Invest to Win

認識投資理論、
找尋贏錢方程式

Dr M.F. Chan

陳茂峰博士

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Outline：

1. Defining Investment
2. Unfolding Investment Theories
3. Understanding Analytical Tools
4. Applying Investment Strategies
5. Deploying Trading Tactics
6. Summary

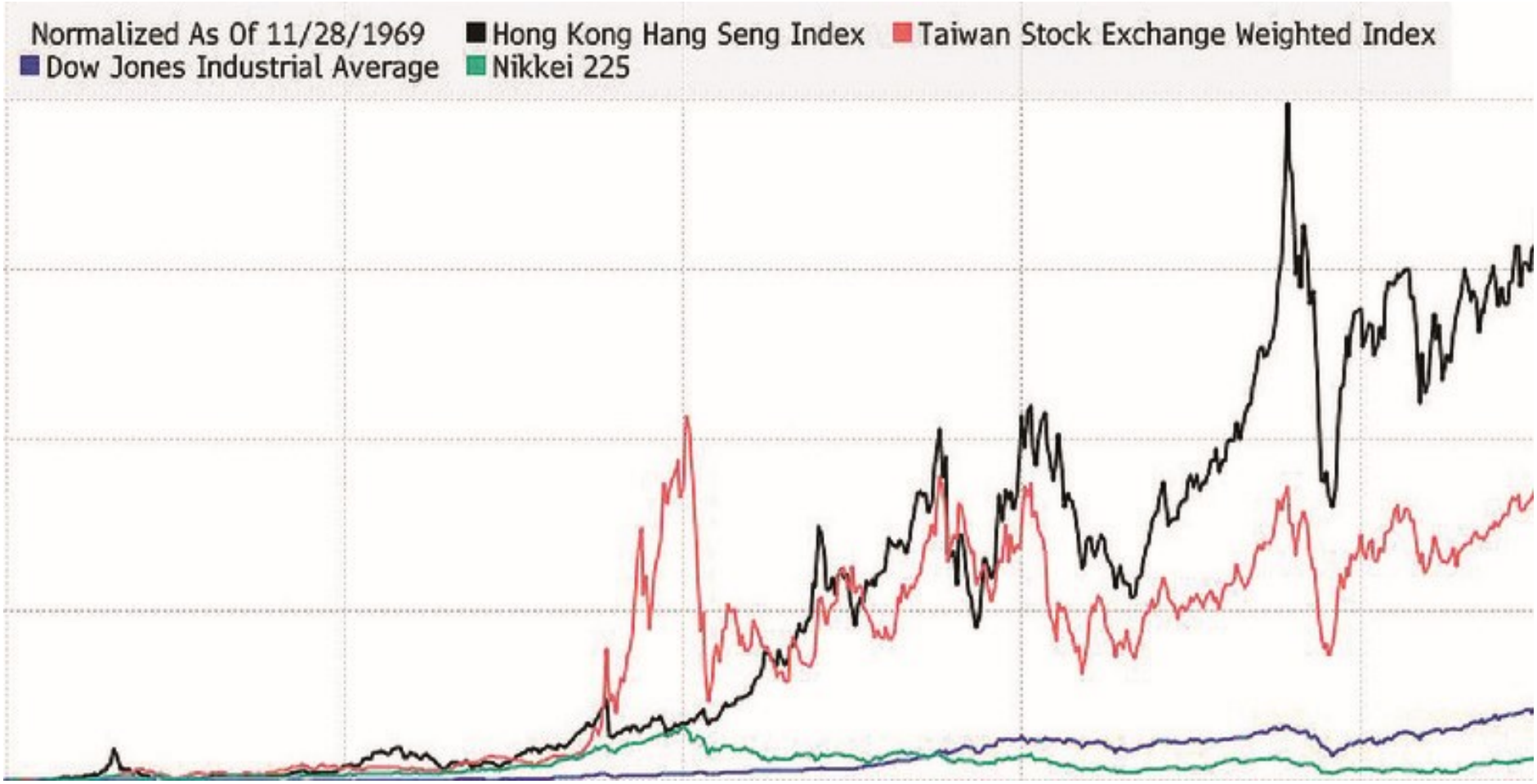
Defining Investment

The Dow Jones Industrial Average: 1896-2016

Human Innovation Always Trumps Fear

50 years of Hang Seng Index (1969-2019)

Hang Seng Index returned 16700% in this period (annualized return 10.8%)



Definition of Investment

- **Investment is the commitment of current financial resources in order to achieve higher gains in the future.**
- **The objectives: safety, income, capital gain, preserve purchasing power, get rich, …**
- **Investment is decision making under uncertainty – there is calculated risk, no sure win**
- **The assets: cash, bonds, stocks, financial instruments, properties, artworks, antiques, human beings, …**

We limit the discussion to securities, esp stocks

Definition of Investment

- **2 stages of investment process:**
  - ✓ **Valuation - Decide on the future performances (risks, returns, comovements) of available securities;**
  - ✓ **Portfolio Mix - Design and choice of portfolio mix.**
- **Analytical tools deal with valuation issues, investment theories are more related to portfolio construction.**

Unfolding Investment Theories

Economic Theories of Personal Investment

- **Life Cycle Theories of Savings and Consumption**
  - ✓ **The life-cycle hypothesis (Modigliani and Brumberg, 1954):**

    an individual attempts to maximize his utility (personal well-being) by balancing a lifetime stream of earnings with a lifetime pattern of consumption.
  - ✓ **The permanent income hypothesis (Friedman, 1957);**
  - ✓ **The relative income hypothesis (Dusenberry, 1949)**

Dow Theory (1896) of Technical Analysis

- **The Dow Theory is a technical analysis framework that predicts the market is in an upward trend if one of its averages (DJIA) advances above a previous important high, accompanied or followed by a similar advance in the other average (DJTA).**
- **3 market movements – main movement, medium swing, short swing**
- **3 phases - accumulation, public participation (or absorption), distribution**
- **Question: Is it really a portfolio theory?**

Theories based on Rational Expectations

- **The premise: individuals base their decisions on human rationality, information available to them, and their past experience.**
  - ✓ **Rational expectation is a major macroeconomic topic**
- **A mainstream macroeconomic theory, with contributors being Nobel prize laureates in Economic Sciences**
  - ✓ **Robert E. Lucas (1995), Thomas John Sargent (2011)**

Theories based on Rational Expectations

- **Modern Portfolio Theory (MPT)**
  - ✓ **Proposed by Harry Markowitz in 1952, awarded Nobel prize in 1990**
  - ✓ **The premise:**
    1. **investors are risk averse, and prefer a portfolio with higher returns at a given risk level, or lower risk at a higher expected return**
    2. **Investment risk can be reduced by diversifying a portfolio through individual, unrelated securities**

Theories based on Rational Expectations

- **Modern Portfolio Theory**
  - ✓ **2 types of risks – systematic risk (market risk) which an investor has to bear, unsystematic risk (specific risk, idiosyncratic risk) which can be reduced by diversification**
  - ✓ **investment risk is measured by standard deviation of the returns for a number of observations.**
  - ✓ **Co-movements of assets are measured by the pairwise correlation of return changes.**

The formulation is a convex quadratic programming problem:

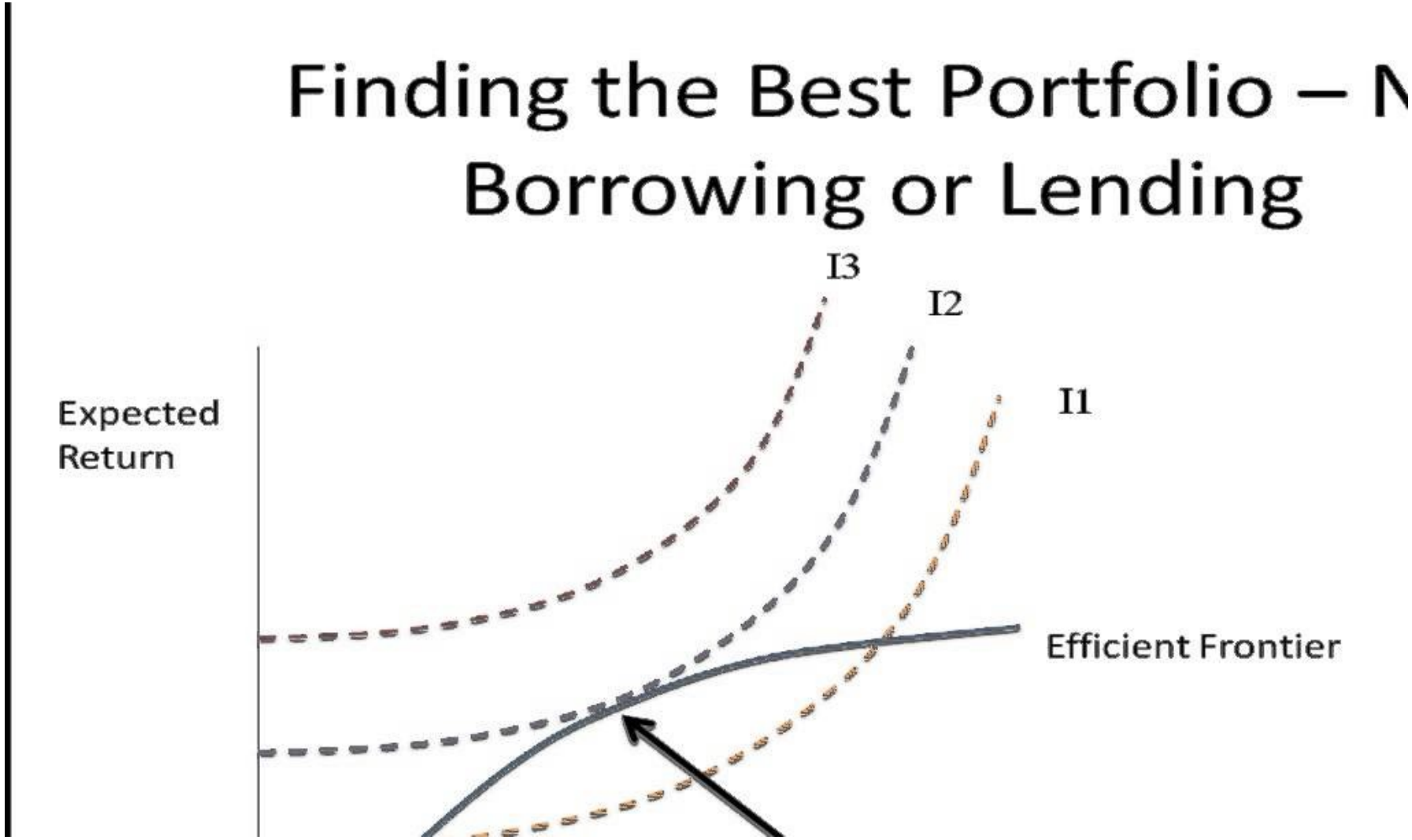
A general Markowitz's portfolio with practical constraints could be:

$$
\begin{array}{lll}
\underset{\mathbf{w}}{\text{maximize}} & \mathbf{w}^T\boldsymbol{\mu} - \lambda \mathbf{w}^T\boldsymbol{\Sigma}\mathbf{w} & \\
\text{subject to} & \mathbf{w}^T\mathbf{1} = 1 & \text{budget} \\
& \mathbf{w} \geq \mathbf{0} & \text{no shorting} \\
& \|\mathbf{w}\|_1 \leq \gamma & \text{leverage} \\
& \|\mathbf{w} - \mathbf{w}_0\|_1 \leq \tau & \text{turnover} \\
& \|\mathbf{w}\|_\infty \leq u & \text{max position} \\
& \|\mathbf{w}\|_0 \leq K & \text{sparsity}
\end{array}
$$

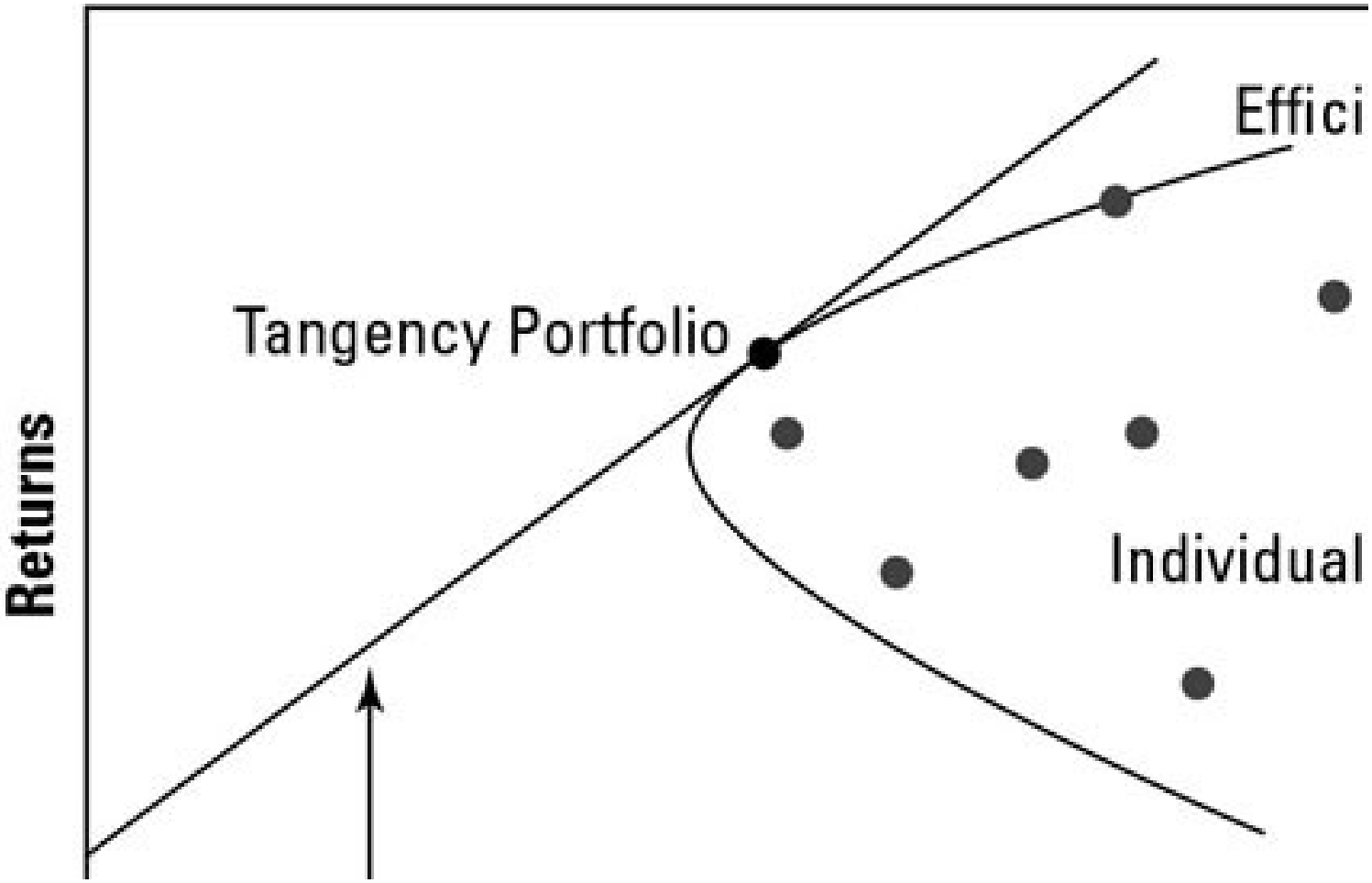
where:

- $\gamma \geq 1$ controls the amount of shorting and leveraging

Optimal Portfolio of risky assets for an investor:



Assuming investors' risk tolerance are the same, then the Optimal Portfolio of risky and risk-free assets with borrowing are on the CAL line



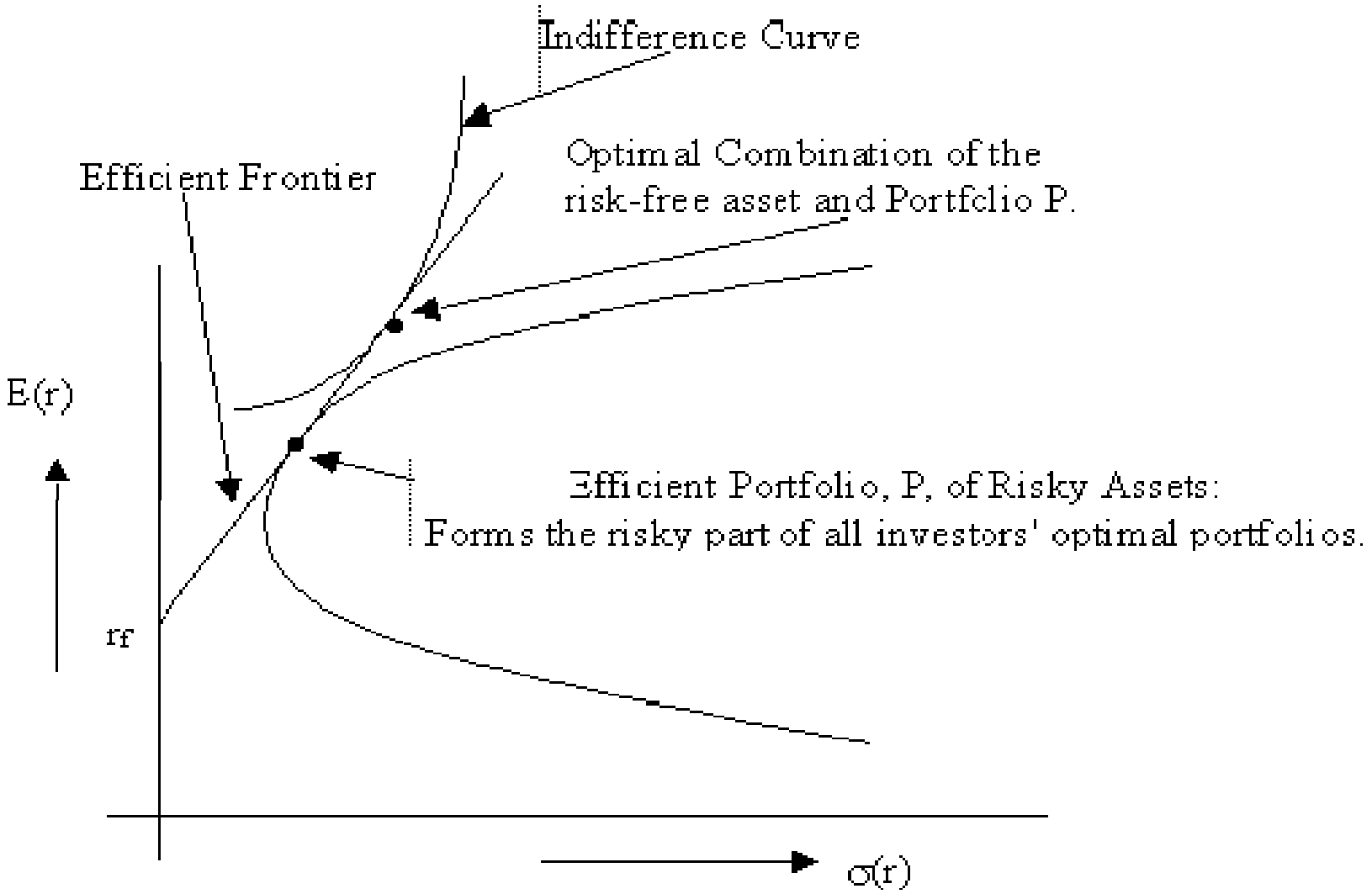


Figure: Optimal Portfolio Selection with Many Risky Assets and a Risk-free Asset

Theories based on Rational Expectations

- **Efficient Market Hypothesis (EMH)**
  - ✓ **Proposed by Bachelier (1900), Mandelbrot (1963), Samuelson (1965), and Eugene Fama in 1970 (Nobel 2013)**
  - ✓ **The premise: stocks trade at their fair market value which reflect all information**
  - ✓ **3 forms of market efficiency:**
    - **Weak-form: present share prices fully reflect all the data of past prices**
    - **Semi-strong form: share prices fully reflect all publicly available information in addition to all past information**
    - **Strong form: share prices fully reflect both publically available information and inside information**

Theories based on Rational Expectations

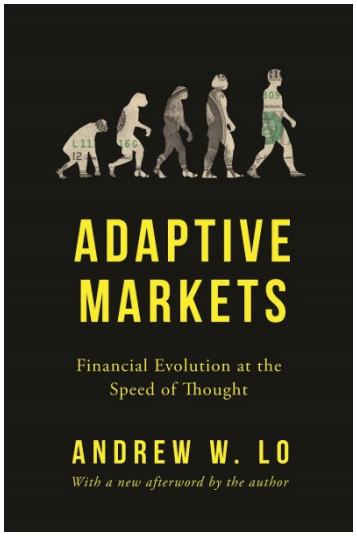
- **Efficient Market Hypothesis (EMH)**
  - ✓ **If market is weak-form efficient, technical analysis is of no use**
  - ✓ **If market is semi-strong efficient, then an average investor cannot outperform the market**
  - ✓ **Most stock markets are semi-strong efficient, including emerging markets**
    - **Stock price movements are random walk (Brownian motion), no serial correlation**
  - ✓ **There are rare evidence on existence of strong-form efficient markets.**
  - ✓ **Anomalies to market efficiency: calendar effects, investors' cognitive biases**

Behavioral Finance Theories

- **Prominent advocates: Amos Tversky, Daniel Kahneman (Nobel 2002), Robert Shiller (Nobel 2013), Richard Thaler (Nobel 2017)**
- **Study the effects of psychological, cognitive, emotional, cultural and social factors on the decisions of individuals and institutions**
- **Examples of human biases: Loss Aversion, Herding Mentality, Mental Accounting, Overconfidence, illusion of control, Self Attribution Bias, Hindsight Bias, Confirmation Bias, Narrative Fallacy, Representative Bias, Framing Bias, Anchoring Bias, …**

Evolutionary Finance Theory

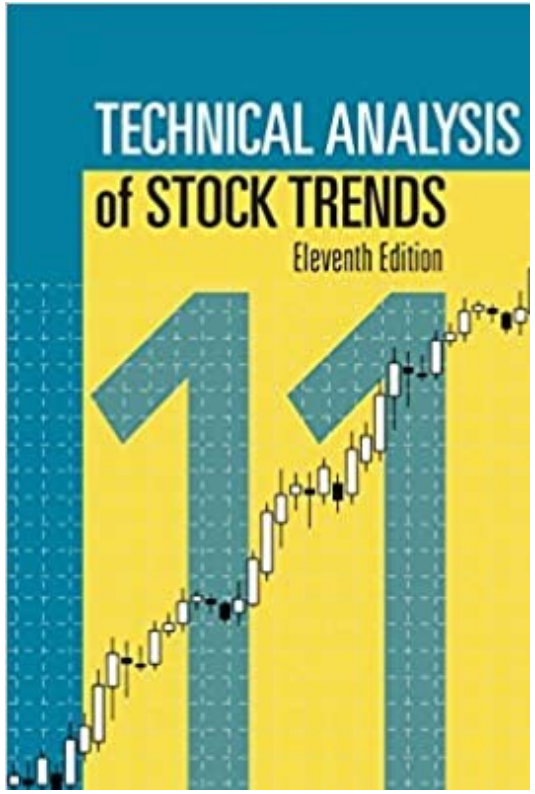
- **The theory proposes that economic processes evolve and that economic behavior is determined both by individuals and society as a whole.**
- **Theories: Self-organisation, complexity theory, path-finding**
- **Scholars: mostly from Europe, eg. Austrian Kurt Dopfer**



Understanding Analytical Tools

Technical Analysis

- A methodology for forecasting the direction of stock prices through the study of past market data, primarily price and volume
- Can be dated back to 17th century in Holland – "Confusion of Confusions" by Joseph de la Vega
- Dow Theory (1986) – most famous one
- Reference: "Technical Analysis of Stock Trends (11/e)" by Robert D. Edwards and others



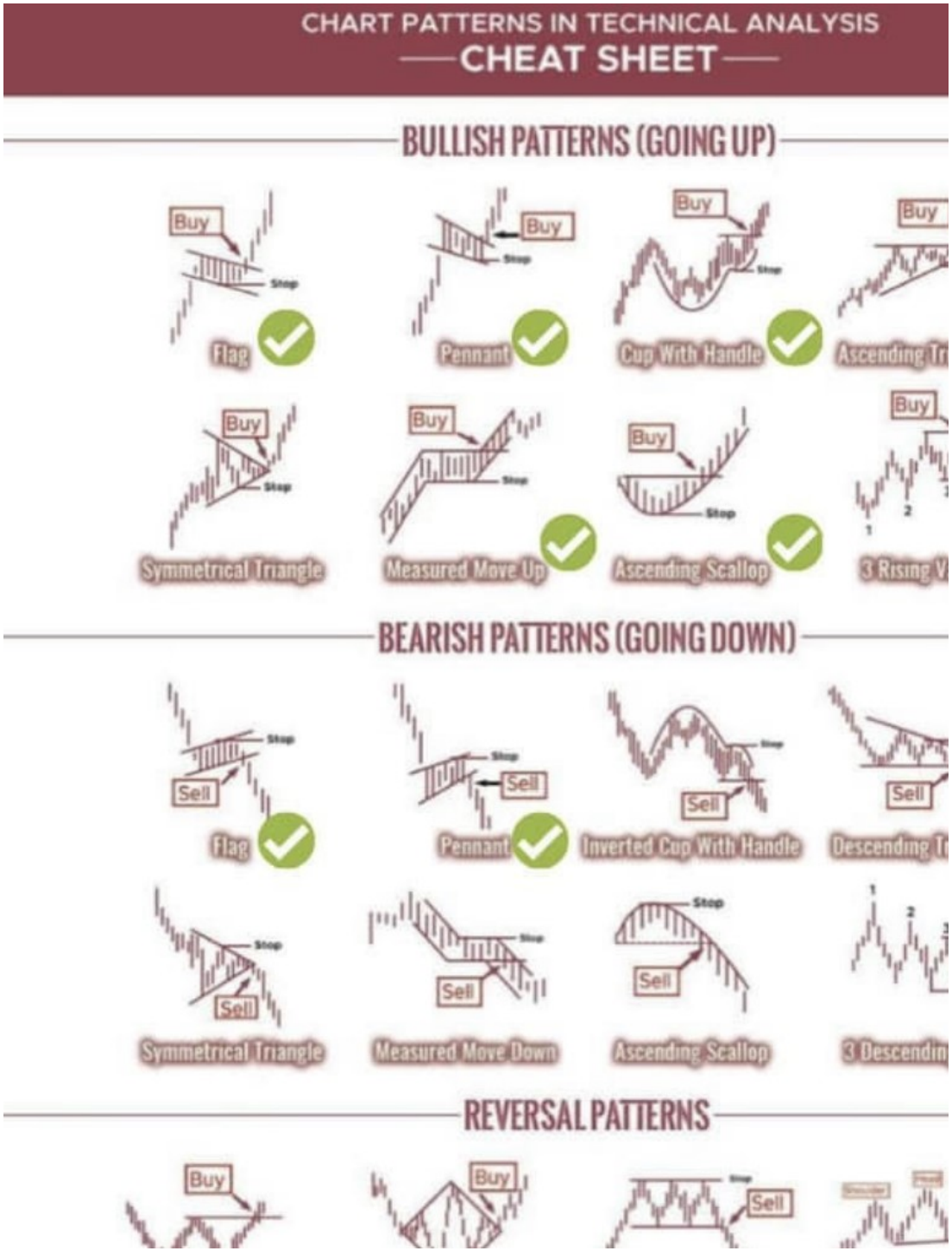


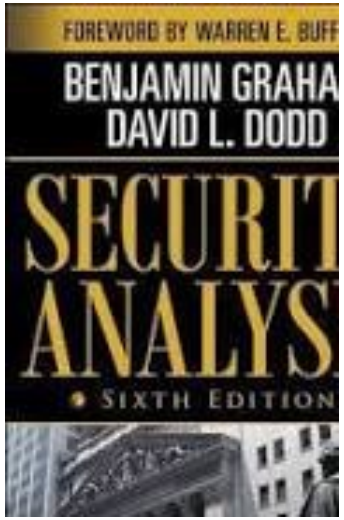
CHART PATTERNS IN TECHNICAL ANALYSIS
CHEAT SHEET
BULLISH PATTERNS (GOING UP)
Buy
Stop
Flag
Pennant
Cup With Handle
Symmetrical Triangle
Measured Move Up
Ascending Scallop
BEARISH PATTERNS (GOING DOWN)
Sell
Inverted Cup With Handle
Measured Move Down
REVERSAL PATTERNS

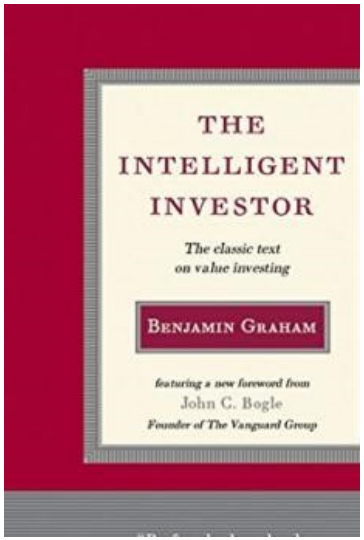
Fundamental Analysis

- **Fundamental analysis is a method of evaluating the intrinsic value of an asset by examining and analysing the economic, social and financial factors that could influence its price in the future.**
- **If the calculated fair value (intrinsic) is higher than the market price, the stock is deemed to be undervalued and a buy recommendation is given.**
- **Quantitative factors: revenues, earnings, future growth, return on equity, profit margins, and other financial data available in a company's financial statements**
- **Qualitative factors: quality of key executives, management style, entrepreneurship, brand recognition, patents, proprietary technology, etc that cannot be quantified.**

Fundamental Analysis

- **Widely adopted by professional investors**
- **Usually associated with value investment**
- **Key figures: Benjamin Graham, John Templeton, Warren Buffett**
- **Key publications: Security Analysis (1934), The Intelligent Investor (1949).**





Fundamental Analysis

- **Modigliani–Miller theorem (Nobel 1985 & 1990) on company value and cost of capital**
  - ✓ **1.** $V_U = V_L$ **value of a firm is independent of its cost (equity/bond) structure ;**
  - ✓ **2.** $r_E = r_0 + \frac{D}{E}(r_0 - r_D)$
    - **expected return on equity = expected return on no-leverage firm plus debt-proportional excess return**

- **Value of a company (DCF Model)**
  = Present Value of Future Cashflows
  = Value of No-growth + Present Value of Growth Opportunities
  = Book Value + PVGO

Quantitative Analysis

- **Most models are derived from Modern Portfolio Theory**
- **Capital Asset Pricing Model (Treynor 1961, Sharpe 1964, Lintner 1965)**
  - ✓ **William Sharpe was awarded Nobel prize in 1990**

$$E(R_i) = R_f + \beta_i(E(R_m) - R_f)$$

where:

- $E(R_i)$ is the expected return on the capital asset
- R_f is the risk-free rate of interest such as interest arising from government bonds
- β_i (the *beta*) is the sensitivity of the expected excess asset returns to the expected excess mar

$$\beta_i = \frac{\operatorname{Cov}(R_i, R_m)}{\operatorname{Var}(R_m)} = \rho_{i,m}\frac{\sigma_i}{\sigma_m}$$

- $E(R_m)$ is the expected return of the market
- $E(R_m) - R_f$ is sometimes known as the *market premium* (the difference between the expect and the risk-free rate of return).
- $E(R_i) - R_f$ is also known as the *risk premium*

Quantitative Analysis

- **Security Market Line (SML):**

$$\text{SML} : E(R_i) = R_f + \beta_i(E(R_M) - R_f).$$

- **Security Market Line is where "fair value" of securities lie. If the expected return of a security is above the SML, the secuity is undervalued.**
- **CAPM is a single-factor model for asset pricing**

Quantitative Analysis

- **Stephen Ross (1976) developed the Arbitrage Pricing Theory, a generalized multi-factor model for asset pricing:**

$$\mathbb{E}(r_j) = r_f + \lambda_{j1} RP_1 + \lambda_{j2} RP_2 + \cdots + \lambda_{jn} RP_n$$

where

- RP_n is the risk premium of the factor,
- r_f is the risk-free rate,

That is, the expected return of an asset *j* is a linear function of the asset's sensitivities to the *n* factors.

- **The factors can be any economic indicators**

Quantitative Analysis

➢ Fama-French 3-Factor Models (1992)

$$r = R_f + \beta(R_m - R_f) + b_s \cdot SMB + b_v \cdot HML + \alpha$$

- ✓ r is the portfolio's expected rate of return,
- ✓ Rf is the risk-free return rate,
- ✓ Rm is the return of the market portfolio
- ✓ "three factor" β is analogous to the classical β but not equal to it,
- ✓ SMB stands for "Small [market capitalization] Minus Big" and HML for "High [book-to-market ratio] Minus Low"; they measure the historic excess returns of small caps over big caps and of value stocks over growth stocks.

➢ The Fama–French three-factor model explains over 90% of the diversified portfolios returns

Quantitative Analysis

- **Carhart four-factor model (1997): add a momentum factor (MOM), which is long prior-month winners and short prior-month losers**
- **Fama-French 5-Factor Models (2013): add profitability and investment factors**
- **Returns-based style analysis: uses style indices rather than market factors**
  - ✓ Styles: large/small, value/growth etc

A.I. Analysis

- **New developments?**
- **Neural networks v.2?**
- **Algorithmic trading v.2?**
- **Is it for risk-management or price-discovery?**

Applying Investment Strategies

Risk Profiling – Know Yourself

- **Risk Profile – the evaluation of an individual's willingness and ability to take risks**
- **Risk Capacity – the (financial) risk you can afford to take**
- **Risk Tolerance – the (physiological) risk you are willing to take**
- **Risk Required – the (market) risk you need to take in order to (possibly) achieve the expected return**

Set Investment Policy

- **Investment Objectives – return expectation, periodic cash needs**
- **Investment Horizon – how long**
- **Risk tolerance**
- **Investment Constraints - responsible investment (ESG), liquidity needs**
- **Choice of markets, asset classes, and benchmarks**
- **Asset allocation and portfolio construction**
- **Portfolio review and rebalancing**

Markets and Assets

- **Markets – global vs local, developed vs emerging**
- **Assets – equities, bonds, mutual funds, ETFs, derivatives, precious metals, collections, …**
- **Industries / Sectors – established vs start-ups, recurrent income type, cyclical business, …**
- **Companies – blue chips vs SMEs**

Portfolio Construction

- **Asset allocation - > security selection -> market timing**
- **Heuristic vs optimization**
- **Active vs passive**
- **Index titling vs Core-satellite**

Market Timing

- **Brinson, Hood and Beebower (1991): attributes of portfolio returns –**
  91.5% Asset Allocation
  4.6% Security Selection
  2.1% Market Timing
  1.8% Other Factors

Rebalancing

- **Strategic asset allocation – adjust around the "neutral" policy portfolio**
- **Tactical asset allocation – change satellite holdings**
- **Buy and hold vs constant mix vs constant proportion**
  - ✓ **Constant mix – reduce higher return holdings to normal weighting**
  - ✓ **Constant proportion – increase risky holdings when they return more, and vice versa**

    $ Stock Investments=M×(TA−F)

    where:

    M=Investment multiplier (More Risk = Higher M)

    TA=Total portfolio assets

    F=Allowable floor (minimum safety reserve)

Lif-cycle Investment

- **Assumes an investor's risk tolerance decreases with age**
- **Start with a "neutral" protfolio defined by age, then reduce the equity weighting over time**
- **Decision on the bond-equity weightings:**
  - "100-minus age" rule
  - "70-minus age" rule
  - Shiller rule – accelerating increase of bond over time, eg. 85% equity at age 25, 71% at age 35, 26% at age 55.

Deploying Trading Tactics

Trading Tactics

- **Market timing activities – do they really work?**
- **Trending vs Contrarian – buy at breakthroughs vs buy at troughs**
- **Long term trade – trading in and out on quality stocks**
- **Theme investing – another version of trending, chasing after fashionable stocks?**

Summary

Summary

- **Investment is a must for everyone, the question is invest in what asset (bank saving is a low-risk investment)**
- **Investment is a science, with human elements**
- **Investment requires discipline and hard work**
- **Long term investment return reflects the market's economic growth**
- **Warren Buffett's Golden Rules of Investing:**
  Rule No. 1: Never Lose Money
  Rule No. 2: Never Forget Rule No. 1

Thanks!