Pompian Model Behavioral Investment Types

Availability Bias

Factors Affecting Objectives and Constraints for Pension Plans

Bank Objectives and Constraints

Putting undue emphasis on information that is readily available. It can include

- Retrievability, focusing on what is first thought of.
- Categorization, putting emphasis on how an idea is categorized.
- Narrow range of experience.
- Resonance occurs when people assume what interests them is representative of what others find important.

May produce market participants who

- Choose managers based on advertising.
- Limit investment choices to what they are familiar with leading to under-diversification and inappropriate asset allocation.

- **Risk.** Acceptable risk should be set in an ALM framework based on effect on overall balance sheet. Usually have a below-average risk tolerance because portfolio losses can't interfere with liability needs.
- **Return.** Objective for the securities portfolio is to earn a positive interest spread—the difference between the cost of funds and the interest earned on loans and investments.
- **Liquidity.** Needs are driven by withdrawals and demand for loans, as well as regulation. The resulting portfolio is generally short and liquid.
- **Time horizon.** Short and linked to duration of liabilities.
- **Taxes.** Banks are taxable entities. After-tax return is the objective.
- **Legal and regulatory.** Banks are highly regulated. Risk-based capital guidelines require reserves against assets. The riskier the assets, the higher the capital requirement. This give portfolios a high-quality, short-term, liquid asset tilt.
- **Unique circumstances.** No generalizable issues.

- **Passive Preserver.**
  - Low risk tolerance.
  - Suffers from emotional biases.
  - Not wiling to risk own capital.
  - Usually not financially sophisticated.
  - Possibly difficult to advise because he's driven by emotion.
- **Friendly follower.**
  - Passive investor with low to moderate risk tolerance.
  - Suffers from cognitive biases.
  - Tends to overestimate risk tolerance.
  - Wants to invest in the most popular things without regard to fit.
  - Best approach in advising is to use quantitative methods to educate.
- **Independent Individualist.**
  - Active investor willing to risk own capital.
  - Has moderate to high risk tolerance.
  - Suffers from cognitive biases.
  - Likes to invest, does own research.
  - Difficult to advise but will listen to sound advice.
- **Active Accumulator.**
  - Active investor with high risk tolerance.
  - Suffers from emotional biases.
  - Aggressive investor who likes to get involved.
  - Often from entrepreneurial background.
  - Most difficult type to advise, and should not be involved in investments.

- **Risk and return.**
  - **Future pension contributions.** Return levels can be calculated to eliminate the need for contributions to plan assets.
  - **Pension income.** Pension expenses go on the income statement, and negative expenses are also recognized.
- **Liquidity.**
  - **Number of retired lives.** More retired lives compared to active participants means more liquidity is required.
  - **Amount of sponsor contributions.** Smaller corporate contributions relative to retirement payments means more liquidity needed.
  - **Plan features.** More liquidity for early retirement and lump-sum payouts.
- **Time horizon.** If the plan is terminating, the horizon is the termination date. For ongoing plans, time horizon depends on characteristics of participants.
- **Taxes.** Most retirement plans are tax exempt. In some countries some portions are taxed and others are not.
- **Legal and regulatory factors.** The existing regulatory framework must be incorporated into the IPS. Legal counsel is required for complex issues. A pension plan trustee or manager is a fiduciary and must act in the best interest of the participants.

Foundation Objectives and Constraints

Non-Life Insurance Company Constraints

Life Insurance Company Objectives

Five Differences Between Mutual Funds and Exchange-Traded Funds

- **Liquidity** needs are high because of uncertain cash flows. Typically the company
  1. Holds money market securities such as T-bills and commercial paper.
  2. Holds a laddered portfolio of highly liquid government bonds.
  3. Matches assets against known cash flow needs.
- **Time horizon** is affected by two factors. It is generally short, due to the short duration of the liabilities. Secondly, in the U.S. the duration tends to swing with the underwriting cycle and change in use of tax-exempt bonds.
- **Tax considerations** are changing in the U.S. Companies are taxable entities with an after-tax return objective.
- **Legal and regulatory constraints** are less onerous for non-life than life insurance companies. Asset valuation reserve is not required, but risk-based capital requirements have been established. Non-life companies are given more leeway in choosing investments.
- **Unique circumstances** are not generalizable.

1. Mutual funds are less frequently traded. In the U.S., a fund's NAV is only provided once a day at the end of the day. ETFs trade throughout the day.
2. ETFs don't have to maintain recordkeeping for shareholders like mutual funds. These expenses can be large and are sometimes passed on to shareholders. ETFs have their own set of fees because they trade through brokers.
3. Mutual funds pay lower license fees to S&P and other index providers than ETFs do.
4. ETFs are more tax efficient because selling an ETF is generally a transaction with another investor, as opposed to exchanging securities for cash. The first is a nontaxable transaction for the ETF, while the second is taxable for the mutual fund. These taxes may be passed on to the investor.
5. The cost of holding an ETF long-term is usually lower than that for a mutual fund. Mutual funds generally have higher fees because of liquidity, recordkeeping, and taxes which investors pay for through fees.

- **Risk.** May be more aggressive than pensions because there are no defined liability requirements. Board will consider time horizon and other circumstances when setting risk tolerance.
- **Return.** Time horizon is important. If perpetual payout is needed, preservation of purchasing power is needed. One guideline is to set minimum return to payout plus inflation and expenses.
- **Time horizon.** Most have infinite time horizon and can thus tolerate above-average risk choosing securities with high returns as well as maintaining purchasing power.
- **Liquidity.** Spending rate is the anticipated spending requirement. Many countries have a minimum spending rate as percentage of assets. Ongoing foundations need to earn the inflation rate as well. Some maintain a fraction of annual spending as a cash reserve.
- **Tax considerations.** Foundations are not taxable except that investment income of private foundations is taxed at 1% in the U.S.
- **Legal and regulatory.** Rules vary by country and type of foundation. Most regulations concern tax-exempt status.

- **Risk**
  - **Valuation risk** and ALM are tied with interest rate risk. Mismatches between asset and liability duration makes the surplus volatile as rates change. Thus the durations are closely tied.
  - **Reinvestment risk** is important for some products. Most assets in the portfolio will be coupon-bearing securities and so the value is partially determined by the rate at which incoming cash flows are invested.
  - **Cash flow volatility** should be minimized as life insurance companies have loss or delays of income.
  - **Credit risk** is a major concern and analysis is required to measure it. It has become a strong point for the industry and is managed through a broadly diversified portfolio.
- **Return**
  - Minimum return must equal assumed rate of growth in policyholder reserves. Essentially growth rate needed to meet projected policy payouts.
  - Better is to earn a net interest spread, a return higher than actuarial assumption. This would grow the surplus and allow the company to offer products at a lower price.
  - Can be difficult to measure total return in the insurance industry.
  - Investments are heavily fixed income with the exception of the surplus which may invest in stock, real estate, and private equity.

Advantages and Disadvantages to Direct Real Estate Investment

Effects of Adding Hedge Funds to an Existing Portfolio

Stages of Venture Capitalized Companies

Classifications of Hedge Funds by Segment

- Vary widely, so the benefits in individual styles will differ.
- From 1990 to 2004, had higher absolute and risk-adjusted returns, but faired less well from 2000 to 2004.

- Advantages
  - Many expenses are tax deductible.
  - Ability to use more leverage then usual.
  - Direct control of properties.
  - Ability to diversify geographically.
  - Lower volatility of returns than stocks.
- Disadvantages
  - Lack of divisibility.
  - High information cost.
  - High commissions.
  - High operating and maintenance costs and management requirements.
  - Geographic risks, such as neighborhood deterioration.
  - Political risks, such as changing tax codes.

- **Relative value** strategies exploit mispricings. Includes equity market neutral, convertible arbitrage, and fixed income arbitrage.
- **Event-driven** strategies invest short-term based on the outcome of an event. Includes merger arbitrage and distressed securities.
- **Equity hedge** involves taking long and short equity positions with varying overall net long or short positions and can include leverage.
- **Global asset allocators** take long and short positions in both financial and non-financial assets.
- **Short selling** takes short-only positions with the expectation of a decline in value.

- **Early stage.** Includes seed money often put up by the founders, start-up funds to begin product development, and first-stage funding to begin manufacturing and sales.
- **Expansion stage.** Can include young companies with a well-established product, more established companies looking for growth, or those looking to IPO. Second-stage financing supports further expansion. Mezzanine or bridge financing is used to prepare for an IPO and many include both debt and equity capital.
- **Exit stage.** May involve an IPO, merger, or acquisition (which may be another VC firm).

Financial Risk Factors

Non-financial Risk Factors

Advantages and Disadvantages of VaR

Scenario Analysis and Stress Testing

- **Operational risk** is loss due to failure of systems or from external events.
- **Settlement risk** is present when funds are exchanged. E.g., if one party makes payment and the other defaults. Risk is low for exchange trades using a clearinghouse. Much higher for OTC transactions.
- **Model risk** refers to the fact that models are only as good as their construction and inputs, (e.g., sensitivities, correlations, likelihoods, etc.).
- **Sovereign risk** is a form of credit risk in which the ability and willingness of a sovereign government must be considered.
- **Regulatory risk** is present when it's unclear how a transaction will be regulated or if that regulation will change.
- **Tax, accounting and legal risk** like regulator risk, refer to situations in which laws may change. Political risk refers specifically to changes in government triggering one of these risks.
- **Environmental, social and governance risk** (ESG) exists if company decisions cause environmental damage, human resource issues, or poor corporate governance which harm the company.
- **Performance netting risk** is payments from a party used for another.
- **Settlement netting risk** refers the liquidator of a counterparty in default changing terms of netting agreements such that the non-defaulting party now has to make payments to the defaulting party.

- **Market risk** is created by changes in interest rates, exchange rates, market prices, etc. This is frequently the largest component of risk.
- **Credit risk** is the risk of loss caused by a counterparty failing to pay. Historically, credit risk was a binary measurement, but credit derivatives allow for a more continuous measurement. It is often the second largest financial risk.
- **Liquidity risk** is the risk of loss due to the inability to take on or remove a position quickly at a fair price. It can be difficult to measure as liquidity can appear adequate until a certain event occurs. A narrow bid-ask spread generally indicates good liquidity. Average trading volume may give a better indication of liquidity. Liquidity of derivatives is generally linked to that of the underlying security.

In scenario analysis, a user defines events such as

- Yield curve shifts and twists.
- Changes in yield volatilities.
- Changes in the value and volatility of equity indices.
- Changes in the value of currencies or foreign exchange rate volatilities.
- Changes in swap spreads.

The value of the portfolio is compared before and after these events. Sometimes actual or hypothetical extreme events are used.

Scenario analysis weakness is the inability to measure byproducts of factor movements. I.e., it's hard to model the interactions of multiple factors.

Stress testing is often used as a complement to VaR. The idea is to reveal abnormal situations which might not be covered when using historical standard deviations. Some stressing models are

- **Factor push analysis** in which factors are pushed to the most disadvantageous combination.
- **Maximum loss optimization** which uses mathematical and computer modeling to find the worst combination of factors.
- **Worst-case secenario** uses the worst case an analyst thinks likely to occur.

- Advantages
  - Industry standard required by many regulators.
  - Aggregates all risk into a single, easy to understand number.
  - Can be used in capital allocation by giving each unit a certain amount of VaR. When units have less than perfect correlation, the firm-wide VaR is less than the sum of the unit VaR.
- Disadvantages
  - Some methods, e.g., Monte Carlo, are difficult and expensive.
  - Different computation methods can generate different VaR estimates.
  - Can generate a false sense of security. Only as good as inputs. Additionally, it's a measure of probability, so the situation can always be worse.
  - One-sided focusing on the downside while ignoring any upside potential.

Types of Credit Risk

Methods of Managing Market Risk

Minimum-variance Hedge Ratio

Issues with Costs of Strategic Currency Risk Management

Risk budgeting finds acceptable levels of risk and allocates risk to different business units. In an enterprise risk management (ERM) system, capital is allocated to portfolio managers based on risk and exposure to each sector. This allows monitoring of the risk budget as well as measuring risk-adjusted performance with return on VaR.

In addition to VaR, other methods for budgeting risk include

- **Position limits** that put a dollar cap on a position.
- **Liquidity limits** which set nominal position limits as a percentage of trading volume.
- **Performance stopouts** which set absolute dollar losses over a certain period.
- **Risk factor limits** which limit exposure to particular risk factors.
- **Scenario analysis limits** which limit loss due to a particular scenario.
- **Leverage limits** which limit the amount of leverage a manager can use.

Current credit risk is the amount of a payment currently due. Current credit risk is zero on all but one date.

Potential credit risk is based on payments due in the future and exists even if there is no current credit risk. It can change over time.

Cross-default provisions are present in most lending agreements and specify that if a debtor defaults on one payment, he defaults on all obligations. This means that there is a credit risk associated with payments due to other creditors.

- The bid-ask cost on currency trades is generally small, but frequent rebalancing can be costly.
- Options require a premium which is lost if the option expires out-of-the-money.
- Forward currency contracts are often shorter than the hedging period, so they require FX swaps. This creates cash flow volatility from gains and losses on the contracts.
- Overhead costs can be high, requiring a back office and trading infrastructure. Cash must be held in multiple currencies for settlement and margins.
- Hedging every currency movement is generally too costly. Managers choose partial hedges and rebalance monthly instead of daily.

A mathematical approach to determining hedge ratio. It's a regression of the past changes in the value of the portfolio (R_{DC}) to the past changes in the value of the hedging instrument. The hedge ratio is the beta (slope) of this regression. It minimizes tracking error.

Bull Spread

Number of Futures Contracts Needed to Achieve a Target Portfolio Duration

Effects of Gamma on Delta Hedging

Interest Rate Caps and Floors

$$\text{number of contracts} = (\text{yield beta})\left(\frac{\text{MD}_T - \text{MD}_P}{\text{MD}_F}\right)\left(\frac{V_P}{P_f \times \text{multiplier}}\right)$$

where:

V_P = current value of the portfolio

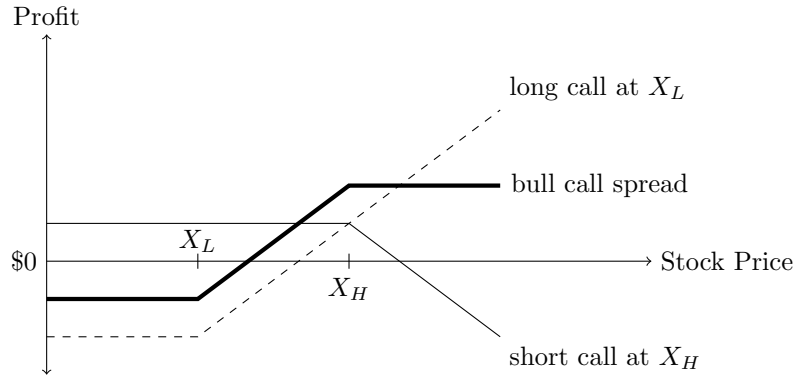
P_f = futures price

MD_T = target modified duration

MD_P = modified duration of the portfolio

MD_F = modified duration of the futures contract

Purchase a call option with a low exercise price, X_L and sell a call with a higher exercise price, X_H. At inception, $X_L < X_H$ and $C_{L,0} > C_{H,0}$. The investor expects the stock price to end up between X_L and X_H. This provides limited upside if the stock rises, with a limited downside.



$$\begin{aligned}
\text{profit} &= \max(0, S_T - X_L) - \max(0, S_T - X_H) - C_{L,0} + C_{H,0} \\
\text{maximum profit} &= X_H - X_L - C_{L,0} + C_{H,0} \\
\text{maximum loss} &= C_{L,0} - C_{H,0} \\
\text{breakeven price} &= X_L + C_{L,0} - C_{H,0}
\end{aligned}$$

Interest rate caps and floors are series of interest rate call and put options. Each cap and floor is called a caplet and floorlet.

Caps and floors are OTC contracts so they're tailored. The terms generally specify

- Reference rate—typically LIBOR.
- Cap or floor strike rate.
- Length of the agreement.
- Reset frequency, whcih determines days in each settlement period, D_t.
- Notional principal (NP).

The greater the value of gamma the more risk in the position (i.e., the more variability in the value of the option.)

The gamma of an at-the-money option is greatest near the expiration. When gamma is large, option values are subject to large changes, the position faces the most risk, and the investor is most likely to use a two-option hedge. In this situation, two options are used to force both delta and gamma to zero.

Swaps for International Diversification

Summary of Trading Tactics

Constant Proportion Portfolio Insurance

Performance of Rebalancing Strategies in Different Markets

Trading Tactic	*Strengths*	*Weaknessess*	*Usual Trade Motivation*
Liquidity-at-any-cost	Quick, certain execution	High costs and leakage of information	Information
Costs-are-not-important	Quick, certain execution at market price	Loss of control of trade costs	Variety of motivations
Need-trustworthy-agent	Broker uses skill and time to get low price	High commission and potential leak of intention	Not information
Advertise-to-draw-liquidity	Market-determined price	High costs and possible front running	Not information
Low-cost-whatever-the-liquidity	Low trading costs	Uncertain timing and possible trade into weakness	Passive and value

Swaps can be used to create international diversification by paying the return on a domestic index and receiving the return on an international index. This creates extra cash flow risk compared to a fixed-receiver swap because of the possibility of both indices declining and having to make two payments.

Benefits of using these swaps are

- Costs are generally lower than selling domestic and buying international stock.
- Can be defined for a temporary period of time for which exposure is desired.
- Can be paid in U.S. dollars to avoid foreign currency exposure.

- **Up or down trending market**
  - CPPI will outperform. As values increase or decrease, the cushion and resulting allocation increases or decreases, respectively.
  - Buy-and-hold underperforms CPPI because no purchases or sales are made to capitalize on the changing market values.
  - Constant mix strategy has the worst performance. Increases in value require selling to bring allocations back to the target. This lowers exposure to future increases in value. The opposite is true for decreases in value.
- **Nontrending, mean-reverting markets**
  - CPPI will have the worst performance. A rise in value triggers more allocation, which will then add exposure to an asset that will fall in value. The opposite is true of a fall in value.
  - Buy-and-hold will perform better than CPPI because no buys or sells are made.
  - Constant mix has the best performance because increases in value trigger sales at market highs and decreases trigger buys at market lows.

Using CPPI, target weight varies with portfolio value and a specified minimum value. The difference is called the cushion. To get target allocation use

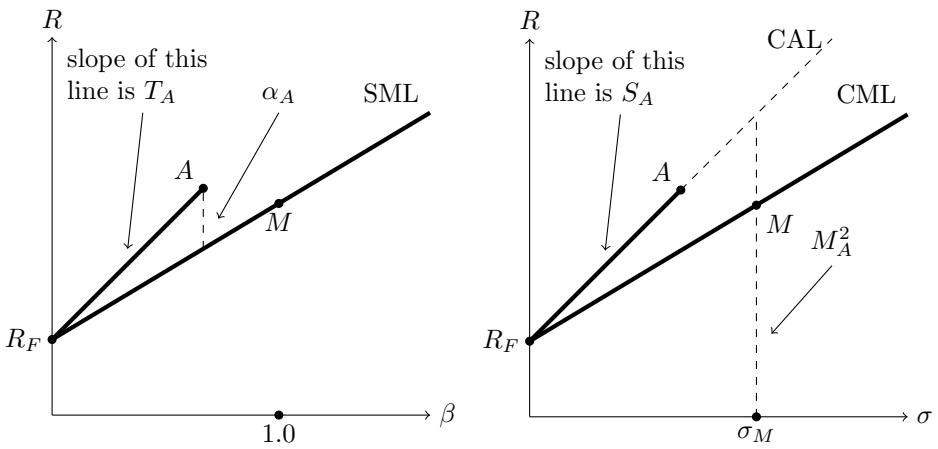
$$\text{target investment} = M \times (\text{portfolio value} - \text{floor value} = M \times \text{cushion})$$

where M is the constant proportion for an asset class. To use CPPI, M must be greater than 1 and it doesn't change once selected.

Strengths and Weaknesses of Micro Attribution and Fundamental Factor Model Attribution

Diagram of Risk-Adjusted Measures

Dividend Discount Model and H-Model



- **Micro attribution**
  - Strengths
    - ◇ Separates performance between sectors and securities.
    - ◇ Relatively easy to calculate.
  - Weaknesses
    - ◇ Needs an appropriate benchmark with securities and weights at beginning of evaluation period.
    - ◇ Security selection will affect weighting.
- **Fundamental factor model attribution**
  - Strengths
    - ◇ Identifies factors other than security selection and sector allocation.
  - Weaknesses
    - ◇ Factor exposures must be determined at start of evaluation period.
    - ◇ Can be complex and lead to spurious correlation.

The constant dividend discount model is

$$P_0 = \frac{D_1}{r - g_L} = \frac{D_0(1 + g_L)}{r - g_L}$$

The H-model assumes a short period of high growth at rate g_S

$$P_0 = \frac{D_0}{r - g_L}\left((1 + g_L) + \frac{N}{2}(g_S - g_L)\right)$$

where:

P_0 = current price
D_0 = current dividend
r = equity discount rate
g_S = short-term real rate of growth
g_L = long-term sustainable growth rate

For developing markets or markets undergoing change, particular problems are

- Economic data can be scarce or unreliable. Fundamental change can make past data no longer relevant.
- Market earnings growth rates will not track economic growth for countries undergoing structural economic change.
- Developing economies can have erratic monetary policy, inflation, and hyperinflation, which these models don't account for.