Corporate Cash Balance, Volatility, and Adjustment: Growth Firms vs. Cash Cows

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Recognizing that variables known to affect optimal cash balance also serve to distinguish growth firms from cash cows allows us to identify and compare the behavior of cash balances and related variables for these two types of firms. Using data on U.S. firms for 1988-2014, average cash balance is 4.5 times higher for growth firms than cash cows. Volatility is also far higher for growth firms with respect to cash balance, operating cash flow, and other cash-related variables. However, adjustment speed is similar for growth firms and cash cows. Growth firms manage cash adjustments with greater use of stock issuances.

INTRODUCTION

The question of why firms hold cash has been of interest to financial economists at least since Keynes (1936) espoused two basic motives: transactions and precautionary. Subsequently, corporate finance theory has provided additional insight into the motivations of firms to hold cash, such as in Jensen and Meckling (1976), Galai and Masulis, (1976), Myers (1977), and Jensen (1986). (See also Denis, 2011.) Such theories have allowed researchers to develop reasonably effective empirical analyses of determinants of optimal cash holdings and the behavior of cash and related variables, including Opler et al. (1999), Almeida et al. (2004), and many others.

In this paper we recognize that most of the variables known to affect optimal cash balance are also key variables that serve to distinguish growth firms from cash cows. This recognition allows us to identify, examine and compare the behavior of cash balances and related variables for these two types of firms. Using data on U.S. firms for 1988-2014, we find that, on average, cash balance is 4.5 times higher for growth firms than for cash cows. Cross-sectional volatility is also far higher for growth firms with respect to cash balance, operating cash flow, and other variables related to cash. However, estimated speed of adjustment is similar for growth firms and cash cows. Additional evidence indicates that growth firms manage adjustments with greater use of operating cash flow, stock issuance, and stock repurchases.

The remainder of the paper is organized as follows. The next section reviews the literature and develops our hypothesis that the growth firm/cash cow dichotomy explains much of the variation in in cash balances and related variables. The following two sections describe the data used in our empirical analysis, provide initial empirical evidence, and present our main empirical results. The final section summarizes.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

In this section we develop a hypothesis that cross-sectional variation in cash holdings is largely determined by the status of individual firms in terms of whether they are growth firms or cash cows. A growth firm is defined as a firm that has substantial investment opportunities that outstrip its (likely low) internal cash flow, while a cash cow is a firm that is profitable but has little or no profitable investment opportunities. We argue that each of numerous variables can serve as (noisy) measures of a firm's status in this regard, including variables that have been used to measure other constructs in previous literature. Our discussion largely focuses on the seminal work of Opler et al. (1999), who introduce a trade-off theory of cash balance and several variables that they argue are determinants of optimal cash balance. Opler et al. (1999) conclude from their study that firms with strong growth opportunities and riskier cash flows hold relatively high cash balances.

The first two variables that we consider to distinguish growth firms from cash cows are Tobin's Q ratio (Tobin, 1969) and R&D expenditures, both of which should be higher for growth firms. Opler et al. (1999) use both Q and R&D expenditures as measures of a firm's growth opportunities, and argue that cash balance will be directly related to both because firms with greater growth opportunities are more likely to forgo profitable projects if they are short on cash.

The next four measures we consider are age, size, operating cash flow, and dividends. Here we primarily appeal to the lifecycle theory (e.g., DeAngelo, et al., 2006, 2010; Bulan, et al., 2007) for our predictions. This theory suggests that small, young growth firms with high Q and low operating cash flow will tend to have high cash balances, largely financed by lumpy equity issuance, and will not pay dividends, while large, mature cash cows with low Q will have low cash balances and will pay dividends. Opler et al. (1999) find that cash balance is generally negatively related to firm size and argue that transaction costs models such as Miller and Orr (1966) suggest economies of scale in cash management. Regarding operating cash flow, Evidence in Opler et al. (1999) is mixed with regard to the relationship between cash balance and operating cash flow. However, to the extent that they find a positive relationship, they argue that agency costs of managerial discretion cause firms to hold more cash than would be optimal for shareholders. Opler et al. (1999) also report mixed results regarding the relationship between cash balance and dividends.

Finally, we consider the relationship between growth vs. cash cow status and leverage. Growth firms as we define them should have little or no leverage because the purported benefits of debt, including the tax benefit (e.g., Kraus and Litzenberger, 1973) and a reduction in agency costs of free cash flow (Jensen, 1986) would be of little use for them, while purported costs of debt, including distress cost factors (e.g., Kraus and Litzenberger, 1973) and costs associated with underinvestment (Myers, 1977) and asset substitution (Galai and Masulis, 1976; Jensen and Meckling, 1976) would be relatively large. However, the opposite would be true for cash cows, so cash cows should have higher leverage. Thus, the relationship between cash balance and leverage should be negative. Opler et al. (1999) find a strong negative relationship between cash balance and leverage, noting that "…it is generally the case that the variables that affect cash holdings are also variables that affect leverage, but usually with the opposite sign…" (p. 24).

DATA AND INITIAL EMPIRICAL EVIDENCE

Dataset

The universe of firms from which we draw our sample includes all U.S.-incorporated, publicly traded NYSE, AMEX, and NASDAQ firms on the COMPUSTAT annual database for fiscal years 1988–2014. We exclude financial firms (SIC code values 6000–6999) and utilities (SIC code values of 4900-4999) because of their regulated status, and firms with any missing variable values.
Our final sample includes 79,011 firm-year observations.

Variables

The variables used in the empirical analysis are calculated as follows. (All ratio variables are winsorized at 1st and 99th percentiles.) The cash balance variable, CASH, is calculated as

$$CASH_{i,t} = CASHBAL_{i,t} / AT_{i,t}, \quad (1)$$

where $CASHBAL_{i,t}$ is firm i's year-end t balance of cash and equivalents and $AT_{i,t}$ is firm i's total assets at year-end t. Firm i's year t change in cash is denoted as chgCASH.

Tobin's Q ratio, Q, calculated as:

$$Q_{i,t} = (AT_{i,t} - BEV_{i,t} + MEV_{i,t}) / AT_{i,t}, \quad (2)$$

where $BEV_{i,t}$ and $MEV_{i,t}$ are firm i's year-end t book and market equity values, respectively. R&D expenditures, R&D, is calculated as:

$$R\&D_{i,t} = R\&DExp_{i,t} / AT_{i,t}, \quad (3)$$

where $R\&DExp_{i,t}$ is firm i's year t R&D expenditures.

Our proxy for firm age is Young, a dummy variable that takes on a value of 1 (0) if the firm has been a publicly traded firm for less than 5 years (5 or more years). Firm size, SIZE, calculated as the natural log of firm i's year-end t GDP-deflated total assets. Operating cash flow, CF, is calculated as:

$$CF_{i,t} = (NCFOAT_{i,t} - DIV_{i,t}) / AT_{i,t}, \quad (4)$$

where $NCFOAT_{i,t}$ and $DIV_{i,t}$ are firm i's year t after-tax net cash flow from operations and cash dividends, respectively. Our proxy for dividends, DIVdum, is a dummy variable that takes on a value of 1 (0) if the firm paid (did not pay) a dividend in year t. Our leverage measure is book leverage, LEVbk, calculated as:

$$LEVbk_{i,t} = (DLT_{i,t} + DCL_{i,t}) / AT_{i,t}, \quad (5)$$

where $LTD_{i,t}$ is long-term debt, and $DCL_{i,t}$ is the debt in current liabilities, for firm i at year-end t. Net change in debt, NetChgDebt, is calculated as:

$$NetChgDebt_{i,t} = (DIss_{i,t} + DRet_{i,t} + chgCURRD) / AT_{i,t}, \quad (6)$$

where DIss and DRet are the dollar amounts of year t debt issuance and debt retirement, respectively, and chgCURRD is the dollar amount of the year t change in current debt.

Net working capital, NWC, is calculated as:

$$NWC_{i,t} = (CA_{i,t} - CL_{i,t} - CASHBAL_{i,t}) / AT_{i,t}, \quad (7)$$

where $CA_{i,t}$ and $CL_{i,t}$ are firm i's year-end t balances of current assets and current liabilities, respectively. Year t capital expenditures and cash acquisitions for firm i, CAPEXP and ACQ, are calculated as:

$$CAPEXP_{i,t} = (CAPX_{i,t}) / AT_{i,t}, \quad (8)$$

and

$$ACQ_{i,t} = (ACQUIS_{i,t}) / AT_{i,t}, \quad (9)$$

where CAPX and ACQUIS are the dollar amounts of capital expenditures and cash acquisitions, respectively. Firm I's year t stock issuance and repurchases, STKiss and STKrep, are calculated as:

$$STKiss_{i,t} = (SSTK_{i,t}) / AT_{i,t}, \quad (10)$$

and

$$STKrep_{i,t} = (RSTK_{i,t}) / AT_{i,t}, \quad (11)$$

where SSTK and RSTK are the dollar amounts of stock issuance and stock repurchases, respectively.

We also calculate CFstdIND, the cross-sectional mean of the standard deviations CF for firms in each industry, where for each firm the standard deviation of CF is calculated using data for all years in the

sample. Finally, we follow Carpenter and Petersen (2002) in defining the actual growth rate of a firm as chgTA, the relative change in assets from one year to the next:

$$chgTA_{i,t} = (AT_{i,t} - AT_{i,t-1}) / AT_{i,t-1}. \quad (12)$$

Initial Empirical Evidence

Our initial empirical evidence consists of summary statistics, time trends, and correlations, shown respectively in Table 1, Figure 1, and Table 2. In Table 2 and subsequently, ***, ** and * indicate significance at 1%, 5%, and 10% levels, respectively. Regarding summary statistics, note initially that the mean and median values of CASH, 0.164 and 0.083, are close to corresponding values of 0.170 and 0.065 reported by Opler et al. (1999). The large discrepancy between mean and median values of CASH suggests that a minority of firms have very large CASH balances. Such skewness is also evident in the distributions of Q and R&D, where mean values also are larger than median values. Fig. 1 shows annual mean annual values of CASH, R&D, and Q.

TABLE 1
SUMMARY STATISTICS

Variable	N	Mean	Std.	Q1	Median	Q3
CASH	79,011	0.164	0.197	0.023	0.083	0.236
SIZE	79,011	4.584	1.799	3.186	4.373	5.739
Young	79,011	0.122	0.327	0.000	0.000	0.000
Q	79,011	1.825	1.334	1.076	1.408	2.051
CF	79,011	0.054	0.143	0.029	0.077	0.120
R&D	79,011	0.040	0.081	0.000	0.000	0.046
DIVdum	79,011	0.401	0.490	0.000	0.000	1.000
LEVbk	79,011	0.215	0.188	0.034	0.190	0.342
NWC	79,011	0.104	0.180	-0.017	0.089	0.220
CAPEXP	79,011	0.061	0.063	0.021	0.041	0.077
ACQ	79,011	0.022	0.057	0.000	0.000	0.011
CFstdIND	79,011	0.073	0.020	0.056	0.075	0.085
STKiss	79,011	0.031	0.093	0.000	0.003	0.015
STKrep	79,011	0.015	0.038	0.000	0.000	0.009
NetChgDebt	79,011	0.009	0.084	-0.023	0.000	0.032
chgAT	79,011	0.126	0.322	-0.026	0.064	0.192

FIGURE 1
ANNUAL MEAN VALUES OF CASH, R&D, and Q.

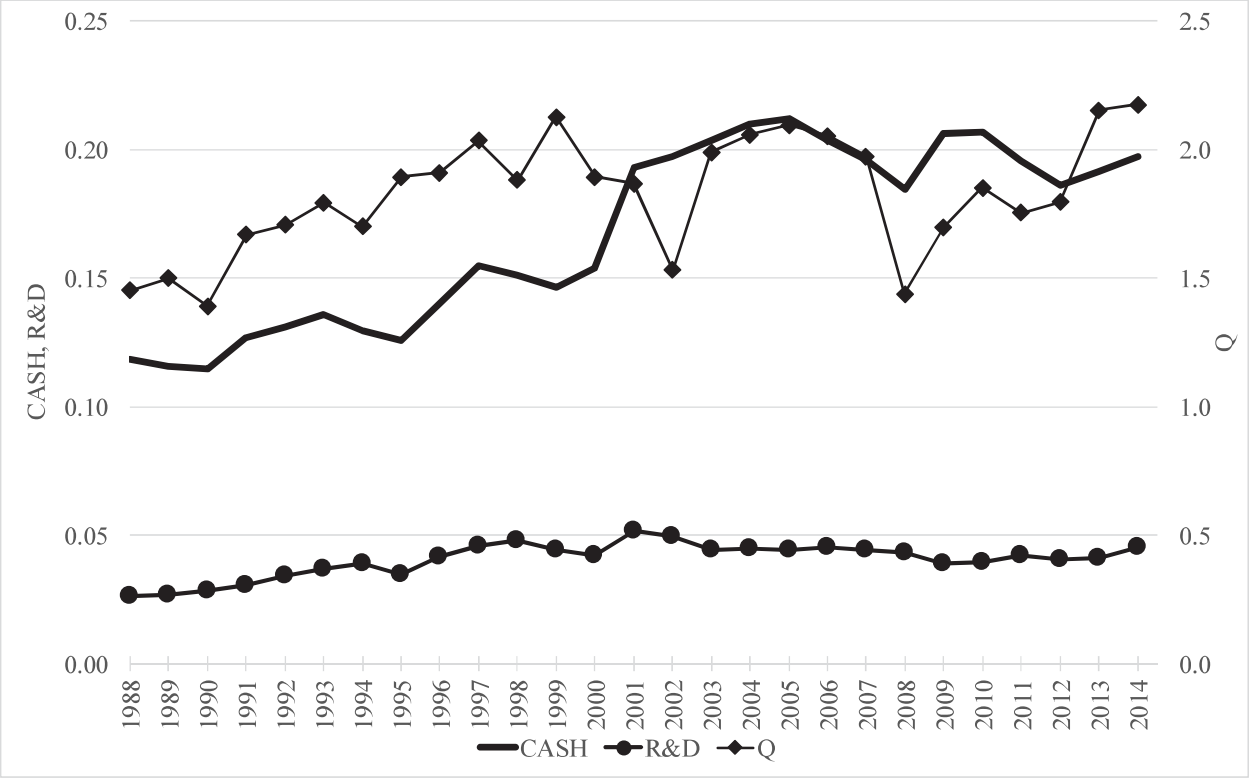

TABLE 2
CORRELATIONS AMONG PROPOSED DISTINGUISHING VARIABLES

	CASH	Q	R&D	Young	SIZE	CF	DIVdum	LEVbk
CASH	1.000	0.369 ***	0.535 ***	0.131 ***	-0.250 ***	-0.315 ***	-0.240 ***	-0.461 ***
		(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Q		1.000	0.324 ***	0.101 ***	-0.044 ***	-0.016 ***	-0.065 ***	-0.267 ***
			(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
R&D			1.000	0.108 ***	-0.223 ***	-0.466 ***	-0.236 ***	-0.274 ***
				(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
Young				1.000	-0.170 ***	-0.095 ***	-0.178 ***	-0.017 ***
					(<0.0001)	(<0.0001)	(<0.0001)	(<0.0001)
SIZE					1.000	0.205 ***	0.394 ***	0.241 ***
						(<0.0001)	(<0.0001)	(<0.0001)
CF						1.000	0.114 ***	-0.003
							(<0.0001)	(0.4201)
DIVdum							1.000	0.076 ***
								(<0.0001)
LEVbk								1.000

All three variables show general increases in mean values over time, though mean values all three variable appear to have stabilized roughly after 2000. The increase in mean cash balances (at least through 2000) is consistent with Bates et al. (2009), and the apparent co-movement of the three variables

is consistent with our hypothesis under the proviso that, among U.S. firms, the prevalence of growth firms has increased relative to cash cows over time.

Finally, Table 2 shows Pearson correlations among the principal variables in our analysis. (p-values are shown in parentheses.) The correlations are generally consistent with predictions of our hypothesis. Specifically, CASH is positively correlated with Q, R&D, and Young, and negatively correlated with SIZE, CF, DIVdum, and LEVbk, all as expected. Further, Q is positively related to both R&D and Young, and negatively correlated with SIZE, CF, DIVdum, and LEVbk, all as expected. As such, the correlation evidence in Table 2 strongly suggests that we can effectively use combinations of these variables to distinguish growth firms from cash cows. We proceed with that task in the next section.

MAIN EMPIRICAL RESULTS

Our earlier arguments combined with the correlation evidence presented in the previous section strongly suggest that each and every variable shown in Table 2 (CASH, Q, R&D, Young, SIZE, CF, DIVdum, and LEVbk) is a noisy measure of a firm's status along the growth firm-cash cow continuum. Since the main goal of this paper is to identify growth firms and cash cows and examine the differences in their policies regarding cash, it appears that we can use all of the other variables to distinguish firms.

Factor Analysis

Thus, to identify firms in terms of their growth firm vs. cash cow status, we subject Q, R&D, Young, SIZE, CF, DIVdum, and LEVbk to factor analysis to determine whether: (a) a strong common factor exists among these variables, and (b) a resulting common factor appears to be a measure of status consistent with our hypothesis. We apply the principal components method with varimax rotation to the above variables using the full-sample panel data. The factor analysis results in the extraction of one major factor and two minor factors. For the major factor, the eigenvalue is 2.099, implying that the major factor explains 30.0% of the common variance of the input variables. We discard the minor factors. Results associated with the major factor are displayed in Table 3.

TABLE 3
RESULTS OF FACTOR ANALYSIS

Eigenvalue of major factor :	2.099
Common variance explained:	30.0%

Correlations of major factor scores, Fscore, with component variables (Factor pattern):

Component variable	Corr.	p value
Q	-0.436	(<0.0001) ***
R&D	-0.754	(<0.0001) ***
Young	-0.355	(<0.0001) ***
SIZE	0.629	(<0.0001) ***
CF	0.531	(<0.0001) ***
DIVdum	0.559	(<0.0001) ***
LEVbk	0.474	(<0.0001) ***

Generating equation for Fscore:

Fscore = -0.808 -0.156(Q) -4.461(R&D)-0.516(Young) +0.167(SIZE) +1.763(CF)
+0.543(DIVdum) +1.203(LEVbk)

Denoting scores for the major factor as Fscore, we find that Fscore is strongly and reliably correlated with each of the input variables: Q (-0.436); R&D (-0.754); Young (-0.355); SIZE (0.629); CF (0.531); DIVdum (0.559); and LEVbk (0.474). The generating equation for Fscore is:

Fscore = -0.808 -0.156(Q) -4.461(R&D) -0.516(Young) +0.167(SIZE) +1.763(CF)
+0.543(DIVdum) +1.203(LEVbk) (13)

Note that Fscore decreases with Q, R&D, and Young, and increases with SIZE, CF, DIVdum, and LEVbk. Thus, we can interpret Fscore as either an inverse measure of growth firm status or a direct measure of cash cow status, and in either case the results are fully consistent with our hypothesis.

Regressions of Cash Holdings

We now perform several OLS regressions of cash balance. In all regressions we include fixed year effects to control for the trends shown in Fig. 1. The results of four regressions are displayed in Table 4. (Standard errors shown in italics are heteroskedasticity consistent.)

In regression model [1], the sole regressor is Fscore. As expected, the coefficient of Fscore is negative and highly significant, indicating that firms that score lower (higher) in terms of being a growth firm (cash cow) generally have higher (lower) cash balances. Further, the R^2 of this regression is substantial at 0.403 (40.3%). By design the standard deviation of Fscore is 1.0, so the coefficient value of -0.121 indicates that a one standard deviation increase of Fscore is associated with a decrease in CASH by -0.121, or 12.1%, which is substantial relative to the standard deviation of CASH itself, 0.197 (see Table 1).

In regression model [2], the regressors include all of the individual variables used in the factor analysis. The coefficients of the variables are all highly significant and their signs agree with our earlier arguments; that is, CASH is positively related to Q, R&D, and Young, and negatively related to SIZE, CF, DIVdum, and LEVbk. The R^2 of this regression is 0.464, which is only slightly higher than for regression model [1], indicating that Fscore fairly well captures the information in the individual proposed determinants of CASH.

In regression model [3], the regressors include various variables that Opler, et al. (1999) and Bates et al. (2009) used in their regression analyses. All coefficients are highly significant and the signs of the coefficients generally agree with those reported in the other studies. The R^2 is 0.538, indicating that other variables included in the regression, including NWC, CAPEXP, ACQ, and CFstdIND, marginally increase explanatory power relative to models [1] or [2]. Finally, in regression model [4] regressors include all variables under consideration, and the resulting R^2 is 0.540.

TABLE 4
OLS REGRESSIONS OF CASH HOLDINGS

	[1]	[2]	[3]	[4]
Fscore	-0.121 ***			
	0.0005			
Q		0.026 ***	0.023 ***	0.022 ***
		0.0004	*0.0004*	*0.0004*
R&D		0.687 ***	0.552 ***	0.550 ***
		0.0081	*0.0079*	*0.0078*
Young		0.033 ***		0.033 ***
		0.0016		*0.0015*
SIZE		-0.005 ***	-0.012 ***	-0.011 ***
		0.0003	*0.0003*	*0.0003*
CF		-0.212 ***	-0.125 ***	-0.119 ***
		0.0042	*0.0040*	*0.0040*
DIVdum		-0.036 ***	-0.033 ***	-0.030 ***
		0.0012	*0.0011*	*0.0011*
LEVbk		-0.322 ***	-0.332 ***	-0.332 ***
		0.0030	*0.0029*	*0.0029*
NWC			-0.295 ***	-0.292 ***
			0.0029	*0.0029*
CAPEXP			-0.467 ***	-0.479 ***
			0.0081	*0.0081*
ACQ			-0.247 ***	-0.258 ***
			0.0086	*0.0086*
CFstdIND			0.778 ***	0.786 ***
			0.0257	*0.0256*
Intercept	0.145 ***	0.199 ***	0.267 ***	0.258 ***
	0.0021	*0.0026*	*0.0032*	*0.0032*
Year effects	Yes	Yes	Yes	Yes
R^2	0.403	0.464	0.538	0.540

In summary, we interpret the results in Table 4 as indicating that our proposed variables for distinguishing growth firms from cash cows, whether they are used individually or expressed in terms of factor scores Fscore, are successful in explaining variation in cash balances. The results of the regression of CASH on Fscore are particularly important as they allow us to use Fscore as a measure of the growth firm/cash cow continuum in additional analysis to follow.

Comparisons of Variable Means and Variances for Growth Firms vs. Cash Cows

Our next tests involve comparisons of means and variances of various variables for growth firms vs. cash cows. Growth firms (cash cows) are defined as firms with Fscore values in the lowest (highest) tercile, while firms in the middle tercile are referred to as mixed firms. Results of these comparisons are displayed in Table 5. Panel A shows results of comparisons of the variables used in the factor analysis, including Q, R&D, Young, SIZE, CF, DIVdum, and LEVbk, as well as the asset growth variable chgTA. Panel B shows results for the cash-related variables CASH, TARGET, DEV, chgCASH, and CF, where TARGET is the predicted value of CASH based on model [4] in Table 4, and DEV = CASH – TARGET.

TABLE 5
COMPARATIVE ANALYSES OF STATISTICS ON FACTOR VARIABLES AND CASH-RELATED VARIABLES FOR GROWTH FIRMS AND CASH COWS

							Growth firms vs. cash cows:		
	Growth firms		Mixed firms		Cash cows		Diff. of means:		Diff. of Var.:
	Mean	Variance	Mean	Variance	Mean	Variance	Diff.	t-value	F-value
Panel A. Factor analysis input variables and chgTA.									
Q	2.428	3.6694	1.559	0.7528	1.487	0.3713	0.941	75.93 ***	9.88 ***
R&D	0.098	0.0133	0.015	0.0009	0.008	0.0003	0.090	125.11 ***	42.55 ***
Young	0.268	0.1963	0.080	0.0734	0.018	0.0177	0.250	87.80 ***	11.11 ***
SIZE	3.317	1.3069	4.257	1.6928	6.178	2.4568	-2.862	-239.38 ***	1.88 ***
CF	-0.006	0.0469	0.084	0.0059	0.085	0.0034	-0.091	-65.87 ***	13.81 ***
DIVdum	0.065	0.0612	0.321	0.2181	0.817	0.1496	-0.751	-265.52 ***	2.44 ***
LEVbk	0.098	0.0190	0.218	0.0314	0.327	0.0292	-0.229	-169.00 ***	1.54 ***
chgTA	0.156	0.1729	0.116	0.0738	0.106	0.0632	0.050	16.77 ***	2.74 ***
Panel B. Cash-related variables.									
CASH	0.304	0.0592	0.122	0.0197	0.068	0.0069	0.236	149.08 ***	8.62 ***
TARGET	0.297	0.0219	0.132	0.0069	0.065	0.0056	0.232	226.70 ***	3.95 ***
DEV	0.007	0.0322	-0.010	0.0139	0.003	0.0072	0.004	n/a	4.45 ***
chgCASH	-0.004	0.0165	-0.002	0.0063	-0.002	0.0028	-0.003	-2.96 ***	5.81 ***
CF	-0.006	0.0469	0.084	0.0059	0.085	0.0034	-0.091	-65.87 ***	13.81 ***

In Panel A, results of comparisons of the mean values variables used in the factor analysis are all as expected: Relative to cash cows, growth firms have significantly higher mean values of Q, R&D, and Young, and significantly lower mean values of SIZE, CF, DIVdum, and LEVbk. Meanwhile, volatility is significantly higher for growth firms than cash cows with respect to Q, R&D, Young, and CF, while volatility is significantly greater for cash cows with respect to SIZE, DIVdum, and LEVbk.

The last row of Table 5 Panel A shows results for chgTA. Mean values of chgTA are 0.156 and 0.106 for growth firms and cash cows, respectively. The difference of these mean growth rates, 0.050, is highly significant (t-value=16.77). Thus, as expected asset growth is higher, by about 50%, for growth firms than cash cows. However, asset growth is also more heterogeneous for growth firms than cash cows, as the variance of chgTA is significantly higher for the former than the latter (F-value=2.74).

In Panel B, mean values of CASH are 0.304 and 0.068 for growth firms and cash cows, respectively, and the difference is highly significant (diff.=0.236; t-value=149.08). In other words, on average growth firms hold 4.5 times higher cash balance than cash cows! These results strongly underscore the importance of the growth firm/cash cow continuum as a determinant of cash balance. Further, we find that the variance of CASH is far higher for growth firms, 0.0592, than for cash cows, 0.0069, and this difference is highly significant (F-value=8.62). The combined results for CASH are therefore consistent with Opler et al. (1999) and others, who argue that firms with riskier cash flows (and therefore, presumably, more volatile cash balances) will have higher cash balances. The novelty here is that we establish that both average cash balance and cash volatility is higher for growth firms than cash cows.

Next we examine results for TARGET and DEV. For both growth firms and cash cows the average value of TARGET is close to the corresponding average value of CASH, so that the average value of DEV is near zero for both types of firms. That is, the model we use for TARGET generates predictions that are essentially unbiased for both types of firms. However, for both TARGET and DEV, variance is significantly higher for growth firms than for cash cows (F-values of 3.95 and 4.45, resp.). The result for TARGET indicates that the heterogeneity of optimal cash balance is greater for growth firms than for cash cows, while the result for DEV indicates that growth firms experience greater deviations from optimal cash balance than cash cows.

Finally, we consider the variance statistics for chgCASH and CF. Given that the variances of CASH, TARGET, and DEV are greater for growth firms, we strongly suspect that the variance of chgCASH would follow suit. Indeed, the variance of chgCASH is significantly higher for growth firms than cash cows (F-value=5.81). Finally, we ascertain whether the greater fluctuations in the previous variables for growth firms would be due at least in part to greater fluctuation in operating cash flow for growth firms. Indeed, the variance of CF is significantly greater for growth firms than cash cows (F-value=13.81).

In summary, we conclude that our method of separating firms into growth firms vs. cash cows is effective not only in separating firms by actual and target cash balances, but also in terms of the volatility of cash and cash-related variables. Based on the evidence in Table 5, it is fair to conclude that growth firms have generally higher cash balances not only for the reasons given earlier that led us to use our chosen variables to distinguish them from cash cows, but also because the volatility of cash and related variables is far greater for growth firms than cash cows, and theory suggests that firms with greater cash volatility will have higher optimal cash balances.

Speeds of Adjustment for Growth Firms and Cash Cows

Next we examine firms' speed of adjustment toward estimated optimal cash balance. Speed of adjustment analysis represents a test of the dynamic version of the tradeoff theory, and have been conducted for leverage by Flannery and Rangan (2006), Lemmon et al. (2008), Ogden and Wu (2013) and others. Following Flannery and Rangan (2006), we use the one-step method to estimate speed of adjustment, which is expressed in the following regression:

$$CASH_{i,t} = \alpha + \lambda\hat{\beta}X_{i,t} + (1-\lambda)CASH_{i,t-1} + \varepsilon_{i,t}, \quad (14)$$

where $X_{i,t}$ is the vector of determinant values shown in Table 4 model [4].

We generate estimates of speed of adjustment using all firms in our sample and separately for firms in each of the terciles along the growth firm/cash cow continuum. It is not clear whether growth firms or cash cows would exhibit faster speeds of adjustment, as growth firms have higher volatility of cash balance and other cash-related variables including operating cash flow; however, they also generally carry far higher cash balances on average, which would serve to cushion cash volatility (see Table 5). It is also possible that firms in general, or growth firms or cash cows in particular, tend to adjust more or less quickly to positive vs. negative deviations from optimal cash, so we also estimate separate speeds of adjustment for firms for which the lagged value of the deviation of actual cash balance from the target, lag(DEV), is negative and positive, respectively.

The results are displayed in Table 6. The first column in Panels A, B, and C show results of using all observations, firms with a negative deviation, and firms with a positive deviation, respectively, while columns 2, 3, and 4 in each panel show corresponding results for previously defined growth firms, mixed firms, and cash cows, respectively. Focusing on half-life, calculated as $\ln(0.5)/\ln(1-\lambda)$, the results in Table 6 can be summarized succinctly: Half-lives are similar for all subsamples, as all are within a narrow range of 1.7 to 2.6 years surrounding the full-sample value of 2.5 years. Further, these values support the tradeoff theory of cash balances based on the heuristic guide provided by Flannery and Rangan (2006), who suggest that half-lives of two (five) years indicate that deviations from target are (are not) important.

TABLE 6
RESULTS OF ONE-STEP SPEED OF ADJUSTMENT REGRESSION MODEL

	All obs.	Growth firms	Mixed firms	Cash cows
Panel A: All obs.				
Lag(Cash)	0.755 ***	0.721 ***	0.768 ***	0.729 ***
	0.0022	*0.0041*	*0.0036*	*0.0039*
Adj Speed (λ)	0.245	0.279	0.232	0.272
Half-life (years)	2.5	2.1	2.6	2.2
Year fixed effects	Yes	Yes	Yes	Yes
Observations	69,531	20,937	23,922	24,672
R-square	0.825	0.789	0.763	0.675
Panel B: lag(DEV) < 0				
Lag(Cash)	0.714 ***	0.657 ***	0.749 ***	0.720 ***
	0.0056	*0.0108*	*0.0091*	*0.0092*
Adj Speed (λ)	0.286	0.343	0.251	0.280
Half-life (years)	2.1	1.7	2.4	2.1
Year fixed effects	Yes	Yes	Yes	Yes
Observations	38,998	10,949	14,522	13,527
R-square	0.669	0.635	0.524	0.488
Panel C: lag(DEV) > 0				
Lag(Cash)	0.715 ***	0.698 ***	0.690 ***	0.682 ***
	0.0042	*0.0077*	*0.0073*	*0.0063*
Adj Speed (λ)	0.285	0.302	0.310	0.318
Half-life (years)	2.1	1.9	1.9	1.8
Year fixed effects	Yes	Yes	Yes	Yes
Observations	30,533	9,988	9,400	11,145
R-square	0.854	0.765	0.782	0.721

The observed similarity in cash balance deviation half-lives for growth firms and cash cows observed in Table 6 has important implications for our study of these two types of firms. This is because, when combined with results in Table 5 indicating that the volatility of cash-related variables is far greater for growth firms than cash cows, the results imply that growth firms must be taking other actions, such as

retaining CF or engaging in external financing activity, to a much greater extent than cash cows to offset shocks to cash balances. Our final empirical analyses in this paper consist of two types of tests to address this issue.

Regressions of chgCASH on CF

For our initial tests we conduct regressions of chgCASH on CF. This analysis is motivated by Almeida, et al. (2004), who argue that constrained firms should have a positive cash flow sensitivity of cash, while unconstrained firms' cash savings should not be systematically related to cash flows. As defined, our growth firms are generally smaller and younger, and thus are more likely to be financially constrained than our cash cows (Hadlock and Pierce, 2010).

Following Almeida, et al. (2004), our initial regression specification is:

$$chgCASH_{i,t} = a + bCF_{i,t} + cQ_{i,t} + dSIZE_{i,t} + \varepsilon_{i,t}, \quad (15)$$

and includes both firm and year fixed effects. The results are displayed in Table 7 Panel A. As expected, the coefficient of CF is greater for growth firms and cash cows; indeed the coefficient is insignificant for cash cows. As a robustness check, we use Fscore rather than Q and SIZE as a control. The results, shown in Panel B, are similar.

TABLE 7
REGRESSIONS OF CHANGE IN CASH ALTERNATIVELY ON CASH FLOW WITH CONTROLS, FSCORE, AND FSCORE WITH EXTERNAL FINANCING VARIABLES

								Fixed effects:			
Sample:	CF	Q	SIZE	Fscore	STKiss	STKrep	NetChgDebt	Firm?	Year?	N	R^2
Panel A											
All	0.049 ***	0.004 ***	-0.004 ***					Yes	Yes	69,531	0.116
	0.0040	*0.0004*	*0.0008*								
Growth firms	0.063 ***	0.005 ***	-0.009 ***					Yes	Yes	22,271	0.188
	0.0077	*0.0008*	*0.0022*								
Mixed firms	0.071 ***	0.004 ***	-0.009 ***					Yes	Yes	23,369	0.204
	0.0088	*0.0010*	*0.0014*								
Cash cows	-0.006	0.001	-0.004 ***					Yes	Yes	23,891	0.144
	0.0069	*0.0009*	*0.0009*								
Panel B											
All	0.063 ***			-0.006 ***				Yes	Yes	69,531	0.115
	0.0044			*0.0011*							
Growth firms	0.074 ***			-0.006 ***				Yes	Yes	22,271	0.185
	0.0092			*0.0023*							
Mixed firms	0.103 ***			-0.025 ***				Yes	Yes	23,369	0.205
	0.0087			*0.0025*							
Cash cows	0.013 *			-0.017 ***				Yes	Yes	23,891	0.146
	0.0068			*0.0018*							
Panel C											
All	0.073 ***			0.000	0.321 ***	-0.259 ***	-0.030 ***	Yes	Yes	69,531	0.240
	0.0048			*0.0012*	*0.0055*	*0.0110*	*0.0049*				
Growth firms	0.070 ***			0.006 ***	0.344 ***	-0.309 ***	-0.084 ***	Yes	Yes	22,271	0.261
	0.0089			0.002	*0.0089*	*0.0259*	*0.0138*				
Mixed firms	0.102 ***			-0.017 ***	0.258 ***	-0.269 ***	-0.012 *	Yes	Yes	23,369	0.232
	0.0088			0.003	*0.0130*	*0.0166*	*0.0072*				
Cash cows	0.021 ***			-0.014 ***	0.160 ***	-0.179 ***	-0.005	Yes	Yes	23,891	0.161
	0.0069			0.002	*0.0128*	*0.0121*	*0.0048*				

There is, however, a problem in interpreting the results for growth firms in Panels A and B. To wit, as shown in Table 5 the mean value of CF for growth firms is actually negative (-0.006), so on average growth firms would generally *consume*, rather than *accumulate*, cash out of operating cash flow.

Consequently, growth firms would require net external finance to accumulate and maintain the large cash balances that they exhibit. Such would not generally be the case for cash cows, though, because the average value of CF is positive for these firms (0.084; see Table 5).

We address this issue by adding the external financing variables STKiss, STKrep, and NetChgDebt to the regression specification in Panel B. The results are displayed in Table 7 Panel C. The coefficient of STKiss is greater for growth firms (0.321) than for cash cows (0.160), suggesting that growth firms rely more, per dollar, on stock issuance to replenish cash than do cash cows. As such, the results are inconsistent with the argument that growth firms are more financially constrained, because stock issuance appears to be more important for them than for cash cows. In addition, the coefficient of STKrep is larger in size for growth firms (-0.259) than for cash cows (-0.179), indicating that growth firms have a greater tendancy, per dollar, to disgorge excess cash through stock repurchases than cash cows. Finally, the coefficient of NetChgDebt is actually negative, though relative small, for both growth firms (-0.030) and cash cows (-0.005).

Finally, we gauge the importance of external financing for growth firms and cash cows by comparing the means and variances of STKiss, STKrep, and NetChgDebt for the two types of firms. The results are displayed in Table 8. The mean value of STKiss is far greater for growth firms, 0.057 than for cash cows, 0.010, and the difference is highly significant (diff.=0.047; t-value=53.79), and the variance is also significantly greater for growth firms than cash cows (F-value=17.81). Combined with results in Table 7 Panel C, the results indicate that stock issuance is far more important for growth firms than cash cows. Differences in STKrep and NetChgDebt, however, are less dramatic.

TABLE 8
COMPARATIVE ANALYSES OF STATISTICS ON EXTERNAL FINANCING VARIABLES FOR GROWTH FIRMS AND CASH COWS

							Growth firms vs. cash cows:		
	Growth firms		Mixed firms		Cash cows		Diff. of means:		Diff. of Var.:
	Mean	Variance	Mean	Variance	Mean	Variance	Diff.	t-value	F-value
STKiss	0.057	0.0168	0.016	0.0022	0.010	0.0009	0.047	53.79 ***	17.81 ***
STKrep	0.016	0.0018	0.016	0.0016	0.017	0.0012	-0.001	-2.64 ***	1.44 ***
NetChgDebt	0.010	0.0058	0.006	0.0077	0.006	0.0064	0.003	4.61 ***	1.10 ***

SUMMARY

This paper shows that theory can be used to effectively distinguish growth firms from cash cows, and that these two types of firms differ dramatically in terms of cash balances, cash-related volatility, and means of cash management. In terms of cash balances, growth firms generally hold 4.5 times as much cash as cash cows, and cash balances are far more volatile for growth firms than cash cows. Growth firms are also far more heterogeneous in terms of target cash balance than cash cows, and growth firms also experience greater volatility in terms of deviations from target cash balance. Nevertheless, growth firms and cash cows are comparable in terms of half-live of cash deviations, and this appears to be largely due to the fact that growth firms rely far more on stock issuance to replenish cash.

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