# LLOYD TEVIS
## INVESTMENTS, LLC

Securing your future through Precision Investing[TM]

# Advising the Private Client
# What is Wrong With Current Investment
# Advice and How to Fix It

Nicolo G. Torre, PhD CFA *

January 31, 2024

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**Abstract**

We discuss the process by which individuals receive investment advice. We find the current process so riddled with errors that its outputs have very limited value. However, we show thay the process can be fixed – resulting in a much better process. We term this new process Precision Investing™ . Better yet, the fix is virtually a drop-in replacement for the current system. Major technical improvements deep in the engineering of systems makes this possible. This note, addressed to finance industry practioners but not specifically to technical experts, discusses the issues at a conceptual level and explores business implications.

*CEO, Lloyd Tevis Investments, LLC

# Contents

# 1 How Modernity Came About

Historically when one wanted investment advice one went to an advisor and he cooked up a portfolio for you. Every advisor's methodology was different and so it was not really possible to speak of a standard process. About twenty years ago, however, advisors began adopting software tools. These tools were based on certain algorithms and as a result the advice industry began to consolidate around a common practice. Today advisory operations are bound to their tool sets and it is no longer possible for advisors, outside those serving the very high end clients, to implement an idiosyncratic advice process. In a certain sense it is the software which is dictating the advice.

# 2 The Model Portfolio Process

The process embedded in the software is what I will call the model portfolio process. If you have received professionally generated investment advice in the last ten years you have most likely been exposed to this process and may well recognize your experience in the description I now give. The process centers on the efficient frontier diagram (figure 1.) This diagram plots

Figure 1: The Standard Efficient Frontier Diagram
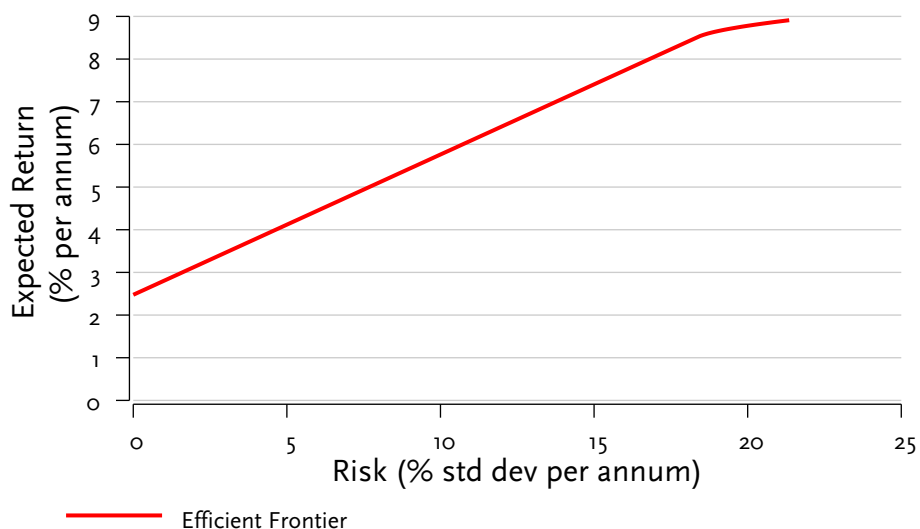
portfolio expected return against risk and points out a certain curve (the efficient frontier) which represents the most return per unit of risk. It is a desirable characteristic of portfolios that they efficiently generate return from the risks they expose holders to. Accordingly, there is no reason to select a portfolio that does not fall on the efficient frontier. In paricular, along the frontier the advisor has selected several portfolios spaced out at intervals. These are the model portfolios which give the process its name. Some set of labels is used to describe these selected portfolios. Often names related to risk like conservative, moderate and aggressive will figure among the labels – but the labels are purely conventional and each advisor can pick whatever set of labels seems best to him. To determine which portfolio is right for you the advisor may administer a risk questionnaire. This questionnaire is a psychometric instrument which is intended to measure your tolerance for investment risk. Typically questionnaires have three to ten questions and produce a score which can be related to one of the model portfolios. To explain the long term results to be expected from this investment recommendation the advisor may show you a Monte Carlo simulation. A Monte Carlo simulation generates many possible future histories of asset prices and thus portfolio values. As a result, for a given future point in time it can show you the distribution of possible portfolio values. In particular, this analysis will show you the results from selecting today's model portfolio and holding it for ten or twenty years with periodic rebalancing back to its original weights. This investment strategy is what we term a fixed mix strategy as it maintains the portfolio weights at fixed values. The result of a fixed mix strategy is a financial outcome which is normally distributed (i.e. shaped like a bell curve.) The mean will correspond to the expected return of the selected model portfolio and the width will be determined by the portfolio risk and the length of the investment horizon. Impressed by this display of analytic horsepower, all laid out in a glossy report, you are likely to accept the advice. However, if you are inclined to do a little comparison shopping you can try the next door advisory shop. Here you will get a nearly identical experience because the two shops are most likely using the same software vendor. Impressed by the sense of industry consensus, you then accept the advice.

The model portfolio process I have described is one very convenient to software vendors. It uses a small number of predetermined model portfolios. As a result everything can be precomputed, vetted by investment and legal departments in the back office, and loaded into the software's database. The

vendor can focus his attention on producing the glossiest possible report. It looks like the advisor is producing advice for the client in front of him, but actually all he is doing is producing a pre-canned brochure lightly accessorized with the prospect's name and perhaps a few other pertinent details.

# 3   Issues With The Efficient Frontier

But our concern is not with the laziness of software vendors. Rather our concern is with the algorithms embedded in the software. Let us start by considering the efficient frontier diagram. It shows return plotted against risk. But portfolio risk is always measured against a benchmark. Here it is assumed that the benchmark is cash. Although labeled as risk what is actually being plotted is portfolio volatility – a narrower concept.

The difference between risk and volatility can be dramatic. On the volatility efficient frontier the portfolio which represents keeping your money in a bank deposit will typically plot as the zero risk point on the curve, while the all equity portfolio will plot at the maximum return point. The efficient frontier will transition fairly smoothly through different mixes of more cash like and more equity like portfolios. But suppose your goal is to make a certain payment in ten years time and you adopt the risk benchmark reflecting that goal. On this new efficient frontier diagram (figure 2 next page) the risk free asset is now the ten-year zero coupon Treasury note – an instrument that was highly inefficient in terms of the volatility frontier. On the new diagram it is now the bank deposit which is highly inefficient. There is nothing mysterious about this. If your idea of a benchmark is cash of course a bank deposit is low risk. But if your idea of benchmark is funding an expense ten years out of course the ten year Treasury note is low risk. The diagrams are simply telling you fairly obvious points which you already knew. What is eye catching, however, is just how inefficient the volatility frontier is compared to the funding frontier - at least in this particular case.

As this example shows, the choice of benchmark has a critical impact on the definition of risk, the position of the efficient frontier and composition of portfolios along the frontier. In short, benchmark selection is an essential input to the advisory process. Pick the wrong benchmark and the apparently efficient portfolio will actually grossly misallocate your capital. Institutional investors know this well of course. Banks for instance are critically concerned with their asset-liability mismatch, while pension funds and endowments put

Figure 2: Funding and Volatility Efficient Frontiers
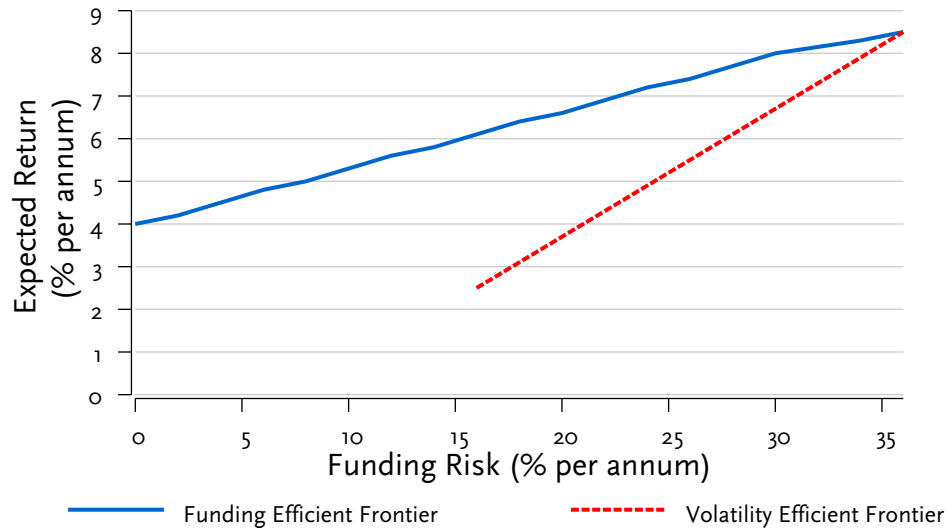


considerable effort into modeling out their funding programs to select the right benchmark. Individuals also should begin their advisory process by asking themselves what it is they are expecting their investments to do for them. The rub of course is that the answer will be personal to each investor. A personalized benchmark takes us out of the comfortable world in which everything can be precomputed. As such it enormously complicates the life of the software provider. Life is just easier if clients will continue to passively accept a volatility efficient frontier.

## 4   Issues With the Risk Questionnaire

Next let us consider the risk questionnaire. There are two fundamental problems with this tool. First, it is a bit of pseudo science. Second it is measuring the wrong thing. In short, it is a completely useless input. The pseudo science comes in to play in how the questions are scored and translated into risk levels. Typically each question has a multiple choice answer and a numeric value, interpreted as more or less risk tolerant, is assigned to each response. The whole questionnaire is then summarized by adding up the response scores. But those scores must be translated to risk levels and that

requires a nonlinear transformation for which there is no scientific basis. One goes through all the motions of empirical science, but at the end of the day its just a bit of mummery no different from a stage magician. Even had one made a successful psychometric measurement what it would be telling you is how the advisee feels about risk. But the advisee's feelings about risk are only loosely connected to how much capacity to carry risk the advisee has. An advisee may feel they are very comfortable with high risk investments like equities or venture capital, but if they are in fact head over heels in debt hopefully their advisor will discourage them from acting on those feelings. Similarly, with older advisees it is often the case that they are adamant about following "conservative" investment strategies, when in fact they have considerable capacity to carry investment risk. Again the better advisor should educate the advisee into listening to their rational interests rather than their feelings.

If the input provided by the risk questionnaire is so useless why is the use of this tool so prevalent? The answer is, I think, that the legal department champions it. The critical investment decision is how much risk to carry. The risk questionnaire squarely puts this decision on the advisee and thus protects the advisor from the lawsuits that might be brought by advisees with after the fact regrets about the level of risk they took. But where is the value add in an investment process which transfers the critical investment decision from the professional advisor to the presumably less well informed client? Letting the attorneys cut out the heart of the advisory business's value add may not be a sound business decision in the long run.

# 5  Issues With Monte Carlo Simulation

Finally we turn to the Monte Carlo Simulation. Clients look to this analytic to understand where they are going to get to. Their fundamental concern is "am I going to get hurt" and implicitly they want to know if they are going to end up with enough money to pay their bills. The simulation is almost surely run in terms of real dollars, rather than dollars of constant purchasing power. As a result, one may be looking at some point in the final result distribution but not know if one got there along a path which experienced considerable hyperinflation or along a path which experienced an economic boom and no inflation. Consequently, one does not know whether the result will pay the bills or not. To have answered that question one would need to simulate the

cost of the bills along side the portfolio simulation and report the results as what percentage of the bills got paid. Technically that is a doable task, but once again one is outside the bounds of easy to write software.

There is a second problem with the Monte Carlo Simulation which is a good deal more subtle. Practitioners know this problem well, but the origin of the problem often escapes them. The Monte Carlo Simulation adopts a fixed mixed investment strategy. This strategy results in a normally distributed outcome. But clients do not want a normally distributed outcome. Typically they want the vast bulk of their bills paid without question and as much upside capture as possible. In short, they want a shot at getting rich with no risk of going poor. A perfectly rational desire which a normal distribution struggles to accommodate. The problem is clients want an asymmetric result ("heads I win, tails I do not lose") but normal distributions are symmetrical. To avoid the possibility of going poor one can reduce portfolio volatility, but then there is hardly any upside capture. Or one can push out volatility ("get aggressive") and then the Monte Carlo faithfully reports a substantial possibility of ending up poor.

What real clients and advisors do of course is something different. They monitor results. If things are going well and core expenses are securely covered they incrementally expand the portfolio risk. If things are going poorly they dial risk down to keep essentials securely funded. In short, they follow a dynamic strategy and not a fixed mix strategy. A key fact about dynamic strategies is that they can deliver asymmetric results, so following such a strategy can be a sensible choice. But since the strategy the advisor and his client are following is not the strategy they are simulating, the simulation result is not telling them much about where their actual strategy is taking them to. They are looking at a navigation instrument, but actually they are flying blind. Its hard to see in that situation how they can be making their best decisions. There is even a troubling concern they might from time to time be taking very bad decisions. Again a solution is clear but hard to implement. One must formalize the dynamic strategy with the precision required for algorithm definition and then simulate the strategy actually being implemented.

# 6 Regulatory Issues

The SEC licenses investment advisors. It considers investment advice to be advice which is tailored to the client's circumstances. Model portfolios, by contrast, are more like off the rack clothing – there is no tailoring to the individual's circumstances. It is a good question whether operators of a model portfolio investment process are not in fact running unlicensed mutual funds. Running a mutual fund requires a different regulatory license. So far the SEC has not taken a position on this issue, but it is clear that there is a degree of regulatory discomfort with the situation. Concern about a large advisor triggering a systemic event in one of its unregulated funds may ultimately push the SEC into modifying regulations.

The SEC is also firm on the point that advice should not be misleading. We wonder if administering bogus psychometrics, drawing the wrong graph and combining the two to recommend a portfolio is adequately staying clear of what the SEC would consider improper. Heretofore this conventional practice has not drawn much scrutiny, but standards evolve over time and what was acceptable in the past may not always be so.

Primarily these considerations should be a concern to larger advisory firms which make considerable investments in training and equipping staff and which are natural targets for legal and regulatory scrutiny.

# 7 Preliminary Summary

We opened this paper with the claim that the model portfolio advisory process was riddled with error. I hope by now to have persuaded the reader that there are rational grounds for concern with this process. If we look over the points of criticism we see that they all fall along the same lines – the steps of the process may individually be technically correct but the conceptual framework is too narrow. As a result we base our decisions off answers to the wrong questions. Rather than stringing a bunch of separate analyses together with a half thought out narrative, we should begin by asking ourself what it is we really want to accomplish and then build the process and tools to meet that objective.

There are probably different ways one might go about this. Here I will present how we have approached the problem at Lloyd Tevis Investments, LLC. We feel our solution has an obvious naturalness to it, but we are not

claiming that it is the only way to invest. One needs a name to refer to the process separate from the software which implements it or the firm which provides it, so we choose to call our process "Precision Investing™ " to distinguish it from the rather hand waving approach which is the model portfolio process.

# 8  Precision Investing™ – Forming the Investment Mandate

Precision Investing™ posits that our fundamental desire is to fund our life and that investing is undertaken to generate part of the funds that we require. Accordingly our first task is to articulate a vision for our life. This vision might be fairly straightforward:

> Get started in a career. Get married, raise a family, retire and live out our golden years following personal interests.

With a little gentle probing even that basic story can fill out with additional color and detail – where will we live, in what sort of dwelling, what big ticket items will we purchase. With additional probing we can sort out priority levels. For instance, it is essential our dwelling be large enough to hold our nuclear family. Actually we would like it to be a bit more – perhaps a junior suite for a guest bedroom and a media room for the family to flop in and make its mess out of the way of drop in guests. Given extra funds, we might stretch to include recreational areas – perhaps a swimming pool or tennis court. We take the middle priority level as the life we consider realistically achievable and which we are targeting having. The more basic lifestyle is what we would consider an adequate fallback if times prove tough, while the more generous lifestyle captures how spending would expand should resources permit.

While many people will have lives falling into the same basic shape, it is clear that the details and priorities will be highly personal choices. And those personal details matter - you want to live your life - not your siblings life, not the life your parents wanted for you or that your teachers thought you could handle. Certainly no one wants to live the life a software vendor selected for them just because it was easy to program or because an advisor could process a client quickly. An analogy can be drawn to fingerprints.

Our fingerprints are all built out of archs, loops and whorls. But how those components are put together are unique to us. In the same way, we build our life vision from a common part box, but we each envision a life unique and precious to us.

The job of Precision Investing™ is to turn that precious vision into reality. As investment managers we take this description as our mandate for how we should invest. Under normal conditions (i. e. where assets return their expected returns) we should plan on meeting the target lifestyle. Under reasonable worser case circumstances (i. e. a standard deviation down on market performance) we should be aiming to still achieve the basic lifestyle. And in the reasonable better case (i. e. markets outperform by a standard deviation) we should be aiming to fund at least part of the more aspirational life. For this mandate to be reasonable of course there has to be some balance between the client's resources and aspirations. Helping the client understand what he can reasonably achieve is part of our mission. But once agreement has been reached on what the client wants and what we think can be delivered, the mandate is fully formed. At this point what we are doing for the client is very clear to him and so too is our value add – we are helping him fund the life he wants. That is something of critical importance to him and only we have the tools and knowledge to do it for him. Clearly a reasonable AUM fee is well earned.

# 9 Precision Investing™ – Building the Portfolio

Next we must consider that the investment portfolio is typically not the sole source of funding for the client's life. Contributions will often be made by a host of other assets, for instance earnings from jobs, rental income or inheritances and trusts may play a part. Credit products may reduce cash flow limitations and insurance products manage life risks. The role of each part is clarified by forming a plan for allocating funds to spending, debt service, insurance purchase and investing. On the investing side we may have choices between tax sheltered and unsheltered accounts. A convenient analytic which helps to pull this complex flow of cash into perspective is the balance sheet which shows the contribution of each component to the client's resource base and the size of each spending objective in drawing on

that base. The role of the portfolio is to fund the goals not funded from the noninvestment assets, accordingly the benchmark against which we should measure risk is the funding benchmark defined as

$$\text{funding benchmark} = \text{goals} - \text{noninvestment assets}$$

When the risk of a portfolio is measured against this benchmark we will refer to its risk as the funding risk. Typically the funding risk can be broken into two parts

$$\text{funding risk} = \text{structural risk} + \text{policy risk}$$

The structural risk is the minimum level of risk that can be achieved across all possible portfolios. As such it represents the unavoidable risk that results from the client's life goals and selection of noninvestment assets. Controlling this risk is not in the advisor's hands. The policy risk is the additional increment in risk which results from how the advisor constructs the portfolio. This is the part of risk which the advisor can control. When we form the efficient frontier diagram the interesting quantities to plot are portfolio expected return versus portfolio policy risk.

Once we have constructed the funding efficient frontier the next issue is to determine the correct level of funding risk – our risk capacity. In general, this falls directly out of our mandate. Assuming return expectations adequately reward risk taking, we want to take as much risk as is consistent with not putting our essential funding targets at risk. In other wrds, we want to fully utilize our risk capacity. The legal department will continue satisfied with this solution. The client in agreeing to the mandate has given us the clear guidance which sets this critical decision. But rather than resting that guidance on the pseudo-science of the risk questionnaire, the guidance is given in terms of the nuts and bolts of what constitutes a minimum acceptable outcome. Given the state of current investment risk control methodology this ought to be a criterion which can be a practical standard.

# 10 Precision Investing™ – Simulating the Strategy

Our choice of risk capacity is now algorithmically determined from the client's goal structure and financial condition. Accordingly it is straightforward to

simulate the dynamic investment strategy that choice results in. That strategy is calculated to optimize funding of the client's prioritized goals. Accordingly, the strategy should at least match and generally outperform any fixed mixed strategy in terms of funding these goals. This out performance results from capturing the value of the real options the client holds to manage his risk level. By contrast, the fixed mix strategy assumes those options are never exercised. Out performance by the dynamic strategy is, therefore, to be expected. In some cases, this out performance may be modest whereas in other cases it can be quite large.

## 11   Precision Investing™ – Reporting the Investment Results

The client delegates to the advisor managing his portfolio, but of course he wants to check in from time to time to hear how things are going. The essential question is does the funding of goals remain within tolerances. In other words, has the advisor successfully managed funding risk? The more curious clients may wish to know more – they would like to understand what drives the twitches in funding level. In general changes in levels will be attributed to a number of factors, among them – changes in goals, passage of time and pay off of goals, performance of noninvestment assets, and performance of investment assets. The performance of investment assets may further broken down into market performance, asset performance and any cost or tax drags which are present. What does not enter into this report is comparison against arbitrary measures of performance such as the S&P 500 index.

## 12   Precision Investing™ – What it Accomplishes

Precision Investing™ provides the correct investment strategy to optimize funding of ones life. We think that is a very natural strategy to follow. It reduces to an algorithmic process the less well defined approach by which human advisors attempt to accomplish the same end for their clients. In the process it transforms the advisory process from a craft activity in which the personal skills of the craftsman play a large part in determining outcomes

to a more engineered activity. The great virtues of engineered processes are greater reliability and lower cost from not being dependent on the skilled but expensive craftsman.

In fact, Precision Investing™ can be reduced to an entirely client driven process. Doing so provides the lowest cost way of accessing this advice. But just as the fact that cars may be self driven does not imply that they must be self driven, so too Precision Investing™ may also be deployed as an advisor mediated experience. Reasons to incorporate an advisor still include the benefits of education, coaching and a client preference for a higher touch service offer. In the current advisory market if one wants high quality personalized investment advice which goes beyond model portfolio advice, one must enter into a high touch relationship with a human advisor. Precision Investing™ separates advice quality and touch level into separate components of the advisory offer. As such it opens up a greater range of service choices for clients.

# 13 Precision Investing™ – Technical Challenges

The essential idea of the Precision Investing™ approach is to place investment assets, noninvestment assets and life goals all in a common analytic framework. The key technical step which must be taken is to extend the risk model to encompass the additional types of assets and liabilities. A risk model is an econometric model describing the covariance of price changes. In the most common situation a risk model is applied to estimating the covariance of security prices. However, there is no inherent reason why it cannot be extended to include the prices of any priced commodities.

The second technical challenge to implementing Precision Investing™ is that it must be implemented with wide enough scope as to be able to serve the needs of a high percentage of a target clientele. We have taken as our target clientele the US mid-market investor, roughly defined as people with enough capital to care about its careful management but not so much capital that estate tax planning considerations drive the investment program. This group runs from roughly speaking the young saver with $ 50,000 to the married couple which at peak wealth has not more than $ 30 million dollars. The assets and liabilities held by persons in this group can be quite broad and the scope on which Precision Investing™ needs to work is correspondingly broad. Appendix one lists the scope of our current implementation. Readers

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are encouraged to scan this list to get a sense of the analytic challenge.

# 14  Precision Investing™ – an example of AI?

Precision Investing™ reduces to an algorithm and thus renders executable by a computer system the task of generating and implementing the investment program required to fund a particular client's life. This is a task historically performed by a human advisor. To the extent the computer can perform a task formerly held to require human intelligence, it is reasonable to consider it an example of artificial intelligence or AI as it is commonly called.

Most AIs include two fundamental components – a machine learning module and an optimization module which applies what has been learned to a designated task. Both elements are present in Precision Investing™ . The econometric models are a case of machine learning, while the cash flow management and portfolio construction modules both involve optimization. Thus from a structural viewpoint Precision Investing™ is again a type of AI.

On the other hand, a particular type of AI – generative AI – has generated considerable concerns. These concerns include possible bias in the machine learning, inexplicable "black box" outputs, possible confabulation on the part of the algorithm and possible loss of control by the human operators. None of these features are present in Precision Investing™ . The machine learning is focused on market prices and not human beings, accordingly issues of ethnic or class bias are absent. The analytic methods and algorithms have all been subjected to decades of research. From that perspective there is nothing "black box" about the methodology. In particular, the investment proposal which is generated shows clearly all the steps in the chain of reasoning applied to reach the final investment recommendation. As such there is no room for the machine to confabulate. Finally, the life to be funded is the controlling input and it is entirely under operator control. None of the concerns which apply to generative AI, therefore, apply to Precision Investing™ .

If there is a valid concern about Precision Investing™ we think it centers on the fact that it is essentially omniscient about the client's economic life. It knows every financial service (e.g. credit, insurance, investments) which the client will ever buy, when and what are the client's requirements for purchase. In addition, it knows the client's current and future creditworthiness and the total value of a client relationship, For marketers of financial services this level of understanding is pure gold. But clients may not wish to be

so transparent to salesmen. We think the best outcome for clients is when they may selectively disclose information produced by Precision Investing™ to product suppliers so as to secure bids based on correct but not excessive disclosures. It is very much to client's advantage to have AI working for them rather than just empowering the organizations selling to them.

# 15   Summary

Our initial thesis was that investment advice based on the model portfolio process was seriously flawed but that it could be fixed. In fact, we saw that the model portfolio process is too narrowly conceived – it ignores the goals which drive investing, it ignores the priority structure of goals, it incorporates feelings about risk uncontrolled by considerations of risk capacity, and it simulates a fixed mix investment strategy which is unlikely to actually be implemented. Precision Investing™ overcomes all these limitations by explicitly incorporating the client's goal and priority structure, by extending the risk analysis appropriately and by incorporating a clear concept of risk capacity. Finally it performs an accurate simulation of its recommended investment strategy. This simulation provides a wealth of understanding of the strategy and its ability to meet the client's funding goals. As such it provides a sound basis for accepting the recommendation. As a software service, Precision Investing™ is a drop-in replacement for the flawed model portfolio service. Precision Investing™ will not solve all of life's problems, but it does provide a much firmer foundation for a client's management of their financial life. We feel it will replace model portfolio management as the industry standard for advising individual investors.

# A   Current Scope of Precision Investing™

1. Family Structure

   (a) Single and Couples (married, unmarried, same and different sex)

   (b) with/without dependents and other family members

   (c) with/without plans for change in family structure (marriage, divorce, additional children)

   (d) with/without special actuarial considerations

   (e) with/without career plans

   (f) with/without testamentary plans

2. Goals

   (a) spending objectives:
       i. monthly spending
       ii. episodic spending
       iii. capital spending
       iv. real property purchase
       v. medical/health spending
       vi. education spending
       vii. spending on domestic help

   (b) planning objectives
       i. retirement timing
       ii. giving programs (charitable, noncharitable, tax sheltered and taxable)
       iii. legacies

   (c) financial objectives
       i. debt reduction
       ii. emergency fund
       iii. spending reserve
       iv. wealth building

3. Policies

   (a) cash management

   (b) funding management

   (c) credit utilization

   (d) investment management

   (e) investment selection

   (f) trading restrictions

4. Investments

   (a) Common Stock

   (b) Warrants

   (c) Preferred Stock (including convertible preferred)

   (d) ADRs

   (e) Bonds (Treasury, Municipal and Corporate) - possibly with call and put features, cpi indexing, sinking funds, pay in kind provisions, floating rates, perpetual terms, and conversion rights

   (f) Funds (money market, unit trusts, open end, closed end, ETFs and ETNs)

   (g) Limited Withdrawl Funds (hedge, VC and PE)

5. Investment Accounts

   (a) Bank accounts

   (b) Cash and Margin brokerage accounts

   (c) IRAs (traditional, Roth, rollover, education, SEP)

   (d) Plans (401k,403b,SIMPLE,529)

   (e) HSA

6. Insurance

   (a) Term

   (b) Permanent (endowment, modified endowment, non-endowment, variable/whole life)

   (c) Disability and Long Term Care

(d) Annuity (single/joint/survivor life, with/with out term certain)

7. Credit

    (a) secured by real property, security holdings or life policies
    (b) unsecured term and revolver
    (c) secured credit lines
    (d) with fixed or floating rates
    (e) with self-amortization and balloon maturities
    (f) with/without assumption rights
    (g) with/without prepay penalties

8. Employment Assets

    (a) salary, incentive and deferred compensation (rabbi trusts)
    (b) self employment income
    (c) employee stock options (statutory, non-statutory, incentive)
    (d) stock appreciation rights (with/without caps)
    (e) restricted shares
    (f) pension plans (various benefit formulae and vesting schedules)

9. Retirement Assets

    (a) Social Security benefits
    (b) Pension benefits

10. Real Property

    (a) Residential (primary and secondary)
    (b) Investment (land and rental)
    (c) Mixed Use (time share and multi-occupant)

11. Family Assets (Liabilities)

    (a) Alimony
    (b) Child Support

(c) Prospective Inheritance

(d) Trusts (income and remainder)

12. Other Assets and Liabilities

    (a) Income Producing Asset

    (b) Marketable Asset

    (c) Miscellaneous Obligation

13. Taxes

    (a) Federal, State and Local Income Tax

    (b) resident, nonresident, part-year resident

    (c) filing status varying by jurisdiction

    (d) special rules for expatriates, military and members of tribes

    (e) tax assets (loss and deduction carry forwards)

    (f) wash sale avoidance

    (g) tax loss harvesting

14. Modeling Considerations

    (a) Risk model allows for time varying volatility, non-normal (large) returns and contagion

    (b) Tax rates endogenously determined

    (c) Tax computations reflect character of income

    (d) Assets held in multiple accounts with different ownership, use of funds and tax character

    (e) Portfolio construction locates assets for best tax advantage

    (f) Buy/sell decisions made at lot level

    (g) Tax loss harvesting avoids wash sales across accounts and has controllable trigger loss level

    (h) Accounts can be fully/partially managed or unmanaged

    (i) Real property analysis reflects owner role as passive,involved or active. Assets may be pooled for passive loss purposes.

    (j) Legacy assets included in/exclude from portfolio construction

    (k) User defined Assets

15. Provided Analytics

    (a) Cash Flow Planning

    (b) Dynamic Strategy Creation

    (c) Portfolio Construction

    (d) Dynamic Strategy Simulation

    (e) Executive Summary (Client Presentation)

    (f) Investment Proposal

    (g) Action Item Report

# B   About the Author

Nicolo G. Torre is the founder and CEO of Lloyd Tevis Investments, LLC. He is a leading quantitative investment manager. He studied math and history as an undergraduate at Harvard and went on to a PhD in pure mathematics at the University of California at Berkeley. On completing his studies he joined the firm Barra, now part of MSCI. At Barra he made fundamental improvements to the multi-factor risk model and developed key algorithms of quantitative trading. He was promoted over a ten year period to Managing Director of Research, the senior investment position at the firm. As such he carried responsibility for the firm's risk model which is fundamental to the management of about half of world capital – or approximately \$100 trillion dollars at current valuations. That figure is ten times the assets of the Federal Reserve System and five times the GDP of the US economy.

During Torre's tenure at Barra the US Treasury first issued bonds linked to the Consumer Price Index – the Treasury Inflation Protected Securities (so called TIPS.) This was one of only two blue chip asset classes to be introduced in the past fifty years and it was the largest innovation in Treasury financing operations in living memory. Torre was the invited expert chosen to present the investment case for the new instrument to the global investment community. This role led naturally to work done in conjunction with Brown Brothers Harriman to incorporate TIPS into portfolio strategies for the Treasury's major creditors.

Torre left Barra to join the firm of Greenwich Capital (now known as RBS Securities) in 2000. At Greenwich Capital he ran a proprietary trading desk which implemented algorithmic trading strategies in US equities and currencies. Here he observed first hand the reliability of the high frequency risk control techniques he had developed during the harsh out of sample test provided by the 9-11 attacks.

In 2002, Torre partnered with Andrew Rudd at the firm of ASI. Here he developed the first ETF strategies for Ishares and State Street Global Advisors. These strategies were instrumental in repositioning ETFs from a day trading tool into fundamental building blocks of long term investment strategies. This work led naturally to developing the first RoboAdvisor (known as Sharebuilder) for ING Bank. This product was both cloned by all subsequent RoboAdvisors as well as inspiring many small dollar savings programs. Torre and Rudd's next contribution was to develop the concept of goal based investing. This concept was operationalized in a TAMP developed for Citicorp.

The service it supported met with strong customer adoption but the effort was abandoned by the bank in the refocusing of its operations forced by the unrelated 2008 mortgage crisis.

Torre founded the firm of Lloyd Tevis Investments, LLC to carry forward the development of goal based investing. After a long R&D process, this firm launched its Precision Investing™ service in 2023. Precision Investing™ reformulates goal based investing to succeed as an investment service offered direct to the end investor. It thus combines the the distribution methods pioneered with RoboAdvisors to the sophisticated strategy work and strong risk control techniques which have been enduring elements of Torre's career. Finally its robust automation builds on the experience gained from algorithmic trading. It is thus fair to say that it draws on experience and specialized knowledge gained in every part of Torre's career.

Surveying the totality of Torre's work from risk management and algorithmic trading through strategy development, introduction of TIPs and ETFs, the invention of RoboAdvisors and finally the development of goal based and Precision Investing™ it is clear that his contributions have majorly shaped the investment art as it is practiced in our day.