Wrap up: Market Efficiency, Valuation Concept, and Cost of Capital

Equity Analysis FN 451: Part II Fundamental Analysis

Course lecturer: Sirinattha Techasiriwan

Topics to be Discussed:

I. Understand Market Efficiency, Intrinsic Value and their Implications

II. Fundamental Analysis and Valuation Concepts

III. Return Concepts

1) The Risk Free Rate (R_f) & The Equity Risk Premium (k_m)
2) Estimating the Required Return on an Individual Stock (k_e)
3) Estimating the Cost of Debt (k_d)
4) Weighted Average Cost of Capital (WACC)

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Efficient Market Hypothesis

Efficient Market Hypothesis (EMH): An efficient market is one where the **market price is an unbiased estimate of the true value of the investment.**

- The **true value** is the **intrinsic value** or the **equilibrium value**, which reflects the price that **rational investors** with **full knowledge** about the **asset's characteristics** are **willing to pay** for the **asset's future earnings**.

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Determining an Asset's Value

- An asset's value is the **present value** of its **(expected) future cash flows** discounting at a **risk-adjusted discount rate**.

$$V_0 = \sum_{t=1}^{\infty} \frac{CF_t}{(1+r)^t}$$

Challenges:

- Defining and forecasting **cash flows**
- Estimating appropriate **discount rate**

Valuation inputs are important

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Three Levels of Market Efficiency

Eugene F. Fama (1971) suggested that markets could be efficient at three levels, based on what information was reflected in price:

- **Weak form efficiency:** The current price reflects **the information contained in all past prices**.
  - **Charts and technical analyses** that use past prices alone would not be useful in finding undervalued stocks.
- **Semi-strong form efficiency:** The current price reflects the information contained not only in **past prices but all public information.**
  - **No approach that is predicated on using public information** would be useful in finding undervalued stocks.
- **Strong form efficiency:** The current price reflects **all information, public as well as private.**
  - **No investors** will be able to find undervalued stocks consistently.

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Implications of Market Efficiency: Segments Where Market Seems to be Inefficient.

- There is also much that can be learned from studies of market efficiency, which highlights **segments where market seems to be inefficient**.
  - **Stocks that are neglected by institutional investors are likely to be undervalued and earn excess returns.**

Analysts search for mispriced stocks and make recommendations, which makes the market efficient and causes prices to reflect intrinsic values.

Implications of Market Efficiency: Short-Term Price Momentum

Over weeks or months, there is some evidence of **price momentum**. Stocks that has gone up in the last few weeks or months seem to have a tendency to continue to outperform the market in the next few weeks or months, and vice versa.

When the long term is defined in terms of years, there is **negative correlation** in returns, suggesting that **markets reverse themselves over very long period.**

Source: http://people.stern.nyu.edu

II The Objective of Fundamental Analysis

What is the objective of valuation?

Determine the fair value

★ **Is the market price differ from the fair value?**

BUY / UNDERVALUED market price < fair value

SELL /OVERVALUED : market price > fair value

abnormal return

★ **make profit when th market price reaches the fair value**

II

Steps in Fundamental Analysis

Two general approach of fundamental analysis

Top down approach: An analysis of the impacts of the economic environment on industries and securities of companies in the industries.

Bottom up approach: An analysis of individual companies

The difference between the two approaches **is the perceived importance of economic and industry influence on individual firms and stocks.**

John Burr Williams (1900 – September 15, 1989), one of the first economists to view stock prices as determined by “intrinsic value”. He is recognized as a founder and developer of fundamental analysis. He is best known for his 1938 text "The Theory of Investment Value", based on his Ph.D. thesis at Harvard University.

II

Steps in Fundamental Analysis (cont.)

Economic, industry, company analysis

- Explore all the **external** factors (economic conditions, government regulations and rules, industry competitive environment) and company's **internal** factors (investment policy, investing policy, competitive strategy, governance, etc.) **that impact the company**

Financial statement projection

- **Translate those factors into assumptions**
- Link the assumptions into **financial forecast**

Valuation & Sensitivity Analysis

- Translate forecasts into **valuation**
- Sensitivity analysis
- Scenario analysis

$$V_0 = \sum_{t=1}^{\infty} \frac{CF_t}{(1+r)^t}$$

Challenges:

- Defining and forecasting **cash flows**
- Estimating appropriate **discount rate**

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The Discount Rate and the Required Rate of Return

- **The discount rate** is the interest rate you need to earn on a given amount of money today to end up with a given amount of money in the future.

- **The required rate of return is** the minimum level of expected return that investors requires in order to invest in the asset, given the asset's riskiness (i.e. the opportunity cost or the cost of capital – the highest level of expected return available elsewhere from investments of similar risk).

Analysts use the *required rate of return* as a discount rate to determine *fair value* of an asset by discounting expected cash flows from the asset to present value.

*** Risk-adjusted discount rate** is the rate appropriate to the riskiness of the cash flows being discounted.

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Discount Rate and Cash Flows Must be Consistent

- Cash flows to discount
  - Dividends (Dividend Discount Model) $V_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+r)^t}$
  - Free Cash Flows to Equity (FCFE) $V_0 = \sum_{t=1}^{\infty} \frac{FCFE_t}{(1+r)^t}$
  - Free Cash Flows to Firm (FCFF) $V_0 = \sum_{t=1}^{\infty} \frac{DCFF_t}{(1+r)^t}$
- The discount rate should be consistent with the cash flow being discounted.
  - Dividends ➡ Cost of Equity ➡ Equity Value
  - Cash Flow to Equity ➡ Cost of Equity ➡ Equity Value
  - Cash Flow to Firm ➡ Cost of Capital ➡ Firm Value
  - Residual income ➡ Cost of Equity ➡ Add to BV of Equity
  - Economic Value Add ➡ Cost of Capital ➡ Add to BV of a Firm

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III

1) The Risk Free Rate (R_f) & the Equity Risk Premium (k_m)

III

Components of the Rate of Return

- **Expected return on any investments** can be written as the sum of the **risk-free rate** and an **extra return to compensate for the risk** (**risk premium**).

Expected return = ? Risk-free rate + ? Risk premium

(Discussion: Historical, current or expected?)

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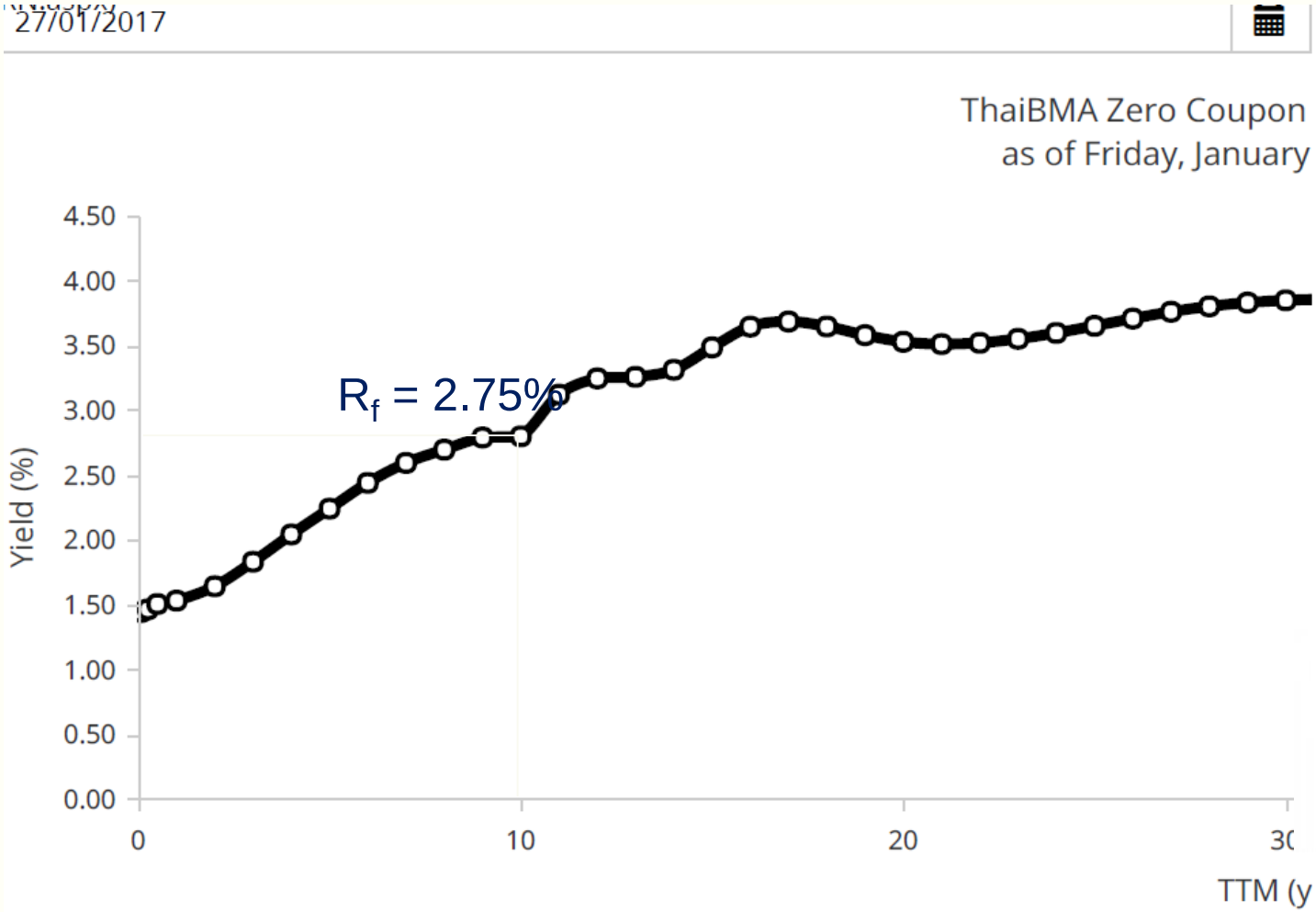
Risk Free Rate (R_f): Thailand

ใช้อัตราผลตอบแทนของพันธบัตรรัฐบาลระยะยาวปลอดดอกเบี้ย

Long-term zero-coupon government bond yield



Source: http://www.thaibma.or.th/EN/Market/YieldCurve/Zero.aspx

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Risk Free Rate (R_f): United States

As of 2 August,2017

Treasury Yields

Bloomberg Markets | Markets | Tech | Pursuits | Politics | Opinion | Businessweek

NAME	COUPON	PRICE	YIELD	1 MONTH	1 YEAR	TIME (EDT)
GB3:GOV **3 Month**	0.00	1.05	1.07%	+6	+81	4:59 PM
GB6:GOV **6 Month**	0.00	1.11	1.13%	+0	+76	4:59 PM
GB12:GOV **12 Month**	0.00	1.18	1.21%	-2	+72	5:00 PM
GT2:GOV **2 Year**	1.38	100.05	1.35%	-3	+66	9:25 PM
GT5:GOV **5 Year**	1.88	100.30	1.81%	-8	+74	9:25 PM
GT10:GOV **10 Year**	2.38	100.95	2.27%	-4	+74	9:25 PM
GT30:GOV **30 Year**	3.00	102.67	2.87%	+3	+60	9:25 PM

Treasury Inflation Protected Securities (TIPS)

NAME	COUPON	PRICE	YIELD	1 MONTH	1 YEAR	TIME (EDT)
GTII5:GOV **5 Year**	0.13	100.04	0.12%	-9	+34	9:15 PM
GTII10:GOV **10 Year**	0.38	99.08	0.47%	-10	+41	9:25 PM
GTII20:GOV **20 Year**	3.38	138.48	0.63%	-6	+29	9:23 PM
GTII30:GOV **30 Year**	0.88	97.47	0.97%	-1	+33	9:23 PM

Source: https://www.bloomberg.com/markets/rates-bonds/government-bonds/us

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Are Government Securities Risk-Free?

- **Maturity risk - Duration matching:** The duration of the default-free security used as the risk-free asset is matched up to the duration of the cash flows in the analysis

- **Inflation risk** - While **government bills** and **zero-coupon government bonds** offer returns that are **risk free in nominal terms, they are not risk free in real terms**.
  - The risk-free rate used to come up with expected returns must be based on the **same expectations of inflation as those embedded in forecasts of free cash flow.**

Real risk free rate - The standard approach to come up with an estimate of the real risk-free rate is to **subtract an expected inflation rate from the nominal interest rate** to arrive at a real risk-free rate.

III

Equity (Market) Risk Premium

1. Historical Estimates

Historical market risk premium = Historical market return – Historical risk-free rate

** The **risk-free rate** chosen in computing the **premium** has to be consistent with the risk-free rate used to compute **expected returns**.

2. Forward-Looking Estimates

- Implied Equity Premium from Gordon growth model (GGM) estimates
- Survey estimates

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Example: Using Historical Market Risk Premium to Estimate Expected Return

- 10-years zero-coupon Thailand government bond yield is 2.75%. Equity risk premium for SET is 7.96%.

- By adding the two numbers, the **required return on the SET is 2.75% + 7.96% = 10.71%.**

Country	Moody's rating	Total Equity Risk Premium
United States	Aaa	5.69%
Australia	Aaa	5.69%
United Kingdom	Aa1	6.25%
Hong Kong	Aa1	6.25%
Korea	Aa2	6.40%
China	Aa3	6.55%
Japan	A1	6.69%
Malaysia	A3	7.40%
Thailand	**Baa1**	**7.96%**
Philippines	Baa2	8.40%
Italy	Baa2	8.40%
Spain	Baa2	8.40%
Indonesia	Baa3	8.82%
Portugal	Ba1	9.24%
Vietnam	B1	12.09%
Cambodia	B2	13.51%
Greece	Caa3	19.90%

Source:
http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctryprem.html
Last updated: January 2017
(U.S. 10-Year Treasury Yield is 2.2%)

III

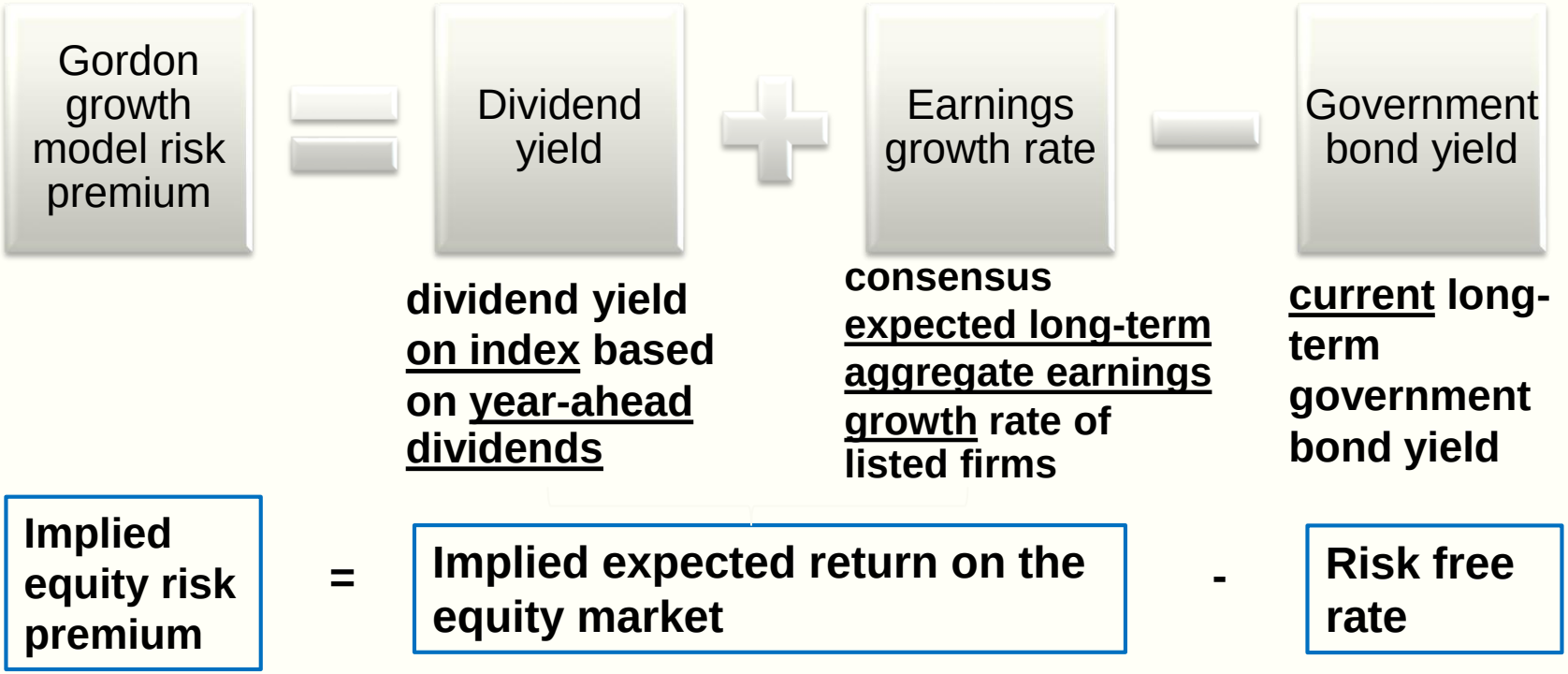
Issues for Using Historical Equity Risk Premium Estimates

- Length of Sample Period
  - Use the longest holding period possible (such as 10, 20, 50 years).
    - **If the market premium is stable**, a longer history will reduce estimation error due to volatility of shorter periods
    - **If the premium changes over time** and estimation error is small, a shorter period is better.
    - Given the lack of any discernible trend and the significant volatility of shorter periods, you **should use the longest time series possible**.

In using a historical estimate to represent the equity risk premium going forward, the analysts is assuming that the **parameters that describe the return-generating process are constant over the past and into the future.**

III Forward-Looking Equity Risk Premium: Implied Equity Premium from Gordon Growth Model Estimates

Gordon growth model is based on an assumption of earnings growth at a stable rate, a constant dividend payout ratio and a constant price/earnings (P/E) ratio.



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Example: An asset's value is the **PV** of its **(expected) future cash flows** discounting at a **risk-adjusted discount rate**.

Valuation: Stock A

Discount rate	10%					
Year	**0**	1	2	3	4	5
Expected cash flows (dividend)		-	-	-	-	46.50
PV of expected cash flows		-	-	-	-	**28.87**
Fair value	**28.87**	31.76	34.93	38.43	42.27	46.50
Dividend yield	**0.0%**	0.0%	0.0%	0.0%	0.0%	
Capital gain yield	**10.0%**	10.0%	10.0%	10.0%	10.0%	
Total return	**10.0%**	10.0%	10.0%	10.0%	10.0%	

Valuation: Stock B

Discount rate	10%					
Year	**0**	1	2	3	4	5
Expected cash flows (dividend)		2.887	2.887	2.887	2.887	31.76
PV of expected cash flows		**2.62**	**2.39**	**2.17**	**1.97**	**19.72**
Fair value	**28.87**	28.87	28.87	28.87	28.87	31.76
Dividend yield	**10.0%**	10.0%	10.0%	10.0%	0.0%	
Capital gain yield	**0.0%**	0.0%	0.0%	0.0%	10.0%	
Total return	**10.0%**	10.0%	10.0%	10.0%	10.0%	

2.887+28.87

Valuation: Stock C

Discount rate	10%					
Year	**0**	1	2	3	4	5
Expected cash flows (dividend)		1.000	1.250	1.750	2.500	38.50
PV of expected cash flows		**0.91**	**1.03**	**1.31**	**1.71**	**23.91**
Fair value	**28.87**	30.76	32.58	34.09	35.00	38.50
Dividend yield	**3.5%**	4.1%	5.4%	7.3%	0.0%	
Capital gain yield	**6.5%**	5.9%	4.6%	2.7%	10.0%	
Total return	**10.0%**	10.0%	10.0%	10.0%	10.0%	

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Example: Implied Equity Premiums (GGM) – S&P 500

- The current level of the S&P 500 index is 2,480.3, the **expected dividend yield on the index is 1.9%,** and the **expected growth rate in earnings and dividends in the long term is 7%**. Solving for the **implied expected return on equity** yields the following:

implied expected return on S&P500 = 1.9% + 7% = 7.9%

- If the current risk-free rate is 2.27%, this will yield a premium of:

implied equity premium = 8.9% - 2.27% = 6.63%

* As of 31 Jul 2017, 10-years zero-coupon U.S. government bond yield is

S&P 500 Growth Rate Forecast Values

Year over Year Percent Change in the S&P 500.

Month	Date	Forecast Value	Avg Error
0	Jul 2017	14.27	±0.0
1	Aug 2017	13.8	±1.3
2	Sep 2017	15.7	±1.7
3	Oct 2017	14.2	±2.0
4	Nov 2017	9.3	±2.3
5	Dec 2017	6.4	±2.5
6	Jan 2018	9.6	±2.7

Updated Aug 2017 *Source: Financial Forecast Center, LLC.

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Example: Implied Equity Premiums (GGM) – SET

- The current level of the SET index is 1576.38 (31 Jul, 2017). The **expected dividend yield on the index next year is 3.0%,** and the **expected growth rate in earnings and dividends in the long term is 7.0%.** Solving for the **implied expected return on equity** on equity yields the following:

  implied SET return = 3.0% + 7.0% = 10.0%

- If the current risk-free rate is 2.75% (10-years zero-coupon Thailand government bond yield), this will yield a premium of:

  implied equity premium = 10.0% - 2.75% = 7.25%

By comparing implied SET return of 10.0% (based on next year dividend yield and the long-term growth rate) and the expected SET return of 10.71% (based on historical market risk premium of 7.96%), do you think the current SET index is undervalued, overvalued or fairly valued? Why?

III

2) Estimating the Required Return on an Individual Stock (k_e)

The Required Return on Equity (k_e) or The Cost of Equity

- **Equity risk premium** reflects the **risk premium on the broad equity market** (**market risk** or **systematic risk** or **un-diversifiable risk**). It reflects the **risk inherent to the entire market**.
- Equity risk premium reflects an **average-systemic-risk equity security**. Each asset in the market portfolio has **particular level of systematic risk contribute to the systematic risk of the market portfolio**.
- **Beta (β)** measures the **systematic risk of each asset that contribute to the systematic risk of the entire market portfolio**. In other words, **Beta (β)** adjusts the equity risk premium for **the asset's particular level of systematic risk.**

Systematic Risk versus Unsystematic Risk

- **The asset sensitivity to the market portfolio** is measure by **beta (β)**. The beta measure the **systematic risk**, or the risk **affects the overall market** and cannot be diversified away.
  - **Systematic risk**, also known as "**market risk**" or "**un-diversifiable risk**“ or “**volatility**”, which consists of the day-to-day **fluctuations in a stock's price relative to the market**.
  - **Unsystematic risk**, also known as "**specific risk**," "**diversifiable risk**" or "**residual risk**“ is the type of risk that is **specific to individual stocks** and can be diversified away as the investor increases the number of stocks in his or her portfolio. In more technical terms, it **represents the component of a stock's return that is not correlated with general market moves**.

A Model Used to Determine the Required Return on Equity (k_e): CAPM

- **An asset pricing model** is an equilibrium model used to determine the **required return (expected return)** on an asset at a given level of risk.
  - The most popular one is **the capital asset pricing model (CAPM)**.

Expected return = Risk-Free Rate + Beta(Risk Premium)

$$R_i = R_f + B_i(R_m - R_f)$$

- The capital asset pricing model (CAPM) defines a **stock's risk** as the **stock sensitivity to the stock market** (how **much the stock and the entire market move together**, i.e. **market risk** or **systematic risk**).
- **This sensitivity of the stock to the stock market** is measured using a term known as **beta**.

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Equilibrium Models Assumptions

- The market is in a competitive equilibrium (i.e. the market price is the fair price);
- Investors are risk averse and make investment decisions based on mean–variance optimization.
- All assets are tradable (all investors have the same assets to invest in);
- Single-period investment horizon (all investors are facing the same investments problems);
- No transaction costs, no taxation, investors are not limited in their borrowing and lending, Same interest rate for lending and borrowing (risk free rate of interest).

Estimating Betas

Approaches for estimating betas:

1) Using a Service Beta (Historical Betas)
2) Regression Estimates of Betas (Historical Betas)
3) Fundamental Betas

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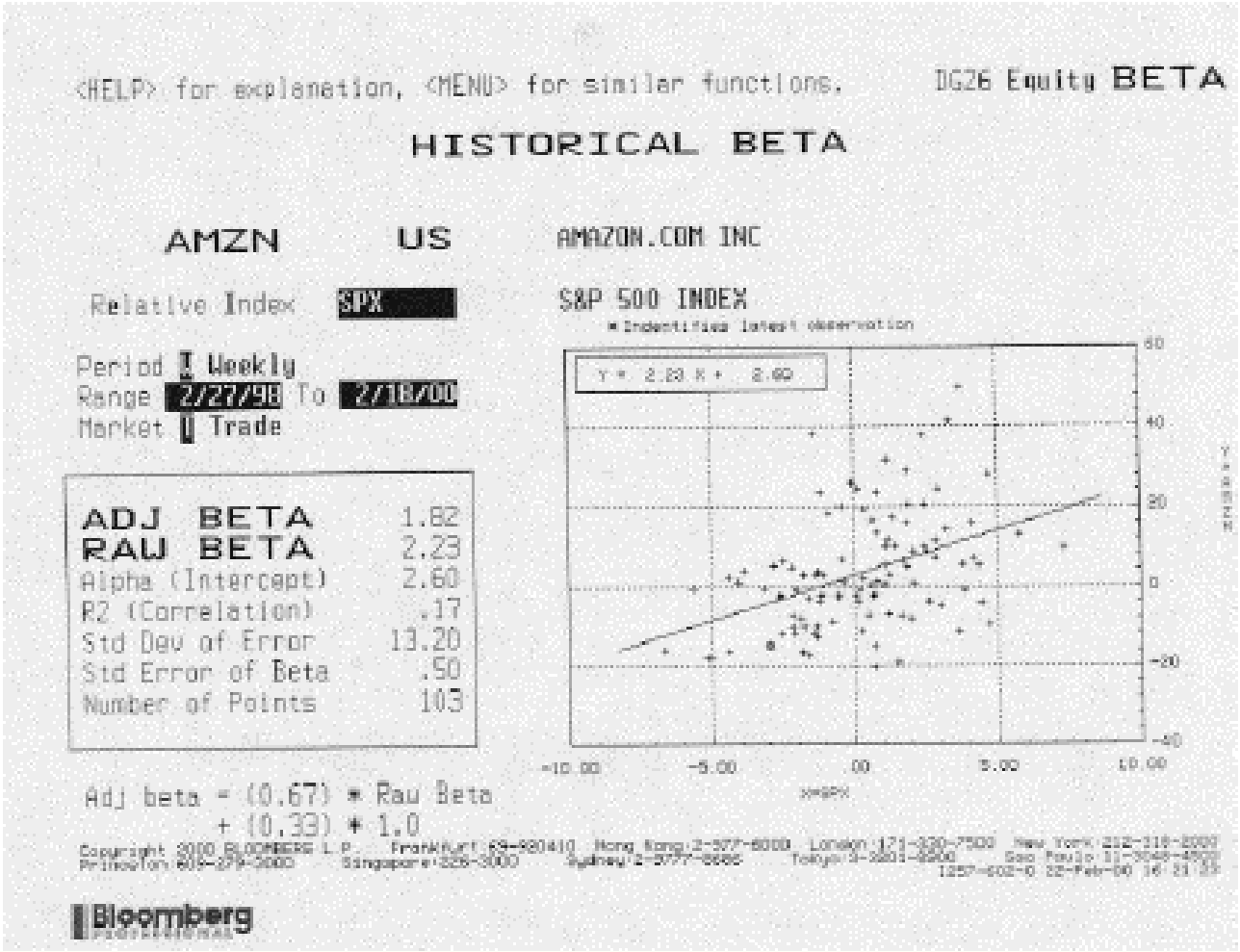
Service Beta: Beta from Bloomberg



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Service Beta: Beta from Reuters

23 Aug, 2017 SUPER 1.31, SET 1573.38

SUPER.BK on Stock Exchange of Thailand	Change (% chg)	Prev Close	Day's High	Volume	52-wk High
		1.24฿	1.29฿	238,732,100	1.84฿
1.28THB	0.04฿ (+3.23%)	Open	Day's Low	Avg. Vol	52-wk Low
4:10am EDT		1.25฿	1.25฿	316,794,508	1.00฿

OVERALL

Beta:	2.36
Market Cap(Mil.):	฿33,913.34
Shares Outstanding(Mil.):	27,349.46
Dividend:	--
Yield (%):	--

FINANCIALS

	SUPER.BK	Industry	Sector
P/E (TTM):	29.95	9.68	12.98
EPS (TTM):	0.04	--	--
ROI:	4.14	12.43	8.09
ROE:	9.66	17.67	12.71

Energy Absolute PCL (EA.BK)

Beta:	1.53
Market Cap(Mil.):	฿140,807.50
Shares Outstanding(Mil.):	3,730.00
Dividend:	0.08
Yield (%):	0.40

SPCG PCL (SPCG.BK)

Beta:	1.51
Market Cap(Mil.):	฿18,849.40
Shares Outstanding(Mil.):	923.99
Dividend:	0.50
Yield (%):	5.88

Gunkul Engineering PCL (GUNKUL.BK)

Beta:	2.71
Market Cap(Mil.):	฿30,416.12
Shares Outstanding(Mil.):	7,418.56
Dividend:	0.03
Yield (%):	0.84

How do you determine whether the beta of SUPER is reasonable compared to its peers?

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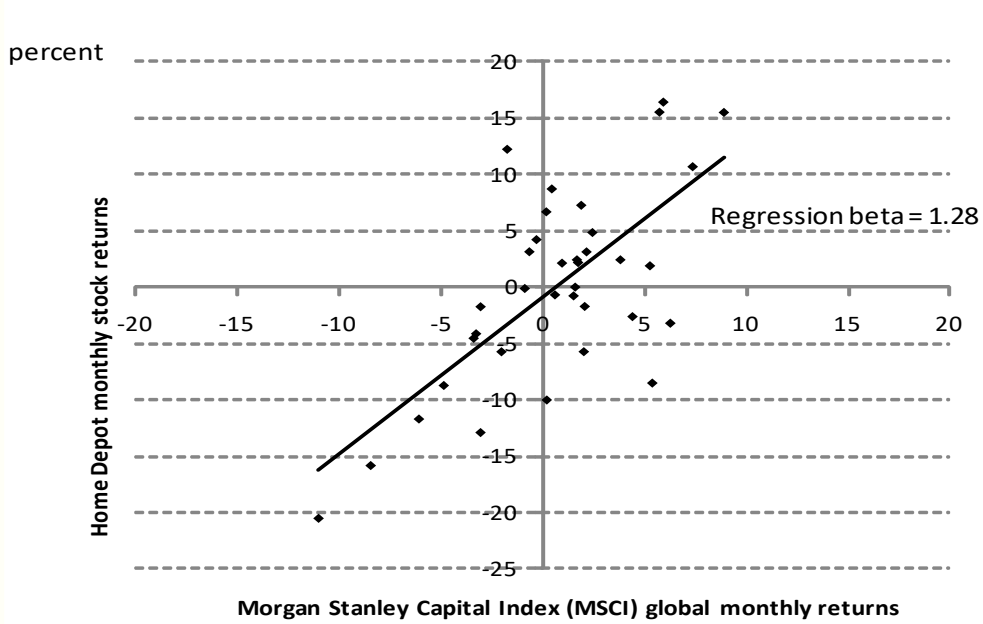
Regression Estimates of Betas

Home Depot: Stock Returns, 2001–2006

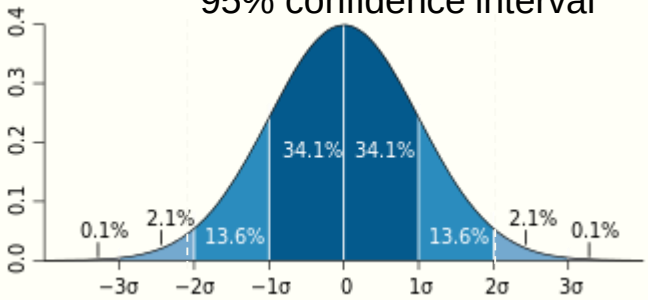


Home Depot's returns are regressed against **MSCI World Index's return**. Based on data from 2001 to 2006, Home Depot's beta is estimated at **1.28**.

The regression's **R-squared was 37%,** and the **standard error** of the beta estimate was **0.216**.

Using **two standard errors (0.216*2=0.432),** Home Depot's true beta lies between **0.85 and 1,71**.

two standard error
95% confidence interval



Adjusted beta = (2/3)(1.28)+(1/3)(1) = 1.187 (Bloomberg)

What problems do you see in the above estimation of beta?

III

Key considerations on Regression Estimates of Betas

- Raw regressions should use **at least 60 data points (e.g., five years of monthly returns).**
- Using shorter return periods, such as daily and weekly returns, is problematic for **illiquid stock and on the bid-ask bounce**.
- **Rolling betas** should be graphed to examine any **structural changes** (for example, changes in **corporate strategy** or **capital structure**, which often **lead to changes in risk for shareholders**) or short-term deviations in a stock's risk.
  - **Structural change in the company business** would affect beta.
  - When necessary, consider **how the industry is likely to move with the economy**, in order to bound your result.
  - **Market portfolio:** changes in the mix of the market portfolio leads to changes in industry betas.

Fundamental Betas

- Improving the results from the regression by deriving an **unlevered industry beta** and then **relevering the industry beta to the company's target capital structure**.

Structural Changes Affect Beta

IBM: Market Beta, 1985–2008

III

Fundamental Beta

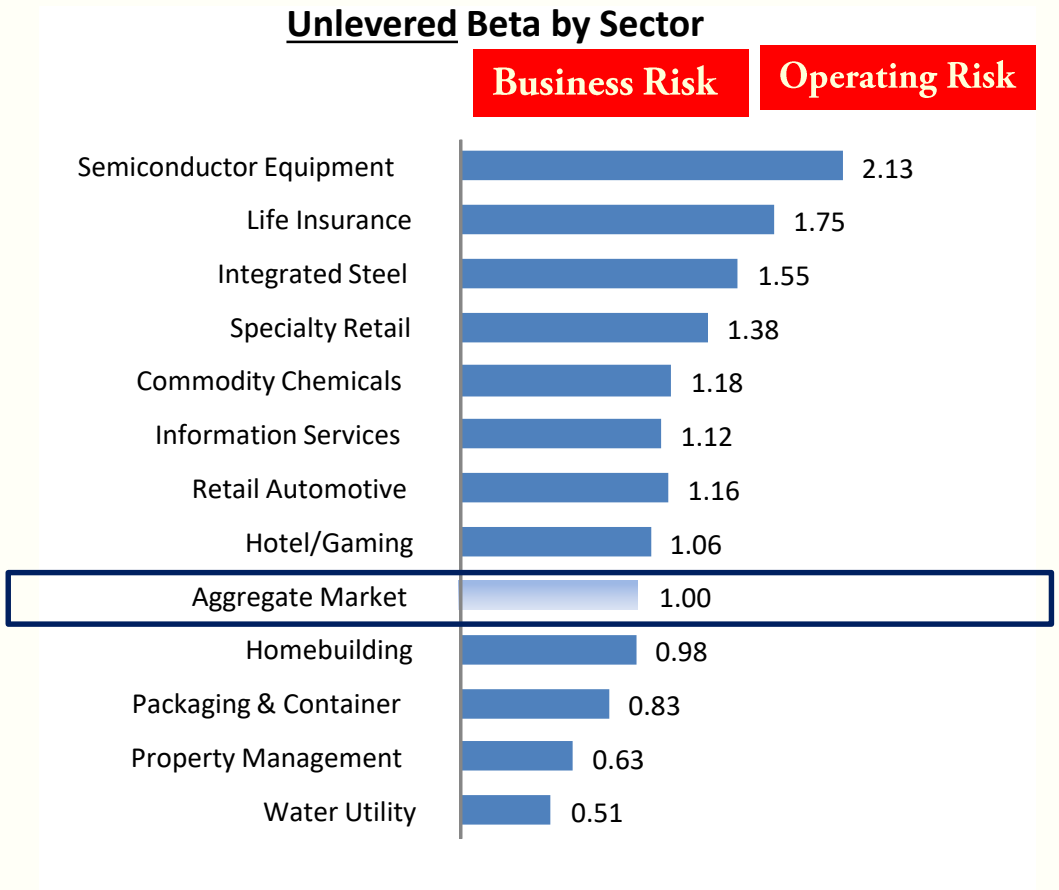
- **Determinants of Betas.** The beta of a firm is determined by three variables:
  (1) the type of business or businesses the firm is in
    - Cyclical firms can be expected to have higher betas than noncyclical firms.
    - The degree to which a product's purchase is discretionary will affect the beta of the firm manufacturing the product.
  (2) the degree of operating leverage of the firm, and
  (3) the firm's financial leverage.
    - A firm that has high fixed costs relative to total costs is said to have high operating leverage and higher beta.
    - A firm that has high debts to total debts is said to have high financial leverage and higher beta.

Unlevered Betas Represent Exposures to the Economy's Strength

- A company's unlevered beta represents its revenue and cash flow exposure to the economy's strength (i.e. business and operating risk).

$$\beta_u = \frac{\beta_L}{(1+(1-T)(D/E))}$$

$$\beta_L = \beta_u \times (1+(1-T)(D/E))$$



Source: Damodaran, A., 2012, Investment Valuation: Tools and Techniques for Determining the Value of any Asset, 3rd Edition, John Wiley & Sons.

III

3) Estimating the Cost of Debt (k_d)

III

Estimating the Cost of Debt

The cost of debt measures the **current cost to the firm of borrowing funds** to finance projects.

Approaches to estimate the cost of debt

1. When a firm has **long-term bonds** outstanding that are widely traded, the bonds' **yield to maturity (YTM)** represents the firm cost of debt.
   - Search Bloomberg (or other financial databases) for the yield to maturity **(YTM) on the company's long-dated, option-free debt.**
2. If firms have bonds outstanding that do not trade on a regular basis, we can estimate their costs of debt by using their **debt ratings and associated default spreads**.
3. Smaller firms and most private businesses choose not to get rated. To estimate the cost of debt, there are two alternatives
   1. **Recent borrowing history**.
   2. **Synthetic rating**: assign a rating to a firm based on its financial ratios.

After-tax cost of debt = Pretax cost of debt(1 – Tax rate)

Sirinattha Techasiriwan
สิรินัฏฐา เตชะศิริวรรณ

Yield to Maturity (YTM) - When a firm has long-term bonds outstanding that are widely traded

- **A YTM is differ from a coupon rate. A coupon rate** is the interest rate stated on a bond when it's issued. The coupon is typically paid semiannually.
- **A yield to maturity (book yield, redemption yield)** is the **expected rate of return (internal rate of return or IRR) on a bond if held until maturity**. The YTM calculation takes into account the bond's **current market price (P_0)**, **par value**, **coupon interest rate** and **time to maturity**.
  - The YTM assumed that all coupon payments are **reinvested** at the

Example: Yield to Maturity (YTM)

- Find the yield to maturity of a Bt1,000 par value, 3 years, 10% coupon debenture at the following market price:
  a) Bt951.98, b) 1,078.73, c) 1,000

a) $P_0 = 9{,}519.8 = 100(PVIFA_{k\%,3}) + 1{,}000(PVIF_{k\%,3}) \rightarrow k = 12\%$

b) $P_0 = 1{,}078.73 = 100(PVIFA_{k\%,3}) + 1{,}000(PVIF_{k\%,3}) \rightarrow k = 7\%$

c) $P_0 = 1{,}000 = 100(PVIFA_{k\%,3}) + 1{,}000(PVIF_{k\%,3}) \rightarrow k = 10\%$

Using calculator: YTM (3 N, 100 PMT, 1,000 FV, -951.98 PV; CPT I/Y = ??)
(3 N, 100 PMT, 1,000 FV, -1,078.73 PV; CPT I/Y = ??)
(3 N, 100 PMT, 1,000 FV, -1,000 PV; CPT I/Y = ??)

Example: Use Financial Database on YTM

- To find the yield to maturity for companies with **liquid** corporate debt, search for trading data on the company's **long-term** bonds (greater than 10 years).
- Example: Consider trade data on bonds from **Home Depot (2036 5.875 percent bond)**. Which yield would you use to represent Home Depot's cost of debt?
  - Large trade for Home Depot's 2036 bond were completed at 5.865% and 5.894%. Weighted average of the two yield is **5.878%** (reflects a default risk premium of 2.8% above the 10-year U.S. Treasury bond yield of 3.1%).

Home Depot

Coupon	5.875
Maturity	12/16/2036
Rating	BBB+/Baa1

Trade date	Time	Price	Yield	Size
6/18/2010	11:37:19	99.440	5.917	214K
6/18/2010	9:33:40	97.898	6.034	10K
6/18/2010	9:32:39	98.898	5.958	10K
6/17/2010	15:11:00	99.387	5.921	400K
6/17/2010	13:23:11	98.819	5.964	6K
6/17/2010	13:23:11	98.986	5.951	6K
6/17/2010	13:13:20	100.132	5.865	5,000K
6/17/2010	13:06:59	101.539	5.760	10K
6/17/2010	13:06:59	99.414	5.918	10K
6/17/2010	12:31:45	99.745	5.894	4,025K

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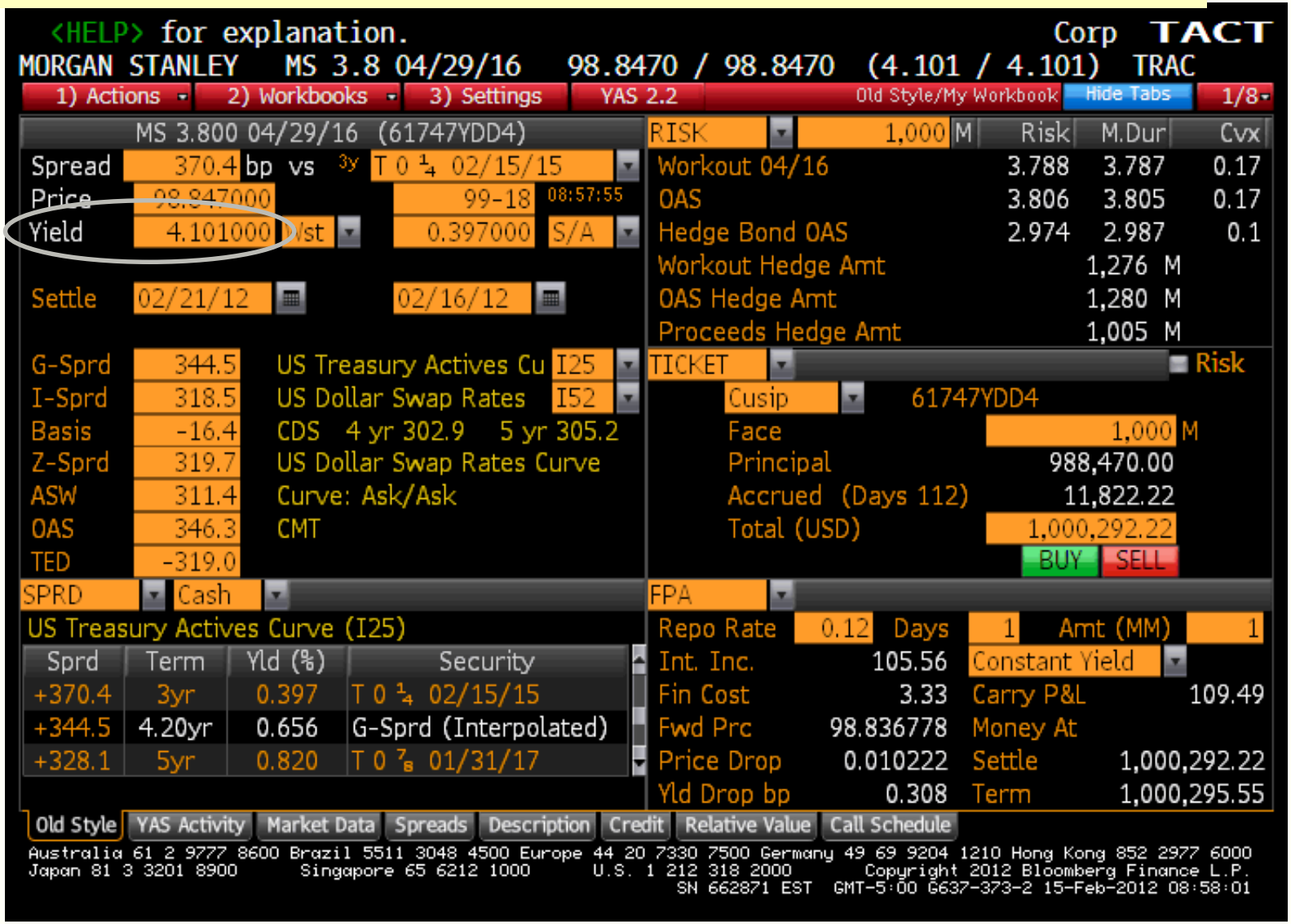
Source : Valuation: Measuring and Managing the Value of Companies by Tom Copeland, Tim Koller and Jack Murrin, McKinsey & Company, Inc, University Edition, 5th edition

Example: Bloomberg Information on YTM



III

4) Weighted Average Cost of Capital (WACC)

Estimating the Cost of Capital: WACC

- The weighted average cost of capital is the **market-based weighted average** of the after-tax cost of debt and cost of equity:

$$\text{WACC} = \frac{D}{V} k_d (1 - T_m) + \frac{E}{V} k_e$$

- To determine the weighted average cost of capital, we must calculate its three components: (1) the **cost of equity**, (2) the **after-tax cost of debt**, and (3) the company's **target capital structure using market-based (not book) values**.
  - The **book values** of the invested capital are largely based on **historical costs**, while **market values** reflect the **current cost** of the invested capital.
  - **Market values more closely reflect how you raise your capital**.

The market value of equity = market capitalization of common = number of outstanding shares x stock price

The market value of debt: We consider **interest-bearing debt** both **short-term and long-term** borrowings.

http://www.thaibma.or.th/compositerpt/DealerPriceReport.aspx

Example: The Cost of Capital (WACC)

Home Depot: Weighted Average Cost of Capital (as of May 2009)

percent

Source of capital	(target market-based weight) Proportion of total capital	Cost of capital	Marginal tax rate	After-tax opportunity cost	Contribution to weighted average
Debt	31.5	6.8	37.6	4.2	1.3
Equity	68.5	10.4		10.4	7.1
WACC	**100.0**				**8.5**

- **The cost of equity** of 10.4% was estimated using CAPM.
  - The May 2009 **10-year U.S. government zero-coupon STRIPES** rate of 3.9% is used as a proxy for the risk free rate.
  - The estimated market risk premium is 5.4% and the beta is 1.21.
- **The pretax cost of debt** is estimated to be equal to the May 2009 yield to maturity of BBB+ rated (equal to the rating of Home Depot debt) debt at 6.8%.
- The current debt-to-value ratio of 31.5% **is expected to be maintained going forward**.

* A **striped bond** is a bond that has had its main components broken up into a zero-coupon bond component and a series of coupon component and sold individually

Summary of the Components of WACC

Weighted Average Cost of Capital

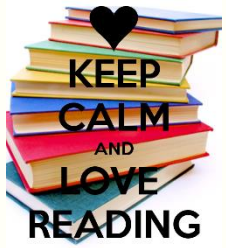
Component	Methodology	Data requirements	Considerations
Cost of equity	Capital asset pricing model (CAPM)	• Risk-free rate	Use a long-term government rate denominated in same currency as cash flows.
		• Market risk premium	The market risk premium is difficult to measure. Various models point to a risk premium between 4.5% and 5.5%.
		• Company beta	To estimate beta, lever the company's industry beta to company's target debt-to-equity ratio.
After-tax cost of debt	Expected return proxied by yield to maturity on long-term debt	• Risk-free rate	Use a long-term government rate denominated in same currency as cash flows.
		• Default spread	Default spread is determined by company's bond rating and amount of physical collateral.
		• Marginal tax rate	In most situations, use company's statutory tax rate. The marginal tax rate should match marginal tax rate used to forecast net operating profit less adjusted taxes (NOPLAT).
Capital structure	Proportion of debt and equity to enterprise value		Measure debt and equity on a market, not book, basis. Use a forward-looking target capital structure.

Source : Valuation: Measuring and Managing the Value of Companies by Tom Copeland, Tim Koller and Jack Murrin, McKinsey & Company, Inc, University Edition, 5th edition

Assignments:

Damodaran, A., 2012, Investment Valuation: Tools and Techniques for Determining the Value of any Asset, 3rd Edition

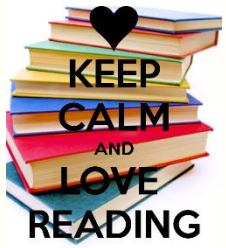
- Read chapter 1-Introduction to Valuation, chapter 6-Market Efficiency (pages 111-115, 126-149)
- **Time value of money exercises (self-practice)**
- **End of chapter 1 exercises (questions 1-3)**
- **End of chapter 6 exercises (questions 6-7)**



Assignments:

Damodaran, A., 2012, Investment Valuation: Tools and Techniques for Determining the Value of any Asset, 3rd Edition

- Read Chapter 7-Riskless Rates and Risk Premium (pages 154-156, 161-169, 172-176); Chapter 8-Estimating Risk Parameters and Costs of Financing (pages 182 – 187, 193 – 203, 208 – 222)
- **End of chapter 7 exercises (questions 2, 3, 7, 10, 12)**
- **End of chapter 8 exercises (questions 3, 6, 17, 24)**



Time Value of Money Exercises:

1. What will a deposit of $4,500 at 12% compounded monthly be worth at the end of 10 years? (Ans 14,852)

2. The Tried and True Corporation had earnings of $0.20 per share in 1978. By 1995, a period of 17 years, its earnings had grown to $1.01 per share. What was the compound annual rate of growth in the company's earnings? (Ans 10%) CAGR = Cumulative Annual Growth Rate

3. Find the present value of $1,000 to be received at the end of 2 years at a 12% nominal annual interest rate compounded quarterly. (Ans 788)

4. What is the present value of an asset that generates a cash flow of $15 every year at a 15% required rate of return? (Ans 100)

(self-practice)