The Fundamentals of Asset Allocation,

The Weaknesses of Modern Portfolio Theory

&

A Fundamental Framework for the Management of Assets & Liabilities over Time

The TAMRIS Consultancy

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FOREWORD

It has always seemed logical to me that you cannot make a decision about the present point in time without considering its impact on the future and the future's impact on the present. It has always seemed logical to me to never accept or reject any idea without first questioning and then understanding and finally agreeing or disagreeing with its fundamentals. Obviously, the easiest decision of all is to follow the herd and to accept without question that which you are taught and told to do. But those who take the hard road know that you do not choose the truth, the truth chooses you.

I have for a long time disagreed with much of that which is taught and practised in the financial services industry and still do. But over the last few years I have become increasingly concerned over the inexorable rise of modern portfolio theory and its sidekick the mean variance optimiser.

When I started researching this area in the late 1980s and started developing asset and liability management systems in the early 1990s, modern portfolio theory was little more than a twinkle in the eye of the mainstream retail financial services industry.

I did look at modern portfolio theory in the late 1980s and very early 1990s when I was developing my early asset and liability modelling and management framework but could not find anything in it of direct and relevant value.

I then went over again in much depth the models and derivations of the models in the summer of 1997 when I was reassessing my approach and developing a more advanced, fully integrated asset and liability management framework. Indeed, I spent much time trying to develop a mean variance model that I could actually use within an integrated asset and liability management framework, but again a) found it (the MVO and MPT) wanting and b) found little of direct relevance and use to an integrated asset and liability management framework. I must admit I spent a not inconsiderable amount of time trying to find a way to make MPT work in liability space.

In late 2003 when I decided to write up my research and development to date, I once again looked at the full body of modern portfolio theory including much of the work in dynamic financial analysis and, found that it had moved even further away from what I considered to be the fundamentals of asset and liability management.

Finally, in 2006 I find that I can no longer take the direction modern portfolio theory is leading portfolio theory in general and have decided to bite the bullet and fully detail my own views on the subject.

I have never been taken in by Modern Portfolio Theory's simple arguments, primarily because I have always felt the most important aspect of portfolio structure was the relationship between assets and liabilities, because I felt this was a dynamic and symmetrical relationship and that the integration of the two held the key to the eventual automation of the personalisation of portfolio construction, planning and management. I felt this was the heart of the matter.

I am no philistine and I do of course use statistical analysis in much of my work, but I have never agreed with making it the centre piece of the asset allocation process, only a servant of the process itself. Of course, maths and algorithms lie behind almost everything, but I prefer the maths to have a spatial relationship with the subject matter and this is something which I find most financial economics lacks. I just cannot see the relationship between mean variance and the solution to the total portfolio problem, and I mean it when I say that I cannot see it. I can visualise the physical universe of assets and liabilities over time, but the mean variance structure is just not there.

There are those who disagree with Modern Portfolio Theory and its simplifying assumptions, but they are generally few and far between. Unfortunately, coming out and saying you are against it is a bit like saying the "Emperor has no clothes"; the one who speaks the truth often looks the bigger fool. It is far easier to

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believe in it all and to say that you are either “very close friends with it or have a personal acquaintance that is”. Indeed, it is rare not to read a brochure or to browse a website these days without finding out how closely the organisation follows and believes in the mantra. The problem is, as I have said to others who have taken their own roads, once you know you are right, there is no turning back.

The point I am making is that this critique of modern portfolio theory is made by someone who is very much aware of the physical structure of the problem, by someone who has developed their own solution to the problem and by someone who understands the complexity and knows how simply this complexity can be managed. This document as such is borne out of frustration at the inability of the world to fully comprehend the basic fundamentals and the simple relationships that can be leveraged to solve a very, very complex problem.

At the same time I am not saying that modern portfolio theory lies at the heart of the problem, but it is definitely obstructing the development of the solution. Modern portfolio theory is not to blame for the conflicts of interest that plague the industry, the high costs and the endemic chasing of short term performance. But at the moment it is standing in the way of change.

This area is both simple and complex and requires an understanding of economics, probability theory, markets, human behaviour as well as an appreciation of the physical spatial properties of structural relationships.

So please, read on and decide for yourselves!

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1 Introduction

There is a fundamental heart to every universe, a universal set of rules around which complexity can be managed.

Wealth management is all about the accumulation, protection and management of risk and return and consumption of capital. "Asset allocation" is the current framework in which much of investment capital is managed and consumed. The financial services industry as we know it would probably not exist without "asset allocation" and, this is no compliment.

"Asset Allocation" appears to take away the need to know virtually anything about investment. All it requires, apparently, is a simple mantra about risk and return and the benefits of diversification, a simple piece of software designed by "Nobel Prize winners" and used by "institutions" and there you have it. Apparently it is so simple to use that many investors end up paying 2% to 4% of their capital each year just for the privilege.

But all is not well in the world of asset allocation, much has to change and much more has to be explained.

This document details the weaknesses of the simple asset allocation argument, discusses the implied fundamental principles and weaknesses of modern portfolio theory/mean variance optimisation and looks at the fundamental building blocks of asset allocation as it relates to a fundamental symmetrical framework for the dynamic management of asset risk and return at a point in time and over time relative to financial needs at all points in time.

Asset and liability management is a real life space-time continuum which is part of what makes it such a complex total problem; asset risk (1) and return (2), liabilities (3) and time (4) the fourth dimension.

This document contends that far from being able to ignore investment discipline, valuation and financial needs and time, portfolio theory and asset allocation must incorporate them into its structure if it is to move forward.

The "portfolio problem" universe is risk and return at a point in time relative to liabilities at a point in time, risk and return over time relative to liabilities over time and the management and integration of the two. But the "portfolio problem" universe is not one of equilibrium and efficient markets, it is one of market and economic disequilibrium. Risk is therefore wider, fuller and deeper in disequilibrium; absolute valuation risks due to disequilibrium, performance risk (most investors prefer to be in rising overvalued markets than falling under valued markets) and volatility risk, the relative price reaction to new information.

Anything else is inefficient.

The "Portfolio Problem" is not a point in time, two dimensional, "mean variance", equilibrium pricing problem. Modern financial economics has over simplified the problem.

If asset management knew how to integrate lifetime liability management with point in time management of risk and return, the consumer and the frontline financial advisor would not be using the "overly simple", high cost asset allocation services we currently see.

If many of today's academics had to construct, plan and manage a portfolio to meet financial needs over time and were forced to address many of modern portfolio theory's simplifying assumptions, many would come to the conclusion that mean variance optimisation is neither an efficient nor a total wealth management framework.

The mean variance optimiser is really a theoretical framework developed to model the relationship between risk, return and relative price movements and no more, although modern portfolio theory has effectively extended it by design to a theoretical model of equilibrium pricing. The mean variance optimiser is overly simple.

a) It cannot incorporate liabilities into its optimiser.

b) It cannot manage disequilibrium risks and the impact these risks have on risk/return relationships over time.

c) It cannot even represent point in time "efficient market" risk/return relationships[1], constrained as it is by an average of past relationships.

d) It is unstable and by virtue of this limited in application to broad asset classes and is often used to provide a definitive when it is no more than a vague generalisation.

In the main it is often promoted as the final solution by those with limited knowledge of its weaknesses and limited understanding of the total problem itself. Importantly, it can never provide the total solution that the total problem demands.

By asking those who advise to bypass a rationale decision making process when making asset allocation decisions, Modern portfolio theory (MPT) is weakening portfolio, market and economic efficiency.

Modern portfolio theory relies on markets efficiently pricing risk and return in a one period model and by implication, equilibrium pricing (economic and market equilibrium) in a one period model. Its prescription with regard to asset allocation depends on complete uncertainty over future information that governs the future direction of price movements. The price movement in this instance is the relative price reaction to change as the market and the economy moves to its next equilibrium point; how it does this is not clear.

Not only must future price movements be uncertain, but they must be random and independent of price movements in any other period. At the same time the factors and relationships governing the transmission of information into price movements that reflect the mean variance solution must themselves be stable, otherwise there would be no "mean variance" solution based on past relationships going forward. These factors and relationships would be presumed to comprise the "valuation models and relative pricing relationships" that would be needed to determine the correct prices of all assets at a point in time and the economic relationships that underpin equilibrium economic activity in any one period[2].

Modern portfolio theory's simplifying assumptions are unnecessarily restrictive. Under its assumptions the implication is that any asset allocation decision that is not the "market portfolio" is no more than a gamble. If the market portfolio is "point in time" risk/return efficient and future pricing is based on stable equilibrium pricing relationships, the "market portfolio" should retain its symmetrical pricing relationships in all markets providing all markets are in equilibrium, all relationships are symmetrical and their dynamics constant[3].

But, mean variance efficient derived from a mean variance optimiser does not mean a commitment to a positive return outcome, nor can an average be mean variance efficient during all market periods; it just implies a mathematical symmetry between historical average pricing relationships, which are presumed on average to hold for all future relationships. All of this is a tall order.

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[1] These are point in time relationships which will be viewed from the mean variance as a deviation from the mean, when they in fact represent an equilibrium price.

[2] There must actually be valuation models and frameworks that correctly value point in time risk and return, otherwise the market would not be able to set prices efficiently. These valuation frameworks would also presumably require a direct relationship with factors determining economic equilibrium.

3 In symmetry, energy can be passed from one element to another without affecting the overall relationship. MPT's mean variance solution relies not just on symmetry but on the energy characteristics of each element remaining constant.

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- Future price movements, as with the economic and corporate factors that underpin price movements, may be uncertain and ostensibly random, but they are ultimately dependent on fundamental long term economic (equilibrium/equilibrating) relationships. Shares, markets and economies are not flips of the coin where relationships reset prior to each new flip. It is extremely difficult to visualise independent equilibrium market/economic points in time and space.

    - Assumptions over independent movements are more important to stability of the one period efficient market assumption and the validity of the mean variance solution than a genuine attempt to understand fundamental long term economic and asset pricing relationships.

    - If modern portfolio theory's assumptions are incorrect over independence versus dependence, over equilibrium versus disequilibrium, then investor utility maximisation and the efficient economic allocation of capital requires a different portfolio framework.

- Any reliance on one period market efficiency and by implication equilibrium pricing, is a dangerous assumption for investors to rely on. It ignores the absolute risks of asset price bubbles and disequilibrium associated with mature business cycles and excess money supply growth. A portfolio construction model must be able to cope with disequilibrium in the real world, if it cannot, it cannot have practical application.

    - Markets do not appear to be efficient at pricing throughout the market cycle since because demand/supply imbalances at market and economic peaks and troughs are the biggest determinants of price. Markets are most likely only efficient during the initial arbitrage process whereby changes in earnings and earnings expectations or other news are adjusted for by the market pricing mechanism.

    - There are inherent conflicts of interest within the roles of financial intermediaries and asset managers that prevent them from engaging in efficient pricing during periods of extreme shifts in relative and absolute demand for securities. Conflicts of interest lie at the heart of problems in achieving an efficient market place.

- Standard deviation as a measure of price movement (relative price reaction to new information or change) is fine, but it is sorely lacking as a measure of total risk. Standard deviation can only take centre stage if markets efficiently price risk at all points in time (i.e. all stages of the market and economic cycle). If they do not then the relevance of standard deviation is marginal to the allocation decision and so is the relevance of the mean variance optimiser in managing risk. Other risks become more important to the portfolio construction, planning and management decision.

- While there is indeed a market portfolio, it is not the portfolio that all investors should hold but the sum of all economic and portfolio decisions representing consumption, production, savings and investment and exists only as a sum of all these decisions. Each individual has their own consumption and investment profile which should determine, alongside risk preferences and point in time risk of markets, the portfolio structure, the planning of future structure and the management of structure.

- In an uncertain world where long term relationships are dependent on the fundamental nature of asset risk and return over time, the focus should be on a structure which reflects both dependent long term relationships and the need to manage the uncertainty and instability of short term disequilibrium asset price/economic relationships. Indeed, over the short term the risks of stock market investment at critical points are such that to assume the market is efficiently pricing risks to return and hence future consumption would be naïve at best. Blind faith in "efficient markets" is to all intents an abnegation of responsibility.

- In some respects a good deal of modern portfolio theory's rationale depends on equilibrium pricing. In equilibrium there are no significant valuation risks, just a steady transition from one equilibrium

> point to the next equilibrium point and all relationships are dependent on the current and not the prior equilibrium. There are no mean reversions and no need for any time dependent relationships because you never effectively stray from relationships that determine equilibrium. The problem with this view is that real world is more representative of disequilibrium and it is this disequilibrium that complicates the management of risk and return. Modern portfolio theory has no relevant structure for managing disequilibrium.

Academics, portfolio managers and financial services industry professionals have spent much of the last five decades trying to apply mean variance optimisation and modern portfolio theory, in spite of its weaknesses, to the portfolio management problem. This perseverance and adherence to the "modern portfolio theory" dogma has stifled the development of a real world solution to the total portfolio problem.

There are also notable inconsistencies between proponents of modern portfolio theory, in particular between those who follow a weak form of modern portfolio theory that use the mean variance optimiser to construct and manage portfolios and believe in the time diversification of risk and hence dependence of relationships underpinning prices over time and, those that follow the strong form, random walk, efficient markets' hypothesis.

What has also entrenched "modern portfolio theory" in the minds of those adhering to it without question is the belief that it is synonymous with and the sole protector of diversification and asset allocation. It is not, since asset allocation, diversification and rationale management of risk and return has long existed outside the strict theoretical framework of modern financial economics.

This document contends that the strong form of modern portfolio theory does not hold and that the weak form delivered by the financial services industry is seriously flawed. A portfolio theory that cannot incorporate financial needs and the dynamic relationships between asset risk and return at a point in time and over time is not a total portfolio theory. This document provides a framework for that integration and provides a solution to the space-time continuum that is the true portfolio problem.

To rely on statistics alone to build a two dimensional world view of normality as much as ignores the ground beneath our feet.

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2 Asset Allocation

Asset allocation at its simplest is basically where you are invested. At one level it represents your allocation to the main asset classes; cash and bonds, equities, property and commodities.

At a deeper level it represents the allocation within asset classes. For example:

- **Cash and bonds**; domestic and international cash and notice/liquidity of such; domestic and international government fixed interest and the maturities of such; domestic and corporate fixed interest and the quality of such; indexed linked bonds; zero coupon/strips; collateralised debt instruments and other investments.

- **Equities**; domestic and international large cap, mid cap, small cap, emerging; value or growth; recovery, speculative, split capital, hedge funds, principal protected notes etc, etc.

But, at its most complex, asset allocation represents the factors that determine the allocation and that which the allocation is meant to manage. These are by far the most important and the most controversial issues within asset allocation.

These issues are dependent on the portfolio theory that states how risk and return should be managed given a portfolio's objectives, the economic and market theory that determine the fundamental nature of asset risk and return and the investment management discipline that states how risk and return is managed at any one point in time.

The above will determine whether you favour managing point in time risk and return or long term risk/return relationships and to what extent you are able to manage the "space-time continuum" of the asset/liability relationship. While it would seem sensible that a portfolio theory manages both point in time risk and return and risk and return over time, as well as the ability of assets to meet financial needs at all points in time, this is not necessarily the case. Modern portfolio theory in particular states that you can only manage point in time risk and return, implies that you cannot directly manage absolutes (liabilities) and that the asset allocation of each portfolio (given uncertainty going forward) should be the same for all irrespective of financial needs.

2.1 Retail asset allocation services

There is in fact a great deal of confusion over just what asset allocation is and what it does and this is best represented in the various claims made by many of the simple asset allocation services available to the retail investor.

- They claim to adhere to modern portfolio theory and to provide an efficient portfolio when they can provide no more than a basic and constrained asset allocation.

    - Under the strong form of modern portfolio theory, the range of portfolios recommended conflict with the central tenet that each individual should hold the market portfolio (whatever that may be) or the market portfolio and the risk free asset. The retail mean variance optimisers operate under a weaker form of modern portfolio theory, allowing for a wider range of portfolio options. The weaker form implies that risk and returns and hence risk premiums are time dependent, or at least stable and dependable over time. This implied time dependency complicates and invalidates the efficacy of the mean variance optimiser. See time dependency section 4.1.3.

  - The mathematical models that produce the portfolios have several weaknesses incapable of providing an "efficient portfolio". See section 6.2, key weaknesses of the mean variance optimiser.

- They claim that asset allocation is some high percentage of return and therefore a portfolio will deliver as long as it has "asset allocation", when in fact asset allocation is where you are invested and is responsible for all risk and all return. See section 2.2 with regard to asset allocation and return for further information.

  - Indeed, the amount of risk and return varies according to the asset allocation, the price at which you allocate and the time frame over which you allocate.

  - The implication that asset allocation equals some high percentage of return conflicts with the implied modern portfolio theory rule that asset allocation is made under uncertainty over the distribution of future risk and return. All that should be certain is the relative price reaction. Anyone who uses a Monte Carlo simulator and follows modern portfolio theory is effectively modelling the range of risk and return that a recommended portfolio is facing. The only reason a mean variance optimiser uses return as an input is to calculate the efficient frontier.

  - Any advisor who provides a target risk and return for the portfolio from the optimiser software is in conflict with modern portfolio theory's assumption that all future risk and return is uncertain. All you can provide to the client is the expected range of random independent distribution of returns as would be determined, for example, by a Monte Carlo simulation.

- Many imply that by combining assets that have low correlations to each other you can actually increase your total return. There is an assumption that sum of the parts is greater than the whole and while the sum of the variances is indeed less than the whole, the return is neither greater nor less; the mean return of a mean variance portfolio is the weighed sum of individual returns. The only way you can enhance return is by managing the allocation over time which is not an implied function of a mean variance optimiser[4]. Managing allocation via rebalancing implies not only some form of time dependent return relationship, but it also implies a valuation risk which would not be possible in an efficient market.

- Most of the services that claim to implement modern portfolio theory also claim to provide portfolio personalisation. Under modern portfolio theory, personalisation of asset allocation implies a higher level of certainty over the distribution of risk and return than is accounted for under its own assumptions. Also as is discussed in section 6, mean variance optimisers cannot account for liabilities within its structure.

  - Modern portfolio theory states that all individuals should hold the market portfolio[5] at all points in time. The mean variance optimiser is incapable of personalising to liability profiles over time even if were to dispose of this strict assumption.

None of the weaknesses and few if any of the constraints that are imposed on these models to make them work are ever communicated to the investor and few investment advisors who use them are aware of their flaws and limitations.

- Most, if not all of the asset allocation models employed by the financial services industry fail to include transaction costs in the models. Reducing asset allocation components' return by the transaction and management costs would dramatically change the recommended asset allocations produced by these models.

[4] Much confusion over risk and return has been caused by the use of arithmetic returns, necessary in mean variance optimisers. Arithmetic returns are adjusted down by high volatility, but when we talk of a higher return investment we should be talking long term geometric returns, which are already adjusted for volatility.

[5] Risk aversion can only affect the cash allocation, not the allocation of the market portfolio.

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- Most services use (expensive) actively managed funds. Use of actively managed funds contravenes modern portfolio theory's belief in complete uncertainty over the direction of future price movements.

…portfolio theory at the retail level is stuck in the 1950s.

The academic community is well aware of many of the weaknesses of the mean variance construct even in trying to get it to implement a modern portfolio theory solution. Much of the current work into mean variance optimisation is focussed on reducing the estimation errors on inputs, on how to develop more robust and stable asset allocation outcomes, on how to deal with liabilities (financial needs) and how to make these models adjust to the dynamics of time. In most instances, all that has been achieved is a morass of mathematical complexity.

The relevance of modern portfolio theory for the private investor is effectively no more than the covariance and, portfolio theory at the retail level is stuck in the 1950s.

2.2 Asset allocation and return

There is a certain amount of confusion as to what "asset allocation" is or is not capable of achieving, especially with regard to return. Much of the confusion and many of the incorrect references to asset allocation and return are derived from the 1986 Brinson, Hood and Beebower study into US pension fund returns over a ten year period between 1974 and 1983.

> The BHB study had nothing to do with promoting the asset allocation process or asset allocation objective of the mean variance optimiser even though many of the policy allocations may have been derived from such models.

The study compared the returns that would have been derived from the strategic or policy allocations to the actual returns achieved by the pension funds. The study analysed how much of the variability of the returns of the actual performance could be accounted for by the variability of returns of the strategic policy allocation. They found that, on average, 93% (R squared) of the variability of the actual returns were explained by the variability of returns of the policy allocations.

The results of the Brinson study did **not mean** that asset allocation was responsible for 93% of return. All it meant was that the average asset allocation of all the pension funds over the time period in question could well have been pretty close to the average policy allocation of the funds.

If your asset allocation is similar to a comparable benchmark then the amount of return you could have achieved and the variability of the return would have been very similar to the comparable benchmark. Take a significantly different position to an index and your potential returns and the variability of your returns will likely differ substantially from the index.

The Brinson study relies on the integrity of the policy allocation as a viable comparable benchmark against which to judge the benefits of asset allocation. In order for asset allocation to deliver a certain return, we need a structure that has been designed to achieve an optimal or efficient return in the first place. The study did not assess whether the allocations were themselves efficient and whether or not higher returns could have been achieved through alternative allocation mixes. In fact, if we presume that markets are efficient and market efficiency depends on point in time valuation and econometric frameworks and point in time allocations are recalculated, then it would be the static original policy allocation through time that is the deviation.

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2.3 Strategic policy and tactical asset allocations

The issue of static, strategic policy allocations and variable tactical asset allocations is one fraught with inconsistency.

If we assume that the policy allocation is from a mean variance allocation and we also assume market efficiency, then deviations from the policy allocation could well be due to the market efficiently valuating market components at a point in time; note that a market index which is supposed to be efficient under modern portfolio theory has allocations to constituents which change over time, yet these are not considered deviations from a policy allocation.

Rebalancing is effectively stating that you believe the market has wrongly valued a market component and that you can manage risk and return more efficiently by reallocating back to the original policy allocation. Reallocating back to the policy allocation should logically invalidate the original policy allocation if the above logic holds true.

Once you step outside of the modern portfolio theory/mean variance prescription, then there is no rationale for the existence of a static strategic policy allocation, thereby invalidating the BHB analysis and its "asset allocation" conclusions, including those conclusions falsely construed.

The concept of a static strategic allocation that is fixed over time is also alien to any investment discipline that believes a) that risks and returns of assets classes and individual securities vary over time and b) that returns are dependent or mean reverting.

If the policy allocations are strategic allocations designed to optimise risk and return at a point in time relative to the time frame of liabilities/consumption, then the strategic allocation should change as relative and absolute valuations and time dependent asset and liability relationships change. This means that the strategic allocation should be a dynamic one. In this context there is no such thing as a fixed policy allocation and all tactical changes should be strategic.

The only place where a static allocation framework should exist is in an equilibrium model. This model would only be used to create and manage strategic allocations based on the deviation of current risk/return relationships from long term equilibrium risk/return relationships. Since we are always at a relative position from equilibrium, or disequilibrium there is no "policy" allocation in the sense of a static strategic allocation. The strategic allocation should represent the optimum allocation at all points in time and should be dynamic.

In many ways the Brinson study is red herring. Indeed, there is no mention of an "asset allocation return holy grail" in any of the core text of either modern portfolio theory or valuation based investment disciplines. Risk/return trade-offs yes, but no mention of asset allocation being a specific xyz% of return.

The real reason why the Brinson study has gained popularity is because of its implied support of the passive side of the passive and active investment argument and its implied support of mean variance asset allocation software. The passive versus active argument is that if you want to get 100% of the return of an asset class you buy the index, if you want more and take the risk of less you need to take contrary positions. Excluding costs, this argument in facts supports the fact that asset allocation is 100% of the risk and 100% of the return, whatever they may be.

2.4 The value added by static strategic asset allocation services

Even if we accept the shortcomings of the mean variance optimiser and its crude policy allocation, the problem with many of the asset allocation services is that they do not often practise what they preach.

While they may recommend a long term asset allocation structure between cash, bonds and equities and possibly a basic allocation within equities to domestic and international markets, they then proceed to choose

active investment vehicles with high asset management charges that are not related to an asset allocation policy within a market that would best represent the risk/return profile of the policy allocation.

> There is nothing wrong in selecting active investment strategies providing the risk/return and allocation profiles are covered within the structure that determine the asset allocation. The problem with "tactical decisions" is that quite often they are not related to an asset allocation profile derived from a valuation perspective and most mean variance optimisers cannot handle the more volatile assumptions of specific fund objectives (e.g. technology funds). If they were related, they would be strategic policy allocations and not tactical.

There is no point selecting a 30% exposure to say the Canadian market and then selecting the best performing funds of the moment to access that exposure if the allocation and valuation profile of the funds are not generated by the allocation policy.

If the static asset allocation outputs of retail asset allocation services are not efficient or optimum allocations and the tactical allocations have no underlying rationale, then what value does the average individual investor get from these services?

If they are going to be true to their static policy allocation roots, irrespective of the weaknesses of such, the cost of these basic asset allocation services should be next to nothing and, should follow the implied prescription of Modern Portfolio Theory and the Brinson study; buy index funds and stick to the "strategic" asset allocation irrespective of market conditions.

It would seem logical that basic mean variance asset allocation services should be invested in no more than exchange traded funds costing the individual investor no more than online brokerage commissions and the low annual MER, plus a nominal service cost for rebalancing and maintaining the allocation over time. Why is the ordinary investor paying 2% to 4% a year for often very basic asset allocation services when they could be paying a fraction **(2/5th to 1/10th)** of the cost?

2.5 Active versus passive investing

Passive investing acknowledges that if you want to consistently beat the market day in day out you have to be one of the first to buy and one of the first to sell (more or less) and that the ability to consistently beat the market given that the market reacts instantaneously to new information is next to impossible. You do not need to have a brain to push a button to buy on good news and sell on bad news!

It is interesting to note if you are in a one period model where future price movements are random and independent then you cannot allocate in accordance with value, only the sensitivity of price movement to new information. So valuation based disciplines are ruled out at a very early stage in modern portfolio theory. If you cannot perform on price at a given point in time, you cannot perform at all could be another implied conclusion of modern portfolio theory and support for indexed investment.

Passive investing arguments also recognise that many active investors' asset allocation is fairly similar to that of the market; a position often taken in order to avoid the risk of under performance. In this instance the benefits of slight deviations from the index are more often than not outweighed by transaction costs and the higher management costs of active investment strategies.

Passive investing also acknowledges that the performance profile of many styles tends to go in cycles and that predicting or timing investment based on price movements alone is extremely difficult and that the law of averages, adjusted for transaction and management costs means that it is difficult for all but the marginal active investor to outperform over time.

As a modern portfolio theorist who wanted to manage market risk and believed that allocating on the basis of future return was too uncertain, allocating to an index fund would be the logical choice.

But, just as the arguments for passive indexed investment are logical, so are the arguments for valuation based passive investment styles that allocate according to the specifics of relative and absolute valuation at a point in time. Indeed, passive based valuation styles also implicitly believe in indexed allocations in the absence of relative pricing differentials. True value investing is a passive, disequilibrium investing style characterised by low turnover and could well be deemed to be tracking the true equilibrium earnings/price relationship.

The foundation of an efficient market implies the presence of rationale decision makers. These rationale decision makers should stop buying over valued assets (and may indeed sell them short) and will favour assets that are under valued. Indeed, if decision makers follow a rationale valuation and allocation policy you would see the market converge to efficient pricing, lower turnover and lower costs; you would also see at times of excessive demand for assets an increase in the cash allocation of rationale investors, which should stabilise markets. But markets clearly do not value rationally at all points in time and significant over and under valuation can and does exist as well as persist for long periods of time.

…value investing could well be deemed to be tracking the true equilibrium earnings/price relationship.

It is worth noting that to date the market can only adjust prices upwards for excess demand and downwards for insufficient demand, it cannot manage excess or insufficient demand to correctly value assets because it has no control over the allocation of cash and other assets within a portfolio. The ability of the market to price efficiently is also questioned when we consider that the financial intermediaries who are responsible for valuing prices have a conflict of interest. Most are rewarded financially for making those investment decisions and most are penalised for short term under performance. Indeed, it is easier for the financial intermediary to sell the best performing investment of the moment and for the portfolio manager to follow the trend. Therefore a large proportion of those responsible for making rationale decisions have interests which compromise their ability to make rationale decisions. **Indeed, part of the allure of the index fund is that it is free from the costs of such conflicts, albeit indirectly** affected by the decisions made under those same conflicts of interest.

The object lesson of valuation driven passive investing is that investors instead of seeking short term price performance should be looking to buy long term earnings growth. Unfortunately, this also implies a belief in time dependence of returns, something which is not allowed for within modern portfolio theory.

Value based investment styles and modern portfolio theory are therefore inherently incompatible and contrary investment disciplines, which effectively means in a modern portfolio theory world that attention to price movement is rationale and attention to relative or absolute valuation is irrational. One is an equilibrium pricing discipline the other a disequilibrium valuation discipline.

Passive index investing does not always lead to efficient pricing of risk and return and will at times reinforce negative valuation trends. These negative valuation trends can be damaging to an investor's ability to optimise their planned consumption of capital. In some ways an index investment can be viewed as a cheaper way of following the crowd.

In some ways an index investment can be viewed as a cheaper way of following the crowd.

Passive investing does not mean that rationale disciplined investors cannot out perform the market over time, nor that contrary positions to excess valuation are not important stabilisers in the market place, nor that rationale investors should not act rationally when it comes to valuing risk in over valued markets, nor that investors should not limit allocation at high market valuations in the interests of minimising the risks to consumption of capital and hence utility maximisation.

It is possible that movement towards efficient markets may actually be hindered by the use of passive indexed vehicles in a market where rationale investors' decisions are compromised. The market actually needs more independent "rationale/contrary" decision makers that are able to adjust their allocations to highly valued assets at peaks in the market and economic cycles – see section 4.3 for information regarding absolute valuation risks.

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Some may view hedge funds as contrary/rationale decision makers, although they again are exposed to the conflicts of interest of a performance driven remuneration culture. Indeed, it is precisely because of the hedge fund that modern portfolio theory could be construed as being in conflict over market efficiency. Many academics that have developed the theory and teach the theory are also the same academics that have developed hedge fund strategies that take advantage of market inefficiencies. If markets were efficient you would not be able to sell short and buy long and make any more than the risk free rate of return in any period. Indeed, many hedge fund strategies are based on valuation differentials derived from period to period price dependent information. In disequilibrium you can earn more than the risk free rate or considerably less, depending on whether prices are above or below equilibrium prices.

What this implies is that most investors are not rationale and that rationale agents capable of pricing assets are needed to stabilise the system. In this sense, it should be irrational investors that should hold the index and rationale investors that price. But what if those charged with responsibility for stabilising the system were also operating under intense conflicts of interest?

There is an inherent paradox in modern portfolio theory's view of efficient markets and the construction of efficient portfolios based on price sensitivity to new information. Stocks are priced as a multiple of earnings. This must presumably mean that they are either priced for the future based on estimates of future growth, or based on the past by extrapolating forward, or a combination of both. Under modern portfolio theory past movements cannot influence the present and the future cannot be used to determine the direction of return. It is extremely difficult to visualise a valuation or factor framework that can use only one time period of information to price at a multiple without inferring some historic or future dependence for risk and return. The pricing of risk cannot be based on unknowns but known and relatively stable relationships.

Therefore if rationale investors are assuming price dependency and market efficiency depends on rationale investors, then what of the assumption of random independent price movements.

In truth it is the law of supply and demand that makes it impossible for the average investor to outperform and costs likewise for a further significant percentage of the balance. Indeed, markets do not even need to efficiently value stocks in order for index investment to provide the best average solution.

But the biggest concern over indexed investment if markets are not efficient at pricing risk and return is the fact that excess demand causes the value of an index as a whole to rise above the ability of the underlying assets to deliver the earnings growth that justifies the risks. The market is a cyclical animal, dependent on supply and demand conditions and its pricing is exposed to the impact of excess demand for shares at the peak and excess supply of shares at the trough. An index fund is only an efficient solution when those determining asset and security allocation are acting rationally. At the present moment in time, index funds are most likely a *second best solution*. If the market were truly efficient and adjusted for excess/insufficient demand for assets, then it would represent a best solution – see section 4.4 on relative valuation for more information.

Rationale investors with the resources to do the job properly could well use index funds or components when an index allocation or component reflects the best combination of relative and absolute value. Irrational investors should use the index alternative all of the time, irrespective of relative valuation, because this is where many would be invested but at a much larger cost.

2.5.1 What percentage allocation to index investment?

Interestingly enough, while diversification is erroneously termed the only free lunch in investment, index investments appear to be just that. In an efficient market place, an index fund would need to pay a fee to the pricing agents who have spent time and money helping the market set prices. If they do not, index funds could be deemed to be "downloading" for free the work of active investors.

It is also interesting to look at just what percentage of the market place should be allocated to index fund investment. It is worth noting because while index funds may well be a low cost way of earning the market

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return, they are not efficient methods of allocating capital to the market. Someone needs to be allocating the capital invested by holders of index funds and those reallocating capital need to be paid and the payment is most likely the return differential on the inefficient allocation of capital by the index funds themselves. Active managers would need to be selling short and buying long.

Currently index funds allocate according to the prices set by active investors. The greater the allocation to index funds as a percentage of the market place the greater the effort needed by active investors to reallocate capital. The greater the allocation to index funds the less diversified rationale active investors must be in order to move prices at the margin. The greater the allocation to index funds the less efficient the market becomes in the initial allocation of capital, the greater the need for and the potential return from active investment.

Index investment would appear to invalidate the modern portfolio theory premise that all rationale investors should hold the market portfolio.

Who would provide the capital for the active investors? Would all investors hold a percentage of the index and a percentage of the active? In this case, investors would end up paying very high fees for the active management which would more or less offset the low fees on the index approach. Who would shoulder the risks of active investment?

It is most likely that when we are talking about efficient markets and investment in efficient markets that what we are talking about are point in time relative and absolute valuation frameworks that allow investors at a low cost to efficiently allocate to markets in general, without the constraints of the static index approach and the costs of current “active” asset allocation services. These allocation models would be set by independent agents (no transaction and no performance returns) and would reflect the pricing of rationale agents adjusted for the impact of relative and absolute demand and the actions of irrational investors in the market place.

One of the major barriers to the development of efficient markets is the current distribution framework of wealth and asset management services and products. It is labour intensive, it is sales and performance orientated and it is dominated by players who transact, manage and sell at the same time as purport to advise and act in the client’s interest. Allocation via the current medium of active management is inefficient, indirect and expensive, but it is the only route for many to the necessary asset allocation medium.

Hence the static index fund, which is really borne of the inefficiency of the current system and while its price efficiency and independence may be reflective of a truly efficient market place, index funds as we know them are not market efficient.

The development of an efficient market place depends on the development of a much more efficient interface between the investor and the capital markets. This interface will be the integrated asset and liability management frameworks discussed in sections 4 and 5.

We are still some way from an efficient market place.

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3 Asset Allocation, Diversification and the Market Portfolio

Some say that diversification is a separate issue from asset allocation. In terms of managing the risk of uncertainty of price movements they are essentially the same, although you could argue that diversification manages risk at the level of the individual security while asset allocation manages risk at the "market portfolio" or the asset class level.

At a point in time, both manage risks that are caused by changes in absolute and relative demand for one asset or asset class relative to another asset or asset class. Both, in terms of modern portfolio theory are meant to manage the risk associated with uncertainty over the future size and direction of price movement due to movements in relative and absolute demand.

Within a valuation driven investment approach, diversification is also a return management platform. Given that modern portfolio theory implies not just uncertainty over the size of return but also its direction, diversification in modern portfolio theory is a point in time risk management platform.

Modern portfolio theory is more concerned about short term price movements while valuation driven methodologies are more concerned about the price of earnings and the growth of earnings over time and are therefore time dependent or time diversification methodologies. Modern portfolio theory believes that future price movements are uncertain, random and independent and, are therefore just as likely to fall over time as rise. Therefore it cannot over weight assets it considers are going to produce the highest return over time because these assets are currently "correctly priced" and no-one knows their future returns.

The following will focus on diversification and asset allocation as point in time risk diversification strategies.

Diversification on one level seeks to manage the specific risks of individual investments and the impact of changes in relative demand for individual securities within a given market.

Assuming no new cash investment in a market, selling one asset in order to buy another causes the price of one asset to fall and the price of another to rise; in this case both absolute and relative prices change. A cash purchase on the other hand causes a change in the relative price of both and the absolute price of one. Assuming these relative price differences persist, an undiversified investor would be exposed to either a fall in price of their investments or would under perform the return they could have had if they had held the other assets.

If you do not want to be exposed to the risks (changes in relative demand) of buying and selling by other investors, you buy the market portfolio or the index for that asset class.

As we increase the number of securities within a portfolio the exposure to specific risk reduces, as does the benefits of exposure to specific return. The more securities we hold the less exposed we are to changes in demand within the asset class and the more likely our risk and our return is likely to reflect the risk and the return profile of the market for that asset class.

At the generic investment level, market risk within an asset class is the impact of changes in absolute and relative demand for assets within that asset class. In modern portfolio theory market risk is the price movement of a security as new information/demand enters the market place. As new information and demand enters all prices adjust to the new risk/return paradigm. As such, if these price changes occur the instant new information enters the market place, the only risk you can be rewarded for within modern portfolio theory is market risk, whether you are diversified or not. Since you do not know what the new information will be and will not have the time to act on it before other market participants, the ability to earn a return from active management is severely restricted.

If your stocks have a higher price sensitivity than the market, then you are rewarded for taking more market risk than the market and vice verse, this is the only way you can engineer higher return in the modern portfolio theory market place. The market portfolio for an asset class is the most efficient combination of assets for that asset class in that it should provide for the point in time the best risk/return trade-off.

Market risk is the sum of all relative price reactions and is measured in the Capital Asset Pricing Model as beta and beta for the market is 1. But market risk can in itself by a very dangerous risk as investors in the major indices in the late 1990s found.

There is a problem with the concept that market risk is the only risk you can be rewarded for taking. In a one period model with no prior or future dependency of price movement, it is only new information that can affect the relative or absolute direction of a price. If prices are efficient then you cannot know in advance of the new information where a potential price differential will develop. However, if prices are dependent and price movements are as much influenced by the impact of demand in response to positive or negative price movements, significant valuation differentials can and do develop. Market risk is therefore not the only risk you can be rewarded for; in fact at certain points in the market cycle absolute valuation risk is the predominant risk factor.

Because excess demand for an asset class is more likely to flow out of the most highly demanded and therefore most liquid component of that asset class, full diversification to the market can expose an investor to significant valuation risk. The asset allocation and the diversification proposed by modern portfolio theory are only efficient in an efficient market place without demand imbalances. This places doubt on standard deviation's importance as a central measure of risk, since its dominance is dependent on conditions which allow for efficient valuation of risk and return, something which clearly does not happen at market peaks and troughs.

Presumably the one period model is not only representative of market efficiency but also an economy at equilibrium. If this is the case modern portfolio theory needs to be able to account for asset allocation decisions when an economy is out of equilibrium which it does not.

In an efficient market place where the transmission mechanism of changes in economic variables are known, rationale and efficient investors "will" possess a decision framework (factor (?) valuation (?) and econometric) that relates new information/demand conditions into changes in the price of the security. In an efficient market place new information affects prices in terms of the sensitivity of those securities to the new information. If the models and frameworks used to price information and demand are correct, price sensitivity should be a good guide as to how much a share or a portfolio of shares should perform for a given change in the main market index. This is where the rationale for beta comes from[6]. The trouble is that beta is an average covariance relationship, whereas in a dynamic market and economic environment sensitivity to information is dynamic and evolving.

Holding the market index for equities is only a risk if the absolute demand for equities falls, whether this fall is engineered by a change in relative demand for equities amongst all asset classes or a fall in absolute demand for all asset classes. In this sense, market risk is the risk an asset class is exposed to when total demand for that asset class fluctuates for one reason or another and the risk to the market portfolio when absolute demand for all asset classes changes. This risk can only be managed by diversifying across all asset classes in the "market portfolio", in other words diversification of asset allocation.

[6] It is noted that beta has not proved to be a reliable indicator of price sensitivity to new information. This is likely due to the fact that not all demand efficiently or rationally prices risk and because market and corporate fundamentals are dynamic and changing. Multi factor models have been more successful, but this only acknowledges that risk and return is a complex and dynamic process that is not constant, but evolving.

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If you are fully diversified within an asset class (for example Canadian equities) you would hold the index. In this case you would be fully protected against changes in the demand for any of the constituents of the index. But, you would still be exposed to the impact on prices of money moving into or out of the asset class.

As long as demand for an asset class remains constant, efficient diversification within the asset class will manage the risk of changing relative demand for the constituents of that asset class. In this case, as shares go up and down in price in response to changes in relative demand, the overall value of a diversified asset class portfolio should remain constant[7].

Relative demand can move from equities to bonds, to property, to commodities and to other assets and vice versa. If you are not allocated to other asset classes you will not benefit from the increase in their valuation and will be exposed to falling prices in the asset class liquidity is leaving. This conclusion does not mean that you should be fully diversified across all asset classes, just that if you want to neutralise point in time changes in relative demand for all asset classes within the "market portfolio" you need to be fully diversified within the "market portfolio". Obviously, this also depends on your view of market and economic equilibrium.

If you believe in market inefficiency at managing absolute and relative demand in a disequilibrium model with time dependence returns then you will not wish to allocate to the market portfolio unless the market portfolio is at an equilibrium valuation.

If you believe in market efficiency and an equilibrium model of time independent returns, then you would hold the market portfolio, because you cannot diversify relative to any point other than the current point in time.

Finally and most importantly, when we talk of market risk in a modern portfolio theory model we are talking of normal market risk and normal market conditions and not the extreme risk we see resulting from periods of significant market and economic imbalances; the Crash of 1929 and 1987 and the bear markets of the 1970s and 2000-2003 were not normal risks.

In a modern portfolio theory construct market risk is a rationale relative price movement that moves a market from one equilibrium point to the next. Therefore, the modern portfolio theory construct cannot handle or manage times of great financials stress. During such times liquidity (demand) is more likely to flow out of the market portfolio to broader monetary aggregates and cash, thereby negatively impacting market portfolio structure. Being fully allocated to the market portfolio will not manage such risk, since such risk should not exist in an efficient market place.

Note that cash cannot actually leave assets and that total cash balances do not increase when people sell assets, just that the fall in demand for assets increases the allocation to cash as a proportion of the overall portfolio. Also note that most financial crisis are the result of accumulated imbalances in either the asset market or the economic market place. Few crisis are the result of bolts from the blue new information.

If modern portfolio theory's views on the independent direction of risk and return over time are incorrect, the conservative diversification and asset allocation policies that it prescribes could end up reducing potential return and increasing risk.

We are always out of equilibrium and at times relative and absolute valuations will deviate "significantly" from their equilibrium allocations. Modern portfolio theory cannot deal with this risk/return paradigm, only a time dependent and dynamic asset allocation discipline can.

[7] If we assume no transaction costs, no bid offer spread and no corporate failures; in other words no loss of liquidity from the market.

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3.1 The market portfolio and the economics of consumption, savings, investment and production

Looking back at historical risk/return profiles of assets we see that equities are a very high risk over short periods of time. We also know that different types of lower risk security offer different types of capital guarantees over time and lesser or greater certainty of income.

It seems perverse that securities that have been developed with the specific purpose of allowing investors with different financial objectives to participate in the capital markets, cannot be used to personalise a portfolio to the consumption profiles of an individual over time.

Yet this is precisely the prescription of modern portfolio theory. Instead of allocating assets in accordance with the short and long term risk profiles of assets and financial needs, all investors must hold the same "market portfolio" of risky assets.

This is unfortunate because it does not help us maximise future consumption for those who will not need to access their capital for some time, nor does it helps us to enhance the certainty of short term consumption of capital for those who are consuming capital. One portfolio cannot possibly fit all financial needs all of the time. The problem is further complicated by the fact that there is no strict definition of the "market portfolio". This makes an assessment of the structural strengths and weaknesses of the market portfolio impossible.

Every individual will have a different consumption profile and time frame and the balance between current consumption and future consumption will be different for each individual. In this sense the market portfolio should represent the sum of all individual portfolios as they relate to their current and future consumption.

As an "equilibrium model" modern portfolio theory's market portfolio may well be representative of the average consumption, production, savings and investment decisions in the economy. In order for modern portfolio theory to have relevance, its simplifying and restrictive assumptions must correctly represent the fundamental nature of asset class risk and return. If the relationship between asset risk and return over time is dependent on long term fundamental economic relationships, then the relevance of the market portfolio to each individual portfolio decision is lost. Indeed, once we look at dependency, we note that the nature of asset risk and return does change over time and because of this so should asset allocation. But dropping the assumption of independent price movements does more than just change the longer term relationship between asset allocation and liabilities, it also introduces the importance of managing absolute valuation risks to returns if a market and economy are in disequilibrium. It therefore adds a further constraint to the portfolio problem; opening up one dimension does not just change one decision, but the universe of decisions as they relate to the new dimension.

The belief that markets are point in time "efficient" and that the future is random and independent has neatly taken away responsibility for modern portfolio theory to manage market and economic risks to the ability of assets to meet individual financial needs/consumption of capital over time.

The efficient market portfolio is not something which is bought, but something which is built; it is a consequence of economic savings and investment, consumption and production decisions.

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4 Fundamental nature of asset class risk and return

Modern portfolio theory believes that the size and direction of future returns are random and independent. This means that a framework that adjusts asset allocation to the time frame of consumption based on the perceived historical risk/return characteristics of asset classes over time cannot exist. It also believes that markets are efficient at pricing risk, which also by implication assumes that market and economic activity is at equilibrium.

If markets are efficiently pricing risk and markets and economies are at equilibrium and future price movements are independent, then not only is it impossible to structure for the future, but there are no disequilibrium risks (excess return/excess risk) to manage.

The only risk that exists and that can be managed is standard deviation or the alternate sensitivity to market risk (beta), which is the relative price reaction to "new information" within an economy at equilibrium, or the transition of an economy from equilibrium to equilibrium. All that remains within this model is to select the mean risk return trade of associated with the sensitivity of price to new information.

Take away random and independent and add random and dependent and all of a sudden the allocation of risk and return and its relationship with financial needs/liabilities/utility maximisation is time dependent. That is asset allocation relative to financial needs is dependent on the nature of asset class risk and return over time.

Take away equilibrium pricing and we move into a universe of disequilibrium, which brings additional dynamic risks into the asset allocation and risk management problem. This moves us away from a point in time to over time and from a stable to a dynamic risk/return dimension.

In this context we should look at the size and timing of financial needs in determining optimal asset allocation where the "one size fits all" market portfolio of modern portfolio theory ceases to have relevance to the individual and ceases to be efficient. In this context we also need to manage the significant risks associated with disequilibrium; these are called significant market and economic risks and are defined as absolute valuation risks.

As such the "market portfolio" becomes the sum of all individual economic and portfolio decisions and the importance of point in time "market risk" alone defers to the management of point in time risk and return relative to point in time financial needs and asset risk and return over time relative to financial needs over time.

In the world of random dependent, disequilibrium, no portfolio theory is whole without a statement of the fundamental nature of asset class risk and returns that underpins its structural foundations and risk/return management methodology.

Since much of this document's criticism of modern portfolio theory is based on the fundamental nature of asset risk and return over time and short term "absolute" valuation or disequilibrium risks, this section focuses on these important topics. Without such statements it is impossible to reconcile a portfolio theory with its structural objectives. In the case of the individual this objective is that of maximising short and long term utility by optimising the allocation to short and long term financial assets relative to the short and long term risks to the ability of these assets to meet financial needs.

The fundamental nature of assets is important in that it ties the portfolio to both the portfolio objective and the economic imperative.

The economic imperative is to produce goods and services for consumption at all points in time and the portfolio objective is to allocate capital for current and future consumption through the management of risk and return at all points in time.

A portfolio theory that can maximise utility of capital will also complement the consumption, savings, investment and production decisions of the economy. The fundamental nature of asset class risk and return is divided into two components.

a) The fundamental nature of asset class risk and return over time (long term equilibrium relationships).

b) The fundamental nature of risk and return at a point in time or short term disequilibrium relationships.

Once we understand the significance of the two components we find that we can develop a dynamic framework for the management of assets and the management of financial needs at a point in time and over time at the same time. We are not just managing asset risk and return at a point in time but its interaction with financial needs over time.

Also, as per the section on absolute and relative valuation, we can also develop frameworks that are better able to manage the significant risks to return resulting from deviation from equilibrium relationships. This section of the report starts with an introduction of asset allocation under uncertainty and explains why returns over time are fundamentally dependent and not independent.

4.1 Asset allocation under uncertainty

All asset allocation is asset allocation under uncertainty. The question is, what is the nature of the uncertainty and to what extent can we manage it through portfolio structure?

Modern portfolio theory believes that the future is not just uncertain, but each price movement is random and independent of the other. This view point is important, because under modern portfolio theory the future is no more certain than a toss of the coin and after each toss of the coin the coin returns to an equilibrium state.

> The fact that a market may be standing at high levels and the economic cycle long in the tooth has no bearing on the future price movement or the risks of future price movements within this model.

Indeed, a toss of the coin has greater certainty than the probability of future stock market returns, since the probability distribution of a stock's return (the historical returns and the frequency each return occurred) is much wider than heads or tails. A Monte Carlo distribution of future returns shows that the range of potential outcomes under a random sampling of an historic probability distribution widens the longer the time frame.

If we believe in this view of the world there is no way in which we can structure a portfolio for the future, only for the present point in time. It would appear that the best we can do is select a mean variance solution of past risks and returns, hoping that the "efficiency" of the decision frameworks underpinning the data is such that the resulting allocation is "on average" symmetrically mean variance efficient through all potential outcomes. This means that the relationship between risk and return must hold (that is the sensitivity of price movements to information holds at all times) and that standard deviation is an accurate measure of the relative price reaction to new information.

If the mean variance solution is not efficient at a point in time, but only an average solution across time then it will fail to deal with the impact of point in time price movements on utility maximisation even in an efficient one period model. While prices do not deviate from equilibrium in a one period equilibrium model, prices from one period to the next are relative. By stringing together a large number of independent time periods, as per the mean variance optimiser, we are actually creating a pricing relationship that is relative and hence deviates from the supposed equilibrium pricing relationship in any one period; this is caused by the model's reliance on a mean return absolute.

If the mean variance optimiser is point in time mean variance inefficient it is also point in time inefficient at maximising utility. Modern portfolio theory requires a more stable structure that can manage point in time risk and utility maximisation at a point in time irrespective of risk. Utility maximisation should not be a hostage to structure.

What if future returns are still uncertain but are instead bounded by time dependent relationships?

The range of randomly sampled probability distributions of the Monte Carlo in this case do not represent the future distribution of risk and return at any one point in time and the indifference of the mean variance structure to the size and timing of liabilities becomes a problem.

4.1.1 Random walks and mean reversion

When people talk of markets following a random walk they mean that the price movements in each period are independent of the price movements in any prior or future period. This is the case in an equilibrium model because all price movements in equilibrium are dependent on point in time equilibrium relationships and not historical equilibrium relationships. Every period starts off with a new equilibrium and, new information or change occurs and a new equilibrium is formed.

Only the information or change in the next period is important and the information or change in the next period is also independent of the information or change in the prior period, otherwise by inference price movements would be dependent.

> This view is difficult to reconcile within a model of real world market and economic relationships where output growth in the next period is related to output growth, investment and demand growth in the current period and where even the impact of unknown shocks depend on the structural relationships and imbalances in a prior period. It would seem logical that even an equilibrium position is built upon the foundation of previous equilibriums and that the information and relationships in the previous equilibriums would have an impact on the current equilibrium relationships.

The only way to model the future of a random walk is to assume that past distributions of price movements are derived from efficient pricing of risk and return and to randomly select from those past distributions (or relationships) a probability distribution of future price movements. One of the best approximations of such a future is considered to be that performed by a Monte Carlo Simulation and derivatives thereof.

If you believe in the random walk hypothesis you need to understand just what exactly it is referring to. A “random walk” relates to the observed random movements of molecules in liquids and gases. The random walk hypothesis ignores the fact that universal relationships are not all random and independent; the rotation of the earth, the speed of light, the force of gravity are all bounded by the laws of the universe. It is indeed strange that the movements of share prices are assumed to be unrelated to any prior equilibrium or equilibrating force and are only bound by the equilibrium relationships of each point in time.

Yes, the movement of molecules in gases are random and independent. They are random and independent because there are millions of molecules all blindly moving in close proximity, knocking into each other and knocking each other off course. However, if we look at other relationships, the rate at which molecules move when heated, the rate at which liquids cool and molecular activity slows we find more dependent relationships. .

It is also important to note the difference between a toss of the coin and the movement of a share price. Every time you toss a coin you go back to the start, or equilibrium. However, if you are moving away from equilibrium the probability does not reset.

There are also those who believe that the distribution of returns actually narrow and move back towards the mean historical return of the asset or asset class. This is backed up by the observed tendency for stock

markets to fall when price/earnings or other relationship becomes stretched by historical standards or rise when valuations relative to the economic cycle become compressed relative to historical norms.

Proponents of reversion to the mean are not without their critics, but these critics tend to be those who believe markets and economies are at equilibrium. These people therefore believe that reversion to the mean can be assessed in the same probabilistic format of random walk modelling. If you toss a coin 500 times and all outcomes are heads, under the probabilities format it would be impossible for the next 500 tosses to be tails. Such a simple analysis is often used to criticise arguments for the existence of mean reversion, when in fact mean reversion is based on something entirely different.

At the heart of reversion to the mean is the idea that the further you move away from equilibrium the greater are the forces moving you back and this has nothing to do with probability. However, you can only revert back to the mean if it was the mean that you reverted from. Moving back to a point that is not equilibrium has no rationale whatsoever, even if occasionally you may pass through this point in subsequent deviations from equilibrium.

The problem in markets is that a) the mean return changes over time and, b) is dependent on valuations and factors which drive valuations over time. While earnings should grow more or less by the nominal rate of growth of output, share price relationships and hence mean returns can be impacted by long term declines in interest rates, inflation and the expansion of price relatives such as the P/E ratio. It is possible for a market to keep moving away from a previous equilibrium point for decades, indeed the old equilibrium point will have shifted if any of the factors determining a valuation relationship have changed. This does not mean that mean reversion does not exist, or that the reversion must go back to the original mean (since it clearly cannot unless the relationships revert back to those determining the old mean), just that statistical analysis alone may not pick it up.

Much of the criticism against mean reversion arguments tends to come from those who view mean reversion arguments as supporting investment at any price. Buying at extreme valuation levels will mean that your "mean return" will never ever reach the mean of the equilibrium relationship. Likewise, if historic mean return is based on a lower interest rate/higher price multiple environment and the market moves once and for all to a higher interest rate/lower price multiple environment and, you buy immediately before the market shifts, your "mean return" will never revert back to either the previous or the new mean return relevant to old or the new underlying equilibrium relationships.

Although it must be noted that an in an equilibrium model there is no deviation from the mean since all deviations are new equilibrium relationships, which means no reversion to the mean. Mean reversion, or the tendency that is called mean reversion is merely price movements in disequilibrium.

4.1.2 A relative equilibrium relationship

Modern portfolio theory implicitly assumes that each time period relevant to a share price movement is in equilibrium, but it does not state how equilibrium is achieved in each time period. Since it also believes that prices movements in each period are independent of any prior time period/equilibrium point, it is unclear how the model moves from one equilibrium point to another.

> Many economic and market shocks are due to the build up of excess and much of the direction of movement is dependent on where in the market and economic cycle and hence how far from equilibrium markets and economies are. Even changes in growth rates of money supply are dependent on prior period relationships that occasioned a need to raise or reduce interest rates. Therefore most movements are movements to or from equilibrium and the size and direction of most shocks are due to the extent of the relative deviation from a position of equilibrium. Ergo movements are dependent on equilibrium or equilibrating relationships and prior deviations from equilibrium.

The economy probably never reaches an equilibrium point for a number of reasons. Populations and the growth rate of populations are always changing, money supply growth rates are always changing, new investment is being made and tastes and preferences are always shifting and not all allocation of demand

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and capital and investment is rationale or efficient. Ergo market and economic movements are therefore dependent on both prior and current equilibrium relationships. In this sense equilibrium is constantly mutating and evolving, building upon and in conflict with prior equilibrium relationships.

It is therefore likely that at any one point in time the equilibrium point relevant to that point in time is some way off and the prior equilibrium points are ceding to new, but not wholly or completely. Because the relationships under pinning equilibrium are always changing, the equilibrium point and the equilibrium relationships will keep on shifting, pretty much like a horizon. The closest we can get to equilibrium is probably the equilibrium growth rate of output which reflects the evolution of current demand and output relationships. This equilibrium growth rate of output is constrained by fundamental economic relationships governing output growth. So effectively there is a law that governs relationships between current and future equilibrium points and this is the law that governs the growth rate of output.

It is the market's relationship, or the market's pricing of assets relative to these dynamic equilibrium points that is of interest within a portfolio theory and it is the dependence of price movements and information or change that leads to changes in economic and market demand and supply conditions that is important for short and long term management of risks to returns of a given asset allocation strategy.

In truth the past, the present and the future are all related, equilibrium is an expanding space/time continuum, and our relationship with equilibrium is always a relative one. Disequilibrium is also therefore a natural state indicating the distance in time and space from the equilibrium point and the evolution of the equilibrium point. This means that price movements at a point in time are also naturally time-space dependent, though still uncertain.

4.1.3 Time Dependency

If you are a modern portfolio theorist, it does seem odd though to call a movement that is rationale and efficient at a point in time, random. In an efficient market place, a share price movement is not random, it is calculated and it has purpose.

This is in contrast to the Brownian movement of molecules whose direction is thwarted by the movement of other molecules, thereby preventing them from moving efficiently to where they want to go. Brownian motion is inefficient.

Presumably it is the information underlying a purposeful price movement that is random from period to period. Otherwise, if we are really comparing point in time share price movements to Brownian motion, we are actually stating that point in time movements are not efficient, but thwarted or pushed by all the contrary or herd like decisions in a market place.

This would suggest that markets are point in time inefficient in pricing risk and return. In fact, if we took Brownian motion literally it would a very long period of time for a market to efficiently price information, indeed perhaps never at a point in time. Perhaps this really is more like the market, always moving towards equilibrium but never getting there.

This does raise questions as to what market efficiency actually means. Could it be that it is the market's inefficiencies that make it next to impossible to exploit the real valuation differentials at a point in time? In this case markets would be inefficient at a point in time and you could only exploit price differentials over time by allocating according to valuation and not on price sensitivity to information or change.

It is nevertheless true that it is virtually impossible to predict the direction of the price of a share on any given day. There are just so many factors that impact on its movements that we have little or no control over its point in time direction. Indeed, over short time periods share price movement is outwardly very similar to the movement of molecules in liquids and gases.

However, we know that a share has a relationship and this relationship is the company and this company produces goods, bears costs and makes a profit and that an index has a relationship with all the companies in an economy. Since the share should reflect the price of current and expected future earnings, the movement of the price of the share is ultimately dependent on the earnings of the company over time and factors that drive those earnings. Over the short term the share price can deviate, for a number of reasons, from the ability of the company to produce the future earnings implied by the price relationship.

Note that the relationship between the share price and the earnings from it should also be viewed in the context of the long term relationship between growth in output and the growth in savings/asset demand from that output. Share prices are demand driven and over the long term demand is a function of growth in output; over the short term demand can deviate because of excess/insufficient money supply growth and a preference for a higher/lower equity allocation. Too high a valuation is all about too high a level of demand relative to the long term demand relationship.

But the fact that a share price is related to earnings is not sufficient to prove dependency over time.

In order for share price movements (let us say the market) to be dependent, there must be some fundamental equilibrium or equilibrating relationship.

We know that factors that affect demand in the current period impact on supply in the next period and vice versa. We also know that price appreciation in the asset markets can affect consumption in future time periods and that significant accumulated structural imbalances can have significant long term impact on the economy.

Is it possible for demand and supply relationships to be totally independent over time? Are there no forces/rules/laws/imperfections that govern the relationship between aggregate demand and aggregate supply over time and are there no constraints on the boundaries of either movement?

In the real world there are relationships and constraints that limit or determine the interaction of demand and supply over time and there are constraints that limit the ability of aggregate demand to increase aggregate supply. We also know that the activity of central banks and governments can negatively and positively impact economic activity at different points of the cycle and that actions in one period affect activity in the next.

Ultimately an economy's ability to produce is limited by the amount of labour and capital it has and over time its ability to increase production is dependent on its ability to increase productivity through technological change and innovation. Likewise demand is constrained by the output an economy produces, the amount of this output that is consumed, the amount that is saved and the amount that is invested in productive assets.

We also know that short term shocks to the economy do affect output, consumption, investment and savings and that these impact on earnings. But we also know that over time these shocks are absorbed by the economy.

While we are never fully at equilibrium, because of continuous shocks (negative and positive) to aggregate demand and aggregate supply, we are always governed by the same laws of equilibrium and therefore disequilibrium by which demand and supply are constrained. As such, the physical laws governing the relationship between and the growth rate of demand and supply ensure that there is a time dependent relationship between share prices and their underlying earnings. Future price movements are constrained and time dependent, although obviously the longer the time frame, the less dependent a future action will be on a prior point in time.

An equilibrium model in which activity in one period is independent of activity in the next period is very difficult to visualise in the context of the dynamics of real world markets and economies. Obviously equilibrium models are important in isolating relationships and understanding how relationships adjust when new

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information or change hits a system but they should not be used to form the basis of a real world portfolio construct.

Stochastic models of uncertainty used by modern portfolio theory therefore ignore the important long term relationships that drive the equilibrium relationships between the demand for and supply of output and hence the demand for and supply of earnings.

> Instead of future movements being independent of prior period information and movements, returns can actually be imperilled through the accumulation of economic excess and structural imbalance often associated with strong prior market returns.

As far as the short term price movements are concerned, because of a) the constant shocks to aggregate demand and supply and b) the impact of changes in absolute and relative demand for assets, they may as well be independent in terms of one's ability to predict short term movement. They are as good as independent in the sense that you cannot rely on their fundamentals to create the certainty needed to rely on them for utility maximisation purposes over the short term. Since we live in a short term continuum, management of the point in time asset/liability relationship cannot rely on the time dependent fundamentals of equity investment.

We can only conceivably rely on it, to a greater or lesser extent, at a point in time forward from the present. If we want to benefit from time dependency of asset returns we need to be able to concurrently manage the uncertainty of the present and the time horizon. Importantly, as we will discuss, the risks of equity investment are not constant and no rules governing time dependence of mean reversion or time diversification of risk can be used to validate investment at any price.

4.2 Fundamental nature of assets

The returns on cash, fixed interest investment and equities are all returns on equity capital; equity capital is capital invested in productive assets and services.

A company that borrows from an institution will need to earn a higher rate of return than the loan. The institution that lends capital to the company will need to lend at a higher rate than the return it provides the lender of capital. Purchasers of fixed interest investment bypass the intermediary stage and earn the cash and the loan return but still forego the equity risk premium.

Purchasers of fixed interest investments and holders of cash can also be considered to be taking a short term hedged position with regard to the return on equity capital; exchanging the risk premium for greater certainty of capital and a fixed or floating interest rate.

Purchasers of equities earn all three components of return “over time”.

All three components of asset allocation (cash, fixed interest and equities) depend for their return on the return on capital. The return on capital is constrained by earnings growth and the cost of capital which are themselves dependent on demand and supply conditions within the economy. Purchasers of geared equities also earn the risk premium sold by holders of fixed interest or variable rate debt.

Cash, fixed interest and equities are all exposed to the same risks

If the return on all three components, over time, is determined by the return on equity capital over time, then all are exposed to the same long term economic risks.

Indeed, the fundamental rationale for long term equity investment depends on the sustainability of long term economic growth (an expanding universe) and views on growth are key to the pricing of the returns on equity capital. In the event of a long term economic decline, cash and fixed interest investment will only provide

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short term protection. Money only really has value in the presence of a healthy relationship between consumption and production.

Equities are naturally protected against long term inflation risk.

The important differential between equities and lower risk nominal assets is that equities are naturally "protected" against long term inflation risk. Nominal lower risk cash and fixed interest investments are not. The long term compounded risks of inflation effectively turns lower risk assets into higher risk/lower return investments over time.

> It is worth noting that mean variance optimisers by ignoring the benefits of long term compounding of returns in the risk/return trade-off, also ignore the long term compound risks of inflation to return on lower risk asset classes. They ignore the longer term nature of asset class risk and return key to managing risk and return and maximising utility over time.

This does not mean that equity investments are not exposed to short term inflationary shocks of long duration (interest rate changes impact economic demand which affects earnings which reduces valuation of future earnings) or that all real assets uniformly keep their real values, but that the nominal price of real assets is a function of demand and supply. A 10 dollar note stays as a 10 dollar note for all time, no matter what the supply or the demand.

> It is also important to note that equities are only protected against inflation of goods and services in the economy, but not in the case of deflation. Deflation of a limited duration benefits nominal assets and is a risk to real asset prices; falling prices increase the purchasing power of cash and a deflationary trend implies higher returns on cash than productive assets. Equities are also not protected against asset price inflation where the price earnings multiples expand and, hence the relationship between price and long term earnings deviates. Asset prices are at risk once demand imbalances stabilise, for example once interest rates rise and money supply growth falls. Asset price inflation is a risk to stock market investments – see section 4.3 and absolute valuation risks.

In an inflationary world there is only one fundamental asset class, the class of productive and real assets and the easiest way to hold a diversified holding of this asset class is via equities.

It is the long term fundamental nature of asset risk and return over time that reverses the short term risk/return relationship of cash and bonds relative to equities. This is logical and in keeping with the rationale for fixed interest investment in the first place.

Over the short term the return on equities is exposed to economic and market risk.

Short term economic risk is the natural risk of the business cycle (caused by demand/supply imbalances) and the short term risks to earnings and earnings growth that can significantly impact the short term valuation of shares.

Market risk in the generic sense is primarily a demand driven valuation risk that is exacerbated by peaks and troughs in economic cycles and peaks and troughs in relative and absolute demand for a security or asset class.

Markets appear poor at efficiently pricing risks to return at critical valuation points. One of the reasons may be a lack of focus on the impact of valuation risks to the ability of assets to meet financial needs, which would affect the relative demand for that asset class. Another reason is the impact of excess demand for "investment assets" during periods of strong economic growth when a) money supply growth is strong and b) relative demand within the portfolio decision shifts to the out performing asset classes of the time. A final reason is undoubtedly the conflicts of interest of those financial intermediaries and asset managers whose remuneration depends on transactions and point in time performance.

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The ability to identify, value and manage absolute valuation risks is important for the management of the initial investment decision and the ongoing management of excess risk and return. You cannot rely on the fundamental nature of asset class risk and return over time to make blind allocations to an asset class irrespective of valuation and this applies to any portfolio theory.

4.2.1 Fundamental rules

From the fundamental nature of assets we can derive the following rules that drive short and long term asset allocation in the consumption driven model.

- Future asset price movements are time dependent on fundamental long term economic relationships.

- Cash and fixed interest returns are components of and dependent on the return on equity capital. Over the long term, they are exposed to the same economic risks as equities. Irrespective of the direction of uncertainty, asset class returns are all dependent and exhibit stable long term relationships

    - Long term holdings of low risk assets do not diversify long term (economic) risks.

- Nominal lower risk assets are exposed to long term inflation risks making them potentially higher risk long term assets.

    - There is no fundamental risk management rationale for "long term" holdings of "lower risk assets".

    - There is no fundamental return management rationale for holdings of lower risk/lower return assets.

- Over the short term equities are higher risk investments because of their exposure to market risk (principally the demand driven excess valuation component of market risk) and economic risk (which amplifies market risk). These are disequilibrium risks and as such are natural risks.

    - Relying on capital invested in equities to meet ongoing short term financial needs will expose an individual to significant financial risk. The time frame of this risk is dependent on the degree of market and economic risk, the time frame of which varies.

- Over the short term, shorter term duration lower risk assets provide greater income and capital security. Certainty of income and capital is important for investors looking to maximise their utility of capital.

- If equities are higher risk/indeterminate return investments over the short term and lower risk/higher return assets **relative** to lower risk assets over the longer term, there must be a point at which the relative risk on equity investment falls below the risk of short term low risk investment and a point beyond which the uncertainty on equity returns becomes manageable[8].

    - This time frame is the period of "significant short term stock market and economic risk". Identifying and managing this time frame is key to optimising and managing the risks to both short and long term consumption of capital.

    - The allocation to low risk assets and equities is driven primarily by the size and timing of financial needs arising over the period of significant market and economic risk.

[8] Note that this does not mean that beyond this time frame that equities cease to be a risk, but that an appropriate structure should be capable of managing this risk and of keeping this risk distant.

- It is possible to isolate significant market and economic risk through an optimised construction, planning and management process.

4.3 Absolute valuation risk/Significant market and economic risk

You need to manage absolutes for a liability relationship and relatives for a risk and return relationship and both for an asset and liability relationship.

Absolute valuation risks occur when markets are at levels which expose new investors to a high risk of significant short term loss of capital and a significant risk of under performing low risk investment alternatives over very long time periods.

Absolute valuation risk gets confused with investment timing risk. Investment timing risk is the risk an investor exposes themselves to when trying to determine the best time to buy and sell throughout the market cycle to maximise short term return. Investment timing tends to use, amongst others, short term indicators of relative valuation between stocks and bonds to determine buying and selling decisions.

Absolute valuation analysis concerns itself with the long term risks to return posed by excessive valuations of future earnings caused by periods of excess demand for shares whereas market timing is primarily interested in predicting the direction of short term price movements. Predicting the movement of demand is different from being aware of its magnitude.

Absolute valuation risk is not concerned about the margin of short or long term return, but the margin of short and long term risks to return. If your portfolio objective is to maximise utility and minimise the risks to utility maximisation, you need to be concerned about this risk. Absolute valuation risks can impact investors for ten, twenty or more years.

> Indeed, it is odd that risks which are synonymous of disequilibrium are the precise risks to which many modern portfolio theorists point to as rationale for the management of point in time uncertainty through the market portfolio which is a portfolio constructed on average price movements.

Over the short term, market movements are indeed random and impossible to predict. In the short term market movements are influenced more by demand imbalances (disequilibrium) while over the long term, return is determined by supply or the equilibrium growth rate of output and valuation by the average long term relationship between savings and the equilibrium growth rate of output.

Ignore the fundamental long term relationships that govern return and valuation at your peril. All that you end up doing by buying at extreme valuations is to increase the amount of time you would need to hold an investment before the earnings from that investment justify the risk of holding it.

Market timing is a fools' game and so is investing at any price.

It is not difficult to determine when a market exposes investors to long term risks to return, but it is impossible to know when a market is going to rise or fall. It is important that the fundamentals of the long term relationship between the supply of return and the demand for return are understood.

- Over the long term "nominal" growth in earnings is related to nominal growth in output. Therefore long term returns on stock market investments are constrained by long term real economic growth.

- Growth in output is constrained by the amount of labour and capital in an economy and the growth rate of that output is constrained by the ability to increase labour, capital and the productivity of labour. Economies do not grow at the same rate as short term share price movements.

- Output and earnings growth rises and falls with the business cycle for a number of reasons. Future growth in output and earnings is likely to be lower than average at the peak of an economic cycle and higher than average at the bottom of a cycle.

- At the top of an economic cycle much of the recent profit growth may be due to excess demand, excess demand that may be taken out of the economy as interest rates are raised to curb economic activity. Risks to earnings growth and risks to prior earnings growth are therefore higher the more mature the economic cycle.

- Price earnings ratios should actually be falling the more mature the economic cycle to adjust for the risks to earnings growth and to reflect the fact that future growth is more expensive (the need to invest) and constrained by the ability to increase productivity. That price earnings ratios rise is more a function of excess demand for assets than an indication of the future potential value of the underlying assets.

- The higher the price earnings ratio the greater the dependence on future earnings growth. In this case, the higher the valuation the greater the reliance on future investment and future productivity growth. Indeed, the investment needed to generate future earnings may not have been made and the necessary growth in income needed to finance that future demand does not yet exist. The higher the valuation and the more mature the economic cycle, the greater the long term economic risks to returns. That is, the economy is incapable of producing the return needed to justify the share price.

- Low interest rates, high price earnings ratios, low risk premiums and an advanced economic cycle imply a high level of dependence on a very stable low risk investment environment and a very stable long term economic environment. There is no economic rationale for high price earnings ratios in an advanced economic cycle even during periods of stable low inflation and low interest rates. At such points in time valuations are being determined principally by excess demand for assets and irrational expectations of future returns.

- Long term absolute valuation of equities should be determined principally by the long term economic risks to return and not by short term bond yield relatives. In truth, equities become riskier the lower the interest rate, the lower the inflation rate and the more advanced the economic cycle.

- The time frame of equity investment should be related to the time frame of the economic risk associated with the valuation. The longer the time frame in which excesses (excess demand, excess production) have accumulated the longer the time frame it will take for excesses to work themselves out of the system. Longer economic cycles are more likely to accumulate excess than shorter cycles.

- Over time the growth of money supply needs to be related to the growth of output. Over short time periods excess money supply growth will cause prices of assets to rise. Over the longer term the price of assets depends on the long term relationship between money supply growth and output growth. Short term significant deviations from the average long term relationships are caused by temporary excess demand associated with temporary excess money supply growth. As soon as demand and supply readjust so do market valuations. Efficient markets ignore the influence of money supply on asset prices because the market's role is to allocate demand. Markets are therefore not efficient at managing absolute risks to return.

What the above means is that we need an economic and market valuation framework to assess the time frame of significant market and economic risk relevant to the risks of the initial investment decision, as well as the ongoing management of excess risk and return. This framework will need to be able to manage excess risk and return at the margin (the margin being the increase in the time frame of significant market and economic risk) for existing investors as well as managing the initial investment risk for new investors.

While one can understand an asset manager who is concerned about short term relative performance avoiding the issue of absolute valuation risks, portfolios dedicated towards the provision of current and future financial needs have to be aware of it and have to be able to manage it.

In a world where short term price movements are unpredictable but related to the long term ability to generate the earnings that underpin valuation, a portfolio theory that ignores absolute valuation risks ignores significant risks to utility maximisation.

Modern portfolio theory conveniently ignores the importance of absolute valuation risks within its structure by a) assuming that markets are at equilibrium and efficiently price risk and return, b) assuming future price movements are independent and c) by virtue of b implying that the direction of economic variables is also independent. In this case even extended business cycles and the associated excess demand for investment assets that occur during these periods pose no more of an investment risk than any other point in the cycle.

By ignoring absolute valuation risks modern portfolio theory constructs offer no viable entry or exit points for the management of significant risks to the ability of assets to meet financial needs over time. Economists have long acknowledged the risks of excess demand, yet financial economists are blasé about the impact of asset price bubbles. It may be because asset price bubbles are quick to adjust once a decline is initiated, but this surely ignores the very real risks significant declines in asset prices have on utility maximisation. In this sense you could say that modern portfolio theory is not concerned with the portfolio and its relationship with the investor, but prices and their relationships with the market.

4.4 Relative valuation

Relative demand moves to where current price expectations are greater and more certain, all else being equal. A shift in relative demand will result in a fall in the price of assets sold and a rise in the price of assets purchased.

If you have a market place with only two similar and equally priced assets (a and b), an increase in the earnings of one relative to the other will cause the prices of both assets to instantly adjust irrespective of the size of the shift in demand in the market place. The holder of the asset with the lower earnings will want to sell his or her asset because their share is overvalued and the other share is now cheaper. The holder of the cheaper share will not sell the cheaper assets unless he or she is able to purchase the other share at a price that will leave him or her in a no worse off position.

If prices did not adjust in the market place we would find that price relatives would diverge from current earnings and the current rate of earnings growth. Stocks earning more would be cheaper and stocks currently earning less would be more expensive. There would be a short term arbitrage opportunity and, it is this need to arbitrage short term valuations that can unintentionally initiate more pronounced deviations in relative valuation. It is this constant short term arbitrage that is considered to be “market efficiency”. Trying to beat this short term arbitrage is a difficult and almost impossible task.

Relative pricing and relative price movements are integral to market efficiency and efficient pricing. Stocks, sectors and market components will all be priced differently by the market to account for differences in earnings growth and certainty of earnings growth, the cyclicality of earnings growth as well as other factors such as size and liquidity. So prices in an efficient market should already start off at a relative position. If earnings, or earnings expectations or certainty and security of earnings changes over the short term you will find relative prices adjusted up or down.

In a modern portfolio theory efficient market with rationale investors setting equilibrium prices, arbitrage pricing would be the start and the end of market transaction process; new information, new prices, new equilibrium.

In a market characterised by disequilibrium (periods of significant excess demand and deficient demand), irrational investors, financial intermediaries and agents with conflicts of interest, market prices are not just

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affected by the initial short term arbitrage, they are affected by the level of demand for relative share price performance. Arbitrage in this market place is not the be all and end all of market activity and herein lies the rub.

We know investors prefer to be in rising areas of the market associated with relatively good news than areas of falling absolute or relative valuation associated with relatively bad news. We also know financial intermediaries and agents are also sensitive to the business risks of under performance. We therefore have an in built bias within the market place for buying rising assets and selling falling assets.

New demand coming into a market is therefore more likely to emphasise areas of higher potential relative return and/or areas perceived to offer greater certainty or security of return. It is because of this bias that relative pricing is likely to move beyond the rationale differential arbitrage to prices which reflect demand rather than return differentials.

In an investment cycle we therefore have the initial adjustment to relative earnings or relative earnings prospects followed by the larger shifts in demand attracted by the stronger performance characteristics of the rise in prices. Since demand is fundamental in share price appreciation, the performance continues to impress and the valuation continues to move further away from fundamentals. This additional price appreciation will attract further demand and will often result in further sales of under valued assets.

Relative demand impacts asset prices at all stages of the market and economic cycle as earnings and expectations of earnings growth change. The impact of changes in relative demand (as with absolute demand) is most pronounced during market and economic peaks, market and economic troughs and during periods of severe market turmoil. If excess demand for shares can cause markets to rise far above their ability to generate earnings growth to justify their values, then within a market there are likely components that are significantly and extremely relatively overvalued and significantly and extremely relatively under valued.

These shifts can be even more extreme when investors believe that there has been a significant once and for all shift in the relative attraction of a sector or component. In the late 1990s we saw a profound shift towards growth stocks based on the belief that new internet based businesses would take over the market place and supplant the older earth bound businesses. This trend reversed itself with a vengeance from 2000 onwards when relative demand focussed on small to medium companies and value stocks. We know that over time the relationships between sectors, stocks and market caps can move between periods of significant relative over and under valuation.

An efficient market place would manage relative value, it would also manage the allocation of absolute demand, since it is excess demand that is the primary risk in the market place with the relative allocation of that demand exacerbating valuation risks within specific market components.

4.4.1 Money supply and the realities of demand for stocks

A share that has risen in price does not mean that more people have bought it, just that those who want to buy it are willing to buy at the current or a higher price. It does mean that a greater portion of current demand is required to buy it, which means that a smaller portion of current demand is left to purchase other assets. The amount of shares held by the market does not change, all that changes is the price.

As in all instances, the price is determined by the marginal seller and the marginal buyer. In this context all changes in relative prices could easily be initiated by new demand, since past demand does not support share prices; the demand for these shares has long since passed onto the people who sold the shares. Current demand for shares at its most fundamental level is a function of money supply growth and the cash allocation decision within portfolios.

Whether there is greater or lesser demand for shares in a market, the total cash balances of all investors are unaffected by purchases or sales. Cash is not absorbed by the market, it is only transferred from buyer to seller.

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All that rises in share prices does is to create a new equilibrium allocation between cash balances and share prices. How money supply growth impacts share prices is discussed in Professor Tim Congdon's essay on "Money and Asset Prices in boom and Bust".

Diversification fully exposes you to market and economic risk

While modern portfolio theory's "asset allocation" seeks to diversify risk through exposure to the broad market in proportion to the broad market allocation, this fully exposes you to significant market and economic risk during periods of excessive absolute demand and significant relative price differentials.

4.4.2 Indexation and relative valuation

Within the mean variance structure we know that we can combine components with different relative price movements and that if we hold these components through the price cycle then we can average out the risks. But, for a rationale investor within a mean variance structure and in a market characterised by disequilibrium, this would only make sense if we were to start off from a point of neutral relative valuation.

The mean variance optimiser with its focus on covariance implies that in a market characterised by disequilibrium, relative price movements are the rationale for the mean variance structure. Since the mean variance structure also focuses on risk adjusted return, it logically follows that higher relative valuation implies lower return and higher risk and that relative under valuation implies lower risk and higher return. This means that the mean variance structure in the real world should fundamentally be a relative valuation structure and not a passive index structure.

We have touched on the mean variance dichotomy throughout this report. On the one hand it is designed to maximise return for a given level of risk on the presumption that historical returns and relative price movements are likely to be a good representation of the future risk/return trade-off.

On the other hand the logical implication of strong form modern portfolio theory with its belief of random and independent price movements, means that it is a symmetrical model of relative price reactions and is not specifically intended to maximise future return; the returns, positive or negative will on average be symmetrical and equally distributed (assuming a normal distribution).

It is important to note that the importance of current relative price movements to future return and future relative price reaction applies to both interpretations of the mean variance optimiser, whether it be the weak or the strong form of modern portfolio theory. In a disequilibrium model of dependent price movements, relative price movements are important in structuring a portfolio to maximise return and minimise risk, whereas in an equilibrium model relative price models are important in determining the relative price reaction to reach the new equilibrium point.

A passive index approach would buy the index, buying more of the overvalued and less of the under valued component. Assuming the index represents a market with no transaction costs where no demand can leave and only new demand can enter, it does not matter what the relative valuation positions are at the time of purchase, they are all equivalent to a neutral valuation point; undervalued assets increase in value to compensate for any loss in value of the overvalued asset as relative demand shifts. All that matters is the growth rate of new absolute demand (itself dependent on money supply growth and growth in output) which determines the rate of growth of share prices and the rate of growth of dividends.

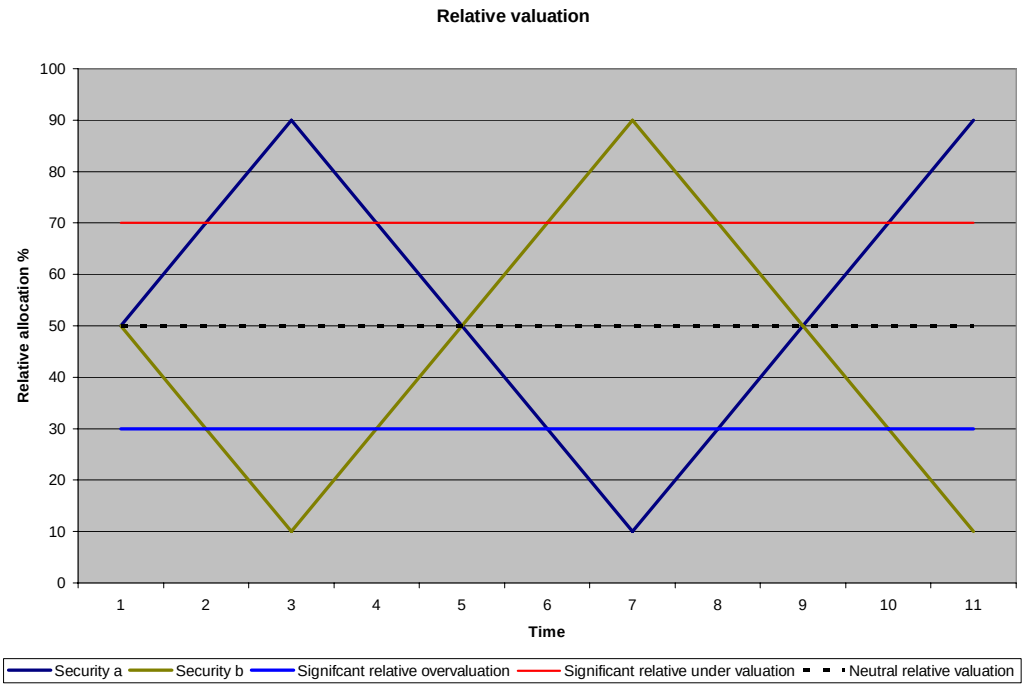
The trouble with the simple index approach is that it assumes that there is no excess demand for securities in the market place and ignores the fact that the areas of highest exposure to changes in demand are those very same significantly relatively over valued assets. In this instance an indexed allocation, at times, poses an extremely high risk to an investor's financial security. These overvalued components represent areas of highest absolute valuation risk. Provided a portfolio's asset allocation is managed properly, relative valuation differentials provide significant opportunities for managing risk and return (at the margin) and for maximising utility of capital. Discussion of the management of excess risk and return and the management of the time frame of significant market and economic risk is discussed in section 5, Fundamental Frameworks.

The more overvalued a market component, the further away its price will be from that which can be supported by the long term natural rate of demand/savings for that asset relative to the long term natural rate of growth in output. If real output growth is constrained by economic fundamentals, so is the growth rate of demand and therefore long term demand is governed by the long term relationship between savings and output growth.

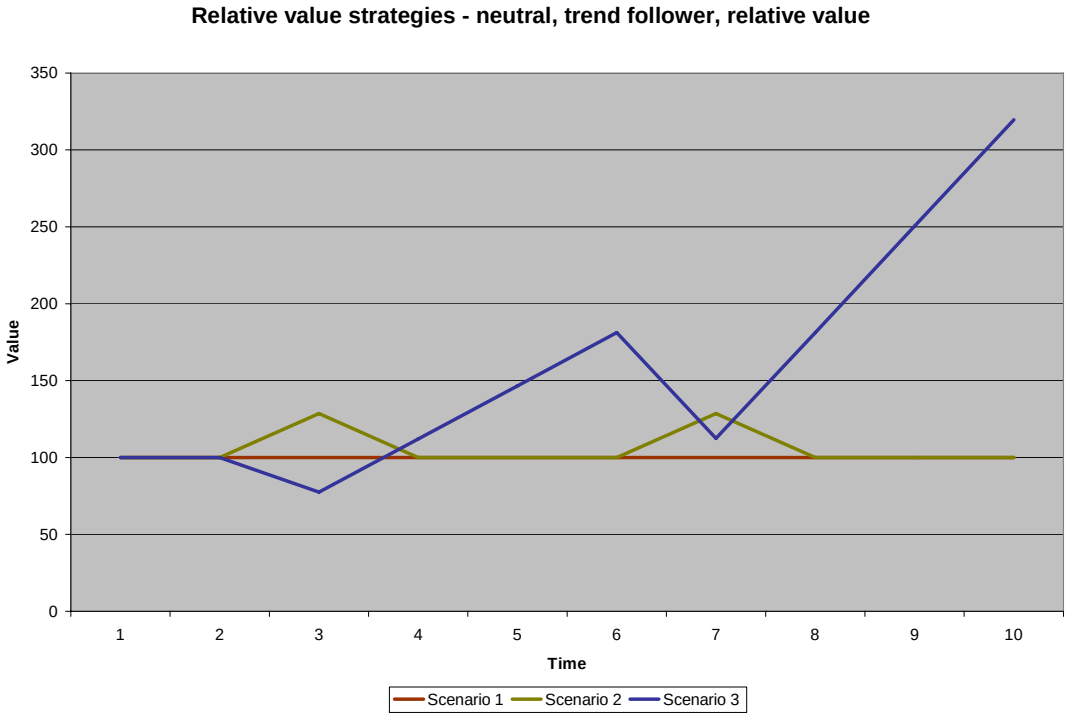
The question is, is it rationale to buy a stock, sector, or market cap, yield or growth component while it is relatively over or under valued and to what extent can relative valuation be traded? Logically the relative valuations at entry should determine the allocation to the market components, but once invested management of relative valuation should focus on significant deviations. To what extent these deviations are managed depends on the liability profile of individual investors and their risk and performance preferences.

4.4.3 Dynamics of relative valuation

The following chart shows two securities, a and b with a starting neutral relative valuation and a neutral allocation of 50% of an assumed portfolio. The upper red line indicates significant relative overvaluation and the bottom blue line, significant relative undervaluation. The back dotted line indicates neutral relative valuation.



The next chart shows three allocation strategies, a passive indexed, a naive trend follower and a relative valuation strategy.



The dark red line shows a neutral allocation strategy; this is equivalent to buying the index at any point in time. It does not matter when you buy the index as far as relative demand is concerned as long as absolute demand does not leave the market place. This line also represents the return profile for a relative value investor where there are no significant deviations of relative value.

The dark green line is the effect of a naïve trend follower. A naïve trend follower would sell assets that are falling in price and buy assets that are rising in price. Since it may take a while for the naïve trend follower to be confident of a trend, we have assumed they buy at the level of significant over valuation. They see a short term appreciation but then note that after a while the asset they sold is falling in relative terms and, the asset they sold is rising in relative terms. They sell the falling asset at the level they bought it and buy the rising asset at the level they sold it. This is not meant to represent the actual points they would buy or sell, just that buying a rising trend and selling a falling trend can be a pointless exercise in the long run. The margin of significance is smaller. The above also assumes no transaction costs.

> Note predicting the size and timing of share price performance is next to impossible, but defining with a reasonable degree of certainty the significance of deviation of relative valuation is not.

The dark blue line is the impact of selling a significant portfolio of the overvalued asset as it breaches the line of significant relative overvaluation and buying the relatively under valued asset as it passes through the point of significant relative under valuation. The next transaction is when the under valued asset itself reaches a position of significant over valuation and the sale and purchase process starts again.

The above shows that you do not need to know where the top or the bottom of a market cycle is, all you need do is focus on significant differences. It also states that a rationale investor should only be looking to buy and sell significant relative value.

Obviously most securities in a domestic market are not going to be showing this degree of relative price movement. Therefore significant deviations of relative value are not going to occur every month, or even every year. What is important for the above is the initial investment decision and the parameters for managing deviations in relative value. Buying relative value is of course the most significant, this is exactly

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what Dimensional Fund Managers preach with their indexes biased towards value, although it must be noted that there will be periods when small caps and value stocks are over valued relative to larger caps and growth stocks.

4.4.4 Relative valuation and efficient Markets

A rationale investor aware in a disequilibrium market would be aware of the risks that excess demand and extreme absolute valuations pose to future return and would be aware of the mechanics and causes of relative valuation as well as the opportunities provided by both absolute and relative valuation to the management of risk and return over time.

A rationale investor would develop frameworks for identifying and managing these risks, would not invest at any level but would look to areas of absolute and relative value to make their decisions. Even a rationale investor in equilibrium markets would develop a relative valuation framework to price efficiently.

It is clear that markets are probably initially "efficient" in matching demand and supply for securities to new information at a point in time through short term arbitrage pricing, but that this price correction can be over extended due to the impact of relative and absolute demand on share price performance. Indeed, those responsible for efficient arbitrage would also be those selling high and buying low those assets that have become significantly over or under valued. In this context, arbitrage does not need new information to determine relative pricing.

In an efficient equilibrium model, significant deviations from relative value (that is price movements that cannot be accounted by arbitrage alone) should not occur.

In an efficient market characterised by disequilibrium, rationale decision makers would be aware of deviations of share prices from their long term valuation relationships. At high market valuations changes in the relative allocation of cash and equities would favour an accumulation of cash reserves and a higher cash allocation as opposed to investment in the market.

This leads us to another important issue, the financial intermediary. The financial intermediary makes their money from transactions. While many purport to be providing advice as to asset allocation and risk management, they are really offering advice on products and transactions. It is in their interest to initiate market purchases with cash balances.

The obverse of the above is the risk to the financial intermediary of holding cash back in highly valued markets or in allocating cash to under valued components. The risk is performance risk, which is the short term risk of continuing rises in over valued assets and continued falls in under valued assets. Uneducated investors are averse to performance risk and would rather invest in rising assets. As far as financial intermediaries are concerned, short term performance risk is a risk to their business and a risk to their ability to attract new demand.

Do index funds aid market efficiency? If it is the irrational "fear and greed" investor that buys the index funds then yes. Otherwise, taking rationale investors out of the market place (and investing them in the index) means that index asset allocation decisions are more likely to be under the influence of the irrational investor.

4.4.4.1 An Alternate View of the MPT Universe

What if all investors are not rationale and disciplined and, markets are not efficiently pricing risk and return at all points in time?

What if the long term movement of prices are ultimately determined by earnings growth and the cost of capital and short term prices in the market are determined more by changes in money supply growth than underlying long term fundamentals?

The fact that the average investor is unable to outperform the market place at all points in time is hardly an argument that all investors should diversify away specific risk and expose themselves only to the market.

In fact it would seem sensible that rationale investors should not over expose themselves to the decisions of the multitude and the short term risks of the market place. Indeed, this is precisely the stance that investors like Warren Buffett take.

Perversely and paradoxically, a Warren Buffet portfolio has more of the risk that today's "modern portfolio theory" looks to average away. This risk is the specific risk of the business. Modern portfolio theory states that you can minimise your exposure to this risk by holding more and more stocks, until all you are left with is market risk. As such, you could term Warren Buffet's approach as one that is efficiently exposed to specific risk, while modern portfolio theory is one that is efficiently exposed to market risk. Warren Buffet gets rewarded more for taking the specific risk of the company than for taking the risk of the market.

4.4.5 Mean variance optimisation as a relative valuation model

Modern portfolio theory's adoption of the mean variance optimiser has much to do with its assumption that markets are efficient and that past relative price reactions represent a symmetrical model of risk and return that can be used to construct asset allocations that are efficient whatever the future direction of the market. It also assumes markets are at equilibrium at all points in time since standard deviation is only the relative price reaction in an efficient market and not the significant risk of a market in disequilibrium.

As discussed, "mean variance efficient derived from a mean variance optimiser does not mean a commitment to a positive return outcome, nor can an average be mean variance efficient during all market periods; it just implies a linear mathematical symmetry between historical average pricing relationships, which are presumed to hold for all future relationships, as per the Capital Asset Pricing Model.

If we think about it, the only way a market can be efficient, is if it has point in time valuation frameworks or factor models that adjust prices to new information. In this instance modern portfolio theory should be using point in time models instead of restrictive mean variance optimisers.

The mean variance framework assumes that historical risk, return and covariance data best represents the symmetrical risk/return trade-off. Since modern portfolio theory does not believe you can forecast future returns, it cannot logically be using past returns for anything other than to infer a symmetrical risk/return relationship. Return is merely used to construct the efficient frontier; if it could be ditched one would assume it would be. In this sense, the mean variance framework is a relative risk/relative return framework. It therefore relies on reversion to the mean (or reversion to equilibrium pricing) of the relative valuation relationship since depending on correlation is the same thing as depending on a reversion to the mean.

The trouble is the mean variance symmetrical relationship is derived from a linear and average historical relationship and will never match the point in time symmetry that underlines market efficiency, or the efficient valuation of markets, if this existed.

Portfolio theory therefore needs a point in time relative valuation framework that does not require an absolute return input. The question is should a relative valuation framework be based on the strict assumptions of modern portfolio theory?

Random and independent

This document states that price movements are ultimately dependent on long term real economic relationships and the nature of the equilibrium/equilibrating relationships (see section 4.1.2). In this framework, not only are we able to look at longer term relationships for constructing forward looking portfolios, but standard deviation ceases to be the most important risk. In fact, at any given point in time, standard deviation is price movement, or the relative price reaction to change.

Once we lengthen the time frame of the investment horizon we find that point in time efficiency (point in time risk/return) may no longer be on "the efficient frontier" and whatever is most efficient becomes a function of the time frame, the absolute and the relative valuation.

The most important risk is valuation risk since future return is most dependent on this. The impact of standard deviation within a structure that can manage significant short term stock market risk diminishes over the time of significant short term risk/return management. Even within an equilibrium model we need to focus on valuation differential, since we need to know the deviation of the old price from the new equilibrium given the new information.

Market efficiency

Once the assumption over dependency is broken, markets under modern portfolio theory's strict assumptions can no longer be efficient at pricing risk and return, because standard deviation is not a measure of significant risk caused by positions at odds with equilibrium and because valuations are relative and time dependent. Market efficiency was only ever presumed to be point in time efficient and once we introduce dependency and time we acknowledge absolute and relative valuation risks, because dependency also implies a disequilibrium model.

4.4.6 Point in time relative valuation models

The most important component of the mean variance optimiser is the covariance of price movements. The trouble is that the strength of the covariance is diluted by averaging out the information it holds. Covariance is the relative price movement/relative demand relationship and, we can use relative price movement to greater effect within a point in time relative valuation model of equilibrium relationships.

Point in time relative valuation models depend on an assumption over the equilibrium allocation to market cap, sectors and style (value/growth) and, stocks if you are going as low as individual securities.

This equilibrium allocation is the market allocation of all stocks, sectors and market cap if all components were correctly valued in accordance with their risks to return. Another way of saying it is the relative price relationship needed to deliver a given long term relative risk premium that would compensate an investor for their additional risks. Note relative risk premium is important since we are in relative and not absolute space.

While we do not know the actual future risks and could not measure them with certainty, we do know the historical price relatives for all market components and we do know that these price relatives incorporate a significant amount of information and validation of that information.

Therefore we can develop and estimate an equilibrium pricing relationship and hence equilibrium allocation framework by using historical analysis of relative pricing relationships, with point in time fine tuning to adjust for changes in component composition or stock specific characteristics, in other words the marginal drift in relative valuation relationships as you move towards a future (dynamic) equilibrium point.

Comparing the average relative pricing relationships to the current point in time allows you to set the point in time deviations from this equilibrium valuation and to gear these deviations.

Note that relative pricing relationships set the allocation profile to one dependent on longer term pricing relationships, which are economic and time dependent relationships. It is not a market timing/arbitrage pricing model; arbitrage and timing should essentially be considered to be the roles of market agents charged specifically with efficient pricing. Relative pricing relationships are also theoretically more efficiently priced relationships, since they are adjusted for excess relative demand/excess relative supply over shorter time periods.

This should effectively reduce the allocation to components that are overvalued relative to the presumed equilibrium point (areas that are exposed to higher relative demand) and over weight to areas that are under

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valued (impacted by falling relative demand). Higher relative valuation implies higher relative risk and lower relative return and lower relative valuation implies higher relative return and lower relative risk.

Using a relative valuation framework should also mean that buying and selling of relative valuation is a function of the significance of the deviation, otherwise buying and selling will be running contrary to the initial efficient arbitrage pricing process.

> Price relatives are a proxy for relative risk and deviation from average price relatives (relative to the rest of the market) is a strong guide to current relative risk and return relationships. Indeed, asset allocation at a point in time is driven by relative price movement, or current covariance.

A relative valuation platform also synchronises asset allocation with the economic and the stock market cycle, protecting against irrational deviations from equilibrium valuations and allocations. It is also a quasi-or real index strategy in that the closer you are to equilibrium the more sense it is to hold the market allocation.

You can create a relative valuation framework from anything. You can infer it from a bottom up derived asset allocation stance by comparing the recommended allocation to the market and working backwards from the relative allocations to get the equilibrium structure. In this sense you can also test your asset allocation against historical date to assess its efficiency and its risks.

The above means that we have a model that can use historical data to produce efficient point in time asset allocation which is not tied to any absolute input. Return is taken out of the equation, meaning the model is a symmetrical point in time model capable of adjusting to and managing all market relationships.

The asset allocation outputs from these models are point in time asset allocations representative of the current relative prices in the market place. Please note that the management of existing asset allocations is different from the initial recommended asset allocation provided by the models. Sophisticated benchmarking is needed to manage significant deviations and these are not the subject of the current document.

The benefit of such an approach is that often complex valuation analysis and complex asset/liability management relationships can be managed simply within a relative valuation framework.

Please note that relative valuation on its own says nothing about the asset and liability relationship; it is only concerned with point in time management of risk and return. Relative valuation is the vertical point in time perspective to risk and return. Absolute valuation is the horizontal risk/return relationship, or the dependent real asset/liability relationship. This is important because mean variance optimisation in disequilibrium only represents one of the risk dimensions and not efficiently so. For an initial investment an absolute valuation analysis would determine of how much of relative valuation allocation should be invested.

4.4.6.1 Global relative valuation models

Extending relative valuation frameworks to global markets is more complex, because you have to be able to adjust for the economic and market cycle, but the objective is the same, to manage excess risk and return.

It is important to point out the difference between a model that is focussed on risk/return management alone and one that is focussed on the management of financial needs.

The ability to diversify globally increases the opportunity to realise excess valuation for short to medium term consumption and is essential for the efficient management of portfolio structure and structure's ability to meet planned financial needs. See section 5.5 The Management of Excess Risk and Return.

Financial demands on a portfolio over time can be significant. Small global allocations are ineffective in managing the risks of the domestic market economic and market cycle. Within a consumption driven portfolio structure you need to increase the opportunities you have available to realise excess return. In this instance the optimum allocation is a function of the number of markets to which you are allocated, the size

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and timing of financial needs over time and the synchronisation of market and economic cycles. Section 5.5 The management of Excess Risk and Return highlights the potential benefits of global diversification within a global relative valuation model.

4.4.7 The investment universe, asset allocation and liquidity

One of the problems with a mean variance optimiser is that it focuses asset allocation on risk and return at a point in time.

For one, the risk/return trade-off does not represent the long term fundamental nature of asset risk and return. While inflation risks on low risk assets accumulate over time, capital gains on equities accumulate, but not without significant short term deviations.

Obviously the need for a short term risk return trade-off is important within a framework without a liability management component. It is unfortunate nevertheless that an investor is often forced to make these decisions without a visual perspective of the changing nature of risk and return over time and the impact of different asset allocation stances on these returns and the impact these risks have on their financial security.

An asset only poses a risk if you are forced to realise it to meet a financial demand. If for example your need to realise a highly liquid blue chip equity following a significant risk event is always at the very least some eight years away, the need to realise a moderately liquid mid cap equity always at least some 12 years away and if the need to realise a less liquid small cap equity is say always at least 15 years away, then the risk of such an allocation is going to be different from the point in time risk represented by a point in time trade-off.

For a given investment universe, where risk and return vary over time, the optimum asset allocation is dependent on the point in time absolute and relative valuation and the relationship between the size and timing of financial needs over time as a percentage of capital over time and the nature of asset class risk and return over time. The ultimate allocation profile is dependent on the client's risk and performance preferences.

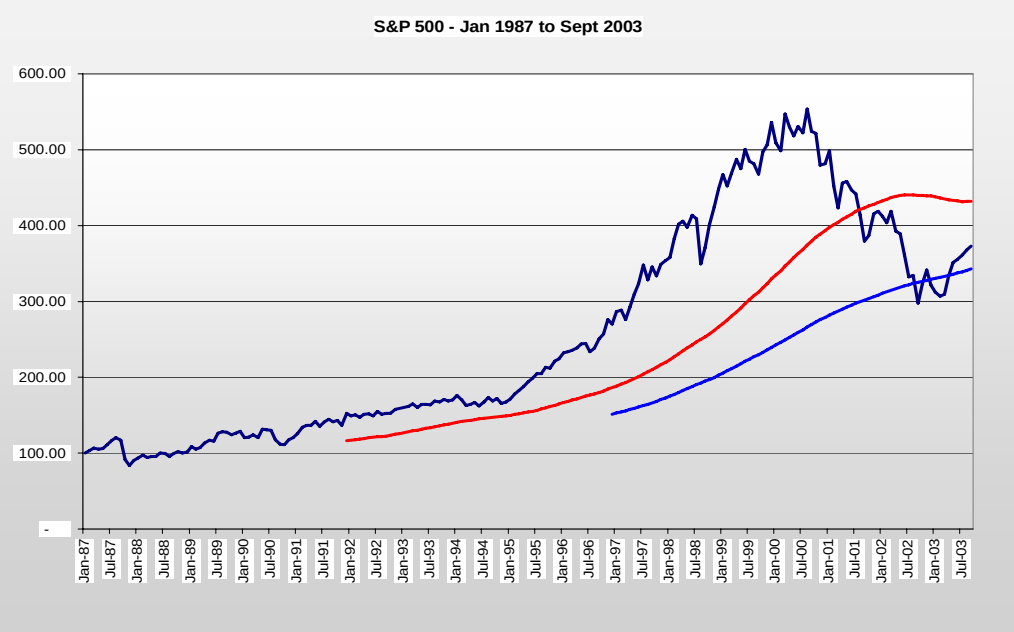
Point in time risk and return management is both the vertical (risk and return at a point in time) and the horizontal (risk and return over time).

4.5 Time diversification of risk

The fundamental nature of asset risk and return does indeed change over time, but only from a point in time looking forward. At all points in time, however, the risks of equity investment remain the same, which is why you should never be exposed to them at a point in time.

We can see that the risks of equity investment decrease the further the time frame of investment by looking at 60 month and 120 month moving averages of market indexes. The following graph shows the actual price volatility of the S&P 500 for rolling 60 month and 120 month periods and represents the risks that an individual who would have always been 5 years and 10 years away from a financial demand on capital would have faced.

This clearly shows that the impact of the volatility of price movement falls as the time horizon shifts. But this benefit is only available if you do not have to sell equities to meet financial needs over time. If a portfolio is not structured to manage this risk, the actual risk to which you are exposed remains the same at all points in time.



If you are consuming a significant element of capital over time the sensitivity of your financial security to market and economic risk will remain significant over time.

"Time diversification of risk" does exist, in the sense that providing you do not need to access capital, the longer the time frame, all else being equal, the greater the potential benefits of being able to accumulate the differential return.

It does not mean that returns are guaranteed if you take a long term horizon. Equity investment at any market level cannot be validated by a simple mantra that equities always provide a "long term return". They do not, since investors can be left nursing real losses on capital invested for 10 and 20 years if bought at extreme valuations.

Nevertheless, there does appear to be confusion over time diversification by a number of practitioners and academics.

- The first relates to the stochastic modelling of return and hence risk over time. If the mean and the normal distribution of return around the mean represent the historical lower and upper bounds of return, stochastic modelling of uncertainty represents the future potential range of the lower and upper boundaries of potential return. It would appear in this sense that the longer the time frame, the bigger the risk. There are two problems with this analysis.

    - The first is that this analysis only works if future returns are independent. This document contends that the fundamental nature of asset class risk and returns are dependent over time.

    - The second, if the distribution of the uncertainty of return were to actually represent volatility, then the upper and lower boundaries would need to represent the range of annual/monthly price movements. Since they are clearly not, uncertainty over the final end point is not volatility risk, but economic risk, which is different.

- The second relates to the fact that the probability of a negative risk event increases the longer the time frame. This is true, the longer you are invested the greater the probability of being exposed to a market crash, correction or bear market. So what!

- This is precisely why you need to be able to hold a stock market investment for long periods of time. Risk will happen, it is guaranteed! But, the longer you can hold an investment the less exposed you will be to short term stock market and economic risks. Look at any historical analysis of return and, the return profile will have absorbed every single period of risk to hit the market.

- Time diversification of risk does not mean that risk disappears, just that the impact of a risk event happening 10 years down the road is different from a risk event happening today and a risk event happening today is likely to have less relevance to a financial demand on capital invested in 10 years than a financial demand on the capital today.

- Within a properly constructed, planned and managed portfolio, short term risk events should not impact on the ability of a portfolio to meet financial needs over time. Indeed, proper planning of structure recognises the long term benefits of equity return and the short term risks to the ability of those assets to provide return.

- The only time criticism of "time diversification" arguments apply is for those who use time diversification of risk as an argument for investors who will need to access their capital at all points in time, without a structure to manage it and as an argument to justify investment at any point in time, when the benefits of time diversification of risk may be academic.

- This particular criticism of time diversification lacks a clear rationale. Does it mean that representing a shorter time frame allows you to downplay the risks of equity investment, or does it mean that over short time periods stock market investment is a lower risk? Which is the higher risk strategy, exposing yourself to risk over short period of time or over a long period of time?

- Critics of "Time Diversification" have pointed to studies showing that option premiums for periods as long as a 30 year time frame are prohibitively expensive. There are a large number of valid reasons why the price of an option over a 30 year time frame should indeed be significant enough to deter you from buying the option. None of these reasons rule against the viability of long term stock market investment.

    - If an option is being stochastically priced, then the range of uncertainty over long time periods is indeed very large and the cost of an option to cover this risk significant. While over short time periods the movement of prices has a higher degree of randomness and can be largely independent of fundamentals, over the long term, returns and risks are dependent on the underlying growth in earnings and the cost of capital and, of course the starting point. In fact, the range of potential outcomes is much narrower; stochastic pricing will assume the full range of outcomes associated with the full range of positions along the market and economic cycle. You however are starting from only one point in time.

    - You only need one risk event for most options to have exercisable value. Since a long term holder of the equity would be able to ride out a risk event, buying an option would allow them to benefit from the return on exercising the option. Since the holder of the option cannot benefit from riding out a period of risk, this risk event should naturally have a price that is independent of the long term fundamental nature of risk and return of the asset class being covered by the option. Option pricing is not a mirror image of the time diversification of risk; the high cost of the option is reflecting the risk to the writer of the option and not the time weighted risk of the temporary loss to the holder

    - If you were to purchase an option at an extreme market valuation, the risks to the writer of the option would most likely last beyond the current market and economic cycle.

- The writer of a long term option is not just exposing themselves to market risk, a risk which is diversified over time, but is exposing his or herself to economic risk which cannot be diversified away.

- Options are ultimately designed to transfer the return on an investment from those who do not want to bear the risk of that return. Take away market risk from the Capital Asset Pricing Model and we have the risk free rate of return. The fact that a long term option premium is high means that the option writer is doing what they should be doing; earning the risk premium on the stock market investment.

- An option writer has to be able to earn a higher return on writing options than he or she could earn by investing their capital in the market and they have to compensate themselves for the risk.

- There is also the argument that individuals who believe in time diversification of risk are invoking the law of large numbers which is meant to mean that the longer the time horizon the more likely actual return will equal the long run historical average. This is not true. The price at which you pay for earnings growth will have a direct bearing on the mean return you are able to receive over time, which may be above or below the long term average historical return earned. This is covered in Section 4.1.1 Random Walks and Mean Reversion.

Those who disagree with the fundamentals of time diversification believe that returns are random and independent. Interestingly enough, the stochastic nature of long term option pricing is based on a disequilibrium price history and not equilibrium pricing. Outlying risk and return are based on relative price reactions from a position of disequilibrium. If it were based on equilibrium pricing the range of future uncertainty would much lower.

Those who believe in time diversification believe that long term returns are dependent. Time diversification exists and it is a very important part of the education and risk assessment process. But, it can only be relied upon within a structure capable of managing the continuous point in time risks equities are exposed to.

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5 A Fundamental Framework

Context and perspective is all important. If we can only manage one period at a time and the future direction of prices in all future periods is uncertain, random and independent, then the best we can do is to allocate to a balanced portfolio that is best able to manage the future distribution of risk; whatever that portfolio may be.

> Risk in this sense is market risk, which is the relative price reaction, positive or negative, at a point in time to new information in a market presumed to start from an equilibrium position prior to the new information or change.

This contrasts with the needs of the individual investor who prefers certainty of income and capital to uncertainty and who needs greater certainty of both to plan for the future. In a time dependent disequilibrium world view, a balanced portfolio structured only with respect to symmetrical relative price reactions and not financial needs in any one period, where there is little or no degree of certainty over what can be taken from their assets over time is not an optimal position.

Most investors, even the high net worth, are at risk of depleting capital, to lesser or greater extent, over their lifetimes. Capital depletion under uncertainty places the process of utility maximisation under further stress.

Modern portfolio theory's framework cannot cope with an absolute time dependent liability relationship. If we believe in modern portfolio theory's approach to asset allocation, what we can take from our assets is a constant proportion of what they are worth in any given period and because of the uncertain nature over the distribution of the future return a limited amount even then. This means we cannot plan ahead and cannot maximise utility at all points in time.

> Utility maximisation in this sense is utility maximisation under complete uncertainty and certainly does not allow for managed consumption of capital over an individual's lifetime.

Utility maximisation is constrained under the modern portfolio theory solution to average annual adjustable withdrawals. If financial demands are greater than yield, we also risk having to sell assets (even lower risk assets are risky if they have to be sold prior to maturity) at a loss and at a transaction cost to realise the difference. Indeed, in a disequilibrium world view, the lack of a fundamental framework for the management of assets and liabilities has led many financial planners to work on the basis on maximum lifetime withdrawals, or so called magic numbers[9].

Although there is never "total certainty", there is indeed a significant degree of certainty provided by the fundamental nature of assets that allows us to develop frameworks to structure and manage the asset and liability relationship and to manage the uncertainty of future price movements to the ability of assets to meet financial needs over time.

> Indeed, even the mean variance optimiser, under the weak form of modern portfolio theory, effectively relies on future risk premiums on asset classes being certain and constant, despite the fact this is in conflict with the strong form of modern portfolio theory's assumptions over uncertainty, equilibrium and independence of price direction.

In the real world, if we are able to look to the future with a degree of certainty with respect to risk/return relationships we have to be able to manage the complexity of integrating asset and liability management. Relating asset allocation at a point in time and over time to the size and timing of financial needs over time involves thousands of calculations. If we have a fundamental set of rules that relate asset allocation to liability profiles, these relationships can be automated and the complexity simply managed.

[9] TAMRIS discusses maximum safe withdrawals in its March 2006 review.

The relationship between point in time risk and return (relative and absolute valuation) and the long term asset and liability management relationship is a symmetrical one; as prices fall, future returns rise, as prices rise future returns fall, irrespective of the direction of change the asset/liability relationship is the same. While a mean variance framework is supposed to be symmetrical within mean variance space, it is neither symmetrical in asset and liability space, because it lacks a direct structural relationship with financial needs over time, nor is it symmetrical within point in time risk and return, because it lacks a direct relationship with current relative price movements.

In order to manage the relationship between financial needs and asset class risk and return over time and at all points in time, at the same time, we need a dynamic symmetrical framework that manages structure as point in time risk/return relationships change. This means integration of the valuation, the asset allocation and the management decision regarding all components.

5.1 The Portfolio problem

The portfolio problem lies in the ability to deliver asset management expertise efficiently and productively in the presence of personalisation which requires the integration of the management of risk and return at a point in time and over time relative to existing and future capital, financial needs and risk preferences. This is a dynamic, symmetrical relationship.

In fact, the biggest component of personalisation is the construction, planning and management of assets relative to the client's inflows to and outflows from the portfolio over time.

5.1.1 The one period problem

If we were looking at simple income objectives over short periods of time, for example a year, the portfolio problem is simple; we are looking at the relationship between an asset allocation's risk and return relative to a simple liability objective.

Within modern portfolio theory, the risk/return equation is one which looks at the most efficient combination of assets to meet the client's return/yield objectives. Because the point in time liability is more often than not small relative to the overall portfolio, the rationale of the risk/return relationship in liability space is not stretched.

5.1.2 The multiple period problem

It gets more complicated once we move away from a simple income objective and start to increase the time horizon because of the size and timing of future income and capital inflows to and from the portfolio. If we assume that the nature of asset risk and return change over time, so must the number of potential asset/liability relationships increase.

In the context of modern portfolio theory, liabilities are not an input into portfolio structure. At this point the limitations of the MVO structure constrain the solution. All that can be done to reflect liabilities is to determine the average return needed by the client's financial needs and use this to structure the portfolio, which conflicts with modern portfolio theory's key assumptions over random and independent price movements. However, even then, the return profile is only an average and provides no information regarding the point in time size and timing of income and capital needs.

In a traditional fixed asset allocation yield driven approach, it is impossible to incorporate all this change into portfolio structure; there are frankly too many variables. All the traditional approach can do is to have a limited time horizon, say a three year horizon, where the portfolio is structured to meet the yield/growth objective and known liabilities are planned for. As needs change and liabilities enter the equation the portfolio manager has to react and make changes within this 3 year window.

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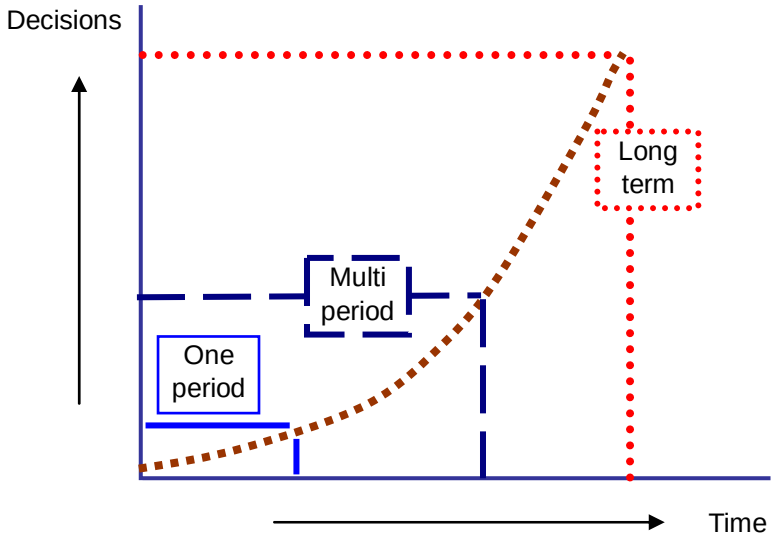
5.1.3 The long term problem

Not only does the complexity of the relationship between asset allocation and liability profiles increase over the very long term, but we are faced with a number of other decisions that we were not faced with in the single and multi period problems.



- What is the effect of asset allocation and liabilities on the ability of assets to meet needs over time?
- Will the client's asset last?
- Is the current income level appropriate?

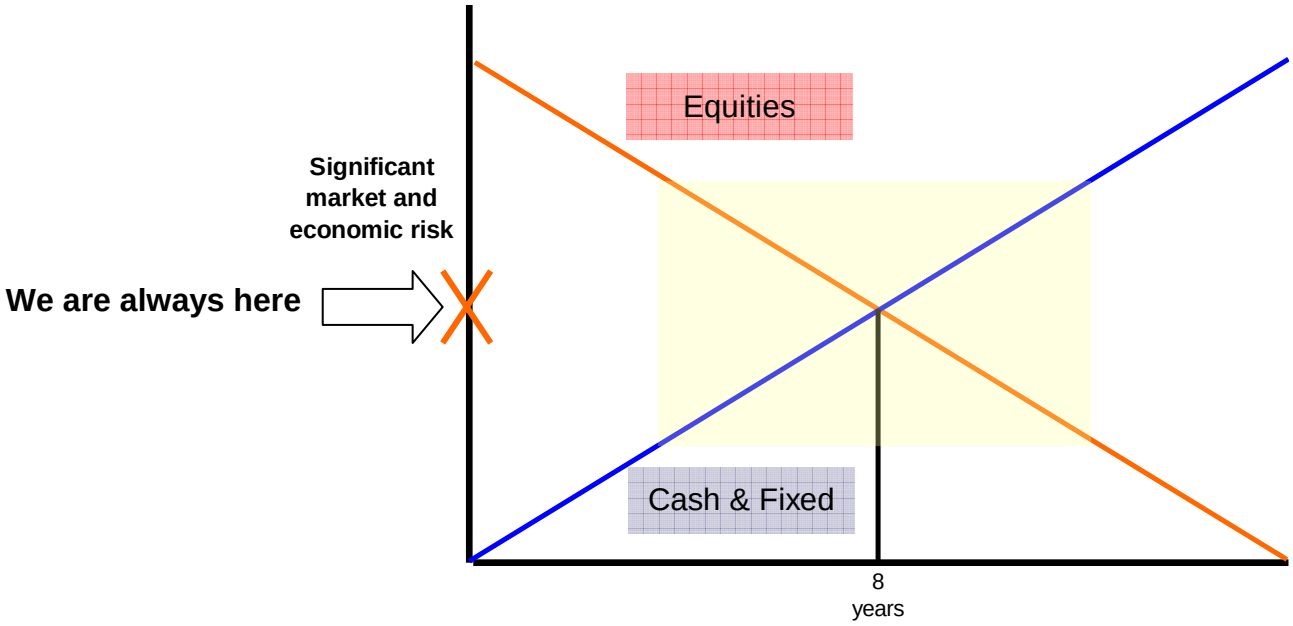
In this context we also find that we may need to understand the disposition of all current and future assets and, all current and future financial needs. We then start to have to assess the effect of current demands on the ability of assets to meet needs over time.

The portfolio problem mutates into a short and long term optimisation problem. It would appear that trying to solve all these problems is actually making the portfolio problem ever more complex. This is one reason why it is generally not managed and why the asset manager will hand over this responsibility to the financial planner. In this sense, all that most portfolio solutions have done is to hand over the problem, the costs of the problem and the risks attached to the problem to someone else.

5.2 A Simple Symmetrical Framework

From the fundamental nature of asset risk and return and the rules stated in section 4.2.1 we can develop a simple, integrated, symmetrical, dynamic "two period, short/long continuum" asset allocation framework for the construction, planning and management of assets to meet financial needs at all points in time from one point in time.

But do not be deceived by the simplicity of the model.



The graph shows the relative risk of equity investments falling over time (**red line**) relative to a lower risk cash and short to medium term fixed interest portfolio (**blue**). The two lines assume the economy (aggregate demand and supply) is operating at its equilibrium rate of growth and that over time money supply is growing at a rate sufficient to allow growth in nominal demand to keep up with growth in nominal output and stock prices are growing in line with growth in nominal earnings.

> Please note that we are always at **year "0"**, we are not able to benefit from the changing nature of risk and return over time without a structure to manage short term risk. We can only get to the margin of short term risk by a portfolio structure designed to manage the time frame of significant market and economic risk.

The **blue line** represents the inflationary and economic risks to the return on low risk assets and is discounting the sum of this future uncertainty. The impact and the uncertainty of inflation risk on short term nominal low risk assets are already discounted and short term changes in inflation will not therefore impact the position of the blue line. Since the assets represent short term low risk assets interest rate risk is also discounted and will not result in a shift in the blue line; over time the marginal differences in short term return will average out. While there may be marginal short term shifts in absolutes, the above is a relative long term framework.

Markets are assumed to be correctly valuing future earnings growth in an equilibrium state assuming that the rate of growth of demand for earnings is growing at the same rate as earnings growth. This means that the supply of savings is just enough to keep demand for securities in line with the growth rate of earnings.

Any number of factors can cause the **red line** to shift. A demand and/or supply side shock causing output and hence earnings to fall will see the red line shift downwards, reducing demand for investment assets and the level and the time frame of significant economic and market risk. Demand side shocks causing output and earnings to rise above the equilibrium growth rate will result in excess demand for both output and assets increasing the probability of a need to raise interest rates and rein in demand. Note that the red line already discounts future productivity increases, as such only short term increases in excess nominal demand for assets and output cause a short term shift in the red line.

The cross over point is the timeframe of significant market and economic risk and hence the time frame of greatest uncertainty over return. It represents the short term risks to asset prices in the event of real and nominal shocks to demand and reflects the fact that we are never at equilibrium, only at a point relative to it.

The time frame of significant market and economic varies in accordance with the stock market and economic cycle, the level of excess demand for assets at a point in time and the point on entry into the market - see section 5.4 for further information on the time frame of risk.

The 8 years selected here is meant to represent an example of a period of significant market and economic risk. It is the time frame it took the total return on the UK FTA All Share to outperform the return on a lower risk high interest cash account from 1974 to 1981. This was a period of high money supply growth, strong output price and followed a period of asset price inflation, very high interest rates and a decline of some 75% in the market.

This time frame is an example of the type of risk such a framework should be capable of taking in its stride at any point in time. Since 1973 was a period of excess risk and return, the actual level of cover would have been higher than that needed to cover an equilibrium growth rate and the natural risks of a disequilibrium model. Indeed, at extreme market valuations and advanced economic cycles, this time frame would need to be extended as per reasons discussed on section 4.3 dealing with absolute valuation risk.

The cross over point represents the short term/long term optimisation of risk/return management and the optimum allocation to lower risk assets and equities at a point in time.

5.3 A time space continuum

This model is consumption driven, allocating capital within the portfolio in accordance with the relationship between short and long term financial needs and asset class risk and return over time.

It isolates the impact of significant market and economic risk on the consumption of capital through dynamic management of the time frame of significant market and economic risk, which may be 8, 10, 12 or more years out, depending on the level of market and economic risk at the time. Conservative modelling of risk and return will further constrain the impact of uncertainty on the ability of assets to meet financial needs over time.

The short term asset allocation provides security against significant market and economic risk. Its asset allocation structure is dedicated, to greater or lesser extent, to income and capital needs arising over this period of significant risk.

While the portfolio is consuming capital as well as income at all points in time, the object is not to draw down the low risk portfolio, but to manage excess risk and return at the margin. Excess return is realised at the margin, the margin being sufficient capital to keep the allocation to low risk capital in keeping with the time frame of significant market and economic risk. As this time frame expands, so does the management of excess return at the margin.

If a risk event occurs and no components of an equity portfolio can be realised for an excess return, the low risk portfolio provides the short term capital consumption and liquidity requirements. It is therefore important that the liquidity structure of the low risk portfolio matches the size and timing of financial needs. For example, while the management of excess risk and return is managed at the time frame of significant market and economic risk (8 to 12 years out) liquidity and financial needs are always managed at the point in time. If 30,000 dollars is needed next month, the low risk structure should be able to provide that liquidity.

It is a time space continuum in that the portfolio is managing a) immediate and future financial needs, b) present and future risk/return relationships and c) short and long term uncertainty through the short term low risk portfolio and the dynamic management of equity capital.

It is a structure able to manage both point in time market risk and the "over time" dependent economic risks. As such it manages uncertainty at all times and allows individuals to benefit from long term asset class returns while protecting them from point in time asset class risks.

5.4 Time frame of risk

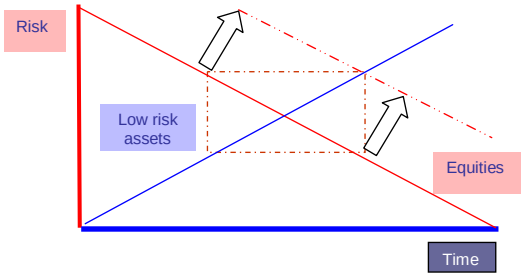
In section 5.2 we looked at the basic theoretical framework and used an 8 year timeframe for significant and market risk as an example of the time frame of significant market and economic risk.

The actual time frame is specific to the risk/return environment, the individual risk preferences and the initial investment risk taken by the investor.

> Many financial professionals are unaware of the time frame of significant market and economic risks and the specific physics of the problem and will often look to much shorter time frames to manage these risks.

The time frame of significant market and economic risk for existing investors effectively starts when markets have fallen to levels that take away excess risk and excess return from market or security valuations. For example, for long term investors in the broader US stock market index, the market started to exhibit extreme risk and returns from late 1996. As such, the market would have represented excess realisable value for most investors (those invested prior to 1996) for some time after it started to fall. Therefore the real time frame of significant risk is not necessarily the peak to the next peak, but the point at which opportunity costs of lower risks shorter term assets cross with the opportunity costs of higher risk assets. This would be the case even if the subsequent market recovery failed to breach its previous high.

The time frame of peak to recovery is most important for those with initial investment capital and this is why absolute risk needs to be quantified and managed. Therefore, within the two period model, the actual time frame of the low risk allocation will depend on the time in which stock market investments were made and the accumulated excess returns of the portfolio. Significant risk for example could be an 8 year time frame for a new investor, but only a 4 year time frame for an existing investor. This is a significant difference.



This time frame of risk will shift in accordance with market valuations and the economic cycle. It will also be influenced by the risk assumptions used in the financial modeling of uncertainty for low risk as well as higher

risk assets. Higher assumed inflation, interest rate and credit risk would force a higher allocation to low risk assets than would possibly be needed by current inflation and interest rates and default rates.

The time frame of significant risk and return will also be influenced by the level of geographical and market diversification. Greater diversification exposes you to investments with different relative price movements, allowing you greater flexibility and opportunity to realise both absolute and relative excess return. Note that the structure of the framework protects against extreme risk events when all markets are likely to fall at once.

The time frame of risk is also sensitive to the client's risk aversion. Conservative investors should be able to select the time frame of risk they would prefer to be exposed to.

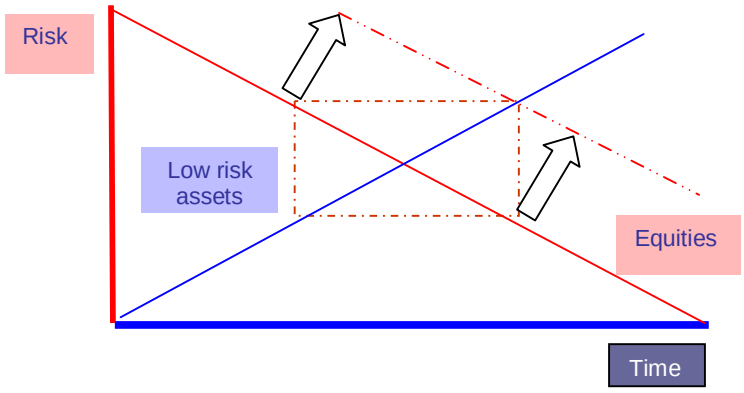
5.4.1 Structural components of low risk asset allocation

Understanding the basic components of the short term liability management component for the management of point in time risk is key to understanding and managing the time frame of significant market and economic risk. There are in fact 5 components to this section of the portfolio

- A liquidity management or minimum allocation component, below which the portfolio should never fall.
- A significant risk/return management component; the allocation to cover natural and significant stock market and economic risk; held at a minimum, unless in declining and under valued markets, via the management of excess risk and return.
- Extreme risk/return management component; additional low risk allocation during periods of extreme valuation risk associated with mature economic cycles and excess demand for assets. This essentially excess return realised and stored for future consumption.
- Conservative portfolio adjustment for risk averse investors.
- Initial investment risk component; allocation to low risk assets/cash in lieu of equity investment due to absolute/extreme valuation risks.

5.5 The management of excess risk and return

As stated, the time frame of significant market and economic risk is not a constant and will vary over the economic and market cycle as noted by the following graphical illustration.

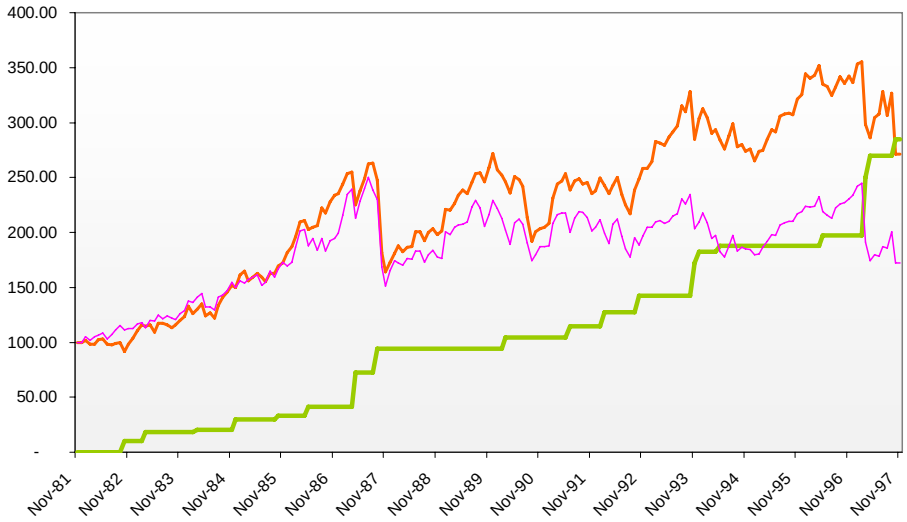


Whereas in modern portfolio theory asset allocation is central to diversifying and managing risk, diversification within a time dependent framework is also a return management platform. Instead of periods

of excess risk and return being dangerous for investment, they are actually periods that can be used to enhance the management of risk and return.

Such periods provide opportunities for realising excess capital return. Realising excess capital return "at the margin" enhances present consumption and reduces risks to future consumption associated with the component realised and provides a natural framework for disciplined management of risk and return over time.

The following chart illustrates the long term return benefits of a relative valuation and allocation framework for a global diversified portfolio with a liability/consumption objective. It provides a disciplined approach to buying low and selling high with the ability to use such capital outflows from the equity portfolio to naturally rebalance equity asset allocations without the need for taking a reinvestment risk. Outflows are used to rebuild the low risk portfolio.



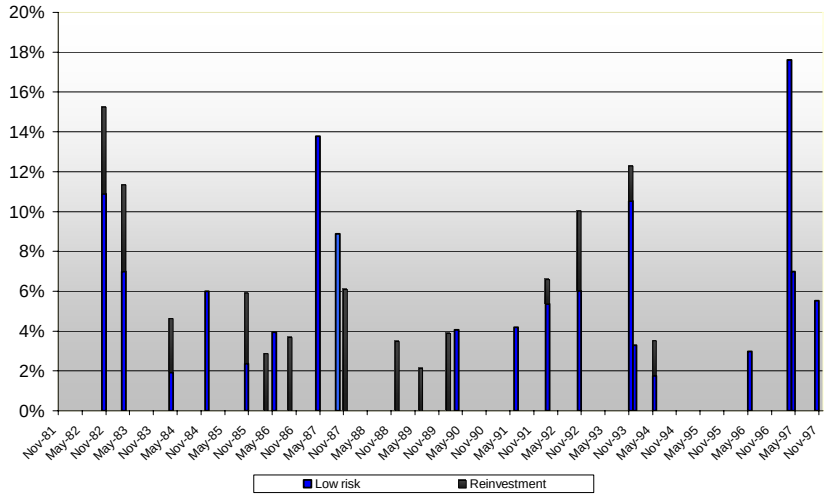
The chart shows a simple back test during the period January 1981 to November 1997 for a global portfolio with the UK stock market as the domestic market in question.

The orange line represents a balanced global portfolio with allocations to domestic (in this case the UK 35%), the US (15%), Europe (20%), Japan (15%) and Asia (15%, representative of allocation to global emerging markets). The allocation to each market is managed by a relative valuation methodology. Once an allocation to a market has exceeded its maximum benchmark allocation, the allocation is reduced back to its benchmark. Funds raised from the transactions are either transferred to the lower risk portfolio or reinvested in markets where the relative valuation has fallen below the recommended minimum allocation.

> Knowledge of market movements were not used to time transactions. That is a market that was about to fall was not deliberately sold, nor was a market that was about to rise bought.

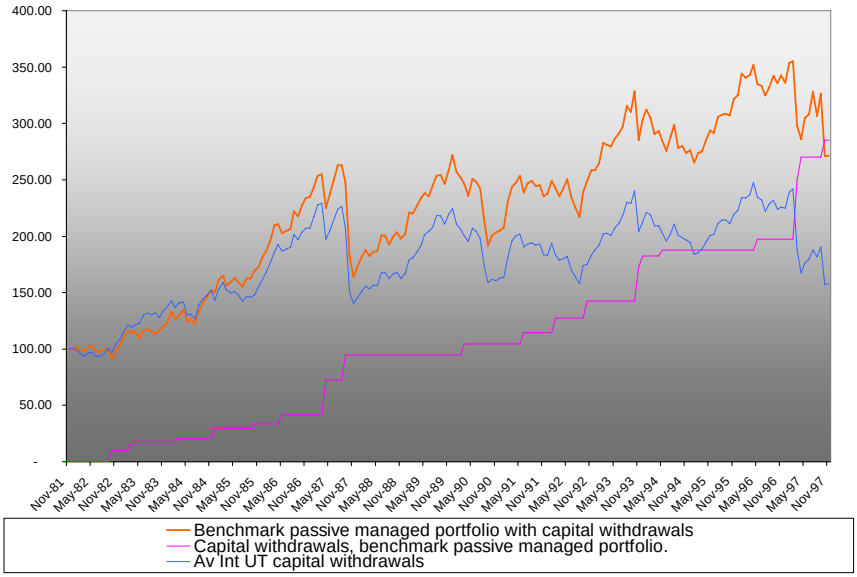
The purple line represents the domestic market index, in this case the UK FTSE A All Share. The green line the capital withdrawals from the equity portfolio. What the above shows is that the ability to realise capital from a wide variety of markets increases the potential for the long term total return. Investing only in the domestic market reduces the ability to sell highly valued assets. The benefits of this type of performance enhancement increase the more widely diversified the portfolio.

Global Transactions November 1981 to November 1997



The above analysis is one based on trades being made only when a market is significantly over or under valued. In fact only 23 transactions were recorded over the period. Of these, only 6 transactions involved only sales and repurchases of equities while in any one year the largest equity for equity transaction represented no more than 6% of the portfolio. The proceeds of the vast majority of transactions were directed towards low risk investment and hence capital gain captured for future expenditure.

Just to show the benefits of segregation, the following chart shows the same withdrawal strategy from the average UK international unit trust (mutual fund) over the same time period.



The benefits of segregation and the management of relative valuation can also be enhanced at each specific market level. Instead of selling and buying the index which is demonstrated in the above charts, abnormal return is bought and sold in each specific market.

The management of segregation requires a structure capable of managing allocation at both the portfolio construction and the portfolio management level.

5.6 Fundamentals of asset and liability modeling and management

A mean variance optimiser will construct a portfolio from point in time risk/return assumptions alone. Its modelling of the uncertainty of future price movements is not only a separate process but it also provides no clear guide as to the actual risks to return facing the portfolio at a given point in time. Section 6.4, The Monte Carlo Band-Aid also discusses weakness of the Monte Carlo simulation.

As stated numerous times throughout this document the modern portfolio theory position on portfolio structure, planning and management is that price movements are not only random but they are independent, meaning that the future is one of extreme directional uncertainty. This means that you cannot structure, plan or manage a portfolio relative to financial needs beyond the point in time. All you can apparently do is assume the markets' are efficient at pricing risk and return and develop a mean variance efficient portfolio on the premise that because markets' efficiently price risk, past relative price reactions will be representative of future relative price reaction relationships. This document on the other hand believes the following.

- Long term price movements are dependent on long term economic relationships and, while still uncertain this uncertainty is constrained. We can therefore structure portfolios in accordance with the short and long term uncertainty and the short and long term fundamental nature of asset risk and return over time.

- Over the short term markets are not efficient at managing absolute and relative valuation risks exacerbated by excess demand for investment assets. We must therefore manage short term excess risks to return not managed by the market. The management of asset allocation risks and returns is dependent on point in time relative and absolute valuation models.

- Inflows to and outflows from the portfolio and the size and the timing of these flows are the single most important determinant of asset allocation. Efficient management of risk and return cannot be conducted without such flows being taken into consideration within the structure and the planning. Since asset allocation and liability profiles must be integrated so must modelling and management.

- We can combine the fundamental nature of asset risk and return over time and models of absolute valuation risk to model the risks to return and better manage uncertainty.

Within an asset and liability management framework the construction/**optimisation**, the planning/**modelling** and the management (**of all asset and liability relationships**) all take place within one integrated structure.

- This structure relates the individual's consumption/liability profile over time to the asset allocation and security selection required to manage short and long term return and risks to the ability of assets to meet financial needs over time.

- The structure relating asset allocation and security selection to financial needs is dynamic and adjusts to real time changes in both relative and absolute price relationships.

5.6.1 Components of an asset and liability management framework

This dynamic, real time, integrated asset and liability management framework is comprised of five components.

- **Liability modelling**; the modelling of future inflows (*income and capital*) to and outflows from (*income and capital*) the portfolio over time. It should be impossible to efficiently construct a portfolio without knowledge of future inflows to and outflows from a portfolio.

- **Short term asset liability modelling and management.** This is the engine of the asset and liability management framework and, it replaces the mean variance optimiser. It determines amongst others

a) the allocation to low risk assets and equities needed to meet liabilities over the time frame of significant market and economic risk,

b) the specific allocation to each low risk security relative to size and timing of financial needs,

c) the adjusted low risk allocation for risk aversion and absolute valuation risks and

d) the equity portfolio (yield, liquidity profile, global and domestic market allocations) and initial allocation relevant to the asset/liability profile, risk aversion and current relative and absolute valuations.

It provides the framework for the management of an existing portfolio's low risk asset allocation and liquidity requirements and the management of excess risk and return at the margin of the longer term portfolio. It is the heart of the construction, the planning and the management of assets to meet financial needs over time ensuring at all time the steady transition of the point in time continuum that is the asset/liability relationship of the portfolio.

- **Long term asset liability modelling** – this component incorporates the short term optimisation output and extends it through the modelling of the asset/liability relationship over the lifetime of the portfolio.

- **Valuation, allocation and management frameworks –** the short term asset and liability optimiser does not select securities, determine asset allocation or value markets. All this is determined centrally via valuation, allocation and management models and frameworks. This component also delivers the decision rules for the management of the low risk portfolio and the equity/longer term portfolios. Through this integration it is possible to create and manage an unlimited number of unique personalised portfolios from one low risk allocation framework and a limited set of longer term equity portfolios.

- **Risk/return modelling** – while valuation, allocation and management determines efficient point in time security selection and asset allocation, risk/return modelling determines the risk and the return assumptions used to model risks to return. These models are real time adjusting to changes in relative and absolute prices as well as well as economic cycle adjustments.

Appendixes A and B show the basic asset and liability model process used to construct, plan and manage recommended and existing portfolio allocations. For those interested the following link provides a more detailed overview of a prototype asset and liability modelling and management system (developed between 1997 and 1998).

Integrated system overview.

5.6.2 Short term asset liability optimisation

The most important and most complex component of the asset and liability management framework is the short term asset and liability optimiser. The following are the inputs to this model.

- Inflows to and outflows from the portfolio over the time frame of significant market and economic risk and longer for risk averse clients. This is as detailed as monthly over the very short term (the immediate 12 months) and, no less detailed than annually thereafter.

- Low risk security selection and time frame of allocation strategy and risk assumptions. Security selection will vary over the time frame of the liability profile. Additionally, low risk assets will need to be hit with interest and inflation risk amongst other risks to ensure the low risk allocation can manage uncertainty.

- Long term/equity portfolio security selection and asset allocation for the universe of client yield requirement and risk aversion. This document does not go into detail into defining the relative valuation universe of portfolio options although it is possible from a small number of portfolio options to construct

an unlimited number of unique portfolio allocations. Likewise, from a small number of simple rules governing the management of asset allocation, it is also possible to personalise the management of allocation to take account of risk aversion, liability profile and market risks at a point in time.

- Short and long term modelling assumptions governing inflation risk, stock market risk and return, low risk asset class risks and other asset class risks. Modelling assumptions will also govern the long term relationship between low risk assets and the longer term/equity portfolio.

- Absolute and relative valuation model integration with asset allocation, security selection, portfolio planning and management. This ensures the relationship between asset allocation and liability management is point in time symmetrical. This integration is complex but integral to the viability of an integrated asset and liability management system.

This report will focus briefly on the basic mechanics of the short term asset liability optimiser. A more detailed analysis of the physics and the operation of such a framework is a separate and detailed subject.

5.6.3 Low risk security selection

The short term asset liability model optimises portfolio allocation to low risk assets and equities in accordance with a client's short term liability profile, see example below.

	Short term liability profile							
	Inflows				Outflows			
	Income	Pension	Capital inflows	Total inflows	Drawings	Capital	Total	Deficit (-) surplus (+)
Jan-04	-	-	-	-	-	79,681	79,681	- 79,681
Feb-04	4,000	1,441	-	5,441	4,167	-	4,167	1,275
Mar-04	4,000	1,441	-	5,441	4,167	-	4,167	1,275
Apr-04	4,000	1,441	-	5,441	4,167	-	4,167	1,275
May-04	4,000	1,441	-	5,441	4,167	-	4,167	1,275
Jun-04	4,000	1,441	-	5,441	4,167	-	4,167	1,275
Jul-04	4,000	1,441	-	5,441	4,167	-	4,167	1,275
Aug-04	4,000	1,441	-	5,441	4,167	-	4,167	1,275
Sep-04	4,000	1,441	-	5,441	4,167	-	4,167	1,275
Oct-04	4,000	1,441	-	5,441	4,167	-	4,167	1,275
Nov-04	4,000	1,441	-	5,441	4,167	-	4,167	1,275
Dec-04	4,000	1,441	-	5,441	4,167	-	4,167	1,275
Jan-05	45,120	16,631	-	61,751	50,000	-	50,000	11,751
Jan-06	42,413	16,005	-	58,418	50,000	-	50,000	8,418
Jan-07	39,868	15,417	-	55,285	50,000	-	50,000	5,285
Jan-08	37,476	14,864	-	52,340	50,000	-	50,000	2,340
Jan-09	35,227	14,344	-	49,572	50,000	-	50,000	- 428
Jan-10	15,171	30,878	45,842	91,892	50,000	-	50,000	41,892
Jan-11	11,673	33,031	-	44,704	50,000	-	50,000	- 5,296
Jan-12	10,972	32,599	-	43,572	50,000	-	50,000	- 6,428
Jan-13	10,314	32,194	-	42,507	50,000	-	50,000	- 7,493

The above excerpt short term liability profile summary shows short term liabilities from 1 to 10 years. The "current" year is broken into monthly components allowing cash management for near term liabilities. Net income and capital liabilities can be separately fed to the short term asset/liability optimiser.

The model constructs the low risk portfolio by passing the client's net real liability requirements through the organisation's central low risk investment strategy and security selection and optimising the allocation to each security.

An example of a top level strategy interface (*there are likely to be different interfaces for income and capital demands as there will be for longer term low risk allocations*) is shown below. Behind each of the strategy components is a set of securities specific to the timeframe. Each liability profile allocated is therefore an optimised and personalised low risk asset and security allocation.

ID	Allocation	3 months	4 to 12 months	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years
1	**Short term cash management**	100%	100%	100%	100%	0%	0%	0%	0%	0%	0%	0%
2	**Secure low risk**	0%	0%	0%	0%	90%	70%	60%	60%	50%	50%	40%
3	**International cash & fixed**	0%	0%	0%	0%	10%	20%	20%	20%	25%	25%	20%
4	**Corporates**	0%	0%	0%	0%	0%	10%	15%	15%	15%	15%	15%
6	**Specialist low risk**	0%	0%	0%	0%	0%	0%	5%	5%	10%	10%	15%
8	**In house funds/managed**	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%

The above denotes the recommended security selection and asset allocation process for income liabilities (capital liabilities would have a different strategy), but it also provides a liquidity management and asset allocation framework for the management of existing portfolios.

ID	Low risk asset	Security	Strategic cash	Year 1	Year 2	Year 3	Year 4	Year 5	year 6	Year 7	Year 8	Year 9	Year 10
1	Gilt edged	Conv 9.75% 06	1	0%	0%	0%	100%	100%	0%	0%	0%	0%	0%
3	Gilt edged	Treasury 7.25% 2007	1	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%
4	Gilt edged	Treasury 9% 2008	1	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
5	Gilt edged	Treasury 7% 2009	1	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%

The above table is an example of a recommended “secure low risk” portfolio and is the pure dedicated or cash matched component of the low risk portfolio.

The short term optimization model outputs a recommended low risk allocation and portfolio personalized to each client’s liability profile. It also outputs a dynamic structural framework for the management of existing asset allocation. Importantly the derivation of the low risk portfolio is concurrent with the derivation of the equity portfolio and the determination of both is made within the one integrated model which differentiates it from traditional dedicated low risk modelling and management.

5.6.4 Modeling assumptions

Within an asset and liability management framework, modelling is used to manage uncertainty, not to predict return or to construct a portfolio. Indeed the assumptions used to select securities and to determine asset allocation strategy are separate from the assumptions used to model uncertainty.

Modelling should recognise that it is impossible to predict the exact size and timing of future returns on assets, the size and timing of economic growth and the rate of change of economic variables or the risks to the size and timing of both.

The time frame over which most asset/liability modelling is conducted means that with the exception of index-linked securities, it is impossible to assume anything other than a constrained long term return relationship

between earnings growth, economic growth/business cycles, inflation and price relatives upon which to fix the return relationship.

However, a fundamental asset and liability framework provides a natural framework for modeling and managing the impact of risks to the ability of assets to meet financial needs over time.

Modelling within an asset and liability framework is broken down into 2 main components. The modelling of risks to low risk return and, the modelling of risks to longer term asset class returns, most notably equities. The short term management of significant risk structure naturally provides protection against significant short term uncertainty, while the modelling of low risk asset allocation risks should ensure within a reasonable degree of certainty that a portfolio can meet these needs during periods of significant risk.

5.6.5 Low risk return modeling

The nominal returns and capital values of low risk investments are fairly easy to project. The risks to these returns are not and, it is the modeling and management of risk that short term asset liability modeling and management is primarily concerned with.

Why? An individual's financial security depends on their low risk assets to meet their financial needs as and when they arise and to protect their assets and financial security in the event of significant stock market and economic risk. The risks that affect the modeling and management of low risk investment are divided intro three main areas

- Asset risks such as inflation, interest rate, liquidity, credit and currency risks
- Liability risks in the context that liabilities or expenditure is greater than planned.
- Stock market and economic risk in the sense that the actual period of stock market and economic risk will vary. This risk is discussed in section 5.4.3, the time frame of risk and in Section 4.3, absolute valuation risk/significant stock market and economic risk.

5.6.6 Equity modeling

We know that returns on cash, fixed interest and equity investments are related and dependent on long term economic growth.

We also know that the long term relationship between earnings growth and growth in output is fairly stable, but that over the short term earnings growth (positive and negative) can deviate significantly from the long term average for a number of reasons, chief amongst them being the economic cycle.

We know that the price we pay for our earnings and the current stage of the economic cycle have a major impact on the short and the long terms returns we can expect from our assets.

We know that from market and economic peaks that long term returns have been below average and short term returns often negative for significantly periods of time. We also know that at market and economic troughs long term returns have been significantly above average.

We can therefore use our knowledge of stock market and economic cycles to model risks to equity returns. We can use these models to generate conservative return assumptions that have already been hit with the risks that are likely to occur throughout the lifetime of the portfolio.

For example in an advanced economic and market cycle a model will build in a recession, a downturn in earnings, a fall in price earnings, and a contraction in price multiples (P/E ratios). It will also model the subsequent direction of the market and economic cycle over a number of cycles. These models can be as conservative as you want them to be. If current price earnings ratios are high, inflation and interest rates low,

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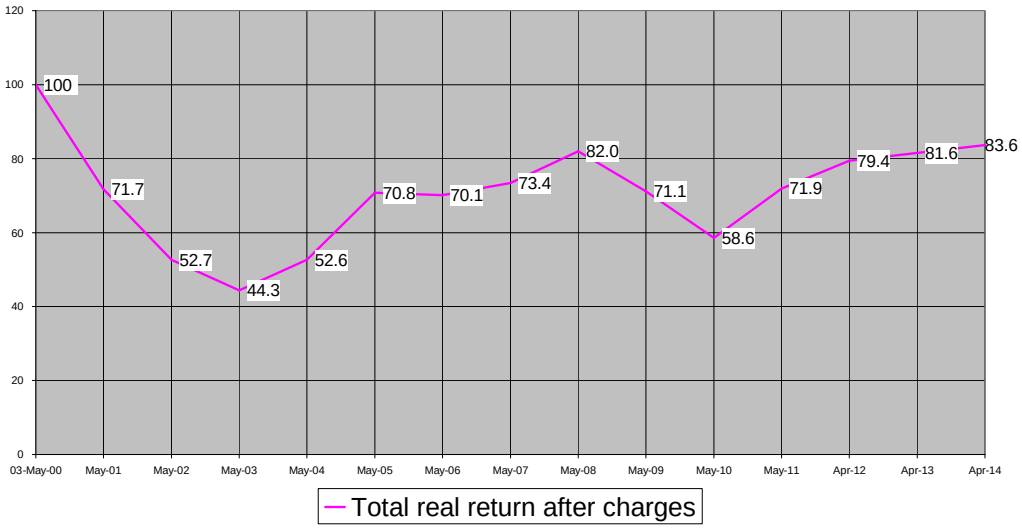
you may want to build in the risk of price earnings ratios moving back to a longer term average. Also if the economic cycle is extended the probable profit downturn is likely to be larger. By using conservative assumptions over future earnings growth, economic cycles, inflation, asset management expenses and valuation criteria we can effectively constrain uncertainty via modeling to cope with significant risks to return.

The following is an example of return assumptions derived from the type of model discussed. The chart shows the projected total real return on the S&P 500 from May 2000 to May 2014.

S&P 500 - Total real return after charges - May 2000 to May 2014



Appendix C provides further information on a stock market and economic risk to return model. Note that the size and timing of future economic cycles are not going to be the same as those input into your models; your models are there to ensure that the risks to return of economic cycles and stock market corrections, bear markets etc are taken into consideration in the return estimation.

The objective is to ensure that there is a stable platform in which investment planning can operate within uncertainty. Investors are looking for stability and certainty in ability to meet planned financial commitments. The return modelling you employ is critical in providing this.

As stated, the model is based on the present moment in time. At high market levels, the model discounts a major correction or crash, at peak economic cycles the model discounts a recession. Clients' needs are not based on optimistic assumptions.

Modelling needs to be compatible with portfolio management objectives.

Individual investors will have limited capital, they will often be depleting capital over time. Too high a return assumption will deplete capital at a faster rate to the detriment of future financial security.

Return assumptions need to be compatible with the structure and objectives of your portfolios.

A portfolio with short term liabilities needs both a shorter term and a longer term return assumption. The first to model the short term economic and stock market risk in the market place and the second to model the longer term return profile of the portfolio.

The return assumption should be appropriate to the portfolio structure. A portfolio protected against significant short term risk within its structure can accept a longer term return assumption.

Equity return modelling requires a discipline.

As with investment discipline, return assumptions should not be carried away by exuberant markets or swayed by falling ones.

Equity return modelling also requires an investment planning discipline.

Where assets and liabilities are being managed over time, equities will be realised continuously to meet future liabilities. As such, modelling needs to take into consideration the impact of long term portfolio activity.

Importantly the models need to reflect the actual risks of the market and economic cycle and are effectively a disequilibrium modelling discipline. Stochastic modelling of historic probability distributions cannot do this.

5.7 Integration of Valuation, Allocation & Management

If markets efficiently price risk and return at a point in time, if mean variance analysis can develop symmetrical risk/return structures from past pricing relationships and the future direction of price movements and the relationships underpinning price movements are random and independent of prior and future movements, then the mean variance optimiser is an efficient allocation vehicle and all investors should hold the market portfolio.

But, if markets are not point in time efficient and prices reflect demand rather than risks to return, if market movements over the long term are not independent but dependent, then we need to be able to manage both absolute and relative valuation and we need to be able to deliver portfolios personalised to liabilities profiles over time in order to manage risk and return and to maximise utility.

In this context it is imperative that models defining absolute and relative valuation are directly integrated within the portfolio construction, planning and management process. This also means that integrated asset and liability management frameworks will be dynamic. Integrating a valuation and allocation model is more than just about producing a recommended portfolio, it is ultimately and mostly about management.

As soon as a portfolio is recommended, it becomes an existing portfolio and its allocation deviates from the recommended for a number of reasons. Managing this deviation is complex because a) future capital inflows and outflows to and from the equity portfolio represent future changes to allocation and b) deviations from recommended allocations will depend on relative over or under valuation, on absolute valuation, on risk preferences and liability profiles. This document does not discuss the decision rules defining this aspect of asset and liability management in any great depth given that its focus is primarily one of a basic framework. However, the development of these benchmarks is a fairly simple affair, albeit requiring a fairly high level of explanation.

5.8 An efficient, dynamic, symmetrical framework

It is clear that the portfolio problem is more than just risk and return at a point in time. Ignoring financial demands on a portfolio and the management of asset and liability relationships over time and at a point in time, clearly over simplifies the portfolio problem.

Yes an asset and liability management framework that treats asset risks and returns as time dependent relationships, that considers the management of valuation risks as critical to maximising consumption and that demands the integration of a number of complex relationships is a much more structurally complex framework to develop. Nevertheless such a dynamic and symmetrical framework is the only one capable of simply managing the complex interrelationships of the space/time continuum.

The ability to integrate all business process components into one central service process has ramifications for cost, service, asset management distribution and the future structure of the financial services market place.

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6 Modern Portfolio Theory & The Mean Variance Optimiser

Modern portfolio theory believes that markets are point in time efficient. It also believes that future price movements and information underlying price movements are random and independent, thereby implying that the market and the economic relationships are at equilibrium; at equilibrium price movements are dependent on equilibrium relationships not disequilibrium relationships.

If markets are efficient at pricing risk and return, all assets must be correctly priced relative to one another at all prior points in time. That is all price differentials will have been arbitraged away by price movements in each period and all price movements will be representative of the nature of risk and return of a security, market component or asset class.

Therefore, if markets are efficient at pricing risk and return, they have most likely been efficient at pricing risk and return for some time. If you believed that markets were efficient at valuing risk and return at all points in time and you wanted a portfolio with a specific risk and return profile (note not a fixed risk/return profile because this is impossible under assumed independence of future price movements) and you did not have access to the valuation models that underpin efficient pricing at a point in time, you might decide to use historic pricing relationships to structure an efficient asset allocation. This is where the mean variance optimiser comes into the picture.

Efficient markets and independent price movements are key to the validation of the use of the mean variance optimiser. Take away equilibrium and you take away independent price movements and you no longer have truly efficient markets and both time and space open up as problems that need to be managed.

6.1 The Mean Variance Optimiser

The most commonly used “statistical inference” portfolio construction tool in the financial services market place today is the mean variance optimiser. It combines “expected returns”, “expected risks” and “expected correlations” to produce a recommended asset allocation or portfolio.

The portfolios produced by the mean variance optimiser are meant to be “efficient” in the sense that the risk/return relationships underpinning the allocation are presumed to hold for all market conditions. This does not mean that the expected risk and return used by the model will be the risk and return produced by the portfolio, just that the average of the future distribution of return around the mean (whatever that mean is, positive or negative) will be more or less the same as the distribution around the mean in the model.

> The model therefore assumes that all risk/return relationships are constant. It also means the portfolio will only be mean variance efficient over time and not at a point in time, even though the market will be efficient at a point in time. This is due to the fact that the mean variance model is a statistical inference of time series efficiency and not a point in time model of risk and return.

While Markowitz was the first to formally recognise that relative price movements, risk and return were important components of the asset allocation decision, the framework that he introduced in his 1952 paper to demonstrate the mechanics of this relationship was really no more than a framework for allocating to stocks and not a total portfolio management framework.

Much of what Markowitz proposed can easily be replicated with a value biased investment strategy where the portfolio is comprised of those stocks that have been rising for some time and are starting to be realised and those stocks that have fallen, purchased and yet to rise and those that have risen but not far enough or for long enough to be sold. If you are paying attention to value and the management of the allocation to value, you should by implication be paying attention to relative price movements or correlation.

Modern portfolio theory does not hold the rights to diversification.

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It is poignant to note that Markowitz's original analysis focussed mainly on the issue of stocks, mainly on the correlated risk of stocks and, ignored risks of valuation and their impact on the ability of assets to meet current and future consumption/expenditure. It is poignant because subsequent developments of financial economics have also completely ignored these issues.

This document argues, inter alia, that the mean variance optimiser should not represent the primary framework for the construction, planning and management of assets to meet financial needs over time and that standard deviation is neither the best representation of risk nor the most important risk for the allocation and management of assets to maximise personal financial needs over time. It is only one of many risks, risks which include valuation, performance and volatility.

Indeed, standard deviation can only take centre stage if markets efficiently price risk at all stages of the market and economic cycle and, if they do not then the relevance of standard deviation is marginal and so is the relevance of the mean variance optimiser.

Markowitz's focus on standard deviation has more to do with the fact that his was a statistical analysis and that standard deviation is the best measure of risk for this type of limited analysis. The importance of correlation or relative price movements to the management of equity risk and return at a point in time remains pivotal, undeveloped and relatively ignored. See Section 4.4 on Relative Valuation.

6.2 Key weaknesses of the mean variance optimiser

This mean variance model as applied within the retail financial service industry has several key weaknesses.

- An internal conflict with modern portfolio theory's assumptions of random independent movements and equilibrium pricing.
- A reliance on historical risk/return relationships.
- An inability to manage short term risks to return and hence short term risks to consumption.
- The lack of a liability management framework and input to portfolio structure.
- Its focus on short term risk/return trade offs which ignore the fundamental nature of asset class risk and return over time.
- The market portfolio is not an optimum allocation of assets for the individual.
- The lack of a portfolio management function; integrating the management of assets and liabilities can actually enhance return and reduce risk. In particular the lack of a liability or consumption management function makes it "***utility maximising inefficient***".

6.2.1 Dependent or independent movements

The mean variance optimizer uses historical risk/return relationships to determine the mean variance efficient allocation to assets. This implies a constant risk premium between low risk assets and higher risk equity investments.

You could argue that using the mean variance optimiser to construct forward looking allocations based on constant historical risk/return relationships implicitly assumes price movements are dependent over time and not independent. You could also argue that if efficient markets are responsible for maintaining this constant risk premium that efficient markets will continue to maintain these risk/return relationships over time.

This as much assumes that price movements are random and time dependent and that we therefore have greater certainty over the long term fundamental nature of asset risk and return. This means we should be asset allocating according to the size and timing of financial needs over time providing we can manage uncertainty and the random nature of day to day price movements. In this sense portfolio theory is being constrained by the mean variance structure which as discussed throughout this document lacks a liability input.

6.2.2 Historical risk/return relationships

Even if markets were efficient at pricing risk and return and risks to return, the allocation to market components would at least change over time.

A mean variance optimiser assumes that the dynamics of the risk/return relationship are constant. We know this is not the case since the components of index funds vary over time; although many significant short term deviations are due more to the demand for certainty of price movement than the supply of earnings determining price relationships. In this case, so should the allocations to the "market portfolio" change over time, whatever "the market portfolio" may or may not be.

If markets were efficient at pricing risk and return at a point in time and past pricing relationships were good approximations of the symmetrical risk/return relationships between assets and asset classes and future returns were random and independent, then fixed asset allocations derived from a mean variance optimiser might be a good compromise and possibly equivalent to point in time efficient allocations over long time frames.

However the major problem in the real world with the use of historical asset allocations is the fact that relative and absolute demand are often more important factors in determining market prices at critical points in the market and economic cycle. If price movements are also dependent over time on fundamental economic relationships, the use of historical pricing relationships to determine efficient asset allocations brakes down. Over the short term asset prices can significantly under and over value future real return relationships.

Investing on the basis of averaged historical risk, return and relative price movements will expose investors to unnecessary risks at critical points in the market and economic cycle. Use of historical risk, return and relative price movements cannot therefore result in efficient portfolios. While in an equilibrium model the deviation from the point in time may be significant at times but small most of the time, in a disequilibrium model the deviation can be extreme and significant for long periods of time.

If we are to look at this in terms of a mean variance distribution, both the mean and the distribution of its variance will shift depending on a) the stage of the market and the economic cycle and b) the time frame of the portfolio.

6.2.2.1 A theoretical model only

Indeed, the mean variance structure is only a theoretical model of an efficient point in time asset allocation framework. It is constrained by its reliance on historical return to set the symmetrical pricing relationship. While covariance or point in time relative pricing is the lynchpin to efficient asset allocation, the mean variance optimiser's use of historical average price relationships completely ignores and obscures the dynamics of current pricing relationships which are key to optimising risk and return and setting prices in both an equilibrium and a disequilibrium model.

Furthermore, as section 4.4 discusses, once you move to a relative valuation framework, you can no longer use standard deviation (point in time standard deviation is the price movement) and you can no longer use expected return to determine structure. In a symmetrical risk/return relationship there are only deviations from equilibrium relationships and your allocation is determined by your liquidity needs and your willingness to accept the performance risks of greater leverage.

The mean variance optimiser is in truth a statistical convenience, a theoretical model of the relationship between risk, return and relative price movements. It uses historical price relationships to allocate because it lacks a point in time relative valuation framework in which to allocate.

As soon as you divorce yourselves from the underlying fundamental relationships that determine and dictate volatility, return and covariance of return, you undermine the very foundation of the development of an efficient market place. The mean variance optimiser through the use of staid historical relationships is more likely to effect an inefficient allocation of capital and represents a barrier to the development of a rationale decision making processes.

6.2.3 Ability to manage short term risk/return relationships

A reliance on historical averages and the efficient market strait jacket renders the mean variance optimiser all but useless in positioning a portfolio for the short term management of risk and return so critical for those with ongoing financial commitments. According to firm adherents of modern portfolio theory and the efficient markets' hypothesis there is no such thing as extreme valuations that pose extreme risks to the ability of assets to meet financial needs over time.

Part of the problem lies undoubtedly with the belief that future market movements are random and independent, meaning that it is not the valuation of markets but the next period's information that holds the risks. Once we acknowledge that long term market movements are time dependent and the market and economic relationship are in perpetual disequilibrium we can no longer afford the luxury of such simplifying assumptions. We must value and manage absolute valuation risk.

Significant valuation risks have durations of years, and in extreme cases decades. These are very significant risks to the ability of capital to meet future financial needs. It is therefore strange that a methodology that also believes that consumers are risk averse and utility maximising should ignore the biggest single risks to either.

Presenting consumers with risk/return trade-offs that may differ wildly from those they are about to experience would also suggest that their application in the retail financial services industry should be covered with financial health warnings.

In 2000 the world stock markets were standing at historical highs, but most mean variance optimisers assumed that a) the market was correctly valuing risk and b) that markets were not over valued. Worse, in 2000, mean variance optimisers assumed that higher risk investments were capable of producing higher returns when in fact, many higher risk investments were set to lose 80% of their value over the next 2 to 3 years; the NASDAQ is still some 60% off its all time high 6 years after the fact.

Instead of concerning itself with asset risk and return at a point in time and financial needs over time, modern portfolio theory has chosen to concern itself with the beauty of historical physical asset pricing relationships.

6.2.4 Liability input/consumption relationship

What makes an argument for the importance of a liability component to a portfolio theory apparently insurmountable are the years of an implied acceptance of a theory that does not have one.

Again we need to go back to a central simplifying assumption of modern portfolio theory that all future price movements are random and independent over time and markets are efficient. Therefore any structure skewed towards a time dependent asset/liability profile as opposed to a mean variance point in time risk/return relationship is exposing itself to unnecessary risk.

If either of the above simplifying assumptions are incorrect, that is the market is not efficient at pricing absolute and relative valuation risks and future prices are random and dependent, then the modern portfolio theory construct breaks down and a liability component needs to be introduced into the equation.

Why? Because a) you can relate asset allocation over time to the size and timing of liabilities over time which allows you to better optimise allocation to current and future consumption and b) if markets are not efficiently pricing significant risks to return, the portfolio must manage this risk through structure.

Mean variance optimisation does not have a liability input and largely ignores the structural ramifications of financial demands on portfolios. Portfolio allocation is more often determined by the required rate of return than the size and timing of financial needs. Required rates of return, unless over a series of short discrete time periods, incorporate little information regarding the size, timing and variance of portfolio income and capital liabilities.

> Understandably if you are focussed on the "mean variance box" you may only be focussing on the normal probability distribution of risk and return under uncertainty in the consumption and portfolio decision making process.

Portfolio frameworks that have a direct liability input are able to align portfolio securities and components to the liability profile (size and timing of consumption) thereby eliminating most of significant risk and the bulk of uncertainty in the portfolio management process. They also lower costs and enable more efficient management of risk and return and the cycling of return towards future consumption.

Portfolio choice should be directly related to the client's consumption profile over time and the fundamental nature of risks and returns over time. Structuring a portfolio from the liability perspective up is not possible within a mean variance framework. The maths would be tortuous and complex as can be seen with the development of dynamic financial modelling; the mean variance optimiser is a theoretical model and not a point in time manager of risk and return.

…modern portfolio theory is not a portfolio theory, but a probabilistic theory of asset pricing in a one period efficient market.

The mean variance optimiser should not be the engine of choice for consumption driven portfolio objectives. In order to make a mean variance optimiser relevant we would at the very least need to split a portfolio up into a large number of dedicated components (components dedicated to the liabilities over time) and let the investor choose where on the efficient frontier they wanted each dedicated component to be. The trouble is that each component would have a relationship with each other which could not be managed by an isolated structure.

One wonders if modern portfolio theorists really do hold to the assumption of equilibrium market and economic relationships and hence random and independent price movements. This assumption is a convenient one in that it has allowed financial economists to focus solely on a symmetrical point in time asset pricing framework and not the wider issues of portfolio construction, planning and management. Whatever the real reason, modern portfolio theory is not a portfolio theory, but a probabilistic theory of asset pricing in a one period efficient market.

6.2.5 A focus on short term risk/return trade off

If returns are uncertain, random and independent and markets are efficient at pricing point in time risk and return, then the risk/return trade-off is a point in time decision. It is all about the probability distribution of future outcomes.

If returns are uncertain, random but dependent (equilibrating) over time, then the risk and return decision framework is spatial and time dependent.

If we assume markets and economies are not in equilibrium, focussing on the short term risk/return profile of an asset class that has a longer term risk/return profile relative to an asset class that has a shorter term/risk return profile is going to weight preference in favour of the lower risk asset class, to the possible detriment of long term consumption[10]. Therefore the mean variance optimiser fails to portray the distribution of risk and return facing the investor at a point in time. At high market valuations it is underestimating short term risk and overestimating return and vice versa at low market valuations. Focussing on short term risk return trade-offs also ignores the fundamental nature of asset class risk and return over time while a reliance on historical data ignores potential significant risks to return.

A well structured portfolio should be able to meet short term financial needs with certainty irrespective of the short term volatility risk of the overall portfolio allocation. The short term volatility of the total portfolio is irrelevant to the current consumption decision. Indeed, the investor needs to be able to focus on the structure and the time frame of risk/return in order to make a rationale decision over the risk/return and consumption trade-off.

What appears in a mean variance optimiser to be one decision over the range of absolute return or absolute loss at a point in time is in fact a totally different decision once we incorporate time and a structure that relates asset allocation to the size and timing of financial needs over time given the nature of asset class risk and return over time.

Capital needed now has a different risk/return decision to capital that may not be needed for 20 years, thereby allowing investors to make more rationale decisions about asset allocation over time. We are effectively talking about time diversification of risk and the fundamental nature of asset risk and return over time. See section 4 for more information about these areas.

A portfolio theory must be able to focus on both the short and the long term risk/return relationships to accommodate consumers' objectives of maximising their utility of capital over time. This is compromised in the mean variance optimiser. If we are maximising both short and long term consumption of capital we need to be able to allocate efficiently to short and long term assets in accordance with short and long term risks as well as short term pricing relationships.

6.2.6 Standard deviation as a measure of risk

Standard deviation as a measure of price volatility is fine, but standard deviation as a measure of total risk is a problem. It is a problem because the biggest risks to the ability to maximize utility are significant market and economic risks and not price volatility.

Significant market risks occur when markets are excessively or highly valued, something which cannot happen within an efficient, equilibrium market but something which does happen during almost every real world market and economic cycle. Asset price inflation occurs normally through one or a combination of excess money supply growth and a shift in the relative demand from cash to other investments assets. Economic risk is a natural consequence of the risks of the business cycle. But significant market risk cannot happen in a one period efficient market model and, economic risk is not a dependent risk within a random walk model.

A mean variance optimizer cannot manage valuation risks because these risks are assumed away in modern portfolio theory. This assumption effectively invalidates standard deviation as the most important risk in the real world, thereby effectively invalidating the importance of the mean variance optimizer as a risk manager.

[10] Asset allocation that focuses on both absolute and relative valuations and long term fundamental risk/return relationships will adjust long term fundamental relationships to current price relationships. Asset allocation requires a direct valuation input. Historical risk/return relationships and rules of thumb are inefficient.

6.2.7 The market portfolio

It is unlikely that mean variance optimisers used in the financial services industry actually use the modern portfolio prescription of the market portfolio or uses the capital market line in determining the appropriate balance of cash and the market portfolio.

This framework holds if modern portfolio theory's assumptions regarding random, uncertain, independent movement of future prices, equilibrium markets and efficient pricing of risk, but falls apart if risks and returns are random and dependent, time variant, relative and absolute.

Whether the market portfolio is the sum of all economic decisions or the portfolio each individual needs to hold is dependent upon the view of the investment universe we are facing. According to the laws of general relativity, the rules governing portfolio construction should be the same for everyone's portfolio.

If the future direction of prices are random and dependent instead of random and independent and, if every individual's risk preferences and decisions as to the time frame of consumption are different, then each individual portfolio will need to reflect the time frame of consumption adjusted for risk/return preferences and hence will be different from the market portfolio.

In this instance the sum of all portfolio allocations equals the market portfolio. The market portfolio is therefore the sum of all consumption, savings, investment and production decisions in the economy.

Moreover, if the fundamental nature of risk and return changes over time, then over the very long term the "real return on equity capital" is the "real" risk free rate of return, all else being equal. Time frame as well as financial demands changes the position of the market portfolio on the efficient frontier.

But just what is the market portfolio?

Modern portfolio theory never properly identifies its constituents let alone how you would calculate the allocation to each constituent. Again, depending on your view of the investment universe, the allocation and components of the market portfolio will change, in which case the market portfolio varies according to the size and timing of consumption and the fundamental nature of risk and return over time.

6.2.8 Lack of a management function

Theoretical models represent the basic interaction of fundamental relationships. While rarely capable of being shunted "as is" to a real life situation, they should be capable of being extended to deal with the much larger number of complex dynamic relationships of real life.

If the real world was the simple restrictive assumptions of modern portfolio theory, the simple framework of the mean variance optimiser would fully translate into real life.

The fact that the simplifying assumptions are not representative of the true relationships causes a problem. The size and timing of individual consumption profiles vary over time as do risk preferences. Add the fact that absolute and relative valuations change constantly and optimum and ongoing asset allocations will differ and we have a complex but manageable set of dynamic relationships.

Frameworks that can manage the relationship between financial needs and asset allocation over time and that are capable of being integrated with point in time valuation models can manage this complexity. A mean variance optimiser cannot. It is to all intents and purposes a plane without landing gear, a theoretical prototype of one of the fundamental relationships of the total portfolio structure.

6.2.9 Secondary weaknesses

The above notes the main weaknesses of the mean variance optimisation framework. There are numerous secondary weaknesses that are of relevance to those that use mean variance optimisers and these are very briefly discussed here.

- The models are extremely sensitive to changes in inputs, so much so that constraints on the asset allocation outputs have to be made to make the models work.

- Many of the constraints reflect the preferences of the users and therefore result in much higher allocations to domestic markets and other preferred asset classes than you would presume would be the case within an efficiently diversified portfolio.

- Asset classes are introduced into the optimiser without regard to their actual composition within the "market portfolio" further exacerbating the fundamental weaknesses of the optimiser.

- Not all asset classes have uniform standard deviations; standard deviation on property is reduced due to the fact that property is infrequently traded and valued. Given the sensitivity of the models to inputs, inefficient allocations are likely to result.

6.3 Modern portfolio theory and the retail financial services market place

The financial services industry widely represents its ability to personalise portfolios to financial needs and risk profiles and to provide efficient portfolios when in fact its models cannot personalise to financial needs, cannot manage point in time risk and return and are unlikely to provide an "efficient" risk/return portfolio.

Mean variance optimisers are capable of providing balanced, diversified, average portfolios that will provide an unknown level return. Whether they are the most efficient in terms of their ability to manage point in time risk and return will be more of a matter of luck than design. They provide a simple tool for those who cannot construct a portfolio and those who may not otherwise provide sufficient balance to do so.

The major problem with the financial services industry and its use of the mean variance optimiser is its fundamental lack of understanding of the limitations of the mean variance structure and the persistent assertions over the delivery of an efficient portfolio and its associated expected risks and returns. Most in the industry believe that asset allocation is 90% of return, that a mean variance optimiser delivers this return and that you can charge 2% to 4% a year for this simple structure while still retaining its relevance.

Services which claim that a mean variance optimiser is capable of a) providing return through the efficient management of risk and return and b) providing a certain percentage of return are incorrect and guilty of misleading the private investor. Asset allocation under uncertainty uses simple assumptions over risk and return to generate an asset allocation that should be populated by simple exchange traded or other index investments. Advisors who adhere to modern portfolio theory cannot use any other asset allocation vehicle as this implies certainty over the direction of future performance, which invalidates the structure and the assumptions.

6.4 The Monte Carlo Band-Aid

The risk and return outputs from a mean variance optimiser are not forward looking expected returns, just the mean return and the standard deviation of the distribution of past price movements used to determine the asset allocation. Unfortunately many who use mean variance optimisers have used the mean return to project forward for modelling what an individual can consumer from their capital over time.

Within a modern portfolio theory construct we do not actually know the future path of risk and return. Under modern portfolio theory assumptions, future price movements are not only random but they are also

independent. However, with markets being "efficient", the point in time framework in which prices are adjusted for new information implies that price movements at a point in time are part of a symmetrical risk/return relationship. Modern portfolio theory uses this assumption to model uncertainty.

How does modern portfolio theory forecast the uncertainty of return?

Quite simply it does not forecast returns, rather it defines the return distribution of future returns. Modern portfolio theory assumes that every time period starts off with a "fresh toss of the coin". Whereas with a coin, the options are only heads or tails, within an asset or asset class it is the probability distribution of historical returns.

The only way we can capture the uncertainty of random and independent price movements in this context is to randomly select pricing (including cross correlations) relationships from this past probability distribution to build up a probability distribution of all future return.

The Monte Carlo comes up with a forecast distribution of the uncertainty of return. The wide distribution over the uncertainty of return is a validation of the argument that all investors should hold the "market portfolio". Anything else would be placing a bet against the future distribution of return. Therefore, Monte Carlo analysis should not be used to select a portfolio which will either lower the probability of loss or raise the probability of return. If you are going to operate within a modern portfolio theory framework you need to heed the logical recommendation of its prescription.

However, if returns are not independent, but dependent (economies and markets move in cycles, for valid reasons) on long term fundamental economic relationships and if market and economic relationships are not at equilibrium then the Monte Carlo simulation ceases to have relevance.

For one, the point in time valuation and allocation models that price risk and return are directly related to time dependent economic variables. Random sampling may well place an economic trough next to an economic peak, a period of excess demand right next to a number of periods of insufficient demand. We could also have a period of rising interest rates following on a sharp decline in demand, or a fall in interest rates following on from a strong inflationary period.

While short term returns are indeed random and appear to be independent (a share can fall when good news is announced and rise when bad news is announced, can continue rising when interest rates rise etc, etc), long term returns on investments are dependent on fundamental economic relationships and the short term deviations from them. We need disequilibrium modelling of risks to returns, not equilibrium modelling.

As such, if we are at the top of a market and an economic cycle, future returns are more likely to be considerably lower and likewise if we are at the bottom of a market and economic cycle are likely to be considerably higher than average. While there still remains uncertainty over the level of risk and return, the distribution of potential outcomes is significantly different from that provided by a Monte Carlo analysis.

If returns are independent, as stated by Modern Portfolio Theory, it does not matter whether you are at the top of a stock market and economic cycle or at the bottom, the probability of future returns based on the probability distribution remains the same. In reality we know this is not the case since investors experience negative returns for long periods of time following market peaks. What this means is that the probability distribution of returns from a Monte Carlo simulation are not the actual probability distributions facing the investor.

Even if markets were at historical average market valuations and economies at the average economic point underlying the long term return data, the probability distribution of the Monte Carlo would not reflect the true probability distribution since the outlying low probability events are derived from data incorporating extreme events which are not related to the current valuation dynamics.

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6.5 Summary

Modern portfolio theory teaches us a number of important statistical characteristics of risk and return and the importance of combining securities with relative price movements. It also rightly acknowledges the uncertainty and randomness of returns.

The mean variance solution is nevertheless incomplete relying as it does on historical data as opposed to point in time pricing relationships and is constrained in its ability to incorporate liabilities and time by simplifying assumptions that ignore longer term dependent pricing relationships and presumes market efficiency and equilibrium. As far as market efficiency is concerned, economists have long acknowledged that excess demand can lead to asset price inflation thereby implying that markets are incorrectly pricing longer term real relationships between prices and earnings; ergo markets have not been hereto efficient at critical points in time.

A "portfolio theory" needs to be able to solve for assets and liabilities and time.

A "portfolio theory" needs to be able to solve for both assets and liabilities and time. The mean variance solution cannot account for liabilities or the changing nature of risk and return over time

Why has mean variance optimisation become the centre piece of modern portfolio theory? The answer may be partly to do with a lack of a formally accepted framework for the management and integration of assets and liabilities over time. Another, the fact that mathematical and statistical disciplines that developed portfolio theory from the 1950s onwards have long since separated ways from traditional asset management and investment discipline. Another is the neoclassical world view of equilibrium markets. For both the academics and the asset managers the issue of integrating the management of assets and liabilities may not have been an issue of sufficient importance.

There is also another reason. The acceptance of modern portfolio theory and the mean variance optimiser has accompanied valid research on the ability of active investment management to out perform the stock market and a growing critical assessment of the high costs of the retail financial services industry and the consequences of the conflicts of interest that lie behind a good proportion of all transactions and recommendations. Modern portfolio theory seems to be one of the few standard bearers for a lower cost rational counterbalance to these conflicts.

7 Total Asset, Life Cycle Wealth Management

All financial advice, whether it be insurance, pensions, estate and general financial planning, depends on the amount of capital a client has both now and in the future and the relationship between that capital and lifetime financial liabilities.

Of all elements of financial services, the management of the relationship between assets and liabilities is the most complex and the most important to the management of lifetime financial needs. But to manage assets to meet lifetime financial needs we need to structure assets to meet these needs as and when they arise. To do this we need to know all planned liabilities and logically the disposition of all assets. To do this is well beyond the ability of current portfolio theory, which focuses principally on the management of risk and return at a point in time.

Total Asset Life Cycle Wealth Management represents the integration of asset management with the management of client financial liabilities and can only be effected through an integrated asset and liability management framework.

- Asset liability modelling and management assesses the ability of assets to meet needs over a client's lifetime and optimises the allocation to low risk assets to protect financial needs against significant stock market and economic risk and, equities and other longer term asset classes to provide long term return.
- Portfolios are constructed in accordance with the interaction of client liability and risk profiles and a firm's investment strategy and, exactly reflect client needs, preferences and expectations.
- The amount allocated to low risk assets, to cash, to fixed interest and specific maturities, to equities, to each global market, to each specific market allocation (market cap, style, yield) is unique to each client.
- Total risk assessment ensures that all factors affecting portfolio structure, performance and management are dealt with at outset.

This integration provides personalised portfolios with enhanced asset and liability management functionality. Investors will have all their assets and needs managed centrally, there will be one overall strategy and portfolio structure and the disposition of all assets will meet individual needs and risk preferences.

To say that the future of the wealth management industry lies in its ability to integrate the management of financial needs with the management of assets is an understatement. Smaller centralised asset management operations will be able to deliver asset management expertise to hundreds of thousands of portfolios personalised to personal financial needs over time. The costs of both asset management and financial planning will fall significantly and the needs of the client will be foremost in portfolio construction, planning and management.

The ability to integrate all business process components into one central service process has ramifications for cost, service, asset management distribution and the future structure of the financial services market place.

8 Conclusion

Are market's efficient at pricing risk and return, are the movements of markets random and independent from period to period and are the financial and economic markets in equilibrium?

The answers to these questions are critical to the way in which portfolios are constructed, planned and managed. They are critical because they affect how portfolios are managed at the point in time and over time, the risks at a point in time and over time and the optimal solution for the management of risk and return and utility maximisation.

If the answer is Yes!

If the answer to both the above is yes, then modern portfolio theory is correct, standard deviation is an appropriate measure of risk, indeed the only risk to which investors are exposed within a diversified portfolio, portfolios cannot be structured to meet financial needs and all that can be managed is the point in time risk and return. The financial world in this sense is a two dimensional world of relative price reactions. Most investors are better off being fully diversified to the "market portfolio" (whatever that is) and letting the market's rational agents make the arbitrage pricing decisions.

The mean variance optimiser in this world is an acceptable second best portfolio construction tool, but only a second best tool. In an efficient market with rational investors, efficient valuation, allocation and management frameworks would exist to manage point in time risk and return. These frameworks would be relative valuation frameworks and would not require a mean historic or expected return to generate the efficient frontier of portfolio options; all risk and all return is relative in a symmetrical pricing relationship.

If the answer is No!

If the answer to these questions is no, price movements from period to period are not independent and markets are not efficient at pricing risk beyond the point in time "demand for and supply of", then modern portfolio theory is incorrect, standard deviation (*or any measure of average deviation for that matter*) or market risk are not the only or the most important measures of risk to which investors are exposed and, portfolios can be better optimally structured to meet financial needs in accordance with the fundamental nature of asset risk and return over time and current absolute and relative valuations.

The above is important, because the concept of risk and diversification within modern portfolio theory is dependent on efficient pricing in a one period model where conditions and prices in the next period are totally independent of all prior and future periods.

- If this is not the case, risks due to inefficient markets, for example absolute valuation risk, become more important at critical points to the ability of assets to meet needs over time and the need to be managed within structure.

- If this is not the case market risk is a risk which you need to diversify against and market diversification itself becomes a risk; market risk is a risk because of the consequences of periods of excess demand on asset prices and the risks to asset prices when excess demand is either taken out of or accommodated within the system. The focus on market risk is also a consequence of the focus on the point in time and ignores the inability of pricing agents to make decisions over the consequences of excess demand. In this sense, modern portfolio theory is a concept whose price depends on perfection.

- If this is not the case, time diversification of risk adjusted for disequilibrium pricing is the optimum allocation strategy. This means that liabilities over time (consumption, financial needs whatever you

want to call it) are the principal determinants of asset allocation in a world where the nature of asset class risk and return changes over time.

In this second universe where markets are not efficient at managing absolute valuation risks (excess demand relative to long term real relationships) and where long term price movements are ultimately dependent, the mean variance optimiser is inefficient as a portfolio construction tool. Its inability to manage (*and its exposure to*) to absolute valuation risks, its inability to manage liabilities and long term asset/liability relationships render it inappropriate for managing risk and return at a point in time and over time. The mean variance optimiser is not a consumption friendly tool, it is in truth a constrained theoretical model of risk and return and relative price movement. It is a model constrained even in its own limited universe of risk and return and should at least have long since progressed to a symmetrical relative valuation model of risk and return.

So just what is the real universe?

The real universe is one where over the long term market movements are dependent on fundamental long term real economic relationships and that over the short term deviate from these long term relationships as evinced by the market and economic cycles and the risks associated with such.

The real universe is one where the short term movements of asset prices are random and uncertain and exposed to often significant short term risks.

The real universe is one where markets are able to efficiently arbitrage new pricing information, but inefficient at managing demand for price movements and hence in enforcing the management of valuation risks to returns. Markets at the margin are moved by demand, not by efficient pricing. While investors are predominantly risk averse, their preferences for greater certainty of return to less and more return to less compromises their ability to effectively manage risks to return. A rationale market agent should know when prices have deviated significantly from the ability of assets to generate the implied return, yet most market agents' decisions are in conflict with a) their form of remuneration and b) their clients' aversion to being out of rising highly valued markets or market components and being in undervalued, under performing components. Market agents are not rewarded for making rationale decisions, they are rewarded for transacting and performing.

The real universe is one where the herd dominates over the short term, where it is next to impossible to outperform the market by moving with the herd and where most prices are determined by the herd. The real universe is one bounded by short term demand for and supply of assets and the long term fundamental nature of asset class risk and return.

In this case, the portfolio problem is the management of risk and return at a point in time relative to financial needs at a point in time and, risk and return over time relative to financial needs over time. Managing anything less is inefficient.

Therefore we need a fundamental framework that relates asset allocation to the size and timing of financial needs over time and that manages significant absolute and relative valuation risks. We need a framework capable of managing short term and long term uncertainty in a world of long term dependent disequilibrium pricing and markets whose efficiency is limited to matching demand for and supply of relative return at a point in time.

The dilemma & the solution

For those without the expertise, the knowledge and the resources, for those without access to rational and independent agents, the mean variance optimiser may well be the only current accepted alternative available. The trouble is the mean variance optimiser is also in the hands of those agents whose interests conflict with their ability to act rationally.

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This document is not arguing against the importance of diversification or asset allocation, the contrained validity of index funds or the insanity of an objective that aims to out perform the herd on a daily basis. It is stating that the modern portfolio theory construct for managing risk and return is insufficient, incorrect and inappropriate to the real problem and that the mean variance solution that should have led to the development of so much more is now serving to constrain the development of the portfolio solution.

Instead of assuming markets are efficient, instead of assuming that investors are rationale, we need to act rationally and to develop a rationale, integrated, dynamic and symmetrical asset and liability management framework.

There are in truth three different entities in the market place. These are the providers of transactions and products, the providers of active management and the managers of valuation, asset allocation and structure. Ultimately the financial services industry needs to evolve to a market place where these three entities are separate and independent. We also need to move to a system where the investor takes responsibility over the performance risks they want to take, over the initial or absolute valuation risks they want to be exposed to, and over the structure to manage the risks to the ability of their assets to meet their financial needs.

Ultimately we need a layer of independent market agents who are paid only to make rationale structural discussions about valuation, asset allocation and, structure to manage short and long term risks to the ability of assets to meet financial needs. Modern portfolio theory is constraining the portfolio solution. An integrated, dynamic, symmetrical asset and liability management framework would lay the basis for a more efficient financial services industry structure.

We are always at the present point in time, the future is always uncertain, yet our ability to manage the present point in time depends on our ability to relate to and manage the uncertainty of all future relationships and all future points in time from the present. This is the space/time continuum, this is the universe of the integrated asset and liability management optimiser constrained to operate under uncertainty.

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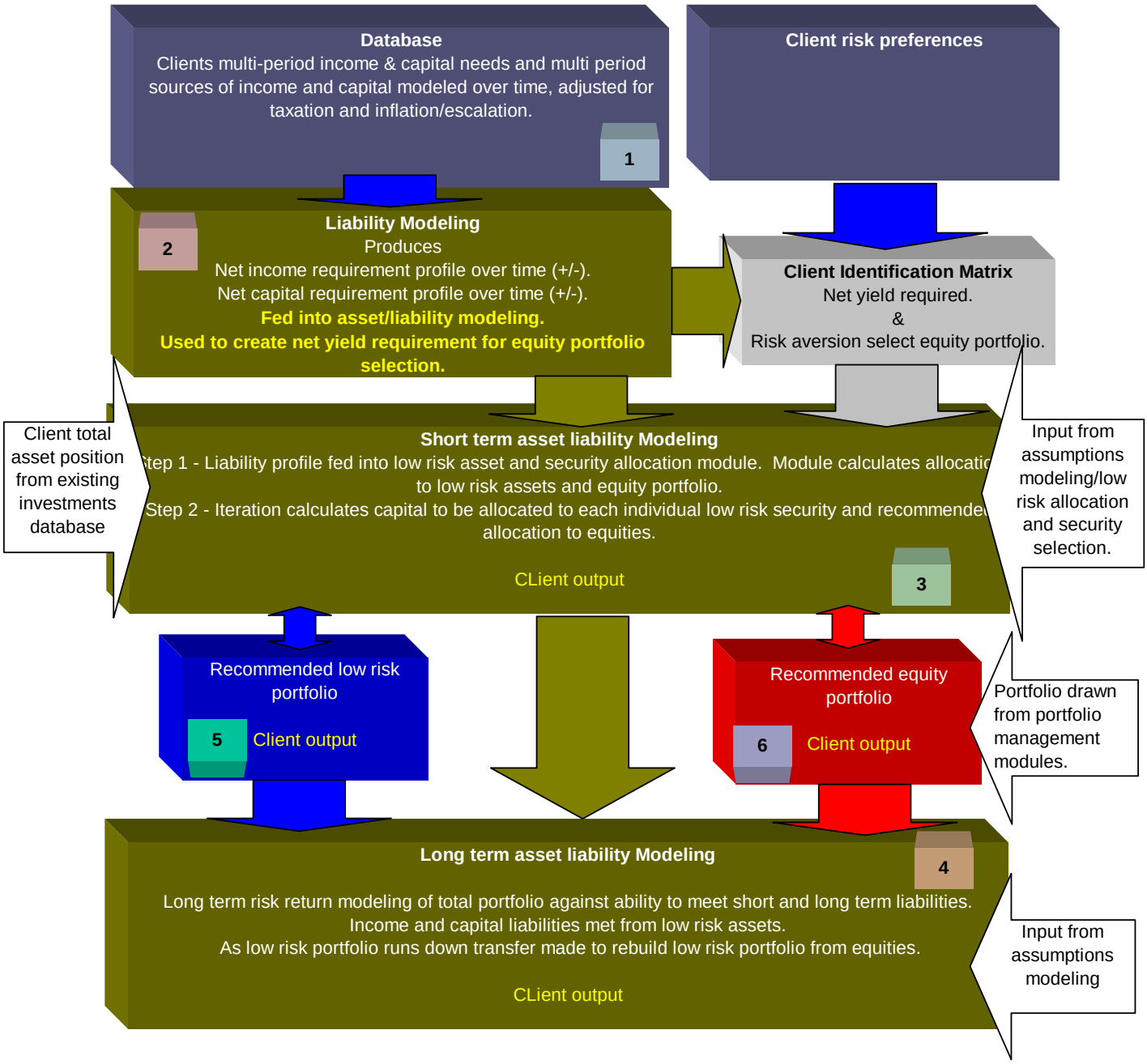
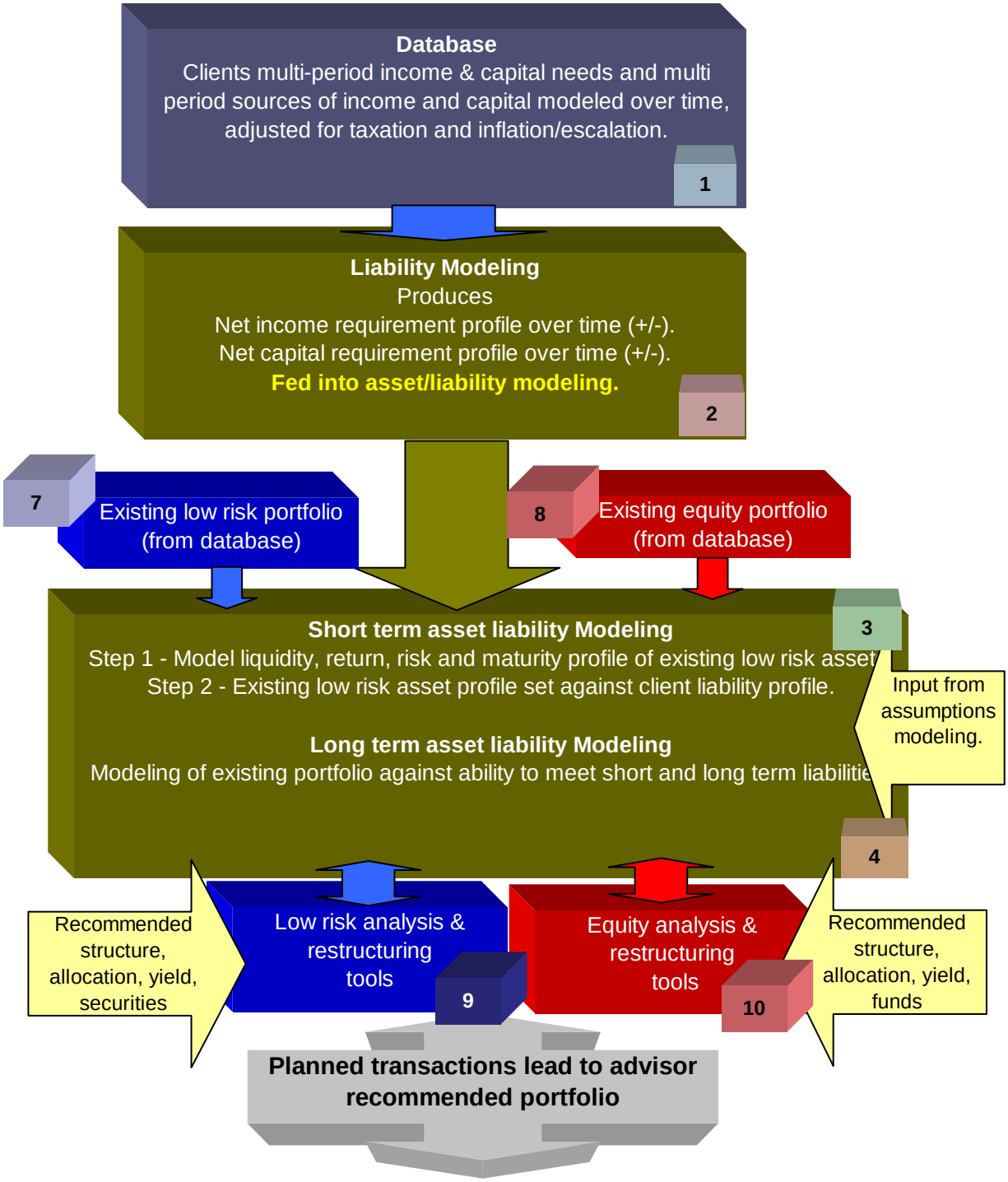
Appendix A Optimisation Process

Asset and liability management framework and process for determining recommended portfolio allocation.

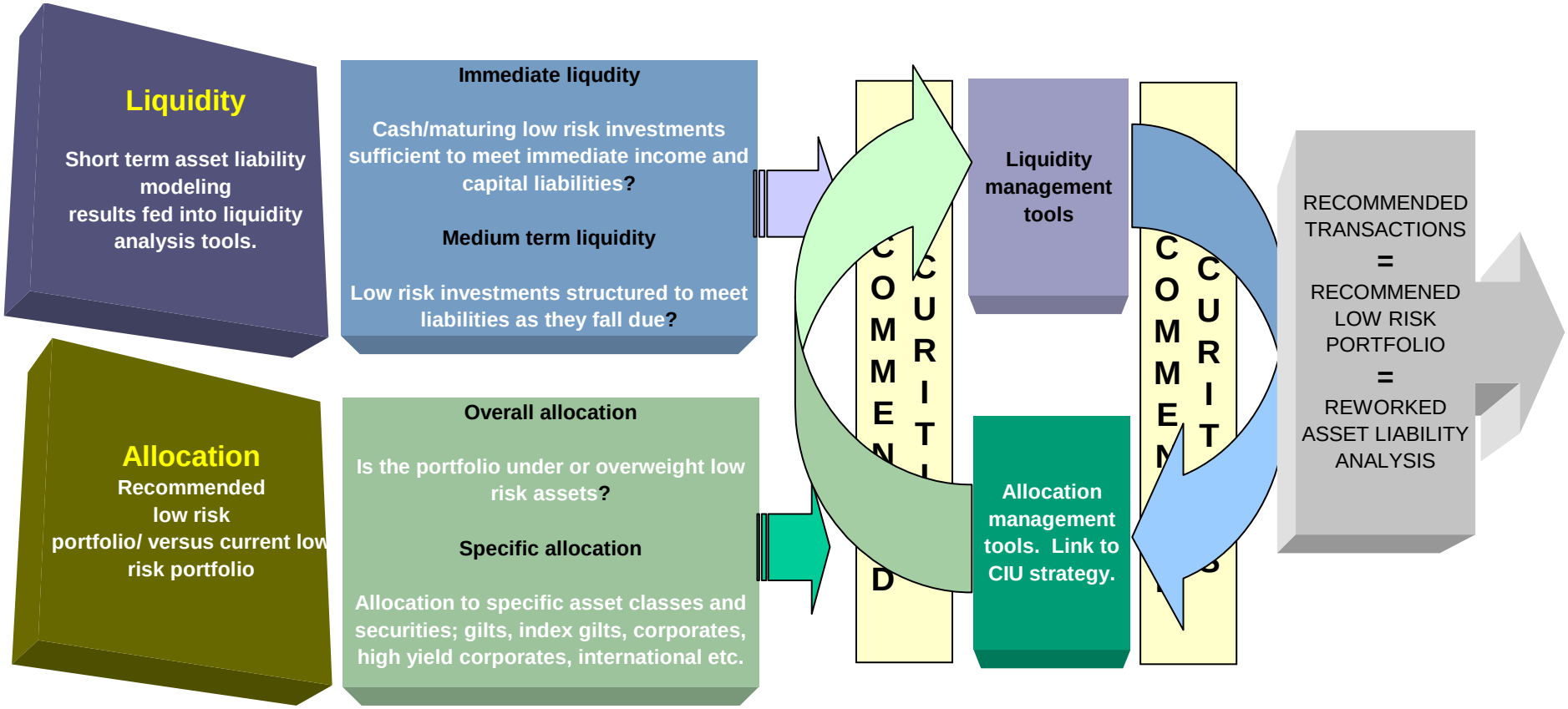


Appendix B Existing allocation process

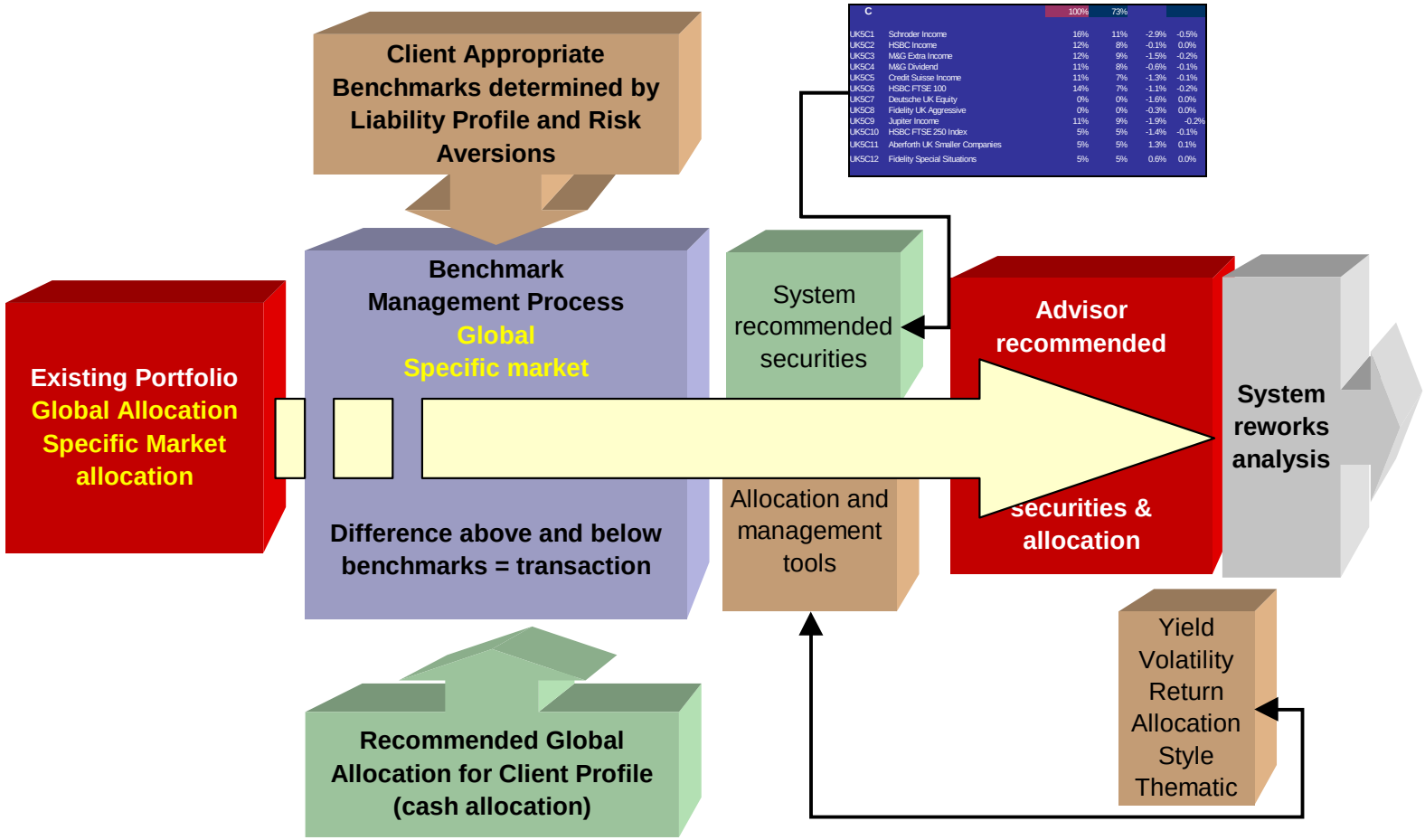
This system process is used for managing existing clients and for managing the transition of new client portfolios to recommended client portfolios.



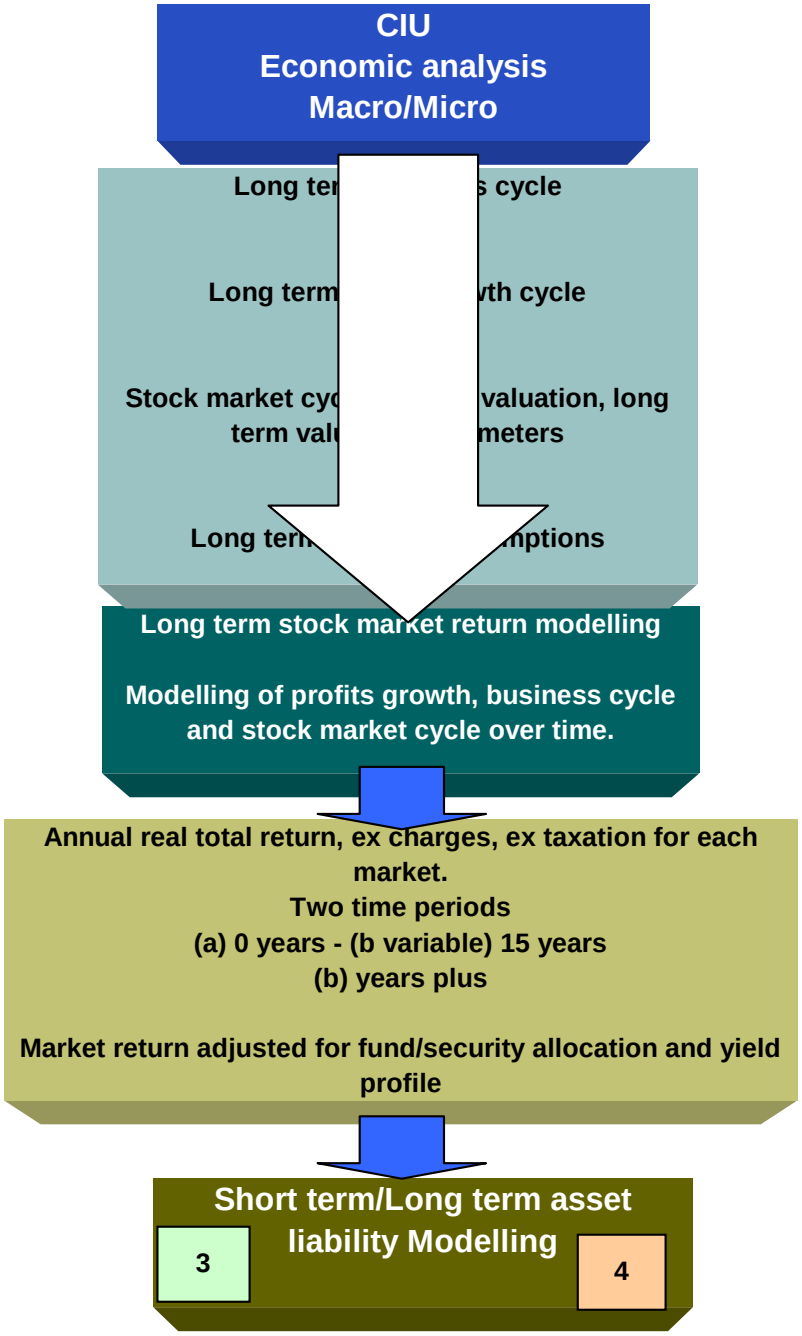
Low risk analysis & restructuring tools



Equity analysis and restructuring tools


Client Appropriate Benchmarks determined by Liability Profile and Risk Aversions
C
100%
73%
UK5C1 Schroder Income 16% 11% -2.9% -0.5%
UK5C2 HSBC Income 12% 8% -0.1% 0.0%
UK5C3 M&G Extra Income 12% 9% -1.5% -0.2%
UK5C4 M&G Dividend 11% 8% -0.6% -0.1%
UK5C5 Credit Suisse Income 11% 7% -1.3% -0.1%
UK5C6 HSBC FTSE 100 14% 7% -1.1% -0.2%
UK5C7 Deutsche UK Equity 0% 0% -1.6% 0.0%
UK5C8 Fidelity UK Aggressive 0% 0% -0.3% 0.0%
UK5C9 Jupiter Income 11% 9% -1.9% -0.2%
UK5C10 HSBC FTSE 250 Index 5% 5% -1.4% -0.1%
UK5C11 Aberforth UK Smaller Companies 5% 5% 1.3% 0.1%
UK5C12 Fidelity Special Situations 5% 5% 0.6% 0.0%
Benchmark Management Process
Global
Specific market
System recommended securities
Advisor recommended
System reworks analysis
Existing Portfolio
Global Allocation
Specific Market
allocation
Difference above and below benchmarks = transaction
Allocation and management tools
securities & allocation
Yield
Volatility
Return
Allocation
Style
Thematic
Recommended Global Allocation for Client Profile (cash allocation)

Appendix C Stock market risk/return model (CIU – Central Investment Unit)



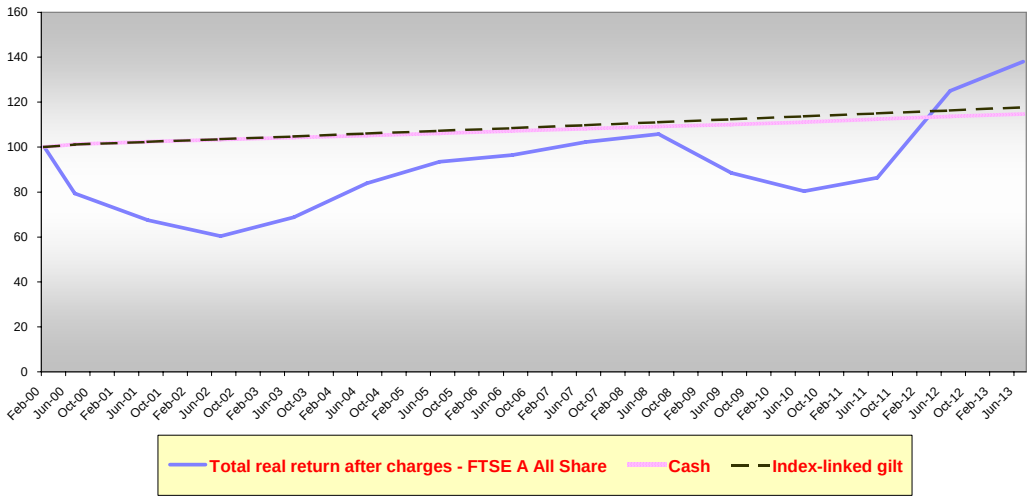
This is the model used to determine the long term risk return assumptions for stock market investment within the asset/liability models.

This section relies on macro and micro economic expertise of a central investment unit. The current system model is a 15 year model into which a long term business cycle, a long term profit cycle and a long term stock market cycle is input. The present moment in time should reflect the current stage of the business and profit cycle (advanced, recession, boom, recovery), the current stage of the market cycle (depressed, highly

valued, fair value etc). The more advanced the business, profit and market cycles the lower the future expected return and vice versa. Assumptions need to be objective and conservative.

The model is not designed to predict future return but to assess the ability of a portfolio to meet future income and capital needs in the face of long term stock market and economic risks. At high market levels, the model discounts a major correction or crash, at peak economic cycles the model discounts a recession. Clients' needs are not based on optimistic assumptions.

UK long term risk return - February 2000



The above shows the modelled return on the FTSE A All Share over a 15 year time frame from early February 2000. The economy was at the peak of the economic cycle, markets were over valued, risk was high. Assumptions needed to be conservative. As such, no investor using this type of asset/liability modelling would have had to readjust long term expenditure in the light of current market falls. The chart is in real terms (market level would be higher in nominal terms), is after tax and annual management charges.

The objective of asset/liability management is to minimise the risk to income and capital provision over time. Higher return objectives will create higher potential volatility of such provision, conservative assumptions will reduce volatility.

The system has models for each major market. The model generates two period return assumptions, one based on current valuations, the second based on long term average valuations. Returns for each market are adjusted for a fund's/securities yield, asset allocation and return profile. These return assumptions underpin the system's asset/liability matching models.

The models themselves are automatically updated in response to market movements but rely on CIU economic updates for the macro input.