A Theoretical Analysis Connecting Conservative Accounting to the Cost of Capital

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Abstract

We connect conservative accounting to the cost of capital by developing an accounting model within an asset pricing framework. The model has three distinctive features: (1) transaction-cycle-conformity, where the book value equals the value of cash at the beginning and the end of a cash-to-cash transaction cycle; (2) a revenue recognition principle, where uncertainty affects the amount of revenues recognized; (3) a matching principle, where expenses are matched with revenue with a conservative bias due to uncertainty. We demonstrate how the growth rate of expected earnings, the accruals-to-cash ratio, and the expected earnings yield relate to the expected stock return.

Keywords: conservative accounting, risk and return, earnings growth, accruals, earnings yield

JEL Classifications: M41, G12

1. INTRODUCTION

This paper investigates the properties of accounting numbers when uncertainty is built into revenue and expense recognition and measurement. The operating accounting principle is conservatism, which Sterling (1970) rates as the most influential principle in accounting. We show how key financial statement information such as earnings growth, accruals, the book rate-of-return, and the earnings yield convey information about risk and expected stock return when prepared under conservative accounting.

We make the connection to risk by introducing conservative accounting into an asset pricing framework. Accounting conservatism deals with uncertainty as follows: earnings recognition is deferred until uncertainty has been substantially resolved.[1] This conservatism "bias" is applied in two ways. First, a revenue recognition principle prescribes that revenues are recognized only when cash is deemed to be either "realized" or "realizable" and performance obligations have been satisfied. In asset pricing terms, earnings are not booked until a firm has a low-beta asset, i.e., cash or a near-cash receivable (discounted to cash equivalent with an allowance). Second, when expenses are matched with recognized revenue, the matching is done with a conservative bias. If potential future revenue from an investment is particularly uncertain, the investment is expensed more rapidly, often with immediate expensing. Both deferral of revenue recognition and the rapid expensing of investment depress current earnings and increase future expected earnings. We establish conditions under which conservative accounting and the resulting accounting numbers inform about risk and the expected return to investing.

[1] We recognize that "risk", the term used in asset pricing research, is sometimes distinguished from "uncertainty," the term mainly used in the accounting literature. We discuss this further in Sections 3 and 6, as well as in the Appendix 2.

The accounting we model is similar to that under GAAP and IFRS, so the properties that we highlight are features of those regimes. The FASB's *Statement of Financial Accounting Concepts (SFAC) No. 2* (1975) defines conservative accounting as "a prudent reaction to uncertainty," and conservative accounting practices permeate accounting. It has its manifestation in the "realization principle": the refusal to recognize sales from prospective customers, even if they are in the order book, honors the principle of waiting until uncertainty is resolved (*SFAC No. 5* 1984, *Staff Accounting Bulletin No. 101* 1999).[2] It is also applied by anticipating losses but not gains before realization. Rules such as the recognition of loss contingencies, or the lower-of-cost-or-market for inventory valuation, are good examples. Uncertainty also bears on the accounting for investment, with R&D investment and brand building (advertising and promotion) expenditures being common examples of investments that are particularly risky and thus expensed: such investments may not produce revenue (*International Accounting Standard (IAS) 9* 1978, *IAS 38* 1998). Similarly, immediate/rapid expensing extends to investment on supply chains and distribution systems, employee development, software development, start-up costs, accelerated depreciation, and impairments, to name a few. This accounting yields lower current earnings but higher future earnings *if* the expenditures produce realized earnings. The *if* implies that the expected earnings are at risk.[3] The risk that this accounting captures may not be

[2] Traditional revenue recognition principles require (among other things) that the major economic activity be accomplished and "receipt of cash is reasonably certain." The FASB's *Statement of Financial Accounting Concepts No. 5* (1984) and SEC's Staff Accounting Bulletin No. 101 (1999) dictate the recognition of revenue when it is realized or realizable and earned. The recent converged revenue recognition standards, the FASB's *Revenue from Contracts from Customers* ASC 606 and the IASB's IFRS 15, invoke the criteria of "probable collectivity" of cash and the satisfaction of a performance obligation. These criteria require the accountant to wait until uncertainty about execution of a contract (on both sides) is resolved.

[3] In justifying the immediate expensing of R&D under *SFAC No. 2*, the FASB focused on the "uncertainty of future benefits." In *IAS 38*, the IASB applied the criterion of "probable future economic benefits" to distinguish between "research" (which is expensed) and "development" (which is capitalized and amortized). Uncertainty also enters into the accounting for contingent assets and liabilities in *IAS 37* and for the calculation of the deferred tax asset and uncertain tax provisions when tax outcomes are uncertain. More generally, the notion of "prudence" is broadly applied.

priced risk, of course. To that point, the paper casts this accounting in an asset pricing framework to connect these accounting features to the expected return required by investors as expressed in a general, no-arbitrage asset pricing model.

We begin our analysis with a single-transaction-cycle model. We show that conservative accounting creates more growth in expected earnings, causing it to differ from the growth rate of economic earnings. We then identify conditions under which: (1) the growth rate of expected earnings increases with risk and the expected stock return; (2) the expected earnings yield (i.e., the forward E/P ratio) is negatively related to the expected stock return; (3) the accruals-to-cash (or equivalently, the accruals-to-earnings ratio) is negatively related to the expected stock return.

Intuitively, for higher risk investments, less revenue is recognized in the current period due to the elevated level of perceived uncertainty. In addition, more expense is recognized in a conservative fashion (expenses are effectively mismatched with revenue). Both of these aspects push earnings recognition into the future, causing the growth rate of expected earnings to increase. At the same time, the near-term accruals-to-cash ratio, as well as the earnings yield, drops. Under fairly general conditions, the growth rate of expected earnings is positively related to expected return, while the accruals-to-cash ratio and the earnings yield are negatively related to the expected stock return.

Next, we extend our model to include multiple overlapping transaction cycles. In this case, expected earnings in any given period are affected by two countervailing forces: earnings are depressed due to the conservative accounting for new investments; at the same time, resolution of uncertainty regarding cash inflows from older investments tends to inflate earnings. We show how growth in investment affects the relations between earnings growth, the accruals-to-cash ratio, the earnings yield, and the expected stock return. In particular, we show that the correlation between earnings growth and the expected stock return can turn negative, contrary to the single-transaction-cycle case**.** Accruals and the earnings yield are more likely to be negatively related to the expected stock return for (small) firms with high growth in investment. The relations between various earnings measures and the expected stock return get significantly weaker, even becoming insignificant, among (mature) firms with stable investment.

Our paper contributes to the literature by providing a justification for linking earnings recognition and measurement to risk. In traditional financial statement analysis and security valuation, predicted earnings growth and earnings yield are often considered independently of the discount rate. That is, the so-called "numerator" effects are considered separately from the "denominator" effects in valuation. Our analysis demonstrates that earnings growth and risk are intrinsically related. We show that accounting principles induce earnings growth that ties to risk; thus an investment strategy that buys growth in expected earnings could be risky. Any variable that predicts uncertain cash flows that are at risk of not being realized, such as accruals, is potentially an indicator of the cost of capital. The negative relation between accruals and expected stock return provides a risk-based explanation for the well documented accrual anomaly (e.g., Sloan 1996, Hafzalla et al. 2011). In addition, our analysis also yields new testable hypotheses, such as the negative correlation between the forward earnings yield and future stock returns, as well as between the earnings growth rate and future stock returns, under particular investment conditions.

The rest of the paper is organized as follows. Section 2 discusses the literature and our contributions in more detail. Section 3 introduces the basic setting with a single-transaction-cycle and Section 4 models properties of conservative accounting in this setting. Section 5 covers the multiple-transaction-cycle setting. Section 6 concludes the paper with a discussion of the limitations of our analysis and possible ways to extend it.

2. CONNECTION TO PRIOR RESARCH

Conservative accounting has been a focus in both empirical and analytical research in accounting, justifiably so given its prominence in GAAP and IFRS accounting.[4] On the theory front, Feltham and Ohlson (1995), Zhang (2000), Pope and Wang (2005), Rajan et al. (2007) are the main papers that examine the properties of conservative accounting, showing how the accounting affects earnings, earnings growth, the dynamics of the book rate of return, and the relation between accounting data and firm value. However, because they establish no connection to the expected return, these papers implicitly cast conservative accounting as a pure accounting phenomenon, unrelated to the economics of the firm ─ noise to be accommodated in valuation and performance evaluation.

This is our point of departure: rather than characterizing conservative accounting as creating a numerator effect in an accounting-based valuation model, we examine its implications for the discount rate in the denominator. While this prior literature models how conservative accounting affects (abnormal) earnings growth under specified conditions, our analysis models how earnings growth and risk are intrinsically related; conservative accounting principles result in earnings growth that ties to risk. In applying standard valuation models, predicted growth in earnings is often considered independently of the discount rate. In our analysis, earnings growth and risk are intrinsically related.

Consequently, any variable that predicts uncertain future earnings that is at risk of not being realized is potentially an indicator of the cost of capital. For example, the negative relation

[4] For a related literature on alternative explanations for accounting conservatism and delayed recognition, see, e.g., Devine (1963), Watts (2003 and references therein), Christensen and Demski 2004, and Fan and Zhang (2012).

between accruals and the expected stock return in our model provides a risk-based explanation for the well documented accrual anomaly (e.g., Sloan 1996, Hafzalla et al. 2011). Similarly, numerous papers have documented an empirical relation between the earnings yield (E/P) and stock returns, for example in Basu (1977, 1983). Conservative accounting (that ties to risk) affects earnings in the E/P ratio, so we also derive testable conditions for the relationship between E/P and stock returns.

The main focus of the paper is on unconditional conservatism, but our results also apply to conditional conservatism in Basu (1997) and Watts (2003), for this also reduces expected earnings in the E/P ratio (via impairments, for example). Much of the empirical literature on conditional conservatism focuses upon its effect on the quality of (accounting) information and the connection of that quality to the cost of capital (for example, García Laraet al. 2011). By introducing the accounting in an asset pricing framework, we make a direct link to the cost of capital.

Lyle et al. (2013) connect accounting numbers to the systematic risk in asset pricing models. They establish this connection via the residual income valuation model with the linear information dynamics of Ohlson (1995), and provide an explanation for the negative association between changes in economy-wide risk and future stock returns. Their analysis is based on so-called unbiased accounting (with the book rate of return converging to the underlying cost of capital in expectation), and so does not incorporate the features of conservative accounting and growth under biased accounting (in the Feltham and Ohlson (1995) modification of the Ohlson (1995) model, for example).

Ohlson (2008) connects earnings growth to risk in a permanent earnings model. Our approach differs: a key assumption of our analysis is that the accounting satisfies the transaction-cycle-conformity condition, which is violated in permanent earnings models such as Ohlson (2008) and Ohlson and Zhang (1998). Our paper also connects risk and growth, but explains how that arises via transaction processing that dictates the actual journal entries of accounting. There is no sense of increasing risky investment reducing earnings in the Ohlson (2008) model, or of earnings increasing with the resolution of risk (with earnings realizations). The driving accounting principle in the Ohlson (2008) model is the reduction of current earnings to yield a constant permanent growth rate indicative of the risk premium. The driving principle in our analysis is earnings deferral under uncertainty and recognition of earnings upon the resolution of uncertainty. Accordingly, the resulting earnings dynamic is quite different in our framework from the permanent earnings dynamic in the Ohlson (2008) model, emphasizing the feature that earnings recognition is a matter of resolution of uncertainty rather than a matter of setting earnings to report a permanent growth rate.

The incorporation of the transaction-cycle-conformity rule is another departure point from the literature that builds on the linear information dynamics model (e.g., Feltham and Ohlson 1995; Zhang 2000; Lyle et al. 2013). Our study uses a stylized two-period-transaction-cycle as the basic building block. This modelling choice is motivated by our research objective of linking accounting conservatism to the underlying uncertainty. When the level of uncertainty is low, which occurs at the beginning and the ending of a cash-to-cash transaction cycle, unbiased accounting is applied. In contrast, when uncertainty level is high, accounting is conservative. Unlike the linear information dynamics model, such an approach does not depend on exogenous residual income parameters that connect neither to cash flow risk nor to the accounting designed to respond to that risk. Applying unbiased accounting at the end of a transaction cycle enables us to better capture the reversal reserves created by conservative accounting. We would like to note, however, that imposing this transaction-cycle-conformity rule has its cost. Most noticeable, our analysis does not yield a closed form solution linking market value to accounting data, as in Feltham and Ohlson (1999) and Lyle et al. (2013). Nonetheless, by using a model of overlapping transaction cycles with finite periods, we are able to highlight the link between accounting conservatism and risk, and to illustrate how factors such as cash flow duration and investment growth affect the relation between earnings and expected stock returns.[5]

On the empirical front, a number of papers have documented how conservative accounting connects to stock returns. Penman and Reggiani (2013) show that delayed recognition of earnings is associated with higher stock returns. Penman et al. (2018) and Penman and Zhu (2014) show how conservative accounting of the type modelled here explains book-to-price effects in returns and other return anomalies. Penman and Zhang (2019) develop a measure of conservative accounting to show how book rate-of-return (affected by conservative accounting) empirically conveys information about risk and the expected return. Our paper provides the theoretical underpinnings for these findings.

On the policy front, Barker and Penman (2018) have proposed the recognition of uncertainty and the accounting that flows from it as a basis for resolving recognition and measurement issues in the Conceptual Framework of the IASB. The proposed accounting in that paper is designed to satisfy the guiding objective of the Framework to provide information to investors about the "amount, timing, and *uncertainty* of future cash flows" (emphasis added).

[5] More specifically, we can incorporate a separate cash inflow with zero persistence to model the end of a transaction cycle in the linear information dynamics framework (LIM) of Feltham and Ohlson (1995). However, as demonstrated in Ohlson and Zhang (1998), such cash flow needs to be partially capitalized and amortized in order to preserve the AR(1) process of residual incomes, which is the key feature of the LIM models that underlies the parsimonious relation between accounting data and firm value. Such an accounting would be incompatible with the idea that fair value accounting is applied at the end of the transaction cycle when uncertainty is low.

Our paper supplies the theoretical grounding for the proposed accounting to provide information about the uncertainty that (both debt and equity) investors face in investing in firms.

3. BASIC SETTING: SINGLE TRANSACTION CYCLE WITH TWO PERIODS

3.1 Investment

A firm makes an investment $C_0 < 0$ (i.e., cash outflow) at time *t=0*. The transaction cycle, which starts with this initial investment, consists of two periods. Uncertain cash inflows occur in the subsequent periods, denoted C_1 and C_2.[6] Initially we assume full payout, i.e, cash flows are paid out as dividends as received. In section 4.4, we introduce financial assets to examine the effect of delayed dividend payout. Let r_t^{RF} denote the risk-free discount rate for period *t*. From Rubinstein (1976), the present value of C_1 and C_2 equals

$$P_0 = \frac{E_0[C_1]+Cov_0(C_1,Q_1)}{1+r_1^{RF}} + \frac{E_0[C_2]+Cov_0(C_2,Q_2)}{(1+r_1^{RF})(1+r_2^{RF})} = \frac{E_0[C_1]}{1+r_1} + \frac{E_0[C_2]}{(1+r_1)(1+r_2)} \tag{1}$$

where Q_t is a random variable that satisfies the no arbitrage condition (the "kernel"), and $Cov(C_t,Q_t)$ indicates the discount for risk in period *t*. For ease of exposition we assume a flat term-structure of the risk-adjusted discount rates such that $r_1 = r_2 = r$:

$$P_0 = \frac{E_0[C_1]}{1+r} + \frac{E_0[C_2]}{(1+r)^2}\,. \tag{2}$$

We begin our analysis with the assumption of an efficient investment market such that the investment cost equals the present value of the future cash flows. That is,

$$-C_0 = P_0. \tag{3}$$

We examine the case of positive net present value (NPV) investment in section 4.3. Note that the zero-NPV assumption implies that $-C_0$, the amount of initial investment, is endogenous and depends on the risk of cash flows C_1 and C_2.

[6] This stylized cash flow model can be modified to include both cash inflows and cash outflows in the subsequent periods, accommodating periodic cash outflows and expenses.

Assume that C_t ($t=1, 2$) consists of two components with different levels of uncertainty. Specifically, $C_t = C_{ta} + C_{tb}$ and

$$Cov(C_{ta}, Q_t) < 0,\ Cov(C_{tb}, Q_t) = 0,\ \frac{E_0[C_{ta}]}{E_0[C_t]} = \beta^0, \text{ and } -\frac{Cov[C_{ta}, Q_t]}{E_0[C_{ta}]} = \beta^1. \qquad (4)$$

β^0 captures the proportion of cash inflows that are risky. β^1, on the other hand, represents the amount of the discount that investors apply to the risky cash inflows. This discount measure is analogous to the ratio identified by Fama (1977) as capturing differences in expected returns across firms in equilibrium. Appendix 2 provides a more detailed illustration of how β^1 captures the multiplicative effect of two underlying factors: the overall level of riskiness and the pricing of that risk. The latter of the two reflects the relative amount of priced and unpriced risk as perceived by investors. As will be shown in Section 4, this set of parameters $\beta = \{\beta^0, \beta^1\}$ captures the total riskiness of the investment, with $\beta^0\beta^1$ being the total discount applied to C_t due to risk. Since our focus is the effect of risk on cost of capital, we assume that this risk-induced discount is significant and exceeds the time-preference discount, i.e, $\beta^0\beta^1 > r_t^{RF}$, for t = 1, 2.

3.2 Accounting

We apply a system of accounting rules to measure the firm's activities, generating a set of accounting data such as book values and earnings. Two main accounting systems are examined: fair value accounting (FV) and historical cost accounting with accrual revenue recognition and conservative expense matching (HC). A third system of hybrid accounting rules, namely historical cost accounting with cash revenue recognition and unbiased matching (HC^{CRUM}), is also examined as a benchmark to highlight the effect of accrual revenue recognition and conservative expense matching.[7] Our focus is on how historical cost accounting, with accrual

[7] Superscript "CRUM" stands for cash-based revenue recognition ("CR") with unbiased expense matching ("UM").

revenue recognition and a conservative bias in matching expenses to revenues, affects properties of earnings and its relation with risk and the expected stock return.

One restriction we place on accounting is the transaction-cycle-conformity requirement. Specifically, at the beginning of the transaction cycle, we require the book value to be equal to the cash outflow made by the firm. Similarly, at the end of the transaction cycle, we require the ending book value, after dividends are paid out, to be zero. That is

$$B_0 = -C_0 \text{ and } B_2 = 0. \quad (5)$$

This restriction reflects the assumption that when valuing low-beta assets such as cash, fair market values are often used as the basis of measurement because there is little uncertainty regarding the value of such assets. As will be shown later, this assumption has significant impact on the dynamics of earnings when accounting is biased. This conformity condition, however, is often ignored, or violated, in prior studies (e.g., Ohlson and Zhang 1998).

Another condition we impose on the accounting system is the clean surplus assumption:

$$B_t = B_{t-1} + E_t - C_t, \quad (6)$$

where E_t denotes earnings. The three accounting systems we study all satisfy the transaction-cycle-conformity condition and the clean surplus assumption. These conditions emphasize that, from cash to cash over the transaction cycle, total earnings equal total cash flows, but periodic earnings can differ from cash flow due to the application of accrual accounting rules (such as those that recognize uncertainty about total cash flows).

3.2.1 Fair Value Accounting

Fair value accounting, or mark-to-market accounting, serves as a natural starting point for our analysis.[8] With this accounting, the book value of the firm is set to the fair market value of the firm at each point in time. Earnings (or net income) equal the "economic income" of the firm for each period:

$$B_t^{FV} = P_t, \text{ for } t = 0, 1, 2$$

$$E_t^{FV} = \Delta P_t + C_t, \text{ for } t = 1, 2 \qquad (7)$$

where B_t^{FV} and E_t^{FV} are the book value and earnings under the fair value accounting system.

3.2.2 Historical Cost Accounting

Historical cost accounting differs from fair value accounting in terms of how earnings, or more specifically revenues and expenses, are measured. Earnings measurement is governed by two principles: the revenue recognition principle and the matching principle. We examine the historical cost accounting system with two key characteristics: accrual revenue recognition and conservative expense matching. The transaction-cycle-conformity condition (5) and the clean surplus condition (6) imply:

$$B_0^{HC} = -C_0 \text{ and } B_2^{HC} = 0,$$

$$E_t^{HC} = \Delta B_t^{HC} + C_t, \text{ for } t = 1, 2$$

where B_t^{HC} and E_t^{HC} are the book value and earnings under the historical cost accounting system.

Cash-based Revenue Recognition and Unbiased Matching

To examine the effect of historical cost accounting, we start with the benchmark case of cash-based revenue recognition with unbiased matching of expenses with revenues (HC^{CRUM}). Specifically, with cash-based revenue recognition,

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[8] We use the term fair value accounting and mark-to-market accounting interchangeably in this paper. For discussions of differences between these two, see "Fair Value Measurement (Topic 820)," FASB, 2011.

$$REV_1^{CR} = C_1$$

$$REV_2^{CR} = C_2 \quad (8)$$

where C_1 and C_2 are the cash flows during the two periods.[9]

The matching principle governs the recognition of expenses. With unbiased matching, expenses are matched with revenues in the following way:

$$EXP_1^{CRUM} = B_0 \frac{E_0[C_1]}{E_0[C_1]+E_0[C_2]}$$

$$EXP_2^{CRUM} = B_0 \frac{E_0[C_2]}{E_0[C_1]+E_0[C_2]}. \quad (9)$$

Total cost of investment, B_0, is expensed in periods 1 and 2 in proportion to the expected amounts of revenues recognized in the two periods. Next, we introduce accrual revenue recognition and conservative expense matching.

Accrual-based Revenue Recognition and Conservative Expense Matching

GAAP revenue recognition differs from fair value accounting as well as the cash-based REV^{CR}. The revenue recognition principle of historical cost accounting mandates that revenues are recognized when two conditions are satisfied: (a) it is "realized" or "realizable" into cash; and (b) performance obligations are satisfied. Both these conditions relate to the uncertainties associated with a sales transaction, but with different emphasis. The "realization" condition (the "probability of collectivity" under FASB Accounting Standard Update 2014-09) focuses on the inflow side of the transaction, requiring the uncertainty associated with the cash inflow of the trade to be low. The performance obligation condition concerns the outflow side of the sales transaction. It requires that the resource outflow associated with the trades must be mostly complete (i.e., production, packaging, shipping, etc.) such that the remaining uncertainty

[9] Superscript "CR" stands for cash-based revenue recognition.

associated with the outflow side is low. In other words, it must be "earned." In the setting here, since the resource outflow (C_0) occurs at time $t=0$, the "earned" condition is satisfied. The amount of revenue recognized in each period depends on the amount of cash "realized" or "realizable."

To incorporate the revenue recognition principle, we assume that

$$REV_1^{AR} = C_1 + E_1[C_{2b}]$$

$$REV_2^{AR} = C_{2a}.^{10} \tag{10}$$

C_1 is recognized as revenue during period 1 because the associated cash inflow has been *realized* at time 1. $E_1[C_{2b}]$ is considered to be *realizable* since the level of uncertainty is low, leading to the recognition of receivables on the balance sheet. In contrast, recognition of revenue based on C_{2a} is deferred until period 2 when the uncertainty is resolved.

The unbiased matching principle then dictates:

$$EXP_1^{ARUM} = B_0 \frac{E_0[C_1]+E_0[C_{2b}]}{E_0[C_1]+E_0[C_2]}$$

$$EXP_2^{ARUM} = B_0 \frac{E_0[C_{2a}]}{E_0[C_1]+E_0[C_2]}. \tag{11}$$

Next, we introduce conservative bias in the matching of expenses with revenue.

***Definition*:**

Accounting system i is considered to be more conservative than accounting system j if the book value at t=1 under accounting system i is expected to be lower than the book value under accounting system j, i.e.,

$$\frac{E_0[B_1^i]}{E_0[B_1^j]} < 1.$$

[10] Superscript "AR" stands for accrual-based revenue recognition. Throughout the analysis we assume that revenues in both periods are non-negative.

In particular, accounting system i is defined as conservative if

$$\frac{E_0[B_1^i]}{E_0[B_1^{FV}]} < 1.$$

Holding constant the revenues recognized in the two periods, a more conservative expense recognition rule requires more expenses to be recognized in period 1. We model the following conservative bias in the matching of expenses with revenues:

$$EXP_1^{HC} = EXP_1^{ARUM} + EXP_1^{CB}, \tag{12}$$

where $EXP_1^{CB} > 0$ is the amount of conservative bias incorporated in the recognition of expenses in period 1.

Research distinguishes "conditional conservatism" from "unconditional conservatism." The former, developed in Basu (1997) and Watts (2003), is applied on receipt of negative information about future cash flow outcomes. A one-time increase in bad-debt allowances and asset write-offs are examples. Unconditional conservatism refers to accounting rules applied more generally in the presence of uncertainty, rather than on the receipt of information that revises that assessment of uncertainty. The expensing of R&D and advertising and the persistent overestimation of bad debt allowances (relative to the expected cash flows from receivable) serve as examples of unconditional conservatism.

Our model of conservative bias, EXP_1^{CB}, captures both types of conservatism. For instance, $E_0[EXP_1^{CB}] > 0$ can represent the added depreciation of a fixed asset in the early part of the useful life of the asset. This accelerated deprecation captures the effect of unconditional accounting conservatism: the asset is depreciated rapidly because of the risk that revenues may not materialize to cover the cost. Alternatively, $E_0[EXP_1^{CB}] > 0$ can also be thought of as reflecting the expected amount of added expense in period 1 due to potential asset impairment write-off (which, of course, could be due to an *ex post* assessment of insufficient depreciation charged in period 1 and thus a revision of the unconditional conservatism). U.S. GAAP allows for asset write-downs, but not write-ups. $E_0[EXP_1^{CB}] > 0$ captures the expected effect of such conditional conservatism on earnings in period 1. As an illustration, one could assess with non-zero probability that expected cash flow in period 2 will be low such that an asset write-off is triggered, as with the lower-of-cost-or-market rule.

Note, however, when applying to conditional conservatism, $E_0[EXP_1^{CB}] > 0$ only captures the *ex ante* impact of conditional conservatism on expected earnings, not the *ex post* impact on realized earnings conditional on good or bad news. Note also that the prediction from our analysis differs from that often conjectured. In empirical papers in the vein of García Lara et al. (2011), the relationship between conditional conservatism and the cost of capital is predicted to be negative under a rationale that the accounting increases the precision of accounting information.[11] We deal with a different feature of conditional conservatism – the level of conservatism varies with the amount of risk of the underlying cash flows. With a formal tie to priced risk, our analysis predicts a positive relation. These are competing predictions, though, of course, both could be operating with a netting effect.

We assume that the level of conservative expensing, $E_0[EXP_1^{CB}] > 0$, changes with the level of risk as well as the amount of unrealized cash flows.[12,13] Since this amount of conservative expensing is applied at time $t=1$ after cash flow C_1 has been realized, we assume

[11] The empirical results are, of course, conditional on the validity of the cost-of-capital measure used, and identifying this measure has proved elusive. The so-called implied cost of capital often used lacks validation, for example, in predicting stock returns, the (expected return) feature that is prominent in our analysis.
[12] In our setting, for expositional purpose, we abstract away the distinction between uncertainty and risk. Generally speaking, accounting reflects uncertainty, which is a more general notion than risk. Our analysis can be viewed as analyzing the part of uncertainty that affects risk. See section 6 for further discussion.
[13] Fan and Zhang (2012) provides a more detailed analysis of the relation between conservatism and uncertainty. They demonstrate how conservatism in accounting can help increase the overall quality of financial reporting, and that the optimal level of conservatism increases with the level of uncertainty with respect to production outcomes and future cash flows.

that $E_0[EXP_1^{CB}]$ increases with the riskiness of future cash flows, that is, $\frac{\partial E_0[EXP_1^{CB}]}{\partial \beta} > 0$,

$\frac{\partial E_0[EXP_1^{CB}]}{\partial E_0[C_2]} > 0$, and $\frac{\partial E_0[EXP_1^{CB}]}{\partial \beta \partial E_0[C_2]} \geq 0$. Appendix 3 provides a more detailed illustration of how our general model is applied to more specific settings, with the above relation being derived under conditional conservatism such as the lower-of-cost-or-market rule or unconditional conservatism such as the expensing of R&D.

4. CONSERVATIVE ACCOUNTING AND EARNINGS

In this section, we examine how conservative accounting affects the dynamics of reported earnings. We start with the following observation regarding the measurement of risk, and how that risk manifests itself in the amount of earnings measured under the benchmark case of fair value accounting.

Observation 1:

The expected stock return increases with $\beta=\{\beta^0, \beta^1\}$, that is,

$\partial r/\partial \beta > 0$.

Proof: All proofs are in Appendix 1.

Observation 1 states that, in our setting, β fully captures the riskiness of the firm's operations. The first component, β^0, reflects the proportion of cash flow that is risky. Hence, as this ratio increases, the total risk of the firm increases. The second component, β^1, reflects the discount investors apply to risky cash flows.

Note that β^1 expresses risk in terms of the amount of variation in future cash flow relative to its mean. This captures the idea that, for investors, risk is not just about variation in absolute terms, but more about variation relative to the expected value. In other words, for the same amount of variation in cash flow, the lower the mean, the higher the probability that realized cash flows will be low or close to zero. This corresponds to accounting notions such as “sufficiently probable” which seem designed to capture the risk of having low enough future cash flows for an investment to have negative NPV.[14] Such risk is particularly relevant for debt investors and often triggers the application of the conservatism principle in accounting. Next, we show how such risk can be reflected in accounting measurement of earnings under the benchmark case of fair value accounting.

Observation 2:

With fair value accounting (FV), the expected forward earnings-to-price ratio equals the discount rate. The growth rate in expected earnings increases with risk (β). That is,

$$E_0[E_1^{FV}]/P_0 = r \text{ and } \frac{\partial\left[\frac{E_0[E_2^{FV}]}{E_0[E_1^{FV}]}\right]}{\partial\beta} > 0.$$

With fair value accounting, book value incorporates risk and, as a result, the expected earnings yield (i.e. the forward E/P ratio) equals expected stock return. Moreover, the growth rate of expected earnings is also positively related to risk. Beaver et al. (1970) argue that earnings from growth opportunities are riskier than “normal” earnings, implying a positive association between growth and risk. Our analysis shows that, even without distinguishing between earnings deriving from growth opportunities and asset in place, earnings growth with fair value accounting is positively related to risk simply because economic earnings begets future

[14] For more discussion of the role of reference points in decision making, as well as investors’ aversion to extreme losses, see Kahneman and Tverskty (1979).

earnings at a rate that incorporates risk. Next, we examine how historical cost accounting affects this relation.

4.1 Growth in Expected Earnings

Once we deviate from fair value accounting, the relationship between earnings and the expected stock return becomes less clear. Both the revenue recognition principle and the biased matching of expenses create differences between accounting earnings and fair value ("economic") earnings. As such, it is not clear how such earnings can be used to gauge the riskiness of the underlying operations.

***Lemma 1*:**

Historical cost accounting with cash revenue recognition and unbiased matching is conservative,

$$\frac{E_0[B_1^{CRUM}]}{E_0[B_1^{FV}]} < 1.$$

With accrual-based revenue recognition and conservative matching, HC can be more or less conservative compared to HC^{CRUM}, depending on the magnitude of EXP_1^{CB} relative to the total transaction-cycle-earnings.

The first part of Lemma 1 reveals that historical cost accounting, even with cash-based revenue recognition and unbiased matching (HC^{CRUM}), is conservative. This is perhaps surprising given that, in prior studies, accounting rules with unbiased matching are often considered to be unbiased (e.g., McNichols et al. 2014). To understand why, note that, with HC^{CRUM}, book value at the end of period 1 equals

$$E_0[B_1^{CRUM}] = \frac{E_0[C_2]}{E_0[C_1]+E_0[C_2]} B_0 \tag{13}$$

which differs from book value under fair value accounting:

$$E_0[B_1^{FV}] = \frac{E_0[C_2]}{1+r}\,. \tag{14}$$

From equations (2) and (5), equation (14) can be restated as

$$E_0[B_1^{FV}] = \frac{E_0[C_2]}{E_0[C_1]+\frac{E_0[C_2]}{1+r}} B_0 \tag{15}$$

Comparing (15) with (13), it follows that $E_0[B_1^{CRUM}] < E_0[B_1^{FV}]$ because $\frac{E_0[C_2]}{1+r} < E_0[C_2]$. Therefore, even though we have unbiased matching, the book value under HC^{CRUM} is still less than that under fair value accounting.

The second part of Lemma 1 further shows that compared to HC^{CRUM}, HC with accrual-based revenue recognition and conservative expense matching could be more or less conservative. More specifically,

$$\frac{E_0[B_1^{HC}]}{E_0[B_1^{CRUM}]} < (=,>) 1 \text{ if } E_0[EXP_1^{CB}] > (=,<) \frac{(1-\beta^0)E_0[C_2]}{E_0[C_1]+E_0[C_2]} E_0[TE],$$

where *TE* is the total earnings across the entire transaction cycle. Compared with HC^{CRUM}, HC affects earnings in period 1 in two offsetting ways. On the one hand, by recognizing revenue in period 1 based on realizable cash inflow in period 2, i.e., $(1-\beta^0)E_0[C_2]$, HC recognizes revenue faster than HC^{CRUM}. On the other hand, the additional expense ($E_0[EXP_1^{CB}]$) due to conservative-expense-recognition reduces period 1 earnings. The net effect on earnings depends on the relative magnitudes of the two effects.

The fact that earnings in period 1 changes when we switch from FV to HC implies that the growth rate of expected earnings also changes. Next, we examine the relation between earnings growth and risk (β) under HC accounting.

Proposition 1:

Under historical cost accounting with cash-based revenue recognition and unbiased matching (HC^{CRUM}), the growth rate of expected earnings exceeds the growth rate of economic earnings, and is independent of risk (β), i.e., $\frac{E_0[E_2^{CRUM}]}{E_0[E_1^{CRUM}]} > \frac{E_0[E_2^{FV}]}{E_0[E_1^{FV}]}$ *and* $\partial \frac{E_0[E_2^{CRUM}]}{E_0[E_1^{CRUM}]} / \partial\beta = 0$. *With accrual-based revenue recognition and conservative matching (HC), the growth rate of expected earnings increases (does not change, decreases) with risk (β) when the sensitivity of the conservative bias in expense ($E_0[EXP_1^{CB}]$) with respect of β is more than (equal to, less than) that of the transaction-cycle-earnings (TE).*[15]

Note that the transaction-cycle-conformity rule requires that total earnings over the entire transaction cycle are identical under all accounting systems: HC, HC^{CRUM}, and FV. Since HC^{CRUM} is more conservative than FV, it must be the case that

$$\frac{E_0[E_2^{CRUM}]}{E_0[E_1^{CRUM}]} > \frac{E_0[E_2^{FV}]}{E_0[E_1^{FV}]}.$$

However, Proposition 1 also shows that the growth rate of expected earnings under HC^{CRUM} does not depend on β — it is entirely determined by the relative magnitude of cash flows in the two periods.

Interestingly, however, when we introduce accrual-based revenue recognition and conservative expense matching, the growth rate of earnings does depend on risk, β. This is because, under HC accounting, earnings not only reflect expected cash flows, but also depend on the risk associated with expected cash flows. Proposition 1 suggests that even though the growth rate of expected earnings is likely to be different from that under FV accounting, it could still serve as an indicator of risk and expected stock return. More specifically,

[15] Strictly speaking the result should be stated in terms of the inverse of the earnings growth rate, as in the proof, to avoid the zero-or-negative-denominator problem when earning in period 1 becomes negative due to conservative accounting. This caveat applies to all subsequent results concerning the growth rate of expected earnings.

$$\frac{\partial\left[\frac{E_0[E_2^{HC}]}{E_0[E_1^{HC}]}-\frac{E_0[C_2]}{E_0[C_1]}\right]}{\partial\beta} > (=,<)\ 0$$

if and only if

$$\frac{\frac{\partial E_0\left[EXP_1^{CB}\right]}{\partial\beta^1}}{E_0\left[EXP_1^{CB}\right]} > (=,<)\ \frac{\frac{\partial E_0[TE]}{\partial\beta^1}}{E_0[TE]} \text{ and } \frac{\frac{\partial E_0\left[EXP_1^{CB}\right]}{\partial\beta^0}}{E_0\left[EXP_1^{CB}\right]} > (=,<)\ \frac{\frac{\partial E_0[TE]}{\partial\beta^0}}{E_0[TE]} - \frac{E_0[C_2]E_0[TE]}{(E_0[C_1]+E_0[C_2])E_0\left[EXP_1^{CB}\right]}\,. \qquad (16)$$

To understand condition (16), note that although conservative accounting defers earnings recognition from period 1 to period 2, it does not necessarily follow that the growth rate of expected earnings increases with the level of risk. As risk increases, the initial cost of the investment ($-C_0$) also decreases, which in turn increases earnings over the entire transaction cycle (TE). The net impact on the growth of expected earnings thus depends on the relative magnitude of these two effects, which are captured by the sensitivity of conservative bias ($E_0[EXP_1^{CB}]$) to risk and the sensitivity of total transaction-cycle earnings ($E_0[TE]$) to risk. When the sensitivity of the conservative bias is higher, the relation between growth in expected earnings and the expected stock return becomes positive, just as in the fair value accounting case.

The following corollary identifies a more intuitive sufficient condition for the growth rate of expected earnings to be positively related to risk (β).

Corollary 1:

Let θ denote the amount of expected cash flow in period 2 relative to the total amount of expected cash flows over the entire transaction cycle. That is, $\theta \equiv \frac{E_0[C_2]}{E_0[C_1]+E_0[C_2]}$. Assume that expected earnings in period 1 are non-negative. Then there exists a positive threshold level of θ, denoted as θ^A, such that condition (16) holds when

$$\theta > \theta^A. \qquad (17)$$

Condition (17) brings out a key variable, $\frac{E_0[C_2]}{E_0[C_1]+E_0[C_2]}$. As the firm's operation becomes riskier, two things happen: (a) earnings in period 1 are reduced due to increased conservatism; (b) total earnings increases due to larger valuation discount in the cost of the initial investment. Condition (16) compares the two effects: the left-hand side reflects the impact of risk on the amount of conservative bias, the right-hand side captures the effect of risk on total earnings. Note that the conservative bias is applied at time $t=1$, and hence its sensitivity to β is a function of the relative size of the uncertain cash flow remaining at that time (i.e., C_2). The effect of risk on total earnings (and earnings in period 1) is also affected by the relative size of C_2 compared to C_1. Therefore, condition (17) zeroes in on θ, which reflects the growth pattern of cash flows.

The notion of how expected cash flows are distributed over future periods is often referred as cash flow (or equity) duration (Macaulay 1938; Leibowitz, Sorensen, Robert, and Hanson 1989):

$$D = \frac{\frac{E_0[C_1]}{1+r}+\frac{2E_0[C_2]}{(1+r)^2}}{-C_0} = \frac{E_0[TC]}{-(1+r)C_0}\left[1+\frac{1-r}{1+r}\theta\right]$$

where TC is the total transaction-cycle-cash-flows (i.e., $E_0[TC] \equiv E_0[C_1] + E_0[C_2]$). The cash flow duration measure increases with θ, i.e., the relative amount of cash inflows in the more distant future period. This can be seen more clearly using the following undiscounted measure of cash flow duration:

$$D^U = \frac{E_0[C_1]+2E_0[C_2]}{E_0[C_1]+E_0[C_2]} = 1+\theta.$$

The larger the θ, the larger this undiscounted cash flow duration (D^U), indicating that more cash inflows occur in the future.

Incorporating the notion of cash flow duration provides an alternative view of Corollary 1: *Ceteris paribus*, the longer the (undiscounted) cash flow duration, the more likely condition

(17) holds such that the growth rate of expected earnings increases with risk. The reason is intuitive. As the cash flow duration increases, more uncertainty remains at time *t=1*, leading to more conservative expense recognition. At the same time, longer duration means lower revenue and earnings recognized in period 1. Both factors cause the sensitivity of conservative expense to exceed the sensitivity of earnings with respect to β.

4.2 Accruals-to-cash Ratio and the Expected Earnings Yield

Next, we demonstrate that conservative accounting affects accounting earnings yield (*E/P*) and accruals-to-cash (*ACC/C*) ratio, where *ACC* is defined as earnings minus contemporaneous cash flow from operations. Recall that under fair value accounting, the earnings yield fully captures risk, and equals the expected stock return.

Proposition 2:

Under historical cost accounting (HC), the expected accruals-to-cash ratio (or equivalently the accruals-to-earnings ratio) is negatively related (unrelated, or positively related) to β when the cash flow duration θ is above (equal to, or below) the thresholder level θ^A.

Empirical implications of Proposition 2 are intriguing. A *negative* correlation between accruals and subsequent stock returns has been well documented in the empirical literature (e.g., Sloan 1996, Hafzalla et al. 2011).[16] Such a correlation has been widely interpreted as evidence of market mispricing, with the observation that accruals are less persistent than cash flows (they reverse) and the conjecture that the market fixates on accruals as if they are more persistent than they are in reality. Accordingly, stock prices correct in subsequent periods as accruals reverse.

[16] Note that although we use the accrual-to-cash ratio in our analysis to avoid the possibility of having zero or negative earnings in the denominator, it is a simple linear transformation of the accrual-to-earnings ratio used in empirical studies (e.g., Hafzalla et al. 2011). The accruals-to-cash ratio should also correlate with other accruals measures with different deflators, such as the accruals-to-total-assets ratio used in Sloan (1996).

Our analysis also predicts that high accruals are associated with low earnings next period and it also predicts a negative relation between accruals and expected returns. However, these model predications do not arise because of mispricing or investor irrationality. The association between accruals and expected stock returns is due to the incorporation of risk into accruals under conservative accounting. The negative relation reflects risk, not mispricing.

Proposition 3:

There exist $\theta^E > 0$ *such that when*

$$\theta = \frac{E_0[C_2]}{E_0[C_1]+E_0[C_2]} > (=,<)\theta^E, \tag{18}$$

expected earnings yield ($E_0[E_1]/P_0$*) is negatively related (unrelated, positively related) to risk β.*

Proposition 3 shows that, when accounting is conservative, there exists another threshold level of θ, denoted as θ^E, such that earnings yield is *negatively* related to risk when $\theta > \theta^E$. As risk increases, accounting conservatism depresses expected earnings in period 1. At the same time, high risk increases the discount rate which decreases P_0. Proposition 3 shows that when cash flow duration is high, the first effect dominates the second effect such that expected earnings yield decreases. This is in sharp contrast to what we expect under unbiased accounting, where forward E/P is expected to be positively related to risk and stock return.

Note that forward E/P ratio is connected to the book rate of return (ROE_1^{HC}) measure through the book-to-price ratio $\frac{E_0[E_1]}{P_0} = E_0[ROE_1^{HC}]\frac{B_0}{P_0}$. The zero-NPV assumption (1) and the transaction-cycle-conformity assumption (5) imply that $\frac{B_0}{P_0} = 1$. Proposition 3 thus suggests that when condition (18) holds, ROE will also exhibit a "perverse" negative association with the expected stock return. Penman and Zhang (2019) documents this negative association.

Interestingly, expected earnings and $E_0[ROE_1^{HC}]$ also affect the difference between the duration thresholds identified in Propositions 2 and 3. The next corollary explores the relations between conditions (17) and (18) by comparing the difference levels of cash flow thresholds identified in these propositions.

***Corollary 2*:**

When $E_0[E_1^{HC}] > 0$, condition (18) implies condition (17), i.e., $\theta^E \geq \theta^A$. In contrast, when $E_0[E_1^{HC}] < 0$, condition (17) implies condition (18), i.e., $\theta^A \geq \theta^E$.

Corollary 2 shows that the relations between the two conditions depend crucially on whether expected earnings in period 1 are positive or negative. With positive expected earnings, a negative association between earnings yield and risk (β) implies that accruals will be negatively associated with risk — in other words, in terms of the cash flow duration thresholds, $\theta^E \geq \theta^A$. In contrast, when expected earnings in period 1 are negative, the relations reverse. Corollary 2 thus provides a theoretical justification for separating firms with positive and negative earnings when examining the relation among earnings, accruals, and risk as well as expected stock returns in empirical studies.

4.3 Positive Net-present-value Projects

We have assumed so far that the price of the initial investment equals the expected value of future cash inflows, that is, the investment has zero NPV *ex ante*. This makes sense when the equilibrium price of the investment asset fully reflects the cash flows expected to be generated by the investments.

In practice, however, investors in real assets might expect investments to have non-zero NPVs. Entrepreneurs, for instance, can identify production, marketing, or investment opportunities unknown to others, leading to economic rents. In addition, entrepreneurs may process exclusive rights such as patents or know-how which prevent potential competitors from competing away economic rents and driving up the price of real assets. In this case, the NPV will be positive. We now examine how the results in Sections 4.1 and 4.2 are affected when investments have positive NPVs.[17]

Assume that the price of investment, $-C_0$, is fixed and less than the present value of future cash flows such that the NPV is positive. That is

$$-C_0 < \frac{E_0[C_1]}{1+r} + \frac{E_0[C_2]}{(1+r)^2}. \tag{19}$$

When assuming positive NPV, it is important to distinguish the information set on which each expectation, $E_0[.]$, is based. For simplicity, we assume that after the investment is made, information regarding the expected risk of future cash flows is revealed, either through the accounting report or other information channels, and the price of the firm fully incorporates the information. In other words, we assume that expected stock return still fully reflects the risk in future cash flows.

***Proposition 4*:**

Assume that the initial investment ($-C_0$) is fixed and that the investment NPV is positive. Then the relation between expected earnings growth and risk β will be positive. The relation between the accruals-to-cash ratio and risk (β) will be negative. Forward E/P ratio will be negatively related to β when condition (18) holds.

[17] With negative NPV projects, conservative accounting would require an immediate write off which brings the book value equal to the NPV of the investments. The case then becomes similar to the zero NPV case after the asset write off.

As shown in the proof of Proposition 4, with positive NPV, condition (17) hold as long as the amount of conservative expenses increases with risk. This is because total earnings no longer vary with risk (β) as the initial investment ($-C_0$) is exogenously fixed. In other words, the expected accrual-to-cash ratio will be negatively related to the expected stock returns regardless of the cash flow duration. However, unlike C_0, stock price incorporates the amount of NPV. Hence the relation between the forward earnings yield and risk still depends of the duration of cash flows as in the zero NPV case.

4.4 Financial and Operating Assets

Our analysis so far is conducted based on the simplified assumption of full dividend payout. In this section, we examine how delayed dividend payout affects the results. Following Feltham and Ohlson (1995), we assume that any unpaid dividends are saved as financial assets (FA) which earn interests (INT) at the risk-free rate. That is

$$FA_t = (1 + r^{RF})FA_{t-1} - DIV_t + CFO_t. \tag{20}$$

The initial amount of financial assets equals zero. Subsequently, the amount is determined by a firm's dividend policy. As discussed in Feltham and Ohslon (1995), assumption (20) implies that dividends displace market value on a dollar-for-dollar basis so that dividend policy irrelevancy applies (Modigliani and Miller 1958).

Although dividend policy is irrelevant for the cum dividend market value, it does affect the relation between earnings and expected stock returns. Note that accounting for financial assets follows fair value accounting, which reflects the relatively low level of risk associated with financial assets. The expected return on financial assets equals the risk-free rate, which is unrelated to ratios such as earnings growth or the accruals-to-cash. As a result, any relation between operating earnings and the expected stock returns, as discussed in Section 4.1 and 4.2, will be attenuated by the presence of financial assets.

The above observation, nonetheless, brings out a distinctive feature of conservative-accounting-induced relation between earnings and risk (as well as expected returns): it varies between operating and financing activities. This is because accounting for operating assets and financial assets differ in the degree of conservatism, with conservative accounting applied to operating assets. As a result, for instance, operating accruals are negatively related to operating risk, while financial accruals are unrelated to such risk.

5. MULTI-TRANSACTION-CYCLE SETTING: INVESTMENT GROWTH

With the assumption of transaction-cycle-conformity, accounting conservatism shifts earnings across periods within one transaction cycle. When the off-balance sheet reserves from conservative accounting are released to earnings in a later period (if the uncertainty that triggers conservatism is resolved favorably), earnings will, on average, be inflated compared to the fair value accounting level. To examine the total effect of accounting conservatism on earnings with multiple overlapping transaction cycles, we need to identify the net effect of earnings-decreasing accruals in the early part of a transaction cycle and the earnings-increasing accruals in the later part of a transaction cycle. In this section, we extend our model by including multiple overlapping transaction cycles where both effects are at work in any given accounting period. To simplify the exposition, we assume zero-NPV and full dividend payout.

Suppose that identical two-period investments are made in each period, with the same cash flow pattern distributed over the two following consecutive periods, as assumed in Section 3. In each period *t*, cash flows from operations consist of two cash inflows: one from the investment made in the previous period *t-1*, and one from investment made two periods earlier.

Assume that investments are expected to grow at a rate of $1+g_1$ next period, and at a rate of $1+g_2$ the period after, etc. During each transaction cycle, earnings over the two consecutive periods are distributed at a ratio of *1:k*. As shown in Section 4, *k*, which represents the relative amounts of earnings recognized in the two periods over a transaction cycle, increases with the level of accounting conservatism when condition (16) holds. The expected earnings in each period are as follows:

Period 1:	x		
Period 2:	kx +	$(1+g_1)x$	
Period 3:		$(1+g_1)kx$ +	$(1+g_2)(1+g_1)x$
Period 4:			$(1+g_2)(1+g_1)kx$ + … (21)

where x denotes the amount of earnings in period 1 from the first investment made at time 0.

5.1 Growth Rate in Expected Earnings

Proposition 5:

When condition (16) holds, the growth rate of expected earnings has a negative (zero, positive) relation with expected stock return when the expected growth rates of investment accelerate (remain stable, decelerate). That is,

$$\frac{\partial \frac{E_0[E_3^{HC}]}{E_0[E_2^{HC}]}}{\partial k} < (=,\ >)\ 0 \text{ when } g_2 > (=,<) g_1.$$

When condition (16) does not hold, the relations reverse. That is, the growth rate of expected earnings has a positive (zero, negative) relation with expected stock return when the expected growth rates of investment accelerate (remain stable, decelerate).

With multiple transaction cycles, the growth rate of expected earnings from period 2 to period 3 is affected by the growth in investments as well as accounting conservatism:

$$\frac{E_0[E_3^{HC}]}{E_0[E_2^{HC}]} = (1 + g_1) + \frac{(g_2 - g_1)(1+g_1)}{k+(1+g_1)} \tag{22}$$

where g_1 and g_2 are the expected growth rate of investments in periods 1 and 2 respectively. In the case when a firm has constant growth rates g_2=g_1, Equation (22) shows

$$\frac{E_0[E_3^{HC}]}{E_0[E_2^{HC}]} = (1 + g_1)$$

regardless of conservatism. That is, earnings growth is completely determined by the constant investment growth rate. Accounting conservatism ceases to matter.

However, when investment deviates from a constant-growth state, the growth rate of expected earnings is related to the expected stock return. With anticipated growth in investment at time *t=2*, earnings in period 2 are depressed due to conservatism, leading to less anticipated earnings growth. In contrast, with anticipated deceleration in investment growth, the effect of releasing reserves from prior conservatism will dominate, causing the growth rate of expected earnings to be positively related to the expected stock returns.

The case when a firm is experiencing accelerating investment growth deserves special attention. In this case, expected earnings growth will be *negatively* related to the expected stock return, which is the exact opposite of what we expect with fair value accounting: when the cost of capital is high, we expect earnings to grow at a higher rate. Proposition 5 thus highlights the need to control for the difference in the investment growth rate when studying the association between earnings growth and stock returns.

5.2 Accruals-to-cash Ratio

In a multi-transaction-cycle setting, accruals in any period are affected by both the reserve creation effect of accounting conservatism and by the releasing of reserves built in prior periods. In addition, the denominator of the accruals-to-cash ratio is also affected by the cash inflows from both consecutive transaction cycles. The next proposition dissects the various effects.

Proposition 6*:*

When condition (17) holds, there exists a threshold level of investment growth g_1, denoted as g^A, such that the expected accruals-to-cash ratio in period 2 has a negative (zero, positive) relation with the expected stock return when g_1 is greater than (equal to, less than) g^A. When condition (17) does not hold, the expected accruals-to-cash ratio in period 2 is positively related to the expected stock return regardless of g_1.

With overlapping transaction cycles, the expected accruals-to-cash ratio in period 2 is a weighted average of two components:

$$\frac{E_0[ACC_2^{HC}]}{E_0[CFO_2]} = [w_a a_1 + (1 - w_a) a_2] \text{ -1.}$$

The first component (a_1) captures the "reserve-creating" effect of conservative accounting on the accruals-to-cash ratio. It equals the expected accruals-to-cash ratio in the single-transaction-cycle case, which decreases with risk (β) when condition (17) holds. The second component (a_2), which captures the "reserve-releasing" effect of conservative accounting, increases with risk (β).

The relative weight on a_1, w_a, is an increasing function of the investment growth (g_1):

$$w_a = \frac{(1+g_1)[E_0[C_1]}{E_0[C_2]+(1+g_1)[E_0[C_1]}.$$

With zero growth, i.e., g_1=0, it can be shown that $\frac{E_0[ACC_2^{HC}]}{E_0[CFO_2]} = \frac{E_0[C_1]+E_0[C_2]+C_0}{E_0[C_2]+E_0[C_1]} - 1$. In this case, since $\frac{\partial(-C_0)}{\partial\beta} < 0$, $\frac{E_0[ACC_2^{HC}]}{E_0[CFO_2]}$ is positively related to expected stock returns. As g_1 increases, more weight will be shifted toward a_1, which is negatively related to risk. Once g_1 crosses the threshold level g^A, the "reserve-creating" effect will dominate such that the expected accruals-to-cash ratio will be negatively related to the expected stock return. This negative relation between accruals and future stock return is due to conservative accounting rather than market inefficiency.

The threshold level of investment growth, g^A, is also affected by the single-transaction-cash flow duration θ. The next corollary explores this relationship.

***Corollary 3*:**

Assume condition (17) holds. Then the threshold level of investment growth, g^A, decreases with the single-transaction-cycle cash flow duration θ.

Figure 1 provides an illustration of how cash flow duration within each transaction cycle and the investment growth jointly affect the relation between accruals and expected stock return. Two observations are worth highlighting. First, there is a substitutive relationship between the two effects, which is intuitive. As the cash flow duration increases, the "reserve-creating" effects get stronger, which in turn decrease the threshold level of investment growth for the relation between accruals and expected returns to be negative. Second, the two effects are not completely substitutes. There is a minimum level for the single-transaction-cycle cash flow duration, i.e., θ^A as specified in condition (17). If condition (17) is not met, then no matter how high the investment growth rate g_1 is, accruals would still be positively related to expected stock returns. Similar, with zero or negative growth in investment, the relation remains positive regardless of θ.

5.3 Earnings Yield (E/P)

Similar to the case of the accruals-to-cash ratio, both the numerator and the denominator of the earnings yield (*E/P*) are affected by investment and cash flows from both of the consecutive transaction cycles. In addition, as investment projects become riskier, the amount (and price) of each investment decreases due to the increase in risk. The following proposition shows how these factors affect earnings yield, given the conservative bias in accounting.

Proposition 7:

When condition (18) holds, there exists a threshold level of investment growth g_1, denoted as g^E, such that the expected earnings yield in period 2 has a negative (zero, positive) relation with the expected stock return when g_1 is greater than (equal to, less than) g^E. In addition, g^E decreases with single-transaction-cycle cash flow duration θ. When condition (18) does not hold, the expected earnings yield in period 2 has a positive relation with the expected stock return regardless of g_1.

With overlapping transaction cycles, the expected earnings yield in period 2 is a weighted average of two components:

$$\frac{E_0[E_2^{HC}]}{E_0[P_1]} = w_e e_1 + (1 - w_e) e_2.$$

The first component (e_1) equals the expected earnings yield in the single-transaction-cycle case, which decreases with risk (β) when condition (18) holds. The second component (e_2), however, increases with risk (β).

The similarity between the above result and that of accruals in Proposition 7 is intriguing. In both cases, the effect of conservative accounting is decomposed into two components: the "reserve-creating" component and the "reserve-releasing" component. Intuitively, earnings are depressed (inflated) when reserves are created (released). Hence the two components of conservative accounting have opposite effects on the relation between either the accruals-to-cash or the forward E/P ratio with future stock return.

The relative weight on e_1 is an increasing function of investment growth:

$$w_e = \frac{(1+g_1)(-C_0)}{\frac{E_0[C_2]}{1+r}+(1+g_1)(-C_0)}.$$

When a firm is in a steady state with zero growth, $g_1 = 0$, following the proof of Proposition 7, we have

$$\frac{E_0\left[E_2^{HC}\right]}{E_0[P_1]} = \frac{E_0[C_1]+E_0[C_2]-P_0}{\frac{E_0[C_2]}{1+r}+P_0} \quad .$$

Assumption (1) implies that the right-hand side of the above equation equals the discount rate, r. That is, with no growth, *E/P* exactly equals the expected stock return, as conjectured by Ball (1978) for example. This is a manifestation of the well-known "cancelling error" effect of accounting: when there is no growth, earnings equal to economic income regardless of the amount of bias in the accounting.

As g_1 increases, more weight will be shifted toward e_1, which is negatively related to risk. Once g_1 crosses the threshold level g^E, the "reserve-creating" effect will dominate such that the forward E/P ratio will be negatively related to the expected stock return.

The prediction of a negative association between earnings yield and expected stock return is a result that is again due to the conservative bias in accounting. Such a negative association is in sharp contrast to the traditional belief that earnings yield provides a good indicator of expected stock return. Note, however, that our analysis of the no-growth case suggests that even with mild investment growth, E/P is positively related to expected return due to the "cancelling error" effect. However, when the investment growth rate is high, especially when earnings become negative, E/P becomes negatively associated with the expected stock return.

The next corollary explores the relation between the threshold levels of investment growth identified in Propositions 6 and 7.

***Corollary 4*:**

Assume conditions (17) and (18) hold. The threshold level of investment growth for accruals to be negatively related to risk (i.e., g^A) is less than (equal to, greater than) that for earning yield to be negatively related to risk (i.e., g^E) when expected earnings ($E_0[E_2^{HC}]$) is positive (zero, negative).

With positive earnings, a negative relation between earnings yield and risk implies a negative relation between accruals and risk. Figures 1 illustrate how transaction-cycle-cash-flow duration and investment growth jointly affect the relationships between accruals, earnings yield, and risk. The relation reverses when we have negative earnings. That is, a negative relation between accruals and risk implies a negative relation between earnings yield and risk. In terms of Figure 1, the relative size of the two shaded areas would reverse. These results, again, highlight the importance of separating firms with positive and negative earnings when examining the relations among earnings, accruals, and risk as well as expected stock returns in empirical studies.

6. CONCLUDING REMARKS

Our analysis covers a single-transaction-cycle case and an overlapping multi-transaction-cycle case. More generally, depending on the length of a company's investment cycle, a firm's operations can be viewed as a combination of various transaction cycles. Some investments, such as building up brand name and developing know-how, have long investment cycles that may span the entire life of the firm. Others, such as purchasing inventories, have shorter cycles. The former can be better captured by the result of sections 3 and 4, while the latter can be modeled using the setup of section 5. The overall effects of conservative accounting and earnings will be a combination of the two.

Accounting conservatism is applied when there is significant degree of uncertainty in future cash flows, causing a lack of reliable information to measure the business activity in question. In applying the conservatism principle, accountants usually choose, between any two equally acceptable alternatives, one that will result in a lesser asset amount and/or less profit. In this paper, we show how conservative accounting, in response to uncertainty, incorporates risk and the expected return in an asset pricing framework.

Our analysis reveals both accounting-based as well as accounting-and-market-based measures that can be used to infer the level of risk and expected stock return when accounting is conservative. We show how the conservative bias in accounting affects the dynamics of earnings and the relationships between the earnings growth, accruals, earnings yield, and the expected stock return. In particular, we show how the accruals ratio, return on equity, and the earnings yield can be negatively related to the expected stock return as a result of accounting conservatism.

Uncertainty is different from risk. Not all kinds of uncertainty will translate into the same level of risk priced by investors. In our analysis, we abstract away the details of the linkage between uncertainty and risk to better highlight the effect of accounting conservatism. Our study can be thought of as analyzing a case where the link from uncertainty to priced risk is being held constant. Further study incorporating an explicit analysis of priced risk and uncertainty may better examine how various types of uncertainty affects the relation between earnings and the cost of capital.

Another promising direction to extend this research is to incorporate a link between investment growth and risk. In our setting, investment growth is determined exogenously in order to highlight the relation between earnings and expected stock return, holding investment growth constant. Prior research has proposed various links between investment growth and cost of capital (e.g., Aretz and Pope 2018). Incorporating such links would further enrich the model, and show how the relation between earnings and expected stock return changes, endogenously, with investment growth.

APPENDIX 1
Proofs

Observation 1:

From equations (1)-(4), $-C_0 = P_0 = \frac{E_0[C_1]}{1+r} + \frac{E_0[C_2]}{(1+r)^2} = \frac{E_0[C_1]+COV(C_1,Q_{01})}{1+r_1^{RF}} + \frac{E_0[C_2]+COV(C_2,Q_{02})}{(1+r_1^{RF})(1+r_2^{RF})}$

$$= \frac{(1-\beta^0)E_0[C_1]+\beta^0(1-\beta^1)E_0[C_1]}{1+r_1^{RF}} + \frac{(1-\beta^0)E_0[C_2]+\beta^0(1-\beta^1)E_0[C_2]}{(1+r_1^{RF})(1+r_2^{RF})} = \frac{(1-\beta^0\beta^1)E_0[C_1]}{1+r_1^{RF}} + \frac{(1-\beta^0\beta^1)E_0[C_2]}{(1+r_1^{RF})(1+r_2^{RF})}.$$

Taking derivative on both sides with respect to β^0,

$$[\partial(-C_0)/\partial r]\frac{\partial r}{\partial \beta^0} = -\frac{\beta^1 E_0[C_1]}{1+r_1^{RF}} - \frac{\beta^1 E_0[C_2]}{(1+r_1^{RF})(1+r_2^{RF})}.$$

Since $\partial(-C_0)/\partial r < 0$ and $C_0 < 0$, we get

$$\frac{\partial r}{\partial \beta^0} = \frac{\frac{\beta^1 E_0[C_1]}{1+r_1^{RF}} + \frac{\beta^1 E_0[C_2]}{(1+r_1^{RF})(1+r_2^{RF})}}{\partial C_0/\partial r} > 0 . \qquad \text{(A1)}$$

Similarly, $\partial r/\partial \beta^1 > 0$.

Observation 2:

Equations (2), (6), and (7) imply $E_0[E_1^{FV}] = \frac{E_0[C_1]}{1+r}r + \frac{E_0[C_2]}{(1+r)^2}r$ and $E_0[E_2^{FV}] = \frac{E_0[C_2]}{1+r}r$.

Therefore $\frac{E_0[E_2^{FV}]}{E_0[E_1^{FV}]} = \frac{\frac{E_0[C_2]}{1+r}r}{\frac{E_0[C_1]}{1+r}r + \frac{E_0[C_2]}{(1+r)^2}r} = \frac{E_0[C_2]}{E_0[C_1]+\frac{E_0[C_2]}{1+r}}$. (A2)

It follows from (A2) and (A1) that $\frac{\partial \frac{E_0[E_2^{FV}]}{E_0[E_1^{FV}]}}{\partial \beta} = \frac{\partial r}{\partial \beta}\frac{E_0[C_2]^2}{(E_0[C_1]+\frac{E_0[C_2]}{1+r})^2}\frac{1}{(1+r)^2} > 0.$

Lemma 1:

From equations (8) and (9), with HC[CRUM], $E_0[B_1^{CRUM}] = \frac{E_0[C_2]}{E_0[C_1]+E_0[C_2]}B_0$.

From equations (2) and (7), with fair value accounting, $E_0[B_1^{FV}] = \frac{E_0[C_2]}{1+r}$.

$$E_0[B_1^{CRUM}] - E_0[B_1^{FV}] = \frac{E_0[C_2]}{E_0[C_1]+E_0[C_2]}B_0 - \frac{E_0[C_2]}{1+r}$$

$$= E_0[C_2]\left[\frac{E_0[C_1]/(1+r)+E_0[C_2]/(1+r)^2}{E_0[C_1]+E_0[C_2]} - \frac{1}{1+r}\right] = E_0[C_2]\left[\frac{1}{1+r}\left(-\frac{E_0[C_2]\frac{r}{1+r}}{E_0[C_1]+E_0[C_2]}\right)\right] < 0.$$

Therefore $E_0[B_1^{CRUM}] < E_0[B_1^{FV}]$.

Compare (8)-(9) with (10)-(12), it follows that

$$E_0[B_1^{HC}] = E_0[B_1^{CRUM}] + \frac{(1-\beta^0)E_0[C_2]}{E_0[C_1]+E_0[C_2]}E_0[TE] - E_0[EXP_1^{CB}].$$

Hence $E_0[B_1^{HC}] < (=,>) E_0[B_1^{CRUM}]$ if $E_0[EXP_1^{CB}] > (=,<) \frac{(1-\beta^0)E_0[C_2]}{E_0[C_1]+E_0[C_2]}E_0[TE]$.

Proposition 1:

Note that transaction-cycle-conformity assumption (5) and the clean surplus assumption (6) imply $E_0[E_1^{CRUM}] + E_0[E_2^{CRUM}] = E_0[E_1^{FV}] + E_0[E_2^{FV}]$.

Therefore, from Lemmas 1 we conclude $\frac{E_0\left[E_1^{HC^{UM}}\right]}{E_0\left[E_2^{HC^{UM}}\right]} < \frac{E_0[E_1^{FV}]}{E_0[E_2^{FV}]}$.[18]

Note also that $\frac{E_0[E_1^{CRUM}]}{E_0[E_2^{CRUM}]} = \frac{\frac{E_0[C_1]}{E_0[C_1]+E_0[C_2])}E_0[TE]}{\frac{E_0[C_2]}{E_0[C_1]+E_0[C_2])}E_0[TE]} = \frac{E_0[C_1]}{E_0[C_2]}$, hence $\frac{\partial(E_0[E_1^{CRUM}]/E_0[E_2^{CRUM}])}{\partial\beta} = 0$.

Under historical cost accounting with accrual revenue and conservative expense matching (HC),

$$E_0[E_2^{HC}] = \left[E_0[C_{2a}] - \frac{E_0[C_{2a}]}{E_0[C_1]+E_0[C_2]}B_0\right] + E_0[EXP_1^{CB}].$$

Note that $E_0[TE] = E_0[E_1^{HC}] + E_0[E_2^{HC}] = E_0[C_1] + E_0[C_2] + C_0$. Hence

$\frac{E_0[E_1^{HC}]}{E_0[E_2^{HC}]} = \frac{E_0[TE]}{E_0[E_2^{HC}]} - 1$. Therefore $\frac{E_0[E_1^{HC}]}{E_0[E_2^{HC}]}$ is decreasing in $\frac{E_0[E_2^{HC}]}{E_0[TE]}$.

$$\frac{E_0[E_2^{HC}]}{E_0[TE]} = \frac{\left[\beta^0 E_0[C_2] - \frac{\beta^0 E_0[C_2]}{E_0[C_1]+E_0[C_2]}(-C_0)\right] + E_0[EXP_1^{CB}]}{E_0[C_1]+E_0[C_2]+C_0} = \left[\frac{\beta^0 E_0[C_2]}{E_0[C_1]+E_0[C_2]}\right] + \frac{E_0[EXP_1^{CB}]}{E_0[TE]}.$$

Therefore $\frac{\partial \frac{E_0[E_2^{HC}]}{E_0[TE]}}{\partial\beta} > (=,<) 0$ if and only if

[18] In all proofs we examine the inverse of the growth rate of expected earnings, i.e., with the earnings in period 2 as the denominator, or the ratio of earnings in period 2 to total expected earnings, to avoid the negative-denominator problem when earnings in period 1 becomes negative due to conservative accounting.

$$\frac{\partial \frac{E_0\left[EXP_1^{CB}\right]}{E_0[TE]}}{\partial \beta^1} > (=,<) 0 \text{ and } \frac{\partial \frac{E_0\left[EXP_1^{CB}\right]}{E_0[TE]}}{\partial \beta^0} > (=,<) -\frac{E_0[C_2]}{E_0[C_1]+E_0[C_2]}, \text{ i.e.,}$$

$$\frac{\frac{\partial E_0\left[EXP_1^{CB}\right]}{\partial \beta^1}}{E_0\left[EXP_1^{CB}\right]} > (=,<) \frac{\frac{\partial E_0[TE]}{\partial \beta^1}}{E_0[TE]} \text{ and } \frac{\frac{\partial E_0\left[EXP_1^{CB}\right]}{\partial \beta^0}}{E_0\left[EXP_1^{CB}\right]} > (=,<) \frac{\frac{\partial E_0[TE]}{\partial \beta^0}}{E_0[TE]} - \frac{E_0[C_2]E_0[TE]}{(E_0[C_1]+E_0[C_2])E_0\left[EXP_1^{CB}\right]}.$$

Corollary 1:

$$\frac{\partial(1-\beta^0\theta)E_0[TE]}{\partial \beta^1} = (1-\beta^0\theta)\beta^0\left[\frac{E_0[C_1]}{1+r_1^{RF}} + \frac{E_0[C_2]}{(1+r_1^{RF})(1+r_2^{RF})}\right]$$

$$= (E_0[C_1]+E_0[C_2])\frac{\beta^0(1-\beta^0\theta)(1+r_2^{RF}(1-\theta))}{(1+r_1^{RF})(1+r_2^{RF})}. \tag{A3}$$

Note that $\beta_0\beta_1 > r_2^{RF}$ implies $\frac{1}{\beta_0} < \frac{1+r_2^{RF}}{r_2^{RF}}$ and $\theta < \frac{1+r_2^{RF}}{r_2^{RF}}$. Since $\frac{\partial \frac{E_0\left[EXP_1^{CB}\right]}{E_0[C_1]+E_0[C_2]}}{\partial \beta} > 0$ and

$\frac{\partial^2 \frac{E_0\left[EXP_1^{CB}\right]}{E_0[C_1]+E_0[C_2]}}{\partial \beta \partial \theta} > 0$, it follows from (A3) that there exists $\theta^A > 0$ such that when $\theta > \theta^A$,

$\frac{\partial \frac{E_0[EXP_1^{CB}]}{E_0[C_1]+E_0[C_2]}}{\partial \beta^1} > \frac{\beta^0(1-\beta^0\theta)(1+r_2^{RF}(1-\theta))}{(1+r_1^{RF})(1+r_2^{RF})}$. That is, $\frac{\partial E_0[EXP_1^{CB}]}{\partial \beta^1} > \frac{\partial(1-\beta^0\theta)E_0[TE]}{\partial \beta^1}$.

Note also that $\frac{E_0\left[EXP_1^{CB}\right]}{E_0[TE]} = \frac{E_0\left[E_1^{HC^{UM}}\right]-E_0\left[E_1^{HC}\right]}{E_0[TE]} = \frac{(1-\beta^0\theta)E_0[TE]-E_0\left[E_1^{HC}\right]}{E_0[TE]} = 1-\beta^0\theta-\frac{E_0\left[E_1^{HC}\right]}{E_0[TE]}$.

Therefore, when $E_0[E_1^{HC}] > 0$, $\frac{\partial E_0\left[EXP_1^{CB}\right]}{\partial \beta^1} > (1-\beta^0\theta)\frac{\partial E_0[TE]}{\partial \beta^1}$ implies

$\frac{\partial E_0\left[EXP_1^{CB}\right]}{\partial \beta^1} > \frac{E_0\left[EXP_1^{CB}\right]}{E_0[TE]}\frac{\partial E_0[TE]}{\partial \beta^1}$. That is, $\frac{\partial \frac{E_0\left[EXP_1^{CB}\right]}{E_0[TE]}}{\partial \beta^1} > 0$.

Result with respect to β^0can be proven following similar steps outlined above.

Proposition 2:

Condition (17) $\Leftrightarrow \frac{E_0\left[EXP_1^{CB}\right]}{\partial \beta^1} > (1-\beta^0\theta)\frac{\partial E_0[TE]}{\partial \beta^1}$

$\Leftrightarrow \frac{\partial\left((1-\beta^0\theta)E_0[TE]-E_0\left[EXP_1^{CB}\right]\right)}{\partial \beta^1} < 0$

$\Leftrightarrow \frac{\partial E_0[E_1^{HC}]}{\partial \beta^1} < 0$. Therefore $\frac{\partial \frac{E_0[E_1^{HC}]}{E_0[C_1]}}{\partial \beta^1} < 0$.

Result with respect to β^0can be proven in a similar way.

Proposition 3:

Note that $\frac{\partial \frac{E_0[E_1^{HC}]}{E_0[P_0]}}{\partial \beta^1} < 0 \Leftrightarrow \frac{\partial E_0[E_1^{HC}]}{\partial \beta^1} E_0[P_0] - E_0[E_1^{HC}] \frac{\partial E_0[P_0]}{\partial \beta^1} < 0$

$\Leftrightarrow \frac{\partial((1-\beta^0\theta)E_0[TE]-E_0[EXP_1^{CB}])}{\partial \beta^1}(E_0[C_1] + E_0[C_2] - E_0[TE]) + E_0[E_1^{HC}] \frac{\partial E_0[TE]}{\partial \beta^1} < 0$

$\Leftrightarrow \frac{\partial E_0[EXP_1^{CB}]}{\partial \beta^1}(E_0[C_1] + E_0[C_2] - E_0[TE]) > (1 - \beta^0\theta) \frac{\partial E_0[TE]}{\partial \beta^1}(E_0[C_1] + E_0[C_2] - E_0[TE]) +$

$E_0[E_1^{HC}] \frac{\partial E_0[TE]}{\partial \beta^1}$

$\Leftrightarrow \frac{\partial E_0[EXP_1^{CB}])}{\partial \beta^1} > \left[1 - \beta^0\theta + \frac{E_0[E_1^{HC}]}{E_0[C_1]+E_0[C_2]-E_0[TE]}\right] \frac{\partial E_0[TE]}{\partial \beta^1}$

$\Leftrightarrow \frac{\partial E_0[EXP_1^{CB}])}{\partial \beta^1} > \left[1 - \beta^0\theta + E_0[ROE_1^{HC}]\right] \frac{\partial E_0[TE]}{\partial \beta^1}$

$$\Leftrightarrow \frac{\partial(E_0[EXP_1^{CB}]/(E_0[C_1]+E_0[C_2]))}{\partial \beta^1} > \frac{\beta^0(1-\beta^0\theta+E_0[ROE_1^{HC}])(1+r_2^{RF}(1-\theta))}{(1+r_1^{RF})(1+r_2^{RF})} \tag{A4}$$

Note that $\beta_0\beta_1 > r_2^{RF}$implies $\frac{\beta_0}{(1-\beta_0\theta)} > \frac{r_2^{RF}}{\rho[1+r_2^{RF}-r_2^{RF}\theta])}$ which then implies $\frac{\partial E_0[ROE_1^{HC}]}{\partial \theta} < 0$.

Therefore, it follows from (A4) that there exist $\theta^E > 0$ such that when $\theta > \theta^E$, condition (A4) holds such that $\frac{\partial \frac{E_0[E_1^{HC}]}{E_0[P_0]}}{\partial \beta^1} < 0$. Similarly we can prove the result with respect to β^0.

Corollary 2:

Proposition 2 shows that $\frac{\partial \frac{E_0[E_1^{HC}]}{E_0[C_1]}}{\partial \beta^1} < 0$ if and only if

$$\frac{\partial E_0[EXP_1^{CB}]}{\partial \beta^1} > (1 - \beta^0\theta) \frac{\partial E_0[TE]}{\partial \beta^1} \tag{A5}$$

Proposition 3 shows that $\frac{\partial \frac{E_0[E_1^{HC}]}{E_0[P_0]}}{\partial \beta^1} < 0$ if and only if

$$\frac{E_0[EXP_1^{CB}]}{\partial \beta^1} > (1 - \beta^0\theta + E_0[ROE_1^{HC}])\frac{\partial E_0[TE]}{\partial \beta^1}. \quad \text{(A6)}$$

Therefore, when $E_0[ROE_1^{HC}]$>0, (A6) => (A5).

When $E_0[ROE_1^{HC}]$ <0, we get (A5) => (A6).

Proposition 4:

With positive NPV, according to (19), $-C_0$ is fixed and different from P_0. Total earnings is not affected by β:

$$\frac{\partial E_0[TE]}{\partial \beta} = 0.$$

Note also that $\frac{\partial E_0[E_1^{HC}]}{\partial \beta} < 0$ and $\frac{\partial E_0[EXP_1^{CB}]}{\partial \beta} \geq 0$. Therefore, $\frac{\partial \frac{E_0[E_2^{HC}]}{E_0[TE]}}{\partial \beta} > 0$ and $\frac{\partial \frac{E_0[ACC_1^{HC}]}{E_0[C_1]}}{\partial \beta} < 0$.

The result regarding the earnings yield, however, depends on how we measure price (either before or after information regarding future cash flows are incorporated into price). Assuming that price incorporates all information regarding future cash flows, then the relation between forward earnings yield and expected stock returns will be the same as in Proposition 3. However, if we assume that price equals $-C_0$, then we will have $\frac{\partial \frac{E_0[E_1^{HC}]}{E_0[P_0]}}{\partial \beta} < 0$ regardless of cash flow duration.

Proposition 5:

From assumption (21), expected earnings in each period are:

Period 1: x

Period 2: $kx + (1+g_1)x$

Period 3: $(1+g_1)kx$ + $(1+g_2)(1+g_1)x$

Period 4: $(1+g_2)(1+g_1)kx$ + …

Therefore, expected earnings growth rate equals:

$$\frac{E_0[E_3^{HC}]}{E_0[E_2^{HC}]}=\frac{(1+g_1)kx+(1+g_2)(1+g_1)x}{kx+(1+g_1)x}=(1+g_1)+\frac{(g_2-g_1)(1+g_1)x}{kx+(1+g_1)x}=(1+g_1)+\frac{(g_2-g_1)(1+g_1)}{k+(1+g_1)}.$$

$$\frac{\partial\frac{E_0[E_3^{HC}]}{E_0[E_2^{HC}]}}{\partial\beta}=-\frac{(g_2-g_1)(1+g_1)}{(k+(1+g_1))^2}\frac{\partial k}{\partial\beta}.$$

Proposition 6:

Expected earnings in period 2 equals

$$E_0[E_2^{HC}]=\beta^0E_0[C_2]-\frac{\beta^0E_0[C_2]}{E_0[C_1]+E_0[C_2]}B_0+E_0[EXP_1^{CB}]$$

$$+(1+g_1)(E_0[C_1]+(1-\beta^0)E_0[C_2])-\frac{[E_0[C_1]+(1-\beta^0)E_0[C_2]]}{E_0[C_1]+E_0[C_2]}(1+g_1)B_0-(1+g_1)E_0[EXP_1^{CB}].$$

Expected net cash from operations in period 2 equals:

$$E_0[CFO_2]=E_0[C_2]+(1+g_1)E_0[C_1].$$

$$\frac{E_0[E_2^{HC}]}{E_0[CFO_2]}=\frac{\beta^0E_0[C_2]-\frac{\beta_0E_0[C_2]}{E_0[C_1]+E_0[C_2]}B_0+E_0[EXP_1^{CB}]}{E_0[C_2]+(1+g_1)E_0[C_1]}$$

$$+\frac{(1+g_1)(E_0[C_1]+(1-\beta^0)E_0[C_2])-\frac{[E_0[C_1]+(1-\beta^0)E_0[C_2]]}{E_0[C_1]+E_0[C_2]}(1+g_1)B_0-(1+g_1)E_0[EXP_1^{CB}]}{E_0[C_2]+(1+g_1)E_0[C_1]}$$

Let $w_a=\frac{(1+g_1)[E_0[C_1]}{E_0[C_2]+(1+g_1)E_0[C_1]}$, then

$$\frac{E_0[E_2^{HC}]}{E_0[CFO_2]}=w_a\frac{E_0[C_1]+(1-\beta^0)E_0[C_2]-\frac{[E_0[C_1]+(1-\beta^0)E_0[C_2]]}{E_0[C_1]+E_0[C_2]}B_0-E_0[EXP_1^{CB}]}{E_0[C_1]}$$

$$+(1-w_a)\frac{\beta^0E_0[C_2]-\frac{\beta^0E_0[C_2]}{E_0[C_1]+E_0[C_2]}B_0+E_0[EXP_1^{CB}]}{E_0[C_2]}.$$

Note that $\frac{\partial w_a}{\partial g_1} >$. When $g_1 = 0$, $\frac{E_0[ACC_2^{HC}]}{E_0[CFO_2]} = \frac{\beta^0 E_0[C_2] + \frac{\beta^0 E_0[C_2]}{E_0[C_1]+E_0[C_2]} C_0 + E_0[EXP_1^{CB}]}{E_0[C_2]+E_0[C_1]}$

$+ \frac{E_0[C_1]+(1-\beta^0)E_0[C_2] + \frac{[E_0[C_1]+(1-\beta^0)E_0[C_2]]}{E_0[C_1]+E_0[C_2]} C_0 - E_0[EXP_1^{CB}]}{E_0[C_2]+E_0[C_1]} - 1 = \frac{E_0[C_1]+E_0[C_2]+C_0}{E_0[C_2]+E_0[C_1]} - 1$, which is positively

related to risk (β). Note that

$$E_0[E_2^{HC}] = (1+g_1)\left(E_0[C_1] + (1-\beta^0)E_0[C_2] - \frac{[E_0[C_1]+(1-\beta^0)E_0[C_2]]}{E_0[C_1]+E_0[C_2]} B_0 - E_0[EXP_1^{CB}]\right) +$$

$$\left(\beta^0 E_0[C_2] - \frac{\beta^0 E_0[C_2]}{E_0[C_1]+E_0[C_2]} B_0 + E_0[EXP_1^{CB}]\right)$$

$$=(1+g_1)\left((E_0[C_1]+(1-\beta^0)E_0[C_2])\left(\frac{E_0[TE]}{E_0[C_1]+E_0[C_2]}\right) - E_0[EXP_1^{CB}]\right)$$

$$+\left(\beta^0 E_0[C_2]\left[\frac{E_0[TE]}{E_0[C_1]+E_0[C_2]}\right] + E_0[EXP_1^{CB}]\right)$$

$$= E_0[TE] + g_1\left((1-\beta^0\theta)E_0[TE] - E_0[EXP_1^{CB}]\right).$$

$$\frac{\partial}{\partial \beta^1}\left[\frac{E_0[ACC_2^{HC}]}{E_0[CFO_2]}\right] = \frac{\partial}{\partial \beta^1}\left[\frac{E_0[E_2^{HC}]}{E_0[CFO_2]} - 1\right] = \frac{\partial}{\partial \beta^1}\left[\frac{E_0[E_2^{HC}]}{E_0[CFO_2]}\right]$$

$$= \frac{1}{E_0[C_2]+(1+g_1)E_0[C_1]} \frac{\partial E_0[TE]}{\partial \beta^1} - \frac{g_1}{E_0[C_2]+(1+g_1)E_0[C_1]} \frac{\partial\left(E_0[EXP_1^{CB}] - (1-\beta^0\theta)E_0[TE]\right)}{\partial \beta^1}$$

$$= \frac{E_0[C_2]}{E_0[C_2]+(1+g_1)E_0[C_1]}\left\{\frac{\beta^0\left[\frac{1}{\theta} + r_2^{RF}(\frac{1}{\theta}-1)\right]}{(1+r_1^{RF})(1+r_2^{RF})} - g_1 \frac{\partial\left(E_0[EXP_1^{CB}]/E_0[C_2] - (1-\beta^0\theta)E_0[TE]/E_0[C_2]\right)}{\partial \beta^1}\right\}.$$

Therefore, when condition (17) holds, $\frac{\partial^2}{\partial \beta^1 \partial g_1}\left[\frac{E_0[ACC_2^{HC}]}{E_0[CFO_2]}\right] < 0$. Let

$$g^A \equiv \frac{\frac{\beta^0\left[\frac{1}{\theta} + r_2^{RF}(\frac{1}{\theta}-1)\right]}{(1+r_1^{RF})(1+r_2^{RF})}}{\frac{\partial\left(E_0[EXP_1^{CB}]/E_0[C_2] - (1-\beta^0\theta)E_0[TE]/E_0[C_2]\right)}{\partial \beta^1}} \tag{A7}$$

Then $\frac{\partial \frac{E_0[ACC_2^{HC}]}{E_0[CFO_2]}}{\partial \beta} < (=,>) 0$ when $g_1 > (=,<) g^A$.

Corollary 3:

We know from the proof of Corollary 1 that $\frac{\partial\left(E_0\left[EXP_1^{CB}\right]/E_0[C_2]-\left(1-\beta^0\theta\right)E_0[TE]/E_0[C_2]\right)}{\partial\beta^1} > 0$. It is easy to see from (A7) that $\frac{\partial g^A}{\partial\theta}$<0. The relation is illustrated in Figure 1.

Proposition 7:

Expected earnings in period 2 equals:

$$E_0[E_2^{HC}] = \beta^0 E_0[C_2] - \frac{\beta^0 E_0[C_2]}{E_0[C_1]+E_0[C_2]} B_0 + E_0[EXP_1^{CB}]$$

$$+(1+g_1)(E_0[C_1] + (1-\beta^0)E_0[C_2]) - \frac{[E_0[C_1]+\left(1-\beta^0\right)E_0[C_2]]}{E_0[C_1]+E_0[C_2]}(1+g_1)B_0 - (1+g_1)E_0[EXP_1^{CB}].$$

Expected price at the end of period 1 equals:

$$E_0[P_1] = \frac{E_0[C_2]}{1+r} + (1+g_1)B_0$$

$$\frac{E_0\left[E_2^{HC}\right]}{E_0[P_1]} = \frac{\beta^0 E_0[C_2] - \frac{\beta^0 E_0[C_2]}{E_0[C_1]+E_0[C_2]}B_0 + E_0\left[EXP_1^{CB}\right]}{\frac{E_0[C_2]}{1+r}+(1+g_1)B_0} +$$

$$\frac{(1+g_1)(E_0[C_1]+\left(1-\beta^0\right)E_0[C_2]) - \frac{[E_0[C_1]+\left(1-\beta^0\right)E_0[C_2]]}{E_0[C_1]+E_0[C_2]}(1+g_1)B_0 - (1+g_1)E_0\left[EXP_1^{CB}\right]}{\frac{E_0[C_2]}{1+r}+(1+g_1)B_0}.$$

Let $w_e = \frac{(1+g_1)B_0}{\frac{E_0[C_2]}{1+r}+(1+g_1)B_0}$, then

$$\frac{E_0\left[E_2^{HC}\right]}{E_0[P_1]} = w_e \frac{(E_0[C_1]+\left(1-\beta^0\right)E_0[C_2]) - \frac{[E_0[C_1]+\left(1-\beta^0\right)E_0[C_2]]}{E_0[C_1]+E_0[C_2]}B_0 - E_0\left[EXP_1^{CB}\right]}{P_0} +$$

$$(1-w_e)\frac{\beta^0 E_0[C_2] - \frac{\beta^0 E_0[C_2]}{E_0[C_1]+E_0[C_2]}B_0 + E_0\left[EXP_1^{CB}\right]}{\frac{E_0[C_2]}{1+r}}.$$

Note that $\frac{\partial w_e}{\partial g_1} > 0$ implies $\frac{\partial \frac{E_0\left[E_2^{HC}\right]}{E_0[P_1]}}{\partial\beta\partial g_1} < 0$. In addition, when $g_1 = 0$,

$$\frac{E_0\left[E_2^{HC}\right]}{E_0[P_1]} = \frac{\beta^0 E_0[C_2] + \frac{\beta^0 E_0[C_2]}{E_0[C_1]+E_0[C_2]}C_0 + E_0\left[EXP_1^{CB}\right]}{\frac{E_0[C_2]}{1+r}+P_0} + \frac{(E_0[C_1]+\left(1-\beta^0\right)E_0[C_2]) + \frac{[E_0[C_1]+\left(1-\beta^0\right)E_0[C_2]]}{E_0[C_1]+E_0[C_2]}C_0 - E_0\left[EXP_1^{CB}\right]}{\frac{E_0[C_2]}{1+r}+P_0}$$

$$= \frac{E_0[C_1]+E_0[C_2]-P_0}{\frac{E_0[C_2]}{1+r}+P_0} \tag{A8}$$

Assumption (1) implies $P_0(1+r) = E_0[C_1] + \frac{E_0[C_2]}{1+r}$. Substituting $E_0[C_1] = P_0(1+r) - \frac{E_0[C_2]}{1+r}$

into (A8), we get $\frac{E_0[E_2^{HC}]}{E_0[P_1]} = \frac{P_0(1+r)-\frac{E_0[C_2]}{1+r}+E_0[C_2]-P_0}{\frac{E_0[C_2]}{1+r}+P_0} = r$. Therefore, there exists $g^E > 0$ such that

$\frac{\partial \frac{E_0[E_2^{HC}]}{E_0[P_1]}}{\partial \beta} < (=,>)0$ when $g_1 > (=,<)g^E$. In addition, following the proof of Corollary 3, g^E

decreases with θ.

Corollary 4:

Note that $\frac{E_0[E_2^{HC}]}{E_0[P_1]} = \frac{E_0[E_2^{HC}]}{E_0[CFO_2]}\frac{E_0[CFO_2]}{E_0[P_1]}$ implies $\frac{\partial \frac{E_0[E_2^{HC}]}{E_0[P_1]}}{\partial \beta} = \frac{\partial \frac{E_0[E_2^{HC}]}{E_0[CFO_2]}}{\partial \beta}\frac{E_0[CFO_2]}{E_0[P_1]} + \frac{E_0[E_2^{HC}]}{E_0[CFO_2]}\frac{\partial \frac{E_0[CFO_2]}{E_0[P_1]}}{\partial \beta}$.

Since $\frac{\partial \frac{E_0[CFO_2]}{E_0[P_1]}}{\partial \beta} > 0$ and $E_0[C_2] + (1+g_1)E_0[C_1] > 0$, $\frac{\partial \frac{E_0[E_2^{HC}]}{E_0[P_1]}}{\partial \beta} < 0$ implies (is equivalent to, is

implied by) $\frac{\partial \frac{E_0[E_2^{HC}]}{E_0[CFO_2]}}{\partial \beta} < 0$ when $E_0[E_2^{HC}] > (=,<)0$.

APPENDIX 2
Systematic and Idiosyncratic Risk

Assume that

$$C_{2a} = E_0[C_{2a}] + \varepsilon_{2ai} + \varepsilon_{2aj},$$

where ε_{2ai} and ε_{2aj} are independent random shocks with zero mean and standard deviations σ_i and σ_j. Suppose that $Cov(\varepsilon_{2ai}, Q_2) < 0$ and $Cov(\varepsilon_{2aj}, Q_2) = 0$, that is, ε_{2ai} represents systematic (priced) risk, while ε_{2aj} captures idiosyncratic (unpriced) risk.

Let σ_{2a} denote the standard deviation of C_{2a}, and ρ_{2a} denote the overall correlation coefficient between C_{2a} and the pricing kernel Q_2, then

$$\beta^1 = -\frac{Cov(C_{2a}, Q_2)}{E_0[C_2]} = -\rho_{2a}\sigma_{2a}\frac{\sigma_{Q_2}}{E_0[C_2]}, \tag{A9}$$

and

$$\rho_{2a} = \frac{Cov(C_{2ai}, Q_2)}{\sigma_{2a}\sigma_{Q_2}} = \rho_{2ai}\frac{\sigma_{2ai}}{\sqrt{\sigma^2{}_{2ai} + \sigma^2{}_{2aj}}}. \tag{A10}$$

It follows from (A9) and (A10) that β^1 captures the multiplicative effects of two factors: the overall risk (σ_{2a}) and the average pricing of risk (ρ_{2a}). The latter reflects the relative amounts of priced and unpriced risk ($\sigma_{2ai}, \sigma_{2aj}$).

APPENDIX 3
Conditional and Unconditional Conservatism

A3.1 Conditional conservatism: lower-of-cost-or-market

Assume that $C_{2a} = E_2[C_{2a}] + \varepsilon_{2a}$ where, for simplicity, $\varepsilon_{2a} = \{2x^L, x^S, 0, -x^S, -2x^L\}$ with probability $\left\{\frac{p}{2}, \frac{1-2p}{2}, p, \frac{1-2p}{2}, \frac{p}{2}\right\}$. $p \in (0, 1/2)$ and $x^L > x^S > 0$. Specifically, at time 1, a signal s_1 is realized. $s_1 = \{-1,0,1\}$ with probabilities $\{p, 1-2p, p\}$. Conditional on $s_1 = -1, 0, 1$, $\varepsilon_{2a} = \{0, -2x^L\}, \{-x^S, x^S\}, \{0, 2x^L\}$, respectively, with equal probability.[19] Assume also that the lower-of-cost-or-market rule is triggered when $s_1 = -1$. To simplify the exposition, assume that x^S=0 and that the risk-free rates are normalized to zero. Denote $x = x^L$. It is easy to show that

$$\frac{E_0[EXP_1^{CB}]}{p} = (1-\beta^0)E_0[C_2] + \frac{\beta^0 E_0[C_2]}{E_0[C_1]+E_0[C_2]}B_0 - [E_1[C_{2a}|s_1=-1] + Cov(C_{2a}, Q_2|s_1=-1)]$$

$$= x - \rho(C_{2a}, Q_2) * (\sigma_{2a}|s_1=-1) * \sigma_{Q_2} + \frac{\beta^0 E_0[C_2]}{E_0[C_1]+E_0[C_2]}(\rho(C_{2a}, Q_2)\sigma_{2a}\sigma_{Q_2} + Cov(C_1, Q_1)) .$$

Note that $\sigma_{2a} = 2\sqrt{p}x$ and $(\sigma_{2a}|s_1=-1) = x$, hence

$$\frac{E_0[EXP_1^{CB}]}{p} = \left(1 - \rho(C_{2a}, Q_2)\sigma_{Q_2} + \frac{\beta^0 E_0[C_2]}{E_0[C_1]+E_0[C_2]}2\rho(C_{2a}, Q_2)\sqrt{p}\sigma_{Q_2}\right)x$$

$$+\frac{\beta^0 E_0[C_2]}{E_0[C_1]+E_0[C_2]}Cov(C_1, Q_1).$$ Therefore,

$$E_0[EXP_1^{CB}] > 0 \Leftrightarrow \left(1 - \rho(C_{2a}, Q_2)\sigma_{Q_2} + \frac{\beta^0 E_0[C_2]}{E_0[C_1]+E_0[C_2]}2\rho(C_{2a}, Q_2)\sqrt{p}\sigma_{Q_2}\right)x$$

$$> -\frac{\beta^0 E_0[C_2]}{E_0[C_1]+E_0[C_2]}\ Cov(C_1, Q_1).$$

Assume $Cov(C_1, Q_1)$ <0, i.e, risk in C_1 is on average positively priced, then $E_0[EXP_1^{CB}] > 0$ implies $\left(1 - \rho(C_{2a}, Q_2)\sigma_{Q_2} + \frac{\beta^0 E_0[C_2]}{E_0[C_1]+E_0[C_2]}2\rho(C_{2a}, Q_2)\sqrt{p}\sigma_{Q_2}\right)x > 0$. Therefore $\frac{\partial E_0[EXP_1^{CB}]}{\partial x} = p\left(1 - \rho(C_{2a}, Q_2)\sigma_{Q_2} + \frac{\beta^0 E_0[C_2]}{E_0[C_1]+E_0[C_2]}2\rho(C_{2a}, Q_2)\sqrt{p}\sigma_{Q_2}\right) > 0$ and $\frac{\partial^2 E_0[EXP_1^{CB}]}{\partial x^2} = 0$.

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[19] x^S is used to illustrate that uncertainty about C_2 remains after the revelation of s_1 .

Note also that $E_0[TE] = -Cov(C_1, Q_1) - 2\rho(C_{2a}, Q_2)\sqrt{p}\sigma_{Q_2}x$.

Therefore $\frac{\partial E_0[TE]}{\partial x} = -2\rho(C_{2a}, Q_2)\sqrt{p}\sigma_{Q_2}$, and

$\frac{\frac{\partial E_0\left[EXP_1^{CB}\right]}{\partial x}}{\frac{\partial E_0[TE]}{\partial x}} = \frac{p\left(1-\rho(C_{2a},Q_2)\sigma_{Q_2}+\frac{\beta^0 E_0[C_2]}{E_0[C_1]+E_0[C_2]}2\rho(C_{2a},Q_2)\sqrt{p}\sigma_{Q_2}\right)}{-2\rho(C_{2a},Q_2)\sqrt{p}\sigma_{Q2}}$ which is constant over time.

In addition, $\frac{\partial\frac{E_0\left[E_1^{HC}\right]}{E_0\left[E_2^{HC}\right]}}{\partial x} < 0 \Leftrightarrow \frac{p\left(1-\rho(C_{2a},Q_2)\sigma_{Q_2}\right)(-Cov(C_1,Q_1))}{(-2\rho(C_{2a},Q_2)\sqrt{p}\sigma_{Q2})(-Cov(C_1,Q_1)-2\rho(C_{2a},Q_2)\sqrt{p}\sigma_{Q_2}x)} > 0$ which is equivalent to (16).

A3.2 Unconditional conservatism: expensing of R&D

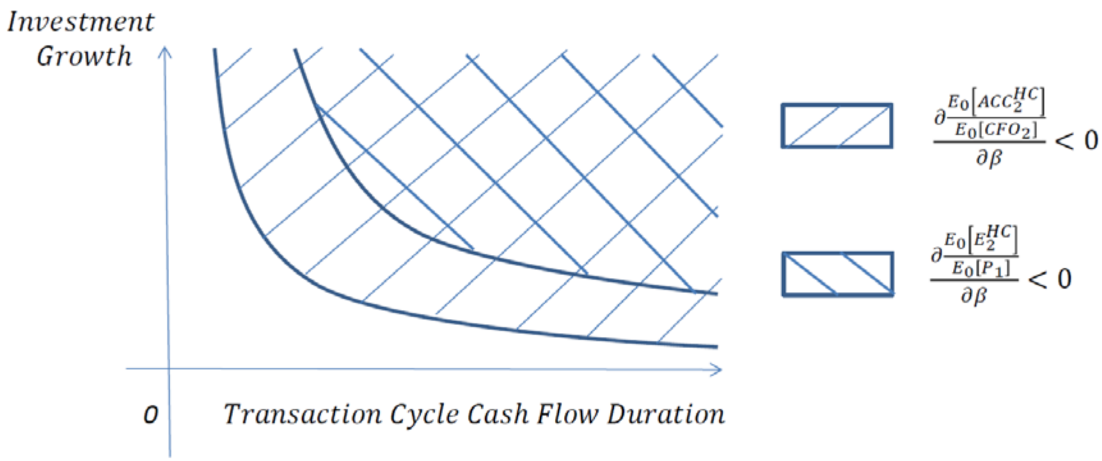
Assume that as the risk of future cash inflows increases the relation between a portion of $-C_0$(denoted as δ) and future cash inflows is deemed to be too noisy, hence that portion of $-C_0$ is immediately expensed. It is easy to show that in this case $E_0[EXP_1^{CB}] = \frac{\beta^0 E_0[C_2]}{E_0[C_1]+E_0[C_2]}\delta$.

Hence

$\frac{E_0\left[E_2^{HC}\right]}{E_0[TE]} = \frac{\frac{\beta^0 E_0[C_2]}{E_0[C_1]+E_0[C_2]}(E_0[TE]+\delta)}{E_0[TE]} = \frac{\beta^0 E_0[C_2]}{E_0[C_1]+E_0[C_2]}(1 + \frac{\delta}{E_0[TE]})$.

Therefore $\frac{\partial\frac{E_0\left[E_2^{HC}\right]}{E_0[TE]}}{\partial\beta^1} = \frac{\beta^0 E_0[C_2]}{E_0[C_1]+E_0[C_2]}\frac{\partial\frac{\delta}{E_0[TE]}}{\partial\beta^1}$, and $\frac{\partial\frac{E_0\left[E_1^{HC}\right]}{E_0\left[E_2^{HC}\right]}}{\partial\beta^1} < 0 \Leftrightarrow \frac{\frac{\partial\delta}{\partial\beta^1}}{\frac{\partial E_0[TE]}{\partial\beta^1}} > \frac{\delta}{E_0[TE]}$ which is equivalent to (16). That is, the amount of unconditional conservatism relative to $E_0[TE]$ increases with risk.

FIGURE 1
Joint Effects of Cash Flow Duration and Investment Growth



This figure illustrates how the investment growth rate and the cash flow duration of each transaction cycle jointly affect the relation between the accruals-to-cash ratio and the expected stock return, as well as the relation between the expected forward earnings yield and the expected stock return, when expected earnings are positive. The two shaded areas (and) illustrate the cases where the accruals-to-cash ratio and the expected earning yield are negatively related to the expected stock return, respectively. When the expected earnings are negative, the relative size of the two shaded areas will reverse. That is, the area will encompasses the area .

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