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Conditional pricing of earnings quality

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A B S T R A C T

I reconsider the pricing effects of earnings quality in the context of conditional asset pricing models. A two-stage regression estimation procedure similar to the procedure described by Lettau and Ludvigson (2001) is employed. Given a conditional two-factor model consisting of the market portfolio and an earnings quality factor, I find evidence for the pricing of earnings quality risk. Earnings quality risk premium and conditional betas vary with economic states. My results stand in contrast to that of Core et al. (2008) whose specifications include an unconditional version of the same two factor model.

1. Introduction

An issue receiving increasing attention in accounting is the relation between characteristics of a firm's reporting practices and its cost of capital. Among these characteristics, "earnings quality", proxyed by various measures of accrual earnings volatility has been viewed as indicative of risk associated with asymmetric information. Whether such risk is priced or not has generated controversy at a theoretical level[1] and mixed empirical findings.[2] Among those, Core et al. (2008), hereinafter CGV, employ a two-stage research design described by Cochrane (2001) in the context of either a single factor asset pricing model (CAPM) or FF's three-factor model augmented by an earnings quality factor, find no empirical support for a premium associated with earnings quality. My purpose in this paper is to conduct further empirical tests based on conditional asset pricing models that allow for time dependency in the parameters of functions describing the relation between pricing kernels and risk factors.

A fundamental issue germane to tests in the context of factor models in general is the implicit assumption of constant (time-independent) parameters in the pricing kernel. The efficacy of this assumption is clearly suspect in light of evidence that expected returns are time-dependent (Keim and Stambaugh, 1986; Fama and French, 1989; Ferson and Harvey, 1999). Moreover, Jagannathan and Wang (1996) and Lettau and Ludvigson (2001), hereinafter LL, find that conditional asset pricing models in which betas and the market risk premium and pricing kernels are time dependent, respectively, outperform unconditional models in explaining variation in the cross section of average returns. Later studies by Lewellen and Nagel (2006), Boguth et al. (2011), and Cederburg and O'Doherty (2016) argue that adding conditional information to asset pricing models are intuitive qualitatively, but the improvement on the model performance in explaining abnormal returns is limited quantitatively. My focus in this paper is not to test the model performance cross-sectionally. I am trying to use the conditional model as a vehicle to reexamine the pricing effect of earnings quality risk which is an important topic from the accounting literature.

Information risk, proxyed by the earnings quality factor, if priced, could be time varying with economic cycle. Specifically, in bad times, investor could rely much more on the accounting fundamentals such as earnings than they do in good times. Therefore, they assign a higher premium to earnings quality risk. At the same time, firms' earnings may have different meanings in its valuation. This

[1] In a study well cite by empiricists, Easley and O'Hara (2004) derive a risk premium associated with information asymmetry in a pure exchange setting.

[2] Francis et al. (2005) document positive loadings of excess returns on earnings quality factor-mimicking portfolios in the context of Fama and French's (1993), hereinafter FF, three-factor model. Aboody et al. (2005) provide weak evidence a risk premium associated with an earnings quality factor that, in turn, is linked to trades of corporate insiders.

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leads to stocks have different exposure to earnings quality risk. This exposure can also change over time. If a firm's earnings is closely associated with its market value, we would expect its exposure to earnings quality risk change more drastically over economic cycle. Since book value is accumulated from past earnings, high B/M stocks are conjectured to be more susceptible to earnings quality risk in bad times.

The basic notion in LL is to support the conditional version of CAPM given how poorly the unconditional version of the model performs empirically. My objective is to use the similar conditional framework to retest the pricing effect of earnings quality factor. While CGV found no support for the pricing of earning's quality by adding an earnings quality factor to other factors in unconditional models, it remains to be seen whether earnings quality is priced in conditional models. Following CGV's lead, I consider conditional specifications for CAPM specifications with earnings quality introduced as an additional factor.

Similar to LL, the approach that I employ in this study is to introduce an instrumental variable for time-dependent information on which trading decisions may be conditioning. The instrumental variable includes the log dividends-to-price, d/p, (Campbell and Shiller, 1988), and the log earnings-to-price, e/p. d/p has been used by the prior studies to capture the economic states. I add e/p as another state variable in this paper with consideration that if and how earnings quality risk is perceived by the market depends on the magnitude of aggregate earnings compared with market price. After instrumental variable is selected, I use a scaled-factor model to derive implications regarding the pricing of earnings quality.[3] As in both LL and CGV, I apply a two-stage Fama and MacBeth (1973), hereinafter FM, procedure to the scaled-factor models to test whether an earnings quality factor is conditionally priced.

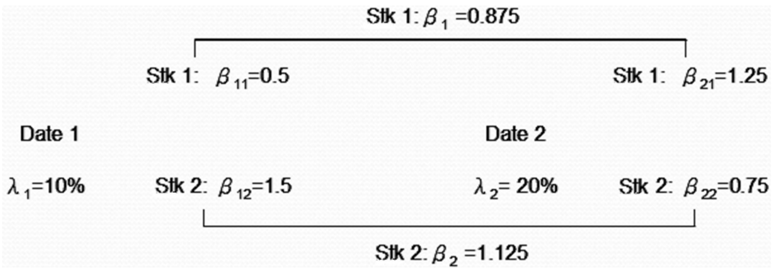
My results indicate the second-stage coefficients for scaled earnings quality as well as the average risk price for earnings quality factor are significantly positive under both conditional variables, over extended sample period also on tests using alternative portfolios. To corroborate the pricing effect, it is found that value stocks compared to growth stock, increase its exposure to earnings quality risk more drastically in bad economy when earnings quality risk premium is high.

The remainder of this paper is organized as follows: In Section 2 I use a numerical example to show that an unconditional factor model may disguise the pricing effect actually existed conditionally. In Section 3, I outline our research design and sample. Results are presented in Section 4 and Section 5 concludes.

2. Asset pricing – unconditional vs. conditional factor model

2.1. A numerical example

In this section, I am going to use a simple numerical example to demonstrate that the pricing effect in a conditional factor model may not be found if one uses unconditional factor model to test it.



Suppose there are two stocks in an economy. The true model is a conditional one factor model. The factor risk premium and stock betas varies over two periods. On date 1, factor risk premium is 10% and stock betas are 0.5 and 1.5 respectively. Therefore, the expected excess return is 5% for stock 1 ($\beta_{11} \times \lambda_1$) and 15% for stock 2($\beta_{12} \times \lambda_1$). On date 2, due to the change of risk premium and betas, the expected excess return becomes 25% for stock 1 ($\beta_{21} \times \lambda_2$) and 15% for stock 2($\beta_{22} \times \lambda_2$). If one uses unconditional one factor model to fit the data, the expected excess return for stock 1 is averaged to 15% and the expected return for stock 2 is 15% too. However the expected betas for two stocks are 0.875 and 1.125 respectively. They can be used to approximate the unconditional betas.[4] Therefore, stocks with different unconditional betas have the same expected excess return; the unconditional factor model would be rejected.

The numerical example above demonstrates that the misspecification of a conditional factor model as the unconditional model would disguise the pricing effect of factors. Therefore, one should carefully explain the non-pricing results found on earlier unconditional models before a conclusion that the pricing effect of earnings quality doesn't exist.

[3] See Cochrane (2001), chapter 8, for a tutorial on this approach.

[4] Prior literature shows that unconditional betas deviate from the expected conditional betas by its covariance with risk factor and squared risk factor (Lewellen and Nagel (2006), Boguth et al. (2011), and Cederburg and O'Doherty (2016)). In the two stocks model above, the deviation are opposite for two stocks. Therefore, except for the only case that deviation is exactly 0.125 towards 1, the unconditional betas would be different for stocks 1 and stock 2. The rejection of unconditional model stays.

2.2. Conditional factor model specification

Following Cochrane's (2001) characterization of factor pricing models in general[5]

For any asset, $$1 = E_t[m_{t+1}(1 + R_{i,t+1})] \tag{1}$$

where m_{t+1} is the pricing kernel (stochastic discount factor) for all assets at time t + 1, R_{t+1} is the asset's return (one-period payoff divided by beginning of period price less 1) at time t + 1, and the expectation operator is conditional on information available at time t.

It is further assumed that the pricing kernel is linear in risk factors with time dependent parameters.

$$m_{t+1} = a_t + b_t f_{t+1} \tag{2}$$

where f_{t+1} is a single factor.

In order to provide a functional representation of time dependency, it is assumed that the time dependent parameters of the pricing kernel are linear functions of an instrument, z_t for information observable at time t;

$$a_t = a_0 + a_1 z_t,\ b_t = b_0 + b_1 z_t \tag{3}$$

With these assumptions, the conditional pricing Eq. (1) above implies

$$1 = E[(a_0 + a_1 z_t + b_0 f_{t+1} + b_1(z_t f_{t+1}))(1 + R_{i,t+1})] \tag{4}$$

Accordingly, we can write the following unconditional representation of excess expected returns

$$E[R_{i,t+1}] - R_{f,t} = \beta_f' \lambda_f + \beta_z \lambda_z + \beta_{f,z}' \lambda_{f,z} \tag{5}$$

where the β_js are regression coefficients from a regression of returns on the risk factor, instrumental (scaling) variable, and the interaction of the factor and scaling variable, and the $\lambda_f + z\lambda_{f,z}$ analogous to average factor risk premiums.[6]

3. Research design

3.1. Two-stage regression analysis

From the derivation above, I can estimate the conditional factor model using the unconditional factor model where factors expand to the original factors, the instrumental variable and the scaled factors between original factors and instrumental variable. The traditional Fama- Macbeth two-stage approach is then applied on the expanded unconditional factor model. For example, in the context of a conditional CAPM augmented by an earnings quality factor, the conditional two factor model is estimated on the unconditional five factor model (6) in which factors include market factor, earnings quality factor, instrumental factor, market factor scaled by the instrumental variable and earnings quality factor scaled by the instrumental variable.

$$\begin{aligned} R_{q,t} - R_{f,t} &= \beta_0 + \beta_{q,mkt}(R_{mkt,t} - R_{f,t}) + \beta_{q,eq} R_{eq,t} + \beta_{q,z} z_{t-1} \\ &+ \beta_{q,mkt,z} z_{t-1} \times R_{mkt,t} + \beta_{q,eq,z} z_{t-1} \times R_{eq,t} + u_{q,t} \end{aligned} \tag{6}$$

where $R_{q,t}$ is the return on portfolio *q*, $R_{f,t}$ is the risk-free return, $R_{eq,t}$ is the return on an earnings quality factor-mimicking portfolio, and z_{t-1} is the conditioning variable value at time $t - 1$. In estimating (6), I use the full times series rather than rolling periods (Campbell and Vuolteenaho, 2004; Brennan et al., 2004).

The first-stage is to estimate factor loadings by regressing excess returns for Fama and French's (1993) 25 book-to-market and size portfolios on those expanded factors as in (6). Tests of second-stage estimates of risk premiums are based on FM's procedure; i.e., the following cross-sectional regressions of excess portfolio returns on first-stage estimates of betas in (6) are run for each period to obtain coefficients the averages of which are treated as independent random variables :[7]

$$R_{q,t} - R_{f,t} = \lambda_0 + \lambda_{mkt}\hat{\beta}_{q,mkt} + \lambda_{eq}\hat{\beta}_{q,eq} + \lambda_z\hat{\beta}_{q,z} + \lambda_{mkt,z}\hat{\beta}_{q,mkt,z} + \lambda_{eq,z}\hat{\beta}_{q,eq,z} + v_{q,t} \tag{7}$$

Our principal interest rests with the estimate of the risk premium associated with scaled earnings quality, $\hat{\lambda}_{eq,z}$ as well as the average risk price $\hat{\lambda}_{eq} + \hat{\lambda}_{eq,d/p} \times z$. Tests on estimates of risk premiums for all model formulations include FM t-statistics and t-statistics adjusted for Shanken (1992) correction.

3.2. Earnings quality measure

As in CGV, my construction of an earnings quality measure follows Francis et al. (2005).[8] Specifically, for each year within each

[5] See Cochrane (2001), chapter 8 for a full treatment.

[6] As LL discuss, assuming conditional co-variances are approximately constant, positive estimated values may be said to imply average conditional coefficients are positive.

[7] Equivalently, average estimates could be obtained from a single cross-sectional regression with average excess returns as in CGV.

[8] While there are several measures of earnings quality in play, for comparability, we follow CGV as closely as possible.

Table 1
Descriptive statistics.

Panel A: Factors for Conditional CAPM (Monthly Returns Data)		$R_{mkt,t} - R_{f,t}$	$R_{eq,t}$	d/p	e/p
Mean		0.53	0.13	−0.01	0.01
STD		4.52	7.25	0.19	0.21
Correlation Matrix					
	$R_{mkt,t} - R_{f,t}$	1.00	0.36	0.04	0.02
	$R_{eq,t}$	0.36	1.00	0.00	−0.04
	d/p	0.04	0.00	1.00	0.73
	e/p	0.02	−0.04	0.73	1.00

Legend: Panel A provides factor descriptive statistics beginning April, 1971 and ending December, 2016 on monthly excess returns on the market, $R_{mkt,t} - R_{f,t}$, returns on the earnings quality factor, $R_{eq,t}$, log dividend-price ratios, d/p, and log earnings-price ratios, e/p. These data are used in constructing tests of earnings quality factor risk premiums in the context of a conditional CAPM.

industry from Fama and French's (1997) 48-industry classifications having at least 20 observations in a given year, I estimate a cross-sectional regression of total current accruals, $TCA_{j,t}$, on lagged, current, and future cash flows, $CFO_{j,t-1}$, $CFO_{j,t}$, $CFO_{j,t+1}$, respectively, the change in revenue, $\Delta REV_{j,t}$, and property, plant, and equipment, $PPE_{j,t}$, all scaled by average of total assets:

$$TCA_{j,t} = \phi_{0,j} + \phi_{1,j} CFO_{j,t-1} + \phi_{2,j} CFO_{j,t} + \phi_{3,j} CFO_{j,t+1} + \phi_{4,j} \Delta REV_{j,t} + \phi_{5,j} PPE_{j,t} + \upsilon_{j,t} \tag{8}$$

where

$$TCA_{j,t} = (\Delta CA_{j,t} - \Delta Cash_{j,t}) - (\Delta CL_{j,t} - \Delta STDEBT_{j,t}),$$
$$CFO_{j,t} = NIBE_{j,t} - TA_{j,t},$$
$$TA_{j,t} = TCA_{j,t} - DEP_{j,t}$$

and $\Delta CA_{j,t}$is the change in current assets, $\Delta Cash_{j,t}$ is the change in cash and cash equivalents, $\Delta CL_{j,t}$is the change in current liabilities, $\Delta STDEBT_{j,t}$ is the change in short-term debt, $NIBE_{j,t}$ is net income before extraordinary items, and $DEP_{j,t}$ is depreciation; all variables scaled by average total assets. Earnings quality is defined by the standard deviation of the residual, $\upsilon_{j,t}$, for firm j over years t-4 to t; a lower standard deviation connotes higher earnings quality.

3.3. Sample

To be consistent with CGV, my sample is composed of all firms for which there is sufficient data from COMPUSTAT to compute earnings quality for years between 1970 and 2016. Monthly data on demeaned log dividend-to-price, d/p and demeaned log earnings-to-price, e/p are from Goyal and Welch (2008). 25 size and B/M portfolio returns are from Fama French's website.

Each month, firms are partitioned into equally weighted quintile portfolios according to the rank of their earnings quality as determined at their most recent prior fiscal yearend. A factor-mimicking hedge portfolio long in the two lowest earnings quality quintile portfolios and short in the two highest earnings quality portfolios is determined with monthly rebalancing. Returns from this hedge portfolio constitute the earnings quality factor in regressions specified by Eq. (6).

4. Empirical findings

4.1. Descriptive statistics

Table 1 provides some descriptive statistics on factors and scaling variables used in the construction of our tests. Panel A presents statistics on monthly data related to estimating risk premiums where d/p and e/p are employed as scaling variables. The earnings quality factor is positively correlated at 0.36 with the excess returns on the market, which is about the same as the 0.33 reported by CGV. Scaling variables d/p and e/p are correlated with a coefficient of 0.73 suggesting they capture somewhat similar effects. The negative mean for d/p arises because the mean employed in demeaning the differences in natural logs was determined over a different time frame.

4.2. Replication of CGV

Table 2 presents results from replicating CGV's risk premium estimates for both an unconditional CAPM (Panel A) and FF's three-factor model (Panel B) both augmented by inclusion of the earnings quality factor. The estimates from our replications are similar to those reported by CGV. The results are not identical mainly due to the COMPUSTAT database used to compute earnings quality had undergoing big structure change in 2007. To make sure our results can be extended to latest, I use the new XPF format while CGV use the old FTP format. Table 2 shows my results are by and large the same as CGV.

Table 2
Unconditional pricing models (Replication of Core et al. 2008).

Panel A: Unconditional CAPM with Earnings Quality Factor				
Core et al. results	Intercept	$\hat{\lambda}_{mkt}$	$\hat{\lambda}_{eq}$	Adj R^2
Estimate	1.95	−1.29	−0.13	0.47
FM t-stat	4.71	−2.88	−0.29	
Our replication				
Estimate	2.04	−1.36	−0.30	0.42
FM t-stat	4.74	−2.95	−0.63	

Panel B: Unconditional Fama-French Three Factor Model with Earnings Quality Factor						
Core et al. results	Intercept	$\hat{\lambda}_{mkt}$	$\hat{\lambda}_{smb}$	$\hat{\lambda}_{hml}$	$\hat{\lambda}_{eq}$	Adj R^2
Estimate	1.54	−1.05	0.13	0.44	−0.78	0.73
FM t-stat	4.48	−2.51	0.77	2.65	−1.72	
Our replication						
Estimate	1.10	−0.62	0.14	0.46	−0.66	0.71
FM t-stat	3.13	−1.45	0.82	2.83	−1.37	

Legend: Panels A contains average estimates of factor risk premiums from month-by-month second-stage cross-portfolio regressions ($R_{q,t} - R_{f,t} = \lambda_0 + \lambda_{mkt}\hat{\beta}_{q,mkt} + \lambda_{eq}\hat{\beta}_{q,eq} + v_{q,t}$)of excess returns on estimated loadings on the market factor and earnings quality factor from first-stage regressions ($R_{q,t} - R_{f,t} = \beta_0 + \beta_{q,mkt}(R_{mkt,t} - R_{f,t}) + \beta_{q,eq}R_{eq,t} + u_{q,t}$). FM t-stats represent Fama and Macbeth t-statistics based on 372 monthly estimates. Panel B contains average estimates of risk premiums and related test statistics similar to Panel A, but with regressions augmented to accommodate a size factor and a book-to-market factor. Adjusted R^2s are based on single cross-sectional regressions of equally weighted portfolio excess returns on estimated betas for the various factors as in CGV.

4.3. Conditional pricing models with earnings quality

4.3.1. Tests on conditional models for the pricing effect within CGV sample period

From Panel A, we observe that the scaled earnings quality factor has a significant positive estimated coefficient, FM t-statistic of 2.33 (2.30 with Shanken's correction). A joint χ^2 test of significance for coefficients of the earnings quality factor and scaled earnings quality factor is positive at 5.9% (7.9% with Shanken's correction) significance levels. The positive average risk price for earnings quality is consistent with earnings quality risk is priced on average.

The results in Panels B are similar to those in Panel A, suggesting that the significance of coefficients of loadings on scaled earnings quality is fairly robust to the choice of scaling variables. This is not surprising given the correlation between *d/p* and *e/p* is 0.73 from Table 1. Again, the Shanken correction results in slightly weaker, but still significant at conventional levels. Although the average risk price for market factor is negative for the models in Table 3, the negative result is not uncommon in the prior literature like LL.

4.3.2. Extending conditional models to the latest

CGV sample period ends in March, 2002. In this section, I will extend the sample period to the latest in December, 2016. Extending the sample period to the latest could confirm our findings that the pricing of earnings quality not only exists in a short time frame.

Extending the sample period to the latest in Table 4 doesn't change the pricing effect of earnings quality. In Panel B, the average risk price for market factor turned positive which is consistent with asset pricing theory. Since the conditional models focus on the time variation of betas and risk premium, a longer sample period would be beneficial to capture the time variation than a shorter one. We will use the full sample period for the rest of the paper.

4.3.3. Tests on conditional models with constrained zero-beta rate

One thing needs to point out is that the intercept term in Tables 3 and 4 Panel A are 0.85 and 0.77 respectively. These estimates suggests zero-beta rate of 9–10% per year in excess of risk free rate. To alleviate the potential model misspecification, I constrain the intercept term to be zero in the following Table 5.

Average risk price for both market factor and EQ factor are positive as indicated in Table 5. The model specification with constrained intercept is better and results are more consistent with economic theory. The pricing effect of earnings quality remains.

4.3.4. Time variation of conditional betas on different stocks

To explain the pricing effect of earnings quality in a conditional model, it requires the earnings quality risk premium and stocks' exposure to the risk vary with economic states. Following LL, I define a good state as the month in which the conditional variable is one standard deviation below its mean value and bad state as a month the conditioning variable is one standard deviation above its mean value. I then report in Table 6 the conditional betas over good, bad and all states for 25 stock portfolios.

The last column on Table 6 shows the change of conditional betas on bad state over good state. Within a given size category, the conditional beta difference over bad and good states increases with B/M. It indicates value stocks tend to have a drastic increase in the exposures to the earnings quality risk in bad economy over good economy. For example, given the same size 1, high B/M portfolio

Table 3
Conditional pricing models within the same period as CGV.

Panel A: Conditional CAPM with Earnings Quality Factor; Scaling by *d/p*							
	Intercept	$\hat{\lambda}_{mkt}$	$\hat{\lambda}_{mkt,d/p}$	$\hat{\lambda}_{eq}$	$\hat{\lambda}_{eq,d/p}$	$\hat{\lambda}_{d/p}$	Adj R^2
Estimate	0.85	−0.35	−0.02	0.15	0.53	−0.09	0.53
FM t-stat	2.68	−0.88	−0.09	0.31	2.33	−2.31	
Shanken t	2.30	−0.75	−0.08	0.26	2.00	−1.98	
Joint significance							
Average risk price		$\hat{\lambda}_{mkt} + \hat{\lambda}_{mkt,d/p} \times d/p$		$\hat{\lambda}_{eq} + \hat{\lambda}_{eq,d/p} \times d/p$			
Estimates		−0.33		0.21			
p value		0.042		0.059			
(Shanken p)		(0.061)		(0.079)			

Panel B: Conditional CAPM with Earnings Quality Factor; Scaling by *e/p*							
	Intercept	$\hat{\lambda}_{mkt}$	$\hat{\lambda}_{mkt,d/p}$	$\hat{\lambda}_{eq}$	$\hat{\lambda}_{eq,d/p}$	$\hat{\lambda}_{d/p}$	Adj R^2
Estimate	0.56	−0.05	−0.09	0.50	0.53	−0.17	0.63
FM t-stat	1.64	−0.12	−0.44	0.99	2.52	−4.41	
Shanken t	1.14	−0.09	−0.31	0.69	1.76	−3.08	
Joint significance							
Average risk price		$\hat{\lambda}_{mkt} + \hat{\lambda}_{mkt,d/p} \times e/p$		$\hat{\lambda}_{eq} + \hat{\lambda}_{eq,d/p} \times e/p$			
Estimates		−0.38		0.55			
p value		0.047		0.057			
(Shanken p)		(0.102)		(0.114)			

Legend: Panels A contains average estimates of risk premiums from month-by-month second-stage cross-portfolio regressions of excess returns on estimates of factor loadings

$R_{q,t} - R_{f,t} = \lambda_0 + \lambda_{mkt}\hat{\beta}_{q,mkt} + \lambda_{eq}\hat{\beta}_{q,eq} + \lambda_{d/p}\hat{\beta}_{q,d/p} + \lambda_{mkt,d/p}\hat{\beta}_{q,mkt,d/p} + \lambda_{eq,d/p}\hat{\beta}_{q,eq,d/p} + v_{q,t}$

where factor loadings are estimated from the first-stage regressions

$R_{q,t} - R_{f,t} = \beta_0 + \beta_{q,mkt}(R_{mkt,t} - R_{f,t}) + \beta_{q,eq}R_{eq,t} + \beta_{q,d/p}d/p_{t-1} + \beta_{q,mkt,d/p}d/p_{t-1} \times R_{mkt,t} + \beta_{q,eq,d/p}d/p_{t-1} \times R_{eq,t} + u_{q,t}$ a conditional CAPM framework with an added earnings quality factor under scaling by the log aggregate dividend yield ratio (*d/p*) in the prior month. FM t-stats represent Fama and Macbeth t-statistics based on 372 monthly estimates and Shanken t represents t-statistics with Shanken's correction. The *p*-values for joint tests represent significance levels of Chi-Square statistics. Panel B replace the scaling variable of *d/p* of Panel A with *e/p*.

Table 4
Conditional pricing models for a longer sample period.

Panel A: Conditional CAPM with Earnings Quality Factor; Scaling by *d/p*							
	Intercept	$\hat{\lambda}_{mkt}$	$\hat{\lambda}_{mkt,d/p}$	$\hat{\lambda}_{eq}$	$\hat{\lambda}_{eq,d/p}$	$\hat{\lambda}_{d/p}$	Adj R^2
Estimate	0.77	−0.23	−0.03	0.04	0.57	−0.11	0.40
FM t-stat	2.49	−0.63	−0.15	0.11	3.08	−2.45	
Shanken t	2.00	−0.51	−0.12	0.09	2.48	−1.97	
Joint significance							
Average risk price		$\hat{\lambda}_{mkt} + \hat{\lambda}_{mkt,d/p} \times d/p$		$\hat{\lambda}_{eq} + \hat{\lambda}_{eq,d/p} \times d/p$			
Estimates		−0.21		0.05			
p value		0.067		0.071			
(Shanken *p*)		(0.097)		(0.104)			

Panel B: Conditional CAPM with Earnings Quality Factor; Scaling by e/p							
	Intercept	$\hat{\lambda}_{mkt}$	$\hat{\lambda}_{mkt,d/p}$	$\hat{\lambda}_{eq}$	$\hat{\lambda}_{eq,e/p}$	$\hat{\lambda}_{e/p}$	Adj R^2
Estimate	0.42	0.12	−0.09	−0.03	0.44	−0.17	0.58
FM t-stat	1.37	0.32	−0.52	−0.09	2.39	−4.51	
Shanken t	0.99	0.23	−0.37	−0.06	1.73	−3.27	
Joint significance							
Average risk price		$\hat{\lambda}_{mkt} + \hat{\lambda}_{mkt,d/p} \times e/p$		$\hat{\lambda}_{eq} + \hat{\lambda}_{eq,d/p} \times e/p$			
Estimates		0.15		0.01			
p value		0.058		0.063			
(Shanken *p*)		(0.105)		(0.117)			

Legend is the same as Table 3.

B5 beta increases by 0.34 in bad state while low B/M portfolio B1 beta only increases by 0.06. The drastic increase in exposures for some stocks over others corroborates my finding on the conditional pricing of earnings quality. The increase is assumed to be zero in an unconditional model.

Table 5
Conditional pricing models with constrained zero-beta rate.

Panel A: Conditional CAPM with Earnings Quality Factor; Scaling by d/p						
	$\hat{\lambda}_{mkt}$	$\hat{\lambda}_{mkt,d/p}$	$\hat{\lambda}_{eq}$	$\hat{\lambda}_{eq,d/p}$	$\hat{\lambda}_{d/p}$	Adj R^2
Estimate	0.47	−0.07	0.25	0.62	−0.25	0.49
FM t-stat	2.40	−0.42	0.65	3.31	−5.39	
Shanken t	1.39	−0.24	0.38	1.92	−3.13	
Joint significance						
Average risk price		$\hat{\lambda}_{mkt} + \hat{\lambda}_{mkt,d/p} \times d/p$		$\hat{\lambda}_{eq} + \hat{\lambda}_{eq,d/p} \times d/p$		
Estimates		0.49		0.27		
p value		0.016		0.071		
(Shanken p)		(0.037)		(0.177)		
Panel B: Conditional CAPM with Earnings Quality Factor; Scaling by e/p						
	$\hat{\lambda}_{mkt}$	$\hat{\lambda}_{mkt,e/p}$	$\hat{\lambda}_{eq}$	$\hat{\lambda}_{eq,e/p}$	$\hat{\lambda}_{e/p}$	Adj R^2
Estimate	0.51	−0.09	−0.04	0.52	−0.20	0.55
FM t-stat	2.59	−0.50	−0.10	3.02	−4.96	
Shanken t	1.76	−0.34	−0.07	2.05	−3.37	
Joint significance						
Average risk price		$\hat{\lambda}_{mkt} + \hat{\lambda}_{mkt,d/p} \times e/p$		$\hat{\lambda}_{eq} + \hat{\lambda}_{eq,d/p} \times e/p$		
Estimates		0.55		0.06		
p value		0.013		0.050		
(Shanken p)		(0.023)		(0.113)		

Legend is the same as Table 3 with intercept restricted to zero.

Table 6
Conditional betas on earnings quality factor.

Portfolio	All	Good	Bad	Bad-Good
S1B1	0.5907	0.5609	0.6195	0.0586
S1B2	0.4576	0.4208	0.4931	0.0722
S1B3	0.3454	0.2344	0.4525	0.2181
S1B4	0.3036	0.2123	0.3917	0.1794
S1B5	0.35	0.1796	0.5146	0.3349
S2B1	0.3507	0.3201	0.3801	0.0600
S2B2	0.2355	0.1448	0.3231	0.1783
S2B3	0.1391	0.0206	0.2535	0.2329
S2B4	0.1063	0.0134	0.1961	0.1828
S2B5	0.1748	0.043	0.3021	0.2591
S3B1	0.23	0.2645	0.1967	−0.0678
S3B2	0.0928	0.0106	0.1722	0.1616
S3B3	0.0547	−0.071	0.1761	0.2471
S3B4	0.0362	−0.1028	0.1704	0.2732
S3B5	0.0872	−0.0841	0.2526	0.3367
S4B1	0.1232	0.1945	0.0544	−0.1401
S4B2	0.0177	−0.0831	0.1151	0.1982
S4B3	−0.0172	−0.1243	0.0862	0.2105
S4B4	−0.0316	−0.1034	0.0378	0.1412
S4B5	−0.0041	−0.1368	0.1241	0.2609
S5B1	−0.0484	−0.0053	−0.0901	−0.0848
S5B2	−0.0679	−0.1092	−0.028	0.0812
S5B3	−0.1174	−0.1708	−0.0659	0.1050
S5B4	−0.099	−0.206	0.0043	0.2103
S5B5	−0.0419	−0.1436	0.0563	0.1999

4.3.5. Test on other portfolios

CGV extends the non-pricing results on other portfolios such as 100 earnings quality portfolio and 64 size, book-to-market and earnings quality portfolios. I report my results on these two portfolios as well as 30 industry portfolios in Table 7. To save space, the average risk price is reported only for conditional variable d/p. The results show the pricing effect of earnings quality is found on 64 size-B/M-accruals quality and 100 accruals quality portfolios but not on 30 industry portfolios. One possible reason is that the earnings quality is constructed with industry difference is removed. A portfolio formed based solely on industry would be orthogonal to the risk factor based on earnings quality.

Table 7
Testing the pricing effect on earnings quality over alternative portfolios.

Joint significance on factors over 64 size-B/M-accrual portfolios		
Average risk price	$\hat{\lambda}_{mkt} + \hat{\lambda}_{mkt,d/p} \times d/p$	$\hat{\lambda}_{eq} + \hat{\lambda}_{eq,d/p} \times d/p$
Estimates	0.37	0.39
p value	0.005	0.011
(Shanken p)	(0.012)	(0.017)
Joint significance on factors over 100 portfolios		
Average risk price	$\hat{\lambda}_{mkt} + \hat{\lambda}_{mkt,d/p} \times d/p$	$\hat{\lambda}_{eq} + \hat{\lambda}_{eq,d/p} \times d/p$
Estimates	0.99	0.09
p value	0.022	0.004
(Shanken p)	(0.022)	(0.005)
Joint significance on factors over 30 industry portfolios		
Average risk price	$\hat{\lambda}_{mkt} + \hat{\lambda}_{mkt,d/p} \times d/p$	$\hat{\lambda}_{eq} + \hat{\lambda}_{eq,d/p} \times d/p$
Estimates	0.58	−0.44
p value	0.003	0.098
(Shanken p)	(0.003)	(0.140)

5. Conclusion

This study extends Core et al. (2008) examination of the pricing of earnings quality from an unconditional to a conditional factor model. If I relax their implicit assumption that pricing kernel parameters are constant and allow those parameters to be time dependent functions of an instrumental variable that proxies for information upon which investors may condition their decisions, I find evidence on the pricing of earnings quality. Augmenting a single factor (CAPM) model by an earnings quality factor, I find significant positive average estimates of risk premiums associated with earnings quality using conditional variables such as d/p and e/p. My results are robust for extended sample period, for models with constrained zero-beta returns and over tests on other alternative portfolios. To corroborate the pricing effect in the conditional model, it is found that value stocks, compared to growth stock, increases their exposure to earnings quality risk more drastically in bad economy when the earnings quality risk premium is high.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.frl.2018.10.015.

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