Accounting for Uncertainty

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A Financial Reporting Objective

A stated objective in the Conceptual Framework of both the FASB and IASB:

To provide information to investors about "the amount, timing, *and uncertainty* of future cash flows."

The Talk

- How accounting conveys information about the *uncertainty* of future cash flows
- How that information is priced in capital markets

The implications:

… for financial statement analysis

… for valuation

… for asset pricing models

Most importantly:

… the implications for accounting policy: How to account for investors under the FASB/IASB Objective

Accounting for Investors : The Effort Thus Far

(Preinreich 1936, 1938; Peasnell 1982; Ohlson 1995, ….)

Given clean-surplus accounting, the value of an investment is given by:

$$Value_0 = Book\ Value_0 + \frac{Earnings_1 - r.BV_0}{1+r} + \frac{Earnings_2 - r.BV_1}{(1+r)^2} + \frac{Earnings_3 - r.BV_2}{(1+r)^3} + \cdots\cdots$$

This expression is derived simply by substituting earnings and book value for dividends via the clean-surplus equation. But…

- Mere substitution puts nothing on the table
- Random numbers for earnings and book values satisfy this equation
- Nothing is said about the discount rate, r

An Accounting Research Agenda

A comprehensive accounting for the amount, timing, and uncertainty of future cash flows

Specifying the accounting for practical investing

….. for the numerator

….. for the denominator

That is our call to research

How accounting conveys information about the uncertainty of future cash flows

Cash Accounting versus Accrual Accounting

- Cash accounting:
  - … recognizes cash receipts and disbursements
  - … only the cash account on the balance sheet

- Accrual accounting:
  - … recognizes earnings that differ from cash flow
  - … generates a balance sheet

What is the principle for recognizing earnings?

A Governing Accrual Accounting Principle for Recognizing Earnings

Under uncertainty, earnings are not recognized until uncertainty has largely been resolved

Before that point, earnings recognition is delayed

Fair value accounting violates this principle

Accounting for Uncertainty: Implementation
1. Revenue Recognition

Recognize revenue only when realized

For realization, FASB ACS 606 and IFRS 15 require:

- Satisfaction of a contract by both sides of the contract
- Receipt of cash is “highly certain”

The “release from risk” principle

Accounting for Uncertainty: Implementation
2. Conservative Accounting for Investment

Expense investment to the income statement if outcomes are particularly uncertain

In the IASB Conceptual Framework (2018), outcome uncertainty (and measurement uncertainty) limits the booking assets to the balance sheet (paragraphs 5.15 – 5.17).

For the accounting for R&D under FASB Statement No. 2, the FASB requires the investment to be expensed due to the "uncertainty of future benefits."

In IAS 38, the IASB applies the criterion of "probable future economic benefits" to distinguish between "research" (which is expensed) and "development" (which is capitalized and amortized).

IAS 16 on property, plant, and equipment requires benefits to be "probable" for the asset to be booked.

IAS 37 introduces uncertainty when recognizing assets and liabilities

Expensed Investment

Research and development (R&D)
Advertising (brand building)
Human capital investments
Software investments
Expenditures on
- …customer loyalty programs
- …distribution systems
- …supply chain development
- …organizational structure

"Conditional conservatism" for on-balance sheet investments is subsumed

A Complementary Accounting Property

- The accounting creates expected earnings growth
  - … from earnings recognition delayed
  - … from expensing particularly risky investment
    - … depresses current earnings
    - … increases expected future earnings
    - … future earnings have no depreciation or amortization

- Under the accounting principles, expected earnings growth is risky

The Origins of this Accounting

This accounting is set in accounting standards

But it was long practiced under “general acceptance”

Instinctively, *prudent accounting* under uncertainty

How uncertainty information is priced in capital markets

Priced Risk: Theory

$$P_t = \sum_{\tau=t+1}^{\infty} \frac{d_\tau}{R^f_{t\tau}} + \sum_{\tau=t+1}^{\infty} Cov_t\,(d_\tau, Q_\tau)$$

The revenue recognition principle

and

conservative accounting for investment

convey information about the discount factor, Q_t, in a general, no-arbitrage asset pricing model

Penman, S. and X. Zhang. 2020. A Theoretical Analysis Connecting Conservative Accounting to the Cost of Capital. *Journal of Accounting and Economics* 69, 1-25.

Priced Risk: A No-arbitrage Accounting-based Consumption Asset Pricing Model

Penman, S. and J. Zhu. 2022. An Accounting-based Asset Pricing Model and a Fundamental Factor. *Journal of Accounting and Economics* 73 (2-3), article 101476.

$$P_t = \sum_{\tau=t+1}^{\infty} \frac{d_\tau}{R^f_{t\tau}} + \sum_{\tau=t+1}^{\infty} Cov_t\,(d_\tau, Q_\tau)$$

$$= \frac{B_t}{R^f_T} + \frac{1}{R^f_T} \sum_{\tau=t+1}^{T} E_t\left[Earnings_\tau + d_\tau\left(\frac{R^f_T}{R^f_\tau} - 1\right)\right] + \sum_{\tau=t+1}^{T} \mathrm{cov}_t(Earnings_\tau, m_\tau)$$

The logic of the model:

Investors give up consumption to buy future consumption, but that consumption is at risk

Future dividends buy future consumption. Those dividends are at risk.

Dividends are paid out of book value. Future book value is at risk.

Earnings generate book value. Future earnings are at risk.

The Intuition for Pricing Accounting for Uncertainty

Earnings are Release from Risk to Consumption

When investors sell a stock (and invest in the risk-free asset), they are released from risk: The risk-free investment conserves consumption.

When the firm realizes earnings (booked as no longer at risk), the investor is equivalently released from risk. The firm can pay out the earnings as a dividend (with the investor then investing the dividend in a risk-free asset) or the firm can invest the earnings in a risk-free account on the investors' behalf (equivalently preserving consumption).

Miller and Modigliani (1961) Dividend Irrelevance is satisfied

Priced Risk: Empirically

- Investment booked to the balance sheet is priced $1.30 per dollar of investment, on average. R&D investment expensed is priced $0.65. Oh and Penman (2021)
- Under IFRS, R&D investments deemed successful are priced with a premium of 2% over R&D investments not yet deemed successful. Oswald, Simpson, and Zarowin (2020)
- The earnings under the two principles convey discount-rate news that affects market prices. Penman and Yehuda (2019)
- Application of the two principles predicts stock returns (reward for risk), return variance, and both return betas and fundamental betas. Penman and Zhu (2022)
- Risk and return are predicted by expected earnings growth and that growth is at risk. Penman, Reggiani, Richardson, and Tuna (2018), Penman and Reggiani (2018)

Implications for Financial Statement Analysis

The Summary Financial Statement Measure

Return on Equity, $ROE_t = \frac{Earnings_t}{Book\ Value_{t-1}}$

This is interpreted as a measure of profitability

ROE Under Accounting for Uncertainty

$$ROE_t = \frac{Earnings_t}{Book\ Value_{t-1}}$$

- The accounting depresses the numerator earnings
- The accounting reduces the denominator

Thus….

- A low ROE due to the accounting conveys high risk
- A high ROE due to the accounting conveys low risk: risk resolved on a low denominator

ROE and Valuation

$$Value_0 = Book\ Value_0 + \frac{Earnings_1 - r.Book\ Value_0}{r - g}$$

$$\downarrow$$

$$= Book\ Value_0 + \frac{(ROE_1 - r).Book\ Value_0}{r - g}$$

$$\uparrow \uparrow$$

- Lower ROE means higher expected earnings growth, but growth that is risky
- Lower ROE means higher *r*

Penman and Zhang (2021); Penman and Reggiani (2018)

A Complete Financial Statement Analysis

ROE involves “bottom line” earnings and book value

Financial statement analysis involves the line items summing to earnings and book value

The relevant line items are those that convey growth at risk under accounting principles

Extracting the Required Return from Financial Statements

- Identify accounting numbers that convey future earnings growth and risk to that growth under the accounting principles
- Combine these numbers into a scalar expected return, ER
- Validate ER against realized returns and risk metrics

Penman, S. and J. Zhu. 2014. Accounting Anomalies, Risk and Return. *The Accounting Review* 9, 1835-1866.

Penman, S., J. Zhu, and H. Wang. 2022. Estimating an Equity Yield to Maturity: Deficiencies of the Implied Cost of Capital (ICC) and an Alternative. At https://ssrn.com/abstract=4031817.

Features of Fundamental Risk (ER) Portfolios

Portfolios Formed on ER Each Year

Fundamental Risk Portfolio	B/P	Sales Growth Rate %	Change in Operating PM	Change SG&A/ Sales %	Change in RD/ Sales %	Change in NOA %	Forward EPS Growth %	Earnings Beta
1 (Low)	0.437	37.4	3.7	-1.5	-0.021	0.190	2.3	0.45
2	0.471	25.5	2.4	-0.6	-0.010	0.154	0.8	0.71
3	0.486	19.5	0.9	-0.4	-0.003	0.124	1.2	0.72
4	0.515	14,5	0.7	-0.3	-0.003	0.098	1.9	0.85
5	0.542	12.1	0.5	0.0	-0.004	0.076	4.4	0.85
6	0.610	9.7	0.3	0.0	0.002	0.057	3.1	0.90
7	0.667	7.8	0.1	0.1	0.000	0.042	5.3	1.16
8	0.775	5.5	0.1	0.2	0.000	0.022	5.1	1.30
9	0.944	3.5	0.5	0.5	0.000	0.004	8.2	2.10
10 (High)	1.354	-0.1	1.1	1.2	0.003	-0.043	12.3	4.42

Validation: Risk and Return

Returns to Portfolios Formed on ER Each Year

Risk Portfolio	Actual Stock Returns Forward Year						Market Beta Forward Year		
	Mean %	Median %	Std Dev	Range	Mean/ Std Dev	Kurtosis	All Years	Up Beta	Down Beta
1 (Low)	4.9	2.8	25.8	97.7	0.190	2.364	1.31	1.77	0.48
2	9.4	4.2	21.1	84.7	0.445	2.344	1.13	1.35	0.81
3	12.9	11.7	21.6	96.7	0.597	2.886	1.15	1.44	0.87
4	14.4	13.9	21.4	103.7	0.673	3.562	1.12	1.38	0.85
5	15,5	11.3	21.5	104.1	0.721	3.330	1.20	1.58	0.96
6	16.0	15.1	19.7	94.1	0.812	3.784	1.18	1.62	0.99
7	17.9	17.4	20.1	99.0	0.891	3.569	1.20	1.65	1.12
8	19.1	17.4	23.5	107.4	0.813	4.316	1.30	1.77	1.27
9	21.2	21.9	25.8	141.3	0.821	6.050	1.41	2.02	1.44
10 (High)	28.2	24.1	36.0	182.6	0.783	5.782	1.82	2.89	1.45

Three Key Financial Statement Risk Measures that Convey Risk

1. Sales Growth
   … High realized sales growth is lower risk
2. ROE
   … Low ROE is high risk
3. Expensed investment/Sales
   … R&D/Sales
   … Advertising and Promotion/Sales
   … Other expensed investments in SG&A/Sales

Implications for Valuation

The Numerator and Denominator Connect

The standard residual income model (short form):

$$Value_0 = Book\ Value_0 \frac{Earnings_1 - r.Book\ Value_0}{r - g}$$

Under the model, Earnings and Book Value are specified by the same accounting that conveys *r*

A comprehensive accounting for valuation

Growth and Risk in Valuation

The standard residual income model (short form):

$$Value_0 = Book\ Value_0 + \frac{Earnings_1 - r.Book\ Value_0}{r - g}$$

r and *g* are not independent inputs*: r* can increase with *g* to leave $Value_0$ unaffected

It is *r* – *g* that is important

Implications for Asset Pricing Models

The State of Asset Pricing
The Theory

The theory of asset pricing is well developed:

Given no arbitrage (and other mild assumptions), there exists N common factors, with an asset's expected return given by sensitivity to those factors:

$$R_{it} - R_{ft} = \alpha_{it} + \sum_{k=1}^{N} \beta_{ikt} F_{kt} + \varepsilon_{it}$$

$$\alpha_{it} = 0, \text{ all } i$$

The Sorry State of Asset Pricing
Empirical Factor Models

Data dredging:

- Factors enter simply via correlations in the data, with little explanation
  - …. Risk or mispricing?
  - …. If risk, why?
- The factor zoo: over 400 potential factor "discoveries"

Theory-based:

- Accounting numbers are measures of economic constructs

A Fundamental Factor Model

A long-short "factor-mimicking portfolio" based on ER

- The resulting factor model dominates extant factor models e.g., Fama and French factor models
  - … on Sharpe Ratios
  - … in standard spanning tests
- The factor provides a parsimonious representation, replacing the "zoo of factors"
- Added to the Market Portfolio, the factor yields a two-factor ICAPM

Penman, S. and J. Zhu. 2022. An Accounting-based Asset Pricing Model and a Fundamental Factor. *Journal of Accounting and Economics* 73 (2-3), article 101476.

Penman, S., J. Zhu, and H. Wang. 2022. Returns on Risky Portfolios are Explained by a Two-Factor Model. At https://ssrn.com/abstract=4020541.

Implications for Accounting Policy…

To provide information to investors about "the amount, timing, *and uncertainty* of future cash flows."

The Guiding Valuation Model with Accounting for Uncertainty

$$P_t = \sum_{\tau=t+1}^{\infty} \frac{d_\tau}{R^f_{t\tau}} + \sum_{\tau=t+1}^{\infty} Cov_t\,(d_\tau, Q_\tau)$$

$$= \frac{B_t}{R^f_T} + \frac{1}{R^f_T} \sum_{\tau=t+1}^{T} E_t\left[Earnings_\tau + d_\tau\left(\frac{R^f_T}{R^f_\tau} - 1\right)\right] + \sum_{\tau=t+1}^{T} \mathrm{cov}_t(Earnings_\tau, m_\tau)$$

The features:

- Expected earnings are discounted at the risk-free rate: They are realized earnings that are “released from risk”.
- These riskless earnings are then discounted for the risk they will not be realized (in the covariance term)

Earnings that are priced are realized risk-free earnings

Historical Cost Accounting vs. Fair Value Accounting

(Conservative) Historical Cost Accounting conveys uncertainty

… earnings are not recognized until uncertainty has been resolved

… a safe balance sheet: add to the balance sheet only with the resolution of uncertainty

Fair Value Accounting takes away information about uncertainty

… Risk is in the balance sheet that then can crash: One sees risk only after the fact

Accounting for Intangible Assets: Capitalize?

The balance sheet effect of capitalization

Suppose the probability of success for R&D is 5%....

Should the R&D be booked to the balance sheet with the pretense that it provides collateral?

The probability of a future impairment is 95%. Rational expectations says: Impair now. That's what we do with assets booked to the balance sheet

Accounting for Intangible Assets: Capitalize?

The income statement effect of capitalization

What is the amortization rate for R&D with no product as yet and no revenue (and there might not be)?

Fuzzy amortization destroys the incomes statement

Expensing investments preserve the income statement and conveys risk

Accounting for Intangible Assets

Accounting for uncertainty resolves the issue

Capitalize only when the investment passes an uncertainty threshold
D but not R?

Penman, S. 2009. Accounting for Intangible Assets: There is also an Income Statement. *Abacus*, 45 (3), 358–371.

Barker, R., A. Lennard, S. Penman, and A. Teixeira. 2021. Accounting for Intangible Assets: Suggested Solutions. Forthcoming, *Accounting and Business Research*.

Barker, R. and S. Penman. 2020. Moving the Conceptual Framework Forward: Accounting for Uncertainty. *Contemporary Accounting Research* 37 (1), 322-375.

Further Reading and References

Penman, S. Accounting for Risk. 2021. *Foundations and Trends in Accounting* 16 (1-2), 1-135.

This monograph supplies the references in this talk