PORTFOLIO RISK MANAGEMENT: AN OVERVIEW

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WORKSHOP NOTES

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November 23, 2015 @ SDMIMD, Mysore, India

Coverage

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i. Revisiting some contemporary concepts of risk of portfolio, systematic risk, unsystematic risk and related aspects. (The presentation will be more focused on systematic forces in wealth development and management.)

ii. Review of some recent developments, selected cases and problems in the field.

Scope…

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- ***Revisit*** some mathematical foundations of portfolio theory based on the Markowitz (1973) model, in order to appreciate the practicalities of the model in modern investment systems.
- ***Risk*** - Acknowledging risk-return tradeoff in finance comes from the fact that the return on investments is not known with certainty when the asset is bought, hence, the variability/volatility of returns, i.e. the uncertainty that the yield on an investment will deviate from what is expected.
- ***Total portfolio risk*** comprising systematic risk and unsystematic risk and familiar with the theory that a diversified portfolio will minimize risk and maximize returns.

Portfolio Theory:
… a major field in Financial Mathematics

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Classification code	Mathematical finance
91G10	**Portfolio theory**
91G20	Derivative securities
91G30	Interest rates (stochastic models)
91G40	Credit risk
91G50	Corporate finance
91G60	Numerical methods (including Monte Carlo methods)
91G70	Statistical methods, econometrics
91G80	Financial applications of other theories (stochastic control, calculus of variations, PDE, SPDE, dynamical systems)
91G99	None of the above, but in this section

Source: http://www.ams.org/msc/msc2010.html?t=91Gxx&btn=Current [23/11/2015]

Total portfolio risk

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- Portfolio risk is made up of two parts – Systematic risk (market risk) + Unsystematic risk (the individual risk of the component securities).
- Market risk affects all securities, so it's unavoidable.
- But unsystematic risk is avoidable risk because if we do not invest in the individual investment, we would avoid the risk.
- Thus, in an ***efficient portfolio***, unsystematic risk is zero – i.e. having diversified it away, only the unsystematic risk remains.

The ‘diversification’ debate

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- Are you merely diversifying assets or really diversifying risks?

Causes of price movement

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- Market forces?
- Sector forces?
- Fundamentals?

Causes of price movement
Evaluating the numerous forces

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- ***Monte Carlo simulation*** has been used to determine the risk measure by which values of several key variables along with their probability distributions simultaneously affect final evaluation.

Basic approaches…

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- Fundamental analysis – tells you what to buy
- Technical analysis – tells you when to buy
  - "Timing is everything." – Is this adage still true in the context of portfolio management?

The ‘bull’ & the ‘bear’ markets

Offensive & defensive strategies
Buy-Hold myth?

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What is ‘efficient’?

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What is 'efficient'?

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- **Well organized:** performing tasks in an organized and capable way
- **Able to function <u>without waste</u>:** capable of achieving the desired result with the minimum use of resources, time, and effort.
- The concept of **<u>efficiency</u>** is vital in a world of rapidly increasing needs viz-a-viz rapidly depleting resources.

Classification of stock market risks

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- Beta stocks
- Alpha stocks
- Gamma stock
- Delta stocks

What is 'Portfolio theory'?

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Portfolio theory

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- ***Portfolio theory*** - the theory that a diversified portfolio will minimize risk and maximize returns, i.e. efficient portfolio.
- ***Portfolio*** – a group of investments held by a person or organization.
- ***Risk*** – standard deviation of portfolio
- ***Return*** - $$R_t = \frac{P_t - P_{t-1}}{P_{t-1}}$$

where, P_t is the price of the stock at the end of the year and P_{t-1} denotes the price at the end of the prior month. If multiplied by 100, the return is the percentage change in the value of the stock during the year.

Portfolio risk management

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Portfolio risk management

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- Portfolio risk management is a meticulous approach to asset selection and managing risk.
- Portfolio risk management is a logical, organized game plan to protect your portfolio regardless of market conditions….
  - Recession
  - Stagnation
  - Boom
  - Handling cyclical & non-cyclical stocks

Portfolio risk management

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- Is past performance a guarantee of future success?
- What is historically common to these dates?
- 1929
- 1973
- 1987
- 1997
- 2007

Intelligent investing…

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- ✓ To invest successfully over a lifetime does not require a stratospheric IQ, unusual business insights or inside information. What's needed is a sound intellectual framework for making decisions and the ability to keep emotions from corroding that framework.

» Warren Buffet

Market portfolio…

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- Market portfolio – most representative assets in the efficient frontier.
- It is said that to create a market portfolio for investment purposes in practice would necessarily include every single possible available asset - real estate, precious metals, stamp collections, jewellery, and anything with any worth, as the theoretical market being referred to would be the world market.
- Examples of conventional proxies of market portfolios in major markets – S&P Global 1200, S&P 500, FTSE 100, (U.S.), NSE 30, NSE 3 (Nigeria), BSE SenSex, Nifty (India), etc.

Global Financial Assets (2014)

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S/NO	ASSETS	VALUE US$ trillion	% OF TOTAL
1	Debt	90	10%
2	Stocks	66	7%
3	Securitized products	44	5%
4	OTC derivatives	693	78%
	TOTAL	***893***	***100%***

- Source: *Business Insider India* (March 25, 2014) http://www.businessinsider.in/CHART-OF-THE-DAY-The-Rise-Of-The-156-Trillion-Market-For-Global-Financial-Assets/articleshow/32681342.cms [18/09/2015]

Efficient portfolio…

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The HM Model: The Efficient portfolio…

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- A ***Markowitz Efficient Portfolio (MEP)*** – where no additional expected return can be gained without increasing the risk of the portfolio, or, where no added diversification can lower the portfolio's risk for a given expected return.
- A ***Markowitz Efficient Frontier (MEF)*** – the set of all portfolios that will give the highest expected return for each given level of risk.
- Also called ***Mean-Variance Model*** – since it is mathematically based on the expected return (mean) and the standard deviation (variance) of the various portfolios.

Harry Max Markowitz :

…the pioneer of modern portfolio theory

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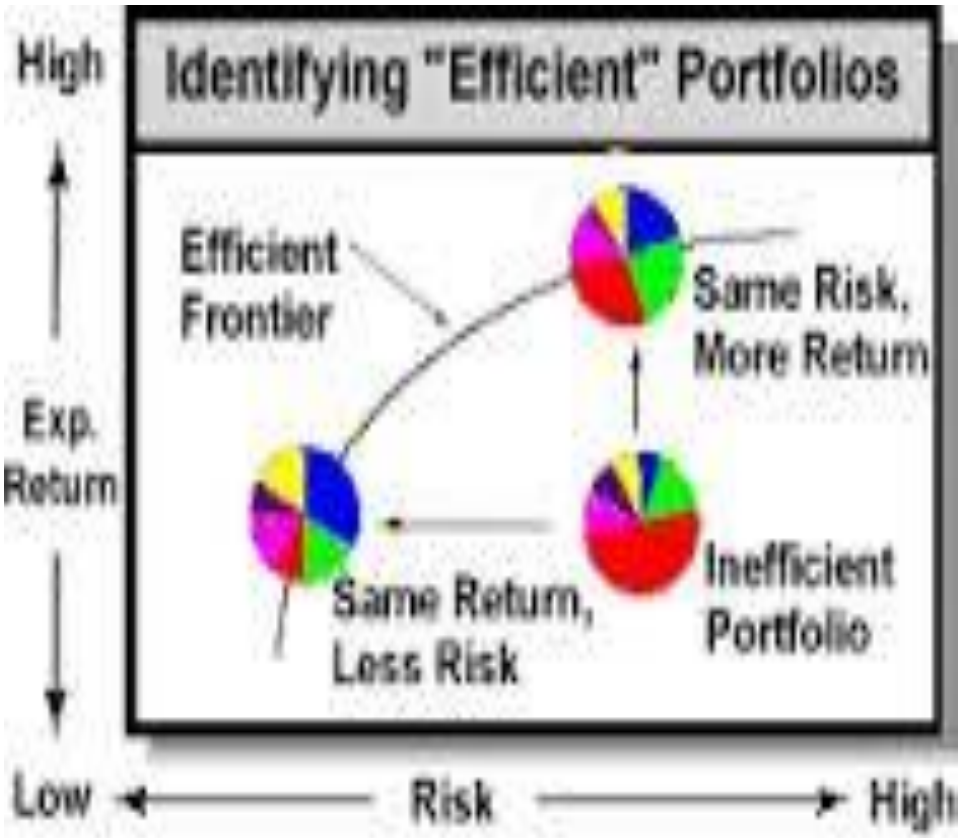

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Harry Markowitz….

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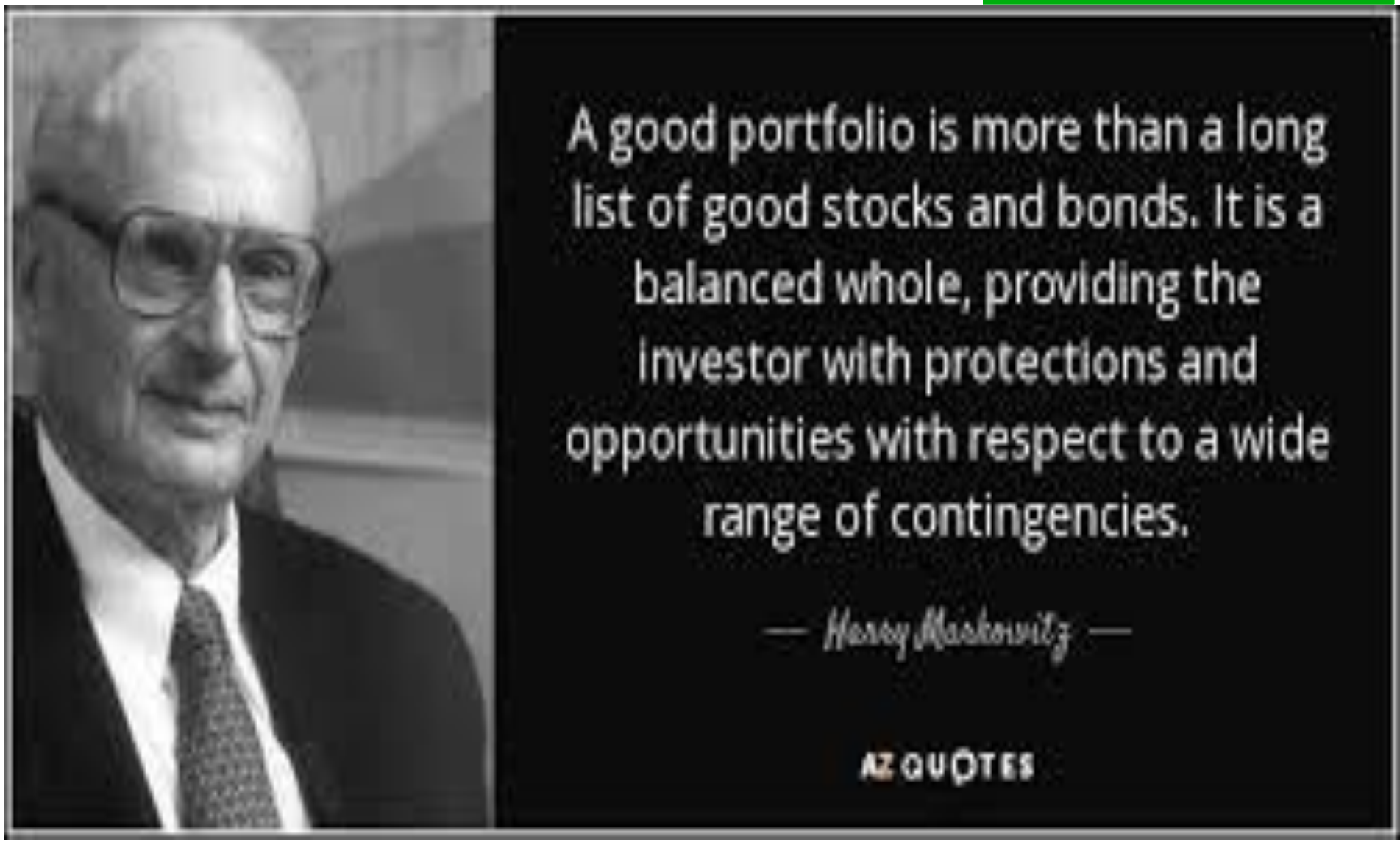

The HM Model: Key assumptions…

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- Portfolio risk is based on the variability of returns from the said portfolio
- Investor is risk-averse
- Investor prefers to increase consumption
- Investor is rational
- The analysis is based on single period model of investment.

Standard deviation as Risk Measure…

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- Uncertainty is understood as the scatter of returns around some reference point – naturally the expected return
- The extent of scatter can be conveniently measured by standard deviation (Capinski & Zastawniak, 2011):
- $\delta Rp = \sqrt{Var(Rp)}$
- *Var(Rp)* being the variance of the return

Risk Measure: Role of probability?

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Rational behaviour: Basis for efficient frontier…

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- Given the choice between two securities, a rational investor will, if possible, choose that with the higher expected return and lower standard deviation, that is, lower risk.

The Capital Market Line

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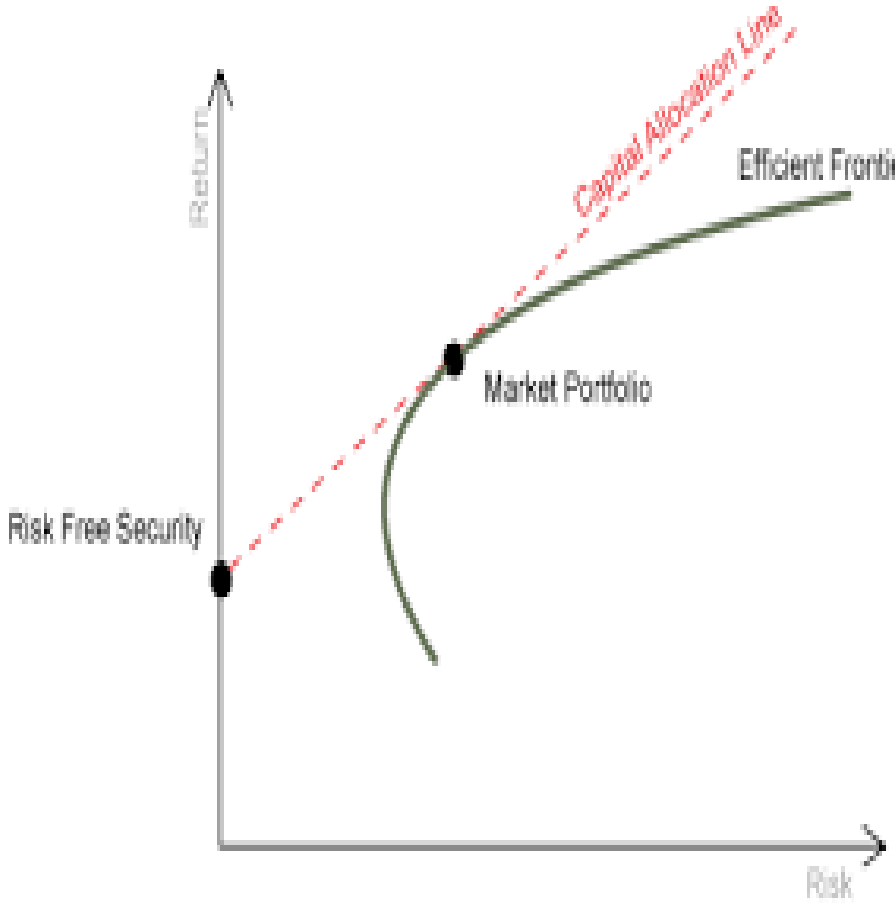
- CML says that the return from the portfolio is the risk-free rate plus risk premium, i. e.

$$R_p = I_{RF} + (R_M - I_{RF}) \, {}^{\delta_p}\!/_{\delta_M}$$



Capital Market Equation…

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- $R_p = I_{RF} + (R_M - I_{RF}) \, {}^{\delta_p}/_{\delta_M}$

❑ Where,

R_p – Expected return of portfolio

R_M – Market portfolio's return

I_{RF} – Risk-free rate of return

δ_p - Standard deviation of portfolio

δ_M - Standard deviation of market portfolio

$(R_M - I_{RF}) \, {}^{\delta_p}/_{\delta_M}$ – risk premium

Risk-free asset

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- The standard deviation for the return of risk-free security is of course zero.
- Why?

Risk premium

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- Recall capital market equation
- $R_p = I_{RF} + (R_M - I_{RF})\,{}^{\delta_p}/_{\delta_M}$
- Or, simply: $R_p = Rf + \beta(Rm - Rf)$
- For a portfolio on the CML with risk δ, the term $(R_M - I_{RF})\,{}^{\delta_p}/_{\delta_M}$ is called the risk premium.
- Risk premium can be viewed as *additional* return above the risk-free return *Rp* which compensates for exposure to risk

Capital Market Line….
Key attributes…

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1. The tangent point is where you obtain the optimum combination of risky investments and market portfolio
2. Only efficient portfolios that consist of risk-free investments and the market portfolio lie on the CML
3. Price of risk has to be positive, hence the CML is upward-sloping, meaning that a rational investor will not invest unless he knows he will be compensated for that risk.

The beta factor

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- Beyond the value of standard deviation as a valid risk measure, the importance or relevance of co-variances between capital assets has also been severally underscored. (recall the doctrine of systematic and unsystematic risk & capital market equation).
- The beta factor, βv, of portfolio v, is given as

$$\beta v = \frac{Cov\,(P, M)}{\delta^2 M}$$

BETA factor in portfolio selection

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- ***Beta*** measures the extent to which returns on the stock and the market move together.

- **NOTE:**

Beta value =1 same risk with market

Beta ≥ 1 High risk asset

Beta ≤1 Low risk asset

Beta = 0 Risk-free asset

The Role of beta factor in portfolio selection…

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- ✓ Asset *beta* - for asset selection and disposal.
- ✓ Portfolio *beta* – to control the level of investment risk.
- ✓ Expected return versus Asset *beta* - allows an investor to discover a suitable investment balance between expected return, without having to diversify into excessive number of different stocks.

CAPM:
What assumptions?

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CAPM basic assumptions

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- Efficient market
- Identical investment holding period
- Listed securities only (i.e. only tradable assets)
- Risk-free rate
- Nil transaction cost
- Rational investing
- Homogenous expectations
- Perfectly divisible asset.

CAPM
…in essence

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- The CAPM describes a state of equilibrium in the market – where the demand and supply of all securities will be balanced..
- Everyone has a portfolio of risk assets with the same weights as the market portfolio.
- The market will remain in equilibrium as long as the estimates of expected returns and beta factors satisfy CAPM equation

$$R_p = I_{RF} + (R_M - I_{RF})^{\delta_p}/_{\delta_M}$$

- In practice, new market information about capital assets will naturally upset the equilibrium (with investors offering to buy more or sell more of the assets), but price adjustments will tend to restore the CAPM equation and state of equilibrium.

CAPM Critique

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CAPM Critique

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- Problems of applying CAPM to capital budgeting for instance
- The biggest problem has to do with accurate estimation under different economic environments
- The CAPM is a single-period model – how do you apply in multi-period investments as in capital budgeting
- Assumes only systematic risk is important, but practically, the investor also wants to know about the unique risk – she wants project that reduces corporate earnings risk as well

ARBITRAGE PRICING THEORY (APT)

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- APT suggests that the expected return on an asset is a function of the expected risk premium associated with each factor and the asset's sensitivity to each of the factors (b_1, b_2, b_3, and so on).
- The APT formula can be stated as follows:
- Expected risk premium on an investment (r_i – rf):
- **$= b_1 (r_{factor}1 – rf) + b2 (r_{factor}\,2 – rf) + \ldots + b_n (r_{factor}\ n – rf)$**

- **Similarities with CAPM**
  - ✓ Both acknowledges Systematic risk and Unsystematic risk
  - ✓ Portfolio diversification
- **Differences from CAPM**
  - ✓ Different formulas
  - ✓ Portfolio efficiency vs. macroeconomic impact assessment
  - ✓ Importance/relevance of market return (Rm)
  - ✓ Single-factor model vs multi-factor model
  - ✓ Statistical vs Explanatory
  - ✓ Demand side vs supply side

APT FACTORS

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- In applying APT, Elton, Gruber, and Mei (1994) suggest the consideration of the following factors:

- (i) Yield spread;
- (ii) Interest rate (changes in Treasury bill yields);
- (iii) Exchange rate (value of Naira relative to basket of other currencies);
- (iv) Real GNP (change in forecasts of real GNP);
- (v) Inflation (change in forecast of inflation);
- (vi) Market (the portion of the market return that could not be explained by the first five factors).

Enter…
Post-Modern Portfolio Theory (PMPT)

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- Associated with software entrepreneurs Brian M. Rom & Kathleen Ferguson, PMPT is an expanded risk-return paradigm designed to address the major practical limitations of CAPM/MPT – the assumption that of a discrete, normal (mean-variance) distribution that may not accurately reflect investment reality.
- Thus, the lognormal distribution was introduced as a more robust model for the pattern of investment returns.

Portfolio evaluation

How to rate management of investment funds

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Measuring Portfolio performance

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- ***Asset Return*** - $R_t = \frac{P_t - P_{t-1}}{P_{t-1}}$
- where, P_t is the price of the stock at the end of the year and P_{t-1} denotes the price at the end of the prior year. If multiplied by 100, the return is the percentage change in the value of the stock during the year.

Measuring Portfolio performance

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- The return *Rp* on a portfolio consisting of two securities is the weighted average
- $Rp = w_1P_1 + w_2P_s$

w1 and *w2* are the weights and *P1* and *P2* are the returns on the two components.

Measuring portfolio performance

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- The expected rate of a portfolio is the weighted average of the rates of return of all its component securities, using proportions invested in the securities as weights:

Stock	Returns	Proportion of Capital
A	15%	1/2
B	10%	1/2

- Portfolio return = (0.15 x 0.5) + (0.1 x 0.5) = ***12.5%***

Portfolio Risk?

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Portfolio Risk?

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- In measuring the risk of a portfolio, we cannot take the weighted average of the individual risks because such an approach ignores the co-relationship between the individual securities in the portfolio.
- We need to pair securities in the portfolio to find out the extent to which the pair is subject to the same influence.
- We do this by deploying correlation statistics.

Correlation analysis:
implications for portfolio management

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- *Perfectly positively correlated investments* – not desirable because the risk of the portfolio will be greater than their individual risks
- *Uncorrelated investments* – desirable because the individual risks tend to cancel out hence the portfolio risk may be smaller
- *Negatively correlated investments* – also desirable because the individual risks tend to cancel out thereby making the portfolio risk smaller than the individual risk

Sharpe Ratio?

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Risk-adjusted return

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- ***Risk-adjusted return*** is simply an investment's return determined by measuring how much risk is involved in producing that return.
- It is a risk-based profitability measurement framework for analyzing risk-modified financial performance and providing more consistent view of profitability across businesses or industries than just the nominal return measurement .
- **Sharpe Ratio** developed by Nobel Laureate ***William Forsyth Sharpe*** to measure risk-adjusted performance of portfolios, and is regarded as the most common portfolio management metric.

Risk-adjusted performance
Sharpe Ratio….

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- $SR_{(x)} = \dfrac{(R_x - R_f)}{\delta_{(x)}}$
- Where,

x is subject portfolio

R_x is the average rate of return for portfolio *x*

R_f is the average rate of return of a 'risk-free' security, that is the Nigerian 91-day Treasury Bills

$\delta_{(x)}$ is the standard deviation of portfolio *x*

The greater an asset's SR, the better its risk-adjusted return performance.

Treynor ratio…

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- The **Treynor ratio** (also called the **reward-to-volatility ratio** or **Treynor measure** measures the returns earned in excess of that which could have been earned on an asset that has no diversifiable risk (e.g., Treasury bills, or a completely diversified portfolio), per each unit of market risk assumed.

- The higher the Treynor ratio, the better the performance of the subject portfolio.

Jack L. Treynor, President of Treynor Capital Management

Treynor ratio…

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- $T = \frac{Ri - Rf}{\beta i}$

- Where

T = Treynor ratio

Ri = Portfolio *i*'s return

Rf = Risk-free asset

βi = Portfolio *i*'s beta

- The higher the Treynor ratio, the better the performance of the portfolio under analysis.

- ***Utility of the Treynor ratio*:**

1. For use as a ranking criterion only; It doesn't signify value-added.
2. Useful if the subject portfolios are sub-sets of a broader, fully diversified portfolio; otherwise, portfolios with identical systematic risk will be ranked the same notwithstanding the differences in total risks.

Jensen's alpha…

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- The Jensen's alpha (**Jensen's Performance Index**, **ex-post alpha**) is used to determine the abnormal return of a portfolio over the theoretical expected return.
- In essence, it reflects the difference between what the portfolio really achieved and what it ought to have achieved going by what the CAPM dictates.
- ***Jensen's alpha*** =

Portfolio Return − [Risk Free Rate + Portfolio Beta * (Market Return − Risk Free Rate)]

Prof. Michael C. Jensen, Jesse Isidor Straus Professor of Business Administration, Emeritus, at Harvard University

Computing the Jensen's alpha…

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❑ **The Jensen's formula:**

$$\propto J = Ri - [Rf + \beta i * (RM - Rf)]$$

❑ Calculating Jensen's alpha requires the following inputs:

- *Ri* = the realized return (on the portfolio),
- *RM* = the market return
- *Rf* = The risk-free rate of return and
- βiThe beta of the portfolio.

Summary: Understanding the widely used performance methods / metrics…

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Methods	**Benchmarks**
Sharpe ratio	Total risk
Treynor ratio	Systematic risk
Jensen's alpha	Theoretical (CML-required) rate of return

Re: Portfolio performance evaluation: Self-study other approaches…

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- Modigliani risk-adjustment performance
- Omega ratio
- ***Sortino ratio***
- V2 ratio, etc.

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SESSION 2

Some developments, practices, selected cases & problems

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Fund Management:
… in brief

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- Pension funds
- Mutual funds – considered a good strategy for the retail investor
- Sovereign funds (Est. US$20 trillion)
- Ethical funds (e.g. Islamic financial assets – US$1.3 trillion in 2011 according to *Reuters*)
- Indexed Funds
- Hedge funds
- Foreign Exchange Reserves
- Hedge Fund
- Private Equity Fund
- Ultra High-Net-Worth Individuals Fund,
- Real Estate, REITs, MBS, etc…

Global Funds under management …the 'big boys'!

https://en.wikipedia.org/wiki/Global_assets_under_management [23/11/2015]

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S/No	Company	Portfolio Size US$ ' billion
1	Blackrock	US$4700
2	Peoples Bank of China	US$3700
3	The vanguard group	US$3000
4	Allianz Global Investors	US$2213
5	State Street Global Advisors	US$2300
6	Government Pension Investment Fund Japan	US$1370
7	Bank of Japan	US$1264

Major investors… other 'big boys'!

https://en.wikipedia.org/wiki/Global_assets_under_management [23/11/2015]

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S/No	Investor	Portfolio Size US$ ' billion
1	Bill Gates	US$76
2	Carlos Slim	US$72
3	Warren Buffet	US$58
4	JP Morgan Asset Management	US$47

Sovereign wealth funds…

[https://en.wikipedia.org/wiki/List_of_countries_by_sovereign_wealth_funds]

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Country	Portfolio Size US$
China	US$1.5 trillion
U.A.E.	US$1.2 trillion
Norway	US$824.9 billion
Saudi Arabia	US$673.9 billion
Kuwait	US$592 billion
India (in the works?)	US$3 billion (Rs20000 Crore seed money)
Nigeria	US$2.9 billion

Pension Fund Management (PRA Act, 2014)
The Nigerian case – Permissible assets

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1. FGN Bonds, treasury bills and other securities
2. States and Local Governments Bonds provided that such securities are fully guaranteed by Irrevocable Standing Payment Orders (ISPOs) or external guarantees by eligible banks or development finance institutions or MDFOs with a minimum credit rating of 'A'.
3. Corporate Bonds, debentures, redeemable/ convertible preference shares and other debt instruments issued by listed corporate entities;
4. Bonds and debt securities issued by eligible unlisted companies; and ABS including MBS and Infrastructure Bonds.
5. Ordinary shares of public limited liability companies listed on a securities exchange registered by SEC.

6. Money market instruments of banks and discount houses as well as Commercial Papers issued by corporate entities.

7. Open/ Close-ended/ Hybrid Investment Funds, including Exchange Traded Funds, which are registered with SEC.

8. Investment Funds whose underlying assets are tangible physical assets. These includes: i. Real Estate Investment Trusts (REITs) registered by SEC.

9. Private Equity Funds registered with SEC.

10. Infrastructure Funds registered with SEC

11. Supranational Bonds issued by eligible MDFOs.

12. Global Depositary Receipts/Notes (GDRs/Ns) and Eurobonds issued by listed Nigerian companies, as certified and approved by SEC.

Rating requirements for pension fund management (Nigeria)

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- Pension Fund Administrators (PFAs) may invest ***a maximum of 20%*** of pension assets under management in State/Local Government Bonds, corporate bonds, infrastructure bonds, supranational bonds and other allowable debt securities, with credit rating of BBB by one registered or recognized Rating Company.

- PFAs' investment strategy should not be solely based on ratings assigned by Rating Companies, as they are only complementary to PFAs internal due diligence and analysis, before investment in any instrument or issuer.

Real estate investment portfolio management

… a growing recognition and interest

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- Global property market estimated at ***£15.7 trillion*** (Mustoe, 2015)
- Over the past two decades, the real estate securities market has seen substantial growth due largely to ***the increasing global adoption of the REIT structure*** which typically conveys to investors the combined benefits of property ownership + capital formation derivable from its inherent tax advantage.
- Global real estate securities market is estimated at ***US$1.2 trillion*** (Bloomberg, 2011).

Securitized real estate portfolio:
Key investment attributes

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- ✓ . Relatively low market risk / portfolio diversification (inherently, geographically diversified)
- ✓ Dividend income + long-term growth potential + liquidity / daily market pricing
- ✓ Greater transparency + corporate governance
- ✓ Experienced management teams creating sustained values via strategic partnerships, acquisitions, disposals, finance & development activities.

Still on the growing real estate importance…
…The 2015 IAQF/SunGard Financial Engineer is Chair in Real Estate & Land Economics

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- The International Association for Quantitative Finance (IAQF) and SunGard recently named Dr. Eduardo Schwartz, Ph.D., Distinguished Professor of Finance, California Chair in Real Estate and Land Economics, and Finance Area Chair at UCLA Anderson School of Management, the 2015 IAQF/SunGard Financial Engineer of the Year (FEOY).

Professor Eduardo Schwartz, Ph.D.

Technology & Asset management fees

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Portfolio Management approaches …

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- Active portfolio management
- Passive portfolio management

Investment management process…

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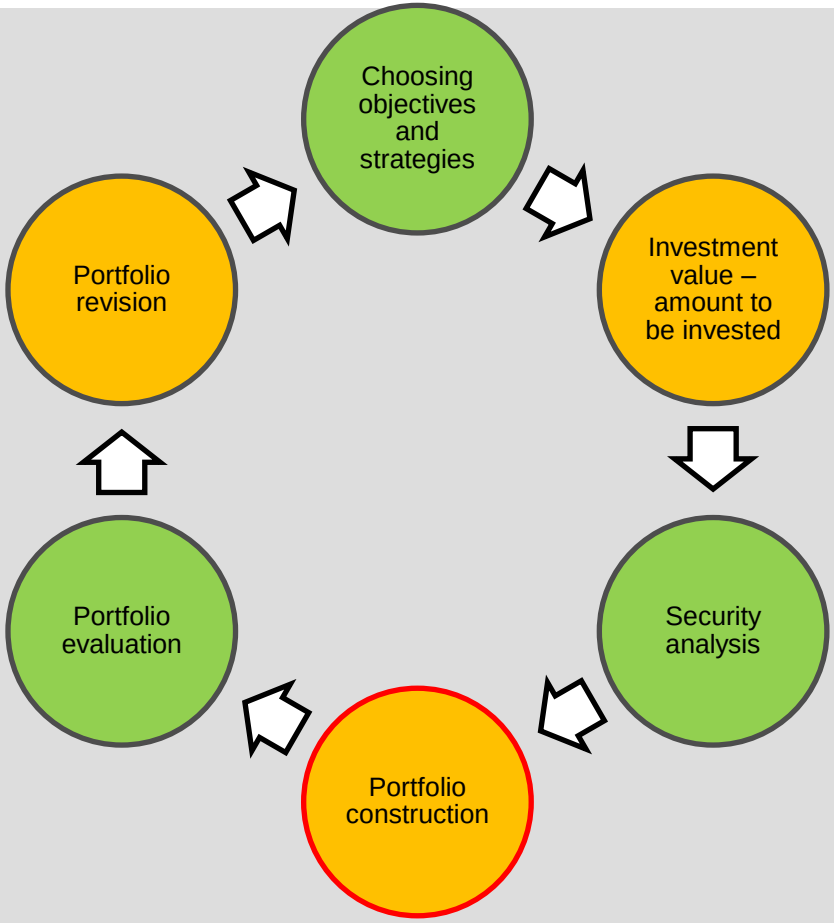

Portfolio construction…

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- ✓Capital allocation
- ✓Asset allocation
- ✓Security selection

Recall
some useful MS Excel functions…

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- FV
- PV
- NPER
- RATE
- PMT
- EFFECT
- PRICE
- YIELD …

- DSTDEV
- IRR
- COVARIANCE
- DVAR…

Beyond PRM analytics: Important workplace skills…

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- ✓Written & oral communication
- ✓Problem-solving abilities – analytical reasoning
- ✓Creative thinking
- ✓Interpersonal skills (team work)
- ✓Time management
- ✓General professionalism, personal effectiveness, and work ethics

Illustration…

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Company	% of Portfolio	Market Price Per Share	Annual Return Per Share
A	15	250K	40K
B	20	375K	52.5K
C	25	180K	36K
D	40	500K	60K

- The market rate of return is 16% and the risk-free rate of return is 11%.

- ***Required:***
- Calculate:
- i. The *beta* factor for each of the shares in the portfolio.
- ii. The *beta* factor for the portfolio as a whole.
- iii. The expected return on the portfolio as a whole.

Solution

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Solution:

- Calculating the expected return from each of the assets, we have the result of the computations in the spreadsheet below:

Company	Annual Return Per Share	Net Price Per Share	Expected Return (Ke) % = Annual Return per share / Net Price Per Share * 100
A	40K	250K	16%
B	52.5K	375K	14%
C	36K	180K	20%
D	60K	500K	12%

Solution (continuation)

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(i) **Solving for *beta* for each asset in the CAPM formula, Ke = Rf + β (Rm – Rf) %, we have as follows:**

- Company A: 16 = 11 + β (16 – 11)

  5β = 5. Therefore, **β = 1**

- Company B: 14 = 11 + β (16 – 11)

  5β = 3. Therefore, β = 3/5, i.e. **0.6**

- Company C: 20 = 11 + β (16 – 11)

  5β = 9. Therefore, β = 9/5, i.e. **1.8**

- Company D: 12 = 11 + β (16 – 11)

  5β = 1. Therefore, β = 1/5, i.e. **0.2**

Solution (continuation)

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(ii) Applying the weighted average of the individual asset's beta factors, we have the *beta* factor for the whole portfolio as follows:

Company	Beta Factor (β)	Weight in Portfolio (W)	β*W
A	1.0	15%	0.15
B	0.6	20%	0.12
C	1.8	25%	0.45
D	0.2	40%	0.08
***Beta* Factor of the whole portfolio**			= **0.80**

(iii) Using the same CAPM formula, the expected return from the whole portfolio can be estimated as follows:

- $Rp = Rf + \beta (Rm - Rf)$ %
- Therefore,
- $Rp = 11 + 0.8 (16 - 11)$

$= 11 + 0.8 (5)$

$= 11 + 4 =$ **15%**

Revision Exercise

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- **(1)** (a) The CAPM predicts that an asset with a *beta* of zero will offer a zero expected return. Is this true or false? Explain.
- (b) Consider the *betas* from 1998 to 2011 for the following assets.

STOCK	*BETA*
A	1.82
B	1.30
C	0.70
D	1.89
E	1.05

- The market return was 70 per cent better than risk-free asset offering an average of 7 percent. **What was the expected rate of return using the CAPM formula?**

- **(2)** You are working as an investment advisor and Mr. Goodluck who is about to retire seeks your advice. Should you recommend a portfolio focused on biotechnology stock or one focused on corporate bonds? Would your answer be different if you were advising Kumar and Halima, a young, newly-wed couple?

- **(3)** i. Compare and contrast the CAPM and APT a two most influential theories of asset pricing.
- ii. Enumerate six APT factors known to you.

Revision Exercise

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(4) (a) A stock has expected return of 23.5% and a beta of 1.75. If the expected market Return is 18%, determine what the risk-free rate of return should be.

- (b) If a stock has expected return of 16.5%, a beta of 8.7 and risk-free rate is 8%. What must the expected market return be?

Revision exercise (5)

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(a)Evaluate the relative usefulness of various portfolio evaluation metrics known to you as an analyst.

(b)How would you differentiate between fundamental analysis and technical analysis?

(c) i. Why is beta so important in portfolio management circles? ii. What is the difference between active portfolio management and passive portfolio management?

Revision exercise (6)

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- The slide that follows displays MS Excel database of empirical rates of return of risk-free investment, market portfolio and real estate securities in the Nigerian capital market (2000-2011).

- ***Required:*** Compute the risk premium

Rates of return of risk-free investment, market portfolio and real estate securities in the Nigerian capital market (2000-2011)

				N-REOC				N-REIT			
Trading year	Market PER (×)	Market Return R_m (%)	Nigerian Treasury Bill Rate R_f (%)	P (₦)	EPS (₦)	PER (×)	R_i (%)	P (₦)	EPU (₦)	PER (×)	Ri (%)
2000	12.25	8.16	15.25	1.52	0.49	3.10					
2001	14.01	7.14	18.38	4.62	0.57	8.11	37.50				
2002	12.52	7.99	18.35	4.00	0.74	5.41	16.02				
2003	19.75	5.06	15.03	6.60	0.91	7.25	22.75				
2004	29.02	3.45	14.25	8.90	0.45	19.78	6.82				
2005	22.3	4.48	7.00	8.75	0.77	11.36	8.65				
2006	17.92	5.58	8.80	13.80	0.88	15.68	10.06				
2007	27.80	3.60	7.00	23.40	0.97	24.12	7.03				
2008	15.9	6.29	4.50	26.8	3.23	8.30	13.80	111.10	5.73	19.39	
2009	11.46	8.73	6.05	19.86	2.21	8.99	8.25	100.00	8.73	11.45	7.86
2010	14.24	7.02	7.50	16.51	1.69	9.77	8.51	97.00	11.75	8.26	11.75
2011	14.32	6.98	14.00	12.00	1.48	8.11	8.96	100.00	4.48	22.32	4.62
Average	17.62	6.21	11.34	12.23	1.20	10.83	13.49	102.03	7.67	15.36	8.08

Source: Research survey, 2015

Revision exercise (7)

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(a) State the basic assumptions underlying the Capital Asset Pricing Model

(b) What practical difficulties would have to be overcome in applying the CAPM to project evaluation?

(c) During a 5-year period, the relevant result for the aggregate market have been found to reveal the following:

Risk-free rate (Rf): 8%

Return on the market (Rm): 14%

For the same period, the result of four selected portfolios are as follows:

Portfolio	Returns (%)	Associated beta factor
A	13	0.80
B	14	1.05
C	17	1.25
D	13	0.90

Required: (i) Calculate the expected rate of return of each portfolio and compare the actual returns with the expected returns. (ii) Based on your calculation in (i), select the portfolio with the best performance.

Keywords…

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- ABS, Active Portfolio Management, Arbitrage Portfolio Theory (APT), Beta, Bonds, Capital Asset Pricing Model (CAPM), Capital Market Line, Capital Market Equation, Common Stocks, Efficient Portfolios, Fund Management, Investment Process, Lognormal distribution, MBS, Mean-Variance Analysis, Normal Distribution, Jensen's Alpha, Rate of Return, Risk, Risk-adjusted performance metrics, Management Fee, Market Portfolio, Modern Portfolio Theory (MPT), Passive Portfolio Management, Pension Management, Pension Fund Administrators, Portfolio Construction, Portfolio Management, Portfolio Evaluation, Post-Modern Portfolio Theory, Portfolio (PMPT), Real Estate, Risk-free Rate, Sortino Ratio, Sovereign Wealth Fund, Standard Deviation, Systematic Risk, Treynor Ratio, Unsystematic Risk.

Resources

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- *Financial management: A step-by-step approach by* Parasuraman, N. R. (2014). Delhi: Centage Learning India Pvt Ltd.
- *Principles of corporate finance*, 11th edition. By R. A. Brealey, S. C. Myers, & F. Allen (2014). London: McGraw-Hill.
- *Mathematics for finance: An introduction to financial engineering by M.* Capiński, and T. Zastawniak (2011). 2nd edn. Springer-Verlag London Ltd.

Additional Resource:

- *Course Manual on Corporate Finance* (2010) by International Learning Platform for Investment Professionals (ILPIP). AZEK / ILPIP, Geneva.

Caveat …

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- *This presentation is not in any way a professional investment advisory. The views expressed in this presentation are solely those of the author in his private capacity as a scholar and all descriptions and comments are strictly for educational and research purposes.*

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