WHITEOAK LEARNING EDGE

WHITEOAK CAPITAL MUTUAL FUND

THE ART AND SCIENCE OF INVESTING

CONCEPTOPEDIA

“Correlation Diversification and Modern Portfolio Theory (MPT)”

Learning Objectives

- Concept of Correlation
- Interpret Correlation values
- Significance of Correlation in portfolio construction
- Behavioural biases clogging judgement when the portfolio is not asset diversified
- Traditional diversification vs. Correlation diversification (Ray Dalio – “Holy Grail of Investing”)
- Modern Portfolio Theory (MPT) and the Efficient Frontier
- Overview of Multi Asset Strategy concept

What is meant by Correlation?

Correlation measures the **strength of the relationship** between two variables or entities or asset-class, without making a statement about cause and effect.

It explains the degree to which **two variables move in relation to one another.**

Though it measures **the degree of association between two variables** or **asset class** etc., however it **does not show whether one asset class has caused the movement of another class**.

In finance, the correlation can measure the **movement of a stock with that of a benchmark index**, such as the Sensex, Nifty etc., or between **two asset class** like Gold and Equity, or Equity and Fixed Income, or between Domestic Equities like Sensex with International Equities like S&P 500.

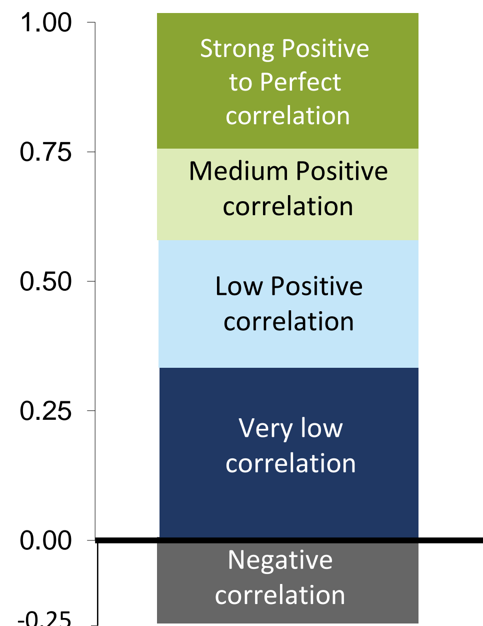
Correlation value ranges from **-1 to +1**

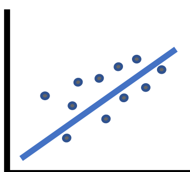
Correlation Values

+1:- the two variables moved either up or down in the same direction together. It depicts **Positive correlation.**

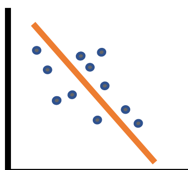
0:- there is no relationship between the two variables. As one variable moves one way, the other moved in another unrelated direction. It depicts **Zero correlation.**

-1:- two variables moved in the opposite directions. It depicts **Negative correlation.**

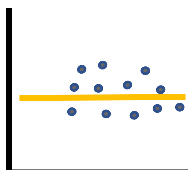




Positive Correlation



Negative Correlation



Zero Correlation

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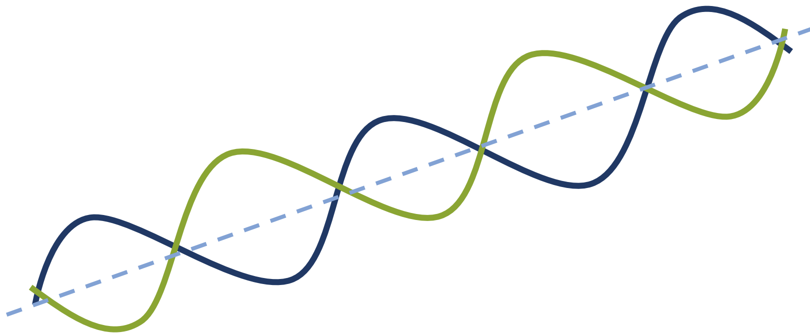
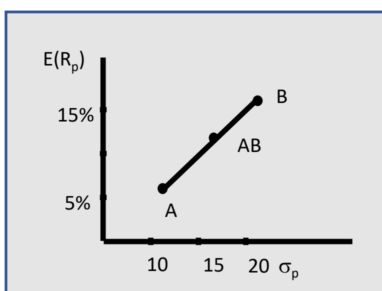
How is correlation concept used in portfolio construction?

Asset Class A + Asset Class B = Lower Portfolio Volatility



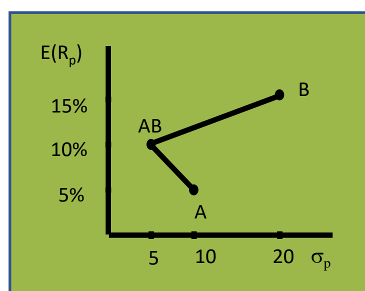
Correlation is closely linked to diversification, as by allocating money to different asset classes that have negative, zero or low correlation helps in creating a perfectly hedged portfolio which reduces portfolio volatility and aids in generating inflation adjusted optimal* returns.

Optimal*:- perfect balance between risk and return



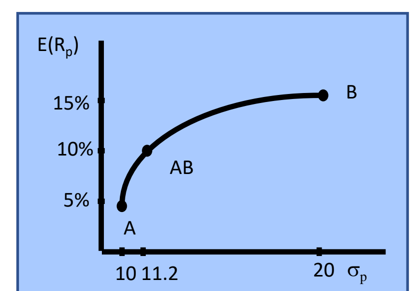
Positive Correlation

- As asset class A and B returns vary in identical pattern, there is a linear risk-return relationship between the two assets.
- Therefore, the risk of portfolio AB is the weighted value of the two assets' standard deviation or volatility (σ).



Negative Correlation

- Asset class A's and B's returns are totally inversely proportional to each other.
- The portfolio AB's standard deviation or volatility will be always at the lowest risk level regardless of proportions in each asset.



Zero Correlation

- Asset class A's return is totally unrelated to asset class B's return.
- As there is a zero correlation, substantial amount of risk reduction can be obtained through this type of diversification.

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The following table shows correlations between various Asset Class for the past 1 year

		AC1	AC2	AC3	AC4	AC5	AC6	AC7	AC8
Corporate Bond	AC1	1.00	0.98	-0.01	0.27	-0.32	0.83	0.40	0.08
CRISIL 1 Yr T-Bill	AC2	0.98	1.00	-0.08	0.25	-0.17	0.88	0.41	0.12
Emerging Market	AC3	-0.01	-0.08	1.00	0.04	-0.41	0.07	0.07	-0.90
Equity India	AC4	0.27	0.25	0.04	1.00	-0.10	0.18	0.13	0.06
Gilt 10 years	AC5	-0.32	-0.17	-0.41	-0.10	1.00	-0.16	-0.13	0.22
Gold	AC6	0.83	0.88	0.07	0.18	-0.16	1.00	0.47	0.10
Silver	AC7	0.40	0.41	0.07	0.13	-0.13	0.47	1.00	-0.02
World Index	AC8	0.08	0.12	-0.90	0.06	0.22	0.10	-0.02	1.00

Note :
- *Returns upto 1 year are absolute and over 1 year are compounded and annualized.*
- *Standard Deviations are calculated on daily return basis for the given period and are annualized.*

Correlation Value	Description	Diversification Benefit
-1.00 to -0.40	Asset pair with negative correlation	Excellent Diversification
-0.40 to 0.00	Asset pair with slight negative correlation	Good Diversification
0.00 to 0.60	Asset pair with mild positive correlation	Moderate Diversification
0.60 to 1.00	Asset pair with strong positive correlation	Poor Diversification

Correlation Table and Chart Source: http://www.teamgenus.in/correlation-assetclass.jsp?mm=yy&yy=3

- **As can be seen that the correlation between different asset class is usually divergent and hence combining or pairing asset class with zero, or negative or low correlation provides good diversification benefits.**
- **It collectively harnesses the positive characteristics of each asset class and at the same time, helps in taming their flip-sides.**

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Divergent correlation between asset class emanates from the fact that every asset class and its sub-type entails a specific objective or purpose. They also have unique risk-return characteristics. Their benefit can be best derived when we hold them for a specific investment tenure.

Asset Class	Objective	Return	Risk	Investment Tenure
Large Cap Equity	Wealth creation and Growth	High	High	Long
Small and Mid Cap Equity	Wealth creation and Growth	Higher	Higher	Longer
Short Term Debt	Capital Protection and Liquidity	Low	Low	Short
Medium Term Debt	Income and Liquidity	Moderate	Low	Medium
Long Term Debt	Income and Stability	Moderate	Moderate	Long
Real Estate	Growth with Rental Income	High	Moderate to High	Long
Private Equity	Wealth creation by spotting investment opportunities in the unlisted space	Higher	Higher	Longer
Gold	Hedge against inflation and economic upheavals	Moderate	Moderate	Cyclical
International Equities	Wealth creation through cross-border diversification and currency play	High	High	Long

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Behavioural Biases in concentrated portfolios

- Human beings are prone to behavioural biases.
- Behavioral mistakes are the investor’s worst enemy.
- During negative market events, two behavioural biases are predominantly evident amongst investors:

Loss Aversion – The pain of losing money is far greater than the pleasure of making money.

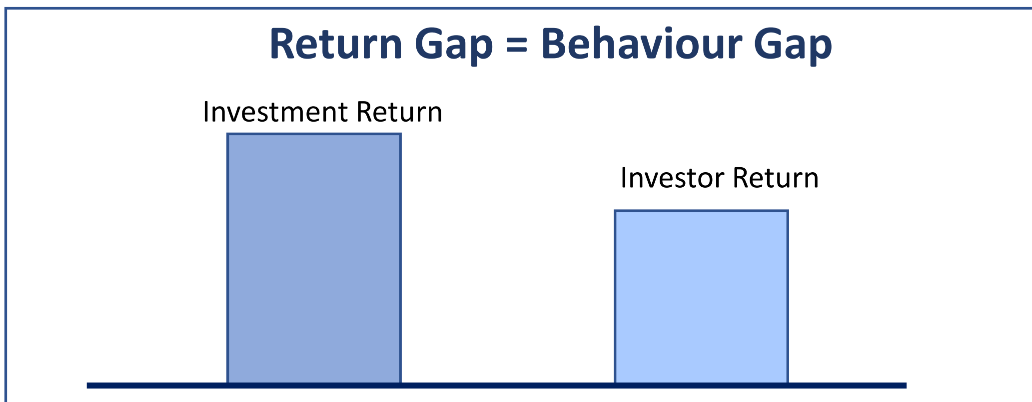
Availability bias – Recent and dramatic events have a grater impact on human psyche.

In a year when equity gives negative returns, investors tend to panic and succumb to knee jerk reactions, as they hurriedly redeem their equity investments or switch out of equity into low-risk assets, thus failing to invest for the long term.

Psychologically it gives them the comfort that they are out of a volatile asset class, and it is the best course of action to take.

How-ever even though equity has the propensity to deliver better returns over longer time periods, unfortunately investors were not able to reap the full benefit.

"The threat to a buy and hold program is the investor himself."



Source: Carl Richards – Behavior Gap

However, by constructing a portfolio comprising multiple asset class with varied correlation and risk-reward features, usually tends to reduce volatility without compromising the ability to create wealth. Even in years where one asset class underperforms, its negative impact on the overall portfolio gets curtailed, on account of outperformance or positive performance of various other asset class.
It thus, provides a psychological comfort to the investor, as instead of seeing a completely negative portfolio value, he or she is likely to see modest returns.
Over a period of time, the portfolio offers the ability to generate better risk and inflation adjusted returns.
Hence, Correlation Diversification is an apt way to manage behavioural issues and flaws.

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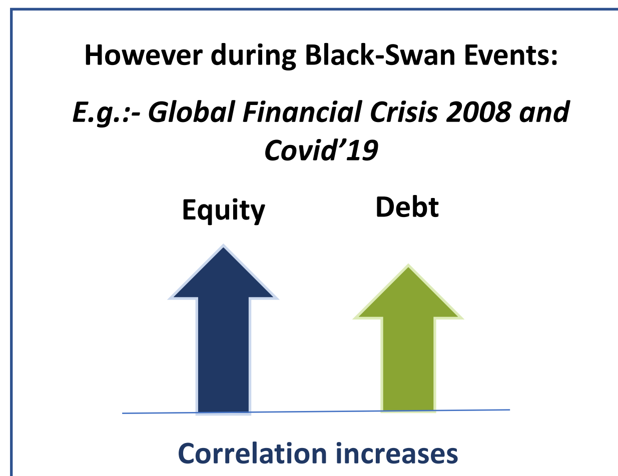
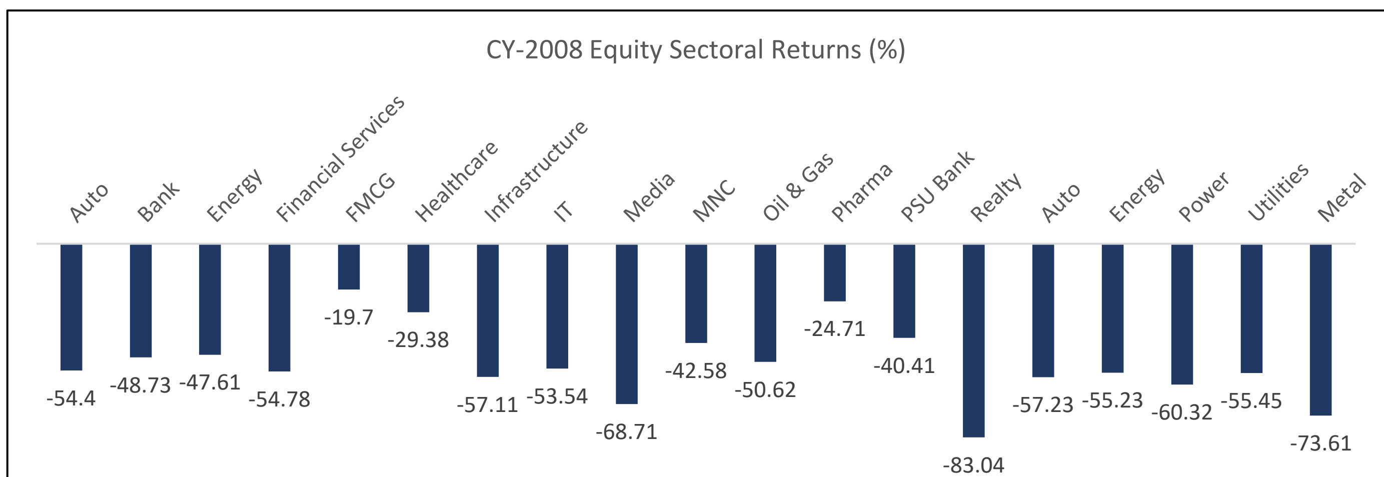
Traditional Diversification

- Traditional portfolio construction focuses either on **security diversification within an asset class like an equity fund with multiple underlying stocks from different sectors or is primarily focused on 2 asset classes**, viz., equity and debt, where equity provides capital appreciation, and debt, or fixed income provides stability and regular cashflows.





- During turbulent times, vast number of underlying stocks and sectors within an equity fund, undergo price fluctuation and correction. Also, by investing in only two asset class, say for e.g., equity and debt, can lead to increased level of volatility and correlation, due to rising uncertainty.

Source: ICRA MFI Explorer, Calendar year 2008 returns. Nifty Auto TRI, Nifty Bank TRI, Nifty Energy TRI, Nifty Financial Services TRI, Nifty FMCG TRI, Nifty Healthcare TRI, Nifty Infrastructure TRI, Nifty IT TRI, Nifty Media TRI, Nifty MNC TRI, Nifty Oil & Gas TRI, Nifty Pharma TRI, Nifty PSU Bank TRI, Nifty Realty TRI, S&P BSE AUTO, S&P BSE Energy TRI, S&P BSE Power Index TRI, S&P BSE Utilities TRI, S&P BSE Metal TRI.

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Correlation Diversification

Research indicates that individual assets within an asset class are usually about 60% correlated with each other. Hence if we think we are fully diversified, we are not.

Annual Portfolio Standard Deviation (10%, 9%, 8%, 7%, 6%, 5%, 4%, 3%, 2%, 1%)

60% correlation

40% correlation

20% correlation

10% correlation

0% correlation

Number of Assets/Alphas in Portfolio (2, 4, 6, 8, 10, 12, 14, 16, 18, 20)

Return to Risk ratio	Probability of losing money in a given year
0.25	40%
0.28	39%
0.31	38%
0.36	36%
0.42	34%
0.50	31%
0.63	26%
0.83	20%
1.25	11%
2.50	1%

Return to Risk Ratio (Sharpe Ratio), which depicts return per unit of risk increases, when we allocate money to multiple asset class instead of one or two asset class.

Portfolio standard deviation (measure of volatility) also decreases.

Probability of losing money is also drastically reduced.

Chart Source: Ray Dalio's "Principles"

- By combining more than 2 asset class (say for example 4 or more asset class) which are uncorrelated or have negative to low correlation, can result in **reducing risk without sacrificing returns.**

- It also allows investors to **increase their return-to-risk ratio (sharpe ratio), which is a key principle in successful investing.**

- As can be seen from the above chart (courtesy: "Holy grail of investing" concept by Ray Dalio), **portfolio volatility as depicted by standard deviation in the "Y" axis decreases, when we combine a greater number of asset class with varied correlation characteristics.**

- It is because the price movement of one asset class which is moving in a negative trajectory, gets mitigated by the price movements of the other lesser correlated asset class. Thus, the **overall negative effect on the portfolio is minimized.**

Correlation diversification is judiciously allocating money to multiple asset class which have divergent correlation dynamics. It is a tool to smoothen returns and lower drawdowns.

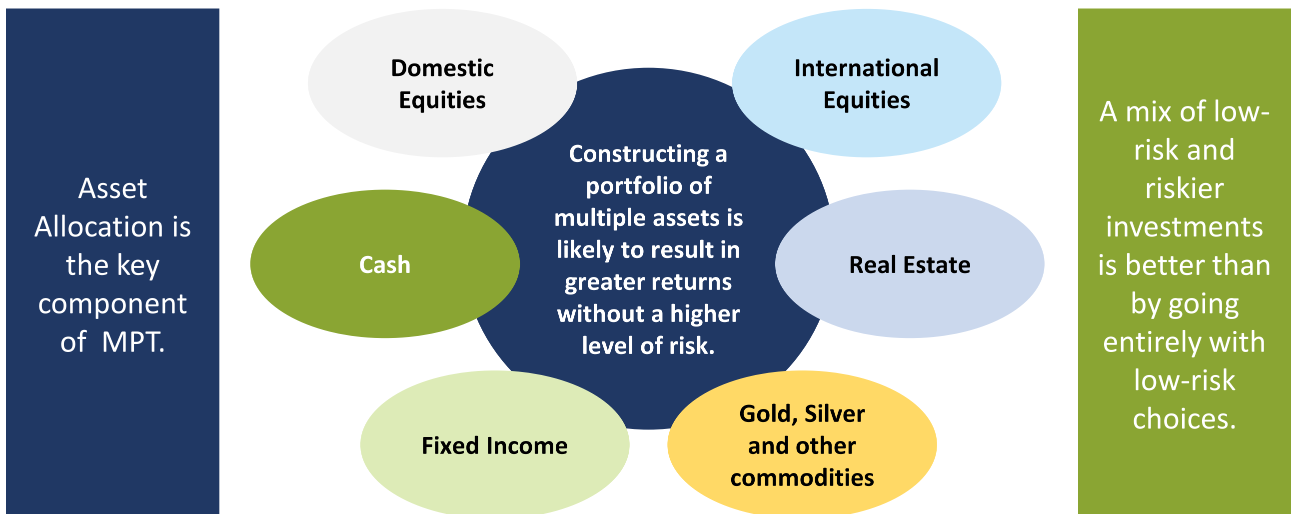
Disclaimer: The above chart and information is for illustrative and educational purposes only and should not be construed as an investment advice.

*"The goal of correlation-based asset allocation is **not so much to pick winners,** but instead **to seek balance and participation.**"*

Modern Portfolio Theory (MPT)

Modern Portfolio Theory (MPT) pioneered by American economist and Nobel laureate Harry Markowitz refers to selecting investments in order to maximize their overall returns within an acceptable level of risk.

Tenets of MPT



Efficient Frontier

- The efficient frontier is the foundation of the Modern Portfolio Theory (MPT).
- It is the line on a graph that represents the combination of investments that are likely to provide the **highest level of return for a given level of risk** or **for a given level of return will have the lowest level of risk.**
- It is created by constructing a series of portfolios keeping in mind correlation between various asset class and then picking the portfolio that offers the best ratio of return to risk.
- The Y axis of the graph is the expected or average return of the portfolio and X axis is the standard deviation or volatility of the portfolio.

A portfolio is said to be efficient if there is no other portfolio that offers higher returns for a lower or equal amount of risk

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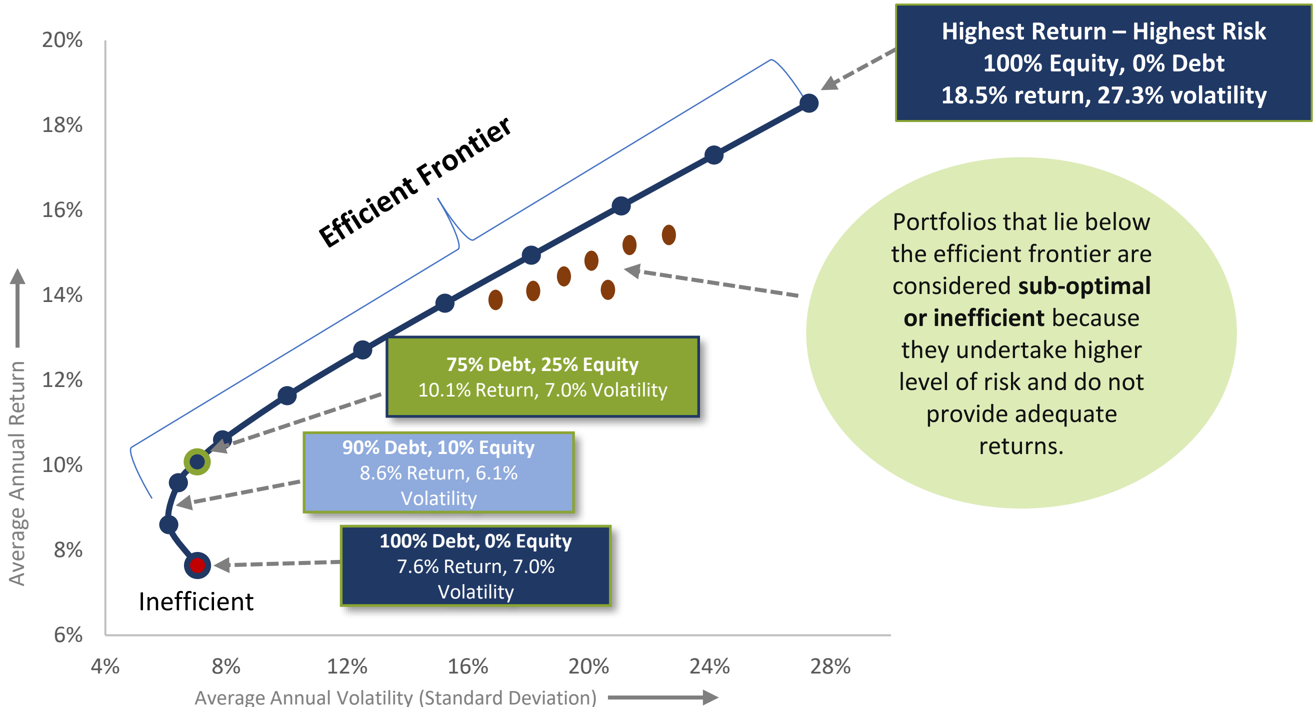
Let's understand the concept of "Efficient Frontier" by analysing portfolios comprising of only two asset class – Equity and Debt.



Identifying the Efficient Portfolio:

- When we reduce the return in a portfolio, the volatility actually increases, as can be seen from the graph above, where a portfolio comprising 100% Debt, has a volatility of 7%, where-as a portfolio which has 90% Debt, and 10% Equity has a lower volatility of 6.5% . It also delivers 1% more return (8.6% over 7.6% return from a pure debt portfolio).
- A portfolio comprising 75% Debt and 25% Equity, delivers even greater return with the same level of risk or volatility of 7%, when compared to a 100% debt portfolio.
- *If our objective is to keep the volatility low then the portfolio with 75% Debt and 25% Equity is considered "Efficient" compared to a portfolio with 100% Debt, as it delivers higher returns for the same level of risk.*

D = Debt (Crisil 10 Year Gilt Index), E = Equity (S&P BSE Sensex TRI). Source: MFIE, Bloomberg and Internal Research of WhiteOak Capital. ^Average 1 Year rolling return on daily basis and Standard Deviation (Volatility) of the return for various combination of Equity and Debt for the period January 2001 to March 2023 is considered for above analysis. **The above analysis is only to illustrate the concept of Multi Asset Allocation. The performance of the "Sample Portfolio" does not represent the performance of the scheme. Past performance may or may not sustain in future. Disclaimer: The above information is for illustrative purposes only and should not be construed as an investment advice.**

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Efficient Frontier - Approach

Identify your financial goals or risk tolerance.

Ascertain the expected return and how much risk you are willing to take.

Construct a series of portfolios, keeping correlations in mind, and how risky and profitable they are.

Pick the portfolio that offers the best possible return to risk ratio.

Benefits:

- ✓ Provides a good framework for risk management.
- ✓ Doesn't rely on timing the markets.
- ✓ Leads to proper diversification.

However, devising efficient portfolios and conducting regular rebalancing requires fair amount of research infrastructure and skill. It also entails close tracking of macro indicators and valuation parameters.

What is a Multi Asset Allocation Strategy?

Efficient Portfolio + Judicious Mix of Assets + Regular Rebalancing and Review

A multi-asset strategy invests in a wide spectrum of assets, such as domestic stocks, international stocks, fixed income, commodities, real estate and cash etc. to create a more agile and diversified portfolio.

It harnesses the principles of **Correlation Diversification and Modern Portfolio Theory.**

Its objective is to construct an **"all-weather" or "sleep well at night" portfolio** that can effectively navigate various economic and market cycles.

As it constitutes prudent mix of various asset class with different risk-return characteristics and correlation dynamics, its endeavour is to reduce volatility without sacrificing returns.

The portfolio is periodically rebalanced after analysing various macro-economic and market indicators and it is managed by professional fund managers.

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