.204	0.195	0.226	0.201
Panel B: FCF									
Mean	-0.086	-0.086	-0.123	-0.151	-0.168	-0.172	-0.149	-0.120	-0.135
Median	-0.027	-0.028	-0.048	-0.057	-0.051	-0.057	-0.058	-0.054	-0.049
Std. Deviation	0.250	0.223	0.280	0.394	1.651	1.035	0.510	0.253	0.768
Panel C: MFCF									
Mean	-0.005	0.005	0.000	-0.013	0.000	-0.026	-0.028	-0.018	-0.012
Median	0.026	0.028	0.029	0.023	0.026	0.023	0.021	0.016	0.023
Std. Deviation	0.214	0.180	0.184	0.261	0.343	0.441	0.410	0.234	0.307
Panel D: ACCCF									
Mean	0.010	0.017	0.022	-0.011	0.005	-0.021	-0.045	-0.018	-0.007
Median	0.031	0.040	0.044	0.042	0.040	0.036	0.036	0.034	0.038
Std. Deviation	0.502	0.321	0.234	0.278	0.248	0.344	0.587	0.320	0.372
No. of firms	670	759	887	923	966	1,011	1,032	1,128	7,376

Table 2: Correlation Matrix of Cash Holdings and Three Measures of Cash Flow (Lower Triangle: Pearson / Upper Triangle: Spearman-Rank)

The Pearson correlation is shown in the lower triangle; the Spearman-rank correlation is shown in the upper triangle. Numbers in parentheses are p-values. Asterisks, "*", "**", and "***" indicate two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

	1		2		3		4	
1. CASH			-.158	***	-.168	***	-.211	***
			(.000)		(.000)		(.000)	
2. FCF	-.131	***			.753	***	.539	***
	(.000)				(.000)		(.000)	
3. MFCF	-.171	***	.258	***			.757	***
	(.000)		(.000)				(.000)	
4. ACCCF	-.199	***	.213	***	.599			
	(.000)		(.000)		(.000)			

5.2 Industry Level Summary Data

One reason for reviewing cash holdings and cash flow at the industry level is that variations in cash holdings and cash flow are a function of business operations and financing demands that vary systematically by industry (Damodaran, 1997). To examine the industry effect, this study adopts the ASX industry classifications scheme, which comprises 24 industry sectors.

Table 3 presents the mean and median values of cash holdings and cash flow by industry sectors over the period 1992 to 1999 and shows that the gold and other metals industries account for 15.6% and 9.7% of listed firms in Australia. The resources sector has a high level of cash holdings, CASH. For example, the median CASH in gold and other metal industries are 20.9% and 21.3%, respectively. The reason that the resources sector tends to maintain a high level of cash holdings is that this industry is highly capital intensive and is characterised by high start-up costs.

Table 3 further shows that free cash flow is negative for most industries except for banks and finance industries whose median values of FCF are 1.7% and 0.2%, respectively. Further, the high-tech industries such as telecommunications, and healthcare and biotechnology are found to have large negative free cash flow. This can be attributed to the fact that most high-tech companies are young, with little prospect for generating cash flows in the near future (Benou & Madura, 2005).

The median MFCF ranges from a minimum of –5.1% for the telecommunications industry to a maximum of 10% for the diversified resources industry. Finally, Table 3 shows that based on the accounting cash flow measure, the transport industry has the highest medium level of ACCCF of 11.1%. The banks and finance industry, on the other hand, has the lowest medium ACCCF of –5.8%.

Table 3: Cash and Cash Flow Measures by Industry Sectors over the Sample Period 1992-1999

Categorisation of industry groups is based on the ASX industry classification scheme as it was in 1999. The sample consists of all firms with available data each year in the Aspect Financial database over the sample period. Firms are included each year if they have the requisite data. CASH is the ratio of cash and short-term deposits deflated by total assets. Free cash flow (FCF) is the ratio of operating cash flow less ordinary dividends, preference dividends, and capital expenditures divided by total assets. Modified free cash flow (MFCF) is the ratio of operating cash flow less preference dividends to total assets. Accounting cash flow (ACCCF) is the ratio of earnings after interest paid, tax paid and dividend paid but before depreciation to total assets.

Industry sector	CASH		FCF		MFCF		ACCCF		No. of firm-years	% of total firm-years
	Mean	Median	Mean	Median	Mean	Median	Mean	Median		
1-Gold	0.209	0.124	-0.227	-0.164	-0.067	-0.042	-0.105	-0.049	1150	15.6
2-Other Metals	0.213	0.134	-0.234	-0.158	-0.085	-0.046	-0.093	-0.048	719	9.7
3- Diversified Resources	0.061	0.036	-0.038	-0.012	0.098	0.100	0.074	0.091	67	0.9
4-Energy	0.188	0.113	-0.275	-0.118	-0.072	0.004	-0.054	-0.012	436	5.9
5-Infrastructure & Utilities	0.195	0.075	-0.153	-0.054	-0.051	0.007	0.010	0.025	83	1.1
6-Developers & Contractors	0.098	0.049	-0.055	-0.027	0.011	0.028	0.067	0.067	285	3.9
7-Building Materials	0.045	0.031	-0.025	-0.019	0.058	0.066	0.078	0.086	147	2.0
8-Alcohol & Tobacco	0.074	0.020	-0.071	-0.046	0.034	0.043	0.079	0.083	128	1.7
9-Food & Household Goods	0.060	0.019	-0.269	-0.023	0.100	0.059	0.097	0.082	221	3.0
10-Chemicals	0.048	0.029	-0.064	-0.015	0.041	0.092	0.050	0.101	50	0.7
11-Engineering	0.086	0.043	-0.022	-0.017	0.052	0.046	0.138	0.083	209	2.8
12-Paper & Packaging	0.026	0.021	-0.020	-0.014	0.069	0.063	0.103	0.084	46	0.6
13-Retail	0.090	0.028	-0.091	-0.026	0.043	0.061	0.056	0.080	234	3.2
14-Transport	0.057	0.028	-0.039	-0.020	0.083	0.083	0.190	0.111	94	1.3
15-Media	0.100	0.030	-0.052	-0.002	0.018	0.052	0.051	0.071	222	3.0
16-Banks & Finance	0.031	0.021	0.001	0.002	0.013	0.011	-0.059	-0.058	118	1.6
17-Insurance	0.115	0.085	0.018	0.017	0.042	0.040	0.023	0.019	62	0.8
18-Telecommunications	0.207	0.107	-0.188	-0.134	-0.065	-0.051	-0.021	-0.039	223	3.0
19-Investment & Financial Services	0.145	0.059	-0.045	-0.009	0.016	0.021	0.010	0.034	846	11.5
20-Property Trusts	0.061	0.022	-0.087	-0.007	0.054	0.056	0.051	0.055	288	3.9
21-Healthcare & Biotechnology	0.190	0.061	-0.157	-0.065	-0.062	0.018	-0.070	0.022	305	4.1
22-Miscellaneous Industries	0.133	0.056	-0.120	-0.053	-0.018	0.023	-0.005	0.044	1062	14.4
23-Diversified Industrials	0.083	0.044	-0.029	-0.018	0.070	0.072	0.074	0.084	179	2.4
24-Tourism & Leisure	0.078	0.038	-0.062	-0.014	0.058	0.062	0.069	0.067	202	2.7

6. Identification and Characteristics of Cash Rich Firms

Two methods of identifying cash rich firms are developed. In the first method, a firm is defined as "cash rich" if one of its cash measures (i.e., CASH, FCF, MFCF or ACCCF) is in the top ten percentile of the sample in any one year. To investigate if cash rich firms tend to cluster in certain industries, Table 4 presents the number and percentage of firms in the top ten percent of each cash measure by industry sectors and shows that cash rich firms measured by the level of CASH are concentrated in resources (i.e., the gold and other metals industries), telecommunications, and healthcare and biotechnology industries.

The adoption of a ten percent cut-off threshold is somewhat arbitrary. Thus, we adopt another method to identify cash rich firms. The second method involves developing a model to predict the "normal" cash requirements for each firm based on their firm and industry factors. To predict a company's level of cash, this study follows the cash model developed by Opler et al. (1999) and utilises the regression methodology.

Based on the literature reviewed earlier on what explains the differences in cash holdings across time, in the following we define the independent variables that are included in the pooled time-series cross-sectional regressions. We have used the same explanatory factors to determine firms' cash holdings and cash flow since both stock and flow measures of cash proxy for the level of liquidity within a firm. **TD_a** measures leverage and is the ratio of total debt to total assets. **Capex_a**, a proxy for financial distress costs, is defined as the ratio of capital expenditures to total assets. **NWC_a**, a proxy for cash substitute availability, is defined as the ratio of net working capital excluding cash to total assets. **SIZE** is the natural log of total assets in 1990 prices, using the consumer price index as the deflator. **MV/BV** is the ratio of book value of total assets minus the book value of equity plus the market value of equity to book value of assets and is a proxy for investment opportunities. **VARCASH** is calculated as the difference between the maximum and minimum values of CASH divided by the average over a six-year period, which includes two years prior to and three years after the sample year plus the sample year itself. **VARFCF, VARMFCF,** and **VARACCCF** is the difference between the maximum and minimum values of FCF, MFCF, and ACCCF respectively divided by the average over a six-year period which, includes two years prior to and three years after the sample year plus the sample year itself.

Following Harford's (1999) approach, sample firms are grouped by industry sectors. Thus, pooled time-series cross-sectional regressions are estimated separately for each industry to account for the liquidity differences across industries, with cash holdings and three other measures of cash flow as the dependent variables. We exclude firms in the financial services industries (including banks & finance, insurance, investment & financial services and property trusts) from the sample when estimating normal cash because these industries have unique accounting and regulatory requirements.

Table 4: Number of Firms in the Top 10% of Each Cash Measure by Industry Sectors over the Sample Period 1992-1999

A firm is defined as "cash rich" if one of its measures of cash is in the tenth percentile in any one year. Categorisation of industry groups are based on the ASX classification scheme as it was in 1999. Sample firms are taken from the Aspect Financial database and are included each year if they have the requisite data. CASH is the ratio of cash and short-term deposits deflated by total assets. Free cash flow (FCF) is ratio of operating cash flow less ordinary dividends, preference dividends, and capital expenditures divided by total assets. Modified free cash flow (MFCF) is the ratio of operating cash flow less preference dividends to total assets. Accounting cash flow (ACCCF) is the ratio of earnings after interest paid, tax paid and dividend paid but before depreciation to total assets. Industries appear in order of their ASX classification number.

Industry	Cash holdings (CASH)		Free cash flow (FCF)		Modified free cash flow (MFCF)		Accounting cash flow (ACCCF)	
	No. of firms in top 10%	% of firms in top 10%	No. of firms in top 10%	% of firms in top 10%	No. of firms in top 10%	% of firms in top 10%	No. of firms in top 10%	% of firms in top 10%
1-Gold	187	16.3	94	8.2	161	14.0	170	14.8
2-Other Metals	127	17.7	52	7.2	48	6.7	47	6.5
3-Diversified Resources	0	0.0	3	4.5	6	9.0	5	7.5
4-Energy	62	14.2	41	9.4	59	13.5	53	12.2
5-Infrastructure & Utilities	14	16.9	4	4.8	2	2.4	2	2.4
6-Developers & Contractors	11	3.9	65	22.8	50	17.5	28	9.8
7-Building Materials	0	0.0	8	5.4	1	0.7	4	2.7
8-Alcohol & Tobacco	5	3.9	14	10.9	5	3.9	12	9.4
9-Food & Household Goods	7	3.2	13	5.9	20	9.0	21	9.5
10-Chemicals	0	0.0	3	6.0	7	14.0	4	8.0
11-Engineering	7	3.3	36	17.2	22	10.5	14	6.7
12-Paper & Packaging	0	0.0	1	2.2	4	8.7	1	2.2
13-Retail	13	5.6	37	15.8	36	15.4	27	11.5
14-Transport	2	2.1	6	6.4	8	8.5	17	18.1
15-Media	12	5.4	32	14.4	31	14.0	36	16.2
16-Banks & Finance	0	0.0	1	0.8	0	0.0	0	0.0
17-Insurance	2	3.2	9	14.5	3	4.8	1	1.6
18-Telecommunications	38	17.0	18	8.1	27	12.1	34	15.2
19-Investment & Financial Services	90	10.6	115	13.6	64	7.6	80	9.5
20-Property Trusts	7	2.4	8	2.8	3	1.0	1	0.3
21-Healthcare & Biotechnology	52	17.0	29	9.5	33	10.8	23	7.5
22-Miscellaneous Industries	95	8.9	119	11.2	121	11.4	133	12.5
23-Diversified Industrials	4	2.2	14	7.8	8	4.5	6	3.4
24-Tourism & Leisure	6	3.0	19	9.4	22	10.9	22	10.9

Cash rich firm-years are defined as the years in which firms' cash holdings (or the other three measures of cash flow) are greater than 1.5 standard deviations of the predicted cash holdings (or the other three measures of cash flow). That is, for each industry, the coefficients from the regression models with year dummies are substituted back into the model to obtain the predicted level of cash. The average predicted values of cash holdings and cash flow for each industry are then calculated. If a firm's cash holdings (or cash flow) are greater than the mean predicted level of cash holdings (or cash flow) plus 1.5 times the standard deviations of the predicted cash holdings (or cash flow), then the firm is classified as cash rich.

Thus, four sets of cash rich firms are obtained. For the remainder of this study, cash rich firms based on the definition of CASH are called Excash rich firms; cash rich firms based on FCF measure are called Exfcf rich firms; cash rich firms based on the definition of MFCF are called Exmfcf rich firms and cash rich firms based on the definition of ACCCF are called Exacccf rich firms.

6.1 Characteristics of Cash Rich Firms

Table 5 provides summary statistics of key financial variables for the four categorisations of cash rich firm-years and compares the characteristics of cash rich firms with the rest of sample firms using Wilcoxon rank-sum z-statistics, which test for differences in the medians between cash rich firms and the rest of sample firms. Panel A of Table 5 reports summary statistics for firms with excess cash holdings (denoted as Excash rich firms) and the rest of sample firms. The mean cash holdings for Excash rich firms are 52.1% while the rest of population firms hold only 7.8% of total assets in cash on average. Panel B shows that Exfcf rich firms and the rest of population firms hold on average 21.8% and -16.8% of FCF, respectively. This difference is statistically significant at the 1% level. Panel C compares firm characteristics of cash rich firms based on excess modified free cash flow (denoted as Exmfcf rich firms) and the rest of population firms. The relatively larger firm size of Exmfcf rich firms suggests that they may actually use their size as an advantage to generate positive operating cash flow. Moreover, the significantly higher market-to-book ratio of Exmfcf rich firms than that of the rest of sample firms implies that they have strong growth opportunities. Panel D shows that the average accounting cash flow of Exacccf rich firms and the rest of population firms are 67.1% and -3.2% respectively and this difference is significant at the 1% level.

7. Identification and Characteristics of Robustly Cash Rich Firms

In this section, we confine our sample to 33 "robustly cash rich" firm-years that arguably are more likely to exhibit free cash flow problems. We define "robustly cash rich" firms as those that are cash rich across all four measures of cash. Given the cash measures, two methods are used to identify robustly cash rich firms.

Table 5: Summary Statistics for Cash Rich Firm-Years and the Rest of Firm-Years

The table presents the mean, median and standard deviation of the financial variables for cash rich firm-years and the rest of firm-years over the period 1992 to 1999 with a Wilcoxon rank-sum test for significant differences in variable median values. Numbers in parentheses are p-values. ***, ** and * denotes significance at the 1%, 5% and 10% level (2-sided), respectively.

Panel A: CASH							Z test for diff.
	Excash rich firm-years			Other firm-years			median
	Mean	Median	Std. Dev	Mean	Median	Std. Dev	
CASH	0.521	0.502	0.228	0.078	0.044	0.086	46.984*** (0.000)
TD_a	0.052	0.002	0.119	0.168	0.133	0.172	-25.606*** (0.000)
Capex_a	0.184	0.038	2.034	0.103	0.055	0.149	-6.616*** (0.000)
NWC_a	-0.015	-0.015	0.191	0.033	0.010	0.196	-7.602*** (0.000)
SIZE	11.275	10.983	1.865	12.740	12.507	2.144	-20.453*** (0.000)
MV/BV	2.709	1.489	5.176	1.741	1.176	4.234	9.865*** (0.000)
VARCASH	1.596	1.532	0.929	2.094	1.946	1.045	-13.970*** (0.000)
No.	966			5,096			

Panel B: FCF							Z test for diff.
	Exfcf rich firm-years			Other firm-years			median
	Mean	Median	Std. Dev	Mean	Median	Std. Dev	
FCF	0.218	0.122	0.311	-0.168	-0.071	0.851	24.189*** (0.000)
TD_a	0.141	0.075	0.160	0.148	0.091	0.172	-0.193 (0.847)
Capex_a	0.038	0.026	0.072	0.120	0.055	0.839	-7.884*** (0.000)
NWC_a	0.007	0.001	0.233	0.026	0.003	0.194	-1.218 (0.223)
SIZE	12.508	12.275	1.965	12.386	12.232	2.446	-0.831 (0.406)
MV/BV	1.800	1.177	2.290	2.006	1.207	4.617	-0.167 (0.868)
VARFCF	0.620	0.536	0.458	0.687	0.645	0.475	-2.518** (0.012)
No.	223			5,839			

Panel C: MFCF							Z test for diff.
	Exmfcf rich firm-years			Other firm-years			median
	Mean	Median	Std. Dev	Mean	Median	Std. Dev	
MFCF	0.278	0.202	0.441	-0.045	0.005	0.308	33.707*** (0.000)
TD_a	0.131	0.083	0.150	0.151	0.096	0.172	-0.948 (0.343)
Capex_a	0.228	0.067	2.693	0.106	0.051	0.327	5.148*** (0.000)
NWC_a	0.005	0.003	0.198	0.027	0.003	0.196	-2.071** (0.038)
SIZE	13.066	12.809	1.994	12.458	12.218	2.177	6.766*** (0.000)
MV/BV	2.138	1.467	3.366	1.874	1.186	4.491	7.416*** (0.000)
VARMFCF	1.306	1.327	0.258	1.294	1.299	0.275	1.011 (0.312)
No.	485			5,577			

Panel D: ACCCF							Z test for diff.
	Exacccf rich firm-years			Other firm-years			median
	Mean	Median	Std. Dev	Mean	Median	Std. Dev	
ACCCF	0.671	0.381	0.947	-0.032	-0.032	-0.032	21.969*** (0.000)
TD_a	0.144	0.080	0.258	0.150	0.150	0.150	-1.061 (0.289)
Capex_a	0.569	0.085	4.695	0.103	0.103	0.103	-3.416*** (0.001)
NWC_a	0.017	0.009	0.257	0.025	0.025	0.025	-0.362 (0.717)
SIZE	12.668	12.347	2.062	12.502	12.502	12.502	-1.529 (0.126)
MV/BV	3.912	1.346	11.569	1.834	1.834	1.834	-3.488*** (0.000)
VARACCCF	1.284	1.124	1.770	1.192	1.192	1.192	-0.897 (0.370)
No.	178			5,884			

Under the first method, a firm is defined as "robustly cash rich" if its four measures of cash (i.e., CASH, FCF, MFCF and ACCCF) are all in the top ten percent in any financial year. Under the second method, a firm is defined as "robustly cash rich" if all cash measures including CASH, FCF, MFCF and ACCCF are greater than 1.5 standard deviations of the predicted cash values. The result shows that there are 29 firm-years (or 25 firms) from the first method and 17 firm-years (or 14 firms) from the second method. Comparing the two lists of robustly cash rich firms reveals that there are a total of 26 different firms across the two methods or 33 firm-years with overlapping firm-years counted just once.

7.1 Characteristics of Robustly Cash Rich Firms

Table 6 reports the levels of cash holdings and cash flow of these robustly cash rich firm-years together with their industry means and medians. Amway Asia Pacific Limited is the only company that has been identified as robustly cash rich for three times (i.e., in 1993, 1995 and 1996) under the first method and twice (i.e., in 1993 and 1996) under the second method over the sample period, and the company belongs to the miscellaneous industries.

Table 7 presents the company characteristics of robustly cash rich firms. It reveals that while 13 out of 33 firm-years (or 8 firms out of 26 firms) have operating history of less than five years, 7 robustly cash rich firm-years (or 5 firms) have more than twenty years of operating history. The results thus show that our sample of robustly cash rich firms consists of both young and mature firms, which are likely to hold cash and cash flow for different reasons. In addition, Table 7 shows that over half of the robustly cash rich firms have smaller firm size and greater market-to-book ratios than their industry medians. This suggests that most robustly cash rich firms have small firm size but high investment opportunities.

Table 8 investigated possible explanations for the observed high cash holdings and cash flow of robustly cash rich firms prior to being identified as robustly cash rich. Of the 33 robustly cash rich firm-years, 17 firm-years (or 53.1%) or 12 firms have initial public offerings three years prior to being classified as robustly cash rich and 4 firm-years (12.5%) have secondary equity issues in the previous three years. This shows that 65.6% of robustly cash rich firm-years have prior equity issuance, either in the form of IPO or SEO. This suggests that equity issuance is a major source of liquidity for these firms and that the high cash holdings and cash flow may be transitory.

To gain an insight into how robustly cash rich firms spend their cash, Table 9 presents the percentage changes in capital expenditure ratio and payout ratio from the year identified as robustly cash rich to one year after. Since these robustly cash rich firms have high levels of undistributed cash and cash flow, paying out excess cash in dividends or spending them on projects indicate a potential reduction in agency problems associated with free cash flow. As capital expenditures may be financed from external sources instead of from internal reserves, Table 9 also reports the ratio of financing cash flow to total assets (CFF) to determine if robustly cash rich firms rely on external funds to support capital expenditures. The fourth column shows that 62.5% have negative financing cash flow in the year identified as robustly cash rich, indicating that their projects have primarily been financed through internal resources.

Table 6: Descriptive Statistics of Four Measures of Cash for Robustly Cash Rich Firm-Years over the Sample Period 1992-1999

Descriptive statistics for robustly cash rich firm-years together with their industry median cash measures are provided. With regard to the industry code, 1 refers to gold industry; 2 is other metals; 3 is the diversified resources; 4 is energy; 11 is engineering; 13 is retail; 15 is media; 18 is telecommunications; 19 is investment & financial services; 22 is miscellaneous; 23 is diversified industrials; and 24 is tourism & leisure. Year refers to the year in which the firm is identified as a robustly cash rich firm. The first column of the table indicates based on which method the firm is identified as robustly cash rich. The first method, "1", defines a firm as robustly cash rich if its four measures of cash are all in the tenth percentile in any one year. The second method, "2", defines a firm as robustly cash rich if its four measures of cash are all greater than 1.5 standard deviations of the predicted values.

Method	Company Name	Indus. Code	Year	CASH Firm	CASH Indus. Median	FCF Firm	FCF Indus. Median	MFCF Firm	MFCF Indus. Median	ACCCF Firm	ACCCF Indus. Median
1	Australian Gold Fields NL	1	1992	0.796	0.184	0.221	-0.126	0.232	-0.042	0.197	-0.057
1,2	Croesus Mining NL	1	1999	0.543	0.092	0.548	-0.143	0.577	-0.038	0.623	-0.066
1,2	Gindalbie Gold NL	1	1998	0.738	0.123	0.461	-0.161	0.522	-0.029	0.515	-0.049
1	Giralia Resources NL	1	1992	0.360	0.184	0.081	-0.126	0.262	-0.042	0.283	-0.057
1,2	Herald Resources Limited	1	1998	0.467	0.123	0.491	-0.161	0.618	-0.029	0.488	-0.049
1,2	Troy Resources NL	1	1994	0.576	0.190	0.697	-0.168	0.707	-0.039	0.636	-0.040
1	Abednego Nickel Limited	2	1992	0.493	0.160	0.206	-0.087	0.394	-0.033	0.321	-0.036
1	Abednego Nickel Limited	2	1994	0.486	0.221	0.186	-0.172	0.346	-0.051	0.319	-0.042
2	Central Asia Gold Limited	2	1994	0.439	0.221	0.373	-0.172	0.417	-0.051	0.408	-0.042
1	Central Asia Gold Limited	2	1995	0.566	0.149	0.204	-0.195	0.250	-0.036	0.217	-0.063
1	Portman Limited	2	1992	0.346	0.160	0.284	-0.087	0.395	-0.033	0.384	-0.036
2	Goldfields Kalgoorlie Limited	3	1998	0.141	0.038	0.208	-0.002	0.736	0.098	0.289	0.093
2	Goldfields Kalgoorlie Limited	3	1999	0.330	0.036	0.239	-0.012	0.484	0.114	0.352	0.071
1	Molopo Australia NL	4	1993	0.791	0.110	0.309	-0.042	0.309	0.037	0.296	0.022
1	Golden West Refining Corporation Limited	11	1995	0.371	0.036	0.153	-0.031	0.168	0.043	0.191	0.091
1	United Group Limited	11	1996	0.444	0.043	0.276	-0.024	0.343	0.047	0.193	0.064
1	ITG Limited	13	1999	0.479	0.030	0.106	-0.033	0.209	0.055	0.185	0.096
1	STW Communications Group Limited	15	1998	0.467	0.039	0.096	-0.016	0.273	0.040	0.188	0.084
1,2	iiNET Limited	18	1999	0.925	0.221	0.209	-0.143	0.415	-0.069	0.444	-0.078
1,2	Mobile Innovations Limited	18	1999	0.640	0.221	0.075	-0.143	0.450	-0.069	0.211	-0.078
1	Challenger International Limited	19	1994	0.532	0.060	0.080	-0.010	0.206	0.020	0.301	0.035
1	Lightning Jack Film Trust	19	1994	0.548	0.060	0.545	-0.010	0.545	0.020	0.556	0.035
1	Lightning Jack Film Trust	19	1996	0.540	0.050	0.071	-0.008	0.625	0.030	0.180	0.037
1	Online Trading Systems Limited	19	1999	0.803	0.075	0.526	-0.015	1.005	0.015	0.768	0.029
1,2	Amway Asia Pacific Limited	22	1993	0.445	0.055	0.096	-0.024	0.442	0.015	0.464	0.043
1	Amway Asia Pacific Limited	22	1995	0.379	0.042	0.101	-0.065	0.216	0.025	0.240	0.058
1,2	Amway Asia Pacific Limited	22	1996	0.584	0.053	0.170	-0.054	0.196	0.011	0.208	0.032
1,2	Bisan Limited	22	1997	0.646	0.052	0.591	-0.065	0.592	0.026	0.495	0.042
1,2	Citect Corporation Limited	22	1997	0.580	0.052	0.104	-0.065	0.431	0.026	0.383	0.042
2	Citect Corporation Limited	22	1999	0.350	0.059	0.075	-0.073	0.447	0.020	0.400	0.035
1,2	Technology One Limited	22	1999	0.807	0.059	0.207	-0.073	0.253	0.020	0.400	0.035
1,2	York Group Limited	23	1995	0.817	0.053	0.859	-0.028	0.859	0.052	0.264	0.094
1,2	UniTAB Limited	24	1999	0.575	0.058	1.238	-0.005	1.894	0.074	1.859	0.076

Table 7: Descriptive Statistics of Robustly Cash Rich Firm-Years Across the Sample Period 1992-1999

Descriptive statistics of company characteristics for robustly cash rich firm-years are presented. Year refers to the year in which the firm is identified as robustly cash rich. Age is defined as the number of years since the firm's incorporation to the year identified as a robustly cash rich. Firm size is the natural log of total assets in 1990 prices. MV/BV is the ratio of book value of total assets minus the book value of equity plus the market value of equity to book value of assets. Capex_a is the ratio of capital expenditures to total assets. The first column of the table indicates based on which method the firm is identified as robustly cash rich. The first method, "1", defines a firm as robustly cash rich if its four measures of cash are all in the tenth percentile in any one year. The second method, "2", defines a firm as robustly cash rich if its four measures of cash are all greater than 1.5 standard deviations of the predicted values.

Method	Company Name	Year	Firm Age	Firm size Firm	Firm size Indus. Median	MV/BV Firm	MV/BV Indus. Median	Capex_a Firm	Capex_a Indus. Median
1	Abednego Nickel Limited	1992	23	12.04	10.72	1.51	1.27	0.09	0.06
1	Abednego Nickel Limited	1994	25	11.88	11.17	1.45	1.50	0.05	0.09
1	Australian Gold Fields NL	1992	30	10.06	10.49	1.47	1.30	0.01	0.07
1,2	Amway Asia Pacific Limited	1993	0	15.00	11.71	8.44	1.18	0.05	0.03
1	Amway Asia Pacific Limited	1995	2	15.70	12.09	4.57	1.04	0.04	0.05
1,2	Amway Asia Pacific Limited	1996	3	15.70	12.19	3.22	1.15	0.02	0.05
1,2	Bisan Limited	1997	13	9.91	12.21	0.78	1.30	0.00	0.06
2	Central Asia Gold Limited	1994	24	10.85	11.17	0.74	1.50	0.04	0.09
1	Central Asia Gold Limited	1995	25	11.03	11.33	0.52	1.08	0.05	0.11
1	Challenger International Limited	1994	9	10.97	12.40	2.02	1.02	0.05	0.00
1,2	Citect Corporation Limited	1997	0	11.91	12.21	6.53	1.30	0.05	0.06
2	Citect Corporation Limited	1999	2	12.28	12.23	17.30	1.35	0.05	0.05
1,2	Croesus Mining NL	1999	14	12.50	11.40	1.02	1.07	0.03	0.07
1,2	Gindalbie Gold NL	1998	5	11.39	11.41	0.53	0.94	0.06	0.11
1	Giralia Resources NL	1992	5	9.04	10.49	2.03	1.30	0.18	0.07
1	Golden West Refining Corporation	1995	11	10.80	12.39	1.61	1.02	0.02	0.05
2	Goldfields Kalgoorlie Limited	1998	1	14.08	15.74	1.53	1.10	0.18	0.11
2	Goldfields Kalgoorlie Limited	1999	2	14.04	15.72	1.25	1.25	0.15	0.07
1,2	Herald Resources Limited	1998	50	12.15	11.41	0.78	0.94	0.13	0.11
1,2	iiNET Limited	1999	4	10.94	11.74	5.19	2.36	0.21	0.04
1	ITG Limited	1999	12	12.73	12.96	3.89	1.34	0.10	0.05
1	Lightning Jack Film Trust	1994	1	12.35	12.40	0.84	1.02	0.00	0.00
1	Lightning Jack Film Trust	1996	3	9.71	12.28	0.69	0.96	0.00	0.00
1,2	Mobile Innovations Limited	1999	5	12.04	11.74	6.24	2.36	0.03	0.04
1	Molopo Australia NL	1993	7	9.07	12.07	4.01	1.50	0.00	0.07
1	Online Trading Systems Limited	1999	0	8.20	12.22	1.69	1.05	0.48	0.00
1	Portman Limited	1992	67	12.99	10.72	1.12	1.27	0.06	0.06
1	STW Communications Group Limited	1998	20	12.43	13.14	3.23	1.35	0.03	0.02
1,2	Technology One Limited	1999	0	11.76	12.23	19.16	1.35	0.05	0.05
1,2	Troy Resources NL	1994	10	10.98	10.98	2.69	1.96	0.01	0.12
1	United Group Limited	1996	10	13.27	12.34	1.49	1.09	0.02	0.04
1,2	UniTAB Limited	1999	0	11.85	13.14	14.86	1.13	0.66	0.04
1,2	York Group Limited	1995	8	9.66	14.35	0.85	1.03	0.00	0.06

Table 8: Prior Equity Issuance by Robustly Cash Rich Firm-Years and Their Delisting Years

The information on initial public offerings (IPOs) and secondary equity offerings (SEOs) is obtained from SDC Platinum database. Year refers to the year in which the firm is identified as robustly cash rich. # The information on delisting date is obtained from the Aspect Financial database. Delist reason: **A** means the company was acquired; **F** means failure to pay listing fees; **R** means delist at company's own request and **O** means others. The first column of the table indicates based on which method the firm is identified as robustly cash rich. The first method, "1", defines a firm as robustly cash rich if its four measures of cash are all in the tenth percentile in any one year. The second method, "2", defines a firm as robustly cash rich if its four measures of cash are all greater than 1.5 standard deviations of the predicted values.

Method	Company Name	Year	IPO within the 3-yr period prior to being identified as robustly cash rich (Yes/No)	Year of IPO	SEO within the 3-yr period prior to being identified as robustly cash rich (Yes/No)	Year of SEO	Year delisted[#]	Delisted in X years after identified as robustly cash rich	Delist reason
1	Abednego Nickel Limited	1992	N		N		1999	7	A
1	Abednego Nickel Limited	1994	N		N		1999	5	A
1	Australian Gold Fields NL	1992	N		N		2001	9	F
1,2	Amway Asia Pacific Limited	1993	Y	1993	N		2000	7	R
1	Amway Asia Pacific Limited	1995	Y	1993	N		2000	5	R
1,2	Amway Asia Pacific Limited	1996	Y	1993	N		2000	4	R
1,2	Bisan Limited	1997	N		N				
2	Central Asia Gold Limited	1994	N		N				
1	Central Asia Gold Limited	1995	N		N				
1	Challenger International Limited	1994	N		N		2003	9	R, A
1,2	Croesus Mining NL	1999	N		Y	1996			
1,2	Citect Corporation Limited	1997	Y	1997	N				
2	Citect Corporation Limited	1999	Y	1997	N				
1,2	Gindalbie Gold NL	1998	N		Y	1996, 1997			
1	Giralia Resources NL	1992	N		N				
1	Golden West Refining Corporation	1995	N		N		2001	6	F
2	Goldfields Kalgoorlie Limited	1998	Y	1997	N		2000	2	O, R
2	Goldfields Kalgoorlie Limited	1999	Y	1997	N		2000	1	O, R
1,2	Herald Resources Limited	1998	N		N				
1,2	iiNET Limited	1999	Y	1999	N				
1	ITG Limited	1999	Y	1999	N		2002	3	A
1	Lightning Jack Film Trust	1994	Y	1993	N		2001	7	R
1	Lightning Jack Film Trust	1996	Y	1993	N		2001	5	R
1,2	Mobile Innovations Limited	1999	Y	1999	N				
1	Molopo Australia NL	1993	N		N				
1	Online Trading Systems Limited	1999	Y	1999	N				
1	Portman Limited	1992	N		N				
1	STW Communications Group Limited	1998	N		Y	1997			
1,2	Technology One Limited	1999	Y	1999	N				
1,2	Troy Resources NL	1994	N		N				
1	United Group Limited	1996	Y	1994	Y	1996			
1,2	UniTAB Limited	1999	Y	1999	N				
1,2	York Group Limited	1995	Y	1992	N				
	Percentage of "Y"		53.1 %		12.5 %				

Table 9: The Subsequent Spending Behaviour of Robustly Cash Rich Firm-Years

Descriptive summary for the spending behaviour of robustly cash rich firm-years in the subsequent year to being identified as robustly cash rich. Year t refers to the year in which the firm is identified as robustly cash rich. Capex_a is the ratio of capital expenditures to total assets. CFF is the cash flow from financing divided by total assets. Payout ratio is the ratio of total dividends excluding special dividends to earnings per share. Accounting information is obtained from the Aspect Financial database. The first column of the table indicates based on which method the firm is identified as robustly cash rich. The first method, "1", defines a firm as robustly cash rich if its four measures of cash are all in the tenth percentile in any one year. The second method, "2", defines a firm as robustly cash rich if its four measures of cash are all greater than 1.5 standard deviations of the predicted values. Note that the percentage changes in capital expenditure ratio and payout ratio are not available for Goldfields Kalgoorlie Limited in year 1999 because it was delisted in the subsequent year.

Method	Company Name	Year t	Capex_a in year t	CFF in year t	Capex_a in year t+1	CFF in year t+1	% change in Capex_a	Payout ratio in year t	Payout ratio in year t+1	% change in payout ratio
1	Abednego Nickel Limited	1992	0.089	-0.030	0.128	-0.476	44.71	48.220	34.500	-28.45
1	Abednego Nickel Limited	1994	0.053	-0.145	0.174	-0.090	228.43	48.370	0.000	-100.00
1	Australian Gold Fields NL	1992	0.011	-0.189	0.100	-0.415	826.84	0.000	0.000	0.00
1,2	Amway Asia Pacific Limited	1993	0.045	-0.303	0.084	0.053	85.87	0.000	32.380	
1	Amway Asia Pacific Limited	1995	0.043	-0.049	0.016	-0.056	-62.35	42.740	70.010	63.80
1,2	Amway Asia Pacific Limited	1996	0.016	-0.056	0.055	-0.435	240.33	70.010	45.570	-34.91
1,2	Bisan Limited	1997	0.001	0.000	0.005	0.000	773.93	0.000	0.000	0.00
2	Central Asia Gold Limited	1994	0.044	-0.017	0.046	0.000	4.03	0.000	0.000	0.00
1	Central Asia Gold Limited	1995	0.046	0.000	0.047	0.000	2.64	0.000	0.000	0.00
1	Challenger International Limited	1994	0.050	-0.029	0.004	-0.086	-92.12	28.550	55.550	94.57
1,2	Croesus Mining NL	1999	0.029	0.001	0.113	0.013	291.51	0.000	0.000	0.00
1,2	Citect Corporation Limited	1997	0.049	-0.011	0.290	-0.300	494.43	83.360	84.580	1.46
2	Citect Corporation Limited	1999	0.045	-0.259	0.156	-0.349	245.62	85.620	81.880	-4.37
1,2	Gindalbie Gold NL	1998	0.061	0.202	0.162	0.001	166.28	0.000	0.000	0.00
1	Giralia Resources NL	1992	0.181	0.214	0.235	0.237	30.37	0.000	0.000	0.00
1	Golden West Refining Corporation Limited	1995	0.015	-0.007	0.146	0.299	850.49	0.000	0.000	0.00
2	Goldfields Kalgoorlie Limited	1998	0.181	-0.596	0.149	-0.167	-18.01	0.000	105.810	
2	Goldfields Kalgoorlie Limited	1999	0.149	-0.167				105.810		
1,2	Herald Resources Limited	1998	0.128	-0.483	0.095	0.028	-26.10	0.000	0.000	0.00
1,2	iiNET Limited	1999	0.206	0.000	0.521	0.385	152.24	0.000	0.000	0.00
1	ITG Limited	1999	0.102	0.000	0.070	0.058	-31.34	0.000	72.560	
1	Lightning Jack Film Trust	1994	0.000	1.417	0.000	-3.201	0.00	0.000	0.000	0.00
1	Lightning Jack Film Trust	1996	0.000	-0.554	0.000	-0.181	0.00	0.000	7.630	
1,2	Mobile Innovations Limited	1999	0.034	-0.770	0.270	-0.458	691.67	0.000	0.000	0.00
1	Molopo Australia NL	1993	0.000	0.020	0.003	-0.045	0.00	0.000	0.000	0.00
1	Online Trading Systems Limited	1999	0.480	0.000	0.134	0.464	-71.97	0.000	0.000	0.00
1	Portman Limited	1992	0.064	-0.003	0.025	0.288	-61.15	22.360	34.260	53.22
1	STW Communications Group Limited	1998	0.033	-1.526	0.000	-0.103	-100.00	73.590	44.980	-38.88
1,2	Technology One Limited	1999	0.047	0.000	0.055	0.233	16.73	0.000	22.220	
1,2	Troy Resources NL	1994	0.010	-0.172	0.001	0.000	-84.87	0.000	0.000	0.00
1	United Group Limited	1996	0.015	0.035	0.041	-0.049	168.05	42.340	46.190	9.09
1,2	UniTAB Limited	1999	0.657	0.000	0.189	-0.290	-71.16	0.000	58.400	
1,2	York Group Limited	1995	0.000	-0.137	0.016	0.000	0.00	0.000	0.000	0.00

Table 9 also shows that over half of the robustly cash rich firm-years (or more specifically, 59.4%) have increased their capital expenditures in the subsequent year to being identified as robustly cash rich. Similar results have been reported by Opler et al. (1999). The last column of Table 9 reports the percentage change in payout ratios. It shows that about half of the robustly cash rich firm-years have increased their payout ratios from the year identified as robustly cash rich to the subsequent year.

Another way of determining how robustly cash rich firms spend their free cash flow is to examine if they have any merger and acquisition activities after being identified as robustly cash rich. Table 10 shows that within three years after being identified as robustly cash rich, 15 robustly cash rich firm-years (or 46.9%) have been bidders and 11 firm-years (or 34.4%) have been takeover targets. The fact that nearly half of the robustly cash rich firm-years have been bidders suggest that these firms may be cumulating cash holdings and cash flow in anticipation of making future acquisitions.

Table 10: The Merger and Acquisition Activities of Robustly Cash Rich Firm-Years Within 3 Years After Being Identified as Robustly Cash Rich

Method	Company Name	Year	No. of times being a takeover *bidder*	No. of times being a takeover *target*
	Abednego Nickel Limited	1992	0	1
1	Abednego Nickel Limited	1994	0	2
1	Australian Gold Fields NL	1992	0	0
1,2	Amway Asia Pacific Limited	1993	0	0
1	Amway Asia Pacific Limited	1995	0	0
1,2	Amway Asia Pacific Limited	1996	0	0
1,2	Bisan Limited	1997	1	0
2	Central Asia Gold Limited	1994	0	0
1	Central Asia Gold Limited	1995	0	0
1	Challenger International Limited	1994	2	0
1,2	Croesus Mining NL	1999	2	2
1,2	Citect Corporation Limited	1997	1	1
2	Citect Corporation Limited	1999	0	0
1,2	Gindalbie Gold NL	1998	1	0
1	Giralia Resources NL	1992	1	0
1	Golden West Refining Corporation Limited	1995	1	2
2	Goldfields Kalgoorlie Limited	1998	0	0
2	Goldfields Kalgoorlie Limited	1999	0	0
1,2	Herald Resources Limited	1998	0	2
1,2	iiNET Limited	1999	3	0
1	ITG Limited	1999	4	2
1	Lightning Jack Film Trust	1994	0	0
1	Lightning Jack Film Trust	1996	0	0
1,2	Mobile Innovations Limited	1999	0	0
1	Molopo Australia NL	1993	0	0
1	Online Trading Systems Limited	1999	3	0
1	Portman Limited	1992	2	2
1	STW Communications Group Limited	1998	6	0
1,2	Technology One Limited	1999	1	1
1,2	Troy Resources NL	1994	0	0
1	United Group Limited	1996	3	0
1,2	UniTAB Limited	1999	3	2
1,2	York Group Limited	1995	0	2

8. Conclusion

In conclusion, this study uses a sample of 7,376 ASX-listed firms over the years 1992-1999 to examine the cash hoarding behaviour and cash richness of Australian companies. Four measures of cash, including cash holdings, free cash flow, modified free cash flow and accounting cash flow, are developed. Compared with US findings, Australian firms on average have higher cash holdings, which may be explained by the relatively high proportion of resources firms in the Australian market.

This study finds that the stock and flow measures of cash give substantially different lists of cash rich firms, suggesting that prior studies that only consider cash at the balance date in testing the free cash flow hypothesis may yield misleading results. These studies need to also consider cash flow measures. Due to the differences in the nature of the stock and flow measures of cash as identified in the study, the employment of just one measure is unlikely to give reliable results.

In this study, we also identify "robustly cash rich firms" that are cash rich in all four measures of cash. Results show that robustly cash rich firms have significantly greater investment opportunities compared with the rest of sample firms, and prior equity issuance is likely to be a major contributor for the observed high levels of cash in these firms. Over half of the robustly cash rich firms have made equity issuance in the previous three years to being identified as robustly cash rich. Additionally, this study finds that in the subsequent year to being identified as robustly cash rich, these firms tend to increase capital expenditures but do not change their dividend payout, suggesting that the cash and cash flow are likely to have been spent on capital expenditures. Further, we find that about half of the robustly cash rich firms have made takeover attempts within three years after being identified as robustly cash rich. Hence, the question that still needs to be answered is whether the investment carried out by managers of these robustly cash rich firms maximize shareholder value. In other words, was the increase in capital expenditures for positive or negative NPV projects? Further tests are required to answer this question.

References

Baskin, J 1987. 'Corporate liquidity in games of monopoly power', *Review of Economics and Statistics,* vol. 69, no. 2, pp. 312-319.

Benou, G and Madura, J 2005. 'High-tech acquisitions, firm specific characteristics and the role of investment bank advisors', *Journal of High Technology Management Research,* vol. 16, pp. 101-120.

Brennan, MJ and Hughes, PJ 1991. 'Stock prices and the supply of information', *Journal of Finance,* vol. 46, no. 5, pp. 1665-1691.

Damodaran, A 1997, *Corporate finance theory and practice,* New York, John Wiley & Sons.

Dechow, P 1994. 'Accounting earnings and cash flow as measures of firm performance: The role of accounting accruals', *Journal of Accounting and Economics,* vol. 18, no. 3, pp. 3-42.

Faulkender, M 2003. 'Cash holdings among small businesses', Working paper, Washington University in St. Louis.

Gregory, A 2005. 'The long run abnormal performance of UK acquirers and the free cash flow hypothesis', *Journal of Business Finance and Accounting,* vol. 32, pp. 777-814.

Harford, J 1999. 'Corporate cash reserves and acquisitions', *Journal of Finance,* vol. 54, no. 6, pp. 1969-1997.

Jensen, MC 1986. 'Agency costs of free cash flow, corporate finance, and takeovers', *American Economic Review,* vol. 76, no. 2, pp. 323-329.

John, TA 1993. 'Accounting measures of corporate liquidity, leverage, and costs of financial distress', *Financial Management,* vol. 22, no. 3, pp. 91-100.

Kim, CS, Mauer, DC and Sherman, AE 1998. 'The determinants of corporate liquidity: Theory and evidence', *Journal of Financial and Quantitative Analysis,* vol. 33, no. 3, pp. 335-359.

Myers, SC and Majluf, NS 1984. 'Corporate financing and investment decisions when firms have information that investors do not have', *Journal of Financial Economics,* vol. *13*, no. 2, pp. 187-221.

Opler, T, Pinkowitz, L, Stulz, R and Williamson, R 1999. 'The determinants and implications of corporate cash holdings', *Journal of Financial Economics,* vol. 52, no. 1, pp. 3-46.

Ozkan, A and Ozkan, N 2003. 'Corporate cash holdings: An empirical investigation of UK companies', Working paper, University of York and University of Liverpool.

Pinkowitz, L 1998. 'The market for corporate control and corporate cash holdings', Working paper, Georgetown University.

Schwetzler, B and Reimund, C 2004. 'Valuation effects of corporate cash holdings: Evidence from Germany'*,* Working paper, Leipzig Graduate School of Management.