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Excess cash holdings and shareholder value

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Excess cash holdings and shareholder value

Abstract

We examine the determinants of corporate cash holdings in Australia and the impact on shareholder wealth of holding excess cash. Our results show that a trade-off model best explains the level of a firm's cash holdings in Australia. We find that 'transitory' excess cash firms earn significantly higher risk-adjusted returns compared to 'persistent' excess cash firms, suggesting that the market penalises firms who hoard cash. The marginal value of cash also declines with larger cash balances, and the longer firms hold on to excess cash. The results are consistent with agency costs associated with persistence in excess cash holdings.

1. Introduction

It is well documented that firms hold a substantial proportion of their total assets in the form of cash and marketable securities, ranging from mean (median) values of 8% (5%) to 22% (7%), see e.g., Kim, Mauer and Sherman (1998), Opler, Pinkowitz, Stulz and Williamson (1999), Harford (1999), Ozkan and Ozkan (2004) and, more recently, Dittmar and Mahrt-Smith (2008). Motives for holding large cash balances are generally linked to trade-off, pecking-order and agency theories, with the trade-off theory attracting most empirical support (Opler *et al.,* 1999). Companies viewed as having 'lazy' cash balances generally come under pressure from institutional investors to return capital to shareholders, due to concerns that stockpiles of cash may lead management to engage in value-destroying activities, e.g., through poorly conceived takeovers (Harford, 1999). Managers may use cash reserves to engage in behaviour for direct personal gain and consumption of excessive perquisites (Jensen, 1986). Perhaps the most critical issue from a shareholder perspective is the potential impact on shareholder returns of holding excess cash reserves. Stockpiles of cash are a reflection of past success and will not reflect in higher returns if left on the balance sheet. Furthermore, if managers have incentives to waste cash holdings on value reducing investments or excessive perquisites, this should ultimately be reflected in lower shareholder returns.

Prior studies have usually examined the impact on shareholder value indirectly, e.g., by examining how mangers use excess cash. For example, Blanchard, Lopez-de-Silanes, and Shleifer (1994) find that excess cash flow firms keep cash windfalls inside the firm instead of distributing them to shareholders. The exception is increasing payouts to management and targeted share repurchases from block holders – activities normally consistent with a decrease in shareholder value. Harford (1999) reports significant negative operating performance for high cash flow acquirers for the 5 years post takeover, providing some support for shareholder value destruction. In a later paper, Harford, Mansi and Maxwell (2008) show that excess cash firms with weaker governance tend to spend cash more quickly, consistent with suboptimal investments and value destruction. Opler *et al.* (1999) also reports significant increases in spending on acquisitions as a firm's holding of excess cash increases, again suggesting value destruction when coupled with Harford's (1999) findings.

Mikkelson and Partch (2003) examine the direct impact of holding excess cash on operating performance. They concentrate their analysis on a sample of firms categorised as 'persistent' excess cash holders, defined as those who maintain cash holdings greater than 25% of total assets for 5 consecutive years.[1] Surprisingly, they find that persistent excess cash has no adverse impact on operating performance, although changes in operating performance does not necessarily imply a change in shareholder value once investors expectations are factored in. Faulkender and Wang (2006) probably come closest to examining directly the impact of excess cash on shareholder value, although they do not examine the relationship between the length of time excess cash is held and shareholder value. Consistent with value destruction associated with large cash balances, they find that the marginal value of cash declines with larger cash balances. More recently, Dittmar and Mahrt-Smith (2007) show that the marginal value of cash is lower for firms with agency problems, captured using corporate governance indices available in the US.

This paper complements the already large body of literature on cash holdings (e.g., Harford, 1999; Opler *et al.,* 1999; Ozkan and Ozkan, 2004; Foley, Hartzell, Titman and Twite, 2008; D'Mello, Krishnaswami and Larkin, 2008; Oswald and Young, 2008), by directly examining the impact, if any, of holding excess cash on shareholder value, and, more importantly, whether the length of time excess cash is held for is an important factor in determining shareholder value destruction. We begin first by developing a baseline model similar to Opler *et al.* (1999). We then use the model to identify a sample of excess cash firms each year and partition the sample according to whether excess cash is transitory or persistent. Transitory excess cash firms are those that have 'one-off' or non-consecutive excess cash balances over the sample period. Persistent excess cash firms are defined as those who maintain excess cash for consecutive periods of at least 2 or more years. Next, we examine the stock performance of transitory and persistent excess cash firms using a matched firm procedure based on industry, size and market-to-book benchmarks. By comparing the stock performance of both groups,

[1] They do, however, benchmark the performance of their sample of persistent excess cash firms against a sample of 'temporary' high cash holding firms. Temporary cash holding firms are defined as those that had a cash to total assets ratio greater than 25% for 2 consecutive years, but they experienced a decline of at least two-thirds within the next 5 years.

across different holding periods of 1 to 3 years, we are able to determine the impact, if any, on shareholder value of holding transitory or persistent excess cash. Lastly, we follow the approach in Faulkender and Wang (2006) and Dittmar and Mahrt-Smith (2007) to test whether the marginal value of cash is lower for firms with larger cash balances, and, more importantly, whether marginal values decline the longer firms hold on to excess cash.

We find that cash holdings in Australia can best be explained by a trade-off model, which is consistent with US and UK findings. In particular, we find that cash holdings are positively correlated with a firm's growth options, cash flow variability, capital expenditures, net investment and financing cash flows. The positive correlation with growth options and capital expenditures are more consistent with a precautionary motive in that firms' hold cash to avoid potential underinvestment. We also find that cash holdings have a negative correlation with leverage and net working capital, consistent with debt and net working capital serving as substitutes. As expected, capital intensive industries (e.g., gold, other metals, etc.) play a dominate role in our Australian sample, holding the highest levels of cash even after controlling for industry-specific effects. On examining the financial characteristics of transitory and persistent firms, we find that while both groups have comparable levels of capital expenditures, persistent firms have higher and safer (i.e., lower variability) operating cash flows, higher free cash flows and lower beta risk. Interestingly, persistent firms have significantly higher growth options, suggesting that compared to transitory firms, they under invest relative to growth opportunities.

The buy-and-hold abnormal stock performance indicates a decline in performance for firms who hold excess cash for consecutive years. By the end of the third consecutive year of holding excess cash, firms significantly underperform matched non-excess firms, and transitory excess cash firms. The marginal value of cash is also lower for firms with larger cash balances, and further, declines the longer firms hold on to excess cash from a value of $1.04 for 1-year to only $0.76 after 3 consecutive years. Taken together, the results suggest that the market penalises firms for holding excess cash for extended periods, which is consistent with agency costs associated with persistence in excess cash holdings. The results also suggest that the market can discriminate between firms that

hold excess cash for investment (i.e., transitory firms) as opposed to agency reasons (i.e., persistence firms). Our results contribute to the cash holdings literature by showing that it is not necessarily the level of excess cash that induces agency problems, but more importantly, the length of time managers retain excess cash.

The remainder of the paper is organised as follows. Section 2 introduces and discusses the cash holdings literature and sets out the baseline cash holdings model employed to define excess cash firms. Section 3 describes the sample construction process and reports some summary statistics for the variables employed. Section 4 reports the results of the baseline regression model and the impact of holding excess cash on shareholder value. Section 5 reports the results of some robustness tests specifically related to endogeneity concerns, and Section 6 concludes with a summary of the main results.

2. Model development and econometric specification

This section reviews the theoretical and empirical literature and presents the baseline regression models used to define excess cash firms.

2.1. Theoretical and empirical literature

The starting point in developing a baseline model is to examine the key determinants of a firm's cash holdings. Both the theoretical and empirical literature provides a useful guide as to which factors are likely to play a key role in explaining cash holdings. Perhaps the most obvious starting point is the transaction costs motive and precautionary motive outlined by Keynes (1936). Under the transactions cost motive, cash holdings serve to bridge the interval between sales receipts and expense payments. The higher the costs associated with raising cash (e.g., short-term borrowing costs, issuing equity, selling assets), the greater the incentive to hold larger amounts of cash. Conversely, cash holdings maintained under the precautionary motive allow a firm to satisfy sudden or unforeseen expenditure requirements without needing to sell assets or raise external finance. Keynes (1936) also

outlines a speculative motive, which is driven by the desire of a company to transform investment profits into cash, since liquid holdings provide the highest level of asset certainty.

The transactions cost motive clearly points to a trade-off between the costs of raising cash and the benefits of holding a buffer of cash. While firms may experience significant costs in raising cash, they also bear the opportunity cost associated with holding cash. Amihud and Mendelson (1986) suggest that a liquidity premium exists between different types of assets. Since cash is the most liquid of assets, the firm incurs the greatest premium or cost from maintaining cash reserves. The primary benefit to maintaining liquidity is allowing the firm to pursue its optimal investment policy when external finance is not available, excessively costly, or when the firm may wish to avoid selling assets or reducing dividends (Opler *et al.,* 1999). One way that liquidity enhances company value is that it insulates the firm from cash flow variability. Baum, Caglayan, Ozkan, and Talavera (2003) posit that liquid assets can be viewed as 'options' exercisable in adverse economic conditions. Investors may ration capital because of information asymmetries (Myers and Majluf, 1984) or agency problems (Jensen, 1986). Cash reserves mitigate the reliance on external financing, which may involve significant direct and indirect costs (Smith, 1977).[2] Furthermore, Whited (1992) points out that firms may not have access to public bond markets, which increases their exposure to cash flow constraints. Therefore, a cash holdings liquidity buffer potentially ameliorates potential underinvestment suffered by equity holders (Mikkelson and Partch, 2003).

Kim, Mauer and Sherman (1998) report several findings that are consistent with a trade-off model, with cash holdings increasing in the cost of external financing (proxied using firm size, credit rating and growth options), and the variance of future cash flows. Furthermore, they find a negative relationship between cash holdings and firm size. This is consistent with their argument that smaller firms build cash reserves because they have higher financing costs. Kim *et al.* (1998) argue that operating and free cash flows provide a source of liquidity to meet operating expenditures and maturing liabilities. Firms with high operating cash flows are found to maintain lower levels of cash

[2] A firm may issue equity if they are overvalued, consistent with Myers and Majluf (1984). Other things being equal, however, a firm would normally prefer to avoid these costs

and liquid securities. On the other hand, there is a positive relationship between cash flow variability and the level of investment in liquid assets, which is consistent with Keynes' (1936) precautionary motive. If firm cash flows have a high degree of variability, then the firm will build-up its cash holdings to avoid potential shortfalls. Additionally, Baum *et al.* (2003) argue that in times of greater uncertainty about the macroeconomic environment, firms will increase their cash holdings in order to offset the adverse effects of negative cash flow shocks. Kim *et al.* (1998) also find a negative relationship between the level of gearing and cash holdings. They posit that firms with access to long-term debt markets are more likely to have commercial paper programs that provide short-term financing for current liquidity needs. Similarly, Minton and Wruck (2001) find that firms with low financial leverage have abnormally high levels of cash holdings.

Opler *et al.* (1999) similarly find evidence supporting the trade-off model. They show that a number of variables that are associated with ease of access to the capital markets (e.g., firm size, leverage and bond ratings) have a statistically significant and negative relationship with cash holdings. Firms with strong growth opportunities, proxied by the MTB ratio, are found to hold more cash, consistent with Myers and Majluf (1984). Similar to Kim *et al.* (1998), they also find a negative relationship between cash holdings, firm size and the variability of operating cash flows. However, they find a positive correlation between operating cash flows and cash, supporting a precautionary motive.

Based on the discussion above, the following variables will enter the baseline regression model:[3]

(i) Real size (RSIZE), measured as the natural logarithm of total assets, deflated using the CPI index;

(ii) Leverage (LEV), measured by the sum of current debt and non-current debt scaled by total assets;

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[3] For the sake of brevity, we do not provide a detailed discussion of each variable. We do, however, link our findings with the relevant theoretical predications in Section 4. For a more detailed description of the variables used, the interested reader is referred to Opler *et al.,* (1999) or Ozkan and Ozkan (2004).

(iii) Growth options and information asymmetry is captured using the MTB ratio, defined as the market value of assets divided by the book value of assets. The market value of assets is calculated as the book value of assets plus the difference between the market value of common equity and book value of equity;

(iv) The size of cash flows is captured using operating cash flows (OCF), measured using net operating cash flows scaled by total assets;

(v) The variability of cash flows (VAROCF) is measured as the standard deviation of the first difference of OCF for the previous 3 years;

(vi) Close cash substitutes are captured by net working capital (NWC), measured as current assets less cash and current liabilities scaled by total assets;

(vii) The level of investment opportunities are captured by capital expenditures (CAPEX), scaled by total assets.

We also include investment (ICF) and financing (FIN) net cash flows, which are directly available from the cash flow statement. To the extent that firms with strong investment and financing net cash flows provides an indication of investment and financing success, we expect a positive relationship between ICF and FIN with cash holdings. Unlike operating cash flows (OCF), ICF and FIN net cash flows are also likely to be more speculative and less predictable, which would suggest a positive relationship with cash. Both ICF and FIN are scaled by total assets. Lastly, we include a variable to capture the level of business confidence since the more confident managers are about future investment opportunities, the larger will be the current holdings of cash reserves. The level of business confidence (CONFID) is captured by the Business Confidence Index (BCI) published in the *Quarterly Business Survey* from the Economic Research Department of the National Australia Bank. The BCI is the most comprehensive survey that exists in Australia of near-term and medium-term expectations of the non-farm business sector. It is likely to be a representative measure of business expectations given that is based on a survey of around 1,000 small to large sized companies. Since the *Quarterly Business Survey* is reported in March, June, September and December, the BCI level that is

matched to a firm uses the closest quarter prior to the firm's accounting year-end. A firm with a year-end in October, for example, is matched to the September index of the same year.

The literature on cash holdings usually measure cash by liquid assets, which includes cash and marketable securities. In this paper, cash is measured as cash including short-term deposits scaled by non-cash total assets (LIQ).

2.2. Identification of excess and persistent excess cash firms

Following Opler *et al.* (1999), we employ alternative estimation methods to test whether our regression baseline model is well specified. We estimate the following model,

$$LIQ_{i,t} = \alpha + \beta_1 MTB_{i,t} + \beta_2 RSIZE_{i,t} + \beta_3 LEV_{i,t} + \beta_4 OCF_{i,t} + \beta_5 NWC_{i,t} + \beta_6 CAPEX_{i,t} + \beta_7 ICF_{i,t} + \beta_8 FIN_{i,t} + \beta_9 CONFID + \beta_{10} VAROCF + \varepsilon_{i,t} \quad (1)$$

where the independent variables are described above. Four models are estimated, comprising of (i) a pooled OLS regression with year dummies; (ii) a pooled OLS regression with industry and year dummies; (iii) a fixed-effects regression, in which firm-specific effects are captured by including an intercept for each firm; and (iv) a Fama-MacBeth regression.[4]

The predictions from the estimated models can be interpreted as generating an optimal level of cash holdings which can be used to define excess cash firms. Since cash holdings clearly differ across industries (see Table 2), we follow Harford's (1999) approach and estimate (1) above for each ASX industry using the fixed-effects model (model 3).[5] Excess cash firms are those that maintain cash greater than 1.5 standard deviations above that predicted by model (1) for any year,

$$XLIQ_{i,t} = ALIQ_{i,t} - (BLIQ_{i,t} + 1.5\sigma_i) \quad (2)$$

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[4] Section 5 reports the results of robustness tests related to model specification concerns.

[5] Note that estimating industry-specific models using the whole time-series will result in a look-a-head bias. This was necessary due to the small number of firms in several industries. To avoid a potential look-a-head bias and to allow for time varying effects, we also estimate yearly models (i.e., Fama-MacBeth) including industry dummies to control for potential industry effects. While the number of excess and persistent excess cash firms changes marginally (i.e., increases), the results (available upon request) remain unchanged.

where $XLIQ_{i,t}$ is excess cash for firm i in time t, $ALIQ$ is actual cash, $BLIQ$ is the baseline cash holdings estimated from (1) above and σ is the standard deviation of the time-series of the firm's cash holdings.

3. Sample construction and summary statistics

The sample is constructed using the Aspect Financial Database (Aspect Huntley Ltd). The initial dataset comprises of 1,817 firms representing 13,783 firm-years. 83 firms have two sets of data under different tickers due to takeovers and ticker changes, which results in the removal of 135 firm-years. Firms are placed into an industry group based on their ASX industry sector code, of which a record for most firms is maintained within the database. 23 firms are missing an industry code and are removed from the initial set. Next, firms with the following ASX Industry Sector classifications are removed: Banks and Finance (#16), Insurance (#17), Investment and Financial Services (#19) and Property Trusts (#20). Firms that fall within these industries maintain cash holdings for fundamentally differently motives compared to other industrial firms due to reasons including capital adequacy, legal and investment requirements. A further 206 firms are removed due to missing variables. To reduce the potential effect of extreme values all variables are winsorised at the 1% level. The final sample consists of 5,876 firm-years.

Table 1 presents descriptive statistics including the mean, median and standard deviation for each variable. The cash holdings variable (LIQ) exhibits a relatively high degree of skewness with a mean value of 26% and a median of 7%. For comparative purposes, Kim *et al.,* (1998) report a mean (median) cash holdings ratio of 8.1 (4.7%), whereas Opler *et al.,* (1999) reports a mean (median) of 17% (6.5%). More recently, Dittmar and Mahrt-Smith (2008) report a mean (median) ratio of 22% (6%). Using a UK sample, Ozkan and Ozkan (2004) report a mean (median) cash holdings ratio of 9.9% (5.9%).[6] The higher mean values for Australian firms are partially due to specific industry

[6] Note that Ozkan and Ozkan (2004) scale cash by total assets as opposed to non-cash assets. Using the same definition, we find a mean (median) cash ratio of 18% (6%).

effects, with a higher proportion of resources-type firms, which tend to hold significantly higher levels of cash (see Table 2).

Insert Table 1 about here

Panel B of Table 1 reports pair-wise correlation coefficients. The correlations are generally in line with the predictions outlined in Section 2. Firm size (RSIZE), leverage (LEV), operating cash flows (OCF) and net working capital (NWC) are all negatively correlated with cash holdings (LIQ). Further, cash holdings are positively correlated with growth prospects (and the degree of information asymmetry), capital expenditures (CAPEX), net financing (FIN), investment (ICF) and the variability of operating cash flows (VAROCF).

Insert Table 2 and Figure 1 about here

Figure 1 illustrates the median cash-to-assets ratio (LIQ) over the period 1990 to 2008 for all firms that have cash holdings data in a particular year, and a sub-sample that have data for all years. The chart shows an upward trend in the median cash holdings over this period for both samples, with peaks and troughs evident during this time-series. During the early 1990s and the 1999 to 2007 period, there was an acute increase in cash holdings, which has some parallels with the underlying economic conditions at the time. Both periods represent recovery periods in that they follow periods represented by significant shocks in the form of merger and IPO activity in the 1980s, 1990s, 2000's and subsequent crashes in the late 1980s and 1990s. Firms usually build up cash holdings during recovery periods in anticipation of future investment opportunities. While part of the build-up in cash holdings from 2000 is likely due to cashed-up newly listed firms, a cautious business outlook, and a reluctance to take risks in light of the investment boom of the late 1990s also partly explains this behaviour, as evident in the higher cash-holdings of our sub-sample of firms that existed throughout the whole sample period.

Table 2 reports mean and median cash ratios by industry group. It emphasises the differences between industries with the mean (median) cash ratios (LIQ) ranging from 4% (2%) to 42% (14%). Industries associated with the resources sectors (e.g., Other metals, Gold, Energy), Telecommunications and Healthcare and Biotechnology appear to hold the highest levels of cash. On

the other hand, service industries, such as Retail and Transport, hold relatively low levels of cash. Contributing to this industry effect is the volatility of operating cash flows, with a significant positive relationship evident (p=0.76). There also appears to be a monotonically decreasing relationship between mean size and cash holdings (p=-0.40), suggesting that smaller firms need to maintain higher levels of cash because obtaining financing may be more difficult and/or their cash collection procedures may not be as efficient as larger firms.

4. Results

This section presents the results of estimating regression (1), followed by an examination of the impact of holding excess cash on shareholder returns, and on the marginal value of cash holdings.

Insert Table 3 about here

4.1. Estimated regressions

Table 3 presents the results for each of the estimated models. The models have high explanatory power, with adjusted R^2 ranging from 39% (model 1) to 46% (model 4). The models also seem to be well specified, with most variables showing consistent statistical significance across pooled OLS, fixed-effects and Fama-MacBeth regressions.[7] Taking a closer look at the coefficient estimates, market-to-book ratio (MTB), capital expenditures (CAPEX), net financing (FIN), investing cash flows (ICF), and variability in operating cash flows (VAROCF) are positively related to cash holdings. On the other hand, cash holdings are negatively related to leverage (LEV) and net working capital (NWC). Most of these relationships are consistent with those reported by Opler et al. (1999) and Ozkan and Ozkan (2004) with one exception: the coefficient sign of firm size (RSIZE) is positive, although only significant for model 2.

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[7] Potential multicollinearity could obscure the significance of highly correlated variables. The correlation coefficients reported Table 1 indicates that the correlations between the independent variables are relatively low (i.e., less than 0.5), so multicollinearity should not pose a problem. To confirm this, we estimate variance inflation factors (a measure of collinearity among three or more variables). The highest factor is 1.63 (OCF), which is well below the value of 10, which is used as the benchmark to indicate potential multicollinearity (see, Neter, Wasserman and Kunter, 1990).

The results from the reported regressions provide some support for the trade-off theory, in particular, Keynes' (1936) precautionary motive in that firms with higher cash flow variability (VAROCF), capital expenditures (CAPEX) and stronger growth options (and possibility higher information asymmetry) as proxied by the MTB ratio, hold more cash. Further, firms with lower debt and higher levels of cash substitutes (NWC) are likely to hold more cash. The negative correlation with debt is supportive of the pecking-order theory in that firms use cash resources to repay debt when it becomes due. Note that the negative relationship does not imply that cash holdings are irrelevant in that firms are indifferent between having one dollar less of debt versus one dollar more of cash. If this was the case, the coefficient on leverage would be insignificantly different from minus one, which it is not, suggesting that cash is not viewed by firms as just net debt.

4.2. Excess cash, transitory and persistence

Using equation (2), 403 firms were identified as holding excess cash over the sample period. Of these, 127 (32%) maintained excess cash for at least 2 consecutive years, with 49 (12%) holding excess cash for at least 3 or more years. An example of a persistent excess cash firm is Ansell limited (Diversified industrial sector), which maintained excess cash over a 7-year period from 1995 to 2001. Its level of cash holdings averaged over $1 billion during this period (or 22% of non-cash assets), falling to $338 million in 2001. The predictions from the model suggest that Ansell should have maintained an average of $280 million over this period (6% of non-cash assets), implying average excess cash of over $700 million per year. 276 firms do not hold excess cash for consecutive years, and are classified as transitory excess cash firms. Further, we identify 697 firms that are not identified by the model as having excess cash (i.e., non-excess cash firms) in any year over the sample period.

Insert Table 4 about here

Table 4 shows the industry distribution of excess cash firms. The distribution indicates that many of the transitory and persistent (defined using a ≥3-year cut-off) excess cash firms are in industries usually associated with highly volatile cash flows, such as the Miscellaneous Industrials,

Gold, Healthcare and Biotech, Other Metals and Telecommunications sectors.[8] However, while industry-related factors seem to play a significant factor, other industries account for over 38% of transitory excess cash firms, suggesting other motivations for holding excess cash. Interestingly, while the 5 industries noted above account for approximately 62% of transitory excess cash firms, they only account for about 45% of persistent excess cash firms, suggesting some industry variation between transitory and persistent excess cash firms.

Insert Table 5 about here

Table 5 (Panel A) presents median financial characteristics of transitory, persistent and non-excess cash firms. The results suggest that both transitory and persistent excess firms differ significantly when compared to non-excess cash firms and, more importantly, when compared to each other. Compared to persistent excess cash firms, transitory excess cash firms hold more cash (LIQ), are smaller in size (RSIZE), have lower operating cash flows (OCF), but higher variability in cash flows (VAROCF). Further, they have comparable capital expenditures (CAPEX) but higher net financing cash flows (FIN). These characteristics are consistent with transitory excess cash firms building up cash flows for investment purposes, which may explain why they do not hold excess cash for consecutive years. Persistent excess cash firm also have higher free cash flows (FCF), dividends per share (DPS) and lower betas. Based on these characteristics it is somewhat difficult to justify the cash holding behaviour of persistent excess cash firms. They hold excess cash, yet they have lower variability in cash flows (VAROCF), lower capital expenditures (CAPEX) and betas and generate larger operating cash flows (OCF). One possible explanation is that they have higher MTB ratios, which is consistent with greater growth options. However, investment levels, as proxied by capital expenditures (CAPEX) and total investments (INV/TA), which includes property, plant and equipment, investments and subsidiaries, are not significantly different from transitory or non-excess cash firms, suggesting possible underinvestment relative to growth opportunities. An alternatively explanation for holding persistent excess cash is dividend policy. Dividends per share (DPS) at 11

[8] Note that industry-specific models were used to determine the optimal level of cash holdings for each firm suggesting a large variation in the level of cash holdings in these industries and so their continued representation in the sample even after controlling for industry-effects.

cents is significantly higher than transitory (7 cents) and non-excess cash firms (8 cents), suggesting that excess cash could be used to fund larger dividends. Interestingly, however, the median dividend payout ratio (POUT) for persistent excess cash firms at 61% is not significantly different from transitory or non-excess cash firms.

4.3. Shareholder returns

The stock performance of both groups, measured using buy-and-hold returns (BAHRs) and buy-and-hold abnormal returns (BAHARs), is presented in Panel B of Table 5. BAHARs are calculated using a control firm approach (see, e.g., Barber and Lyon, 1997; Lyon, Barber and Tsai, 1999), based on industry and firm characteristics. The procedure is operationalised as follows. Each transitory and persistent excess cash firm is matched to a non-excess cash firm from the same ASX industry sector. Similar to Mikkelson and Partch (2003), firm size is measured as total assets less cash. The firm closest in size is then identified as the control firm. We also select a second control firm based on the MTB ratio as a further benchmark.[9] BAHARs are calculated as the buy-and-hold return on a portfolio of transitory or persistent excess cash firms less the buy-and-hold return on a portfolio of matching firms. We examine BAHRs and BAHARs over different horizons ranging from 1 to 3 years. Returns are measured from January of the first year a firm is identified as an excess cash firm, which we then allocate to transitory and persistent portfolios. By comparing the BAHRs and BAHARs to both portfolios over 1, 2 and 3 years, we are able to identify if, and more importantly, when the market incorporates potential agency costs to excess cash holdings.

The results in Table 5 (Panel B) indicate that transitory excess cash firms outperform persistent excess cash firms over the 3 years, although statistical differences in returns only occurs by then end of the 3-year holding period. The difference in BAHRs between both groups ranges from an

[9] Barber and Lyon (1997) and Lyon, Barber and Tsai (1999) advocate the use of a control firm approach in calculating abnormal returns, matched using size and book-to-market characteristics. Given the importance of industry in explaining the cross-sectional variation in cash-holdings in Australia, we adopt an industry-matching procedure with either size or MTB. Unfortunately, we were unable to use a three-way match on industry, size and MTB due to limitations on sample size.

insignificant 1% over 1-year to a statistically significant 61% over 3 years. Transitory excess cash firms also outperform their benchmarks over 1, 2 and 3-year holding periods (BAHARs), whereas persistent excess cash firms underperform by the 3rd year. The negative BAHARs for persistent firms over the 3-year holding period suggest that by the 3rd year the market places less value on firms who hold excess cash for 3 consecutive years. The results provide some evidence that holding excess cash over extended periods (i.e., 2 years or more) results in a decrease in long-run stock performance, and so a fall in shareholder value.

4.4. The marginal value of excess cash

If agency costs related to holding excess cash is a source of lower shareholder returns, we would also expect this to be reflected in the value that investors place on an extra dollar of cash. If this is the case, the marginal value of excess cash should decline with each additional dollar of cash held, and further, the length of time firms hold on to excess cash. To examine this, we employ the Faulkender and Wang (2006) model,

$$r_{i,t} - R_{i,t}^{B} = \beta_0 + \beta_1 \frac{\Delta C_{i,t}}{M_{i,t-1}} + \beta_2 \frac{\Delta E_{i,t}}{M_{i,t-1}} + \beta_3 \frac{\Delta NA_{i,t}}{M_{i,t-1}} + \beta_4 \frac{\Delta RD_{i,t}}{M_{i,t-1}} + \beta_5 \frac{\Delta I_{i,t}}{M_{i,t-1}} + \beta_6 \frac{\Delta D_{i,t}}{M_{i,t-1}} + \beta_7 \frac{C_{i,t-1}}{M_{i,t-1}} + \beta_8 L_{i,t-1} + \beta_9 \frac{NF_{i,t}}{M_{i,t-1}} + \beta_{10} \frac{C_{i,t-1}}{M_{i,t-1}} * \frac{\Delta C_{i,t}}{M_{i,t-1}} + \beta_{11} L_{i,t-1} * \frac{\Delta C_{i,t}}{M_{i,t-1}} + \varepsilon_{i,t} \quad (3)$$

The dependent variable is the excess stock return, $r_{i,t} - R_{i,t}^{B}$, where $r_{i,t}$ is the stock return for firm *i* during fiscal year *t* and $R_{i,t}^{B}$ is stock *i's* benchmark return at year *t.* Since the stock return is the spread of $M_{i,t} - M_{i,t-1}$ divided by $M_{i,t-1}$, this standardisation enables the estimated coefficients to be interpreted as the dollar change in shareholder value for a one-dollar change in the corresponding independent variable. Deflating the firm-specific factors (except leverage) by the 1-year lagged market value of equity ($M_{i,t-1}$) also helps ensure larger firms do not bias the results.

The key coefficient of interest is the unexpected changes in cash (β_1), which captures the marginal value placed by shareholders on an extra dollar of cash. The model assumes that the entire annual change in cash from the previous year is the unexpected change, and so has not been

incorporated into the market value of firms at the beginning of the year.[10] Other variables are included to control for sources of value other than cash, but which may be correlated with cash. Financing control variables include the change in interest expense ($\Delta I_{i,t}$), change in total dividends ($\Delta D_{i,t}$), market leverage at the start of fiscal year ($L_{i,t-1}$) and the firm's net financing during the fiscal year t ($NF_{i,t}$). Changes in the firm's profitability are controlled for using earnings before interest and extraordinary items($\Delta E_{i,t}$). In addition to changes in R&D expenditure ($\Delta RD_{i,t}$), changes in the firm's investments are controlled for with the change in total assets net of cash $(\Delta NA_{i,t})$. The model also includes two interaction terms to capture the marginal value of cash, while controlling for the level of cash holdings (β_{10}) and leverage (β_{11}) at the beginning of the year. Both are predicted to be negative, suggesting that larger cash (leverage) levels at the beginning of the year decrease the marginal value of cash. The intuition here is that shareholders place a lower value on an extra dollar of cash if cash holdings are already large. Also, if leverage is high, any extra value created by cash will go to debt holders, suggesting lower value for equity shareholders. Excess returns are defined using two benchmarks: (i) the value-weighted ASX All Ordinaries Index, adjusted for dividends and stock splits; and (ii) the value-weighted industry indices, based on ASX industrial classifications. The All Ordinaries-adjusted and the Industry-adjusted excess returns are aggregated on a monthly basis for each fiscal year t for stock i.

Table 6 reports some summary statistics for the full sample and subsamples of transitory and persistent excess cash firms. All variables are winsorised at the 1% level to reduce the impact of extreme values. The mean excess returns for the full sample range from a negative 0.05% to a positive 1.8% for industry-adjusted and market-adjusted benchmarks, respectively. Median excess returns become more negative the longer excess cash is held, consistent with the BAHARs reported in Table 5. The mean and median changes in cash holdings (ΔC_t) are generally closer to zero suggesting symmetry. Median cash holdings at the beginning of the year (C_{t-1}) are 7.9% for the full sample, with

[9] As a robustness test, we also use equation (1) estimated using our fixed-effect model (model 3) to provide an alternative measure of unexpected cash. The results (available from the authors on request) remain largely unchanged.

a larger mean of 14% indicating right-skewness, but the mean is lower than the values reported in Table 1 (at 26%) since we are scaling by market values, as opposed to non-cash total assets. As expected, median values for beginning cash holdings (C_{t-1}) are higher for excess cash firms, ranging from 10% to 17%. The change in earnings ($\Delta E_{i,t}$) and R&D ($\Delta RD_{i,t}$) are close to zero and generally positive, suggesting that both profitability and R&D expenditures have been increasing over time. In general, the summary statistics for the full sample are consistent with those reported by Faulkender and Wang (2006).

Insert Table 6 and 7 about here

Table 7 reports the results for four models estimated on: (i) the whole sample (model 1); (ii) transitory excess cash firms (model 2); (iii) persistent excess cash firms, where cash is held for at least 2 consecutive years (model 3); and (iv) persistent excess cash firms, where cash is held for at least 3 consecutive years.[11] The coefficient values for model 1 are very similar to those reported by Faulkender and Wang (2006) and suggest that their model is fairly tractable to Australian data. The coefficient value on the unexpected change in cash suggests that an extra dollar of cash increases shareholders wealth by \$1.48 for firms with zero cash and leverage at the beginning of the year, which is very similar to Faulkender and Wang's (2006) value of \$1.47. For the mean firm with average beginning of the year cash holdings of 14.13% and leverage of 9.91% (see Table 6), this translates into a marginal value of cash to shareholders of \$1.04 (=1.4821 + (-1.8963 * 0.1413) + (-1.7539 * 0.991)). This increases to \$1.30 (=2.8598 + (-6.1927 * 0.1413) + (-2.7264 * 0.991)) for transitory excess cash firms, but then declines the longer excess cash is held to \$1.09 (=1.7338 + (-2.0502 * 0.1413) + (-2.8618 * 0.991)) when held for at least 2 consecutive years to only \$0.76 (=1.0965 + (2.0684 * 0.1413) + (-5.2197 * 0.991)) when held for at least 3 consecutive years. The lower marginal values placed on persistent excess cash firms are consistent with the lower BAHARs reported in Table 5 and suggest that the marginal value of cash to shareholders is not only lower for firms with larger

[10] The results reported in Table 7 use excess returns calculated using the market index as a benchmark. The results are unchanged when we use industry-adjusted excess returns (available from the authors upon request).

cash balances, but is decreasing in value over time. This provides additional evidence in support of higher agency costs to firms who hold excess cash for consecutive years.[12]

5. Endogeneity concerns

The robustness of our results depends heavily on the specification of model (3), which we used to identify excess and persistent excess cash firms. In this section we conduct some additional specification tests to ensure that the coefficient estimates are consistent and reliable. The first issue relates to potential endogeneity arising from measuring both the dependent and independent variables at time *t*, as in Opler *et al.* (1999). If cash holdings and one or more independent variables are simultaneously or jointly determined, endogeneity could render those coefficients unreliable. For example, a firm may consider its cash holdings in conjunction with leverage and capital expenditure requirements. To deal with this issue, we first re-estimate the model excluding leverage (LEV) and capital expenditures (CAPEX). The results reported in the appendix (model A1) show that the coefficients for the remaining variables remain largely unchanged. Additionally, we also exclude other potential jointly determined variables, including net investment (ICF) and financing (FIN) cash flow variables, since these may interact with capital expenditures, leverage and operating cash flows. The results from model A2 in the appendix show some sensitivity to operating cash flows, which are now significant, and capital expenditures which remain positive, but marginally insignificant. The exclusion of net investment (ICF) and financing (FIN) cash flows, however, raises some concerns about omitted variable bias, as indicated by a highly significant constant term and a significant reduction in explanatory power with an R^2 of 19%, compared to 38% in the baseline fixed-effects model reported in Table 3.

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[11] Including year dummies in the models to control for time fixed-effects and estimating cluster robust standard errors to control for firm clustering provides similar results to those reported in Table 7.

An alternative approach to dealing with potential endogeneity arising from simultaneity is to employ instrumental variables for suspect endogenous regressors in estimating our fixed-effects regression. We employ an instrumental variables fixed-effects two-stage least squares regression (FE-2SLS) using lagged values for leverage (LEV), capital expenditures (CAPEX), and net investment (ICF) and financing (FIN) cash flows.[13] Model A3 reports the results for the case in which leverage and capital expenditures are treated as endogenous and model A4 treats leverage, capital expenditures, net investment and financing cash flows as endogenous. The results reported in the appendix again suggest that our coefficient estimates are fairly robust to different model specifications. We also experiment with dynamic or partial adjustment models to control for persistence in cash holdings. The lagged dependent variable (lagged cash holdings) in the model can be interpreted to provide evidence on the speed of adjustment towards a target level of cash holdings. Using the Arellano and Bond (1991) dynamic model, e.g., Ozkan and Ozkan (2004) find an adjustment ratio of 0.6, indicating that UK firms reach their target level of cash holdings relatively quickly (i.e., under 2 years), providing some support for the trade-off model. In unreported results, we estimate the Arellano and Bond (1991) model using the same specification as in Ozkan and Ozkan (2004) and find an adjustment ratio of 0.7, suggesting that Australian firms also move quickly towards a target level of cash holdings, supporting our conclusions that a trade-off model best describes the level of a firm's cash holdings in Australia.[14] The coefficients in our dynamic model, however, are similar to those reported in Table 3.

Other potential sources of endogeneity include omitted observable and/or unobservable variables. Ozkan and Ozkan (2004), e.g., include some managerial and board structure variables in their model to test whether governance plays a role in determining cash holdings in the UK and find some evidence of a non-linear relationship between ownership and cash holdings. Evidence in the US appears to be weaker, with Opler *et al.* (1999) only finding a marginally significant positive relationship between cash holdings and ownership. We have omitted governance variables from our

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[12] We experiment with different lagged values for our instrumental variables, including 1-year and 2-year lags and find that our results remain unchanged. The results reported in the Appendix use a 1-year lag.
[13] See Appendix A in Ozkan and Ozkan (2004) for a detailed description of the dynamic model.

models since it is difficult to source them for Australian firms. It should be noted, however, that the explanatory power of the models reported in our paper are higher (38% to 46%) than those reported in comparable papers, so the models seem to do a reasonable job in explaining cash holdings. Further, Ramsey RESET tests indicate no omitted variable bias, suggesting that the models are reasonably well specified. If, however, omitting governance variables from our models leads to unobserved heterogeneity, this should be picked-up in the fixed-effects model (model 3), assuming that governance characteristics are fairly constant over our sample period.

6. Summary and conclusions

We find results consistent with a trade-off model in explaining the level of cash holdings for Australian firms. Cash holdings are positively related to growth options (and the level of information asymmetry), cash flow variability, capital expenditures, net investment and financing cash flows, whilst they are negatively related to leverage and net working capital. Perhaps not surprisingly, firms in capital intensive industries are found to maintain the highest level of cash holdings. As an illustration, the median firm in the gold sector holds 3 times more cash-in-hand than a corresponding firm in the retail industry. An inverse relationship with size is identified, whilst cash flow volatility is increasing with cash holdings.

Defining transitory excess cash firms as firms who hold excess cash for non-consecutive periods, we find significant differences in financial characteristics and long-run stock market performance when compared to a group of firms that hold cash for consecutive periods of 2 years or more. We define this latter group as persistent excess cash firms and show that they underperform transitory excess cash firms, where performance is measured using buy-and-hold returns. Further, over a 3-year holding period, persistent excess cash firms underperform a benchmark portfolio of firms from the same industry and of similar size or MTB, indicating shareholder value destruction. Consistent with Faulkender and Wang (2006), we find that the marginal value of cash holdings decreases with larger cash balances. We also find that the marginal value of cash decreases the longer firms hold on to excess cash, consistent with our long-run buy-and-hold returns findings.

It is difficult to justify the high cash holdings of persistent excess cash firms on the basis of key financial characteristics examined. For example, compared to transitory excess cash firms and a sample of non-excess cash firms, they have higher and safer operating cash flows (i.e., lower variability) and lower betas. This combined with higher free cash flows, lower marginal values of cash, and lower long-run stock returns suggests that persistent excess cash firm hoard cash at the expense of equity shareholders. The results are consistent with agency costs associated with the holding of excess cash for extended periods.

Appendix A
Specification tests for regressions predicting firm cash holdings

Variables	Predicted sign	Model A1 (FE)	Model A2 (FE)	Model A3 (FE-2SLS)	Model A4 (FE-2SLS)
MTB	+	0.0176**	0.0238***	0.0165***	0.0157***
		(0.0078)	(0.0087)	(0.0041)	(0.0042)
RSIZE	-	0.0074	0.0507***	-0.0049	-0.0010
		(0.0146)	(0.0153)	(0.0079)	(0.0080)
LEV	+/-		-0.4097***	-0.1780***	-0.1858***
			(0.0688)	(0.0291)	(0.0294)
OCF	-	-0.0757	-0.5214***	-0.0337	-0.0473**
		(0.1144)	(0.0950)	(0.0243)	(0.0245)
NWC	-	-0.1900***	-0.3367***	-0.1250***	-0.1317***
		(0.0672)	(0.0898)	(0.0244)	(0.0250)
CAPEX	+		0.1489	0.4229***	0.4429***
			(0.0945)	(0.0433)	(0.0444)
FIN	+/-	0.5423***		0.4663***	0.4648***
		(0.0520)		(0.0164)	(0.0166)
ICF	+/-	0.6184***		0.6665***	0.6663***
		(0.0836)		(0.0189)	(0.0190)
CONFID	+	-0.0022	-0.0002	-0.0032**	-0.0033**
		(0.0016)	(0.0016)	(0.0013)	(0.0013)
VAROCF	+	0.2371***	0.2073***	0.2715***	0.2854***
		(0.0621)	(0.0695)	(0.0316)	(0.0324)
Constant		0.0585	-0.6937***	0.2504	0.1786
		(0.2690)	(0.2824)	(0.1466)	(0.1494)
Year dummies		✓**	✓**	✓**	✓**
Observations		5,876	5,876	4,574	4,497
Adjusted R^2		34%	19%	40%	42%
F-statistic		18.00***	6.18***	4.02***	3.67***

The table reports the results from different specifications of the fixed-effects regression (model 3). Model A1 and A2 omit variables LEV and CAPEX, and FIN and ICF, respectively. Model A3 and A4 use instrumental variables in a 2SLS fixed-effects estimator. Model A3 treats both LEV and CAPEX as endogenous and model A4 treats LEV, CAPEX, FIN and ICF as endogenous. Lagged values of each endogenous variable are used as instruments. The variables are defined in Table 1. Standard errors are in parentheses. Standard errors for models A1 and A2 are corrected for heteroskedasticity using White's (1980) correction. The predicted sign relates to the trade-off model. ***, ** refer to statistical significance at the 1% and 5% levels (two-tailed), respectively.

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Table 1
Descriptive statistics

Panel A: Summary statistics

Dependent variables	N	Mean	σ	Median
LIQ	5,876	0.226	0.527	0.064
MTB	5,876	1.296	1.360	1.145
RSIZE	5,876	17.690	2.159	17.405
LEV	5,876	0.184	0.205	0.137
OCF	5,876	-0.046	0.324	0.026
NWC	5,876	0.004	0.229	-0.001
CAPEX	5,876	0.112	0.139	0.060
ICF	5,876	-0.107	0.273	-0.073
FIN	5,876	0.161	0.442	0.020
CONFID	5,876	7.781	9.305	8.100
VAROCF	5,876	0.146	0.213	0.078

Panel B: Correlation coefficients

	A	B	C	D	E	F	G	H	I	J
A. LIQ	1									
B. MTB	0.03*	1								
C. RSIZE	-0.24*	0.21*	1							
D. LEV	-0.21*	0.01	0.30*	1						
E. OCF	-0.43*	0.10*	0.43*	0.13*	1					
F. NWC	-0.12*	0.05*	0.10*	-0.24*	0.13*	1				
G. CAPEX	0.15*	0.04*	-0.16*	-0.09*	-0.08*	-0.16*	1			
H. ICF	0.48*	0.03*	-0.31*	-0.12*	-0.55*	-0.11*	0.28*	1		
I. FIN	0.16*	-0.05*	0.05*	0.02	-0.08*	0.03*	-0.39*	-0.26*	1	
J. CONFID	0.04*	0.06*	-0.03*	-0.02	-0.01	0.00	0.00	0.04*	0.00	1
K. VAROCF	0.29*	-0.03*	-0.32*	-0.09*	-0.41*	-0.12*	0.05*	0.23*	-0.02	0.00

The table reports descriptive statistics (Panel A) and correlation coefficients of the variables employed in the empirical analysis (Panel B). LIQ is cash including short-term deposits scaled by non-cash total assets (LIQ). Real size (RSIZE) is measured as the natural logarithm of total assets, deflated using the CPI index. Leverage (LEV) is defined as the sum of current debt and non-current debt scaled by total assets. The MTB ratio is calculated as the market value of assets divided by the book value of assets. The market value of assets is calculated as the book value of assets plus the difference between the market value of common equity and book value of equity. OCF is operating cash flows, measured as net operating cash flows scaled by total assets. VAROCF is the variability of cash flows, measured as the standard deviation of the first difference of OCF for the previous 3 years. NWC is net working capital, measured as current assets less cash and current liabilities scaled by total assets. Capital expenditures (CAPEX) are scaled by scaled by total assets. Investment (ICF) and financing (FIN) net cash flows extracted from the cash flow statement are scaled by total assets. Business confidence (CONFID) is captured by the Business Confidence Index (BCI) published in the *Quarterly Business Survey* from the Economic Research Department of the National Australia Bank. *N* refers to the number of observations (firm-years). * denotes statistical significance at the 5% level (two-tailed).

Figure 1
Median firm cash holdings by year

The graph illustrates the median cash-to-assets ratio across all firms by year, and a sub-sample of firms that survived the whole sample period. The cash holdings ratio is calculated as cash plus short-term deposits scaled by non-cash total assets.

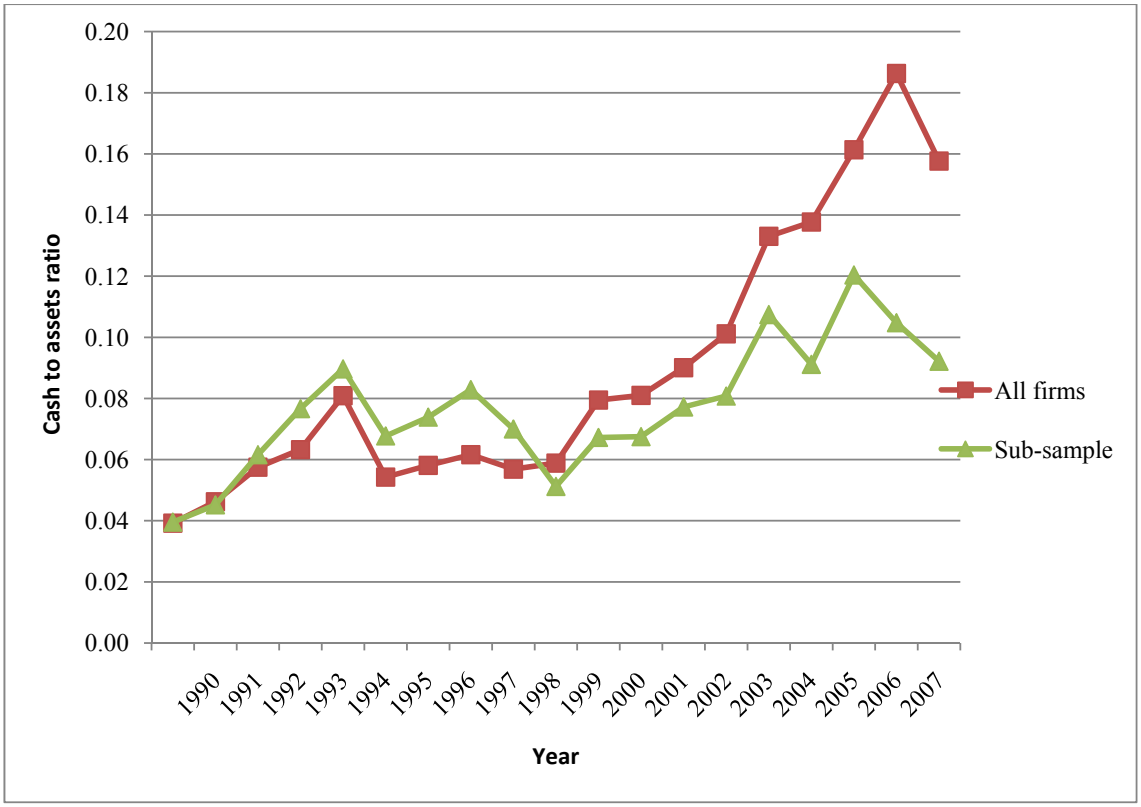

Table 2
Cash holdings by industry

Industry sector	Number of observations	Cash holdings (LIQ)		Mean size ($m)	Cash flow volatility (%)
		Median	Mean	RSIZE	VAROCF
Other metals (#2)	909	0.14	0.38	21	15.99
Gold (#1)	1,446	0.13	0.39	17	16.35
Telecommunications (#18)	397	0.13	0.41	22	24.60
Energy (#4)	563	0.12	0.31	37	13.68
Healthcare& Biotechnology (#21)	553	0.08	0.42	28	18.68
Miscellaneous Industrials (#22)	1,425	0.06	0.23	29	17.19
Infrastructure & Utilities (#5)	131	0.06	0.33	243	11.34
Diversified industrials (#23)	265	0.05	0.11	214	8.57
Developers & Contractors (#6)	407	0.05	0.10	84	21.67
Engineering (#11)	270	0.05	0.12	48	11.85
Tourism & Leisure (#24)	310	0.04	0.10	76	8.48
Media (#15)	371	0.04	0.27	70	12.61
Diversified Resources (#3)	82	0.04	0.06	1,526	4.55
Retail (#13)	367	0.04	0.14	95	10.94
Chemicals (#10)	78	0.04	0.05	207	8.05
Building Materials (#7)	225	0.03	0.06	213	5.55
Transport (#14)	119	0.03	0.05	190	4.17
Paper & Packaging (#12)	85	0.03	0.06	749	4.28
Food & Household (#9)	303	0.02	0.05	105	6.76
Alcohol & Tobacco (#8)	171	0.02	0.04	216	5.74

The table reports median and mean cash-to-assets ratio (LIQ) by ASX Industry (code in parentheses). Size is the mean real total assets (RSIZE) for each industry deflated using the CPI to 2002 dollars. Cash flow volatility (VAROCF) is captured by the mean VAROCF for each industry.

Table 3
Regressions predicting firm cash holdings

Variables	Predicted sign	Model 1 (OLS)	Model 2 (OLS)	Model 3 (FE)	Model 4 (FMB)
MTB	+	0.0187***	0.0180***	0.0125	0.0188***
		(0.0071)	(0.0071)	(0.0077)	(0.0059)
RSIZE	-	0.0056	0.0079**	0.0145	0.0034
		(0.0037)	(0.0038)	(0.0145)	(0.0028)
LEV	+/-	-0.4054***	-0.3847***	-0.3533***	-0.3843***
		(0.0319)	(0.0333)	(0.0523)	(0.0278)
OCF	-	-0.1363	-0.1380	-0.0868	-0.0740
		(0.0952)	(0.0954)	(0.1142)	(0.1266)
NWC	-	-0.1783***	-0.1663***	-0.2529***	-0.1422***
		(0.0539)	(0.0558)	(0.0713)	(0.0308)
CAPEX	+	0.4813***	0.4558***	0.3081***	0.4154***
		(0.0937)	(0.0947)	(0.0983)	(0.0985)
FIN	+/-	0.5046***	0.4987***	0.5330***	0.4766***
		(0.0587)	(0.0588)	(0.0514)	(0.1059)
ICF	+/-	0.6206***	0.6230***	0.6438***	0.5306***
		(0.0974)	(0.0965)	(0.0830)	(0.1364)
CONFID	+	-0.0006	-0.0002	-0.0018	-0.0034
		(0.0019)	(0.0019)	(0.0016)	(0.0028)
VAROCF	+	0.3549***	0.3644***	0.2446***	0.3368***
		(0.0572)	(0.0578)	(0.0603)	(0.0482)
Constant		0.0856	0.0327	-0.0240	0.1262**
		(0.0778)	(0.0781)	(0.2665)	(0.0538)
Industry dummies			✓***		
Year dummies		✓**	✓**	✓**	
Observations		5,876	5,876	5,876	9
Adjusted R^2		39%	40%	38%	46%
F-statistic		45.78***	31.40***	17.73***	67.55***

The table reports the results from OLS, fixed-effects and Fama-MacBeth (FMB) regressions. The dependent variable, cash holdings is measured as cash including short-term deposits scaled by non-cash total assets. Real size (RSIZE) is measured as the natural logarithm of total assets, deflated using the CPI index. Leverage (LEV) is defined as the sum of current debt and non-current debt scaled by total assets. The MTB ratio is calculated as the market value of assets divided by the book value of assets. The market value of assets is calculated as the book value of assets plus the difference between the market value of common equity and book value of equity. OCF is operating cash flows, measured as net operating cash flows scaled by total assets. VAROCF is the variability of cash flows, measured as the standard deviation of the first difference of OCF for the previous 3 years. NWC is net working capital, measured as current assets less cash and current liabilities scaled by total assets. Capital

expenditures (CAPEX) are scaled by scaled by total assets. Investment (ICF) and financing (FIN) net cash flows extracted from the cash flow statement are scaled by total assets. Business confidence (CONFID) is captured by the Business Confidence Index (BCI) published in the *Quarterly Business Survey* from the Economic Research Department of the National Australia Bank. Standard errors corrected for heteroskedasticity using White's (1980) correction are reported in parentheses. FMB standard errors are calculated using the time series of estimated regression coefficients. The reported adjusted R^2 and *F*-statistic for the FMB models are calculated as the average of the yearly regressions. The predicted sign relates to the trade-off model. ***, ** refer to statistical significance at the 1% and 5% levels (two-tailed), respectively.

Table 4
Industry classification of excess, transitory and persistent excess cash firms

ASX code	Industry Name	All Firms	(%)	Transitory Firms	(%)	Persistent Firms	(%)
1	Gold	50	12.41%	39	14.13%	4	8.16%
2	Other Metals	40	9.93%	29	10.51%	1	2.04%
3	Diversified Resources	4	0.99%	2	0.72%	2	4.08%
4	Energy	26	6.45%	18	6.52%	3	6.12%
5	Infrastructure and Utilities	2	0.50%	0	0.00%	1	2.04%
6	Developers and Contractors	14	3.47%	5	1.81%	4	8.16%
7	Building Materials	12	2.98%	10	3.62%	1	2.04%
8	Alcohol and Tobacco	7	1.74%	4	1.45%	1	2.04%
9	Food and Household	15	3.72%	12	4.35%	2	4.08%
10	Chemicals	0	0.00%	0	0.00%	0	0.00%
11	Engineering	13	3.23%	10	3.62%	1	2.04%
12	Paper and Packaging	1	0.25%	0	0.00%	0	0.00%
13	Retail	16	3.97%	8	2.90%	2	4.08%
14	Transport	11	2.73%	6	2.17%	4	8.16%
15	Media	20	4.96%	15	5.43%	1	2.04%
18	Telecommunications	39	9.68%	25	9.06%	5	10.20%
21	Healthcare and Biotech	45	11.17%	29	10.51%	6	12.24%
22	Miscellaneous Industrials	67	16.63%	50	18.12%	6	12.24%
23	Diversified Industrials	10	2.48%	6	2.17%	3	6.12%
24	Tourism and Leisure	11	2.73%	8	2.90%	2	4.08%
	Total	403		276		49	

The table presents the industry distribution of excess, transitory and persistent excess cash firms. The total number of excess cash firms (=403) is calculated as the sum of all firms identified by applying the industry-specific regression model (equation 2). The number of transitory excess cash firms (=276) is calculated as the total number of excess cash firms (=403) less the number of excess cash firms that maintain excess cash for 2 or more years. Persistent excess cash firms (=49) are those that maintain excess cash for 3 or more consecutive years. 127 firms (not reported) maintain excess cash for 2 or more years.

Table 5
Summary statistics and long-run stock returns of persistent, transitory and non-excess cash firms

	Persistent (A)	Transitory (B)	Non-Excess (C)	(A-C)	(B-C)	(A-B)
Panel A: Median financial characteristics						
LIQ	0.087	0.107	0.049	0.038***	0.058***	-0.020
MTB	1.512	1.181	1.168	0.344***	0.013**	0.331***
RSIZE	18.013	17.025	17.476	0.537***	-0.451***	0.987***
LEV	0.137	0.101	0.147	-0.010	-0.046***	0.036
OCF	0.079	0.020	0.013	0.066***	0.007***	0.059***
VAROCF	0.061	0.094	0.073	-0.012***	0.020***	-0.033***
NWC	0.007	-0.006	0.000	0.007**	-0.006**	0.013***
CAPEX	0.064	0.065	0.059	0.005	0.006***	-0.001
ICF	-0.070	-0.089	-0.069	-0.001	-0.020***	0.019***
FIN	-0.014	0.020	0.037	-0.050***	-0.017**	-0.033***
FCF	0.024	-0.020	-0.020	0.045***	0.000	0.044***
INV	0.074	0.074	0.074	0.000	0.000	0.000
DPS	0.11	0.067	0.08	3.000***	-1.300***	4.300***
POUT	0.605	0.618	0.606	0.001	0.012	0.013
BETA	0.704	0.918	0.880	-0.177***	0.038	-0.215***

Panel B: Buy-and-hold returns (BAHRs) and buy-and-hold abnormal returns (BAHARs) over 1, 2 and 3 years

	Persistent	Transitory	Difference
BAHRs 1-year	0.182**	0.196***	-0.014
BAHARs (industry and size) 1-year	0.157	0.130***	0.027
BAHARs (industry and MTB) 1-year	0.062	0.100***	-0.039
BAHRs 2 years	0.213**	0.460***	-0.247
BAHARs (industry and size) 2 years	0.161	0.413***	-0.252
BAHARs (industry and MTB) 2 years	-0.066	0.169***	-0.236
BAHRs 3 years	0.280	0.734***	-0.454**
BAHARs (industry and size) 3 years	-0.039	0.574***	-0.614**
BAHARs (industry and MTB) 3 years	-0.432*	0.166***	-0.598*

The table reports median financial characteristics (Panel A) and buy-and-hold returns (Panel B) for persistent, transitory and non-excess cash firms measured over the sample period 1994-2002. LIQ is cash including short-term deposits scaled by non-cash total assets (LIQ). Real size (RSIZE) is measured as the natural logarithm of total assets, deflated using the CPI index. Leverage (LEV) is defined as the sum of current debt and non-current debt scaled by total assets. The MTB ratio is calculated as the market value of assets divided by the book value of assets. The market value of assets is calculated as the book value of assets plus the difference between the market value of common equity and book value of equity. OCF is operating cash flows, measured as net operating cash flows scaled by total assets. VAROCF is the variability of cash flows, measured as the standard deviation of the first difference of OCF for the previous 3 years. NWC is net working capital, measured as current assets less cash and current liabilities scaled by total assets. Capital expenditures (CAPEX) are scaled by scaled by total assets. Investment (ICF) and financing (FIN) net cash flows extracted from the cash flow statement are scaled by total assets. FCF is free cash flow scaled by total assets. Free cash flow is defined as operating cash flow less capital expenditures. INV is total investments scaled by total assets. Total investments comprise expenditure on property, plant and equipment, investments and subsidiaries. DPS is dividends per share and POUT is the dividend payout ratio. BETA is an equity beta estimated from a market model of the previous 60 months returns for each firm on the ASX All-Ordinaries Index. Panel B reports BAHRs and BAHARs measured over 1, 2 and 3 year holding periods. BAHRs are calculated by compounding the monthly returns starting at the beginning of the year a firm is classified as either a persistent or transitory excess cash firm. The benchmark return in calculating BAHARs is the BAHRs on a portfolio of non-

excess cash firms, matched by industry and size, or industry and MTB ratio. The tests for significant differences in Panel B are T-tests for differences in means and Wilcoxon rank-sum tests in Panel A. *** and ** indicate statistically different at the 1% and 5% (two-tailed) significance levels, respectively.

Table 6
Summary statistics for marginal value of cash holdings sample

	All firms			Transitory (=1-year)			Persistent (≥2 years)			Persistent (≥3 years)		
Variables	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
$r_{i,t} - R^{B}_{i,t}$ (B = market)	0.0177	-0.0225	0.5110	-0.0027	-0.0056	0.4964	-0.0253	-0.0869	0.5141	-0.0201	-0.0873	0.4826
$r_{i,t} - R^{B}_{i,t}$(B = industry)	-0.0055	-0.0365	0.5165	-0.0489	-0.0370	0.5067	-0.0448	-0.1039	0.5275	-0.0446	-0.0860	0.4794
ΔC_t	0.0078	-0.0002	0.1118	0.0068	0.0001	0.1220	0.0043	0.0000	0.0963	0.0109	0.0054	0.0847
C_{t-1}	0.1413	0.0789	0.1523	0.2189	0.1720	0.1719	0.1778	0.1294	0.1586	0.1546	0.1045	0.1499
ΔE_t	0.0050	0.0041	0.1082	-0.0040	-0.0012	0.1014	0.0090	0.0072	0.0795	0.0104	0.0096	0.0740
ΔNA_t	0.1147	0.0575	0.3507	0.0070	0.0020	0.2703	0.0523	0.0212	0.2487	0.0636	0.0296	0.2428
ΔRD_t	0.0008	0.0000	0.0325	0.0017	0.0000	0.0624	0.0001	0.0000	0.0085	0.0006	0.0000	0.0102
ΔI_t	0.0006	0.0000	0.0323	-0.0019	0.0000	0.0290	-0.0005	0.0000	0.0203	-0.0003	0.0000	0.0256
ΔD_t	0.0028	0.0000	0.0142	0.0026	0.0000	0.0156	0.0045	0.0000	0.0158	0.0046	0.0000	0.0161
L_{t-1}	0.0991	0.0202	0.1293	0.0763	0.0074	0.1093	0.0981	0.0266	0.1232	0.1250	0.0549	0.1346
NF_t	0.1131	0.0178	0.2293	0.0314	0.0000	0.1588	0.0171	-0.0136	0.1638	0.0043	-0.0263	0.1572

The table reports summary statistics for the variables used to estimate marginal value of cash regressions. $r_{i,t} - R^{B}_{i,t}$ (B = market) is the excess stock return, where $r_{i,t}$ is the annual stock return of firm i at time t (fiscal year-end) and $R^{B}_{i,t}$ is stock i's benchmark return at time t, where B denotes market (ASX All Ordinaries Index) or the return on industry portfolios, created using ASX industry classifications. All variables (except L_{t-1} and excess stock return) are scaled by lagged market value of equity (M_{t-1}). C_t is cash plus short-term deposits, E_t is earnings before extraordinary items plus interest, and NA_t is total assets minus cash holdings. It is interest expense, total dividends D_t are measured as common dividends paid, L_{t-1} is market leverage, and NF_t is the total equity issuance minus repurchases plus debt issuance minus debt redemption.

Table 7
Regressions for the marginal value of cash holdings

Variables	Predicted sign	Model 1 (All Firms)	Model 2 (Transitory =1-year)	Model 3 (Persistent ≥2 years)	Model 4 (Persistent ≥3 years)
ΔC_t	+	1.4821***	2.8598***	1.7338**	1.0965
		(0.1215)	(0.6956)	(0.9182)	(0.9304)
ΔE_t	+	0.5582***	1.0125***	0.9397**	1.2468**
		(0.0669)	(0.3998)	(0.4701)	(0.5724)
ΔNA_t	+	0.1865***	0.3440**	0.0915	-0.0607
		(0.0231)	(0.1715)	(0.1629)	(0.1858)
ΔRD_t	+	0.5316**	0.5410	0.7476	-1.4945
		(0.2254)	(0.3217)	(4.3580)	(3.7712)
ΔI_t	-	-1.5281***	-2.0150	-3.9961**	-4.1745***
		(0.2333)	(1.2700)	(1.7692)	(1.6341)
ΔD_t	+	1.1211***	2.8524	1.4580	0.7048
		(0.4421)	(2.3693)	(1.9055)	(2.1936)
C_{t-1}	+	0.4405***	0.5828***	0.7517***	0.4424
		(0.0492)	(0.2282)	(0.2301)	(0.2843)
L_{t-1}	-	-0.2783***	-0.0831	-0.1563	-0.3199
		(0.0502)	(0.2999)	(0.2607)	(0.2672)
NF_t	+	0.2086***	-0.0955	0.6191**	0.7562***
		(0.0369)	(0.2522)	(0.2660)	(0.2811)
$C_{t-1}*\Delta C_t$	-	-1.8963***	-6.1927***	-2.0502	2.0684
		(0.3892)	(1.8752)	(2.4735)	(2.9440)
$L_t*\Delta C_t$	-	-1.7539***	-2.7264	-2.8618	-5.2197
		(0.4790)	(2.7885)	(3.6705)	(3.4596)
Constant		-0.0706*** (0.0115)	-0.1627*** (0.0623)	-0.2115*** (0.0614)	-0.1093 (0.0711)
Observations		6,188	194	232	129
Adjusted R^2		12%	18%	19%	26%
F-statistic		67.49***	4.42***	4.9***	4.11***

The table presents the results from OLS regressions of excess stock returns (market-adjusted) on changes in firm-specific characteristics over the accounting year. All variables (except L_{t-1} and excess stock return) are scaled by lagged market value of equity (M_{t-1}). C_t is cash plus short-term deposits, E_t is earnings before extraordinary items plus interest, and NA_t is total assets minus cash holdings. It is interest expense, total dividends D_t are measured as common dividends paid, L_{t-1} is market leverage, and NF_t is the total equity issuance minus repurchases plus debt issuance minus debt redemption. Standard errors corrected for heteroskedasticity using White's (1980) correction and firm-year clustering (Rogers, 1993) are reported in parentheses. ***, ** denote statistical significance at the 1% and 5% levels (two-tailed), respectively.