Northeastern University

GROUP PROJECT

Investing Strategies

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ABSTRACT

This project investigates how Investors go through different Phases of their lifecycle.

In addition to identifying the Phases of the Investor, this project will interpret with the help of real surveys and data on how an Investor can be well / better prepared to build a portfolio which will hold good in return.

This paper will talk about the basics of analysis that Investors go through before picking the right stock or portfolio, what are modern portfolio theories are, what are the Investment avenues which are available to the Investors, approaches to portfolio management and how an Investor can determine what asset allocation to choose and on what basis depending on various parameters which are discussed in the project below.

INTRODUCTION

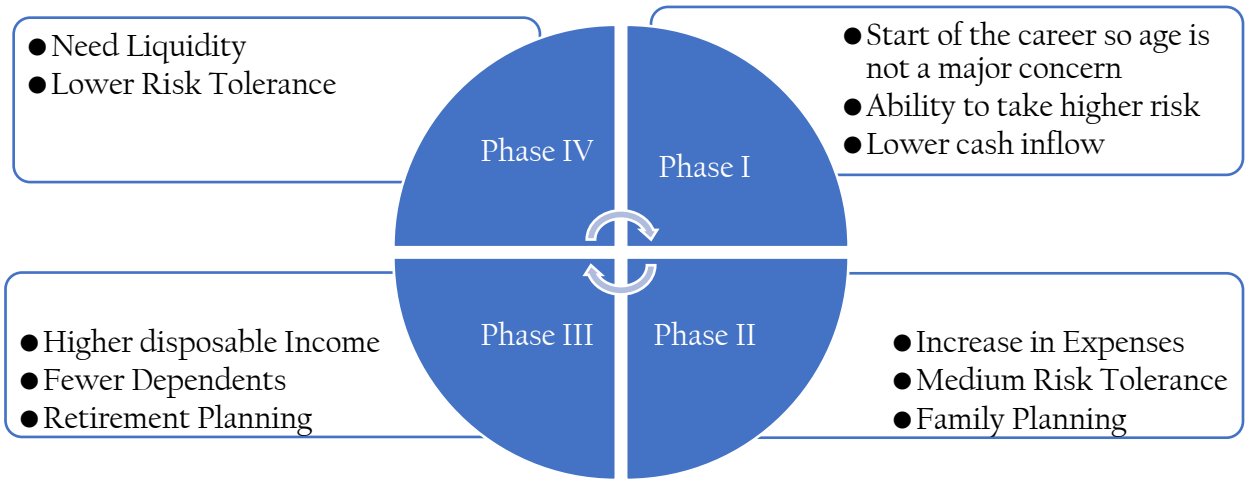
"Price is what you pay, Value is what you get."

-Warren Buffett

An Investor goes through a lifecycle; in this project, we will present the different stages of that lifecycle and how to leverage the knowledge to add value to each phase of the lifecycle.

Overview of the Lifecycle:

The phases of an Investors lifecycle clubbed with the constraints of each phase are represented in the below diagram.



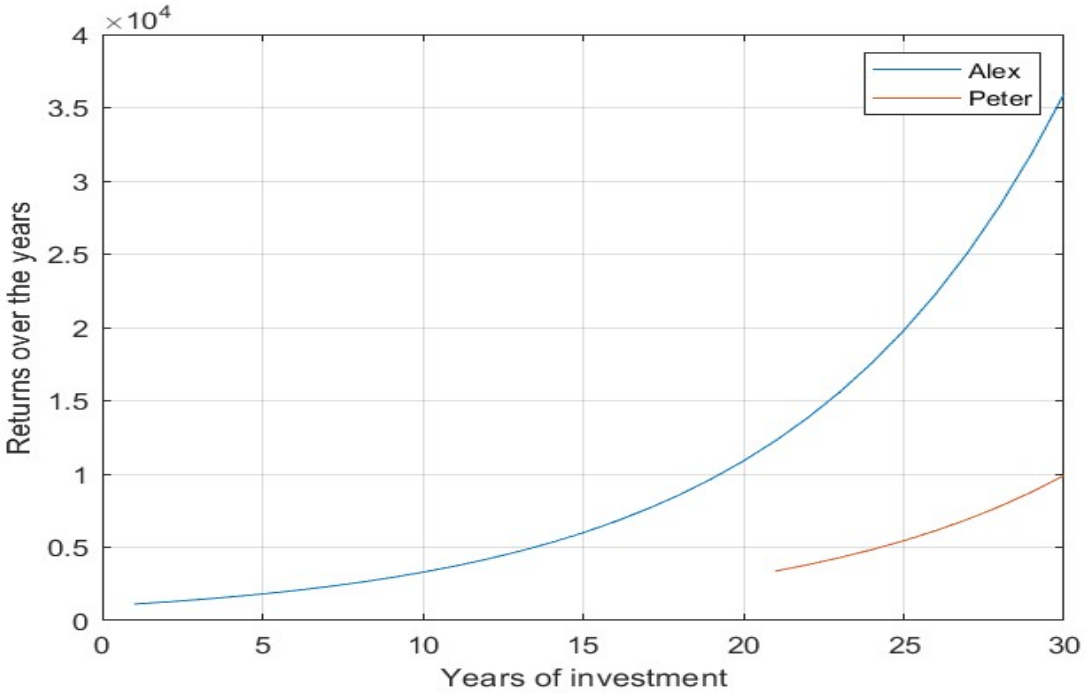
Early Mover Advantage:

Any delay in saving and investing has a steep cost attached to it. The below explains that even if Alex- tripled his savings, he cannot match the wealth created due to Peter's- early start.

Particulars	Alex	Peter
Starts Investing at the age of	25	45
Monthly Savings	$1,000	$3,000
Returns p.a*	12%	12%
Investment till the age of	55	55
Total Investment	$360,000	$360,000
Accumulated Amount at age 55	$3,529,900	$697,000

**Rate of interest is an assumption.*

-Names and characters presented in the diagram are fictional.



It is common for investors to enter the market hoping to make some profit, but are often dismayed when those profits turn into losses. This happens to traders or investors who go on hearsay and execute trades which may not give the expected outcome, perhaps the exact opposite.

We would like to highlight the importance of different types of analysis which form the base of creating an Investment Strategy.

Fundamental Analysis:

Fundamental analysis is based on the premise that any security (and the market as a whole) has an intrinsic value, or the true value as estimated by an Investor. This value is a function of the firm's underlying variables, which combine to produce an expected return and an accompanying risk. By assessing these fundamental determinants of the value of a security, an estimate of its intrinsic value can be determined. This estimated intrinsic value can then be compared to the current market price of the security. Similar to the decision rules used for bonds, decision rules are employed for common stocks when fundamental analysis is used to calculate intrinsic value.

In equilibrium, the current market price of a security reflects the average of the intrinsic value estimates made by investors. An investor whose intrinsic value estimate differs from the market price is, in effect, differing with the market consensus as to the estimate of either expected return or risk, or both. Investors who can perform good fundamental analysis and spot discrepancies should be able to profit by acting, before the market consensus reflects the correct information.

Under either of the two fundamental approaches, an investor will have to work with individual company data. Does this mean that the investor should plunge into a study of company data first

and then consider other factors such as the industry within which a particular company operates or the state of the economy, or should the reverse procedure be followed? In fact, each of these approaches is used by investors and security analysts when doing fundamental analysis.

There is no "right" answer to which approaches to follow. However, fundamental analysis can be overwhelming in its detail, and an Investor should decide which approach seems more reasonable and try to develop a consistent method of action.

Technical Analysis:

Technical analysis can be defined as the use of specific market-generated data for the analysis of both aggregate stock prices (market indices or industry averages) and individual stocks.

The technical approach to investing is essentially a reflection of the idea that prices move in trends which are determined by the changing attitudes of investors towards a variety of economic, monetary, political and psychological forces. The art of technical analysis – for it is an art – is to identify trend changes at an early stage and to maintain an investment posture until the weight of the evidence indicates that the trend is reversed.

Technical analysis is sometimes called market or internal analysis, because it utilizes the record of the market itself to attempt to assess the demand for, and supply of, shares of a stock or the entire market. Thus, technical analysts believe that the market itself is its own best source of data.

Technicians believe that the process by which prices adjust to new information is one of a gradual adjustment towards a new (equilibrium) price. As the stock adjusts from its old equilibrium level to its new level, the price tends to move in a trend. The central concern is not why the change is taking place, but rather the very fact that it is taking place at all. Technical analysts believe that stock prices show identifiable trends that can be exploited by investors. They seek to identify changes in the direction of a stock and take a position in the stock to take advantage of the trend. Quantitative investment management may loosely be described as the application of rigorous mathematical and statistical principles, informed by economic theory, to the study of financial markets with the primary goal of forming investment portfolios to achieve superior returns. This approach to investing has a long history and distinguished academic pedigree. So, while quantitative investment strategies have gone in and out

of favour with investors, it should be clear that this is a time-tested approach based on sound economic principles, rigorous academic research, and real-world analysis. In this paper, we hope to advance the understanding of quantitative investment practices by providing a survey of the academic antecedents of these strategies, as well as more recent learnings driven by the experience of the financial crisis and its aftermath.

Modern Portfolio Theory: *

Modern quantitative investing would not have been practical without the pioneering contribution of Harry Markowitz. His early work in this area was published in an article in the Journal of Finance in 1952, followed by his seminal work in the 1959 book titled Portfolio Selection: Efficient Diversification of Investments. The notion of diversification formalizes, in

mathematical terms, the old adage: "Don't put all your eggs in one basket." It was well known that security prices fluctuated randomly and that all investors faced the possibility of losses on their investments. While several intuitive measures of the uncertain outcomes of an investment were proposed, many by Markowitz himself, his key insight was to recognize that if an investor chose to measure investment uncertainty using the standard deviation of the distribution of returns, then the investment problem becomes mathematically tractable.

He went on to show how to use this insight to form "efficient" portfolios. The notion of efficiency, central to quantitative investing, loosely refers to the best way to achieve investment objectives. For example, if an investor has forecasts of returns on a set of stocks as well as measures of their correlation and standard deviation, then there is an analytically tractable way to form an efficient portfolio — the portfolio is efficient in the sense that it will achieve the highest level of expected return for a given standard deviation.

**Source: American Century Investments; The Evolution of Quantitative Investment Strategies by Vinod Chandrashekaran, Ph.D. (Senior Vice President, Director of Quantitative Research and Portfolio Management).*

Modern Portfolio Theory: **

Harry Markowitz, considered the father of modern portfolio theory, in the 1950s, originated the basic portfolio model that underlies modern portfolio theory. Before Markowitz, investors dealt loosely with the concepts of return and risk. Investors have known intuitively for many years that it is smart to diversify, that is, not to "put all of your eggs in one basket". Markowitz, however, was the first to develop the concept of portfolio diversification in a formal way. He showed quantitatively why, and how, portfolio diversification works to reduce the risk of a portfolio to an investor.

Markowitz sought to organize the existing thoughts and practices into a more formal framework and to answer a basic question: Does the risk of a portfolio equal to the sum of the risks of the individual securities comprise it? Markowitz was the first to develop a specific measure of portfolio risk and to derive the expected return and risk for a portfolio based on co-variance relationships.

Markowitz developed an equation that calculates the risk of a portfolio as measured by the variance or standard deviation. His equation accounts for two factors:

1. Weighted individual security risks (i.e., the variance of each individual security, weighted by the percentage of investible funds placed in each individual security).

2. Weighted co-movements between securities' returns (i.e. the co-variance between the securities' returns, again weighted by the percentage of investible funds placed in each security).

Combination of Securities

It is assumed that combination of two securities results in risk reduction. Is it possible to reduce the risk of a portfolio by adding into it a security whose risk is higher than that of any of the investments held already?

Let's consider the following example:

Obviously, Stock Y is riskier because the standard deviation is higher but the expected return is also higher. We will have to analyse and find out whether it would be sensible for an investor who is already holding Stock X to buy a riskier Stock Y; add it in his portfolio to reduce the risk. Whether buying Stock Y and adding to one's portfolio will amount to diversification?

Let's find out by assuming that we shall build a portfolio of two securities with weightages of 60% for Stock X and weightages of 40% for Stock Y.

The expected return on the portfolio Rp would be 0.6 × 10 + 0.4 × 14 = 11.60%. If we assume that Stock Y gives good returns when Stock X performs badly then we will have returns of 0.6 × 9 + 0.4 × 16 = 11.80%.

If it is the other way around, that is, Stock X performs well while Stock Y does not perform well then, we will have a situation when the return will be 0.6 × 11 + 0.4 × 12 = 11.40%. In either case, we have got returns very close to the expected return with risk virtually being nil. We have assumed a negative correlation between Stock X and Stock Y. In other words, when we have two or more securities in a portfolio, the returns will depend upon the interactive risk between/among those securities.

If we can find two securities that are perfectly negatively correlated then we can have a portfolio of two securities without any risk at all.
***(Source, Investment Analysis and Portfolio Management by Dr. Prasanna Chandra, a Tata McGraw Hill Publication)*

Approaches to Portfolio Management:

Passive fund management:

Such management is done when the objective of the fund is to generate returns equal to return of the Index (e.g., BSE Sensex). The fund tracks the benchmark index. In such funds, expenses are low, so that returns generated by the fund are as close to the index as possible.

Active Fund management:

Here the fund manager seeks to outperform the benchmark index. There are two styles under active management. Growth investing in which the primary objective is to obtain capital appreciation by investing in companies that offer above average earnings growth. Value investing in which investment is done in those companies which are believed to be undervalued in the market currently, but their potential would be realized soon.

Arbitrage Fund:

Arbitrage fund is a type of mutual fund that leverages the price differential in the cash and derivatives market to generate returns. The returns are dependent on the volatility of the asset. These funds are hybrid in nature as they have the provision of investing a sizeable portion of the portfolio in debt markets.

Arbitrage funds are the panacea for low risk-taking investors. In a situation of high and persistent volatility, arbitrage funds provide investors a safe avenue to park their hard-earned money. These funds capitalize on the market inefficiencies and generate profits for the investors. As these funds invest predominantly in equities, their tax treatment is at par with equity funds.

Real Estate Funds:

These funds invest directly into real estate, fund real estate projects, lend money to real estate developers or buy shares of real estate companies.

Quantitative Funds:

A quantitative fund is an investment fund that selects securities based on quantitative analysis. The managers of such funds build computer-based models to determine whether or not an investment is attractive. In a pure 'quant shop', the final decision to buy or sell is made by the model. However, there is a middle ground where the fund manager will use human judgement in addition to a quantitative model.

Fund of Funds (FOFs):

Fund of funds are schemes that invest in other mutual fund schemes. The portfolio of these schemes comprises only of units of other mutual fund schemes and cash/money market securities/short-term deposits pending deployment.

Investment Avenues

1) **Fixed Income / Debt**

Characteristics of this Asset Class:

- More Safety
- Prospect of Capital Appreciation
- Liquidity
- Better returns for longer durations

2) **Mutual Funds**

Characteristics of this Asset Class:

- Long term capital appreciation
- Ability to invest systematically (SIP by SIP)
- Flexibility to redeem amounts
- Numerous schemes to choose from

3) **Alternate Assets**

Acquire stocks in high growth private companies with a long-term horizon and invest in these growth companies before they go public i.e., pre-IPO.

4) **Listed Equity**

The most common form of securities (the conventional stock or common stock or ordinary share) is the equity share issued by a company and the investors in equity shares are owners of the company to the extent of their shareholding. These shareholders are entitled to dividend and other benefits declared by the company and are also entitled to vote. Companies may issue shares without voting rights also. Normally the shares traded are fully paid up but in certain cases partly paid shares are also listed and traded on the stock exchanges.

5) **Insurance**

Life Insurance:

- To protect against uncertainties

- To reduce the risk of heavy debt
- To achieve life goals
- To secure a well retired life

Health Insurance:

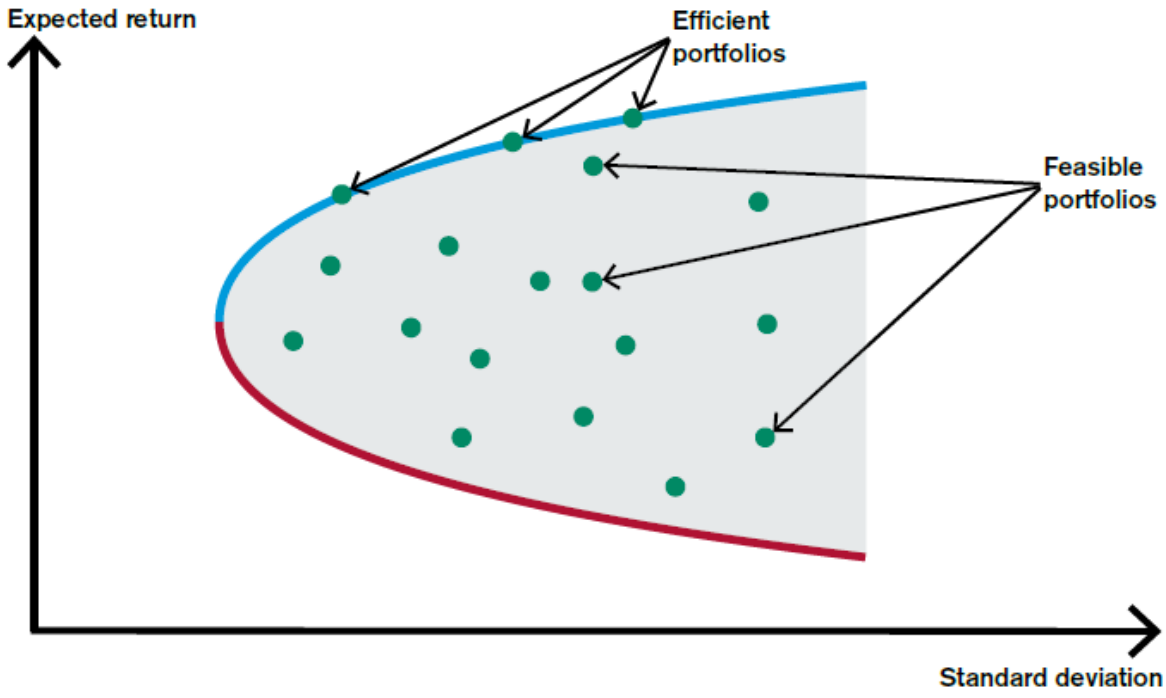
- Changing lifestyles
- Rising medical costs
- Coverage of pre and post hospital visits / expenses.

LITERATURE SURVEY

We referred to 'The Evolution of Quantitative Investment Strategies' by Vinod Chandrashekaran, Ph.D. (Senior Vice President, Director of Quantitative Research and Portfolio Management – American Century Investments) to learn more about what institutions are using to create the strategies for the investors.

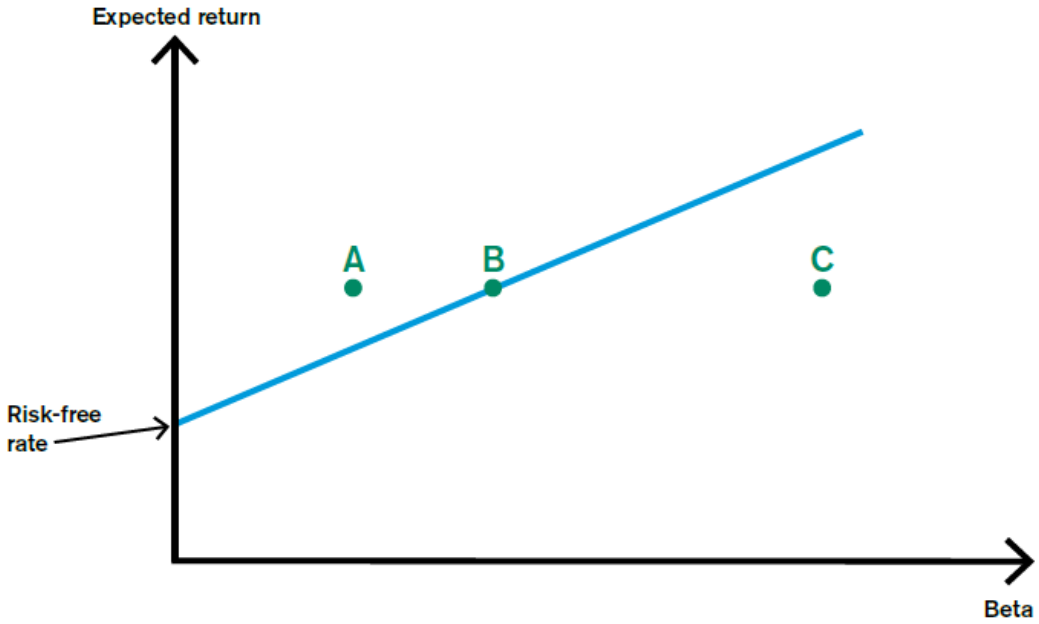
The investment viewpoints of American Century Investments, they speak about the Efficient Frontier which was first proposed by Markowitz, the mean-variance frontier is a popular device used to illustrate the range of risk-return combinations followed by the Security Market Line (SML) which is a line that graphically shows the expected return of each security plotted against its sensitivity to the market portfolio i.e., its Beta (β). Its slope is the expected return on the market portfolio in excess of the risk-free rate. Stocks that are on the SML are considered to be fairly priced according to the Capital Asset Pricing Model (CAPM). Stocks which are above the SML offer higher expected returns and are considered underpriced while those that lie below the SML are overpriced.

Efficient Frontier:



The above image represents the 3 Portfolios on the blue curved line to be the Efficient Frontiers / Efficient Portfolios as they supersede other portfolios due to the Risk: Reward making it easier for the investor to choose what portfolio to be implemented.

Security Market Line:



The above image represents the Security Market Line (SML) and the Stocks A, B and C along the risk-free rate. The stocks above the SML are considered to be underpriced while the ones below the SML are considered to overpriced and the one on the SML is considered to be fairly priced.

The document continues on the path of Anomalies, Growth of Quantitative Strategies and crowding and its aftermath. The empirical study on Quantitative Investment Strategies and Portfolio Management conducted by Jinqiang Guo exhaustively and accurately shows in greater detail topics namely, Portfolio Optimization, Information Variables and Investor Preference, Asset Allocation with a lockup period, Empirical results under the unconditional strategy, optimal portfolios, timing portfolios, demand decomposition, Investment horizon and long-term tactical asset allocation.

The aforementioned strategies and theories are in complete sync with real life scenarios where an Investor; given the age, risk appetite and period of investment attempts to prepare a portfolio which will provide the investor with maximum returns with minimal risk.

DATA AND METHODOLOGY

The following data and methodology were implemented in our project:

1) Risk Assessment Questionnaire filled out by more than 500 investors in India.
2) Scanning the data to find out the Asset Allocation with reference to the risk assessment.

Given the study of the data we arrived at the results which are detailed in the next section of this project.

RESULTS AND DISCUSSION

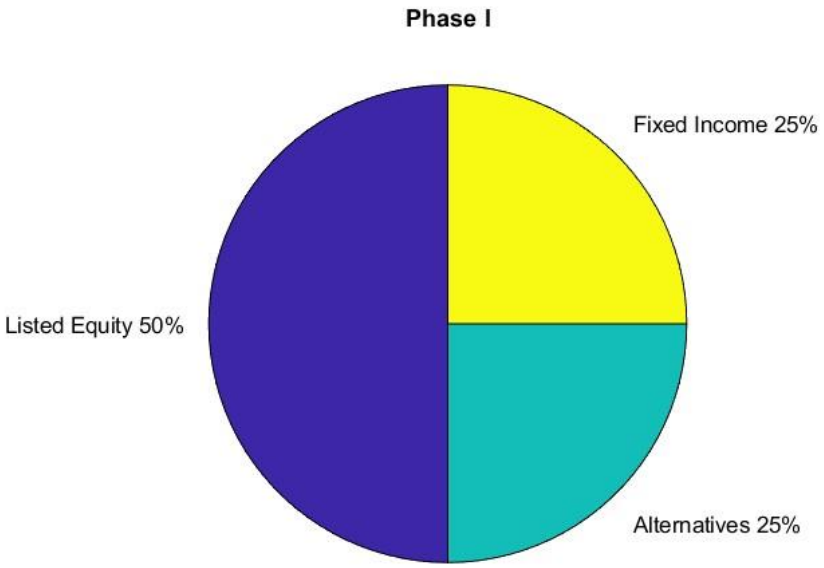
Given the lifecycle phases of an Investor, below are the discussions of the results:

Phase I

Constraints / Characteristics:

- Higher Discretionary Spends
- Lower Disposable Income
- Higher Risk Appetite

Given the above constraints / characteristics; the idle Asset Allocation:

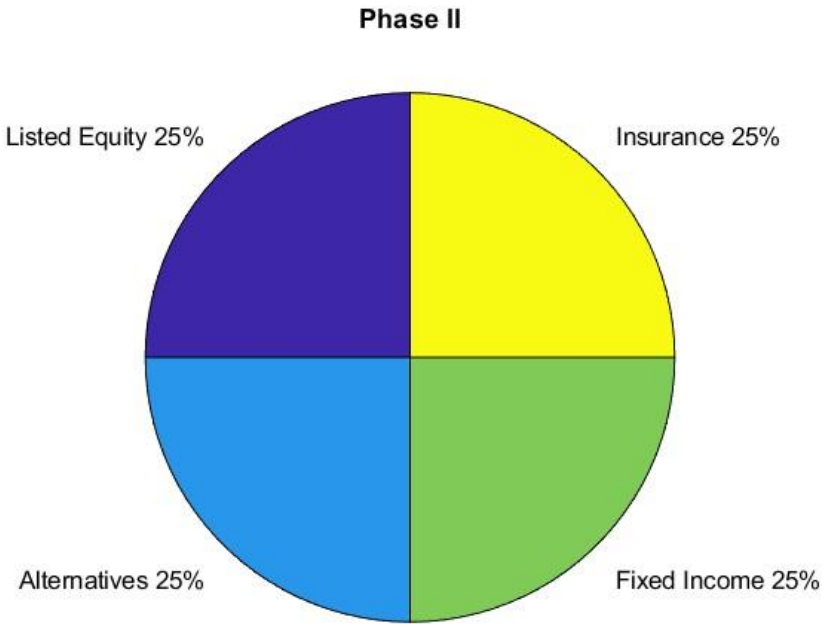


Phase II

Constraints / Characteristics:

- Increase in expenses
- Increased number of financial dependents
- Medium Risk Appetite
- Critical need of building a strong financial base

Given the above constraints / characteristics; the idle Asset Allocation:

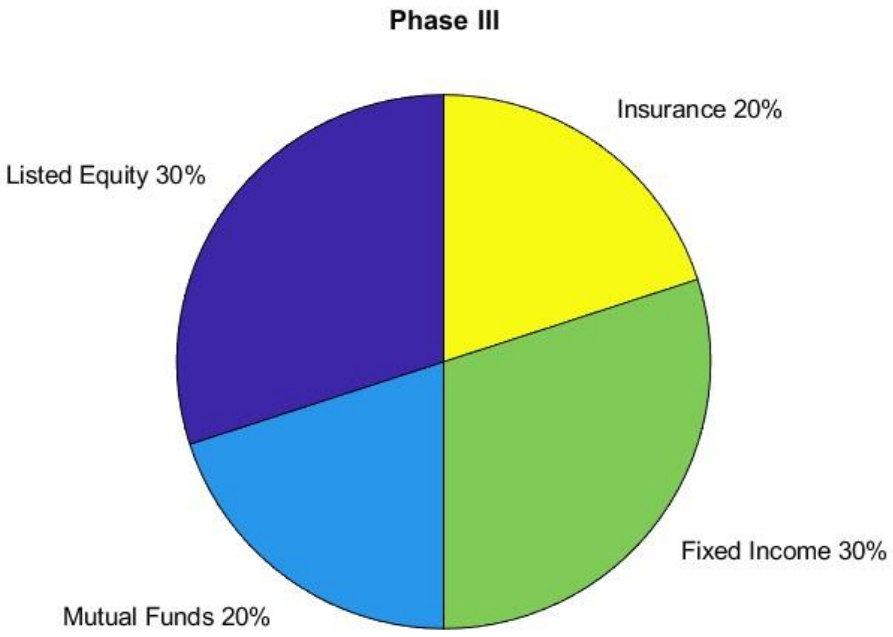


Phase III

Constraints / Characteristics:

- Higher Disposable Income
- Fewer dependents
- Moderate Risk Appetite
- Advanced planning and review of prior Investments needed at this stage

Given the above constraints / characteristics; the idle Asset Allocation:

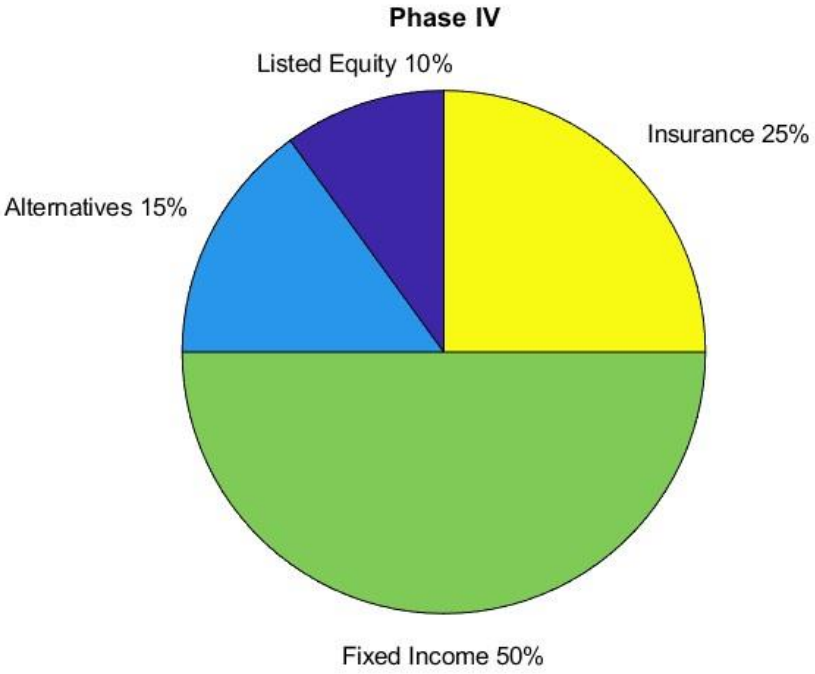


Phase IV

Constraints / Characteristics:

- Increase in expenses
- Increased number of financial dependents
- Medium Risk Appetite
- Critical need of building a strong financial base

Given the above constraints / characteristics; the idle Asset Allocation:



CONCLUSION

A lifecycle of an Investor in the 4 Phases mentioned in this paper are of realistic feature in Investments. This project investigates the impact and returns for the Asset Allocation decided post facto the risk assessment.

The results of the project show the idlest portfolio an Investor can create at each stage/phase of their lives and plan their finances including investments and the overall financing in a better fashion to improve efficiency and results / returns generated by the portfolios.

The empirical study suggests that an Investor is better off by diversifying their portfolio rather than constraining themselves to asset classes i.e., Equity and Debt.

A combined approach to create the optimal portfolio requires quantitative and qualitative data of the Investor and the Asset Allocation that needs to be prepared.

Investors who have a long-term approach have nothing to worry if they follow the portfolio asset allocation provided in this study. Nevertheless, Investors burn their hands by making investments in companies which are not really worthwhile.

It is important to know that despite what the books of a company show and the prices that are reflected in the market are one aspect to check before Investing but another and the most important is the Management of the Company that you need to Invest in.

Investors are better off in the long run when they Invest in companies where the management is strong and growth oriented which would eventually show the results in the books of the company and the Investors.

"How many millionaires do you know of who have made their millions putting their money in their Savings Account? I rest my case"

- Robert Allen

Literature

1) MATLAB Syntax for Image of Early Movers Advantage

```
mc=1000; %monthly contribution
rate=12;% rate of returns
f=@(x)mc*(1+rate/100/12).^(12*x);%Funtion of compound interest with monthly contribution
x=1:30; % Years of Compounding
mc1=3000; %monthly contribution
rate=12;% rate of returns
g=@(y)mc1*(1+rate/100/12).^(12*y);%Funtion of compound interest with monthly contribution
y=1:10; % Years of Compounding
figure(1)
plot(x,f(x))
grid
hold on
grid on
figure(2)
plot(y+20,g(y))
grid on;
xlabel('Years of investment')
ylabel('Returns over the years')
legend('Alex', 'Peter');
```

2) MATLAB Syntax for Image 'Phase I' in the Results section of the project:

```
% PHASE I
x=[50 25 25]
labels = {'Listed Equity 50%','Alternatives 25%','Fixed Income 25%'};
pie(x,labels)
title('Phase I')
```

3) MATLAB Syntax for Image 'Phase II' in the Results section of the project.

```
% PHASE II
x = [25 25 25 25]
labels = {'Listed Equity 25%','Alternatives 25%','Fixed Income 25%','Insurance 25%'};
pie(x,labels)
title('Phase II')
```

4) MATLAB Syntax for Image 'Phase III' in the Results section of the project.

```
% PHASE III
x = [30 20 30 20]
labels = {'Listed Equity 30%','Mutual Funds 20%','Fixed Income 30%','Insurance 20%'};
pie(x,labels)
title('Phase III')
```

5) MATLAB Syntax for Image 'Phase IV' in the Results section of the project.

```
% PHASE IV
x = [10 15 50 25]
labels = {'Listed Equity 10%','Alternatives 15%','Fixed Income 50%','Insurance 25%'};
pie(x,labels)
title('Phase IV')
```

6) Referred to mathworks.com.

7) Referred to Financial Planning Standards Board, USA material.

8) Referred to past experiences of asset allocation of different clientele with different age and risk constraints.