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Investment behavior, observable expectations, and internal funds: a comment on Cummins *et al.* (AER, 2006)

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Abstract

Cummins *et al.* (2006) construct a new measure of fundamentals, and show that the positive cash flow effects typically found in investment-*Q* models disappear when traditional *Q* is replaced with their new measure. Their results are not robust to small changes in their specification or in the dataset used to estimate their model. The explanatory power of cash flow does not disappear when replacing traditional *Q* with their new measure of *Q*; it is never there to begin with. Investment's lack of sensitivity to cash flow may be because their data is biased towards firms with positive cash flow (it is negative for only 242 observations of 11431). This bias and our results mute their argument that the positive cash-flow effects obtained in such models may reflect a failure to control properly for fundamentals rather than the presence of financial constraints.

JEL Classification: Investment, Cash flow, Financial constraints

Keywords: D92; E22

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Introduction

The argument that the correlation between investment and cash flow can be interpreted as evidence supporting the financing constraints hypothesis has been at the center of a raging debate in recent years.[1] The debate largely centers on whether the observed average *Q* adequately proxies for fundamentals.[2] If it does not, cash flow might affect investment simply because it proxies for investment opportunities which are not properly accounted for by average *Q*, and not because firms face financial constraints upon investment.[3]

Cummins *et al.* (2006) (hereafter Cummins *et al.*) contribute to the debate by proposing a direct estimate of the present discounted value of expected future profits that are derived from securities analysts' earnings forecasts. Using a panel of US firms, they conclude that "the positive cash flow effects typically obtained in - investment-*Q* models – may reflect a failure to control properly for fundamentals and need not signal the presence of financial constraints" (p. 796-97) and that "… after controlling for fundamentals using analyst-based average *Q*, investment is insensitive to cash flow, even for firms thought to be liquidity constrained." (p. 796).

Their main argument is that the significance of cash flow in investment regressions is driven by its correlation with fundamentals that are not captured in the traditional measure of *Q*. To support their argument, it is critical that cash flow exhibits statistical significance (at least for firms without bond ratings) in a model including traditional *Q*, and that this significance disappears once fundamentals are properly accounted for with their new analyst-based measure of *Q*. We evaluate their argument using the exact data and programs provided to the *American Economic Review* by Cummins *et al.* Our critical comments are focused on two points.

First, while Cummins *et al.* find that cash flow is insignificant in the properly specified dynamic investment regression that uses their new measure of fundamentals, they do not report results for the same (also properly specified) model using the traditional *Q*. We show that cash flow is insignificant in the dynamic investment regressions for both traditional and analyst-based measures of *Q*. Since the significance of cash flow does not disappear

[1] A number of papers found that firms more likely to face liquidity constraints exhibit higher sensitivities of investment to cash flow (Fazzari *et al.*, 1988; Hoshi *et al.*, 1991). Other studies found exactly the opposite (Kaplan and Zingales, 1997; Cleary, 1999), and others found no relationship between investment and cash flow (Erickson and Whited, 2000; Bond *et al.*, 2004).

[2] Average *Q* is generally measured as the ratio between the market value of the firm and the replacement value of its capital stock.

[3] Traditional average *Q* can be a poor measure of fundamentals when share prices provide a noisy measure of the firm's true value, resulting in a measurement error problem (Bond and Cummins, 2001).

when using their measure of fundamentals (as it is never there to begin with) the critical piece of their argument fails.

Second, Cummins *et al.* report results from a static investment model that, they note, appears misspecified according to their reported test statistics. While the statistical significance of cash flow appears for traditional *Q* and disappears once their new measure of fundamentals is used, we show that these results are highly sensitive to a minor change to the choice of the sample's time dimension. Specifically, they elect to restrict the length of their data and do not use all of the available observations in their data set for estimation. Once we relax this restriction, the statistical significance of cash flow again disappears for both measures of *Q*. We also relax the sample period restriction for the dynamic model, and we find no statistical role for cash flow using either measure of *Q* to control for fundamentals.

We believe that cash flow's inability to help explain investment in the data employed by Cummins *et al.*, whichever measure of *Q* is used, undermines the central argument of their paper. Moreover, the lack of statistical significance for cash flow in their data stands in stark contrast with most of the existing literature on investment and financial constraints. We conclude our analysis by using the evidence presented in Cummins *et al.*'s paper and their data to argue that the weak relationship between investment and cash flow that characterizes their data is probably due to the fact that their sample appears heavily biased towards financially healthy firms that would not normally be the focus of a study on the potential for financing constraints to affect investment.

Cash flow is insignificant in the dynamic model using traditional Q

Cummins *et al.* present five tables of investment regressions estimates, focusing on three samples of firms: a full sample, a sub-sample of firms with bond ratings, and a sub-sample of unrated firms (which they argue are *a priori* more likely to face financial constraints).[4]

Their Table 2 presents estimates of static investment models, their Table 3, estimates of a dynamic model, and their Tables 4 to 6, a series of robustness tests, all relative to the static model. They use a GMM first-difference estimator (Arellano and Bond, 1991), which controls for unobserved heterogeneity by estimating the relevant equations in first-differences, and for endogeneity by using suitably lagged instruments. In each table, they present two sets of diagnostic results: the *m2* test for the second-order autocorrelation of the

[4] An anomalous feature of Cummins *et al.'s* data is that a total of 619 observations appear either in the rated or in the unrated sub-samples but do not appear in the full sample.

first-differenced residuals, and the Sargan test of the over identifying restrictions. Both test the validity of the instruments and the specification of the model.

In their Table 2, Cummins *et al.* show that when traditional average Q ("Q^E") is used to proxy for fundamentals in a static investment model, cash flow significantly affects firms' investment for the full sample and the sub-sample of unrated firms, but not for rated firms. This pattern of results is commonly thought to be consistent with the presence of financial constraints that affect the investment of unrated firms.

It is crucial for their results and for the central argument in their paper that the cash flow effect disappears when their new measure of Q ("$\hat{Q}$") is included in addition to or instead of Q^E.[5] They conclude that once fundamentals are properly accounted for, investment is no longer sensitive to cash flow.

Except for the sub-sample of rated firms, the diagnostic tests presented in their Table 2 suggest that the static investment model is mis-specified. To support their argument, they turn to dynamic specifications in Table 3, which according to the *m2* and Sargan statistics are correctly specified for all samples.[6] In all the regressions presented in Table 3 (which all contain $\hat{Q}$), cash flow is never a significant determinant of investment.

Cummins *et al.* do not present estimates for any dynamic specification containing only Q^E and cash flow. This is an important omission because their argument depends on the disappearance of positive cash flow effects once the fundamentals that are mis-measured in Q^E are properly accounted for with $\hat{Q}$. We fill this gap in Table 1 of this comment, where we use their data to estimate dynamic investment models containing Q^E and cash flow.[7] Following their methodology as closely as possible, we use the investment to capital ratio and the cash flow to capital ratio lagged three and four times as instruments. With the single exception of the rated (i.e. unconstrained) firms, our results show that cash flow is never

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[5] $\hat{Q}$ generally displays more precisely determined and larger coefficients than Q^E. Moreover, those models that include $\hat{Q}$ are better specified than those that do not. This suggests that $\hat{Q}$ is indeed a better measure of fundamentals than Q^E.

[6] As the dynamic models are better specified than the static ones in Cummins *et al.*, it is unclear why the robustness tests contained in Tables 4, 5, and 6 all refer to the latter. Bond and Cummins (2001) use the same dataset as Cummins *et al.* to evaluate the extent to which the empirical failings of the traditional Q model of investment can be attributed to the use of share prices to measure average Q. All of Bond and Cummins' estimates are based on dynamic specifications. The same holds for Bond and Cummins (2000), and also for Bond *et al*. (2004) who carry out an analysis similar to Cummins *et al.*'s, but based on UK data.

[7] Like Cummins *et al.*'s Table 3, our estimates are subject to the Common Factors (*COMFAC*) Restriction. Using $\hat{Q}$ and cash flow as regressors, we were able to exactly replicate the results for the full sample and the rated sub-sample reported in the left-hand side panel of Cummins *et al.*'s Table 3. However, for the unrated sub-sample, we were unable to exactly replicate their results in spite of using the same data and programs (see bottom panel of our Table 1).

significant in these regressions. Thus, in a dynamic setting, cash flow never affects investment for the full sample and the sub-sample of unrated (i.e. constrained) firms, whichever measure of Q is employed to control for fundamentals. Cummins *et al.*'s central argument, that the effect of cash flow disappears once fundamentals are properly accounted for in their new measure of Q, fails in the dynamic specifications, as cash flow is not significant for either models containing traditional Q^E or their $\hat{Q}$. Therefore, their conclusion that: "Our results highlight the fragility of the cash flow effects obtained in investment regressions that do not control for the apparent measurement error in Q^E" (p. 807) is difficult to interpret in a dynamic setting, as these cash flow effects are not observed in the first place.

The results in Cummins et al. are sensitive to the choice of sample period

The data used by Cummins *et al.* span the years 1982-1999 for the full sample and the sub-sample of unrated firms and the years 1986-1999 for the sub-sample of rated firms. It should be noted that the data provided to the *American Economic Review* only include the actual variables used for estimation and the year. They do not include information that can be used to identify the firms or their characteristics.[8]

To estimate their model, Cummins *et al.* choose to use only a portion of their data. They use only the years 1986-1999 for the full and unrated datasets, and 1990-1999, for the rated sample. They use a GMM first-difference estimator (Arellano and Bond, 1991), with three and four lags of the investment to capital ratio and the cash flow to capital ratio selected as instruments.[9] Because the model is estimated in first-differences, one cross-sectional observation is automatically lost for each firm. When a dynamic model is estimated, an additional cross-section is lost. One would therefore expect the samples used in the estimation of the static models to span the years 1983-1999 for the full sample and the sub-sample of unrated firms, and 1987-1999 for the sub-sample of rated firms. For the dynamic models one would expect the samples to span the years 1984-1999 and 1988-1999, respectively.

[8] As the data provided does not include a firm identifier, we were forced to back out the index variable by manually examining the data and the information contained in the Gauss auxiliary files provided by Cummins *et al.* Furthermore, the data only allow the replication of Tables 1 (except for the entry on sales) to 5 in Cummins *et al.* Table 6 cannot be replicated because the data provided relative to this Table contain variables that have different names than those in the other data sets and cannot be identified. Moreover, these data span the years 1984-1995, while according to the output Tables provided by Cummins *et al.* in an earlier draft of their paper (Cummins *et al.*, 2002), the sample used in Table 6 goes up to 1999.

[9] Cummins *et al.* justify this choice by stating that in most cases, the model's overidentifying restrictions were rejected when using period t-2 variables as instruments (see their footnote 7, p. 803).

While Cummins *et al.* do not explain their choice of shorter sub-samples to estimate their regressions, this choice could be justified by a willingness to exclude those cross-sections for which instruments expected to be informative for estimating the slope parameters are unavailable. This would justify using samples spanning the periods 1985-1999 and 1989-1999, still longer than the data that they chose to use. Excluding one additional cross-section, as they do, imposes the additional restriction that two lags of the chosen instruments are available for each cross-section. The GMM procedure does not require the exclusion of cross-sections based on these criteria. If all cross-sections except the first (first two) are used in the estimation of the static (dynamic) investment models, time dummies are still available as instruments for the early cross-sections.

Since restricting the data to omit the second to fourth cross-sections in the estimation of the static model is not required by GMM, we included them to see if Cummins *et al.*'s results are robust to allowing these additional cross sections of their data to be used to estimate the model. In Table 2 of this note, we use the extended sample period to estimate the static investment model for comparison to the results in the left-hand panel of their Table 2. Panel 1 presents our estimates for the periods 1983-1999 and 1987-1999, respectively for the full sample and the sub-sample of unrated firms, and the sub-sample of rated firms. For completeness, one might want to use the same extended sample to estimate both the static and dynamic models. So, panel 2 of Table 2 reports our estimates for the static model using the sample periods 1984-1999 and 1988-1999 (this is the same extended sample that we use to estimate the dynamic model in our Table 3).

In the regressions with $\hat{Q}$, the results are similar to those reported in the bottom left-hand panel of Table 2 in Cummins *et al.*: $\hat{Q}$ generally attracts a positive and precisely determined coefficient, while the coefficient on cash flow is always poorly determined. However, contrary to their Table 2 results, cash flow is also insignificant in our specifications based on the extended samples, which include Q^E. Their conclusion that cash flow only affects investment when fundamentals are not properly accounted for is not robust to making use of all the observations available in their sample.

Table 3 of this note reports estimates of dynamic investment equations based on the extended samples (1984-1989; and 1988-1990). Once again, in these specifications cash flow is never significant, independent of whether Q^E or $\hat{Q}$ is used as a regressor.

The results in Cummins *et al.* are not robust to small changes in their specification or in the dataset used to estimate their model. When their model is estimated using all the available data, cash flow does not help explain investment, whichever measure of Q is employed, and whichever specification is considered. The same applies when a dynamic model is estimated, independent of whether a short or long data sample is used.[10] As a consequence, their data do not allow for an investigation of whether the positive cash flow effects obtained in models based on Q^E reflect the failure to properly control for fundamentals or whether they reflect the presence of financial constraints, as these positive cash flow effects are not observed in their data.

What explains the lack of a link between investment and cash flow?

The robust link between investment and cash flow is well documented (see Hubbard, 1998; and Bond and Van Reenen, 2005, for surveys). The data employed by Cummins *et al.* is unusual in that this relationship is weak, or absent. What then, explains the lack of a robust relationship between the two that we have documented in this comment?

The firms used by Cummins *et al.* are limited to those that are also followed by at least one I/B/E/S analyst. These firms selected for coverage by analysts are not random, and are likely to be relatively profitable firms in industries of interest to I/B/E/S customers.[11] Firms facing constraints are less likely to be followed by I/B/E/S analysts. In an earlier version of their paper, Cummins, Hassett, and Oliner (1997) themselves state: "Our results suggest that the constrained group excludes firms covered by securities analysts." (p. 28).

Cummins *et al.* provide excellent evidence showing that the sample used in estimation is comprised of profitable, financially healthy firms, for which cash flow is unlikely to significantly affect investment. Figure 1 in their paper displays analysts' expected long-term earnings growth on the horizontal axis, and the five-year actual earnings growth on the vertical axis. Only five of 11431 total observations are characterized by negative expected long-term earnings growth. This indicates that the analysts expect positive long-run earnings growth for 99.96 percent firm-years of data. Further, the expected long-term growth for the full sample is 12.30 percent, while corresponding figures for the unrated and rated sub-samples are respectively 13.62 percent and 10.52 percent.

[10] This holds with the single exception of the investment for rated (i.e. unconstrained) firms, when a dynamic model with Q^E, based on Cummins *et al.*'s short sample is estimated.

[11] As stated in Das *et al.* (2006): "…analysts tend to shy away from issuing any public opinions when their true expectations are unfavourable and they are more likely to provide coverage for firms about which their true expectations are favourable." (p. 2). This statement is supported by the fact that according to Table 1 in Cummins *et al.*, the median value of sales in their dataset is 1093 millions of 1996 dollars, while the corresponding value in the Compustat universe is just 459. These numbers suggest that the analyst tend to follow larger firms, which are less likely to face financial constraints.

It is possible that analysts are overly optimistic about the firms' expected long-term growth prospects: Cummins *et al.* themselves suggest that this is the case as "the median forecast exceeds realized growth by about 3 percentage points at an annual rate" (p. 801). However, it is evident from the data that the firms that they analyze display solid actual performance. Only 232 firm-years out of 11431 observations in the full sample display negative cash flow, i.e. 97.97 percent of all observations exhibit positive cash flow. Out of the 1066 firms, 99.34 percent display positive cash flow on average (only 7 firms have average negative cash flow). Cash flow is positive for 98.10 percent of firm-years in the unrated sub-sample (it is negative in only 103 of 5422 firm-years). Of the 642 unrated firms, 640 have positive average cash flow (99.69 percent). In the rated sub-sample, 98.08 percent of all observations (82 of 4268) are characterized by positive cash flow, and 99.07 percent of all rated firms (425 of 429) display positive average cash flow. These numbers are in stark contrast with Cleary *et al.* (2007) who use annual Compustat financial statement data over the period 1980 to 1999 (eliminating data from regulated and financial industries) and find that 23 percent of their observations display negative cash flow. Using Compustat data over the period 1982-1999, we also find that, in fact, slightly more than one-quarter of the observations display negative cash flow and more than one-third of firms display negative average cash flow. Cummins *et al.*'s sample appears therefore heavily biased towards financially healthy firms that would not normally be the focus of a study on the potential for financing constraints to affect investment.

The extent to which the industrial composition of the sample affects the results in Cummins *et al.* is unclear, and may also partly explain why they find that cash flow has very little explanatory power for investment, in contrast to much prior research. The bulk of the studies in this area have in fact focused on manufacturing firms.[12] Their paper is not limited to manufacturing, which makes comparing their results to the literature more complex. However, no information about firms' industry is provided in the data files they made available to the *American Economic Review*, and we cannot investigate this issue.

Conclusions

Cummins *et al.* make a valuable contribution to the literature by providing a technique, based on securities analysts' earning forecasts, which improves the measurement of firms'

[12] A few exceptions are Schaller (1993) who estimated investment equations for manufacturing and non-manufacturing Canadian firms; and Cleary (1999) and Cleary *et al.* (2007) who estimated investment equations for the entire US economy.

fundamentals. Their measure performs better than traditional *Q*: once included in investment regressions, it displays larger and more precisely determined coefficients and improves the general specification of the model.

However, they do not provide a satisfactory answer to the questions that can be raised about the interpretation of cash flow effects in investment regressions that use traditional *Q* to control for fundamentals. Specifically, they suggest that cash flow plays an important role in those regressions simply because it picks up the effects of fundamentals which are not properly accounted by traditional *Q*, and not because of financial constraints. The central argument of their paper is based on their findings that once fundamentals are measured using analysts' earnings forecasts, cash flow is no longer significant. This argument is not convincing as in their paper cash flow generally does not affect investment, whatever measure of *Q* is used. Thus cash flow's explanatory power does not disappear when their new measure of fundamentals is used, as in their data cash flow has no explanatory power to begin with.[13]

We argue that because analysts do not follow all firms, Cummins *et al.* base their analysis on a dataset essentially comprised of financially healthy firms with good growth prospects which are unlikely to display positive sensitivities of investment to cash flow. Controlling for fundamentals in firm level data using analysts-based measures of *Q* is therefore unlikely to become the general practice at this time. Furthermore, it is not clear that the problems of poorly measured fundamentals can be resolved by substituting an analyst-based assessment of equity value for the assessment from the stock market. One can fairly question why a few analysts would be better than all the stock market participants in assessing the firm's equity value.

[13] The only exceptions, when Q^E is used as a measure for fundamentals, are the full sample and the unrated sub-sample when a mis-specified static model is estimated, and the sub-sample of rated firms when a properly specified dynamic model is estimated, both based on a shorter than necessary data set.

References

Arellano, M. and S. Bond (1991). “Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations.” *Review of Economic Studies*, 58, 277-97.

Bond, S. and J. Cummins (2000). “The Stock Market and Investment in the New Economy: Some Tangible Facts and Intangible Fictions.” *Brookings Papers on Economic activity,* 1, 61-124.

Bond, S. and J. Cummins (2001). “Noisy Share Prices and the *Q* Model of Investment.” Institute for Fiscal Studies, Working Paper No. 01/22.

Bond, S., Klemm, A., Newton-Smith, R., Syed, M., and G. Vlieghe (2004). “The Roles of Expected Profitability, Tobin’s *Q* and Cash Flow in Econometric Models of Company Investment.” Institute for Fiscal Studies, Working Paper No. 04/12.

Bond, S. and J. Van Reenen (2005). “Microeconometric Models of Investment and Employment.” forthcoming in J. Heckman and E. Leamer (eds) *Handbook of Econometrics*, Volume 6, Elsevier, North Holland.

Cleary, S. (1999). “The Relationship between Firm Investment and Financial Status.” *Journal of Finance,* 54, 2, 673-92.

Cleary, S., Povel, P., and M. Raith (2007). “The U-Shaped Investment Curve: Theory and Evidence”. *Journal of Financial and Quantitative Analysis*, 42, 1-40.

Cummins, J., Hasset, K., and S. Oliner (1997). “Investment Behavior, Observable Expectations, and Internal Funds.” C.V. Starr Center for Applied Economics Discussion paper No. 97-30, New York University.

Cummins, J., Hasset, K., and S. Oliner (2002). “Investment Behavior, Observable Expectations, and Internal Funds.” *Mimeograph,* available at: http://www.aei.org/publications/pubID.20105/pub_detail.asp.

Cummins, J., Hasset, K., and S. Oliner (2006). “Investment Behavior, Observable Expectations, and Internal Funds.” *American Economic Review*, 96, 3, 796-810.

Das, S., Guo, R-J, and H. Zhang (2006). “Analysts’ Selective Coverage and Subsequent Performance of Newly Public Firms.” *Journal of Finance,* 61, 1158-85.

Erickson, T. and T. Whited (2000). “Measurement Error and the Relationship between Investment and *Q*.” *Journal of Political Economy,* 108, 5, 1027-1057.

Fazzari, S., Hubbard, G., and B. Petersen (1988). “Financing Constraints and Corporate Investment.” *Brookings Papers on Economic Activity,* 1, 141-95.

Hoshi, T., Kashyap, A., and D. Scharfstein (1991). "Corporate Structure, Liquidity, and Investment: Evidence from Japanese Panel Data." *Quarterly Journal of Economics*, 106, 1, 33-60.

Hubbard, G. (1998). "Capital Market Imperfections and Investment." *Journal of Economic Literature,* 35, 193-225.

Kaplan, S. and L. Zingales (1997). "Do Investment-Cash Flow Sensitivities Provide Useful Measures of Financing Constraints?" *Quarterly Journal of Economics*, 112, 1, 169-215.

Schaller, H. (1993). "Asymmetric Information, Liquidity Constraints and Canadian Investment." *Canadian Journal of Economics*, 26, 552–74.

Table 1: GMM estimates of dynamic first-differenced investment equations based on Cummins *et al.*'s data samples

	Full sample (1)	*Rated sample* (2)	*Unrated sample* (3)
Q^E_{it}	0.023***	0.031**	0.005
	(0.007)	(0.014)	(0.007)
$(CF/K)_{it}$	0.115	0.150**	0.151
	(0.080)	(0.067)	(0.097)
$(I/K)_{i,(t-1)}$	0.377***	0.404***	0.232***
	(0.033)	(0.046)	(0.038)
m2 p-value	0.875	0.935	0.425
Sargan *p*-value	0.178	0.471	0.201
COMFAC p-value	0.053	0.267	0.386
Observations	7167	2552	2854
Number of firms	1066	429	642

	Full sample (1)	*Rated sample* (2)	*Unrated sample* (3)
$\hat{Q}_{it}$	0.101***	0.084***	0.046*
	(0.021)	(0.029)	(0.024)
$(CF/K)_{it}$	-0.001	0.084	0.112
	(0.089)	(0.064)	(0.109)
$(I/K)_{i,(t-1)}$	0.254***	0.300***	0.126***
	(0.044)	(0.052)	(0.046)
m2 p-value	0.580	0.960	0.291
Sargan *p*-value	0.639	0.501	0.210
COMFAC p-value	0.347	0.402	0.822
Observations	7167	2552	2854
Number of firms	1066	429	642

Notes: The dependent variable is the first-difference of the ratio of investment to capital $(I/K)_{it}$ for firm *i* at time *t*. $(CF/K)_{it}$ represents the cash flow to capital ratio of firm *i* at time *t*; Q_{it}^E, Tobin's *Q*; and $\hat{Q}_{it}$, Cummins *et al.*'s alternative measure of investment opportunities based on analysts' earnings forecasts. The model is estimated after imposing the common factor (*COMFAC*) restriction. Year dummies are included (but not reported) in all specifications. Robust standard errors are in parentheses. The instrumental variables are period *t*-3 and *t*-4 values of *(I/K)* and *(CF/K)*, as well as year dummy variables. The Sargan test of the overidentifying restrictions is asymptotically distributed as $\chi^2_{(n-p)}$, where *n* is the number of instruments and *p* is the number of parameters. The *m2* test for second-order serial correlation in the first-differenced residuals is asymptotically distributed as N(0,1) under the null of no serial correlation. The *COMFAC* test is asymptotically distributed as χ^2_r, where *r* is the number of non-linear common factor restrictions. * indicates significance at the 10 percent level. ** indicates significance at the 5 percent level. *** indicates significance at the 1 percent level. Sample period: 1986-1999 for full and unrated samples; 1990-1999 for rated sample. All regressions were estimated using the exact data and programs provided to the *American Economic Review* by Cummins *et al.*

Table 2: GMM estimates of static first-differenced investment equations based on extended samples

Panel 1: Sample period: 1983-1999 for full and unrated samples; 1987-1999 for rated sample

	Full sample (1)	*Rated sample* (2)	*Unrated sample* (3)
Q_{it}^{E}	0.032***	0.019*	0.015**
	(0.007)	(0.011)	(0.008)
$(CF/K)_{it}$	0.122	0.041	0.037
	(0.089)	(0.065)	(0.100)
m2 p-value	0.00	0.008	0.00
Sargan *p*-value	0.00	0.002	0.008
Observations	10365	3839	4780
Number of firms	1066	429	642

	Full sample (1)	*Rated sample* (2)	*Unrated sample* (3)
$\hat{Q}_{it}$	0.109***	0.079***	0.085***
	(0.019)	(0.022)	(0.021)
$(CF/K)_{it}$	-0.021	0.008	-0.035
	(0.100)	(0.068)	(0.111)
m2 p-value	0.00	0.013	0.00
Sargan *p*-value	0.008	0.104	0.088
Observations	10365	3839	4780
Number of firms	1066	429	642

Notes: The dependent variable is the first-difference of the ratio of investment to capital $(I/K)_{it}$ for firm *i* at time *t*. $(CF/K)_{it}$ represents the cash flow to capital ratio of firm *i* at time *t*; Q_{it}^{E}, Tobin's *Q*; and $\hat{Q}_{it}$, Cummins *et al.*'s alternative measure of investment opportunities based on analysts' earnings forecasts. Year dummies are included (but not reported) in all specifications. Robust standard errors are in parentheses. The instrumental variables are period *t*-3 and *t*-4 values of *(I/K)* and *(CF/K)*, as well as year dummy variables. * indicates significance at the 10 percent level. ** indicates significance at the 5 percent level. *** indicates significance at the 1 percent level. All regressions were estimated using the exact data and programs provided to the *American Economic Review* by Cummins *et al.* Also see *Notes* to Table 1.

Panel 2: Sample period: 1984-1999 for full and unrated samples; 1988-1999 for rated sample

	Full sample (1)	*Rated sample* (2)	*Unrated sample* (3)
Q_{it}^{E}	0.035***	0.026**	0.011
	(0.007)	(0.012)	(0.008)
$(CF/K)_{it}$	0.140	0.074	0.072
	(0.089)	(0.066)	(0.103)
m2 p-value	0.00	0.019	0.00
Sargan *p*-value	0.00	0.00	0.012
Observations	9299	3410	4138
Number of firms	1066	429	642

	Full sample (1)	*Rated sample* (2)	*Unrated sample* (3)
$\hat{Q}_{it}$	0.122***	0.098***	0.078***
	(0.018)	(0.02)	(0.020)
$(CF/K)_{it}$	-0.022	0.033	0.003
	(0.103)	(0.069)	(0.109)
m2 p-value	0.00	0.029	0.027
Sargan *p*-value	0.033	0.067	0.059
Observations	9299	3410	4138
Number of firms	1066	429	642

Notes: The dependent variable is the first-difference of the ratio of investment to capital $(I/K)_{it}$ for firm *i* at time *t*. $(CF/K)_{it}$ represents the cash flow to capital ratio of firm *i* at time *t*; Q_{it}^{E}, Tobin's *Q*; and $\hat{Q}_{it}$, Cummins *et al.*'s alternative measure of investment opportunities based on analysts' earnings forecasts. Year dummies are included (but not reported) in all specifications. Robust standard errors are in parentheses. The instrumental variables are period *t*-3 and *t*-4 values of *(I/K)* and *(CF/K)*, as well as year dummy variables. * indicates significance at the 10 percent level. ** indicates significance at the 5 percent level. *** indicates significance at the 1 percent level. All regressions were estimated using the exact data and programs provided to the *American Economic Review* by Cummins *et al.* Also see *Notes* to Table 1.

Table 3: GMM estimates of dynamic first-differenced investment equations based on extended samples

	Full sample (1)	*Rated sample* (2)	*Unrated sample* (3)
Q_{it}^{E}	0.022***	0.037**	0.009
	(0.007)	(0.014)	(0.007)
$(CF/K)_{it}$	-0.001	0.010	0.070
	(0.09)	(0.080)	(0.103)
$(I/K)_{i,(t-1)}$	0.408***	0.506***	0.171***
	(0.045)	(0.060)	(0.076)
m2 p-value	0.512	0.507	0.637
Sargan *p*-value	0.060	0.683	0.011
COMFAC p-value	0.028	0.267	0.560
Observations	9299	3410	4138
Number of firms	1066	429	642

	Full sample (1)	*Rated sample* (2)	*Unrated sample* (3)
$\hat{Q}_{it}$	0.091***	0.069***	0.085***
	(0.020)	(0.025)	(0.022)
$(CF/K)_{it}$	-0.072	0.030	0.018
	(0.097)	(0.068)	(0.116)
$(I/K)_{i,(t-1)}$	0.309***	0.365***	0.147***
	(0.049)	(0.072)	(0.050)
m2 p-value	0.918	0.875	0.534
Sargan *p*-value	0.238	0.562	0.114
COMFAC p-value	0.151	0.343	0.756
Observations	9299	3410	4138
Number of firms	1066	429	642

Notes: The dependent variable is the first-difference of the ratio of investment to capital $(I/K)_{it}$ for firm *i* at time *t*. $(CF/K)_{it}$ represents the cash flow to capital ratio of firm *i* at time *t*; Q_{it}^{E}, Tobin's *Q*; and $\hat{Q}_{it}$, Cummins *et al.*'s alternative measure of investment opportunities based on analysts' earnings forecasts. The model is estimated after imposing the common factor (*COMFAC*) restriction. Year dummies are included (but not reported) in all specifications. Robust standard errors are in parentheses. The instrumental variables are period *t*-3 and *t*-4 values of *(I/K)* and *(CF/K)*, as well as year dummy variables. * indicates significance at the 10 percent level. ** indicates significance at the 5 percent level. *** indicates significance at the 1 percent level. Sample period: 1984-1999 for full and unrated samples; 1988-1990 for rated sample. All regressions were estimated using the exact data and programs provided to the *American Economic Review* by Cummins *et al.* Also see *Notes* to Table 1.

Working Paper List 2006

Number	Author	Title
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06/03	Woojin Chung, Richard Disney, Carl Emmerson & Matthew Wakefield	Public Policy and Retirement Saving Incentives in the U.K.
06/02	Sarah Bridges & Richard Disney	Debt and Depression
06/01	Sarah Bridges, Richard Disney & John Gathergood	Housing Wealth and Household Indebtedness: Is There a 'Household Financial Accelerator'?

Working Paper List 2005

Number	Author	Title
05/02	Simona Mateut and Alessandra Guariglia	Credit channel, trade credit channel, and inventory investment: evidence from a panel of UK firms
05/01	Simona Mateut, Spiros Bougheas and Paul Mizen	Trade Credit, Bank Lending and Monetary Policy Transmission