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ORIGINAL ARTICLE

The cash premium in international stock returns

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Abstract The positive cash-return relation, previously found in the USA, is similarly present in international Europe, Australasia, and the Far East (EAFE) markets over the sample period 1990–2016. Across the 20 developed non-U.S. equity markets, high-cash firms outperform low-cash firms on average by 4.2% per year after controlling for firm size, book-to-market, momentum, operating profitability, and investment. Though the observed cash premium varies with the firm's level of debt, a rational risk-based pricing view falls short of fully understanding the effect. Instead, the observed cash premium reflects price corrections arising from the reversal of investors' expectation errors concerning the impact of cash on the firm's future performance and is therefore the outcome of mispricing.

Keywords Corporate cash holdings · Return predictability · Anomaly · Mispricing · International markets

Introduction

Over the last three decades, the cash holdings of a typical U.S. firm have more than doubled (Bates et al. 2009). In the aftermath of the recent financial crisis, the continuing increase in corporate cash holdings has also gained considerable media attention in the financial press. For instance, a 2010 article in *The Wall Street Journal* already states that "U.S. companies are holding more cash in the bank than at any point on record."[1] As of 2016, this trend has not lost its momentum: U.S. firms currently have more than $1.9 trillion in cash. Some firms like General Motors even hold by now nearly half of their market value in cash.[2]

This tremendous shift in the firms' cash-holding behavior has also attracted a recent surge of interest among academics on the stock market implications of corporate cash holdings. Faulkender and Wang (2006) were among the first who have studied how changes in the firm's cash holdings are valued by shareholders. They find in general a positive association between cash increases and the firm's market value, but the marginal impact of cash varies with the firm's financial characteristics. Additional cash has a stronger impact on the firm's market value among firms with low levels of cash, low levels of debt, and constraints in accessing financial markets. Focusing not on changes in cash but on the relation between the firm's general level of cash and subsequent stock returns, Palazzo (2012), Rao et al. (2013), and Lam et al. (2015) find that high-cash firms in general outperform low-cash firms and that this return difference cannot be explained by existing asset pricing models, giving rise to an anomalous cash-return effect or in other words a cash premium in average stock returns.

Given that the studies mentioned above only focus on the U.S. equity market, but the trend of increasing corporate cash holdings is also present outside the USA (Pinkowitz et al. 2013), we contribute in the present paper to the literature by studying the existence of a cash

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[1] Lahart, J., "U.S. Firms Build Up Record Cash Piles", The Wall Street Journal, June 10, 2010.

[2] Davidson, A., "Why Are Corporations Hoarding Trillions?", The New York Times Magazine, January 20, 2016.

premium in non-U.S. equity markets for the first time. As with any finding in empirical research, the uncovered cash-return effect could be the result of data snooping in the sense of Lo and MacKinlay (1990) and therefore be sample specific. To address this concern, we independently examine in this study the relation between corporate cash holdings and subsequent stock returns in the broad cross section of international firms drawn from 20 developed non-U.S. equity markets. As international equity markets provide fresh data, our non-U.S. analysis provides a useful out-of-sample test on the significance of the cash-return relation around the world.

From the previous U.S. evidence, we derive three hypotheses that we test out-of-sample in non-U.S. equity markets. The first hypothesis directly addresses whether international stock returns conform to the same pattern observed in the USA, culminating in the existence of an international cash premium.

H1 There exists a significantly positive relation between the firm's cash holdings and subsequent stock returns that cannot be captured by established determinants of the cross section of average stock returns.

Taking into account the most recent developments in asset pricing, we do not only control for the traditional return effects based on firm size, book-to-market, and momentum (Fama and French 1992; Jegadeesh and Titman 1993) but also for the novel benchmark variables associated with operating profitability and investment that have been recently proposed by Fama and French (2015) for an enhanced description of the cross section of average stock returns.

The findings of Faulkender and Wang (2006) highlight the aspect that the marginal impact of cash on the firm's market value should decrease with the firm's general level of cash and debt. This is because an increase in cash among high-cash-holding firms may only serve to increase taxable distributions to shareholders or foster agency problems, where managers invest in value-destroying projects at the expense of the outside shareholders (Jensen and Meckling 1976). Second, the contingent claims analysis (Black and Scholes 1973; Merton 1973) predicts that an increase in cash among high leverage firms goes largely to the debt holders and not to the shareholders. Thus, the equity market should place a lower value on an additional dollar of cash for these firms. With respect to our analysis of the return effect associated with firm's cash holdings, we formulate our second hypothesis as follows.

H2 The cash premium is weaker among firms with high levels of cash and high levels of debt.

The variation with the firm's level of cash and debt may provide an explanation for the strength of the cash premium among different firms from a rational risk-based pricing view. However, there may be a more comprehensive explanation from a behavioral mispricing-based perspective. Lam et al. (2015) recently find that the cash-return relation may be driven by the fact that low (high)-cash-holding firms are on average overvalued (undervalued) on the stock market. This is because investors seem to underestimate the potential real illiquidity associated with low cash holdings, while they seem to overestimate the potential agency problems related to high cash holdings. In other words, investors may be subject to expectation errors concerning the impact of cash on the firm's future performance and therefore the cash premium is the result of price corrections arising from the reversal of investors' expectation errors.

If mispricing plays an important role in understanding the cash-return effect, the cash premium should consequently differ when the firm's perceived misvaluation is taken into account. Therefore, we formulate our third and final hypothesis as follows.

H3 The cash premium is concentrated among undervalued high-cash firms and overvalued low-cash firms, but absent among overvalued high-cash firms and undervalued low-cash firms.

We identify potentially undervalued and overvalued firms through a financing-based misvaluation measure that explicitly proxies for systematic mispricing across firms (Bradshaw et al. 2006; Hirshleifer and Jiang 2010).

The remainder of the paper is organized as follows. The next section describes the data and variables used in this study. The subsequent sections test the outlined hypotheses and present the empirical results. The final section concludes the paper.

Data and variables

We study an international country sample that consists of firms from 20 developed non-U.S. equity markets. The sample selection resembles the countries included in the well-known Europe, Australasia, and the Far East (EAFE) stock market benchmark from MSCI that measures the foreign stock market performance outside of North America. We collect monthly total return data on common stocks from Datastream and firm-level accounting information from Worldscope. To ensure that accounting information is known before the returns are calculated, we match the latest accounting information for the fiscal year ending in the previous calendar year with stock returns from July of the current year to June of the subsequent year throughout the paper. All data are denominated in U.S. dollars. To ensure that our results are not driven by tiny or illiquid stocks, we follow Ang et al. (2009) and exclude

very small firms by eliminating the 5% of firms with the lowest market equity in each country. In addition, as in Fama and French (1992), we exclude firm-year observations with negative book equity and financial firms because cash holdings may not have the same meaning for these firms as for non-financial firms due to statuary capital requirements. The sample period is from July 1990 to June 2016 (henceforth 1990–2016), and the sample comprises on average 7133 firms per month with available information on corporate cash holdings. Distributional statistics for the sample firms across countries is given in Table 2.

The variables used in this study are defined as follows. A firm's size (SZ) is its market equity (stock price multiplied by the number of shares outstanding) measured as of June of each year in million U.S. dollars. Book-to-market (BM) is the ratio of book equity to market equity at the fiscal year end. Momentum (MOM) is the cumulative prior twelve-month stock return, skipping the most recent month (Jegadeesh and Titman 1993). Following Fama and French (2015), operating profitability (OP) is revenues minus cost of goods sold and interest expense, all divided by book equity.[3] Investment (INV) is the annual change in total assets divided by lagged total assets. Corporate cash holdings (CASH) are defined as the ratio of cash and short-term investments to market equity at the fiscal year end (Faulkender and Wang 2006). The firm's level of debt (DEBT) is the ratio of total debt to total assets (Opler et al. 1999). To proxy for systematic mispricing in the later analysis, we employ a financing-based misvaluation measure that is based on Bradshaw et al's (2006) external financing (XFIN) variable. XFIN is the sum of net equity financing and net debt financing divided by lagged total assets. Net equity financing is the sale of common and preferred stock minus the purchase of common and preferred stock minus cash dividends paid. Net debt financing is the issuance of long-term debt minus the reduction in long-term debt.[4]

Table 1 summarizes the distributional statistics for the variables. A typical firm in the international sample has a size of $978 million in terms of market equity and an average relative valuation based on book-to-market of 0.89. Over the 1990–2016 sample period, we observe a mean (median) cash level equivalent to 29% (18%) of the firm's market value of equity. Faulkender and Wang (2006) report for U.S. firms a mean cash level of 17.26% and a median of 9.45% over the earlier 1972–2001 period. Our observation of generally higher cash levels is consistent with the firms' changing cash-holding behavior over time that has been documented for U.S. firms as well as non-U.S. firms (Bates et al. 2009; Pinkowitz et al. 2013).

Table 1 Summary statistics, 1990–2016

	Mean	25th	Median	75th
SZ	978	45	139	499
BM	0.89	0.40	0.70	1.16
MOM	0.10	−0.19	0.02	0.27
OP	0.74	0.26	0.52	0.92
INV	0.16	−0.04	0.05	0.18
CASH	0.29	0.08	0.18	0.38
DEBT	0.21	0.05	0.18	0.33
XFIN	0.07	−0.04	0.00	0.04

This table shows distributional statistics for the variables used in this study. The table reports the mean, 25th percentile, median, and 75th percentile of the variables. Firm size (SZ) is market equity (stock price multiplied by the number of shares outstanding) as of June of each year in million U.S. dollars. Book-to-market (BM) is the ratio of book equity to market equity at the fiscal year end. Momentum (MOM) is the cumulative prior twelve-month stock return, skipping the most recent month. Operating profitability (OP) is revenues minus cost of goods sold and interest expense, all divided by book equity. Investment (INV) is the annual change in total assets divided by lagged total assets. Corporate cash holdings (CASH) are defined as the ratio of cash and short-term investments to market equity at the fiscal year end. The level of debt (DEBT) is the ratio of total debt to total assets. External financing (XFIN) is the sum of net equity financing and net debt financing divided by lagged total assets. Net equity financing is the sale of common and preferred stock minus the purchase of common and preferred stock minus cash dividends paid. Net debt financing is the issuance of long-term debt minus the reduction in long-term debt

The cash-return relation

In this section, we test hypothesis H1. To examine how international stock returns vary with different levels of cash, we begin our analysis at the portfolio level. Each June, we form quintile portfolios by allocating all stocks in a given country in ascending order to five groups based on their cash holdings from the fiscal year ending in the previous calendar year. Accordingly, a firm is assigned to the low (high) quintile portfolio if its cash is in the bottom (top) 20% of the country's cash distribution. Monthly size-adjusted returns on the equal-weighted portfolios are calculated for the subsequent twelve months, and the portfolios are rebalanced each year. For the size adjustment, the monthly return on a stock is measured net of the return on its matching country-specific size quintile portfolio.[5]

[3] We do not include selling, general and administrative expense, as this item is not broadly available among international firms. The return predictability of operating profitability is, however, not affected by this adjustment.

[4] In line with Hirshleifer and Jiang (2010), we do not include the change in current debt, as it does not reflect market timing.

[5] The size benchmark portfolios are formed each June by allocating all stocks in a given country to quintiles based on firm size. Monthly raw returns on the equal-weighted size portfolios are calculated for the subsequent twelve months, and the portfolios are rebalanced each year.

Table 2 Cash portfolios, 1990–2016

	Firms	Low	High	High–Low
Australia	709	−0.19 (−2.28)	0.29 (3.21)	**0.48 (3.31)**
Austria	53	−0.10 (−0.57)	0.25 (1.59)	0.35 (1.28)
Belgium	71	−0.04 (−0.35)	0.41 (3.30)	**0.45 (2.36)**
Denmark	100	−0.32 (−2.66)	0.13 (0.92)	**0.45 (2.09)**
Finland	83	−0.26 (−1.48)	0.22 (1.29)	0.47 (1.61)
France	473	−0.34 (−4.26)	0.45 (5.23)	**0.79 (5.62)**
Germany	424	−0.31 (−3.56)	0.30 (3.66)	**0.61 (4.12)**
Hong Kong	424	−0.51 (−4.34)	0.37 (3.25)	**0.89 (4.53)**
Ireland	35	0.20 (0.80)	0.26 (1.06)	0.06 (0.15)
Italy	155	−0.20 (−1.88)	0.26 (2.33)	**0.46 (2.46)**
Japan	2500	−0.20 (−3.81)	0.11 (2.25)	**0.30 (3.34)**
Netherlands	109	−0.39 (−3.33)	0.21 (1.62)	**0.60 (2.97)**
New Zealand	59	0.15 (0.81)	−0.31 (−1.80)	−0.46 (−1.57)
Norway	113	−0.08 (−0.50)	0.18 (1.06)	0.26 (0.96)
Portugal	46	−0.37 (−1.93)	0.30 (1.72)	**0.67 (2.37)**
Singapore	289	−0.30 (−3.12)	0.36 (3.65)	**0.66 (3.99)**
Spain	87	−0.01 (−0.08)	0.22 (1.70)	0.23 (1.09)
Sweden	216	−0.31 (−2.44)	0.24 (1.96)	**0.55 (2.65)**
Switzerland	140	−0.24 (−2.54)	0.26 (2.92)	**0.51 (3.35)**
UK	1047	−0.27 (−4.81)	0.41 (6.94)	**0.68 (7.16)**
Average	7133	−0.21 (−5.19)	0.24 (6.43)	**0.45 (6.54)**

This table shows average monthly size-adjusted returns in percent for quintile portfolios sorted on cash along with the average number of sample firms per month in each country. The portfolios are formed each June by allocating all stocks in a given country in ascending order to five groups based on their cash holdings from the fiscal year ending in the previous calendar year. Monthly size-adjusted returns on the equal-weighted portfolios are calculated for the subsequent twelve months, and the portfolios are rebalanced each year. For the size adjustment, the monthly return on a stock is measured net of the return on its matching country-specific size quintile portfolio. High–low reports the spread return between high- and low-cash-holdings firms. The *t* statistic for the average monthly return is given in parentheses. The last row provides cross-country averages on the portfolios. High–low spread returns that are statistically significantly different from zero at the 5% level or better are bolded

Table 2 shows average monthly size-adjusted returns for the low- and high-cash portfolios along with the average number of sample firms per month in each country. The last column (high–low) reports the spread return between high- and low-cash-holding firms for testing whether the return difference is significantly different from zero. For ease of assessment, spread returns with a significance level of 5% or better are bolded.

We observe that high-cash firms are in general rewarded with higher subsequent stock returns, while low-cash firms are penalized with lower subsequent stock returns, culminating in a statistically highly significant average spread return of 0.45% per month (or 5.4% per year) across countries. Though individual country portfolios may be noisier than multi-country portfolios (Fama and French 1998), the return difference between high- and low-cash-holding firms is in 14 of the 20 investigated markets statistically significantly different from zero at the 5% level or better, thus corroborating the existence of a cash premium in the broad majority of countries.

Comparing our international results to the prior U.S. evidence suggests a similar return behavior across equity markets. For instance, in related sorts, Palazzo (2012) finds an average cash premium of 0.54% per month after controlling for firm size, while Lam et al. (2015) document an average spread return between high- and low-cash-holding firms of 0.46% per month after controlling for firm size and book-to-market.

Portfolio sorts represent a very useful approach to investigate how average returns vary with different levels of the variable of interest. However, the portfolio-level analysis also has the potential shortcoming that much of the individual stock information is lost through aggregation. In addition, showing that there exists a positive cash-return relation does not rule out the possibility that the identified return effect is just a manifestation of already known determinants of the cross section of average stock returns.

Before we examine the robustness of the cash premium in more detail by studying the cash-return relation conditional upon the most established return-predictive firm

Table 3 Annual regressions of one-year-ahead cash holdings on common firm characteristics, 1990–2016

	Coefficient
SZ	−0.02
	(−6.19)
BM	0.16
	(18.12)
MOM	−0.05
	(−5.95)
OP	0.03
	(11.33)
INV	0.01
	(3.90)
R^2	0.24
Firms	6267

This table shows average coefficient estimates and associated *t* statistics (in parentheses) from annual firm-level cross-sectional regressions of one-year-ahead cash holdings on common firm characteristics that all predate the dependent variable. The set of common firm characteristics includes firm size (SZ), book-to-market (BM), momentum (MOM), operating profitability (OP), and investment (INV). The explanatory variables are updated each year to predict the firm's cash holdings one year ahead. The regression includes country dummies to control for possible country effects. In the regression, firm size is measured by the natural logarithm of market equity. The R^2 value is adjusted for degrees of freedom. The last row provides the average number of sample firms per year in the regression

characteristics of the cross section, we first investigate how corporate cash holdings are related to these firm characteristics. To address this issue, we estimate an annual firm-level cross-sectional regression of the firm's one-year-ahead cash holdings on common firm characteristics that all predate the dependent variable. Taking into account the most recent developments in asset pricing, the set of common firm characteristics includes firm size, book-to-market, momentum, operating profitability, and investment that all serve as common control variables in the later cross-sectional return analyses (Fama and French 2015).

Table 3 shows average coefficient estimates from the outlined firm-level cross-sectional regression. The explanatory variables are updated each year to predict the firm's cash holdings one year ahead. Since we combine firms from multiple countries in the analysis, we include country dummies here and in all subsequent regressions to control for possible country effects.

To begin with, all coefficient estimates are statistically significant, indicating that the considered explanatory variables are all important determinants of corporate cash holdings. Thus, controlling for these firm characteristics in the subsequent return analyses is important to uncover the genuine cash-return effect. In particular, we find that higher cash holdings are negatively associated with firm size and momentum, while they are positively associated with book-to-market, operating profitability, and investment. Hence, high-cash firms are, on average, smaller value stocks with poor past stock market performance that undertake more corporate investments with higher operating profitability. Our international observations are consistent with the prior U.S. evidence on the typical firm characteristics of high-cash firms (Opler et al. 1999).

After having established that high-cash-holding firms exhibit in general similar features across equity markets, we now examine the cash-return relation in international equity markets in more detail. To do so, we conduct cross-sectional regressions at the individual firm level using the Fama and MacBeth (1973) methodology, which provides a test setting that easily allows for multiple control variables. In particular, we estimate a firm-level cross-sectional regression of monthly stock returns on a cash indicator variable and common controls. Given that typical coefficient estimates in cross-sectional regressions are not always easy to interpret, we gauge the magnitude of the cash premium based on a scaled cash indicator (SCASH). To construct this measure, we allocate each June all stocks in a given country in ascending order to quintiles based on their cash holdings from the fiscal year ending in the previous calendar year. The scaled cash indicator reflects the firms' numerical ranks based on the yearly quintile allocation, where the quintile ranks are scaled to a 0–1 interval, i.e., (quintile rank-1)/4.[6] In this way, the estimate on SCASH can be interpreted in an analogous manner to the high–low spread return in the former portfolio analysis. We employ the previously used set of common firm characteristics as common control variables in the regression to obtain the abnormal return effect associated with the firm's cash holdings that is independent of already known cross-sectional return predictors.

Table 4 shows average coefficient estimates from different specification variants nested within the outlined firm-level cross-sectional regression. Except for momentum, which is measured monthly, we update the explanatory variables each June to predict monthly stock returns from July to the following June.

Of primary interest is specification (1) that reports the baseline result for the full sample. We observe that the return effect associated with the firm's cash holdings is not explained away in the presence of the common cross-sectional benchmark variables. The return difference between high and low-cash-holding firms remains economically and statistically significant and amounts to more than 0.35% per month (or 4.2% per year) after controlling for firm size,

[6] This approach has been proposed by Bradshaw et al. (2006) for an intuitive interpretation of the coefficient of interest.

Table 4 Monthly return regressions on cash indicators and common controls, 1990–2016

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sample	All	All	All	Small	Large	Asia	Europe
Period	Full	Earlier	Later	Full	Full	Full	Full
SCASH	0.35	0.21	0.49	0.49	0.17	0.23	0.41
	(7.06)	(2.91)	(7.48)	(8.84)	(3.00)	(3.26)	(7.25)
SZ	0.01	0.02	0.00	−0.20	0.08	−0.04	0.06
	(0.42)	(0.42)	(0.14)	(−4.91)	(2.21)	(−0.98)	(1.87)
BM	0.24	0.29	0.19	0.16	0.32	0.30	0.24
	(4.83)	(3.64)	(3.20)	(3.41)	(4.77)	(3.54)	(4.11)
MOM	0.56	0.82	0.29	0.59	0.63	−0.01	1.07
	(3.20)	(3.46)	(1.14)	(3.61)	(3.18)	(−0.03)	(5.23)
OP	0.13	0.10	0.15	0.12	0.13	0.11	0.13
	(5.97)	(3.51)	(4.92)	(4.53)	(5.13)	(3.15)	(5.30)
INV	−0.50	−0.53	−0.46	−0.44	−0.47	−0.48	−0.50
	(−9.25)	(−5.79)	(−8.20)	(−6.93)	(−7.37)	(−4.83)	(−8.75)
R^2	0.11	0.15	0.07	0.10	0.14	0.10	0.06
Firms	6552	4776	8328	3139	3413	3687	2865

This table shows average coefficient estimates and associated *t* statistics (in parentheses) from firm-level cross-sectional regressions of monthly stock returns on cash indicators and common controls. Each June, all stocks in a given country are allocated in ascending order to quintiles based on their cash holdings from the fiscal year ending in the previous calendar year. The scaled cash indicator (SCASH) reflects the firms' numerical ranks based on the yearly quintile allocation, where the quintile ranks are scaled to a 0–1 interval, i.e., (quintile rank-1)/4. The set of common controls includes firm size (SZ), book-to-market (BM), momentum (MOM), operating profitability (OP), and investment (INV). Except for momentum, which is measured monthly, the explanatory variables are updated each June to predict monthly stock returns from July to the following June. All regressions include country dummies to control for possible country effects. In the regressions, firm size is measured by the natural logarithm of market equity. The R^2 values are adjusted for degrees of freedom. The last row provides the average number of sample firms per month in the regressions. The earlier and later half samples cover July 1990 to June 2003 and July 2003 to June 2016, respectively. The small (large) subsample consists of the bottom (top) 50% of firms in each country in terms of market equity, measured as of June of each year. Asia includes Australia, Hong Kong, Japan, New Zealand, and Singapore. Europe encompasses the remaining sample countries (see Table 2)

book-to-market, momentum, operating profitability, and investment.

The estimates on the control variables echo in general prior results in the literature and corroborate their importance as cross-sectional return determinants in non-U.S. equity markets. International stock returns are significantly positively related to book-to-market, momentum, and operating profitability, while they are significantly negatively related to investment. In contrast, we do not find that firm size has significant power predicting returns during the sample period. This finding is, however, also in line with recent international evidence (e.g., Fama and French 2012).

The remaining specifications assess the pervasiveness of the cash premium across time and subsamples. Specifications (2) and (3) present sub-period results. The earlier sub-period runs from July 1990 to June 2003 (156 months), while the later sub-period runs from July 2003 to June 2016 (156 months). The return premium associated with the firm's cash holdings is significantly present in the two sub-periods. However, in line with the changing corporate cash-holding behavior over time, we note the tendency that the impact of cash on subsequent stock returns has become stronger from the earlier to the more recent half of the sample period.

A further cause for concern for anomalous return patterns is their pervasiveness across firm size. Though we control for a possible size effect in the cross section of average stock returns by including firm size as one of the control variables, it is interesting to know whether our baseline result holds across small firms as well as large firms. To address this question, specifications (4) and (5) present size-segmented subsample results. The subsample of small (large) firms consists of the bottom (top) 50% of firms in each country in terms of market equity, measured as of June of each year. Though the observed return effect is stronger among smaller firms, as it is the case for most other anomalies, the cash premium is not limited to small firms, but also significantly present among the largest and economically most important firms in international equity markets.

Finally, specifications (6) and (7) provide regional evidence by dividing the EAFE international sample into its two major regions. Asia includes Australia, Hong Kong,

Japan, New Zealand, and Singapore. Europe encompasses the remaining sample countries (see Table 2). The results corroborate that the cash-return relation is robust in terms of economic and statistical significance among Asian equity markets as well as among European equity markets.

In sum, the results in this section are consistent with hypothesis H1. Similar to the prior U.S. evidence, we observe a significantly positive relation between the firm's cash holdings and international stock returns that is not captured by established cross-sectional return determinants.

The variation with the firm's level of cash and debt

Following the insights of Faulkender and Wang (2006), we test in this section hypothesis H2 that the cash premium is weaker among firms with high levels of cash and high levels of debt. To explore whether their U.S. findings carry over to international equity markets, we estimate a firm-level cross-sectional regression of monthly stock returns on SCASH, an interaction term between SCASH and a dummy variable (DLEVEL) that differentiates between firms with high and low levels of cash or debt, and the previously employed control variables. DLEVEL is equal to one if the firm's cash or debt level is above the country's median cash or debt level and zero otherwise. Thus, the average coefficient estimate on the interaction term provides the differential return effect on the cash premium between firms with high and low levels of cash or debt.

Table 5 shows average coefficient estimates from the outlined firm-level cross-sectional regression for a specification, where DLEVEL differentiates firms based on their level of cash and another specification, where DLEVEL differentiates firms based on their level of debt.

The results in specification (1) show that the cash premium is not significantly weaker among firms with already high levels of cash. The estimate on the interaction term is statistically indistinguishable from zero. Thus, from an investor's perspective, we cannot infer a diminishing marginal value of cash with respect to the associated return effect. The positive relation between the firm's cash holdings and subsequent stock returns is similarly present across the full spectrum of cash holdings.

In contrast, the results in specification (2) show that the cash premium is significantly weaker among firms with high levels of debt. In detail, the abnormal return difference between high and low-cash-holding firms is 0.50% per month among low-debt firms, while it is only 0.17% per month (t statistic $= 2.49$) among high-debt firms [formally, $0.50 + (-0.33)$]. Thus, in line with the contingent claims analysis that among high leverage firms the cash held by the firm is largely in the hands of the debt holders, the impact of cash on subsequent stock returns is weaker.

Table 5 Monthly return regressions: interactions based on cash and debt levels, 1990–2016

Specification	(1)	(2)
DLEVEL based on	Cash level	Debt level
SCASH	0.40	0.50
	(5.15)	(10.74)
SCASH × DLEVEL	−0.04	−0.33
	(−0.78)	(−4.92)
SZ	0.01	0.02
	(0.41)	(0.60)
BM	0.24	0.25
	(4.84)	(5.15)
MOM	0.56	0.54
	(3.20)	(3.12)
OP	0.13	0.15
	(5.96)	(7.04)
INV	−0.50	−0.49
	(−9.27)	(−9.02)
R^2	0.11	0.11
Firms	6552	6545

This table shows average coefficient estimates and associated t statistics (in parentheses) from firm-level cross-sectional regressions of monthly stock returns on cash indicators, interaction terms based on cash or debt levels, and common controls. Each June, all stocks in a given country are allocated in ascending order to quintiles based on their cash holdings from the fiscal year ending in the previous calendar year. The scaled cash indicator (SCASH) reflects the firms' numerical ranks based on the yearly quintile allocation, where the quintile ranks are scaled to a 0–1 interval, i.e., (quintile rank-1)/4. DLEVEL is equal to one if the firm's cash or debt level is above the country's median cash or debt level and zero otherwise. The set of common controls includes firm size (SZ), book-to-market (BM), momentum (MOM), operating profitability (OP), and investment (INV). Except for momentum, which is measured monthly, the explanatory variables are updated each June to predict monthly stock returns from July to the following June. All regressions include country dummies to control for possible country effects. In the regressions, firm size is measured by the natural logarithm of market equity. The R^2 values are adjusted for degrees of freedom. The last row provides the average number of sample firms per month in the regressions

In sum, the results in this section only partially support hypothesis H2. The strength of the cash premium varies with the firm's level of debt. However, we do not find a significant variation with the firm's general level of cash in international equity markets.

The influence of mispricing

In this section, we test our final hypothesis H3. The findings of Lam et al. (2015) highlight the notion that investors may be subject to expectation errors concerning the impact of cash on the firm's future performance and therefore the

observed cash premium is the result of price corrections arising from the reversal of investors' expectation errors. Such an explanation implies that stock prices do not immediately incorporate the information contained in the firm's cash holdings and that the occurrence of the cash premium may be dependent on the firm's direction of mispricing.

Following this reasoning, we explicitly investigate the misvaluation aspect by studying the cash premium conditional on mispricing. To proxy for systematic mispricing, we employ the firm's external financing behavior as measured by Bradshaw et al.'s (2006) XFIN variable. Positive values on XFIN indicate issues, while negative values indicate repurchases. The opportunistic financing hypothesis (Ikenberry et al. 1995; Loughran and Ritter 1995) suggests that firms issue additional capital when prices are high and repurchase outstanding capital when prices are low. Thus, issues (repurchases) provide signals of potential overvaluation (undervaluation) based on the management's private assessment of the firm's intrinsic value relative to the market. Conditioning on the firm's direction of mispricing, as proxied by issues and repurchases, should provide a test setting, where market-based expectation errors concerning the firm's future performance and subsequent price corrections are most pronounced. Thus, if the positive return difference between high- and low-cash-holding firms arises from the reversal of investors' expectation errors, the observed cash premium should consequently differ among firms that are perceived as undervalued or overvalued.

To study the cash-return relation conditional on mispricing, we estimate a firm-level cross-sectional regression of monthly stock returns on low- and high-cash indicators (DLOW and DHIGH), interaction terms between the cash indicators and mispricing indicators (DOVER and DUNDER) that differentiate between overvalued and undervalued firms, and the previously employed control variables. As before, we allocate each June all stocks in a given country in ascending order to quintiles based on their cash holdings from the fiscal year ending in the previous calendar year. The low (high) cash indicator is equal to one if the firm's cash is in the bottom (top) 20% of the country's cash distribution and zero otherwise. The overvaluation (undervaluation) indicator is equal to one if the firm's external financing is positive (negative) and zero otherwise. Given this setting, the estimates on DLOW and DHIGH directly provide the abnormal returns associated with undervalued low-cash firms and overvalued high-cash firms, while the estimates on the interaction terms (DLOW $\times$ DOVER and DHIGH $\times$ DUNDER) provide the abnormal returns of overvalued low-cash firms and undervalued high-cash firms.

Table 6 shows average coefficient estimates from the outlined firm-level cross-sectional regression for holding periods up to five years after the explanatory variables are measured to assess the persistence of mispricing over longer horizons. The table reports year-to-year results, where the dependent variables in each year are the monthly stock returns from July to the following June. By way of illustration, the outcomes in the first year are based on the common twelve-month period after the explanatory variables are measured in June, while the outcomes in the second year are based on the subsequent twelve-month period starting at the end of the first year, and so on.[7]

The results show that conditioning on mispricing has a major impact on the observed cash-return relation. First, we observe that there is no significant return effect associated with the firm's cash holdings when undervalued low-cash firms and overvalued high-cash firms are considered. The coefficient estimates on DLOW and DHIGH are both statistically indistinguishable from zero in the first year and all subsequent years.

In contrast, as indicated by the significant coefficient estimates on the interaction terms, we find strong return effects associated with the firm's cash holdings when overvalued low-cash firms and undervalued high-cash firms are considered. For instance, in the first year, undervalued high-cash firms yield positive abnormal returns of 0.28% per month, while overvalued low-cash firms produce negative abnormal returns of –0.36% per month. The cash premium conditional on mispricing therefore amounts to more than 0.64% per month, which is almost twice as large as the standard (unconditional) cash premium of 0.35% per month shown in Table 4.[8]

Consistent with the assumption that the market has problems to fully capitalize the information contained in the firm's cash holdings, we observe that the high returns to undervalued high-cash firms and the low returns to overvalued low-cash firms persist over longer horizons. Though the abnormal return difference between high- and low-cash-holding firms is the largest in the first year, it only gradually decreases over the subsequent years, until the negative abnormal returns of overvalued low-cash firms are rendered statistically insignificant in the fifth year.

In sum, the results in this section strongly support hypothesis H3. The cash premium is concentrated among undervalued high-cash firms and overvalued low-cash

[7] As before, the explanatory variables are updated each June. The only exception is momentum, which is measured monthly during the first year. The decrease in the average number of sample firms from the first to the fifth year is owed to the longer horizon perspective. For instance, the first "Year 5" twelve-month period starts in July 1994.

[8] The additional data requirements for having misvaluation indicators based on XFIN in the regressions do not drive the results. Re-estimating the baseline regression specification (1) of Table 4, on condition of having available XFIN information, produces an average coefficient estimate on SCASH of 0.33 with a t statistic of 6.05.

Table 6 Monthly return regressions: interactions based on mispricing, 1990–2016

	Year 1	Year 2	Year 3	Year 4	Year 5
DLOW	−0.03	0.01	−0.02	−0.02	0.00
	(−0.59)	(0.19)	(−0.43)	(−0.34)	(0.05)
DHIGH	−0.04	−0.06	−0.05	−0.10	−0.06
	(−0.67)	(−0.92)	(−0.72)	(−1.34)	(−0.95)
DLOW × DOVER	−0.36	−0.25	−0.24	−0.29	−0.10
	(−5.91)	(−3.89)	(−3.28)	(−4.11)	(−1.34)
DHIGH × DUNDER	0.28	0.25	0.28	0.22	0.20
	(3.91)	(3.31)	(3.51)	(2.69)	(2.74)
SZ	0.01	0.00	0.00	−0.01	0.02
	(0.18)	(−0.15)	(−0.12)	(−0.17)	(0.58)
BM	0.26	0.24	0.13	0.12	0.11
	(5.35)	(4.64)	(2.52)	(2.29)	(2.23)
MOM	0.72	−0.23	−0.25	−0.12	−0.14
	(3.95)	(−2.18)	(−2.86)	(−1.35)	(−1.96)
OP	0.13	0.15	0.11	0.11	0.09
	(5.41)	(6.16)	(4.34)	(4.32)	(3.30)
INV	−0.47	−0.24	−0.20	−0.13	−0.09
	(−8.25)	(−4.32)	(−3.68)	(−2.23)	(−1.61)
R^2	0.10	0.09	0.09	0.09	0.08
Firms	4126	3899	3672	3466	3263

This table shows average coefficient estimates and associated *t* statistics (in parentheses) from firm-level cross-sectional regressions of monthly stock returns on cash indicators, interaction terms based on mispricing, and common controls. The table reports year-to-year results for holding periods up to five years after the explanatory variables are measured. The dependent variables in each year are the monthly returns from July to the following June. Each June, all stocks in a given country are allocated in ascending order to quintiles based on their cash holdings from the fiscal year ending in the previous calendar year. DLOW, DHIGH, DOVER, and DUNDER are dummy variables that take the value of one if the underlying condition holds and zero otherwise. DLOW (DHIGH) is equal to one if the firm's cash is in the bottom (top) 20% of the country's cash distribution of the year. DOVER (DUNDER) is equal to one if the firm's external financing of the year is positive (negative). The set of common controls includes firm size (SZ), book-to-market (BM), momentum (MOM), operating profitability (OP), and investment (INV). Except for momentum, which is measured monthly, the explanatory variables are updated each June to predict monthly stock returns from July to the following June. All regressions include country dummies to control for possible country effects. In the regressions, firm size is measured by the natural logarithm of market equity. The R^2 values are adjusted for degrees of freedom. The last row provides the average number of sample firms per month in the regressions

firms, but absent among overvalued high-cash firms and undervalued low-cash firms.

Conclusions

In this paper, we study the relation between corporate cash holdings and subsequent stock returns in the broad cross section of international firms drawn from 20 developed non-U.S. equity markets over the sample period from 1990 to 2016 with the aim to provide a useful out-of-sample analysis on the anomalous cash-return effect previously identified in the USA.

First, similar to the prior U.S. evidence, we find a significantly positive cash-return relation in international equity markets. The outperformance of high-cash firms over low-cash firms is not captured by established cross-sectional return determinants. The observed cash premium is robust to traditional controls based on firm size, book-to-market, and momentum as well as to novel controls associated with operating profitability and investment.

Second, analyzing how the cash-return relation varies with the firm's financial characteristics, we observe that the cash premium is weaker among firms with high levels of debt. However, we do not find that the strength of the cash premium is related to the firm's general level of cash. Thus, the cash-return effect is similarly present across the full spectrum of cash holdings.

Third, given that investors may be subject to expectation errors concerning the impact of cash on the firm's future

performance, we finally pursue a behavioral mispricing-based explanation. Studying the cash-return relation conditional on mispricing, we find that the high returns of high-cash firms are due to undervalued high-cash firms, while the low returns of low-cash firms are due to overvalued low-cash firms. Among overvalued high-cash firms and undervalued low-cash firms, there exists no cash premium at all.

Given the similarity between our international findings and the prior U.S. evidence, it is unlikely that the identified cash-return effect is sample specific. Indeed, our results suggest that the cash premium is a rather global phenomenon and it is driven by mispricing.

Our analysis holds important practical implications for investors. First, the firm's cash-holding behavior extends the investment opportunity set of investors by conveying additional information about the firm's future stock market performance beyond that provided by already known return-predictive firm characteristics, such as firm size, value/growth, or momentum. Thus, corporate cash holdings may form the basis for profitable investment strategies or serve as an additional stock selection criteria in the portfolio management. Second, given that the observed cash premium is driven by mispricing, we show that taking into account the firm's external financing behavior as a misvaluation indicator may help investors to differentiate in advance undervalued cash firms from overvalued cash firms, for an enhanced exploitation of the cash premium.

An in-depth analysis of the underlying mechanisms governing the mispricing among cash-holding firms in international equity markets is beyond the scope of this paper but promises to be an interesting avenue for future research.

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