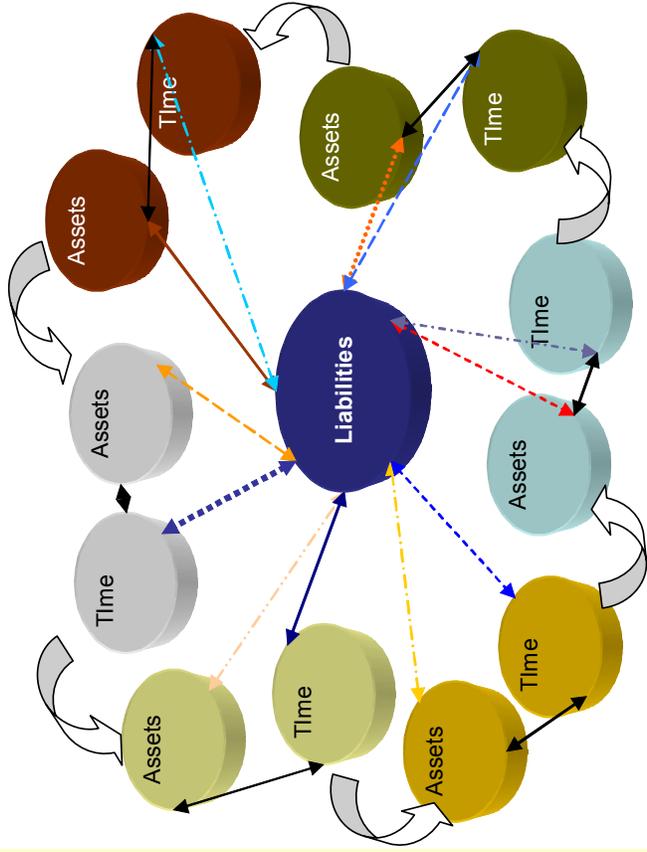


The TAMRIS CONSULTANCY

Liability Management Frameworks



Assets, liabilities and time provide a symmetrical relationship for the management of assets and liabilities over time. Symmetry is a natural physical and spatial relationship which gives structure, strength and a rationale to portfolio management. Without symmetry between assets, liabilities and time, there is no real structure. Modern portfolio theory lacks the liability component needed to provide symmetry to asset and liability management. TAMRIS provides this missing link, a new financial theory and, a dynamic structure to manage assets and liabilities.

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ASSET & LIABILITY MANAGEMENT FRAMEWORKS

The area of asset and liability management and the frameworks used to manage assets and liabilities over time is an extremely detailed area. You only need to read the various TAMRIS Technical documents to appreciate this.

However, the output, the use and the management of liability and asset management frameworks is a totally different issue. Asset and liability management frameworks simplify, control and manage the asset management (excess risk/ excess return) and liability management process.

Imagine never having to personally construct a portfolio for each individual client. Instead, imagine the portfolio constructing itself. Imagine never having to work out what to do, what to sell and when to do it, imagine never having to work out the interaction of changing financial needs and asset allocation over time.

A&LM frameworks do not just construct any portfolio. The amount of cash, the size and timing of fixed interest investments, the equity strategy, the global and specific market allocation, the style, index or active, risk and return are all personal to the client.

Imagine an infinite number of different portfolios for an infinite number of clients run from one central investment discipline and process.

Imagine the instant the price of an asset allocation component changes, the effect of this change is interpreted by the A&LM framework.

Prices change, relative valuations change, allocations shift, return assumptions change, the ability to meet the liability or liabilities remains unchanged, the structure automatically adapts, the analysis required by the client portfolio manager, none.

Imagine every time you have a significant major market move not having to work out how this affects your clients' portfolios, all clients' financial security being naturally protected and managed against such events, while asset allocation decisions in relative space are all handled and adjusted by the system.

Imagine a portfolio structure that plans years in advance, that adapts to change, anticipates change and remains appropriate as things change.

Imagine being able to deliver and manage the most personal portfolios possible, effortlessly. Imagine being able to concentrate on service at the one end and the major asset management decisions at the other free from the complexities of personalising portfolios.

Imagine all of the above, but with the proviso that you are in complete control of all that happens, all of the time. These are AL&M frameworks.

These frameworks do not exist at the present moment in time. They do not exist because liabilities are not actually managed and the risks of liabilities are not incorporated into the portfolio construction framework.

LIABILITY MANAGEMENT , THE MISSING LINK

Asset management is traditionally conducted in risk/return space. The risk around which modern portfolios are constructed is that of standard deviation, a normal monthly risk and a characteristic of the demand for and supply of the asset. Standard deviation is neither the biggest nor the most important risk – See “TAMRIS against Mean Variance Optimisation” .

Liabilities on the other hand are a much more significant risk. In reality, liabilities are negative assets or anti-assets. As anti-assets they are more stable and certain over the short term than a long term asset (equities) and as personal and future liabilities they are more likely to be real and hence immune to inflation risk, a risk to which the more stable shorter term lower risk asset is exposed.

While the day to day volatility of longer term assets represent risk in the face of anti-assets, the biggest risk comes in the face of significant and prolonged declines in asset prices and or significant rises in inflation. It is at these points in time that the effect of anti-assets on asset values is greatest.

Although the management of liabilities is given lip service, it does not have a specific and accepted methodology within the investment industry.

Consider a portfolio manager who is investing cash funds at high market valuations. A modern portfolio theorist would suggest the capital be invested, because otherwise you would be engaging in market timing. On the other hand, at high market valuations, anti-asset risk is at its greatest.

Likewise, consider the asset/liability modeller who keeps forecast returns constant as market valuations rise. As valuations rise, the risks anti-

assets pose to assets increase; yet modern portfolio theory does not naturally accommodate this risk. Where is the symmetry in these investment decisions? The answer is of course, there is none.

If we include liabilities within the asset allocation equation we have the necessary symmetry. This symmetry of assets, liabilities and time provides a much more robust and manageable portfolio management process.

The importance of symmetry within asset allocation and portfolio construction cannot be impressed enough. It is a major landmark in the development of services capable of providing the ultimate satisfaction of client needs and the ultimate in the efficient management of assets and the financial services' business process.

The TAMRIS Triangle is a representation of the physical symmetry and relationship between assets and liabilities over time. Symmetry is a concept long accepted within physics as key to understanding the natural laws and relationships of the universe. Taking away liabilities from the portfolio decision is similar to disabling Einstein's theory of relativity, since this theory incorporates all elements of the universe.

WHY MANAGE LIABILITIES?

As far as the management of assets, the management of liabilities or anti-assets is important to the short and long term risk/return profile of the asset portfolio.

As far as the liability is concerned, the inability to meet liabilities as and when they arise or, to have to revise down planned liabilities is a risk to the individual's short and long term financial security.

As a result, there are two management objectives; asset risk/return and liability risk/return management. These two objectives are related by time.

PROBLEMS OF PERSONALISATION

The problem with liabilities is that they are personal. As such they are not universally homogenous which means that one portfolio does not fit all. In order to manage liabilities each portfolio needs to reflect the individual's financial needs and assets, which means an infinite number of portfolios.

As a result, managing liabilities creates problems. Without a specific *symmetrical theory of asset and liability management*, personalising portfolios to liabilities increases costs and complexity to the point that talk of portfolio personalisation sends financial services personnel running in all directions.

This is unfortunate since the management of net liabilities, that is, the management of both net outflows and net inflows to portfolio structure over time is the most important component of personalisation.

Personalisation of portfolios to risk profiles is only one component of personalisation and an easy one given that risk is homogenous, linear and universal. But risk profiles are only the second moment of personalisation, liabilities are the first. In fact, risk should only affect structure after liabilities have affected structure.

In this context it is important to note that modern portfolio theory cannot manage personalisation, because it does not incorporate liability risk or anti-assets within its structure. This does not mean those using MVOs do not engage in a personalisation process, rather that time and effort needs to be spent outside the portfolio construction framework to achieve personalisation.

While liabilities are indeed personal, and there is no relationship between one person's liability profile and another, the relationship between liabilities and assets is linear and universally homogenous. This means from one set of decision rules you can personalise all portfolios to individual financial needs. Simple!

LIABILITY MANAGEMENT FRAMEWORK

In fact, all assets and all anti-assets operate within the same physical space. If we can define the relationship between assets, liabilities, return, price and time we can automate the interaction and hence the management of assets and liabilities over time, with little or no additional cost and complexity.

This of course depends on an asset liability allocation methodology that relates anti-assets, time and risk to asset allocation. As discussed in TAMRIS Asset Liability Modelling and TAMRIS Against Mean Variance Optimisation, current portfolio theory does not relate anti-assets/liabilities to portfolio structure. As a result there is no symmetry and no natural dynamic relationship within current portfolio management frameworks.

TAMRIS has changed this.

WHY LIABILITY MANAGEMENT FRAMEWORKS?

In fact you can only personalise portfolios to clients' liability profiles via the integration of the management of assets and the management of anti-assets.

Otherwise there is no natural or direct relationship around which to dynamise the construction, planning and management of assets to meet liabilities.

Because of the natural relationship between assets, liabilities and time, liability management frameworks relate the planning and management of portfolio structure to the size and timing of future income and capital inflows and outflows to the portfolio, while at the same time allowing asset management to operate in both risk/return and liability/risk/return space.

You do of course need investment expertise, A&LM frameworks are not off the shelf systems.

The ability to automate and to provide personalisation and, very high level asset management via such a framework, may not be immediately obvious.

Liability management frameworks are only needed when you are looking to automate the construction, planning and management of personal financial assets to meet personal financial needs over time.

Once you are able to automate the management of assets and liabilities you can use liability management frameworks to centralise the management of all aspects of a client's financial needs; insurance, estate planning, pensions, school fees, retirement planning.

Because they centralise and simplify the asset management and investment planning business process, provide advanced portfolio management and investment planning services, they add considerable value and reduce costs to both the providers and receivers of financial services.

Not everybody has liability management service objectives. Those operating in asset/return space need merely to subtract the liability component.

Within TAMRIS the liability component is the short term asset/liability optimiser which allocates low risk and equity assets in accordance with net short term liabilities. See TAMRIS Asset Liability Modelling, Investment Planning, Risk Profiling and Total Asset, Life Cycle, Wealth Management technical documents for further information.

TRANSITION TO LIABILITY MANAGEMENT FRAMEWORK

Liability management frameworks should not change the way you work or your investment disciplines but, they should develop the application of investment discipline towards the management of liabilities. If anything they should simplify processes, centralises resources and allow greater focus on core expertise.

The decision, critically, is whether to have a formal relationship between liabilities and assets and if so, what is the relationship. Without a formal liability framework, complex financial scenarios are impossible to manage and simple financial scenarios incapable of being managed over a wide range of clients.

Informal structures

Most informal approaches to liability management are characterised by short term planning windows of typically one to three years.

As changes and revisions to a client's financial needs are either communicated or enter this short term window, changes are made to the broad portfolio structure. A higher yield may be orchestrated or a specific short term security purchased or capital withdrawn or capital added to the portfolio.

This type of structure only really works for simple objectives, non complex situations and for specific asset management mandates. The more complex and dynamic and, the longer term the financial issues, the greater the decision factors in determining allocation structure and strategy over time. In fact, today's financial services business objectives are constrained by the old informal frameworks.

If assets and liabilities are not integrated into structure and planning, every time there is a change in the liability profile or a change in markets or a change in strategy, there is nothing which relates the new structure to the old and nothing which makes this transition. It all has to be reworked, personally, which does not make sense. Moreover, these changes may well have been better off being planned or effected in advance.

Whenever there is change, a liability framework retains the relationship between assets and asset prices and, liabilities and liability risks and, time, so the portfolio manager does not personally have to rework structure or strategy. In fact, whatever happens to asset prices, these frameworks ensure that the asset and liability relationship is held invariant/constant.

It also means that any change in asset allocation strategy at the central investment unit level is automatically adjusted through assets, liabilities and time.

Without a liability management framework, the number of decisions needed to provide and manage personalisation is far too complex and costly given that liabilities, time and asset prices are in a constant state of change and their relationships, infinite.

Asset and liability management frameworks therefore simplify the problem. They do not intensify the complexity of the solution. The complexity already exists. The question is how to tame this wild horse.

Intermediate structures

How do you bridge the gap between asset management and the management of assets and liabilities?

This is a critical question. Portfolios constructed in accordance with mean variance optimisation cannot bridge this gap. See TAMRIS Against Mean Variance Optimisation.

The traditional balanced portfolio constructs with cash, fixed interest and equity allocations designed to provide yield and manage risk also have similar structural problems. In fact any portfolio whose allocation is not directly related to the size and timing of liabilities and optimised for short and long term financial needs, that cannot incorporate all assets and all financial needs in structure, planning and management, has such weaknesses.

There is, nevertheless, nothing deficient with the investment expertise that runs these services. Most portfolio structures were not set up to deal with these wider objectives and relate in truth to times without computers. The current situation with regard to the management of assets and liabilities is at odds with the very high levels of sophistication in the financial services market in general.

How do you make the transition to a liability management framework?

- You need to define your low risk allocation methodology and then relate it to the management of liabilities and the management of liability risk.
- You need to determine your approach to the management of short and long term financial needs and short and long term financial risk and then relate this to the management of total financial liabilities over time.
- You need to determine your short and long term asset liability modelling disciplines and the relationship between liabilities over time and asset allocation over time.
- You need to be able to model all the above and create frameworks which automate the distribution and management of your central recommended allocations for liability and risk profiles.
- You need a methodology and rationale for the management of assets in liability space.

The major problem is that traditional portfolio theory does not allow for the management of dedicated low risk allocations within a total portfolio structure. As discussed in TAMRIS Fundamentals

Once you start to consider the impact on the future portfolio of future needs, you realise you need to consider portfolio structure over time.

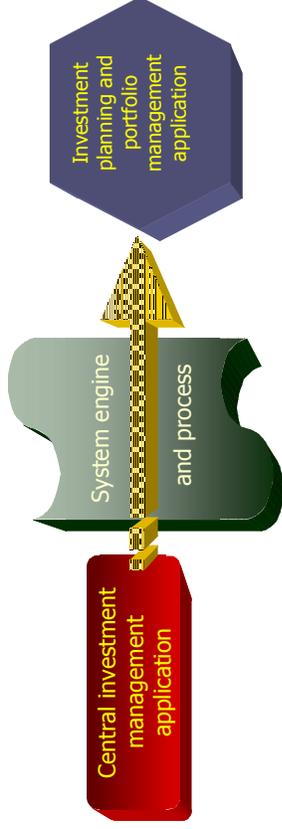
Once you start to assess the ability of a portfolio to meet needs, you find that you need to know the client's long term financial plans, needs and the disposition of all assets.

Once you need to know all assets, you find that you need to be able to manage all assets.

The question, is there an intermediate methodology of running portfolios to meet financial needs? The practical answer is no.

FORMAL ASSET AND LIABILITY STRUCTURES

TAMRIS provides a formal asset and liability structure and has developed integrated systems, processes and methodologies for the management of this relationship. The TAMRIS technical documents detail the system components. The following represents the three system components of the management of assets within a liability management framework.

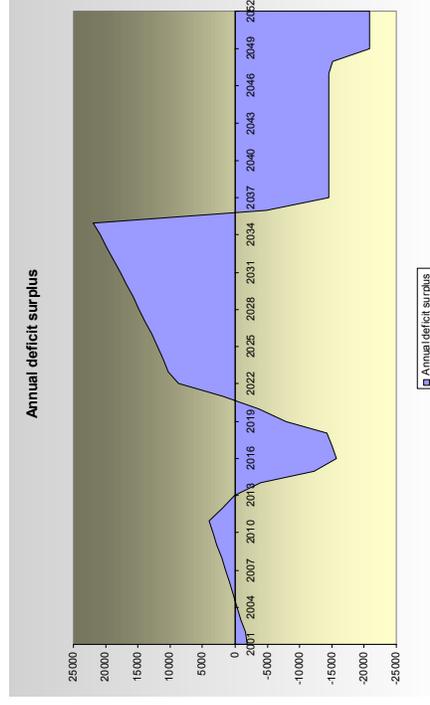


TAMRIS Fundamentals provides the fundamental theory behind the development of its approach. Appendix D holds the most important information of this document, that of TAMRIS's methodology behind Portfolio Optimisation in Liability Space. This provides the fundamental relationship between assets and liabilities over time and the rationale for the management of assets within a liability management framework.

- **System engine and process;** TAMRIS Asset Liability Modelling and Management provides the arguments and framework for the modelling and management of assets and liabilities over time and differentiates A&LM frameworks from traditional asset liability modelling and management conducted only in risk/return space.
- **Central Investment Management;** TAMRIS Valuation, Allocation & Management describe the asset allocation framework and portfolio management structures that allow dynamic management and personalisation of equity portfolios to liability and risk profiles.
- **Investment planning & portfolio management;** TAMRIS Investment Planning describes the actual process of management of the management of assets and liabilities and many of the planning benefits and features of liability management frameworks.

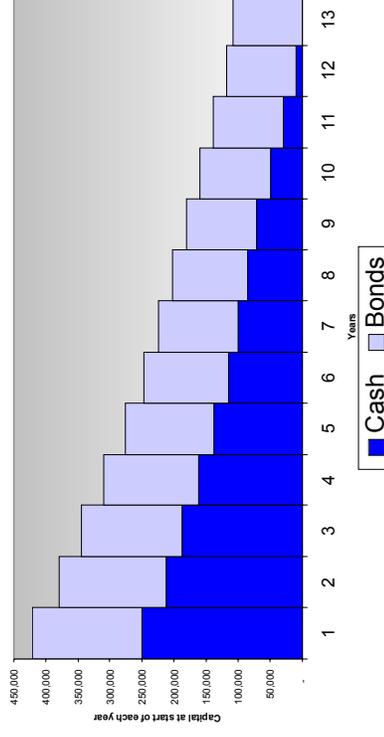
SYSTEM ENGINE AND COMPONENTS

Appendix A denotes the liability management framework and process. Multi period income and capital inflows and outflows represent the client's entire financial needs, effectively centralising all financial needs; estate planning, school fees, retirement planning, pension planning etc. This produces a lifetime liability profile, shown graphically below.



This profile is then fed into the short term asset/liability optimiser determining the low risk and equity allocation and actual low risk portfolio.

Recommended Income security - June 1999



The recommended low risk portfolio is determined by the interaction of the short term asset/liability optimiser with the recommended low risk allocation and security selection.

£	Yield	Income
Domestic cash		-
0 to 3 months cash needs		-
4 to 12 months cash needs		-
2 to 3 year cash needs		-
Domestic fixed interest		-
Gilf edged security, 3, 4, 5, 6, 7, 8 year etc		-
Corporate bond allocation, 3 to 5 yr plus		-
Investment trust income/zero shares etc		-
International Currency & Fixed		-
International Currency & Fixed allocation, 3 to 8 yr		-
Long term cash & fixed		-
Portfolio of lower risk investments		-
Strategic cash & fixed		-
Cash & fixed held for equity investment (currency denom)		-
-		-



recommended securities to individual clients. These portfolios are managed by the system and delivered to the client and serviced by the investment planner, or the Investment planning & portfolio management interface/application.

For further on this, please see TAMRIS Valuation, Allocation & Management, TAMRIS Risk Profiling, Education & Risk Assessment and TAMRIS Asset Liability Modelling & Management.

INVESTMENT PLANNING & PORTFOLIO MANAGEMENT

For detailed information on this part of the system and process and the responsibilities of the investment planner, please see TAMRIS Investment Planning, for which Appendix C is designed to aid understanding. It is important to note that this component has a direct relationship with the liability modelling engine and a direct relationship with the central investment unit valuation, allocation and management benchmarks.

Further detailed information on the components is held in TAMRIS; Investment Planning & Asset Management Systems.

CONCLUSION

Historically investors have had their assets managed by a number of different managers, their cash and other investments may not have been managed at all and there will have been no overall strategy and relationship between all assets and all financial needs.

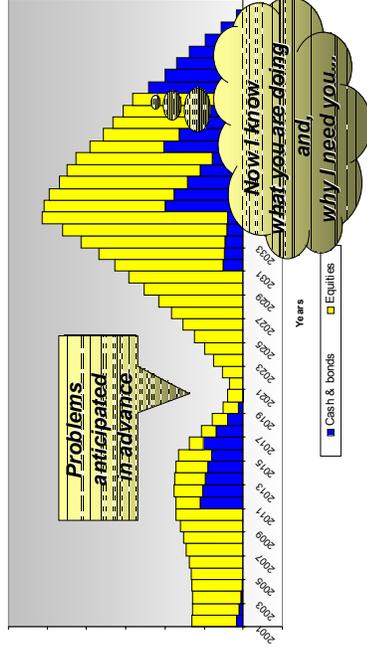
In future, investors will have all their assets and needs managed centrally, services will plan for lifetime needs, there will be one overall strategy and the disposition of assets will match individual needs and risk preferences.

Current systems, processes and methodologies for the management of financial needs and assets are inefficient. The need to simplify the asset management process because of the complexities of managing personalisation has forced the cost and the responsibility of personalisation onto the client. TAMRIS's asset and liability management framework provides a natural physical structure for the management of liabilities and assets over time.

The amount allocated to the low risk portfolio is also adjusted by risk aversion and current market valuations, dependent on an organisation's and allocation framework.

The equity portfolio is selected by the intersection of the liability profile and the client's risk aversions.

The recommended equity portfolio and low risk portfolio and the interaction of the allocation profile of the portfolio over time, relative to liabilities, is then modelled to assess ability to meet financial needs.

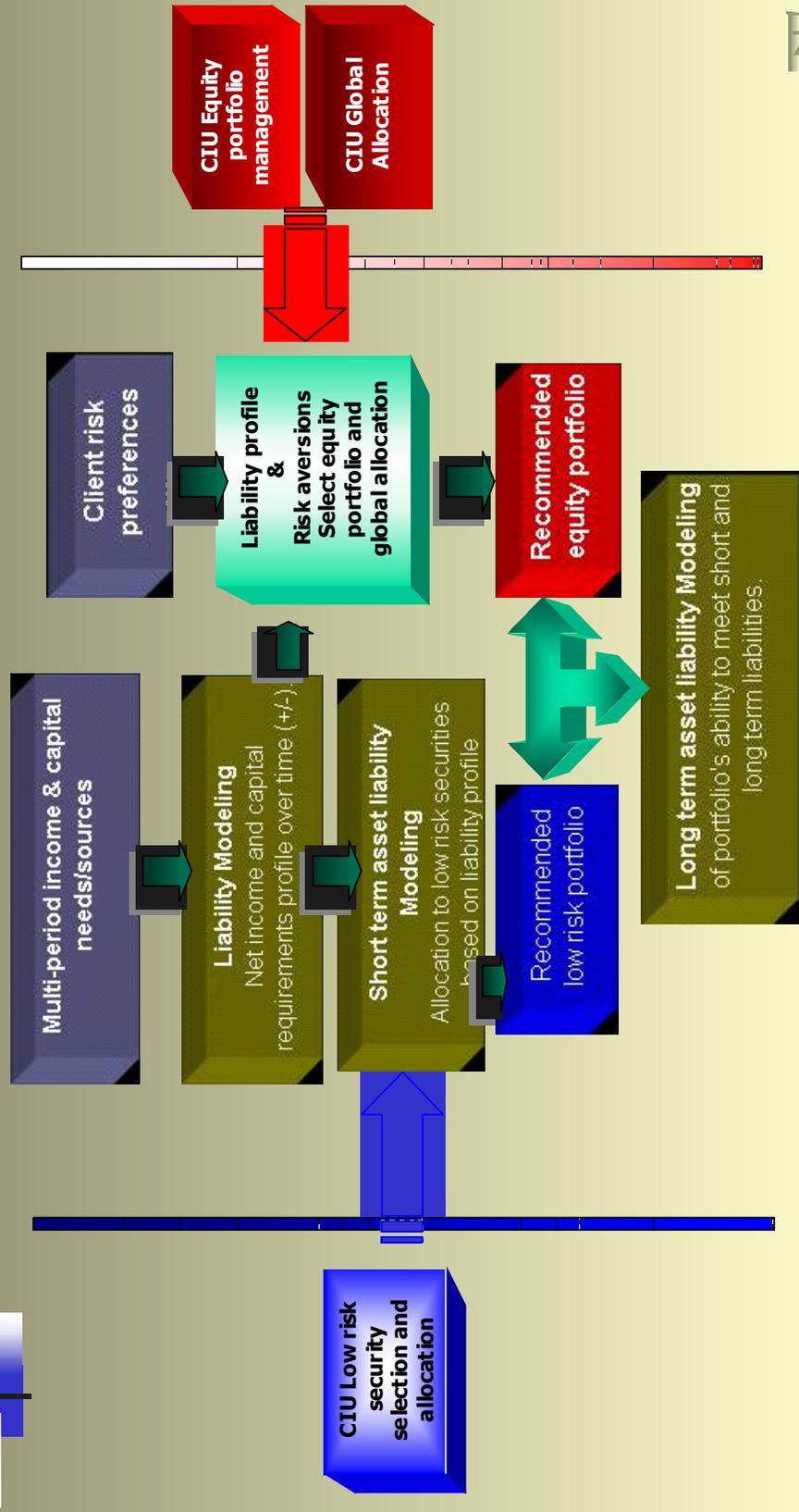


CENTRAL INVESTMENT MANAGEMENT

This represents (Appendix B) the formalisation of an organisation's investment disciplines and the management and delivery of strategy and



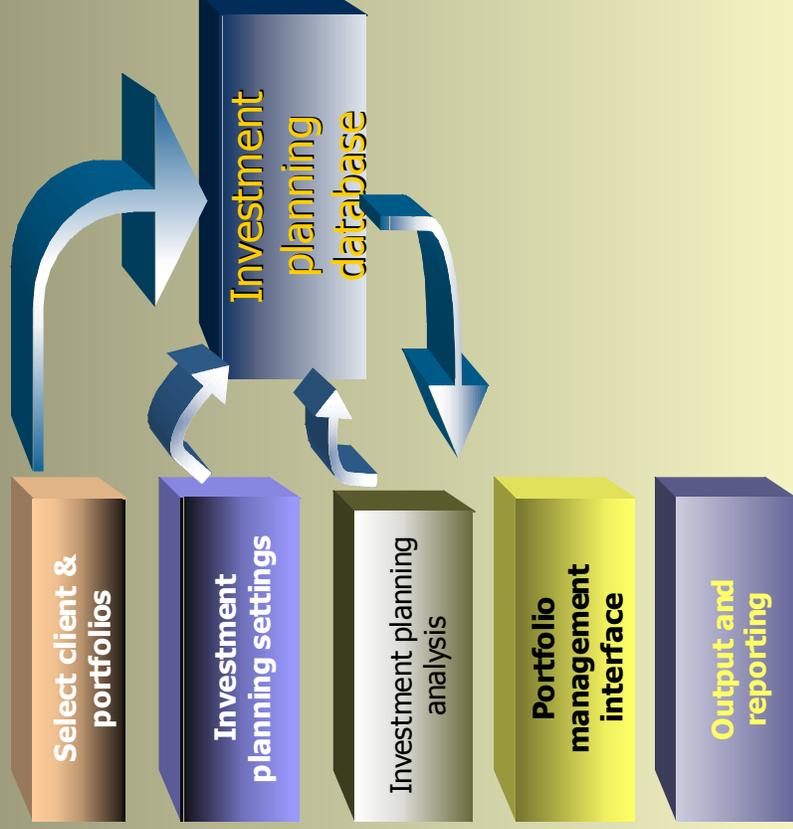
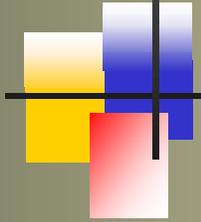
Liability management framework – System engine & Components



Central Investment Unit Application



Investment planning process & management interface



APPENDIX D – PORTFOLIO OPTIMISATION IN LIABILITY SPACE

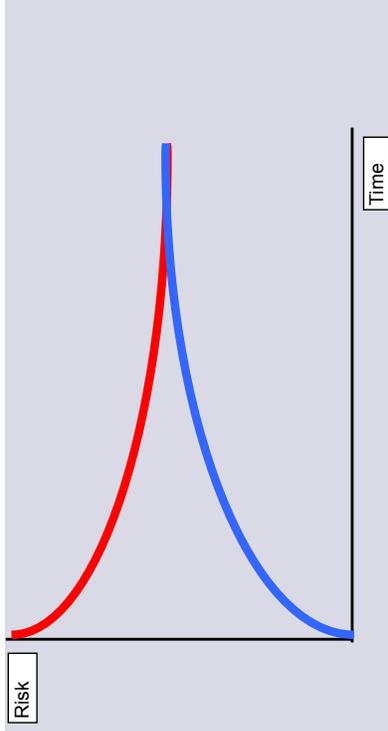
TAMRIS solves the portfolio optimization problem in liability space by structuring portfolios around short and long term income and capital liabilities and short and long term financial assets in accordance with the following methodology.

Equities as long term investments

Over the long term, the returns on cash and fixed interest investments are determined by the return on capital and are exposed to the same economic risks as the return on equities – see TAMRIS **Investment Discipline** for further information.

Long term holdings of low risk assets do not diversify the risks of capitalism. See the graph noted below which illustrates the economic risks to both equities (**red**) and low risk assets (**blue**) in the absence of inflation.

Figure 1 Economic risk in the absence of inflation



Over the long run, equities, purchased at fair valuations, represent an effective method of generating long term returns needed to support future financial needs and, as indirect investments in real assets protect capital against the risks of inflation.

Equities as short term investments

Over the short term equities are volatile and exposed to stock market and economic risk. Otherwise, you would invest 100% in equities, irrespective of liabilities.

Rationale for low risk assets

Outside of risk aversion¹, the reason for holding low risk investments as a constant is to provide security of income and capital to meet income and capital needs.

Structuring portfolios to meet income and capital needs from interest and yield alone may result in excessive long term allocations to low risk assets with limited ability to generate long term income and capital growth and as nominal assets exposed to inflation risk. This can impact on the ability of assets to meet future financial needs.

The alternatives are to either reduce income and capital needs now or to optimize asset allocation to obtain the maximum benefit from both asset classes.

Optimisation

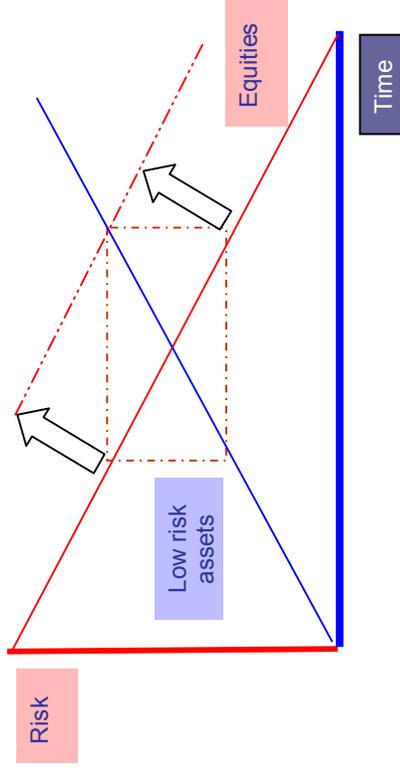
If we are to optimise allocation, bearing in mind the short and long term risk and return profiles of both asset classes, we need to determine the time frame over which low risk assets become higher risk assets than equities.

This means we need to assess both the long term inflationary risk of lower risk assets and the short term stock market and economic risk of equities.

If we use periods of significant stock market and economic risk as a benchmark for short term equity risk, and analyse the time in which it took for the total return on equities to match the return on lower risk investments, we can come to an approximation of the minimum time frame over which it is necessary to hold low risk assets to cover significant risk.

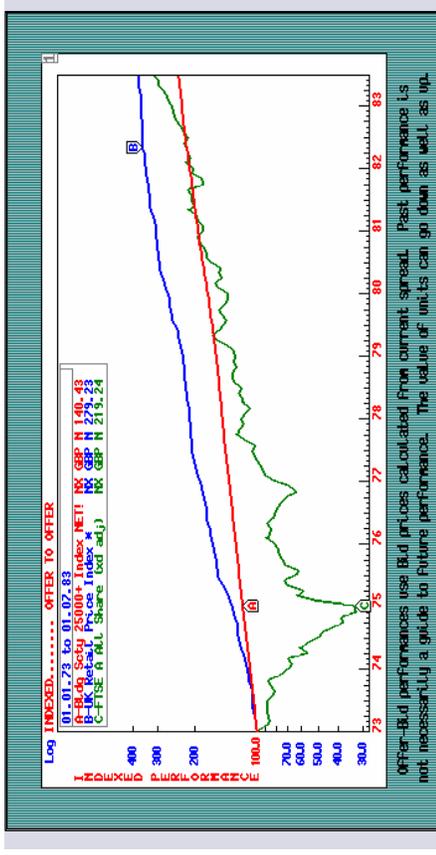
Since significant risk varies and can be greater, cover needs to be managed. This requires the management of excess equity risk and return which naturally depends on valuation disciplines to value economic and valuation risk.

The management of liabilities over time, goes hand in hand with the management of excess risk and return over time and this structure therefore provides a disciplined return management framework and, one driven by the need to manage liability risks.

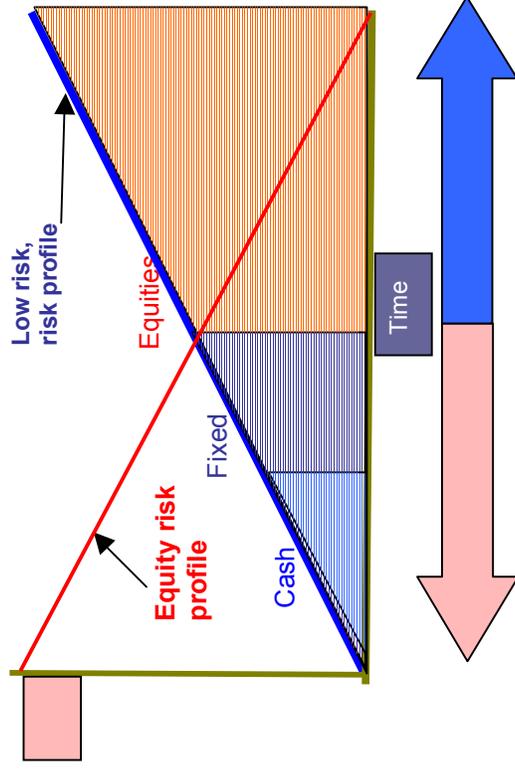


The red line (above graph) shows the risk on equities falling over time, the solid blue, cash and fixed interest, shows the effect of cumulative inflationary risk over time. The dashed red line shows the effects of excessive market valuation on short term investment risk and expanded time frames needed to cover this risk.

For example, following the stock market peak in 1973 in the UK market, it took some eight years for the return on equities to match the return on lower risk assets. Beyond this eight year time frame, lower risk assets became higher risk/lower return investments.



This analysis provides us with the basis for allocating to low risk assets to meet short term income and capital liabilities and equities to meet long term assets. The graph noted below illustrates the optimal allocation structure for low risk assets and equities in the presence of inflation.



In the event of significant stock market and economic risk the lower risk portfolio is capable of supporting financial needs for a significant period of time without having to touch equities. At extreme valuations, cover will need to be higher.

This allocation structure is much more efficient at balancing short and long terms needs and in optimizing the allocation to short and long run assets within portfolios than meeting income needs from yield and interest alone. It is also a natural physical framework which can be automated, allowing for more effective portfolio personalisation.

The way in which this is managed within a dynamic environment is touched on in **TAMRIS Investment Planning**.

Total return

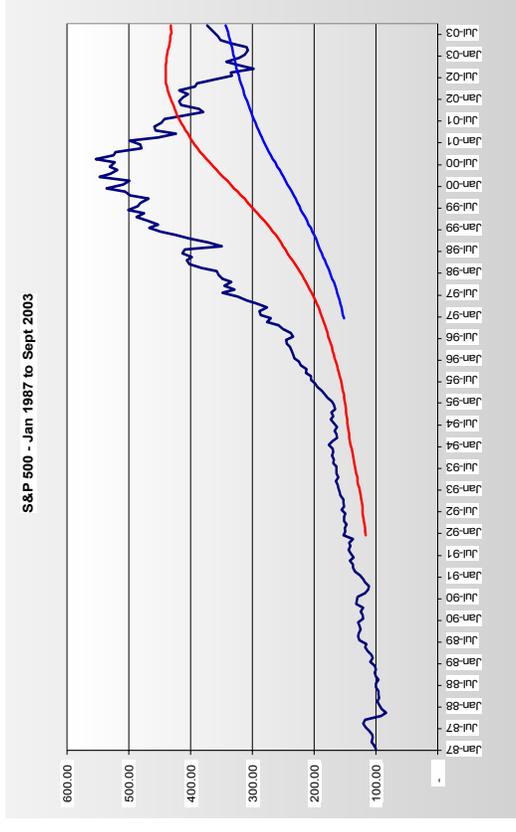
Individual portfolios are run as total return portfolios constrained by a finite set of assets and financial liabilities, the management of which needs to be optimized.

This approach essentially means that at fair market value, with no short term liabilities, investors with a realistic attitude to stock market risk should be invested 100% in stock market investments.

If your liabilities are some ten years away, the benefit of holding significant low risk assets as a constant is minimal, the only benefit being the reduction in the day to day volatility of equities.

2% annual inflation will lead to a loss of 22% of capital invested in low risk capital over the same ten years, the same as the one day fall in the US market in the crash of 1987. In fact, the longer the time frame for holding equities, the actual risk of significant price movements on the capital invested reduces.

Being able to take at least a five year view to equity investment reduces the effective risk from the often wild up and down movements to the smooth red line as the following chart shows. Taking a 10 year view reduces the risk to the blue line. Most investor capital is invested for considerably longer.



Therefore, at fair market values, where low risk allocation is recommended by an asset manager as a constant, in the absence of liabilities, it can only be held for one of the following reasonsii.

- The portfolio manager is risk averse.
- The portfolio manager wants to insure the portfolio against the effects of stock market risk on the ability of the investor to accept risk. That is, the investor's reaction to risk is uncertain and since the probability of risk is uncertain a low risk allocation hedges the risk.
- Equity strategy is insufficiently diversified (specific stock or economic risk) warranting fixed interest content as de facto "equity" diversification as opposed to risk (volatility) reduction.

In fact, TAMRIS research suggests that within a well diversified equity portfolio it is the client's liabilities (**first**), the client's risk aversion (**second**) and current valuations (**third**) that determine basic portfolio structure.

Without the management of total financial assets and total financial needs we cannot optimise the structure and management of assets or liabilities over time. Total Asset, Life Cycle Wealth Management is therefore a necessity.

SHORT TERM ASSET/LIABILITY MANAGEMENT

The optimisation of portfolio structure via short term asset liability modelling solves a key problem; how to personalise portfolio structure to liabilities?

It also provides a framework to automate the personalisation of portfolio structure to liabilities as opposed to having to separately develop an investment strategy for each client?

TAMRIS's short term asset/liability modelling automates optimisation of portfolio allocation to low risk assets and equities and constructs the low risk portfolio by matching (iterating) the client's net real liability requirement against the organisation's central low risk investment strategy and security selectionⁱⁱ. The amount held in cash, the size and timing of the fixed interest allocation are all personal to the client.

It also provides a framework in which all assets and all financial needs can be managed within one allocation and management framework.

Without a framework which can incorporate all financial assets and all financial liabilities, the pursuit of total personalisation could never have been an objective.

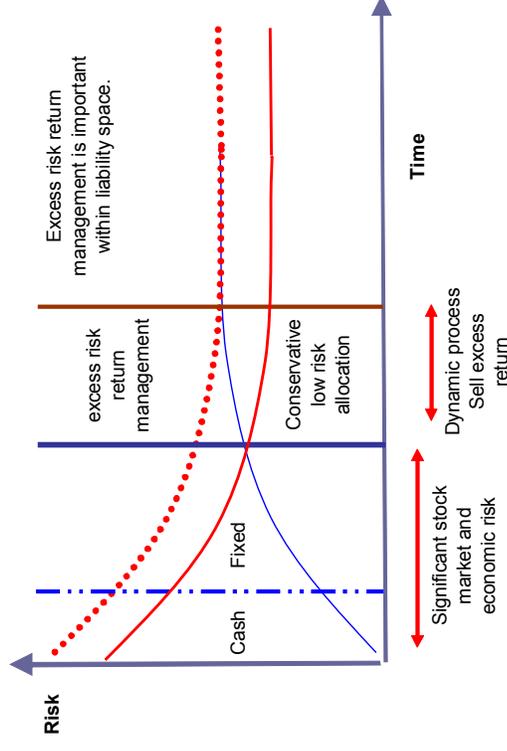
Again conventional portfolio construction methodologies cannot incorporate the management of all financial assets and all financial needs through the lack of a specific liability determinant.

CONCLUSIONS

It all sounds too simple, too naïve, yet in reality it is a very efficient, very robust framework for the management of liabilities, the management of risk and the management of excess return.

The ability to buy low and sell high is the central tenet of equity portfolio management. The problem with equities is that we cannot rely on being able to sell excess return when and if we want. In the presence of liabilities we need to be able to manage excess return safely while protecting liabilities risks. Effectively we are buying and selling equities at the nexus of risk and return, selling well in advance of the liability.

TAMRIS Consultancy



This type of structure depends on asset management expertise to run it, a sophisticated asset liability modelling and management framework to manage the risks to what is effectively controlled depletion of capital for higher liability profiles and conservative asset class risk/return assumptions. It also works most efficiently in the presence of segregated global and domestic market diversification for obvious reasons.

A simple year(s) of cover structure and annual equity transfers is not going to solve the long term asset liability modelling and management optimisation problem. In fact, such a simple approach would expose the client to the same equity risk as if he or she were invested 100% in the equity asset class and relied on withdrawals to meet ongoing liabilities.

ⁱ Long term allocation structures should not start from a position of risk aversion. Risk aversion should only be used to tilt the allocation to one in keeping with an organisation's or investor's risk preferences. As such long term investment, assuming investment at fair market values, should be 100% in equities, since there is no risk/return benefit for holding low risk assets as long term investments.

ⁱⁱ North American portfolios tend to have lower global allocation and higher cash and fixed interest content. Indeed, this is effectively de facto diversification of the risk of single market investment, a different rationale than the reduction of risk per se.

ⁱⁱⁱ See TAMRIS Asset Liability Modelling for further information...