



FINANCIAL EVALUATION AND STRATEGY:

CORPORATE FINANCE

with Heitor Almeida

MODULE 4

Mergers and Acquisitions, Risk, and
Performance Evaluation



VIDEO LESSON 4-1

Objectives and Overview



CREATING SHAREHOLDER VALUE

New products – Module 3



MERGERS AND ACQUISITIONS

Buying other companies that have valuable projects



Or selling the company to another owner

(Flazingo Photos, 2014)

TOPICS IN MERGERS AND ACQUISITIONS

Many interesting topics, so little time ...



We will focus mostly on understanding the key motivations for M&A, how to value them, and how to price an M&A deal

LEVERAGED BUYOUTS



A major form of M&A deal in recent times

We will also discuss what is special about LBOs and how they can create shareholder value.

(commons.wikimedia.org/Chrisloader, 2009)

UNCERTAINTY IN FORECASTS

All of our examples in Module 3 assumed we “knew” the key forecasts.



What should we do if we are not certain?

(McGrath, 2009)

DEALING WITH UNCERTAINTY



In this module, we learn how we deal with uncertainty when valuing an investment.

PERFORMANCE EVALUATION



How do we know if a project or division is generating real economic value?

The answer is directly related to our answer to the previous question: How do we deal with uncertainty?

(Dalager, 2005)

MODULE 3 OBJECTIVES

(1 OF 3)

You will learn:

The concept of synergies in mergers and acquisitions (M&A)

To distinguish between good and bad reasons to engage in M&A

To calculate synergies using net present value (NPV) techniques

How synergies determine the pricing of M&A deals

MODULE 3 OBJECTIVES

(2 OF 3)

You will learn:

To differentiate between cash and stock
financed mergers

The specific characteristics of leveraged
buyouts (LBO)

How to perform sensitivity analysis and
use it in investment decisions

How we incorporate risk into valuation by
changing the discount rate

MODULE 3 OBJECTIVES

(3 OF 3)

You will learn:

To calculate the WACC (weighted-average cost of capital) for a company

To estimate EVA (economic value-added) for a company or a division of a company

How to use EVA for performance evaluation

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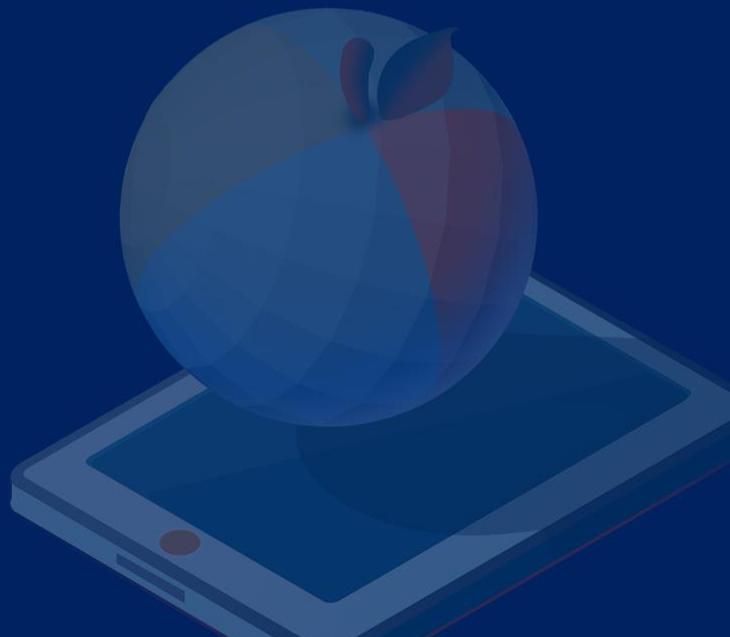
MODULE 4

Mergers and Acquisitions, Risk, and
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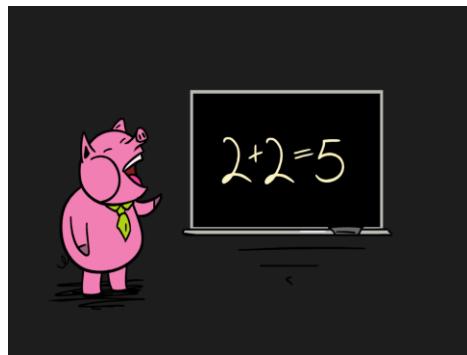
VIDEO LESSON 4-2

Good and Bad Reasons to Engage in M&A Transactions



THE CONCEPT OF SYNERGY

Key idea: merger adds value only if the two merging companies are worth more together than apart ("synergies")



Synergy = 1

(Darby, 2015)

The synergy is the NPV of the merger

OTHER TYPES OF M&A DEALS (1 OF 2)

Some types of M&A deals do not involve a merger between two companies, but the same logic applies

Asset sales

In 2012, Microsoft bought patents from AOL

MSFT + patents > AOL + patents

OTHER TYPES OF M&A DEALS (2 OF 2)

Some types of M&A deals do not involve a merger between two companies, but the same logic applies

Spinoffs

In 2011, Kraft split into two separate companies: Global Snacks (Mondelez International) and the new Kraft (North American grocery business)

New Kraft + Mondelez > Old Kraft

WHEN IS $2 + 2 = 5$? RATIONAL MOTIVES FOR MERGERS (1 OF 2)

A. Economies of scale

Reduce costs, increase profits

B. Industry consolidation and market power

Mergers between competitors in the same industry

Charge higher prices!

WHEN IS $2 + 2 = 5$? RATIONAL MOTIVES FOR MERGERS (2 OF 2)

C. Economies of vertical integration

Buying a major supplier and producing
“in house”

D. Eliminating inefficiencies (such as poor management)

MERGERS AND CASH HOLDINGS

Cash earns very low returns
(treasuries, bank deposits)

Acquiring another company must be
a better use of “idle cash”



In fact, this is a recipe for disaster!

(flickr.com/401(K) 2012, 2011)

ACQUISITIONS BY CASH-RICH COMPANIES

A famous study by Harford (1999) using data from 1977 to 1993 finds that

Cash-rich companies were more likely to attempt acquisitions.

Their acquisitions destroyed shareholder value.

Cash-rich acquirers destroyed seven cents in value for each dollar of excess cash held in the balance sheet.

MERGERS AND CASH

What matters is whether the merger generates synergies ($NPV > 0$).

If a merger adds real value, the companies should be able to finance it.

Don't spend cash just because you have it!

RISK DIVERSIFICATION

(1 OF 2)

Companies with business in many unrelated industries are called “conglomerates.”

An example from the US: General Electric



(Radecki, 2002)

RISK DIVERSIFICATION

(2 OF 2)

Should a company buy another company in a different industry to reduce risks for shareholders?

No –

Shareholders can diversify risks on their own by buying stock directly in the other company.

BREAKING UP CONGLOMERATES

In fact, the current trend in the US is towards increased focus and less conglomeration.

G.E. to Retreat From Finance in Post-Crisis Reorganization

By MICHAEL J. de la MERCED and ANDREW ROSS SORKIN APRIL 10, 2015

Beginning by selling \$26.5 billion worth of real estate assets, G.E. is hastening to return to its roots as one of the mightiest industrial companies in the world, whose operations include jet engines, oil drilling equipment and medical devices. What it will mostly shed is GE Capital, a lender with hundreds of billions of dollars' worth of assets.

MERGERS AND EPS (EARNINGS PER SHARE)

Suppose Firm A acquires Firm B as specified in the example below

	Firm A	Firm B	Merged Firm
Earnings	100	40	140
# Share	100	20	120
Price/share	30	30	-
EPS	1.00	2.00	1.17
P/E	30	15	-

Does this merger create value for the shareholders of Firm A?



MERGERS AND EPS (EARNINGS PER SHARE)

	Firm A	Firm B	Merged Firm
Earnings	100	40	140
# Share	100	20	120
Price/share	30	30	-
EPS	1.00	2.00	1.17
P/E	30	15	-

No – this is a $2 + 2 = 4$ case ($100 + 40 = 140$)

But EPS is going up by 17% for Firm A! Why?

“WEIGHTED-AVERAGING” EFFECT



If a company with low EPS acquires
another company with high EPS ...

EPS will go up!

Another example of why EPS is the
wrong metric to look at

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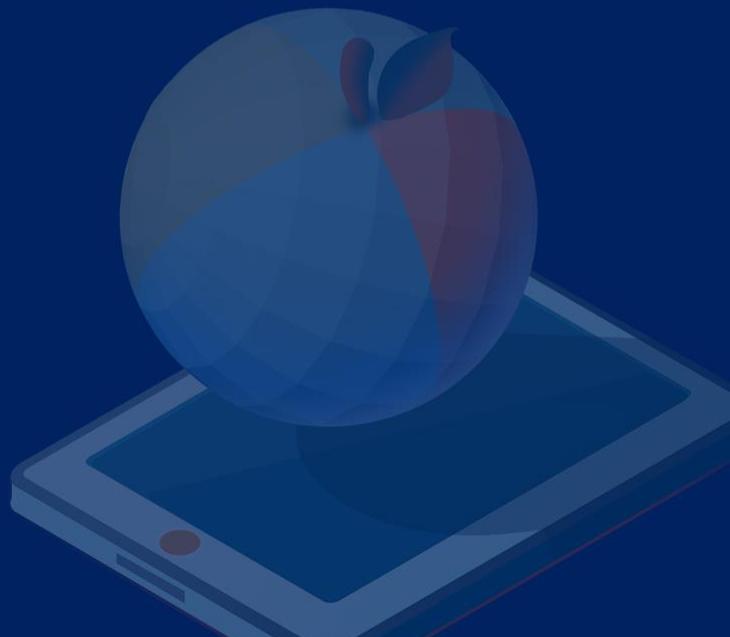
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VIDEO LESSON 4-3

Synergy Valuation and Deal Pricing



WHAT IS THE VALUE OF SYNERGIES?

Placing a value on synergies is exactly like the NPV calculations that we worked with in Module 3.

1. Forecast cash flows from anticipated synergies.
2. Compute the NPV of the synergies using an appropriate discount rate.

EXAMPLE – HEWLETT-PACKARD-COMPAQ MERGER

Merger took place in 2002 and was announced on Sep 4, 2001

Press Release: September 03, 2001

Topics:

Hewlett-Packard and Compaq agree to merge, creating \$87 billion global technology leader

Will Offer Businesses And Consumers Most Complete Set Of Products And Services, With Commitment To Open Systems And Architectures Will Have #1 Worldwide Positions In Servers, PCs and Hand-helds, and Imaging and Printing; Leading Positions In IT Services, Storage, Management Software Companies Expect Annual Cost Synergies Of Approximately \$2.5 Billion; Transaction Expected To Be Substantially Accretive In Year One

PALO ALTO, CA and HOUSTON, TX, September 3, 2001

Hewlett-Packard Company (NYSE: HWP) and Compaq Computer Corporation (NYSE: CPQ) announced today a definitive merger agreement to create an \$87 billion global technology leader. The new HP will offer the industry's most complete set of IT products and services for both businesses and consumers, with a commitment to serving customers with open systems and architectures. The combined company will have #1 worldwide revenue positions in servers, access devices (PCs and hand-helds) and imaging and printing, as well as leading revenue positions in IT services, storage and management software.

DATA ON SYNERGIES

Through major cost savings and improved profitability of business lines, substantial earnings improvements for shareholders would be realized.

Management projected recurring annual pretax cost savings of \$2.5 billion starting in mid-2004. These cost reductions would arise from reductions in administrative/IT costs, R&D efficiency, marketing efficiencies, etc.

Management also projected total revenue losses of 4.1 billion starting in 2004, as a result of consolidation of product lines and other merger costs. The firm's profit margin is 12%.

The tax rate is 26%, and the discount rate is 12%.

Synergies will grow at the rate of inflation (3% expected inflation at the time).

ESTIMATING SYNERGY CASH FLOWS

Lost revenue starting in 2004 = 4.1 B

Impact on bottom line (profits) =

Annual synergy starting in 2004 =
2.5 B

Total synergy cash flow starting in
2004 = 2.5B -

NPV OF ANNUAL SYNERGY

(1 OF 3)

What is the NPV of the annual synergy cash flow as of 2001?



(Maxwell, 2007)

NPV OF ANNUAL SYNERGY

(2 OF 3)

		2001	2002	2003	2004
Cost savings					\$2500
Effect of lost revenue					(\$500)
Change in pre-tax profits					\$2000
Taxes					(\$520)
Net profit					\$1480
NPV synergies					

NPV =

NPV OF ANNUAL SYNERGY

(3 OF 3)

		2001	2002	2003	2004
Cost savings					\$2500
Effect of lost revenue					(\$500)
Change in pre-tax profits					\$2000
Taxes					(\$520)
Net profit					\$1480
NPV synergies		\$13109			

$$\text{NPV} = (1,480 / (12\% - 3\%)) / (1 + 12\%)^2 = \\ 13,109$$

SYNERGIES AND DEAL PRICE

We arrived at a synergy value of 13.1B dollars

Pre-deal valuation for both companies (Aug 31, 2001)

		Shares Outstanding	Price per share
HP pre-deal value	\$45817	1974	23.21
Compaq pre-deal value	\$20859	1689	12.35

How much should HP pay for Compaq?

SYNERGIES AND THE NPV OF THE DEAL

The value of the synergies is the total NPV of the deal.

\$13.1 billion in this case

But this NPV must be divided between acquirer and target!

NPV for target = deal premium =
deal price – target value

NPV for acquirer = synergy – deal
premium

SYNERGIES AND DEAL PREMIUM

A key relationship

If synergy > premium, deal is positive NPV for acquirer

The average premium paid for public targets is approximately 30%, so M&A deals must generate large synergies!

SYNERGIES AND DEAL PREMIUM (1 OF 2)

How much should HP offer to Compaq?



(Maxwell, 2007)

SYNERGIES AND DEAL PREMIUM (2 OF 2)

How much should HP offer to Compaq?

Premium < 13.1 B

So offer must be lower than 20.9B + 13.1B

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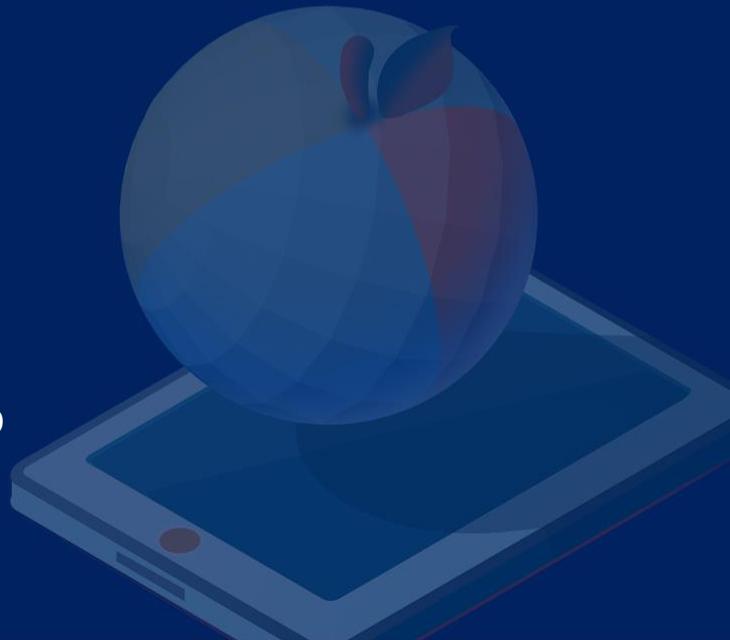
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VIDEO LESSON 4-4

Means of Payment and Stock Market Reaction to
M&A Deals



PAYING FOR A DEAL



Acquirers can choose to pay cash or in stock.

Let us figure out what the key difference is.
(Flazingo Photos, 2014)

PAYING CASH

Back to the HP-Compaq example

Suppose the final price is \$27B.

Compaq had 1,689 million shares outstanding so this represents \$16 a share.

If HP pays cash, it would offer

PAYING WITH STOCK

HP issues new shares and gives them to Compaq's shareholders in exchange for Compaq's shares.

As a result, Compaq shareholders become shareholders of HP, which will become the new (merged) firm.

EXCHANGE RATIO

Exchange ratio = Number of shares
of HP that each Compaq shareholder
receives

What should be the exchange ratio
for the merger?

COMPUTING THE EXCHANGE RATIO

Suppose HP wants to pay \$16 dollars a share.

$$\$16 = \text{HP stock price} * \text{Exchange ratio}$$

Suppose we use HP's pre-deal stock price, \$23.21.

Exchange ratio =

WHAT DOES THIS MEAN?

If you own 10 shares of Compaq, you would receive 6.9 shares of HP.

This particular merger was financed entirely by stock at an exchange ratio of 0.6325 shares of HP for each share of Compaq.

STOCK MARKET REACTION TO THE MERGER



HP stock price went down to 18 dollars a share!

(finance.yahoo.com, n.d.)

STOCK PAYMENT AND STOCK MARKET REACTION (1 OF 2)

Compaq shareholders are paid in stock, so the actual value of the payment depends on the market reaction to the deal.

How much was HP's offer worth following the market reaction to the deal?



STOCK PAYMENT AND STOCK MARKET REACTION (2 OF 2)

The actual value of the offer per share after the announcement was

$$\$ 11.4 = \$18 * 0.6325$$

Compaq's stock price prior to the deal was \$12.35!

What should have happened to Compaq's stock price after the deal announcement?

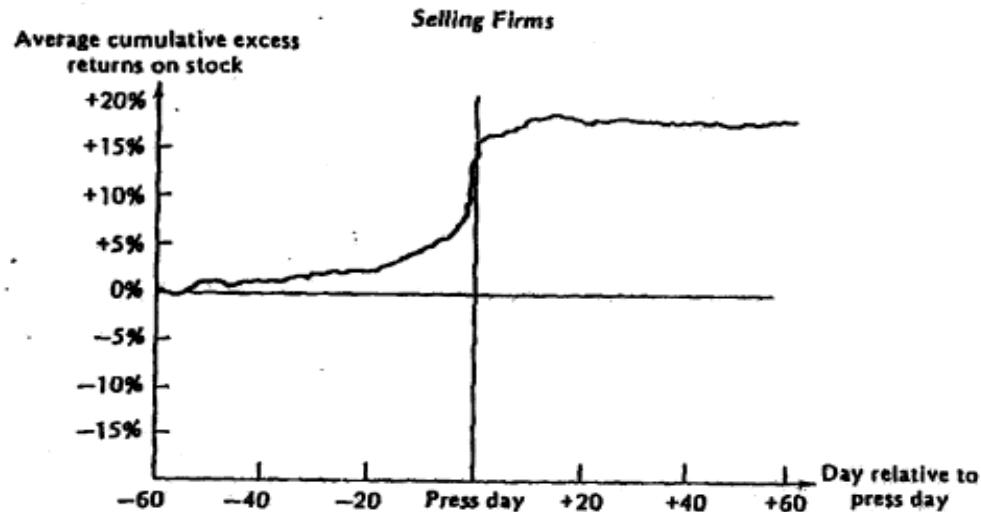
RESEARCH EVIDENCE ON MERGER ANNOUNCEMENT RETURNS

M&A deals give us a chance to look at how the stock market reacts to corporate decisions.

If merger is $NPV > 0$, stock prices should go up

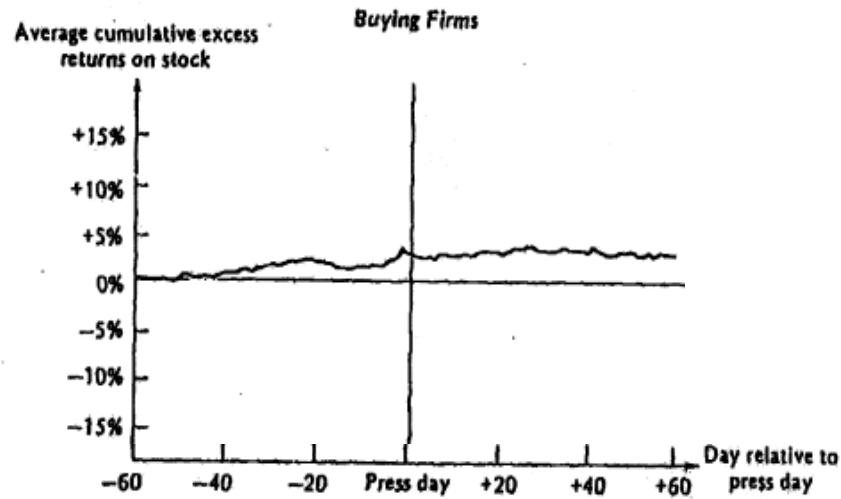
TARGET FIRMS

Deals are positive NPV for targets –
they earn a significant premium on
average.



(Asquith, 1983)

ACQUIRER FIRMS



Mergers do create value, but most or all of the gains go to target firms.

Acquirers pay too much!

(Asquith, 1983)

THE AFTERMATH OF HP-COMPAQ (1 OF 2)

Who was right, the market or the management?

Can we look at long-term stock price reaction?

THE AFTERMATH OF HP-COMPAQ (2 OF 2)

Hewlett-Packard Company (HPQ) ★ Watchlist

30.77 +0.11(+0.36%) NYSE - As of 4:01PM EDT



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LONG-TERM STOCK PRICE REACTION – ANALYSIS

It appears that HP did pretty well in the years following the merger.

But our comparisons are imperfect.

How would HP have done without the merger?

QUALITATIVE ANALYSIS

(1 OF 2)

Why Carly's big bet is failing (Fortune Classics, 2005)

by Carol J. Loomis AUGUST 21, 2011, 1:30 PM EDT



Buying Compaq hasn't paid off for Hewlett-Packard's investors. Not by a long shot. Now, nearly three years after the merger, there is still no easy solution to HP's problems.

(Loomis, 2011)

QUALITATIVE ANALYSIS (2 OF 2)



[Ben Rosen](#)

[Become a fan](#)

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The Merger That Worked: Compaq and Hewlett-Packard

Posted: 04/09/2008 2:40 pm EDT | Updated: 05/25/2011 12:30 pm EDT

Hewlett-Packard and Compaq Computer. Announced the week before 9/11, the HP-Compaq merger was met with almost universal skepticism and cynicism. And well after the merger was consummated in mid-2002, the doubts continued.

Today, the merger is nearly six years old. And, surprise, surprise -- it's turned out to be a sensational combination, whether measured by market share, market leadership or increased shareholder value.

(Rosen, 2011)

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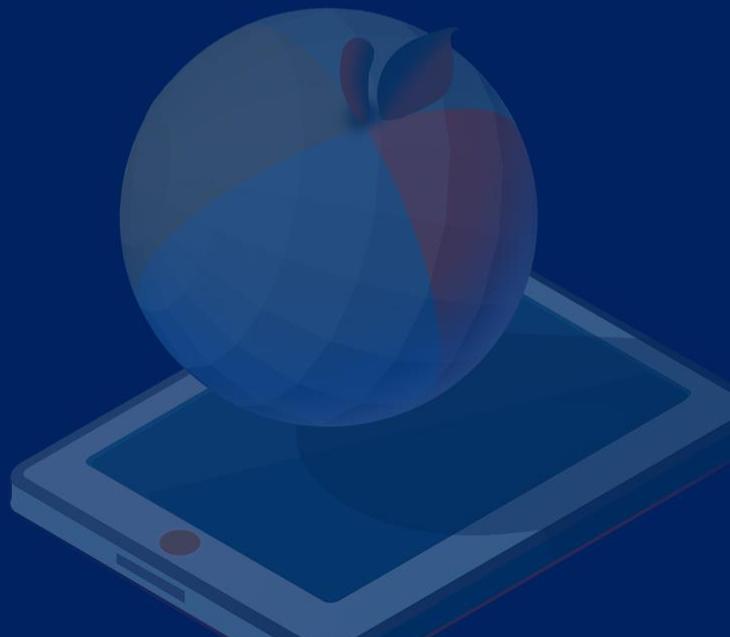
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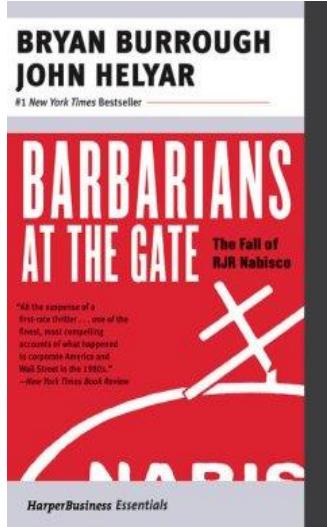


VIDEO LESSON 4-5

Leveraged Buyouts



WHAT IS SPECIFIC ABOUT LBOS?

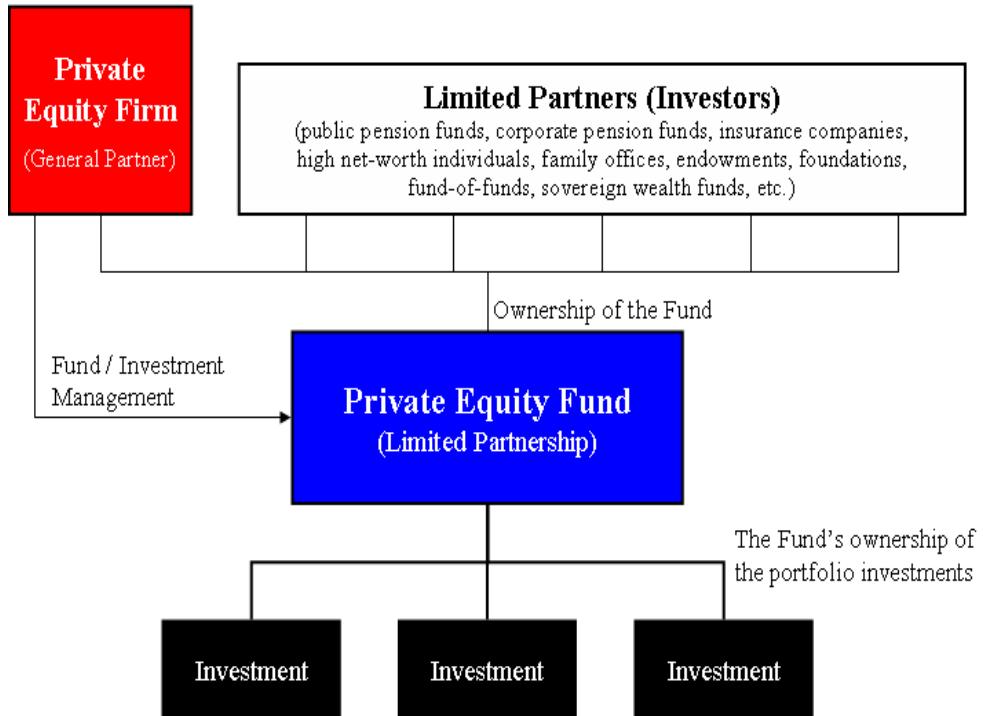


Payment in cash,
financed by debt
(leveraged)

Public firm taken
private (buy out of all
shares outstanding)

Acquirer is an
investment company
(private equity)

PRIVATE EQUITY PARTNERSHIPS (1 OF 2)



PRIVATE EQUITY PARTNERSHIPS (2 OF 2)

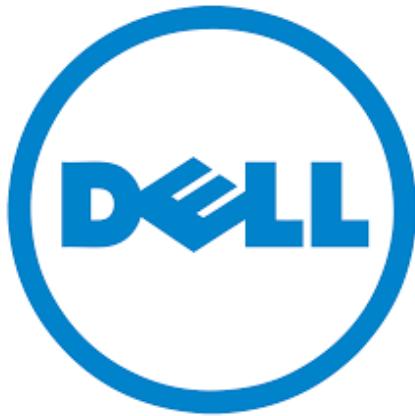
General partners identify investments and manage them

Limited partners provide equity capital (private)

2/20 fee structure: general partners keep 2% of invested capital and 20% of profits

SOME RECENT EXAMPLES OF LBOS

Many well-known companies have gone through LBOs and are managed by private equity firms.



(left: (dell.com, n.d.) (right: (Burdette, 2011)

EXAMPLE – DELL LBO

Prior to the announcement of the LBO (January, 2013), DELL was trading at 11 dollars a share.

Michael Dell owned approximately 15% of the company's shares.

The total equity value was 19.3 billion dollars and debt was 7 billion dollars.

EXAMPLE – DELL LBO PROPOSAL

Michael Dell and Silver Lake (private equity fund) bought all outstanding shares other than Michael's at \$13.65 (25% premium).

Dell had 1.757 billion shares outstanding, so this required 20.4 billion dollars.

$$20.4B = 85\% * 1.757B * \$13.65$$

EXAMPLE – DELL LBO FINANCING

New debt issuance: 15 billion dollars
(banks and Microsoft)

Michael Dell's own cash: 750 million dollars

Silver Lake cash: 1.4 billion dollars

The balance was funded with the company's own cash.

HOW DID THE COMPANY'S FINANCIAL STRUCTURE CHANGE WITH THE LBO?

Pre-LBO		Post LBO	
Assets 26.3	Debt 7	Assets	Debt
	Equity 19.3		Equity

Notice the significant increase in leverage.

Equity is much smaller but entirely owned by Silver Lake and Michael Dell.

HOW DO LBOs CREATE VALUE? (1 OF 2)

Implied value of assets increases by at least 25% in the example above

Average premium paid to target shareholders during 1973-2006 is approximately 37% (median 32%)

Are there synergies in LBOs?



(Maxwell, 2007)

HOW DO LBOs CREATE VALUE? (2 OF 2)

Average premium paid to target shareholders during 1973-2006 is approximately 37% (median 32%)

Are there synergies in LBOs?

Maybe ...

Notice there is no “acquirer.”

How can we have $2 + 2 = 5$?

MAJOR SOURCES OF GAINS IN PRIVATE EQUITY DEALS SUCH AS LBOS

Operational performance: increased efficiency (cut costs)

Long-term restructuring: major change in strategy, away from scrutiny of public markets (DELL)

Undervaluation: buy cheap assets (Warren Buffet)

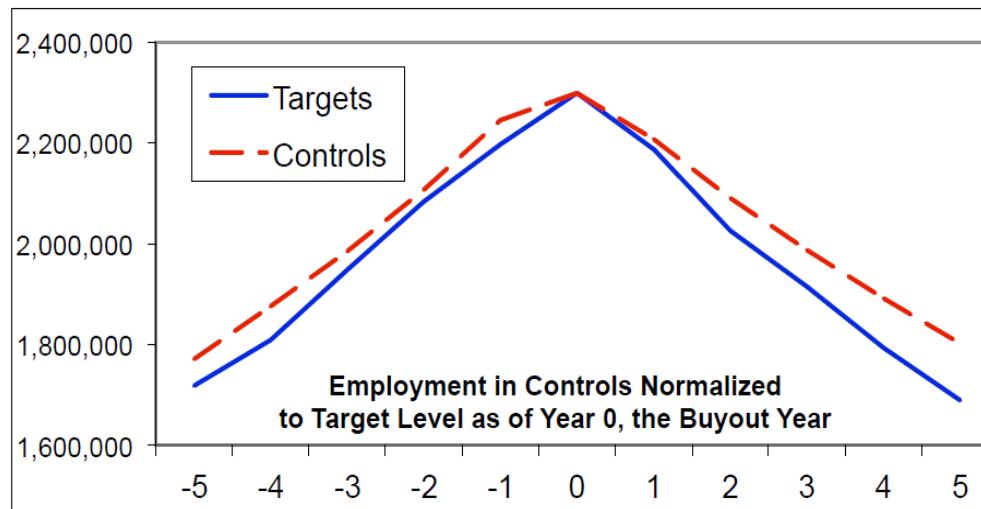
IS PRIVATE EQUITY GOOD FOR THE ECONOMY?

Cut costs = fire people?

Let us look at recent evidence.

PRIVATE EQUITY AND EMPLOYMENT

FIGURE 3A: COMPARISON OF EMPLOYMENT TRAJECTORY FOR TARGET ESTABLISHMENTS TO CONTROLS, BUYOUTS FROM 1980 TO 2000



DISCUSSION

Fall in employment is compensated by job growth in new establishments (2% over 2 years)

Total effect is lower than 1% decline in employment relative to control firms

So, perhaps private equity is not that bad for employment.

HOW IS THE DELL LBO DOING?

In this case, we cannot look at stock price reactions. Why?

But apparently the company is doing very well

THE AFTERMATH OF DELL'S LBO

Dell, Silver Lake Said to Reap 90% Gain a Year After LBO

by David Carey and Jack Clark

November 5, 2014 — 6:11 PM CST

Updated on November 5, 2014 — 11:01 PM CST

The jump in Dell's value over the past year stems from a surge in the company's cash flow and a decrease in debt, said the people familiar with the matter. Cash flow is projected to rise above \$3.5 billion for fiscal 2015, which ends in January. That's up from \$3 billion at the time of the buyout, said one of the people.

The company has used much of the cash flow to shrink debt to around \$15 billion, down from about \$18 billion a year earlier, the person said.

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VIDEO LESSON 4-6

Sensitivity Analysis



DEALING WITH UNCERTAINTY



(United States Department of Agriculture, 2011)

DEALING WITH UNCERTAINTY

When conducting valuation, our baseline case always represents the expected value (average value).

This is true for all model parameters but also for the final valuation.

How do we deal with uncertainty in valuation?

EXAMPLE FROM MODULE 3

Consider the example we solved in Module 3.

\$40,000 initial investment

Cash flow at time 0 = 40,000

\$12,000 added cash revenue per year

Cash flow at times 1 to 5 = 8,700

\$3,000 added cash expenses per year

Cash flow at times 6 to 9 = 6,300

Depreciation is \$8,000 per year for 5 years

Cash flow at time 10 = 9,100

Investment lasts 10 years

NPV at 8% = 13,152

Marginal tax rate is 30%

Salvage value at end of 10 years is \$4,000

Discount rate = 8%

EXPLAINING THE FORECASTS (1 OF 2)

These forecasts should reflect the project's most likely scenario.

For example, the marketing departments may have forecasted the added revenues as follows:

Added revenue = Market price *

Additional sales = \$4 * 3,000 units

EXPLAINING THE FORECASTS (2 OF 2)

And the production department may have forecasted costs as:

Added cost = Cost per unit *

Additional sales + Increase in fixed costs =

= \$0.8 * 3,000 units + \$600

EXPECTED VALUES

The value of sales we used is the expected value.

Suppose there is a 20% chance that sales are \$3,000, but there is also a 20% chance that sales are equal to \$1,000, \$2,000, \$4,000, or \$5,000.

\$1,000 is the worst case; 5,000 is the best. All values are equally likely.

Expected value = average value =

SENSITIVITY ANALYSIS

How sensitive is the NPV to fluctuations in the key parameters?

How does the NPV of the project change under different assumptions?

SENSITIVITY ANALYSIS IN OUR EXAMPLE

If sales are equal to 1,000, NPV is -16,900.

If sales are equal to 5,000, NPV is 43,214.

Do it using the spreadsheet that I provided.

EXAMPLE OF SENSITIVITY ANALYSIS USING EXCEL

USING THE SENSITIVITY ANALYSIS

How should you use the sensitivity analysis?

Should you reject the project because its NPV is negative under the worst possible scenario?



(Maxwell, 2007)

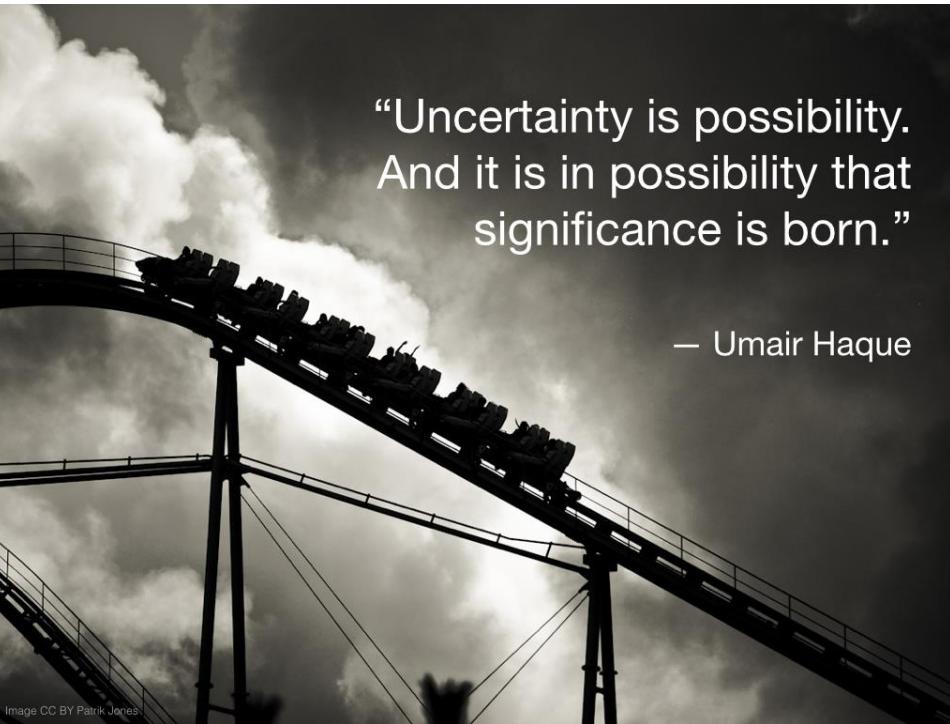
USING THE SENSITIVITY ANALYSIS

How should you use the sensitivity analysis?

Should you reject the project because its NPV is negative under the worst possible scenario?

No

UNCERTAINTY AND VALUE CREATION (1 OF 2)



“Uncertainty is possibility.
And it is in possibility that
significance is born.”

— Umair Haque

Image CC BY Patrik Jones

UNCERTAINTY AND VALUE CREATION (2 OF 2)

NPV will always be negative under pessimistic assumptions.

To create value, a company needs to take risks.

NPV is still 13,152

WHAT CAN WE USE THE SENSITIVITY ANALYSIS FOR?

(1 OF 2)

It is useful to know which variables are most likely to affect the NPV.

For example, if sales are a particularly important variable, the marketing department can do additional research to make sure that 3,000 units is a reasonable forecast.

WHAT CAN WE USE THE SENSITIVITY ANALYSIS FOR?

(2 OF 2)

It can also be useful for planning purposes.

For example, what is the minimum level of sales that is required for the project to create value ($NPV > 0$)?

In our case, sales must be larger than 2,125 units.

Do this using the spreadsheet (trial and error works).

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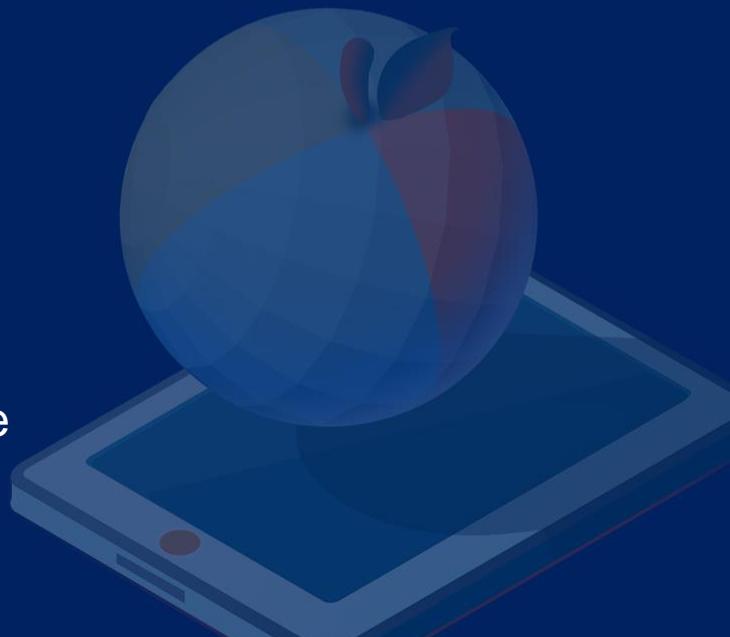
MODULE 4

Mergers and Acquisitions, Risk, and
Performance Evaluation



VIDEO LESSON 4-7

Using Discount Rates to Incorporate Risk into the Valuation



WHERE DID RISK GO?



The example above seems to suggest that the risk in cash flows does not affect NPV.

This sounds wrong and is wrong!

DISCOUNT RATES AND RISK

A key idea in finance

High risk = high discount rate

We haven't found risk yet because we have been taking the discount rate as given!

IRR AND RISK

Remember the result

If IRR > discount rate, then NPV > 0

The higher the risk of a project (the higher the discount rate), the higher the IRR must be.

High risk = high return

BUT HOW DO WE MEASURE RISK?

So little time ...



We will do a review in the next slides.

A more in-depth discussion is available in
Investments-I (Scott Weisbenner).

WEIGHTED AVERAGE COST OF CAPITAL (WACC)

$$\text{WACC} = r_D (1 - T) (D/V) + r_E (E/V)$$

r_D = required return on debt

T = corporate tax rate

D = total debt

r_E = required return on equity

E = market value of equity

$V = D + E$ (company value)

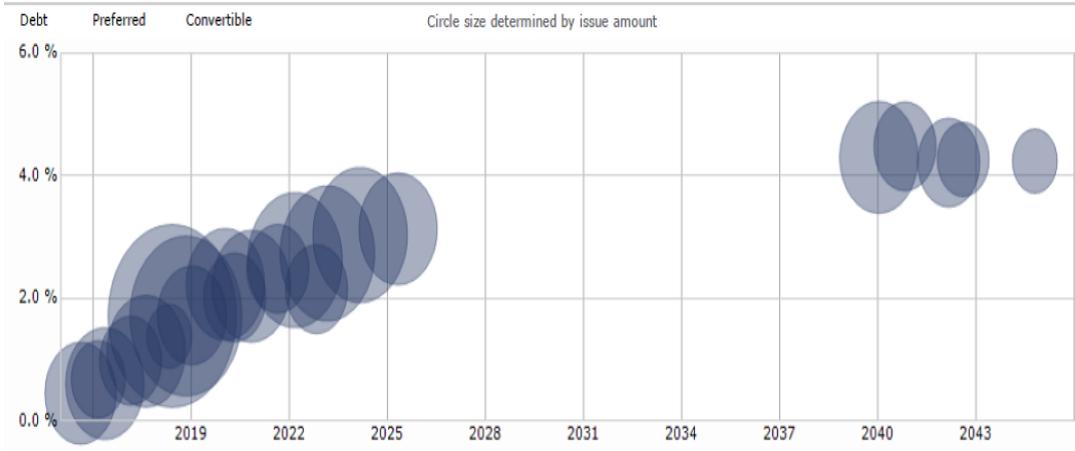
PEPSICO'S WACC

Let us compute the WACC for Pepsico as of June 2015.



THE REQUIRED RETURN ON DEBT

Yield to Maturity



This graph shows yield-to-maturity on Pepsico bonds of different maturity.

YIELD-TO-MATURITY (YTM)

The yield-to-maturity (YTM) on a bond measures the expected return on the bond (the IRR), provided that the company is not close to bankruptcy.

For example, long-term Pepsico debt (maturing in 2040) has a YTM of 4.2%.

This means that if you buy the bond today, and the bond does not default, you expect an annual return of 4.2%.

If the bond defaults, you get less than 4.2%, so true expected return is lower than the YTM.

YTM AND REQUIRED RETURNS (1 OF 2)

So the IRR of the bond is approximately 4.2%.

What should be the NPV of the following investment?

Buy the 2040 Pepsico bond and hold until maturity



(Maxwell, 2007)

YTM AND REQUIRED RETURNS (2 OF 2)

What should be the NPV of buying a Pepsico bond and holding until maturity?

NPV = 0

If $NPV > 0$, many investors would buy the bond and its price would go up (lower returns).

If $NPV < 0$, investors would sell the bond.

If $NPV = 0$, then the IRR =

ESTIMATING THE REQUIRED RETURN ON DEBT

We use this “zero NPV” idea in finance to estimate required returns.

Required return = Expected return

So for bonds, the required return on debt can be approximated by the YTM.

I prefer to use a long-term yield-to-maturity for corporate finance applications (long-term horizon).

We will use 4.2% for Pepsico.

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MODULE 4

Mergers and Acquisitions, Risk, and
Performance Evaluation



VIDEO LESSON 4-8

Estimating the Required Return on Equity – the Market



THE REQUIRED RETURN ON EQUITY

There is no equivalent yield-to-maturity on equity.

Why?

No promised cash flows to equity
(unless it is preferred equity)

If you hold a company's stock, you
get the residual cash flows after
interest is paid off.

USING THE CAPM

Rather, we must use an important finance model to estimate the expected (required) return on equity.

The CAPM (capital asset pricing model)

$$r_E = r_F + \beta * \text{Risk premium on the stock market}$$

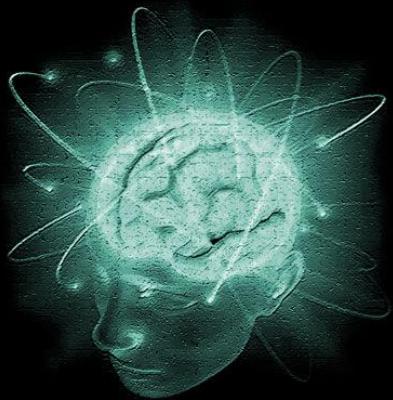
r_E = required return on equity

r_F = risk free rate (YTM on a government bond)

β = beta of firm's equity

INTUITION FOR THE CAPM

“The only real valuable
thing is intuition”



Albert Einstein

STARTING WITH THE MARKET

Ignore beta for now (assume beta = 1)

In this case

Required return on equity = YTM on a government bond + Risk premium on the stock market

YTM ON GOVERNMENT BONDS

In June 2015, the YTM on a 30-year US government bond was approximately

Maturity	Yield	Yesterday	Last Week	Last Month
3 Month	0.02	0.03	0.01	-.01
6 Month	0.12	0.12	0.10	0.04
2 Year	0.69	0.69	0.65	0.67
3 Year	1.07	1.07	1.04	1.06
5 Year	1.65	1.67	1.65	1.69
10 Year	2.30	2.32	2.35	2.41
30 Year	3.01	3.04	3.11	3.20

Required return on the stock market =
3% + Risk premium on the stock market

MEASURING THE RISK PREMIUM ON THE MARKET

A huge topic in finance!

The risk premium on the stock market is the additional return that an investor would demand to invest in the stock market rather than in a government bond.

How would we estimate that?

USING REALIZED RETURNS (1 OF 2)

The NPV of investing in the market should be equal to

Average returns on stocks and bonds (1928-2012)

Portfolio	Average Annual Rate of Return	Stock Market Minus T-Bonds
Treasury Bonds (10-year)	5.38%	
Common Stocks	11.26%	5.88%

How can we use these data to estimate the risk premium?

USING REALIZED RETURNS (2 OF 2)

If we assume that the NPV of investing in the market during 1928 to 2012 was zero (IRR = discount rate), then

The historical risk premium of 6% is the compensation that investors demand to invest in the market.

But how reasonable is this assumption?

ZERO NPV?

Most academics and practitioners currently use 4% to 5% when estimating future expected returns.

Investing in the US stock market in the 20th century was probably a positive NPV investment.

I suggest we use 5%.

WHICH RETURN DO YOU EXPECT FROM THE SP 500 DURING THE NEXT YEAR?

Suppose you are doing this calculation in June 2015.

Expected return between June 2015 and May 2016 is



(Maxwell, 2007)

WHICH RETURN DO YOU EXPECT FROM THE SP 500 DURING THE NEXT YEAR?

Expected market return = T- bond
yield (June 2015) + Risk premium

$$= 3\% + 5\% = 8\%$$

Notice you always start from the
current T-bond yield (3% in this
case).

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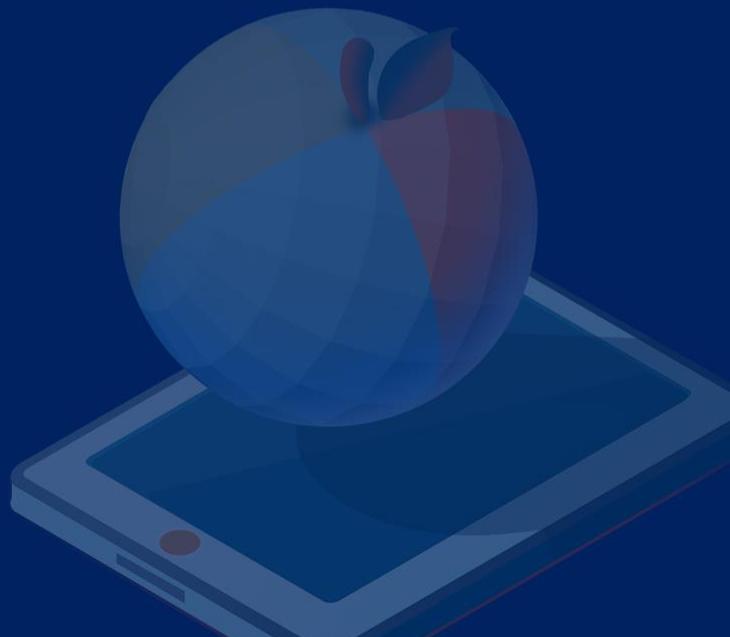
MODULE 4

Mergers and Acquisitions, Risk, and
Performance Evaluation



VIDEO LESSON 4-9

Estimating the Required Return on Equity – the Company



BACK TO PEPSICO

The new feature is the beta.

$r_E = r_F + \beta * \text{Risk premium on the stock market}$

This formula will give us an estimate for the required return on Pepsico's equity.

What does beta measure?

BETA AND RISK

$$r_E = r_F + \beta^* \text{Risk premium on the stock market}$$

Beta measures how sensitive the firm's returns are to movements in the stock market.

Beta = 1 The stock follows the market.

Beta > 1 The stock amplifies the movements in the market.

Beta < 1 The stock dampens the movements in the market.

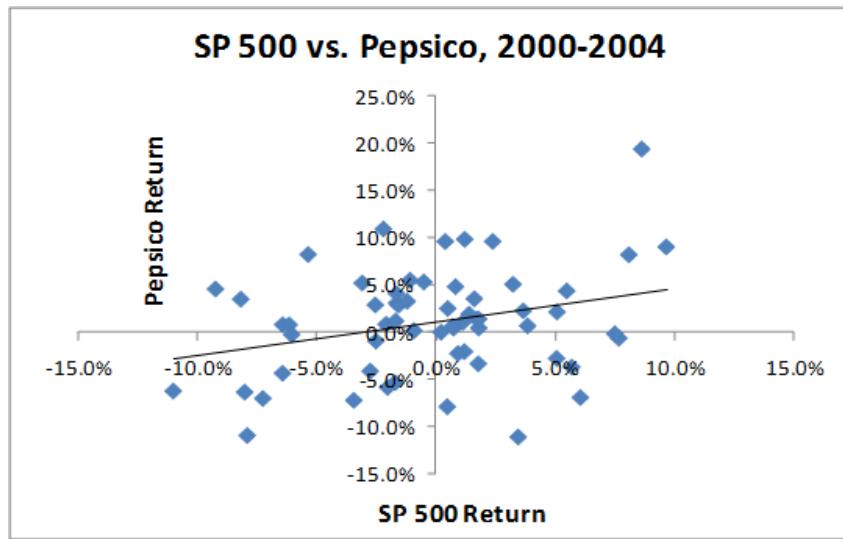
High beta means high risk.

PEPSICO BETA

We use data for Pepsico from 2000-2009.

Beta is typically computed using 5 years of monthly data.

SP 500 VS. PEPSICO, 2000-2004



Regression Statistics

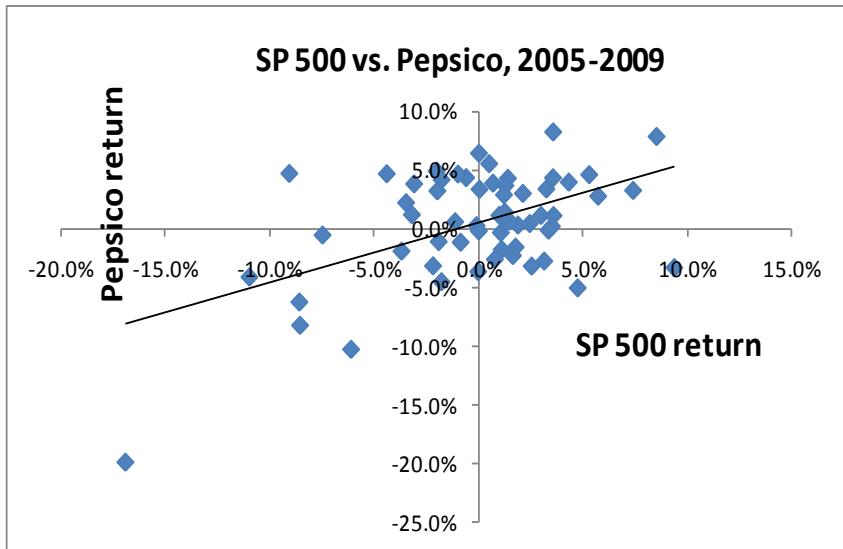
R Square	0.087
Adjusted R Square	0.071
Observations	60.000

	Coefficients	Std. Error	T Stat	P-value	Lower 95%	Upper 95%
Intercept	0.011	0.007	1.552	0.126	-0.003	0.025
X Variable 1	0.355	0.152	2.345	0.022	0.052	0.659

(Almeida, 2015)

$$\begin{aligned}
 \text{Pepsico beta (2000-2004)} &= 0.355 \\
 \text{st dev.} &= (0.152) \\
 \text{95\% confidence interval} &= (0.052, 0.659)
 \end{aligned}$$

SP 500 VS. PEPSICO, 2005-2009



Regression Statistics	
R Square	0.259
Adjusted R Square	0.246
Observations	60.000

	Coefficients	Std. Error	T Stat	P-value	Lower 95%	Upper 95%
Intercept	0.005	0.005	0.996	0.338	-0.005	0.015
X Variable 1	0.508	0.113	4.497	0.000	0.052	0.735

(Almeida, 2015)

$$\begin{aligned}
 \text{Pepsico beta (2005-2009)} &= 0.508 \\
 \text{st dev.} &= (0.113) \\
 \text{95\% confidence interval} &= (0.282, 0.735)
 \end{aligned}$$

SUMMARY OF RESULTS

Beta from 2000 to 2004 = 0.35

Beta from 2005 to 2009 = 0.51

Beta is a statistical estimate.

95% confidence interval ranges from
0 to 0.75

A MORE RECENT ESTIMATE

Capital IQ data, June 2015

Beta = 0.45

This beta reflects data from 2011 to 2015.

ANALYZING THE DATA

Data suggests a fairly low beta,
definitely below one.

I recommend using a range for
betas and “shrink” towards one.

That is, avoid very small or very large
betas in your range.

For Pepsico, I suggest we use a
value of 0.5 below and a range of
0.4 to 0.7.

THE REQUIRED RETURN ON EQUITY FOR PEPSICO

$r_E =$ 30-year government bond yield
+ Beta* risk premium

$$= 3\% + 0.5 * 5\% = 5.5\%$$

The range of 0.4 to 0.7 for the beta would imply a range of 5% to 6.5% for the cost of equity.

THE REQUIRED RETURN ON EQUITY – INTERPRETATION

$$r_E = 3\% + 0.5 \cdot 5\% = 5.5\%$$

With a reasonable range of 5% to 6.5%

Suppose the overall market return in 2016 is 8%, and Pepsico's return is 7%. Should a Pepsico investor be happy?



(Maxwell, 2007)

THE REQUIRED RETURN ON EQUITY – INTERPRETATION

Suppose the overall market return in 2016 is 8%, and Pepsico's return is 7%. Should a Pepsico investor be happy?

No – Pepsico return is lower than the market's.

Yes – Pepsico's return is greater than the required return.

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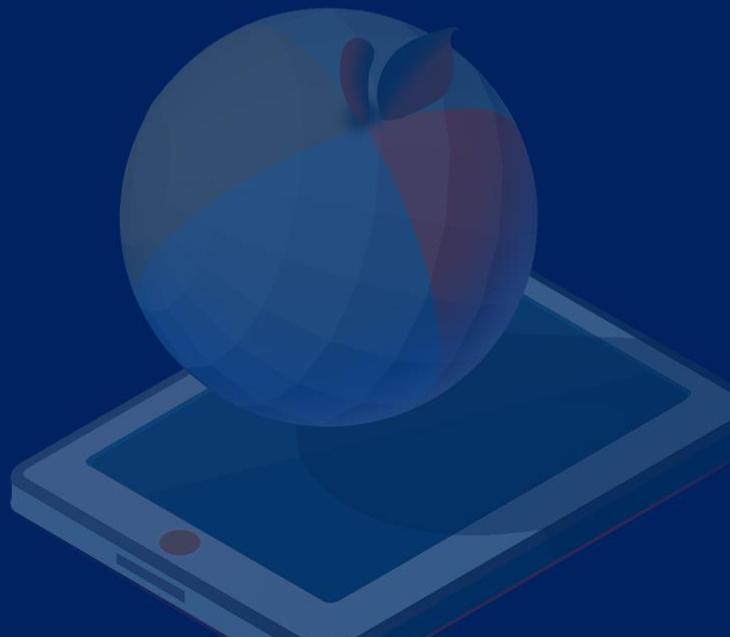
MODULE 4

Mergers and Acquisitions, Risk, and
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VIDEO LESSON 4-10

Estimating the WACC



WE HAVE MADE PROGRESS ...

$$\text{Pepsico WACC} = 4.2\% * (1 - 25\%) * \\ D/V + 5.5\% * E/V = ?$$

Tax rate comes from financial statements (Module 2)

We need to find the capital structure weights (how Pepsico is financed).

CAPITAL STRUCTURE WEIGHTS

Careful – use the market value of equity

Check data (Morningstar) and recall Module 1

Capital Structure Most recent (Mar 2015)



Type	%	Amount
Debt	65.7	30.4 Bil
Preferred	0.1	41.0 Mil
Equity	34.2	15.8 Bil

Is D/V 66%? (PepsiCo Inc., 2015)

DATA ON MARKET VALUE OF EQUITY (MODULE 2)

Currency	USD
Share price as of Jan-10-2015	\$9369
Shares out	1,476.1
Market capitalization	138,291.2
-Cash and short term investments	8,498.0
+Total debt	30,365.0
+Pref. Equity	(141.0)
+Total minority interest	120.0
=Total enterprise value (TEV)	160,140.2
Book value of common equity	16010.0
+Pref. Equity	(141.0)
+Total minority interest	120.0
+Total debt	30,365.0
=Total capital	46,354.0

**Current
Capitalization
(Millions of USD)**

$$\begin{aligned} D / (D + E) &= \\ E / (D + E) &= \end{aligned}$$

(S&P Capital IQ, 2015)

PEPSICO'S WACC

$$\text{Pepsico WACC} = 4.2\% * (1 - 25\%) *$$
$$19\% + 5.5\% * 81\% = 5\%$$

Remember, this is an estimate.

Actual WACC depends heavily on
the value of beta.

BETA AND WACC FOR PEPSICO

Beta	Required Return on Equality	WACC
0.4	2.00%	4.6%
0.5	5.50%	5.1%
0.6	6.00%	5.5%
0.7	6.50%	5.9%

It is important to do sensitivity analysis in any practical problem and check how the answer changes in a reasonable range for WACC.

USING THE WACC (1 OF 2)

The WACC is the discount rate for the company as a whole.

Thus, it is the required return on projects that have similar risks as the company.

Suppose Pepsico is considering developing a new soda. What is the minimum IRR that the soda should generate?



(Maxwell, 2007)

USING THE WACC (2 OF 2)

The WACC is the discount rate for the company as a whole.

Suppose Pepsico is considering developing a new soda. What is the minimum IRR that the soda should generate?

IRR must be greater than WACC

IRR greater than 6% means new soda is positive NPV

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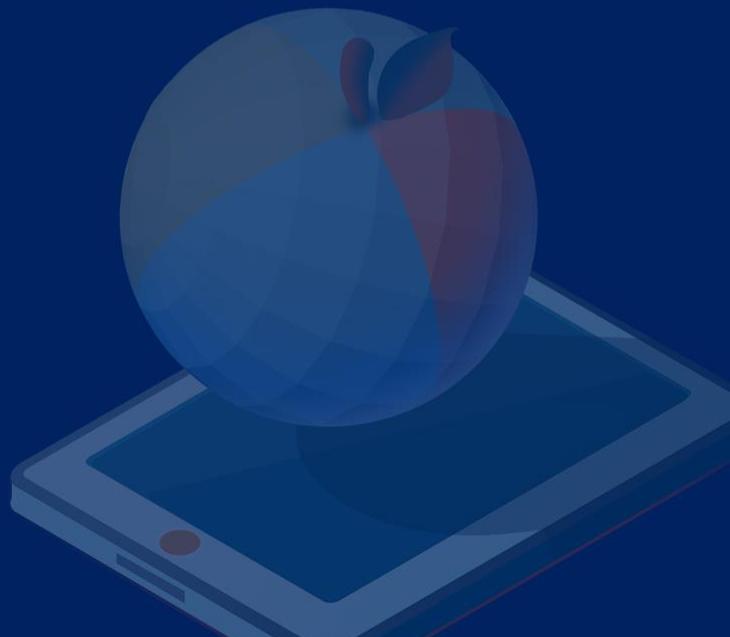
MODULE 4

Mergers and Acquisitions, Risk, and
Performance Evaluation



VIDEO LESSON 4-11

Performance Evaluation: Economic Value Added
(EVA)



MEASURING PERFORMANCE



How do we measure whether a company, or a division, is generating “sufficient” profits?

(Dalager, 2005)

MEASURING PERFORMANCE – EXAMPLE

Suppose you have to invest a million dollars in a project.

How large do annual profits need to be for the project to create value?

Answer: WACC * 1 million!

EVA (ECONOMIC VALUE ADDED)

EVA = OPAT – (WACC × Operating assets)

OPAT = Operating profits after taxes

EVA measures whether a firm is generating real economic profits after accounting for the required return on capital (WACC).

OPERATING ASSETS

Operating assets = Book value of assets – Cash

Why book?

We want to measure the capital invested in the company, not future profits (remember Module 1).

Why exclude cash?

Cash is (generally) not invested in the business.

EXAMPLE: PEPSICO EVA

Is Pepsico generating sufficient profits to cover its cost of capital?

We estimated the WACC at 5%, with a reasonable range of 4.5% to 6.%.

Now we need to measure OPAT and operating assets.

OPAT FOR PEPSICO IN 2014

Income Statement	
	Dec, 2014
Revenue	66683
COGS	30884
SG&A	25708
Others	-92
EBIT	9999
Interest expense	-824
Other non-operating income	-418
Income before taxes	8757
Taxes	2199
Earnings	6558

$$\text{OPAT} = 9,999 - 2,199 = 7,800$$

OPERATING ASSETS FOR PEPSICO IN 2014

Balance Sheet	
	Dec, 2014
Cash and ST Investments	8726
Receivables	9794
Other Current Assets	2143
Current Assets	20663
Net property, plant, and equipment	17244
Goodwill	14965
Other intangibles	14088
Other non-current assets	3549
Non-current assets	49846
Total assets	70509

Operating assets = 70,509 – 8,726 =
61,783

EVA FOR PEPSICO, 2014

Beta	Required Return on Equity	WACC	EVA
0.4	5.00%	4.6%	\$4928.02
0.5	5.50%	5.1%	\$4677.80
0.6	6.00%	5.5%	\$4427.57
0.7	6.5%	5.9%	\$4177.35

Pepsico generated between 4 and 5 billion dollars of pure economic profit in 2014.

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MODULE 4

Mergers and Acquisitions, Risk, and
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VIDEO LESSON 4-12

Using EVA to Measure Performance of a
Company's Division



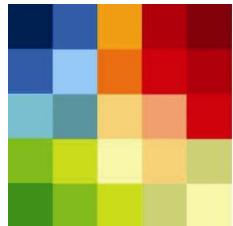
DIVISIONAL WACC AND EVA

If a company has different divisions, company-wide WACC is not the right discount rate for all divisions.

The discount rate needs to reflect the specific risk of each division.

We will learn how to estimate WACC and EVA for a division of a conglomerate.

EXAMPLE: ALTRIA GROUP INC.



Altria

Altria Group, Inc., through its subsidiaries, engages in the manufacture and sale of cigarettes, smokeless products, cigars, and wine in the United States and internationally. The company also offers financial services.

ALTRIA'S WINE DIVISION



Ste. Michelle Wine Estates Ltd. (Ste. Michelle), produces premium varietal and blended table wines. Ste. Michelle is a producer of Washington state wines, primarily Chateau Ste. Michelle and Columbia Crest, and owns wineries in or distributes wines from various other wine regions.

(commons.wikimedia.org/Agne27, 2007)

COMPUTING THE WINE EVA

Suppose we want to compute EVA for Altria's wine division (Ste. Michelle Wine Estates).

First, we need data on profits and assets by division (from Capital IQ, 2014).

	Wine	Tobacco
Op. profit	82.60	5576.2
Assets	867.70	33991.30

Assume taxes are 30%, and cash is zero (no data on cash by division).

$$\text{OPAT} = 70\% * 82.6 = 57.82$$

DIVISIONAL COST OF CAPITAL (1 OF 2)

Now, let us compute the appropriate cost of capital.

Altria's beta is 0.50 (Capital IQ). Is this the right beta to use?

Which risk is this beta reflecting?



(Maxwell, 2007)

DIVISIONAL COST OF CAPITAL (2 OF 2)

Now, let us compute the appropriate cost of capital.

Altria's beta is 0.50 (Capital IQ). Is this the right beta to use?

Which risk is this beta reflecting?

A tobacco beta!

ESTIMATING BETA FOR A COMPANY'S DIVISION

We cannot directly estimate a beta for a company's division. Why?

Two approaches

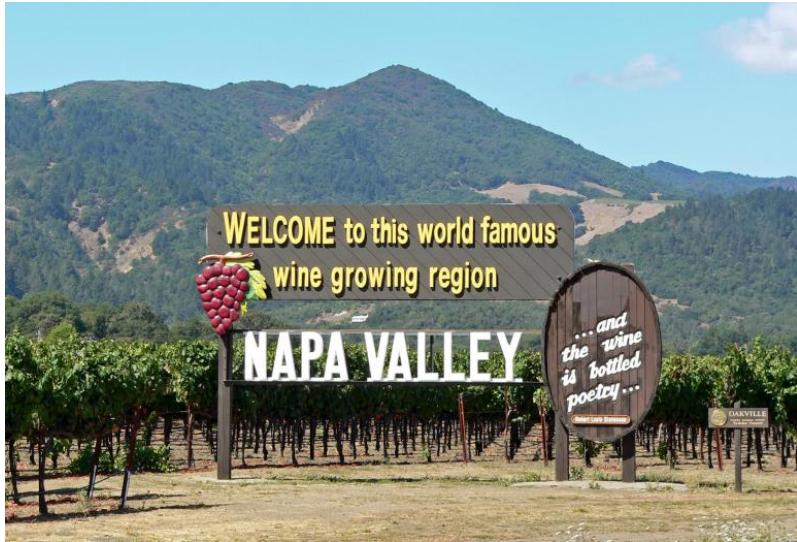
Use an industry beta – average beta across many firms in the industry

Pure-play approach – find a similar publicly traded company and use the beta for that company

INDUSTRY BETAS

<i>Industry Name</i>	<i>Number of Firms</i>	<i>Average Beta</i>
Advertising	32	1.68
Aerospace/Defense	66	0.98
Air Transport	36	1.03
Apparel	54	1.36
Auto Parts	54	1.76
Automotive	12	1.73
Bank	416	0.77
Bank (Midwest)	68	0.89
Beverage	35	0.95
Biotechnology	214	1.23
Building Materials	43	1.57
Cable TV	20	1.40

PURE-PLAY METHOD (COMPETITOR)



Constellation Brands, Inc., together with its subsidiaries, engages in the production and marketing of beverage alcohol brands in wine, spirits, and imported beer categories. The company operates through Constellation Wines and Crown Imports divisions. The Constellation Wines division produces table wines, sparkling wines, and dessert wines.

Constellation Brands' beta is 1.02
(Capital IQ)

ESTIMATING THE WINE WACC

A reasonable estimate would be

$$r_E = 3\% + 1^*5\% = 8\%$$

Also

D/V = 14%, cost of debt = 4.8% (from Altria)

$$\begin{aligned} \text{So WACC} &= 8\%^{*}86\% + 4.8\%^{*}70\%^{*}14\% \\ &= 7.4\% \end{aligned}$$

ESTIMATING EVA

$$\text{EVA} = 57.82 - 7.4\% * 867.7 = - 6.34$$

How should we interpret this result?

Wine division did not generate economic profit during the year

Which mistake would we have made if we had used a tobacco beta?

Underestimate risk, overestimate EVA!

USING EVA

What should Altria do about the negative EVA of the wine division?
Should the division be restructured?

Not so fast – perhaps the wine division is expected to grow a lot and generate higher profits in the future.

If EVA never turns positive, then at some point restructuring may be necessary.

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CORPORATE FINANCE

with Heitor Almeida

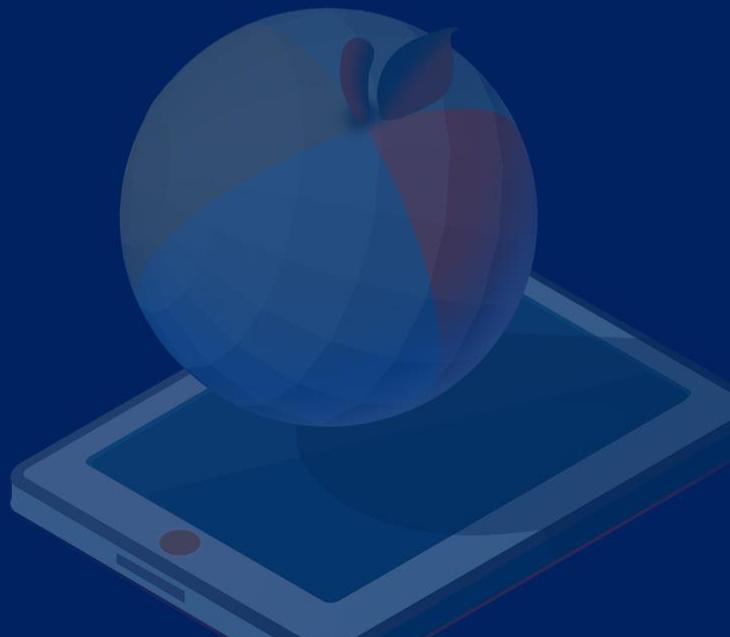
MODULE 4

Mergers and Acquisitions, Risk, and
Performance Evaluation



VIDEO LESSON 4-13

Module 4 Review



WHAT WE'VE LEARNED IN MODULE 4 (1 OF 3)

The concept of synergies in mergers and acquisitions (M&A)

To distinguish between good and bad reasons to engage in M&A

To calculate synergies using net present value (NPV) techniques

How synergies determine the pricing of M&A deals

WHAT WE'VE LEARNED IN MODULE 4 (2 OF 3)

To differentiate between cash and stock financed mergers

The specific characteristics of leveraged buyouts (LBO)

How LBOs can increase shareholder value

How to perform sensitivity analysis and use it in investment decisions

WHAT WE'VE LEARNED IN MODULE 4 (3 OF 3)

How we incorporate risk into valuation by changing the discount rate

To calculate the WACC (weighted-average cost of capital) for a company

To estimate EVA (economic value-added) for a company or a division of a company

How to use EVA for performance evaluation