DUFF & PHELPS

Expected Cash Flows and Valuations

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Organismo Italiano di Valutazione

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Cost of Capital: Applications and Examples 5th ed (Wiley, 2014)

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Roger is co-author with Shannon Pratt of Cost of Capital: Applications and Examples, 5th ed. forthcoming (John Wiley & Sons, 2014); co-author with Shannon Pratt of The Lawyer's Guide to Cost of Capital forthcoming (ABA, 2014); co-author with Shannon Pratt of Cost of Capital: Applications and Examples, 4th ed. and Cost of Capital in Litigation: Applications and Examples and author of the annual Duff & Phelps' Risk Premium Report.

Roger teaches courses for the American Society of Appraisers including Cost of Capital, a course he developed.

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Introduction

- Ibbotson: “The cost of capital is a function of the investment, not the investor.”
- McKinsey: “The cost of capital is the price charged by investors for bearing the risk that the company's future cash flows may differ from what they anticipated when they made the investment.”
- The cost of capital comes from the marketplace -the pool of investors “pricing” the risk of a particular asset. Represents the consensus assessment of the pool of investors that are participants in a particular market – the expected rate of return that the market participants require in order to attract funds to a particular investment.
- The cost of capital is always an expected (or forward-looking) return. Thus, analysts and would-be investors never actually observe the market’s views as to expected returns at the time of their investment.

How Risk is Priced is Still a Relative Unknown

- Professor John Cochrane recently discussed the changes in our knowledge of estimating rates of return for equity over the last 40 years. The generally accepted explanation 40 years ago as to why market dividend yields (i.e., dividend/price) varied over time was the variation in expected cash flows. Today, research has shown that the variation of market dividend yields is due to variation in discount rates.
- He summarizes: “High prices, relative to dividends have reliably led to many years of poor returns. Low prices have led to high returns….Thus …all price-dividend ratio volatility corresponds to variation in expected returns. None corresponds to variation in expected dividend growth, and none to ‘rational bubbles.’”

John C. Cochrane, University of Chicago Booth School of Business, “Discount Rates,” American Finance Association Presidential Address, January 8, 2011
http://faculty.chicagobooth.edu.john.cochrane/research/papers

How Risk is Priced is Still a Relative Unknown
(cont'd)

- "In the beginning, there was chaos. Then came CAPM. Every clever strategy to deliver high returns ended up delivering high market betas as well. Then anomalies erupted and there was chaos again."
- Researchers such as Professors Fama and French found that market returns were a function of other factors and not simply market betas.
- CAPM as it is taught predicts that on the average portfolios of stocks with high beta estimates will earn greater returns than portfolios of stocks with low beta estimates. In fact, we find that variation in returns is not explained by differences in market betas. Rather differences in returns are explained by a "zoo of new variables."
- Professor Cochrane concludes: "Discount rates vary a lot more than we thought. The puzzles and anomalies that we face amount to discount rate variation we don't understand. Our theoretical controversies are about how discount rates are formed….Theories are in their infancy…."

Defining Risk and how it Affects the Cost of Capital

- Cost of capital is all about pricing risk- matching the risk inherent in the net cash flows with the rate of return demanded by the market for accepting that level of risk.
- Probably the most widely accepted definition of risk in the context of business valuation is the degree of uncertainty of achieving future expectations at the times and in the amounts forecast.
- The risk-free rate theoretically compensates investors for renting out their money (i.e., for delaying consumption over some future time period and receiving back currency with less purchasing power in the future).
- The risk premium results from the uncertainty of expected returns and varies widely from one prospective capital investment to another.
- Since uncertainty as to timing and amounts of future net cash flow is greatest for equity investors, the high risk requires equity as a class of capital to have the greatest cost of capital.

Present Value Formula

The numerator:

- The expected amount of economic income (e.g., the net cash flow) to be received from the investment in each future period over the life of the investment.

The denominator:

- A function of the discount rate:

$$PV = \frac{NCF_1}{(1+k)} + \frac{NCF_2}{(1+k)^2} + \cdots + \frac{NCF_n}{(1+k)^n}$$

where:

PV	= Present value
$NCF_1 \ldots NCF_n$	= Net cash flow (or other measure of economic income) expected in each of the periods 1 through *n*, *n* being the final cash flow in the life of the investment
k	= Cost of capital (discount rate)
n	= Number of periods

Relationship Between Discount Rate and Capitalization Rate

- Assuming stable long-term growth in cash flows from the subject investment, the capitalization rate equals the discount rate minus the expected long-term growth rate:

$$c = k - g$$

where:

c = Present value

k = Discount rate (cost of capital) for the subject investment

g = Expected long-term growth rate in net cash flow

Critical assumptions in this formula is that the expected rate of increase (growth) in the cash flow from the investment is relatively constant over the long term.

Relationship Between Discount Rate and Capitalization Rate

Discount rate: applied to all expected economic income to convert the expected economic income stream to a present value.

Capitalization rate: divisor applied to one single

element of the economic income stream to estimate a present value:

$$PV = \frac{NCF_1}{c}$$

where:

PV	= Present value
NCF_1	= Net cash flow expected in period 1 immediately following the valuation date
c	= Capitalization rate

How Risk is Priced is Still a Relative Unknown

- While the *pure* capital asset pricing model (CAPM) is the most widely used asset pricing model, risk pricing has moved beyond considering CAPM beta as the sole measure of risk.
- Empirical tests of CAPM have shown that *pure* CAPM does not do a good job in pricing risk:
  - High (low) beta stocks do not generate high (low) returns
- Is beta measurement the problem: beta a forward measure of risk, yet we use backwards looking methods to estimate beta
- Does the market price more factors (systematic risks measures) beyond beta?

How Risk is Priced is Still a Relative Unknown – Multifactor model example (cont'd)

$$R_i = R_f + B_{i,m}\,RP_m + B_{i,s}\,RP_{i,s} + B_{i,BV}\,RP_{i,BV} + \ldots + B_{i,u}\,RP_{i,u} + \ldots + \varepsilon_i$$

where:

R_i = Realized return for stock of company *i*

R_f = Risk-free rate of return

$B_{i,m}$ = Sensitivity of return of stock of company *i* to the market risk premium or ERP

RP_m = ERP

$B_{i,s}$ = Sensitivity of return of stock of company *i* to a measure of size, *S*, of company *i* and S_i = Measure of size of company *i*

$RP_{i,s}$ = $B_{i,s}$ x S_i = Risk premium for size of company *i*

$B_{i,BV}$ = Sensitivity of return of stock of company *i* to a measure of book value (typically measure of book-value-to-market-value) of stock of company *i* and BV_i

$RP_{i,BV}$ = $B_{i,BV}$ x BV_i = Risk premium for book value of company *i*

How Risk is Priced is Still a Relative Unknown – Multifactor model example (cont'd)

… = Other factors

$B_{i,u}$ = Sensitivity of return of stock of company *i* to a measure of unique risk of company *i*

U_i = Measure of unique risk of company *i*

$RP_{i,u}$ = $B_{i,u}$ x U_i = Risk premium for unique risk of company *i*

ε_i = Error term, difference between predicted return and realized return.

Issues with Estimating the Cost of Capital

The cost of equity capital can be estimated by the build-up method as:

(Formula 9.1)

$$E(R_i) = R_f + RP_m + RP_s \pm RP_c$$

where:

- $E(R_i)$ = Expected (market required) rate of return on security *i*
- R_f = Rate of return available on a risk-free security as of the valuation date
- RP_m = General expected equity risk premium (*ERP*) for the "market"
- RP_s = Risk premium for smaller size
- RP_c = Risk premium attributable to the specific company or to the industry

Issues with Estimating the Cost of Capital (con't)

If we modify the *pure* CAPM to reflect the size effect and company-specific risk, we can expand the cost of equity capital formula to add these two factors:

(Formula 10.6)

$$E(R_i) = R_f + B(RP_m) + RP_s \pm RP_c$$

where:

- $E(R_i)$ = Expected rate of return on security *i*
- R_f = Rate of return available on a risk-free security as of the valuation date
- B = Beta
- RP_m = Market ERP
- RP_s = Risk premium for small size
- RP_c = Risk premium attributable to other company risk factors

Issues with Estimating the Cost of Capital (con't)

- RP_c (often termed "Alpha") added to cost of capital has multiple meanings and uses – results is confusion
  - adjustment to discount rate because quantifiable risk characteristics of subject does not match quantifiable risk of guideline companies (i.e., no good "pure play" guideline companies),
  - company-specific, non-quantified risk "fudge factor" to drive the value to a desired amount,
  - increase in discount rate for biased cash flow forecasts,
  - increase in discount rate because risk-free rate is abnormally low,
  - owners are non-diversified (not applicable for fair value or fair market value),
  - forced reconciliation between WACC and IRR.

Net Cash Flows should be Probability-Weighted Expected Values

- But what measure of economic benefit matches the pricing of the risk of the benefit (i.e., discount rate)?
- When an analyst employs one of the commonly used methods to estimate the cost of equity capital:
  - build-up method,
  - CAPM, or
  - Fama-French 3-factor model

  and then develops an overall cost of capital (weighted average cost of capital or WACC) to discount enterprise level net cash flows, the net cash flows to be discounted or capitalized should be the mean or probability-weighted net cash flows.

Net Cash Flows should be Probability-Weighted Expected Values (cont'd)

EXHIBIT 3.1 Example of Net Cash Flow Expectations

Scenario A—Symmetrical Net Cash Flow Expectation

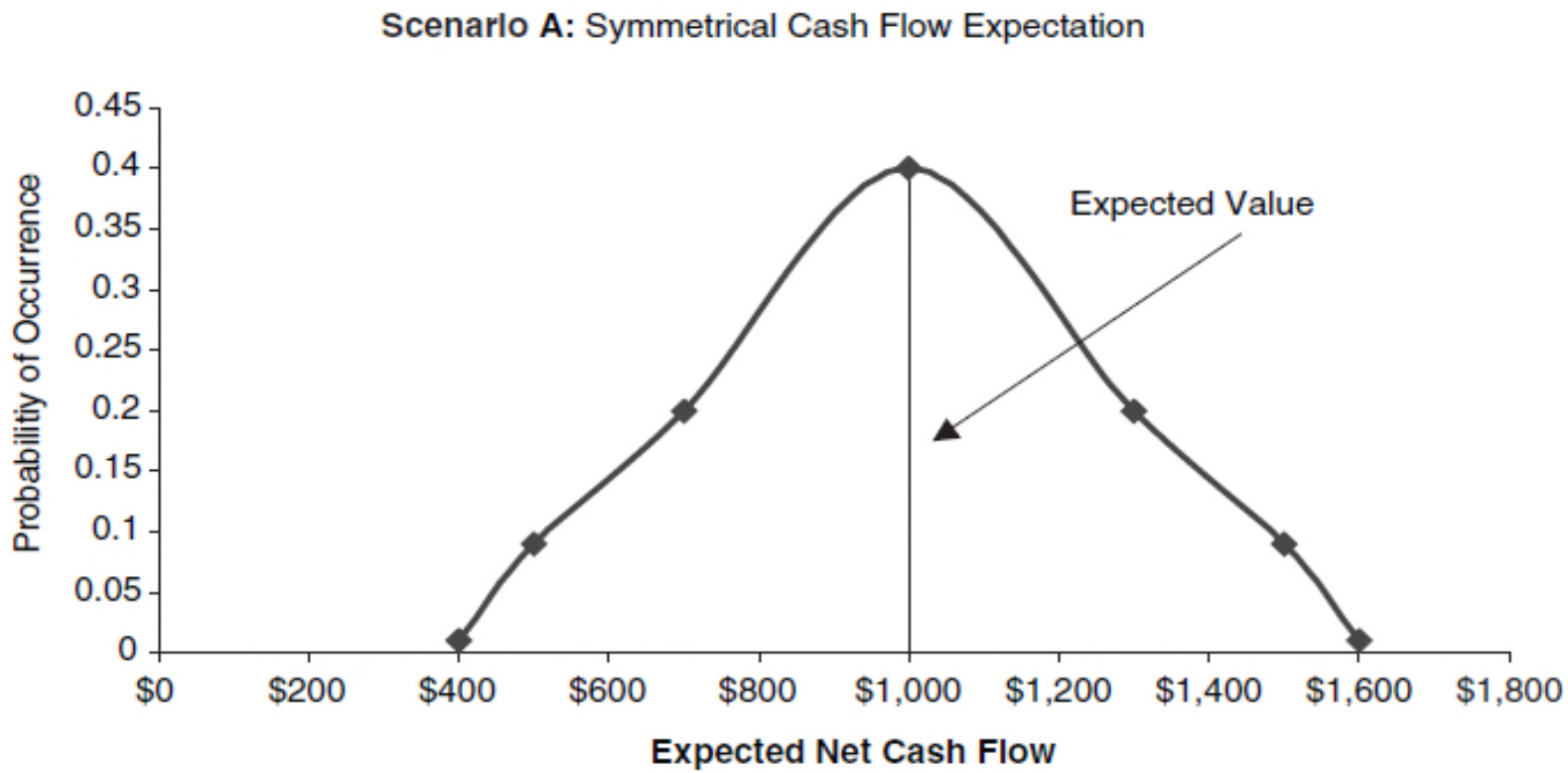
Projected Net Cash Flows	Probability of Occurrence	Probability-Weighted Value
$1,600.00	0.01	$16
1,500.00	0.09	135
1,300.00	0.20	260
1,000.00	0.40	400
700.00	0.20	140
500.00	0.09	45
400.00	0.01	4
	100%	$1,000

Net Cash Flows should be Probability-Weighted Expected Values (cont'd)

Scenario B—Skewed Net Cash Flow Expectation

Projected Net Cash Flows	Probability of Occurrence	Probability-Weighted Value
$1,600.00	0.01	$16
1,500.00	0.02	30
1,300.00	0.05	65
1,000.00	0.35	350
700.00	0.25	175
500.00	0.20	100
(100.00)	0.10	(10)
(600.00)	0.02	(12)
	100%	$714

Net Cash Flows should be Probability-Weighted Expected Values



Net Cash Flows should be Probability-Weighted Expected Values (cont'd)

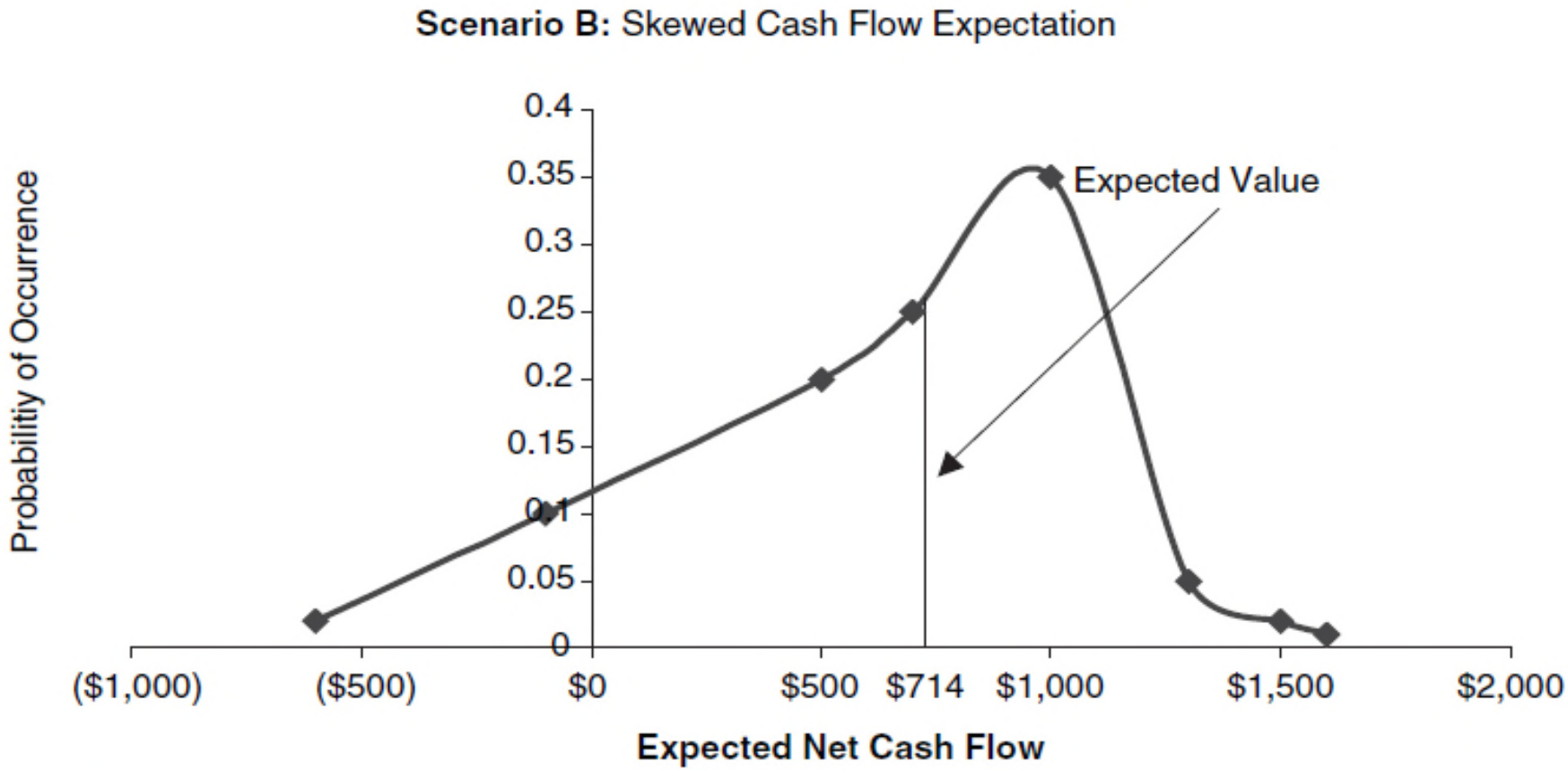


EXHIBIT 3.2 Example of Net Cash Flow Expectations (Graphs of Data from Exhibit 3.1)

Valuation of Risky Net Cash Flows (cont'd)

- Calculating a measure of central tendency (e.g., expected value) by probability-weighting the expected cash flows does not eliminate the risk of the distributions.
- Adding scenarios does not eliminate risk. Regardless of how many Monte-Carlo simulations are run, the risk-free rate is **not** the appropriate discount rate for risky cash flows.
- In fact adding scenarios that reflect the possible impact of materialization of company-specific risks likely increases the variance of possible outcomes which implies the risk has increased.

Risk Aversion Versus Risk Neutrality

- The present value of this series of contingent claims can be depicted in the following formula:

- If investors were risk neutral, the appropriate discount rate for estimating the present value of the expected cash flows would be the risk-free rate.

- But investors are not risk neutral; in the literature, investors are generally assumed to be risk averse.

$$PV = \sum_{1}^{n} \frac{\mathrm{E}(CF)_n}{(1-k)^n}$$

Risk Aversion Versus Risk Neutrality

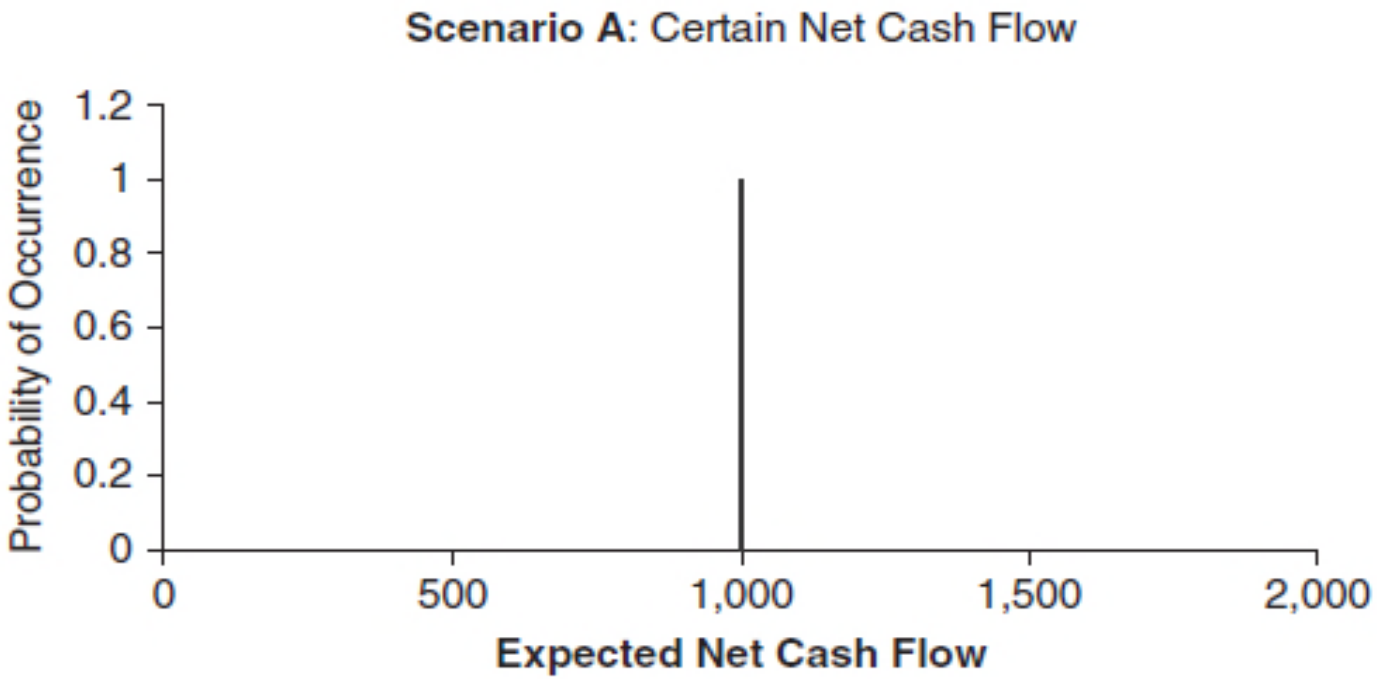
- The present value of a series of net cash flows can be depicted in the following formula:

(Formula 5.2)

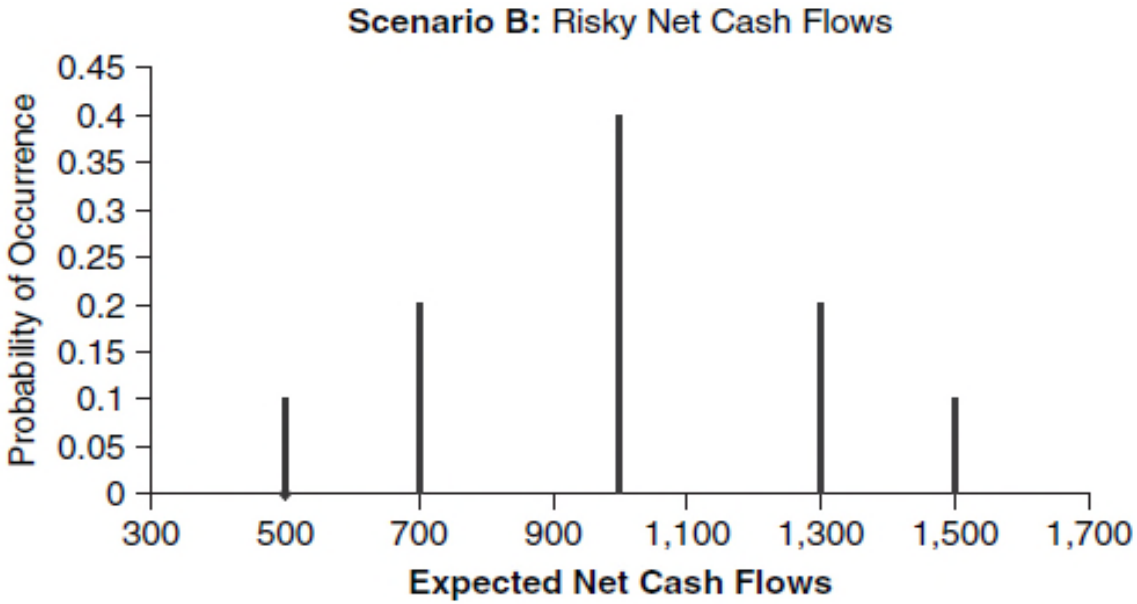
$$PV = \sum_{1}^{n} \frac{E(cash\ flow)_n}{(1+k)^n}$$

- If investors were risk neutral, the appropriate discount rate for estimating the present value of the expected cash flows would be the risk-free rate.
- But investors are not risk neutral - in the literature, investors are generally assumed to be risk averse.
- In the following examples, the expected (mean) cash flow is identical – but would the market price the risks using the same discount rate? Not in a risk averse world.

Risk Aversion Versus Risk Neutrality (cont'd)



Risk Aversion Versus Risk Neutrality (cont'd)



Risk Aversion Versus Risk Neutrality (cont'd)

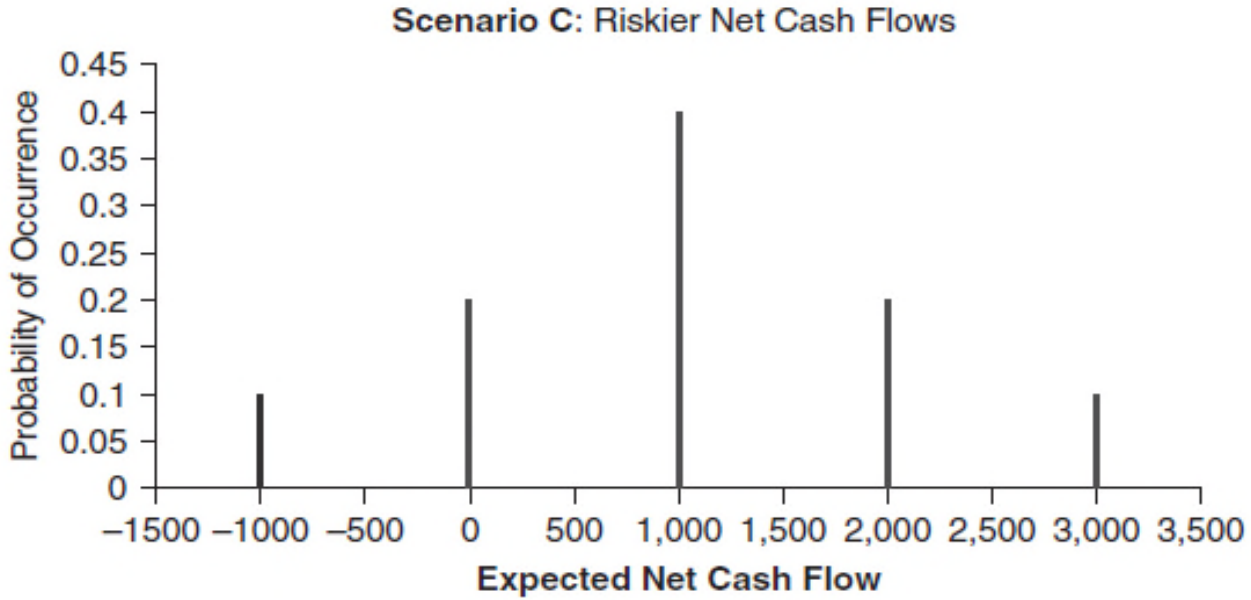


EXHIBIT 5.3 Valuation of Expected Net Cash Flows with Varying Distributions

ASC 820 and Concepts Statement No. 7: Cash Flows and Present Value Discount Rates

- ASC 820 *Fair Value Measurement*, paragraph 10-55-9 identifies three present value techniques are identified as:
  - Discount rate adjustment technique - “bond trader” method
  - Method 1 of the adjusted present value technique (the *Traditional Method* in Con 7) – “certainty equivalent” method
  - Method 2 of the adjusted present value technique (the *Expected Value Method* in Con 7) – “risk-adjusted discount rate” method

ASC 820 and Con 7: Cash Flows and Present Value Discount Rates (cont'd)

- Discount rate adjustment technique (the "bond-trader" approach in finance texts) uses promised cash flows and a promised rate of return that also includes a risk premium (for possible default):

$$PV = Promised\ cash\ flows\ /\ (1+K)$$

where K contains a risk premium (that must be different from k in Method 2).

- Note that this risk premium cannot be estimated from the CAPM alone (though it may be correlated with beta).
- It can only come from carefully selected market comparable securities.
- While ASC 820-10-55-33 provides an example of a "build-up approach", it is not the same build-up approach commonly used to estimate the cost of equity capital.

ASC 820 and Con 7: Cash Flows and Present Value Discount Rates (cont'd)

- The certainty-equivalent approach subtracts a cash risk premium from the expected cash flows and then discounts at the risk-free rate.
  - Con 7 describes this method when one is discounting the "most likely cash flow" (a single "expected" cash flow estimate) adjusted for risk:

(Formula 5.4)

$$PV = \frac{[E(cash\ flows) - cash\ risk\ premium]}{(1 + R_f)}$$

  - See ASC 820-10-55-15 refers to this as Method 1.

ASC 820 and Con 7: Cash Flows and Present Value Discount Rates (cont'd)

- Con 7 observes that when values are uncertain, accountants are trained to use "most likely" values or "best estimates".
- ASC 820 refers to this practice of using "most likely" values as Method 1 (the *Traditional Method* in Con 7).
- Then Con 7 correctly points out that when probability distributions are asymmetric, the "most likely" cash flow is **not** the same as the "expected" cash flow (the probability-weighted mean of the distribution of all possible outcomes).

ASC 820 and Con 7: Cash Flows and Present Value Discount Rates (cont'd)

- How is the cash risk premium determined? Either:
  - Conduct interviews with investors (e.g., ask, "What lesser amount of risk-free cash would make you indifferent between the risky gamble and the risk-free cash?")
  - It can be computed formulaically using capital market data as:

(Formula 5.5)

$$\frac{E(cash\ flow)_1}{(1+k)} = \frac{[E(cash\ flow)_1 - (cash\ risk\ premium)_1]}{1+R_f} = \frac{Certainty\ Equivalent_1}{1+R_f}$$

- In Method 1, the $E(cash\ flow)_1$ = Most likely cash flow – a single estimate.

ASC 820 and Con 7: Cash Flows and Present Value Discount Rates (cont'd)

- One can estimate the certainty equivalent as follows:

(Formula 5.6)

$$\frac{[E(cash\ flow)_1 \times (1 + R_f)]}{(1 + WACC)} = Certainty\ equivalent$$

- Applying standard finance tools to develop risk-adjusted discount rates to simply discount "most likely" cash flows is flawed unless the probability distribution is symmetric.

ASC 820 and Con 7: Cash Flows and Present Value Discount Rates (cont'd)

- The risk-adjusted discount rate approach adds a risk premium to the discount rate, which is then applied to expected cash flows:

(Formula 5.3)

$$PV = \frac{E(cash\ flows)}{(1+k)}$$

where: k = Risk-adjusted discount rate. Where $k >$ risk-free rate of return (R_f).

  - Method 2 is the approach most commonly presented in finance texts as the "standard" present value method.
  - ASC refers to the use of "expected cash flows" as the *Method 2 (the Expected Value Method in Con 7*).
  - These two alternative approaches to discounting uncertain future cash flows are both valid. Consistently applied, they give the same result.

Measuring Riskiness of Net Cash Flows

- All businesses are portfolios of operations and assets. The risk of the expected cash flows can be thought of in terms of the risk of company operations and assets (business risk) and the risk of how it's financed (financial risk).
  - Business risk is the risk of the company operations.
  - The capital structure of the business adds another layer of risk, financial risk. Financial risk is the added volatility providers of equity capital will experience because returns to debt holders and other preferred investors generally are fixed and are senior to returns on common equity.

Cost of Capital in Acquisitions

- The essence of value creation is to invest in capital projects that will earn higher rates of return than their cost of capital (the rate of return appropriate for the risk of the investment).
- An acquirer should analyze an M&A transaction in a similar fashion.
- The evaluation of a potential M&A transaction, however, is generally more complicated and has different risk characteristics than a large capital project.

Cost of Capital in Acquisitions (cont'd)

- An acquirer typically has more capital at risk when it makes an acquisition than when it invests in some other capital project.
- Most capital projects get phased in over time. As a result, if it appears that the project will not be a success, there are many points along the way where the company can halt the project and mitigate the risk of future low or negative cash flows.
- In an M&A transaction, the acquiring firm accepts ownership of the target company up front and is therefore fully committed to the investment. If the expected cash flows from the investment are not realized, the returns on the investment may be less than the cost of capital.

Categories of Cash Flows

- The streams of expected cash flows from M&A transactions can be viewed as falling into three broad categories:
  - “stand-alone” cash flows,
  - integration costs, and
  - synergies.

- The first category, the stand-alone cash flows of the target company, includes the cash flows that the target company would be expected to produce if it were optimally operated as a separate entity.

Categories of Cash Flows (cont'd)

- Second, in a typical acquisition, the acquiring company will make investments beyond those required to acquire the target company in order to integrate the two businesses. These would not be captured in the expected cash flows of the target company. Generally, integration costs are fairly certain and occur shortly after the closing of the transaction.

- The third and most complex category of cash flows to assess is cash flows from synergies - the increase in performance of the combined firm over what the two firms are already expected or required to accomplish as independent firms.

Categories of Cash Flows (cont'd)

- Cash flows resulting from synergies can be placed into four general categories:
  - cost savings (e.g., process improvements, economies of scale, and pricing power over vendors),
  - revenue enhancements (e.g., cross-selling to existing customers), and
  - tax benefits (e.g., write-up of the tax basis of assets and utilization of net operating loss carry-forwards).
  - financing (e.g., resulting net cash flows can support greater debt at lower interest rate).
- The cash flows associated with synergies can run the gamut of highly certain (e.g., cutting certain duplicative overhead costs) to highly speculative (e.g., certain revenue enhancements).

Estimating the Cost of Capital

- To accurately value these cash flow streams in an M&A transaction, they each must be discounted at an appropriate rate.

- Stand-Alone Cash Flows
  - Target company's stand-alone cash flows—those that are expected to be realized from optimally operating the business—should be valued.
  - Remember, the cost of capital should reflect the risk of the cash flows.

Integration Cash Flows

- Additional costs associated with integrating the target business with the existing business - generally occur shortly after the acquisition and, if well planned, have limited variability.
  - Reasonable to discount certain of these cash flows at a rate as low as the after-tax cost of debt of the combined company. This rate reflects not only the low risk of the cash flows but also the likely source of financing.
  - If some of these cash flows are expected to occur over a long period of time or could vary based on certain factors, it may be appropriate to discount these cash flows at the WACC of the combined company. Note: cash flows related to integration costs and synergies that should be discounted are the tax-affected cash flows.

Cash Flows from Synergies

- Synergies - Critically evaluating the potential cash flows from synergies is essential to appropriately valuing an M&A transaction. As one commentator put it:
  - Since shareholders do not have to pay a premium to buy the shares of the target on their own, these payoffs, the synergies, must represent something that shareholders cannot get on their own. They must mean improvements in performance greater than those already expected by the markets. If these synergies are not achieved, the acquisition premium is merely a gift from the shareholders of the acquirer to the shareholders of the target company.

Cash Flows from Synergies (cont'd)

- The risk of achieving the cash flow goals from synergies depends on the specific synergy and situation:

  - **Cost Savings:** Cutting corporate overhead by eliminating duplicate functions is a common synergy that strategic buyers assume can be achieved quickly.
    - While some of these cost cuts can occur immediately (e.g., elimination of one company's board of directors), some can be difficult to implement in as short a time frame as planned because these cuts can often only be made once the two companies have been integrated, which can be a long process.

Cash Flows from Synergies (cont'd)

- **Revenue Enhancements**: One commentator pointed out that "revenue enhancements are notoriously hard to estimate, however, because they involve external variables beyond management's control."
  - A company's customers, for example, may respond negatively to changes implemented as a result of a merger, potentially limiting the expected revenue growth from cross-selling products or services.
  - Competitors may respond aggressively to a merger to protect their market position, possibly limiting expected market share gains.

Cash Flows from Synergies (cont'd)

- **Tax Benefits:** Net operating loss carry-forwards (NOLs) attained through an acquisition can be valuable. However, their value is dependent on the timing of their utilization, which in turn is dependent on the limitations imposed by the income tax code and the acquirer's ability to generate positive pre-tax income.

  The limitation on NOLs can be thought of as a "negative" synergy compared to the standalone value of the Target.

  The risk of generating positive pre-tax income increases if significant leverage is used to complete the acquisition.

Cash Flows from Synergies (cont'd)

- **Financing:** Net cash flows of the combined business may be less volatile – this may lead to a better debt rating which in turn can support a greater amount of debt at lower interest rates.
  - But in no case should the target be valued used the cost of debt resulting from the combination of the businesses. Financing synergy is often the result of the buyers business or capital structure. If the buyer uses his capital structure as the basis for the valuation of the target, he is "gifting" value to the target company shareholders.

Value and Price Differ

- One assesses the cost of capital in order to determine the value of an M&A transaction to an acquirer, not to indicate what price a buyer should pay for an acquisition. It is important for an acquirer to distinguish between the two.

- The value of an acquisition to an acquirer includes
  - stand-alone cash flows of the target company,
  - integration costs, and
  - synergies.

- The price the acquirer should be willing to pay for an acquisition is something less than the value to the acquirer. If it were not, the transaction would not create shareholder value.

Value and Price Differ (cont'd)

- The goal of a buyer is to pay as little as possible, which typically means minimizing how much it pays for potential synergies.
- Paying for synergies that the **acquiring** company brings to the table essentially transfers value to the target's shareholders that should accrue to the acquirer's shareholders.
- However, when there are multiple bidders for a company, it is not uncommon for an acquirer to pay an increasing portion of the synergistic value to win the auction. Knowing when to say "when" can be difficult.

Common Mistakes in Pricing

- Following are some common mistakes that we believe are made when the value of an M&A transaction is being assessed:
  - Using the acquiring firm's overall cost of capital to value the acquisition: the correct cost of capital matches the risks of the expected cash flows (the target) being valued.
  - Basing the cost of capital to value an acquisition on the cost of the capital used to finance the acquisition: For example, a large strategic acquirer may make a small acquisition using all debt and analyze the transaction based on its cost of debt. This may be the cost incurred by the acquirer but not the appropriate cost of capital to assess the value of the acquisition.

Common Mistakes in Pricing (cont'd)

- Failure to differentiate the risks of the different cash flow stream categories (i.e., integration costs, target company operating cash flows, and synergies): Cash flows from synergies are typically riskier than the target company's stand-alone operating cash flows and integration costs.
- Determining the price to pay for an acquisition based on an analysis of premiums paid in other controlling interest transactions: An analysis of control premiums paid in other transactions typically indicates a wide range of premiums have been paid. This is because no two transactions will have the same economic benefits. The key weakness of a premiums analysis is the strength of a DCF analysis. A DCF analysis can take into consideration the specific cash flows of a transaction, while a premiums analysis is merely a broad-based comparison of transactions.

Example

Background

Target	-	WACC	11%
	-	PV of Standalone Cash Flows	$12,900
	-	Price Paid	$16,600
	-	IRR (Buyer forecast)	15%
Buyer WACC			9%
Market Participant WACC			9%

Example (cont'd)

Net Cash Flow Forecast

	Year 1	Year 2	Year 3	Normalized Residual Year	Growth Thereafter
Standalone	$1,000	$1,050	$1,102	$1,135	
% Growth	-	+5	+5	+3	+3
Buyer Forecasts					
Integration Costs	<100>	<100>			
Cost Savings	50	100	103	106	+3
Revenue Enhancements	-	100	300	600	+12 - 15
Tax Benefits	50	50	50	50	-
Forecast	$1,000	$1,200	$1,556	$1,891	
% Growth		+20	+30	+22	+6

Example (cont'd)

Analysis of Forecast Revenue Enhancements

		Year 1	Year 2	Year 3	Normalized Residual Year
Buyer Forecast		-	$100	$300	$600
Buyer Specific Synergy			50	150	300
Market	Optimistic		50 x .25	150 x .25	300 x .25
Participant	Likely		20 x .50	100 x .50	200 x .50
Expectations	Pessimistic		10 x .25	50 x .25	100 x .25
Expected cash flow			25	100	200

Example (cont'd)

Net Cash Flow Forecast

	Year 1	Year 2	Year 3	Normalized Residual Year	Growth Thereafter
Standalone	$1,000	$1,050	$1,102	$1,135	
% Growth	-	+5	+5	+3	+3
Market Participant					
Integration Costs	<100>	<100>			
Cost Savings	50	100	103	106	+3
Revenue					
Enhancements Expected	-	25	100	200	+6
Tax Benefits	50	50	50	50	-
	$1,000	$1,125	$1,355	$1,491	
% Growth		+12.5	+20	+10	+3.25

Example (cont'd)

	Year 1			Year 2			Year 3			Residual				Total
	(1)	(2)	(3) = (1) x (2)	(4)	(5)	(6) = (4) x (5)	(7)	(8)	(9) = (7) x (8)	(10)	(11)	(12)	(13)	
	CF	PVF	PV	CF	PVF	PV	CF	PVF	PV	CF	CAP Rate	CAP CF	PV	
Standalone														
@ 11%	$1,000	0.9009	$901	$1,050	0.8116	$852	$1,102	0.7312	$806	$1,135	0.08	$14,187	$10,374	$12,933
IRR														
@15%	$1,000	0.8696	$870	$1,200	0.7562	$907	$1,556	0.6576	$1,023	$1,891	0.09	$21,011	$13,817	$16,617
Market Participant														
@11%	$1,000	0.9009	$901	$1,125	0.8116	$913	$1,355	0.7312	$991	$1,495	0.0775	$19,238	$14,062	$16,821

Issues - Summary

- No single cost of capital – use range of reasonable estimates
- Mismatch discount rate
  - Correct discount rate is not buyer WACC nor Market Participant WACC
  - Should reflect risk of Target cash flows and risks of synergies
- Biased cash flow forecasts
  - Expected or Aspirational forecasts?
  - Test cash flow estimates over time – does management produced consistently biased forecasts?
  - If analyst adds a “company specific risk” factor to adjust the risks of the forecast cash flows, need to test impact of company specific risk factor against probability weighted cash flows

Issues - Summary (cont'd)

- Will risks change over time? If "yes", then single discount rate inappropriate
- Residual value -
  - Forecasts are often for only a few years of relatively high growth
  - Need to be extended until growth is stabilized at "long-term expected" rate of growth of net cash flows
  - Choice:
    - Extend forecast
    - Choose multi-stage terminal value model

      (see example on PowerPoint following)

Discounting With Changing Business Risks

(from upcoming Cost of Capital: Applications and Examples 5th ed.)

- Typically the discount rate, *k*, used in valuation is assumed to remain constant through time. But if the underlying risk is expected to change over time, the discount rate will change as well.
- For example, assume that the principle product of the subject business is patented and that the patent expires two years following the valuation date. The expected net cash flows in year three and thereafter will likely change (e.g., profit margins will likely decrease as a result of increased competition following expiration of the patent).
- But we would expect that the riskiness of those expected net cash flows would also increase (e.g., expected volatility of the cash flows will likely increase as the result of increased competition).

Discounting With Changing Business Risks (cont'd)

- The net cash flows of a business are not independent of each other. The net cash flows of year three, for example, build on the net cash flow and business operations in years one and two. Expenditures on advertising and sales calls to prospective customers in year one and two created demand for the business's goods and service in year three and thereafter. Capital expenditure in year one and two provide the capability of meeting customer demand in year three and thereafter. In year three even through the patent has expired, much of year three's net cash flow are still dependent on expenditures made in prior years.
- That is, NCF_2 is at least partially dependent upon NCF_1; NCF_3 is at least partially dependent upon NCF_2 and NCF_1, etc.
- Because the net cash flows are dependent (or conditional), the discount factors for later years are dependent upon prior year discount factors.

Discounting With Changing Business Risks (cont'd)

- k_1 = Discount rate (cost of capital) during period1 through n
- k_2 =Discount rate (cost of capital) during period *n+1* and thereafter

$$PV = \frac{NCF_1}{(1+k_1)} + \frac{NCF_2}{(1+k_1)^2} + \cdots + \frac{NCF_n}{(1+k_1)^n}$$
$$+ \frac{NCF_{n+1}}{(1+k_1)^n \times (1+k_2)} + \frac{NCF_{n+2}}{(1+k_1)^n \times (1+k_2)^2} + \cdots + \frac{NCF_{n+m}}{(1+k_1)^n \times (1+k_2)^m}$$

Discounting With Changing Business Risks (cont'd)

- Assume that k_1=12% and k_2=20%

$$PV = \frac{\$100}{(1+0.12)} + \frac{\$120}{(1+0.12)^2} + \frac{\$140}{(1+0.12)^2 \times (1+0.20)} + \frac{\frac{\$140 \times (1+0.05)}{0.20-0.05}}{(1+0.12)^2 \times (1+0.20)}$$

$$= \frac{\$100}{1.12} + \frac{\$120}{1.2544} + \frac{\$140}{1.2544 \times 1.20} + \frac{\frac{\$147}{0.15}}{1.2544 \times 1.20}$$

$$= \$89.29 + \$95.66 + \$93.00 + \frac{\$980}{1.5053}$$

$$= \$89.29 + \$95.66 + \$93.00 + \$651.03$$

$$= \$928.98$$

Residual Model- 3-stage DCF Model

(from upcoming Cost of Capital: Applications and Examples 5th ed.)

$$PV = \frac{NCF_1}{(1+k)} + \frac{NCF_2}{(1+k)^2} + \cdots + \frac{NCF_n}{(1+k)^n}$$

$$+ \frac{1}{(1+k)^n} \left\{ \frac{NCF_n(1+g_1)}{(k-g_1)} \left[1 - \left(\frac{1+g_1}{1+k} \right)^m \right] + \frac{\frac{NCF_n(1+g_1)^m(1+g_2)}{(k-g_2)}}{(1+k)^m} \right\}$$

where:

$NCF_1 \ldots NCF_n$ = Net cash flow expected in each of the periods 1 through n, n being the last period of the discrete net cash flow projections

k = Discount rate (cost of capital)

g_1 = Expected sustainable growth rate in net cash flow, starting with the last period of the discrete projections, n, as the base year for m years

g_2 = Expected sustainable long-term growth rate in net cash flow, starting with the last period of the discrete projections as the base year having increased at the rate g_1 for m years.

We would typically expect that g_2 was less than g_1.

Research on Market Pricing of Other Risk Factors

- Two researchers examined unsystematic risk in portfolios of firms grouped by market value of equity and length of public listing (used as a proxy for age) using data from August 1963 to December 2001.
- They found that unsystematic volatilities of small firms (market capitalization below the median market capitalization of all issues: approximately 3% of total market capitalization in 1962–1969 and 1% in 2000–2001) were positive predictors of stock returns (and are unlike volatilities of bigger, older, and newer firms).
- They found that size is a significant predictor of returns primarily because it is a proxy for entrepreneurial risk.

Research on Market Pricing of Other Risk Factors (cont'd)

- But another study found a strong link between implied unsystematic volatility derived from options (for companies with traded stock options) and future stock returns for those same companies. Those authors point out that the problem with most studies is that they measure unsystematic volatility by examining historical realized volatilities.
- These researchers found that historical realized volatilities do not explain future returns of individual stocks when the pricing model includes implied unsystematic volatility.
- They found that the market prices the following factors: company size, relative book-value-to-market-value of equity, and implied forward unsystematic risk of individual companies. They found that companies with greater implied forward unsystematic risk realized greater stock returns and companies with lower implied forward unsystematic risk realized smaller stock returns.

Research on Market Pricing of Other Risk Factors (cont'd)

- In another study, the authors investigated the inefficiency of the stock market in pricing companies that are small and less visible (i.e., followed by few or no analysts) such that they can be considered neglected by investors. They found that stock market prices of these firms adjust to news only slowly. They also found that their stock prices are volatile. For the most neglected companies, the authors found that company-specific risk is priced by the market. This finding is separate from, though partly related to, the size and lack of liquidity effects.
- In still another study, the authors found that there is a relationship between information quality, beta estimation, and the cost of capital. As information quality improves, the cost of capital decreases. Other studies examine the relationship between firm-specific information, unsystematic risk, and the cost of capital. These studies found that unsystematic risk and the cost of capital vary with the quality of information.

Research on Other Risk Factors (cont'd)

- Is there meaningful information about risk of an investment in the error term of the regression used to estimate beta? That is, if one looks at the error in estimating beta over a look-back period, is there information in the magnitude of the errors?
- One study found that firms with large beta estimation errors are characterized by low-quality earnings, low persistence of earnings, low predictability of earnings, and high volatility of returns.
- Firms with large beta estimation errors are fundamentally weak. The results of the study support the view that the reliability of the beta estimate is an indicator of the uncertainty found by investors. This uncertainty is caused by investors receiving low-quality information and/or fundamental weakness in cash flows, making it more difficult for investors to evaluate firm information.
- This leads to high firm-specific uncertainty associated with firm fundamentals. Further, the amount of firm-specific uncertainty about fundamentals is a crucial determinant of the level of the reliability of the beta estimate.

Research on Other Risk Factors (cont'd)

- In another study, the authors found that errors in earnings forecasts play an important role in the pricing of unsystematic risk and how that relationship changes through the business cycle.
- Firms tend to underestimate the growth rates in earnings during the expansion phase of the business cycle and tend to overestimate the growth rate in earnings during recessions. The tendency is for the underestimation to be more frequent and small while the overestimates are infrequent and large.
- This is borne out with the finding that firms with high volatility or high unsystematic risk realized greater returns following good news and realized low returns following bad news.

Research on Other Risk Factors (cont'd)

- Brockman, Schutte, and Yu, studied unsystematic risk premiums using observations from individual stocks in 44 stock markets from 1980 to 2007.
  - Study differs from most of the prior studies because they looked at unsystematic risk of individual company stocks, not portfolios of stocks.
  - Found that stocks with greater unsystematic risk realize greater returns.
  - The authors then investigated whether the unsystematic risk premium is greater in certain countries. After controlling for volatility of firm cash flows, they found that the unsystematic risk effect increases in countries and at times when trading costs and information costs are high.

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Thank You!

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