The Persistence and Pricing Implications of Changes in Multinational Firms' Foreign Cash Holdings

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Abstract

Using a hand-collected sample of U.S. multinational firms' foreign and domestic cash holdings, we evaluate the association between changes in foreign and domestic cash and one-year-ahead earnings. Because changes in cash are components of cash flows which itself is a component of earnings, a higher coefficient on the change in cash component is interpreted as higher earnings persistence. In contrast to the common belief that accumulating cash in foreign subsidiaries is suboptimal, we find that changes in foreign cash are *as persistent* for future earnings as changes in domestic cash. We further document that foreign cash changes have higher earnings persistence when foreign operations offer better growth opportunities and when repatriation taxes are lower. Our results are robust to controlling for the voluntary nature of foreign cash disclosure. Next, we investigate whether investors efficiently price the earnings persistence implications of changes in foreign and domestic cash. Our results suggest that investors under-react to changes in foreign cash holdings, and this under-reaction is more concentrated in firms with lower analyst coverage.

1. Introduction

Over the past 30 years, U.S. firms have become increasingly global. In 2015, 85 percent of S&P 500 firms had operations abroad, and 52 percent of their income was from foreign operations. As foreign income continues to grow, foreign cash holdings also continue to grow.[1] The record level of U.S. multinationals' foreign cash holdings has attracted much attention from regulators and policymakers.[2] Firms with undistributed foreign earnings held in cash need to pay a 15.5% one-time tax under the Tax Cuts and Jobs Act of 2017, the intention of which is to reduce firms' incentive to accumulate cash overseas. Shareholders are also concerned about whether retaining a significant amount of cash overseas is the most efficient allocation of firm resources.[3] For a multinational firm, the decision of retaining cash overseas, repatriating foreign cash to the U.S., or distributing cash to shareholders and debtholders could have different implications for future earnings. In this study, we evaluate the earnings persistence implications of retaining cash in foreign versus domestic operations and whether capital market participants correctly understand the persistence implications of foreign and domestic cash holdings.

Prior research on the determinants of cash holdings generally finds that firms hold cash for precautionary motives (e.g., Bates et al. 2009). Some studies also argue that entrenched managers have incentives to hoard cash for personal benefits and to avoid capital market scrutiny (e.g., Jensen 1986). For multinational firms, another important reason for retaining cash in foreign subsidiaries is repatriation taxes. Before 2018, U.S.-based multinational firms are taxed on a

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[1] In our study, cash is defined as cash, cash equivalents, and short-term investments.
[2] For example, "SEC asks companies to disclose offshore cash" (http://www.reuters.com/article/us-sec-idUSTRE78J4IA20110920); "Top 50 U.S. companies hold $1.4 trillion in cash offshore" (http://money.cnn.com/2016/04/14/news/tax-us-companies-offshore-cash/index.html); "Trump plans to seek 10% tax on offshore earnings" (https://www.bloomberg.com/news/articles/2017-04-25/trump-s-tax-plan-said-to-slash-rate-for-pass-throughs-to-15-j1y5bn74)
[3] For example, hedge fund manager David Einhorn sued Apple over its high level of cash reserves, "we believe Apple must examine all of its options to unlock the growing value of its balance sheet for all shareholders." (https://www.sec.gov/Archives/edgar/data/320193/000101143813000069/form_px14a6g-apple.htm)

worldwide basis under the credit and deferral system. Repatriating foreign income is usually associated with an incremental U.S. tax cost because the U.S. tax rate (35% before 2018) is higher than most of the countries in the world. Studies show that tax costs of repatriation are an important determinant of U.S. multinationals' cash holdings overseas (Foley et al. 2007).

A line of research examines the valuation consequences of holding foreign cash by regressing stock returns on changes in foreign cash (Chen 2016; Harford et al. 2017) or proxies for changes in foreign cash (Campbell et al. 2014). These studies generally find that investors place a discount on foreign cash that is likely to be "trapped" due to repatriation taxes. The inferences from these studies rely on the assumption that investors correctly recognize the future performance implications of changes in foreign cash. However, observing a lower valuation of foreign cash is consistent with two alternative explanations: (1) foreign cash holdings are indeed used suboptimally and lead to poor future earnings; (2) foreign cash holdings are not used suboptimally but discounted by an inefficient market.[4] Using a comprehensive sample of firms that disclose their foreign and domestic cash holdings, we investigate the implications of foreign and domestic cash changes for future earnings and whether the market correctly prices the future earnings implications of current period changes in domestic and foreign cash balances.

Several competing forces lead us to hypothesize that changes in foreign and domestic cash holdings could have different earnings persistence characteristics. In our study, persistence refers to the extent to which current period earnings components (including accruals, changes in foreign and domestic cash, and distributions) map into one-year-ahead earnings. On the one hand, a firm's foreign operations could offer better growth opportunities, so cash retained and then reinvested in foreign operations will contribute to higher future earnings, resulting in higher earnings persistence.

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[4] Although mispricing is less likely to present in large firms (e.g., multinational firms), prior studies show that multinational firms can be mispriced (Huang 2015; Cohen and Lou 2012; Thomas 1999).

Bodnar and Weintrop (1997) find that the earnings response coefficient (ERC) on changes in foreign earnings is significantly larger than the ERC on changes in domestic earnings, and they attribute the higher foreign earnings ERC to better growth opportunities in foreign operations.

On the other hand, cash retained in foreign jurisdictions could be less mobile because of repatriation tax costs and other restrictions such as foreign exchange controls. Thus, foreign cash could be "trapped" in low-return financial assets (De Waegenaere and Sansing 2008) or be reinvested in suboptimal acquisitions (Edwards et al. 2016; Hanlon et al. 2015), resulting in lower future earnings and lower earnings persistence. However, studies examining firms' repatriation and investment behavior under the American Jobs Creation Act of 2004 suggest that on average MNCs are not capital-constrained in the U.S. indicating that repatriation taxes may not create frictions in firms' internal capital allocation (Blouin and Krull 2009; Dharmapala et al. 2011; Faulkender and Petersen 2012).

We hand-collect the foreign and domestic cash holdings for a comprehensive sample of U.S. multinational firms for the period 2001 to 2015. To examine the earnings persistence implications of foreign and domestic cash changes, we build on the approach developed in Dechow et al. (2008). We first decompose current period earnings into four components – accruals, changes in cash, distribution to equity holders, and distribution to debtholders. The latter three sum up to free cash flows. We then decompose changes in cash into changes in foreign and domestic cash. Finally, we regress one-year-ahead earnings on all these components, and a higher coefficient on an earnings component implies that the component is more persistent.

We find that changes in foreign and domestic cash holdings have similar earnings persistence implications, i.e., a one-dollar change in foreign (domestic) cash feeds into 0.68 (0.70) dollar of one-year-ahead earnings. This finding stands in contrast with the common belief that

retaining cash overseas is suboptimal. Although it is possible that foreign cash might be subject to agency problems or repatriation costs (Edwards et al. 2016; Hanlon et al. 2015), our evidence suggests that on average changes in foreign cash bode well for future earnings.

One plausible explanation for the persistence of foreign changes is that foreign markets offer under-exploited growth opportunities, so cash retained in foreign subsidiaries can earn a higher rate of return. In cross-sectional analyses, we find that changes in foreign cash are indeed more persistent in the high foreign growth subsample. On the other hand, various studies document that repatriation taxes create frictions in firms' cash retention and allocation decisions and are detrimental to firm value (e.g., Edwards et al. 2016; Hanlon et al. 2015; Chen 2016; Harford et al. 2017). In the presence of repatriation taxes, foreign cash might be held as passive investments or reinvested in low-return projects leading to low future earnings, implying low persistence. Consistent with this expectation, we find that changes in foreign cash are less persistent when the firm's estimated repatriation tax costs are higher.

Our analysis relies on a sample of multinational firms that disclose their foreign cash holdings. Although the SEC sent out comment letters requesting firms to disclose foreign cash and most firms comply with the SEC's suggestion, the SEC might not target all firms with foreign cash holdings and not all firms comply with the SEC suggestion. The decision to disclose foreign cash holdings is still to some extent voluntary. If firms with low foreign cash persistence are more likely to withhold disclosure, our inference may not generalize to all firms with foreign cash holdings. To address this sample selection problem, we first model the foreign cash disclosure decision. We find that firms that have received an SEC foreign cash-related comment letter are more likely to disclose foreign cash. We then include the inverse Mills' ratio from the determinant model in the earnings persistence test and find qualitatively similar results.

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Finally, we investigate whether investors correctly anticipate and price the earnings persistence implications of changes in foreign and domestic cash holdings. We find that foreign (but not domestic) cash changes are positively associated with one-year-ahead stock returns, indicating that investors under-estimate the persistence of foreign cash changes. We further find that investors' underreaction to foreign cash changes is concentrated in firms with lower analyst coverage. Despite that firms in our sample separately disclose foreign and domestic cash holdings, investors still cannot fully decipher the implications of foreign cash changes.

Understanding the persistence characteristics and pricing of foreign and domestic cash changes in the multinational context has several important implications. First, several recent studies on the valuation consequences of cash holdings find that investors discount locked-out foreign cash due to repatriation taxes (Chen 2016; Harford et al. 2017; Campbell et al. 2014). These studies implicitly assume that locked-out foreign cash is used sub-optimally and the market prices foreign cash accordingly. Our study directly tests this assumption by investigating whether changes in foreign and domestic cash components indeed have different implications for earnings persistence and whether the market's assessment of earnings persistence of foreign and domestic cash is consistent with observed persistence in earnings. Our results suggest that foreign and domestic cash changes have similar persistence level, and capital market participants behave as if they under-estimate the persistence of foreign cash balance changes.

Second, disclosure on foreign operations is limited and opaque under the current reporting regime. The SEC has long been concerned about the cash holdings disclosure of multinationals. The concern stems from the fact that total cash reported on the balance sheet does not accurately reflect the amount of cash firms have at their disposal because some cash is held in countries with uncertain business environments or high repatriation tax costs. Therefore, the study is especially

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relevant in light of the recent attention on record high levels of foreign cash holdings by multinationals. Our finding that investors under-react to foreign cash changes suggests that the SEC's call for additional disclosure on foreign operations is warranted.

This paper proceeds as follows. Section 2 discusses literature related to our two research questions and develops our predictions. Section 3 describes our sample and research design. Section 4 discusses our empirical results, and Section 5 concludes.

2. Prior Literature and Hypothesis Development

2.1 Prior literature

Our study is related to several lines of research. The first link is a general connection to the extensive literature on earnings persistence and market pricing of different earnings components. Sloan (1996) shows that the cash flow component of earnings is more persistent than the accrual component – that is, the estimated coefficient on current period cash flow is larger than the estimated coefficient on current period accruals when both are regressed on earnings in period t+1. He further shows that investors fail to distinguish between the differential persistence of the accrual and cash components. Xie (2001) decomposes total accruals into nondiscretionary and discretionary components and finds that investors overestimate the persistence of the discretionary accruals.

Studies that investigate the persistence and pricing of accruals implicitly treat the cash flow component (i.e., free cash flow) as homogenous. However, the uses of positive cash flows and the sources to fund negative cash flows both have implications for future earnings. Building on Sloan's (1996) decomposition of earnings into accruals and free cash flows, Dechow et al. (2008) further decompose the cash flow component of earnings into three subcomponents: changes in cash, net cash distributions to debt holders, and net cash distributions to equity holders. They predict and

find that the change in cash (net cash distribution to equity holders) subcomponent is the least (most) persistent and that investors misprice the change in cash subcomponent in a manner similar to their mispricing of accruals (i.e., investors overestimate the persistence of the change in cash subcomponent). Extending Dechow et al. (2008), Chen and Shane (2014) find that positive (negative) discretionary changes in cash are the least (most) persistent.[5] Chen and Shane (2014) also report that investors overestimate the persistence of nondiscretionary changes in cash and discretionary decreases in cash.

The second link is to the literature on the valuation and performance implications of multinational firms. Despite tremendous interest in this area, prior literature has not definitively concluded whether there are net benefits to global diversification. Denis et al. (2002) and Christophe and Pfeiffer (2002) report that multinational firms are traded at a discount, whereas Creal et al. (2014) obtain the opposite result. In accounting, several studies examine the value relevance of foreign earnings relative to domestic earnings but report mixed findings. Some studies report that the earnings response coefficient on foreign earnings is significantly higher than that on domestic earnings (Bodnar and Weintrop 1997; Bodnar et al. 1999). Bodnar and Weintrop (1997) attribute the higher earnings response coefficients to higher growth opportunities in foreign markets. Other studies find that there are no differences between foreign and domestic earnings persistence (Christophe and Pfeiffer 2002; Christophe 2002).

The third link concerns the valuation implications of cash holdings. Prior studies document that a dollar change in cash does not always translate into a dollar change in market value. For example, higher growth potential, limited access to external capital, and better corporate governance are shown to have a positive impact on the value of a firm's cash holdings (Faulkender

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[5] Discretionary changes in cash is the estimated residual of a cash holding prediction model (Bates et al. 2009).

and Wang 2006; Pinkowitz and Williamson 2004; Dittmar and Mahrt-Smith 2007). Several recent studies report that investors place a lower valuation multiple on multinationals' cash holdings when the majority of cash is held overseas and when repatriation tax costs are high (Chen 2016; Campbell et al. 2014; Harford et al. 2017). However, almost all of these studies examine the relation between cash holdings and contemporaneous, not future, returns, so they belong to the value relevance literature, which assumes that investors incorporate all relevant information into stock prices. Our study does not assume investor rationality but rather tests this assumption by investigating whether the market's assessment of the persistence implications of foreign and domestic cash changes is consistent with its observed persistence into future earnings.

2.2 Hypothesis development

When firms generate positive free cash flows, they must decide whether to retain them or to distribute them to equity and debt holders. In the presence of institutional differences, different growth opportunities in different regions, and repatriation tax costs, multinational firms have to make this decision separately for their domestic and foreign operations. In this section, we discuss how different economic factors could influence firms' cash holdings decisions and how they affect the relation between cash holdings and future earnings.

2.2.1 Growth opportunity

Prior valuation studies find that the earnings response coefficient (ERC) on foreign earnings is higher than ERC on domestic earnings (Bodnar and Weintrop 1997; Bodnar et al. 1999). Bodnar and Weintrop (1997) attribute the higher ERC on foreign earnings to higher growth opportunities in foreign operations. Thomas (1999) finds that foreign earnings changes are more persistent than domestic earnings and that investors underestimate their persistence. Blouin et al. (2016) estimate that 39 percent of permanently reinvested earnings (PRE) are placed in high-

growth foreign affiliates, implying that growth plays a critical role in a firm's decision to retain or reinvest foreign earnings.[6] Dechow et al. (2008) argue that firms retaining cash in cash balances are more likely to spend the cash on net assets in future periods, so increases in cash could be a leading indicator of future expenditures on net operating assets (e.g., inventory and PP&E). If expected growth opportunities in the foreign operations are the main driver of a firm's cash retaining decision, then retained foreign cash is likely to lead to better earnings in the future.

2.2.2 Repatriation tax costs

For tax years beginning before December 31, 2017, U.S. multinationals are taxed on their worldwide income. However, U.S. taxes on foreign income are generally deferred until such income is brought back to the U.S. Firms are granted credits for foreign taxes paid, so the remaining U.S. tax due upon repatriation is approximately the pre-tax foreign income times the difference between the U.S. statutory tax rate and the weighted average foreign tax rate. Empirical and anecdotal evidence generally suggests that repatriation taxes affect dividend repatriation and investment decisions (e.g., Desai et al. 2001, 2007; Foley et al. 2007; Graham et al. 2011; Nessa 2016).[7]

Repatriation taxes increase firms' incentive to retain cash overseas (Foley et al. 2007; Chen 2016). If a majority of foreign income is earned in low-tax jurisdictions, firms have strong incentives to delay repatriation to defer repatriation taxes. Therefore, if firms lack investment opportunities abroad, most of the foreign earnings will be retained in cash balances or invested in

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[6] Permanently reinvested foreign earnings (PRE) is not equivalent to accumulated unremitted foreign earnings. PRE is an accounting designation under APB Opinion No. 23.

[7] Hartman (1985) shows that the repatriation tax cost is irrelevant and whether to reinvest or repatriate depends on the after-tax rates of return in the foreign versus U.S. operations. However, this result is derived under two simplifying assumptions: (1) foreign and domestic tax rates are exogenous and constant; (2) repatriation is ultimately unavoidable. Further, Hartman ignores the financial statement benefits to firms of classifying foreign earnings as indefinitely reinvested (Graham et al. 2011).

financial assets. Obviously, investing excess amounts of free cash flows in financial assets is not optimal. If there are no repatriation taxes, these funds would be repatriated and invested in domestic projects or be distributed to shareholders who could then invest them in other higher-return projects. Therefore, the opportunity costs associated with investing in financial assets could be substantial. Bryant–Kutcher et al. (2008) find that investors discount the value of permanently reinvested earnings for firms with excess investment in financial assets. Chen (2016) finds that the negative effect of repatriation tax costs on the value of cash holdings is concentrated in firms that invest heavily in financial assets. The results are consistent with investors discounting tax-motivated investments in cash. Thus, repatriation tax costs could induce firms to hold excess cash in foreign operations, which in turn contributes to lower earnings in the following period.

In addition, cash is the single item on the balance sheet that is most susceptible to managerial rent extraction. Jensen (1986) hypothesizes that when cash is abundant, managers may overinvest or divert it for their personal benefit. Consistent with this hypothesis, prior studies find that when a firm has weaker governance, its cash is valued lower (Dittmar and Mahrt-Smith 2007). Chen and Shane (2014) report that discretionary increases in cash holdings contribute to earnings being less persistent. In a multinational firm, a foreign subsidiary's long geographic distance from corporate headquarters creates significant oversight costs for both directors and shareholders, since making onsite visits is more difficult and time-consuming. This undermines directors' and shareholders' ability to closely monitor the use of cash at foreign subsidiaries.[8] Hope and Thomas (2008) document that firms with limited disclosure on foreign operations experience greater

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[8] Anecdotal evidence suggests that some firms hold their foreign cash in U.S. banks (https://www.wsj.com/articles/SB10001424127887323301104578255663224471212). Cash kept in U.S. banks may not be subject to agency problems discussed above. However, foreign cash parked in U.S. banks is still less flexible compared to domestically generated cash because it cannot be freely used to fund domestic cash shortfalls and can still result in agency problems when used to fund suboptimal foreign acquisitions (Hanlon et al. 2015; Edwards et al. 2016).

expansion in foreign sales, produce lower foreign profit margins, and have lower firm value. To the extent that more severe agency issues are associated with foreign operations, foreign cash changes will be less persistent than domestic cash changes.

To sum up, the more numerous growth opportunities of foreign markets suggest that foreign cash changes should be associated with higher future earnings. On the other hand, foreign cash locked-out due to repatriation tax costs could be subject to various agency problems and opportunity costs, suggesting that foreign cash might bode poorly for future earnings, so we state our first hypothesis in the null form:

> *Hypothesis 1: The cash component of earnings that is retained by the firm's foreign operations is as persistent as the cash component of earnings that is retained by the firm's domestic operations.*

In our empirical analyses, we also partition our firms into subsamples based on high versus low foreign growth expectations and high versus low repatriation tax costs to test predicted differences between these subsamples.

A growing body of literature questions market efficiency with respect to earnings and its components. The premise of this line of research is that investors may not fully understand the time-series behavior of earnings and its components. For example, Sloan (1996) shows that investors overestimate (underestimate) the persistence of the accrual (cash) component of earnings. Dechow et al. (2008) find that stock prices act as if investors understand the persistence of earnings that is distributed to debt and equity holders, but overestimate the persistence of earnings that is retained in cash balances. Due to the complexity of multinational firms and the lack of disclosure on foreign operations, it is likely that investors will fixate on *total* changes in cash and fail to take into account the different levels of persistence of the foreign and domestic changes in cash. We state our second hypothesis in the null form as follows:

Hypothesis 2: Investors correctly price the earnings persistence implications of foreign and domestic cash changes.

3. Research Design and Sample Construction

3.1 Research Design

3.1.1 Earnings persistence test

To examine the earnings persistence implications of domestic and foreign cash changes (*Hypothesis 1*), we follow Dechow et al.'s (2008) earnings decomposition approach. Assuming clean surplus, Dechow et al. (2008) decompose earnings into accruals, changes in cash, net distributions to debt holders, and net distributions to shareholders. The intuition is that earnings can be decomposed into accruals and cash flows. A positive cash flow can be reinvested, distributed to the firm' capital provides or be used to increase the cash reserve. Similarly, a negative cash flow can draw down a firm's cash reserve, or the firm can counter-balance a negative cash flow by issuing additional debt or equity. Details of the earnings decomposition can be found in Appendix A.

To address our research question, we further decompose the changes in cash component into foreign and domestic cash changes. We then use the following equation to estimate the persistence of different earnings components (firm subscripts are omitted):

$$EARNINGS_{t+1} = \beta_0 + \beta_1 ACCRUAL_t + \beta_2 \Delta FCASH_t + \beta_3 \Delta DCASH_t + \beta_4 DIST\_EQ_t + \qquad (1)$$
$$\beta_5 DIST\_D_t + \varepsilon_{t+1}$$

where $EARNINGS_{t+1}$ equals one-year-ahead earnings. The right-hand-side variables – accruals ($ACCRUAL_t$), foreign cash changes ($\Delta FCASH_t$), domestic cash changes ($\Delta DCASH_t$), net cash distributions to equity holders ($DIST\_EQ_t$), and net cash distributions to debt holders ($DIST\_D_t$), add up to current year earnings ($EARNINGS_t$). We deflate all variables by average total assets to allow for cross-sectional comparability and winsorize deflated values at -1 and +1. To

preserve additivity, following Dechow et al. (2008), we first winsorize all scaled earnings components (*ACCRUAL*, Δ*FCASH*, Δ*DCASH*, *DIST_EQ*, and *DIST_D*) at -1 and +1, and earnings is set to the sum of the winsorized earnings components. Hence, to compute EARNINGS in t+1, we need accruals, changes in foreign and domestic cash, and net distributions to capital providers measured in t+1.

β_1 through β_5 are interpreted as the persistence of period t earnings components for one-year-ahead earnings (Sloan 1996; Dechow et al. 2008). For example, if foreign cash is used suboptimally leading to poor future earnings, β_2 will be low. We use Equation (1) to evaluate whether changes in foreign cash ($\Delta FCASH_t$) have the same persistence level as changes in domestic cash ($\Delta DCASH_t$). If changes in foreign cash are more (less) persistent for future earnings than changes in domestic cash, we expect $\beta_2 > \beta_3$ ($\beta_2 < \beta_3$); otherwise, we expect $\beta_2 = \beta_3$.

3.2.2 Market pricing test

To test H2, we evaluate market efficiency with respect to the persistence characteristics of earnings components, with particular attention to changes in foreign and domestic cash. We use the ordinary least squares (OLS) test as suggested in Kraft et al. (2007) and adopted by previous research (e.g., Blaylock et al. 2011; Thomas and Zhang 2011; Dhaliwal et al. 2013).[9] We estimate the following equation (firm subscripts are omitted):

$$RET_{t+1} = \beta_0 + \beta_1 ACCRUAL_t + \beta_2 \Delta FCASH_t + \beta_3 \Delta DCASH_t + \beta_4 DIST\_EQ_t + \beta_5 DIST\_D_t + \quad (2)$$
$$\beta_6 SIZE_t + \beta_7 BTM_t + \beta_8 MOM_t + \beta_9 Beta_t + \varepsilon_{t+1}$$

where RET_{t+1} are twelve-month buy-and-hold returns. The stock return holding period starts four months after the fiscal year end to ensure that financial information is available to investors (Sloan 1996). Following Thomas and Zhang (2011) and Dhaliwal et al. (2013), we

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[9] The OLS approach is conceptually identical to the Mishkin test (see Kraft et al. 2007; Lewellen 2010).

control for size, book-to-market past returns, and market beta. Market efficiency with respect to a specific earnings component suggests that the coefficient β on that component to be indistinguishable from zero, i.e., we cannot use information available at year t to predict returns in year $t+1$. Specifically, if share prices correctly reflect the earnings persistence implications of changes in foreign and domestic cash, we expect to observe $\beta_2 = 0$ and $\beta_3 = 0$. A positive (negative) β_2 (β_3) implies that investors underweight (overweight) the information in changes in foreign (domestic) cash.

3.2 Sample selection

The key to our empirical design is to separate total cash holdings into domestic and foreign cash holdings. Firms only report total cash holdings (including short-term investments) on their balance sheet. Cash holdings by geographic location are rarely disclosed in 10-Ks and 10-Qs before 2010. The Securities and Exchange Commission (SEC) was concerned about the total cash on balance sheets not presenting investors with an honest appraisal of firms' liquidity if a substantial amount of the cash is held overseas. Starting from around 2010, the SEC began sending out comment letters asking multinational firms to disclose their foreign cash holdings and the impact of foreign cash on liquidity.[10] As a result, although disclosing foreign cash is still not mandatory, the number of firms reporting foreign cash has increased significantly over time.[11]

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[10] The SEC has asked firms to: (1) "*consider providing enhanced disclosure of the amount of cash and investments held by foreign subsidiaries that would be subject to the potential tax impact associated with the repatriation of undistributed earnings on foreign subsidiaries;*" (2) "*describe (to the extent material) any significant amounts of cash and cash equivalents that may not be available for general corporate use because such amounts are held by foreign subsidiaries where the company considers earnings to be indefinitely invested;*" and (3) "*disclose whether or not the company would need to accrue and pay taxes if offshore cash holdings were repatriated, and whether or not the company intends to repatriate those funds.*" (https://corpgov.law.harvard.edu/2011/10/15/sec-staff-focus-on-offshore-cash-holdings/)

[11] Some firms started to disclose their foreign cash holdings in the early 2000s. For example, Apple Inc. made its first foreign cash disclosure in 2004.

We hand-collect a sample of foreign cash holdings from 10-K filings. To ensure that our sample has wide coverage, we start with Compustat Fundamentals Annual file and retain firms with non-missing pre-tax foreign earnings (*pifo*) and current foreign tax expense (*txfo*). Because these firms have foreign operations, they are potential candidates to disclose foreign cash. We exclude firms that are not incorporated in the U.S. We start our hand-collection with the reduced Compustat sample of 47,572 observations.

Our search strategy is to start from the fiscal year 2015 for firm i (or the most recent fiscal year the firm is in the reduced Compustat sample) and manually search its 10-K to see if it discloses foreign cash. If we can locate a firm's foreign cash disclosure, we go back to previous 10-Ks and check to see if foreign cash was disclosed.[12] We continue this step iteratively until we find the first fiscal year when foreign cash was disclosed. In most cases, we find the foreign cash-related disclosure under "MD&A – liquidity and capital resources." We provide two examples of the foreign cash disclosure in Appendix B. Our foreign cash sample includes 4,759 firm-years. The sample selection process is outlined in Table 1.

In Table 2, Panel A, we report the number of firms that report foreign cash by year. Before 2008, foreign cash disclosure is scarce, no more than 100 firms make such disclosure each year. Starting in around 2010, the SEC sent out comment letters requesting firms to provide more details on the amount of cash held by their foreign subsidiaries and the liquidity impact of holding cash overseas. Consistent with the timeline of public attention and SEC's commenting process, between 551 and 922 firms disclose foreign cash each year during the period 2011-2015.

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[12] Our search keywords include: "held by", "held outside", "held in", "held at", "foreign subsidiar", "international subsidiar", "repatriat", "cash and cash equivalents", "cash, cash equivalents", "cash equivalents", "outside the U.S.", "outside the United States", "outside of the U.S.", "outside of the United States", and "non-U.S."

To assess the representativeness of our sample, we also compute the proportion of S&P 1500 firms (with foreign operations) that disclose foreign cash each year. Before 2010, less than 7% of S&P 1500 firms with foreign operations disclose their foreign cash holdings. In 2010, 10.2% of S&P 1500 firms with foreign operations disclose foreign cash. Starting in 2011, between 26.6% and 43.1% of S&P 1500 firms with foreign operations separately disclose foreign cash.[13] To assess the significance of foreign cash holdings, we compute foreign cash to total cash ratio and report this ratio by year. The mean foreign cash to total ratio is around 55% in all years. It is somewhat surprising that this ratio is not increasing over time despite the general tenor in the business press that firms are building up cash reserves offshore. In untabulated analysis, we create a constant sample of 432 firms that disclose foreign cash holdings every year from 2011 to 2015. The mean unscaled foreign cash holding per firm increases monotonically over time, from $933 million in 2011 to $1.622 billion in 2015. For this subsample, the foreign cash to total cash ratio increases mildly over time, from 55% in 2011 to 61.5% in 2015.

Table 2, Panel B reports the sample distribution across industries based on the Global Industry Classification Standard (GICS). 36.5% of our sample comes from the information technology industry. Examples of firms in this industry include Alphabet (Google) and Microsoft, consistent with these companies having the flexibility (e.g., their valuable assets are intangibles) to shift operations and profits overseas. In addition, 21.4% of our sample comes from "industrials" (e.g., Caterpillar), consistent with manufacturing firms moving operations or sales offshore to save taxes.

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[13] We note a potential sample selection issue because not all firms with foreign cash disclose it. We believe ex ante that the selection issue will not affect the validity of our results, because our test is based on a sample of firms disclosing their foreign cash, and we do not compare firms that disclose with those that do not. We address the sample selection issue in Section 4.3.

3.3 Descriptive statistics

Table 3, Panel A reports the descriptive statistics for earnings, earnings components, and stock returns. The mean and median earnings scaled by total assets is 0.031 (0.049). The mean and median values for *ACCRUALS* are 0.027 and 0.012, respectively, indicating that firms are growing on average. Changes in cash ($\Delta CASH$) have a positive mean of 0.008 while net distribution to debtholders (*DIST_*D) has a negative mean (-0.020), suggesting that firms use debt financing to grow their asset base and cash reserves. The mean net distribution to equity holders (*DIST_EQ*) is positive (.014), suggesting a positive shareholder payout in our sample.[14] In addition, the mean (median) change in foreign cash (*ΔFCASH*) is 0.007 (0.003), while the mean (median) change in domestic cash (*ΔDCASH*) is 0.000 (0.000), suggesting that increases in cash reserves (*ΔCASH*) mainly come from increase in foreign cash holdings.

Table 3, Panel B reports pairwise Pearson correlations among earnings, earnings components, and stock returns. Consistent with Dechow et al. (2008), we find that accruals (*ACCRUALS*), changes in cash ($\Delta CASH$), and net distributions to capital providers (*DIST_EQ* and *DIST_D*) are all positively correlated with one-year-ahead earnings (*EARNINGS$_{t+1}$*). Changes in foreign ($\Delta FCASH$) and domestic cash ($\Delta DCASH$) are also positively correlated with one-year-ahead earnings, with correlation coefficients of 0.14 and 0.06, respectively. Moving down the *ACCRUALS* column, accruals are negatively correlated with the cash flow components ($\Delta CASH$, $\Delta FCASH$, $\Delta DCASH$, *DIST_EQ*, and *DIST_D*), consistent with Dechow (1994) and Sloan (1996). Finally, consistent with Sloan (1996), accruals are also negatively correlated with one-year ahead stock return.

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[14] Different from Dechow et al. (2008), the mean *DIST_EQ* in our sample is slightly positive. This result is expected because we focus on larger, multinational firms that disclose their foreign cash holdings. Firms in our sample are on average more mature and rely less on equity financing compare to the Compustat universe.

4. Empirical Results

4.1 Earnings persistence test

Table 4 reports the results of our earnings persistence tests. In Column (1), we replicate Dechow et al.'s (2008) Table 3 Regression 4 by regressing period t+1's earnings on period t's accrual and cash flow, where the cash flow is decomposed into changes in cash ($\Delta CASH$), net distribution to equity-holders (*DIST_EQ*), and net distribution to debtholders (*DIST_D*). Similar to Dechow et al. (2008), we find that the three cash flow components ($\Delta CASH$, *DIST_EQ,* and *DIST_D*) have different persistence implications for future earnings. Distribution to equity-holders (*DIST_EQ*) is the most persistent among the three components (coefficient = 0.841, p < .01), and distribution to debtholders (*DIST_D*) and changes in cash ($\Delta CASH$) are less persistent (coefficient = 0.652, p < .01 and 0.691, p < .01, respectively). Because cash distribution to equity holders are more discretionary than distribution to debt holders, a higher *DIST_EQ* signals better future performance. For example, Healy and Palepu (1988) find that dividend initiations convey favorable information about future earnings. $\Delta CASH$ is a component of free cash flow, and in the absence of market frictions free cash flow should be distributed to capital providers. Therefore, undistributed free cash flow ($\Delta CASH$) is potentially subject to the Jensen (1986) type agency problems and indicate poorer earnings going forward. On the other hand, undistributed free cash flow can be used to fund future investments, indicating higher persistence. We find that $\Delta CASH$ is less persistent than distribution to equity holders but more persistent than accrual, while Dechow et al. (2008) find that $\Delta CASH$ and accruals have similar persistence. One possible explanation is that our sample consists of multinational firms which are better governed and less subject to the Jensen type agency problem compared to an average firm in the Compustat universe (Dharmapala et al. 2011).

In Column (2), we estimate our main regression, Eq. (1), by decomposing changes in cash ($\Delta CASH$) into changes in foreign cash ($\Delta FCASH$) and changes in domestic cash ($\Delta DCASH$). The coefficient on $\Delta FCASH$ ($\Delta DCASH$) is 0.682 (0.697), and the two coefficients are not significantly different from each other (p-value = 0.407), indicating that changes in foreign cash have a very similar persistence level to changes in domestic cash. This finding stands in contrast to the conventional wisdom that it is sub-optimal to hold cash overseas. To shed further light on the earnings persistence implications of changes in foreign and domestic cash, in untabulated analysis, we split changes in foreign (domestic) cash into positive and negative changes. We find that positive and negative changes in foreign cash have similar persistence level.

Overall, we find that changes in foreign cash are as persistent for future earnings as changes in domestic cash. This result, seemingly contradicting the common wisdom that retaining foreign cash is suboptimal, is broadly consistent with prior studies that examine firms' repatriation and investment behavior under the American Jobs Creation Act of 2004 (AJCA). Blouin and Krull (2009) and Dharmapala et al. (2011) find that firms do not increase domestic investment, but instead increase shareholder payouts under the AJCA, suggesting that on average multinational firms are well-governed and not capital constrained.

4.2 Earnings persistence test: Subsample analysis

So far we show that on average changes in foreign cash are as persistent as changes in domestic cash. However, Harford et al. (2017) show that investors place a discount on multinational firms' foreign cash relative to domestic cash. Chen (2016) finds that although investors on average do not discount foreign cash, they do so for multinational firms with high repatriation taxes. In this section, we partition our sample based on the costs and benefits of retaining foreign cash. In the first test, we separately examine firms with high versus low foreign

growth potential. In the second test, we partition our sample based on whether the firm faces high estimated repatriation tax costs.

4.2.1 Foreign growth potential

For a given firm, if foreign operations offer better growth than domestic operations, absent capital market frictions and agency problems, cash should be retained and reinvested in foreign operations to generate higher future earnings. Hence, in this scenario, building up foreign cash reserves is an optimal decision, and we expect increases in foreign cash to be more persistent for high foreign growth firms.

Two commonly used measures of foreign growth are growth in foreign profits and foreign sales (e.g., Bodnar and Weintrop 1997). However, both measures mechanically correlate with earnings, potentially confounding coefficient estimates in the earnings persistence regression. Hence, we use a growth measure constructed using industry-level data.[15] An advantage of this approach is that industry level growth is more exogenous and less correlated with firm-level earnings. We obtain foreign and domestic sales from Compustat Historical Segments. We first aggregate foreign and domestic sales for firms in each industry-year cluster. Next, we compute industry level foreign and domestic sales growth. If industry-level foreign growth is greater (smaller) than domestic growth, we classify firms in the industry-year cluster as having high (low) foreign growth potential. We re-estimate Eq. (1) in the two subsamples and we expect changes in foreign cash to be more persistent in the high foreign growth subsample.

Results are presented in Table 5. In Column 1 (low foreign growth subsample), changes in foreign cash ($\Delta FCASH$) have a persistence coefficient of 0.539, while in Column 2 (high foreign

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[15] We use the two-digit Global Industry Classification Standard (GICS) to classify firms into 10 industries. We also use more refined industry classification (based 4-digit, 6-digit, and 8-digit GICS) and find similar results.

growth subsample), the persistence coefficient on $\Delta FCASH$ is 0.813. The difference is statistically significant (p-value = 0.059), suggesting that foreign cash changes are more persistent for future earnings when foreign markets offer better growth opportunities. On the other hand, foreign growth potential should not affect the earnings persistence implication of changes in domestic cash to the extent that foreign growth potential and domestic growth potential are unrelated. We observe that the coefficients on changes in domestic cash ($\Delta DCASH$) are not significantly different across the two subsamples.

4.2.2 Tax costs of repatriation

Tax costs of repatriation is one reason why many multinational firms retain cash overseas (Foley et al. 2007). For firms that face higher repatriation taxes, their foreign cash cannot be freely used to counter-balance domestic cash shortfall. To the extent that the foreign cash is held as passive investments or invested in suboptimal projects (Hanlon et al. 2015; Edwards et al. 2016), it will bode poorly for future earnings indicating low persistence.

Prior studies usually compute repatriation tax costs as follows (Foley et al. 2007; Hanlon et al. 2015): *max(0, 35% × pretax foreign income – foreign tax expense)*, scaled by total assets. This measure is a function of foreign profitability, i.e., firms facing higher repatriation taxes also have higher foreign earnings. In addition, repatriation tax costs are positively associated with changes in foreign cash (Chen 2016). Because foreign earnings is part of overall earnings, to the extent that foreign earnings is persistent, there is a mechanical positive relation between changes in foreign cash and future profitability for firms facing higher repatriation taxes.

To avoid this problem, we compute an alternative measure of firms' repatriation cost, as follows: *35% - foreign tax expense/pretax foreign income*. This alternative measure is expressed as a percentage and is no longer a function of foreign profitability. We then use this alternative

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measure to partition our sample into two subsamples – firms with below median repatriation tax rates, and firms with above median repatriation tax rates. We re-estimate Eq. (1) in the two subsamples and report the results in Table 5, columns 3 and 4.

In Column 3 (the high repatriation tax subsample), changes in foreign cash ($\Delta FCASH$) has a persistence coefficient of 0.597, while $\Delta FCASH$ in the low repatriation tax subsample (Column 4) has a persistence coefficient of 0.831. The difference is statistically significant (p-value = 0.052) and consistent with the expectation that foreign cash is used suboptimally when repatriation taxes are high. Because domestic cash holdings are not subject to repatriation tax, comparing Columns (3) and (4), we observe that the persistence characteristics of changes in *domestic* cash are comparable across the high versus low repatriation partition (0.703 versus 0.669). Overall, results in Table 5 suggest that although on average foreign cash changes are as persistent as domestic cash changes, there exists predictable cross-sectional variation depending on growth opportunities offered by foreign operations and whether the firm faces high repatriation taxes.

4.3 Correct for sample selection

Because our key variables of interest are changes in foreign and domestic cash, only firms that disclose foreign cash holdings enter our sample. Because disclosing foreign cash is a nonrandom firm choice, we face a classic sample selection problem such that the persistence implications documented above may not apply to firms with foreign cash (but do not disclose it). As an attempt to correct for the sample selection problem, we use the Heckman procedure, where we first estimate a binary choice model (disclose foreign cash or not), and include the inverse Mills' ratio from the first stage in our earnings persistence test. We estimate the following first-stage model (firm subscripts are omitted):

$Pr(Disclosure_t) = \beta_0 + \beta_1 SEC\ Comment_{t-1} + \beta_2 LogAssets_t + \beta_3 MB_t + \beta_4\ Foreign\ Sales$ (3)
$Fraction_t + \beta_5 ACCRUAL_t + \beta_6 \Delta FCASH_t + \beta_7 \Delta DCASH_t + \beta_8 DIST\_EQ_t + \beta_9 DIST\_D_t + \varepsilon_{i,t}$

where *Disclosure* is a dummy variable coded one if a firm discloses foreign cash in year t, and zero otherwise. We conjecture that firms receiving an SEC comment letter on foreign cash are more likely to disclose foreign cash in the following year. *SEC Comment$_{t-1}$* is coded one if firm i received a comment letter for its t-1 10-K and zero otherwise.[16] In addition, we control for size and market-to-book ratio, as larger firms generally have better disclosure quality and growth firms generally have more incentives to provide additional disclosure (Core 2001). We also control for the extent of a firm's foreign operations (*Foreign Sales Fraction*) because firms with more extensive foreign operations may hold more foreign cash. In addition, we also include all variables from the second-stage earnings persistence regression (Lennox et al. 2012).

The first stage results are reported in Table 6 Panel A. All multinational firms with foreign operations enter the first stage regression (43,267 firm-year observations). Receiving foreign cash-related comment letters and the extent of foreign operations are positively associated with foreign cash disclosure. In addition, larger and growth firms are also more likely to disclose foreign cash. Finally, the coefficient on changes in total cash (*ΔCASH*) is positive but only marginally significant, suggesting that an increase in total cash holdings does not significantly increase the likelihood of foreign cash disclosure.

We then include the inverse Mills' ratio from the first stage in the earnings persistence regression. Results are reported in Table 6 Panel B. The coefficient on the inverse Mills' ratio is negative and marginally significant. The data are consistent with a weak selection effect. Our main inferences remain similar. Changes in foreign cash are as persistent for future earnings in domestic cash.

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[16] We obtain SEC comment letters from Audit Analytics. We classify an SEC comment letter as "foreign cash-related" if the letter contains "cash" and ("foreign" or "subsidiar").

4.4 Why foreign earnings are persistent?

The observed persistence of foreign cash can be due to (1) cash retained by foreign subsidiaries is reinvested into foreign operations – leading to higher future earnings; or (2) foreign cash is not reinvested, rather, profitable and capital-unconstrained firms have the ability to generate and retain foreign cash. To shed more light on these two possibilities, we examine (1) whether changes in foreign cash are more (less) strongly associated with one-year-ahead foreign (domestic) earnings (as compared to domestic cash); (2) whether changes in foreign cash are associated with changes in investment in foreign operations.

$$Foreign\_Earnings_{t+1} = \gamma_0 + \beta_1 ACCRUAL_t + \beta_2 \Delta FCASH_t + \beta_3 \Delta DCASH_t + \beta_4 DIST\_EQ_t + \quad (4a)$$
$$\beta_5 DIST\_D_t + \varepsilon_{t+1}$$

$$Domestic\_Earnings_{t+1} = \beta_0 + \beta_1 ACCRUAL_t + \beta_2 \Delta FCASH_t + \beta_3 \Delta DCASH_t + \beta_4 DIST\_EQ_t \quad (4b)$$
$$+ \beta_5 DIST\_D_t + \varepsilon_{t+1}$$

$$\Delta Employee_{t+1} = \beta_0 + \beta_1 ACCRUAL_t + \beta_2 \Delta FCASH_t + \beta_3 \Delta DCASH_t + \beta_4 DIST\_EQ_t + \quad (4c)$$
$$\beta_5 DIST\_D_t + \varepsilon_{t+1}$$

$$\Delta FAssets_{t+1} = \beta_0 + \beta_1 ACCRUAL_t + \beta_2 \Delta FCASH_t + \beta_3 \Delta DCASH_t + \beta_4 DIST\_EQ_t + \quad (4d)$$
$$\beta_5 DIST\_D_t + \varepsilon_{t+1}$$

$$\Delta PPE_{t+1} = \beta_0 + \beta_1 ACCRUAL_t + \beta_2 \Delta FCASH_t + \beta_3 \Delta DCASH_t + \beta_4 DIST\_EQ_t + \beta_5 DIST\_D_t \quad (4e)$$
$$+ \varepsilon_{t+1}$$

If retained foreign cash is reinvested in foreign operations, we expect changes in foreign cash ($\Delta FCASH_t$) to be more strongly associated with one-year-ahead foreign earnings in Equation (4a), i.e., $\beta_2 > \beta_3$. Similarly, in Eq. (4b), changes in foreign cash should be *less* strongly associated with one-year-ahead domestic earnings compared to changes in domestic cash, i.e., $\beta_2 < \beta_3$. On the other hand, if the observed persistence of changes in foreign cash is not due to reinvestment of foreign cash into foreign operations, but because the firm has persistent earnings growth worldwide, we expect β_2 to be indistinguishable from β_3 in Eq. (4a) and (4b). Results are reported in Table 7. In Column (1), where t+1 foreign earnings is the dependent variable, the coefficient on changes in foreign cash is higher than the coefficient on changes in domestic cash ($\beta_2 > \beta_3$). In

Column 2, where t+1 domestic earnings is the dependent variable, the coefficient on changes in domestic cash is higher than the coefficient on changes in foreign cash ($\beta_2 < \beta_3$).

Next, we examine whether changes in foreign cash is associated with future investment in foreign operations. We obtain foreign employee count, foreign identifiable assets, and foreign PP&E from Compustat Historical Segment file. Zhang (2007) argues that changes in employee count capture growth-related business activities, and it "*is not an outcome of the financial reporting system and thus is not related to the accounting-based persistence argument.*" Following his argument, our discussion below also focuses on foreign employee growth.

In columns 3-5 of Table 7, one-year-ahead change in employee count, change in identifiable assets, and change in PP&E are used as dependent variables. Here, we are primarily interested in whether the coefficient on changes in foreign cash is positive and significant. To some extent, we are interested in whether the coefficient on changes in foreign cash is larger in magnitude compared to the coefficient on changes in domestic cash. In Column 3, both foreign and domestic cash changes are positively related to one-year-ahead foreign employee growth, and the coefficient on foreign cash changes are larger in magnitude. In Columns 4 and 5, turning to one-year-ahead foreign identifiable assets and PP&E, we find that changes in foreign cash is only marginally significant, and the coefficients on $\Delta FCASH$ and $\Delta DCASH$ are not significantly different. The result in column 4 and 5 could be due to most firms in our sample not being capital-intensive (for example, 37% of our sample are from the information technology industry).

Overall, although we cannot rule out the possibility that the observed persistence of foreign cash is due to profitable and capital-unconstrained firms being able to generate and retain foreign cash, this section provides some evidence that foreign cash persistence is at least partially due to foreign cash being reinvested into foreign operations.

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4.4 Market pricing test

Our second hypothesis concerns whether investors efficiently price the information in the cash components of earnings, with particular attention to changes in foreign and domestic cash. We estimate an OLS model of future stock returns on current period earnings components and control variables (Eq. 2). Results are reported in Table 8. In Eq. (2), $\beta > 0$ (< 0) means that investors under-(over-) estimate the persistence of that component. We estimate Eq. (2) by year and report mean coefficient estimates and Fama-MacBeth t-statistics. Because foreign cash disclosure before 2006 is too sparse, to avoid pre-2006 estimates unduly affecting our results for the return tests, we only use observations in or after 2006.

In Column 1, all variables are in continuous form. Accruals are not significantly related to future returns. The absence of the accrual anomaly is possibly due to our focusing on large, multinational firms over a recent sample period.[17] Our key variable of interest is changes in foreign cash ($\Delta FCASH$). $\Delta FCASH$ is positively associated with one-year-ahead returns, suggesting that investors under-react to foreign cash changes. We do not find evidence that investors under- or over-react to domestic cash changes. Despite that we focus on multinational firms over a recent sample period, a subsample for which mispricing is less likely, we still find evidence that changes in foreign cash are significantly associated with future returns. This result suggests that foreign cash disclosure is not easily deciphered by investors.

In Column 2, we transform all right-hand-side variables into deciles standardized between 0 and 1, such that the coefficient on each transformed variable can be interpreted as the hedge portfolio return to positions taken on that variable. This approach allows us to economically quantify investors' under-reaction to foreign cash changes. Here we do not seek to show that

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[17] For example, Green et al. (2011) show that the hedge returns to the accrual anomaly have declined over time and are not reliably positive after 2000.

investors' under-reaction to changes in foreign cash represents an implementable trading strategy. Our main objective is to point out that investors appear to under-react to the earnings persistence implications of foreign cash changes. We continue to find that investors under-react to foreign (but not domestic) cash changes. Finally, in Columns 3 and 4, we partition the sample based on analyst following and find that investor under-reaction to foreign cash changes only occurs in firms with relatively weaker information environments (Column 3).

Overall, Table 8 suggests that investors under-react to changes in foreign cash. Reconciling the earnings persistence and the pricing test results, the common belief that retaining foreign cash is suboptimal is not supported by the earnings persistence results. However, investors price changes in foreign cash in the same manner as the common belief, i.e., they seem to under-estimate the persistence of changes in foreign cash. In untabulated analyses, we find that investors' under-reaction to foreign cash changes is primarily driven by their under-reaction to foreign cash increases.

5. Conclusion

In this study, we investigate the earnings persistence implications of changes in foreign and domestic cash holdings and whether investors efficiently price the earnings persistence characteristics of such cash changes. Despite prior studies showing that foreign cash is discounted by the equity market, our results suggest that on average changes in foreign cash are as persistent as changes in domestic cash for future earnings. However, there exists some cross-sectional variation. For firms with more foreign growth potential, changes in foreign cash lead to better future earnings and are highly persistent. For firms with relatively high repatriation taxes, changes in foreign cash are less persistent compared with firms with relatively low repatriation taxes, suggesting that for these firms, foreign cash is either invested sub-optimally or "trapped" and

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generates a low rate of return. Our results are robust to controlling for the voluntary nature of foreign cash disclosure. Further analysis suggests that the persistence of foreign cash changes is at least partially due to foreign cash being reinvested in foreign operations.

We also investigate whether investors recognize the different earnings persistence implications of changes in foreign and domestic cash. We find that investors under-react to changes in foreign (but not domestic) cash, and this under-reaction is concentrated in firms with lower analyst coverage. The pricing result suggests that despite that firms disclose foreign cash holdings, investors still cannot fully process the information in foreign cash changes, especially when the firm's information environment is relatively weaker. More salient or standardized disclosure on foreign operations might be warranted.

The Tax Cuts and Jobs Act of 2017 moves the U.S. closer to a territorial system and multinational firms will pay a one-time tax of 15.5% for their undistributed earnings held in the form of cash, and 8% for undistributed earnings held in noncash assets. Multinational firms hold foreign cash for various reasons, with growth and tax considerations being the two prominent ones. To the extent that the Tax Cuts and Jobs Act removes the tax incentives to retain cash offshore, going forward we might expect changes in foreign cash to be even more persistent because growth will be the dominant reason for retaining foreign cash.

Appendix A: Earnings decomposition in Dechow, Richarson, and Sloan (2008)

Earnings can be decomposed into accruals and free cash flow. Prior studies document that the cash flow component is more persistent; however, investors overestimate the persistence of the accrual component and underestimate the persistence of the cash flow component (Sloan 1996). Building on this literature, Dechow, Richarson, and Sloan (2008) (hereafter DRS) further decompose the free cash flow component into three subcomponents and test the different persistence implications of these three subcomponents. They start with the balance sheet equation:

$$Total\ Assets = Total\ Liabilities + Equity$$

Decompose total assets and total liabilities:

$$Cash + Operating\ Assets = Debt + Operating\ Liabilities + Equity$$

Rearrange (NOA is net operating assets):

$$NOA = Debt + Equity - Cash$$

$$\Delta NOA = \Delta Debt + \Delta Equity - \Delta Cash$$

Decompose change in equity and change in debt (*DIST_EQ* is net distribution to equity holders, *DIST_D* is net distribution to debt holders):

$$\Delta Equity = Earnings - DIST\_EQ$$

$$\Delta Debt = Interest\ Expense - Interest\ Paid - DIST\_D$$

Assume interest expense equals to interest paid, and plug in *ΔEquity* and *ΔDebt* into *ΔNOA = ΔDebt + ΔEquity – ΔCash*:

$$\Delta NOA = -DIST\_D + Earnings - DIST\_EQ - \Delta Cash$$

Rearrange (denote *Accruals = ΔNOA*):

$$Earnings - Accruals = \Delta Cash + DIST\_EQ + DIST\_D$$

where the three components on the right-hand side sum up to free cash flow. Previous studies (e.g., Sloan 1996; Xie 2001) implicitly assume that the *free cash flow* components are

homogenous. DRS argue that the three subcomponents of the free cash flow could have different implications for earnings persistence. Specifically, distributions to equity holders should be more persistent than distributions to debt holders because managers will start a capital return program only when they expect earnings to be persistent. In other words, distributing dividends to shareholders has a signaling effect of future earnings persistence. DRS also argue that the change in cash component is less persistent because: (1) cash can be subject to agency problems; (2) cash balances can be misstated (this sounds like a stretch); (3) retained cash will be invested in the future and there is diminishing returns to investment; (4) managers window dress cash balance at quarter or year-end.

Consistent with their prediction, DRS find that the higher persistence of the cash component of earnings is entirely attributable to cash that is distributed to equity holders (*DIST_EQ*). The changes in cash and distribution to debtholders subcomponents have persistence levels almost identical to accruals. Stock prices act as if investors anticipate the persistence of earnings that is distributed to debt and equity holders, but overestimate the persistence of earnings that is retained on the balance sheet.

Appendix B: Examples of Foreign Cash Disclosure

St. Jude Medical, Form 10-K for the fiscal year ended December 31, 2012
(https://www.sec.gov/Archives/edgar/data/203077/000020307713000003/stj-20121229exhibit13.htm)

Liquidity

"At December 29, 2012, substantially all of our cash and cash equivalents was held by our non-U.S. subsidiaries. A portion of these foreign cash balances are associated with earnings that are permanently reinvested and which we plan to use to support our continued growth plans outside the United States through funding of operating expenses, capital expenditures and other investment and growth opportunities. The majority of these funds are only available for use by our U.S. operations if they are repatriated into the United States. The funds repatriated would be subject to additional U.S. taxes upon repatriation; however, it is not practical to estimate the amount of additional U.S. tax liabilities we would incur. We currently have no plans to repatriate funds held by our non-U.S. subsidiaries."

McKESSON Corporation, Form 10-K for the fiscal year ended March 31, 2015
(https://www.sec.gov/Archives/edgar/data/927653/000162828015004098/mck_10kx3312015.htm)

Selected Measures of Liquidity and Capital Resources

"Our cash and equivalents balance as of March 31, 2015 included approximately $2.3 billion of cash held by our subsidiaries outside of the United States. Our primary intent is to utilize this cash in foreign operations as well as to fund certain research and development activities for an indefinite period of time. Although the vast majority of cash held outside the United States is available for repatriation, doing so could subject us to U.S. federal, state and local income tax."

Appendix C: Variable Definitions

Variable	Definition
EARNINGS	Annual income before extraordinary items scaled by average total assets. To preserve the additivity of the earnings decomposition, following Dechow et al. (2008), we first winsorize all scaled earnings components variables at ±1, and set *EARNINGS* to be the sum of winsorized earnings components. (Data source: Compustat Fundamentals Annual)
ACCRUALS	Total accruals, calculated as the year-over-year change in noncash assets minus the change in non-debt liabilities, scaled by average total assets (Dechow et al. 2008). Noncash assets is calculated as total assets (*at*) minus cash and short-term investments (*che*). Non-debt liabilities is calculated as total liabilities (*lt*) less debt (*dltt+dlc*). (Data source: Compustat Fundamentals Annual)
Δ*CASH*	The year-over-year change in cash (*che*) scaled by average total assets (*at*). (Data source: Compustat Fundamentals Annual)
DIST_D	Annual net distribution to debtholders, calculated as the year-over-year change in debt, scaled by average total assets. We then multiply the scaled number by -1 so a positive *DIST_D* means that the firm makes a positive net distribution to its debtholders. Debt is calculated as the sum of long-term debt (*dltt*) and short-term debt (*dlc*). (Data source: Compustat Fundamentals Annual)
DIST_EQ	Annual net distribution to equity holders, calculated as the year-over-year change in equity, plus *EARNINGS*, scaled by average total assets. We then multiply the scaled number by -1 so a positive *DIST_EQ* means that the firm makes a positive net distribution to its equity holders. Here equity is calculated as total assets (*at*) minus total liabilities (*lt*). (Data source: Compustat Fundamentals Annual)
Δ*FCASH*	The year-over-year change in foreign cash holdings, scaled by average total assets. (Data source: hand-collected from 10-K)
Δ*DCASH*	The year-over-year change in domestic cash holdings, scaled by average total assets. (Data source: hand-collected from 10-K)
Disclosure	A dummy variable coded one if a firm discloses foreign cash in year t, and zero otherwise. (Data source: hand-collected from 10-K)
SEC Comment	Dummy variable coded one if firm i received an SEC comment letter on foreign cash-related matters for period t-1's 10-K. (Data source: Audit Analytics)
LogAssets	Natural log of total assets (*at*). (Data source: Compustat Fundamentals Annual)

Foreign Sales Fraction	Aggregate sales from foreign segments scaled by worldwide sales (*sale*) (Data source: Compustat Historical Segments; Compustat Fundamentals Annual)
Foreign_Earnings	Foreign pretax earnings (*pifo*) scaled by average total assets. (Data source: Compustat Fundamentals Annual)
Domestic_Earnings	Domestic pretax earnings (*pidom*) scaled by average total assets. (Data source: Compustat Fundamentals Annual)
$\Delta Employee$	The year-over-year change in foreign segment employee count. (Data source: Compustat Historical Segments)
$\Delta FAssets$	The year-over-year change in foreign segment identifiable assets. (Data source: Compustat Historical Segments)
ΔPPE	The year-over-year change in foreign segment property, plant, and equipment. (Data source: Compustat Historical Segments)
RET	Twelve-month buy-and-hold stock returns. The return accumulation period starts four months after the fiscal year-end. (Data source: CRSP)
SIZE	Market value of equity measured at the end of the fiscal year (Data source: CRSP)
BM	Book-to-market ratio measured as book value of equity (*ceq*) dividend by firm i's market value of equity at the end of fiscal year t (*prcc_f*csho*)
MOM	The buy-and-hold twelve-month stock returns leading up to the firm's fiscal year-end. (Data source: CRSP)
Beta	The firm's CAPM beta, estimated from a regression of firm returns minus the risk-free (one-month T-bill) rate on the value-weighted market index minus the risk-free rate over the 60-month period at the end of fiscal year. (Data source: CRSP)

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Table 1
Sample Selection

	Number of firm-year observations
Compustat Fundamentals Annual file and retain U.S. firms with non-missing pre-tax foreign earnings (*pifo*) and current foreign tax expense (*txfo*), 1984-2015	47,572
Observations with foreign cash holdings data available	4,759
Observations with non-missing change in foreign cash	3,641
Number of observations used in the earnings persistence regression	2,789
Number of observations used in the return regression	3,176

Table 2
Foreign cash sample

Panel A: Sample distribution across years

Year	# Obs	# Obs that are S&P 1500 firms	% of S&P 1500 with foreign operations that disclose foreign cash	Mean foreign cash to total cash ratio
2001	6	2	0.16%	46%
2002	14	6	0.49%	50%
2003	24	12	0.90%	59%
2004	41	22	1.77%	54%
2005	53	27	2.16%	46%
2006	69	37	2.97%	52%
2007	93	47	3.74%	55%
2008	121	64	5.02%	58%
2009	147	83	6.56%	54%
2010	220	130	10.20%	56%
2011	551	340	26.56%	55%
2012	772	478	36.98%	54%
2013	872	539	41.80%	55%
2014	922	558	43.11%	55%
2015	854	524	41.18%	56%
Total	4,759			

Panel B: Sample distribution across industries

Sector	GICS industry	N	% of sample	Mean foreign cash ratio
10	Energy	134	2.8%	0.657
15	Materials	390	8.2%	0.625
20	Industrials	1020	21.4%	0.578
25	Consumer Discretionary	599	12.6%	0.564
30	Consumer Staples	232	4.9%	0.632
35	Health Care	489	10.3%	0.570
40	Financials	113	2.4%	0.524
45	Information Technology	1734	36.5%	0.490
50	Telecommunication Service	9	0.2%	0.615
60	Real Estate	37	0.8%	0.397

Table 3
Descriptive statistics on earnings, accruals, and cash flow components

Panel A: Summary statistics

Variable	N	Mean	Std Dev	P25	P50	P75
EARNINGS	2,789	0.031	0.130	0.008	0.049	0.084
ACCRUALS	3,607	0.027	0.143	-0.032	0.012	0.069
DIST_EQ	3,607	0.014	0.132	-0.016	0.018	0.063
DIST_D	3,607	-0.020	0.102	-0.033	0.000	0.011
ΔCASH	3,607	0.008	0.097	-0.026	0.004	0.040
ΔFCASH	3,607	0.007	0.054	-0.009	0.003	0.022
ΔDCASH	3,607	0.000	0.082	-0.021	0.000	0.019
RET$_{t+1}$	3,176	0.098	0.426	-0.143	0.062	0.280

Panel B: Pearson pairwise correlation

	Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1)	*EARNINGS$_{t+1}$*	1							
(2)	*ACCRUALS*	**0.036**	1						
(3)	*DIST_EQ*	**0.432**	**-0.295**	1					
(4)	*DIST_D*	**0.048**	**-0.496**	**-0.083**	1				
(5)	*ΔCASH*	**0.136**	**-0.141**	**-0.257**	**-0.075**	1			
(6)	*ΔFCASH*	**0.142**	**-0.051**	**-0.090**	-0.020	**0.525**	1		
(7)	*ΔDCASH*	**0.063**	**-0.132**	**-0.243**	**-0.075**	**0.831**	**-0.038**	1	
(8)	*RET$_{t+1}$*	**0.226**	**-0.061**	**0.052**	**0.041**	0.002	-0.003	0.004	1

Notes: All variables are defined in Appendix C, and all variables except for stock returns are winsorized at +1 and -1 (following Dechow et al. 2008 and previous research). Bold indicates that the correlation is statistically significant (10% level or better).

Table 4
Persistence of accruals and cash flow components

$$EARNINGS_{t+1} = \beta_0 + \beta_1 ACCRUAL_t + \beta_2 \Delta FCASH_t + \beta_3 \Delta DCASH_t + \beta_4 DIST\_EQ_t + \beta_5 DIST\_D_t + \varepsilon_{t+1} \qquad (1)$$

	Pred. Sign	(1) Y= $EARNINGS_{t+1}$	(2) Y= $EARNINGS_{t+1}$
ACCRUALS	+	0.590***	0.591***
		(8.75)	(8.82)
$\Delta CASH$	+	0.691***	
		(9.72)	
$\Delta FCASH$	+		0.682***
			(8.56)
$\Delta DCASH$	+		0.697***
			(10.51)
$\Delta FCASH\_Pos$			
$\Delta FCASH\_Neg$			
$\Delta DCASH\_Pos$			
$\Delta DCASH\_Neg$			
DIST_EQ	+	0.841***	0.841***
		(12.09)	(12.04)
DIST_D	+	0.652***	0.653***
		(6.76)	(6.81)
Compare: $\Delta FCASH = \Delta DCASH$			p value = 0.407
Compare: $\Delta FCASH\_Pos = \Delta FCASH\_Neg$			
Compare: $\Delta FCASH\_Pos = \Delta DCASH\_Pos$			
Compare: $\Delta DCASH\_Pos = \Delta DCASH\_Neg$			
Compare: $\Delta FCASH\_Neg = \Delta DCASH\_Neg$			
Observations		2,789	2,789
Adj. R-squared		0.46	0.46

Notes: All variables are defined in Appendix C. t-statistics are reported in brackets. Standard errors are clustered by firm. ***, **, and * indicate significance levels at 0.01, 0.05, and 0.10 in a two-tailed test, respectively.

Table 5
Persistence of accruals and cash flow components: subsample analysis

$$EARNINGS_{t+1} = \beta_0 + \beta_1 ACCRUAL_t + \beta_2 \Delta FCASH_t + \beta_3 \Delta DCASH_t + \beta_4 DIST\_EQ_t + \beta_5 DIST\_D_t + \varepsilon_{t+1} \qquad (1)$$

VARIABLES	(1) Low Foreign Growth	(2) High Foreign Growth	(3) High rep tax	(4) Low rep tax
ACCRUALS	0.557***	0.609***	0.578***	0.636***
	(8.93)	(7.12)	(7.16)	(8.01)
ΔFCASH	0.539***	0.813***	0.597***	0.831***
	(4.64)	(9.31)	(5.89)	(12.77)
ΔDCASH	0.619***	0.753***	0.703***	0.669***
	(9.30)	(6.15)	(6.59)	(9.26)
DIST_EQ	0.801***	0.863***	0.703***	0.669***
	(10.62)	(9.65)	(6.59)	(9.26)
DIST_D	0.602*	0.683***	0.804***	0.774***
	(9.74)	(6.07)	(10.91)	(12.37)
Compare coeff across partitions:				
ΔFCASH	P value = 0.059		P value = 0.052	
ΔDCASH	P value = 0.335		P value = 0.771	
Observations	1360	1429	1344	1342
Adj. R-squared	0.41	0.50	0.48	0.39

Note: All variable definitions are in Appendix C. To compute a firm's foreign growth potential, we first aggregate foreign and domestic sales for firms in each industry-year cluster. We then compute industry level foreign and domestic sales growth. If industry level foreign growth is greater (smaller) than domestic growth, we assign the firm to the "high foreign growth" ("low foreign growth") subsample. Estimated repatriation tax costs are computed as: 35% - foreign tax expense (txfo) / pretax foreign income (pifo). We then partition our sample into two subsamples: firms with above (below) median estimated repatriation tax costs are assigned to the "high rep tax" ("low rep tax") group. t-statistics are reported in brackets. Standard errors are clustered by firm. ***, **, and * indicate significance levels at 0.01, 0.05, and 0.10 in a two-tailed test, respectively.

Table 6
Correct for self-selection

Panel A: Determinants of foreign cash disclosure

$Pr(Disclosure_t) = \beta_0 + \beta_1 SEC\ Comment_{t-1} + \beta_2 LogAssets_t + \beta_3 MB_t + \beta_4 Foreign\ Sales\ Fraction_t +$ (3)
$\beta_5 ACCRUAL_t + \beta_6 \Delta CASH_t + \beta_8 DIST\_EQ_t + \beta_9 DIST\_D_t + \varepsilon_{i,t}$

VARIABLES	Pred. sign	(1) Y = Disclosure
SEC Comment$_{t-1}$	+	0.915***
		(22.92)
LogAsset	+	0.110***
		(11.70)
MB	+	0.011***
		(3.38)
Foreign Sales Fraction	+	0.450***
		(8.87)
ACCRUAL	?	-0.038
		(-0.37)
ΔCASH	?	0.203
		(1.64)
DIST_EQ	?	0.673***
		(4.74)
DIST_D	?	0.002
		(0.02)
Observations		43,267
Pseudo R-squared		7.61%

Notes: This table presents results from the first-stage profit model (Eq. 3). z-statistics are reported in brackets. Standard errors are clustered by firm. ***, **, and * indicate significance levels at 0.01, 0.05, and 0.10 in a two-tailed test, respectively.

Table 6 (cont'd)
Correct for self-selection

Panel B: Earnings persistence regression

$EARNINGS_{t+1} = \beta_0 + \beta_1 ACCRUAL_t + \beta_2 \Delta FCASH_t + \beta_3 \Delta DCASH_t + \beta_4 DIST\_EQ_t + \beta_5 DIST\_D_t + \beta_6 IMR_t + \varepsilon_{t+1}$

VARIABLES	Pred. sign	(1) Y = Earnings$_{t+1}$
ACCRUAL	+	0.608***
		(8.05)
ΔFCASH	+	0.675***
		(7.42)
ΔDCASH	+	0.702***
		(8.01)
DIST_EQ	+	0.812***
		(11.70)
DIST_D	+	0.672***
		(6.76)
IMR	?	-0.011*
		(-1.90)
Observations		2,601
R-squared		44%

Notes: This table presents results from the earnings persistence regression including the inverse Mills' ratio from the first-stage probit model. T-statistics are reported in brackets. Standard errors are clustered by firm. ***, **, and * indicate significance levels at 0.01, 0.05, and 0.10 in a two-tailed test, respectively.

Table 7
Exploratory analysis: why foreign cash is persistent

$$Foreign\_Earnings_{t+1} = \beta_0 + \beta_1 ACCRUAL_t + \beta_2 \Delta FCASH_t + \beta_3 \Delta DCASH_t + \beta_4 DIST\_EQ_t + \quad (4a)$$
$$\beta_5 DIST\_D_t + \varepsilon_{t+1}$$

$$Domestic\_Earnings_{t+1} = \beta_0 + \beta_1 ACCRUAL_t + \beta_2 \Delta FCASH_t + \beta_3 \Delta DCASH_t + \beta_4 DIST\_EQ_t + \quad (4b)$$
$$\beta_5 DIST\_D_t + \varepsilon_{t+1}$$

$$\Delta Employee_{t+1} = \beta_0 + \beta_1 ACCRUAL_t + \beta_2 \Delta FCASH_t + \beta_3 \Delta DCASH_t + \beta_4 DIST\_EQ_t + \beta_5 DIST\_D_t + \quad (4c)$$
$$\varepsilon_{t+1}$$

$$\Delta FAssets_{t+1} = \beta_0 + \beta_1 ACCRUAL_t + \beta_2 \Delta FCASH_t + \beta_3 \Delta DCASH_t + \beta_4 DIST\_EQ_t + \beta_5 DIST\_D_t + \varepsilon_{t+1} \quad (4d)$$

$$\Delta PPE_{t+1} = \beta_0 + \beta_1 ACCRUAL_t + \beta_2 \Delta FCASH_t + \beta_3 \Delta DCASH_t + \beta_4 DIST\_EQ_t + \beta_5 DIST\_D_t + \varepsilon_{t+1} \quad (4e)$$

VARIABLES	(1) $Y = Foreign\ Earnings_{t+1}$	(2) $Y = Domestic\ Earnings_{t+1}$	(3) $Y = \Delta Employee_{t+1}$	(4) $Y = \Delta FAssets_{t+1}$	(5) $Y = \Delta PPE_{t+1}$
ACCRUALS	0.179***	0.475***	0.690***	0.188*	0.071***
	(7.25)	(9.10)	(3.34)	(1.79)	(3.07)
$\Delta FCASH\ (\beta_2)$	0.322***	0.424***	1.519***	0.299*	0.104
	(5.90)	(6.43)	(3.80)	(1.86)	(1.60)
$\Delta DCASH\ (\beta_3)$	0.200***	0.557***	0.820***	0.282**	0.091***
	(5.62)	(9.40)	(3.53)	(2.52)	(3.56)
DIST_EQ	0.246***	0.673***	0.693***	0.137*	0.075***
	(7.86)	(13.14)	(3.48)	(1.66)	(2.77)
DIST_D	0.167***	0.468***	0.601***	0.053	0.005
	(5.74)	(7.41)	(2.68)	(0.50)	(0.21)
Test: $\beta_2 = \beta_3$ (p-value)	0.008***	0.062*	0.059*	0.914	0.914
Observations	2,592	2,592	508	484	775
Adj. R-squared	0.21	0.39	0.10	0.04	0.04
SE clustered by	Firm	Firm	Firm	Firm	Firm

Note: Columns (1) through (5) present results estimating Eq. (4a) through (4e). All variable definitions are in Appendix C. t-statistics are reported in brackets. Standard errors are clustered by firm. ***, **, and * indicate significance levels at 0.01, 0.05, and 0.10 in a two-tailed test, respectively.

Table 8
Market pricing test: Regressing future stock returns on current earnings and earnings components

$$RET_{t+1} = \beta_0 + \beta_1 ACCRUAL_t + \beta_2 \Delta FCASH_t + \beta_3 DCASH_t + \beta_4 DIST\_EQ_t + \beta_5 DIST\_D_t + \beta_6 SIZE_t + \beta_7 BTM_t \quad (2)$$
$$+ \beta_8 MOM_t + \beta_9 Beta_t + \varepsilon_{t+1}$$

	(1)		(2)	(3) Low Analyst	(4) High Analyst
ACCRUAL	-0.107	rACCRUALS	-0.073	-0.066	-0.125
	(-0.30)		(-1.71)	(-0.68)	(-1.54)
ΔFCASH	0.558**	rΔFCASH	0.117*	0.234*	0.064
	(3.11)		(2.02)	(1.96)	(1.21)
ΔDCASH	0.433	rΔDCASH	0.076	0.151	-0.009
	(1.73)		(1.44)	(1.70)	(-0.13)
DIST_EQ	0.520**	rDIST_EQ	0.063	0.073	-0.049
	(3.17)		(1.07)	(1.25)	(-0.81)
DIST_D	0.299	rDIST_D	0.076	0.137*	-0.023
	(0.93)		(1.28)	(1.98)	(-0.53)
Size	0.001	rSize	0.002	-0.053	-0.033
	(0.09)		(0.04)	(-0.53)	(-0.21)
BTM	0.104*	rBTM	0.088	0.210***	-0.102
	(2.15)		(1.82)	(3.92)	(-0.90)
MOM	0.019	rMOM	-0.015	-0.063	0.058
	(0.74)		(-0.33)	(-0.95)	(0.72)
Beta	0.03	rBeta	0.052	0.141	-0.042
	(0.66)		(0.48)	(0.78)	(-0.79)
Observations	3,176		3,176	1,610	1,566
N groups	10		10	10	10
Adj. R-squared	0.11		-0.073	-0.066	-0.125

Note: In Column 1, all independent variables are continuous as defined in Appendix C. In Columns 2 through 4, all independent variables are ranked into deciles (by year) and standardized to fall between 0 and 1. The low (high) analyst subsample includes firms with below (above) median analyst coverage. In all columns, coefficient estimates are the mean coefficient estimates across 10 years. t-statistics in parentheses are Fama-MacBeth t-statistics, which is calculated based on the time-series distribution of coefficients across the 10 years in our sample. Pre-2006, the sample size per year is extremely small. To avoid the possibility that noisy estimates from pre-2006 years unduly affect our results, the regression is estimated only using observations in or after 2006. ***, **, and * indicate significance levels at 0.01, 0.05, and 0.10 in a two-tailed test, respectively.