



Investment Choice in a Centrally Managed Provident Fund

Managing investment risk in the pursuit of sustainable
benefits

Danny L. Quant, FIA, FSAS

March 2016

The issues

- Contributions are fixed – and little appetite to pay more
- They are arguably insufficient to support desired post retirement financial demands:
 - Interest credits are barely above inflation
 - Longevity improvements persist
 - Pre-retirement withdrawals give a false impression of sufficiency
 - Conservative external funds investment strategy decisions

Market volatility doesn't help promote risk taking

The controllable piece and implications

- Investment strategy can be controlled
- Under-performance means:
 - Low benefits initially
 - Insufficient to engineer post-retirement COLAs
 - Inadequate funds to provide for contingent benefits
 - Risk of out-living funds

Concerns: Short term losses & underwhelming long term returns

Solutions

- Engineer a way to increase balances at retirement
- Create a credible way of persuading contributors to take investment risk – before & after retirement
- Create attractive investment strategies
- Manage the short term volatility at an affordable price
- Pre-empt changing personal circumstances

**Historically risk management through diversification
More recently with the concept of life-styling**

Correlation when you don't want it

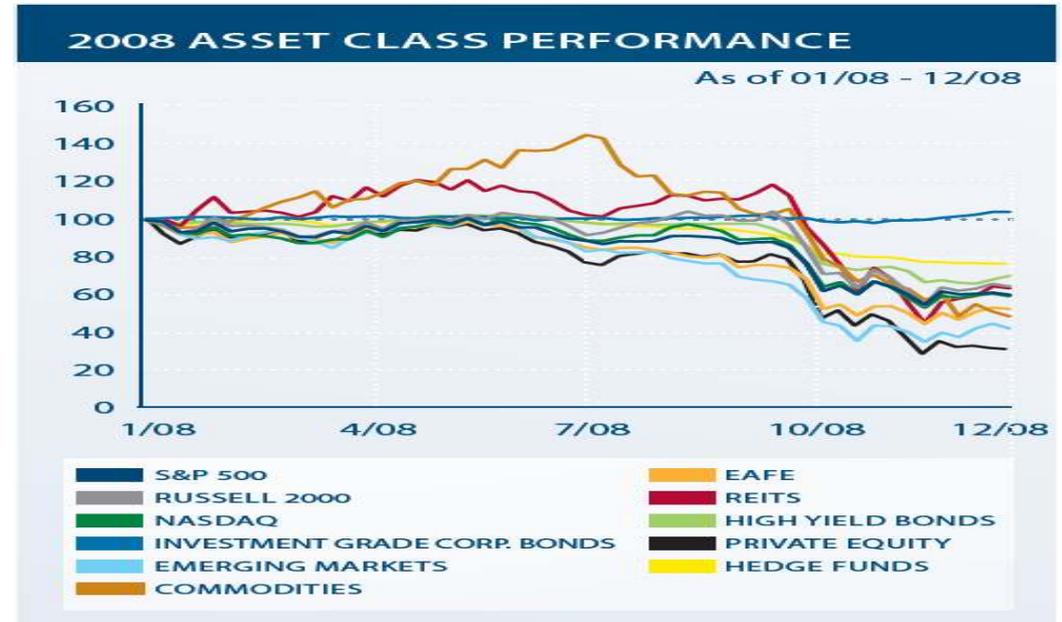
Historically, attempts at smoothing market returns relied heavily on diversification.

Historically, in stable, growing markets asset allocation generally worked.

"Twenty years ago, the average correlation of asset classes in the typical pension plan was 25%. Now, the average correlation of those same asset classes is 70%."

Putnam Investments (2011)

Diversification fails during crises when nearly all asset classes decline together



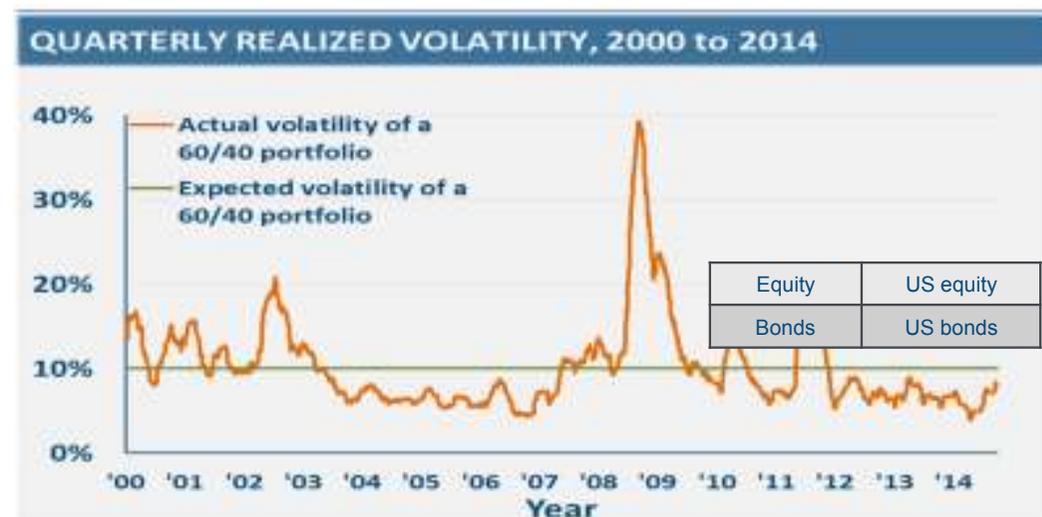
Source: Milliman Financial Risk Management LLC as of 1/1/08 - 12/31/08

Diversification has been losing effectiveness as global markets become more correlated

Volatile volatility

Simplistic solutions such as using a static 60/40 allocation to equity and fixed income, do not work since asset class volatilities are not constant.

Asset Class	Volatility: 2000-2010	Volatility: Q4 2006	Volatility: Q4 2008
US Large cap	21%	7%	67%
US Small cap	26%	14%	77%
Developed International	19%	8%	60%
Emerging Markets	21%	11%	67%



Source: Milliman Financial Risk Management LLC as of 1/1/08 – 12/31/08

From time to time, a 60/40 fund's volatility can deviate significantly from the expected average volatility



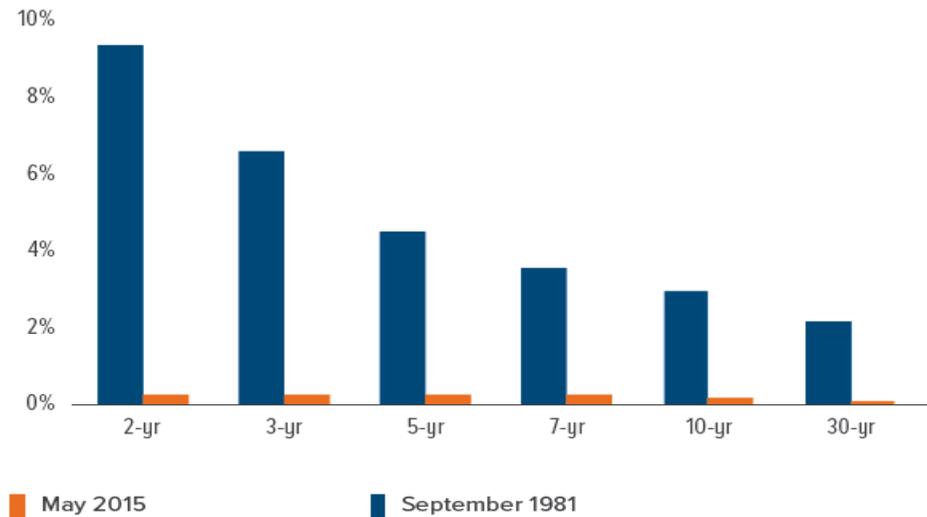
The performance shown is historical, for informational purposes only, not reflective of any investment, and does not guarantee future results. Any reference to a market index is included for illustrative purposes only, as it is not possible to directly invest in an index. Indices are unmanaged, hypothetical vehicles that serve as market indicators and do not account for the deduction of management fees or transaction costs generally associated with investable products, which otherwise have the effect of reducing the performance of an actual investment portfolio.

Expensive bonds?

10-YEAR TREASURY YIELD TO MATURITY¹



THEN AND NOW: YIELD PER UNIT OF DURATION ACROSS THE CURVE¹



Previously: Bonds offered diversification and returns, as interest rates moved gradually lower.

Today: Bond yields (as a predictor of subsequent market return) are at historic lows, while duration (interest rate risk) is significantly higher.

**Dynamic Risk Management:
Disinvest from bonds, and re-invest in equities.
Same (or better) level of risk management**

Relationship of Volatility and Time in equities



Volatility shows “stickiness”
Predicting market direction is hard; calmness or volatility?
This lends itself to a short-term volatility prediction model

Managing risk



Insurance guarantee

- Costly
- No upside

Hard floor or gap protection

- High costs
- Counter-party risks

Volatility management

- Trades some upside
- Additional costs

Diversification

- Serial correlation issues
- Timing

**Potential to combine Risk Control & Asset Allocation
as a platform for controlled growth**

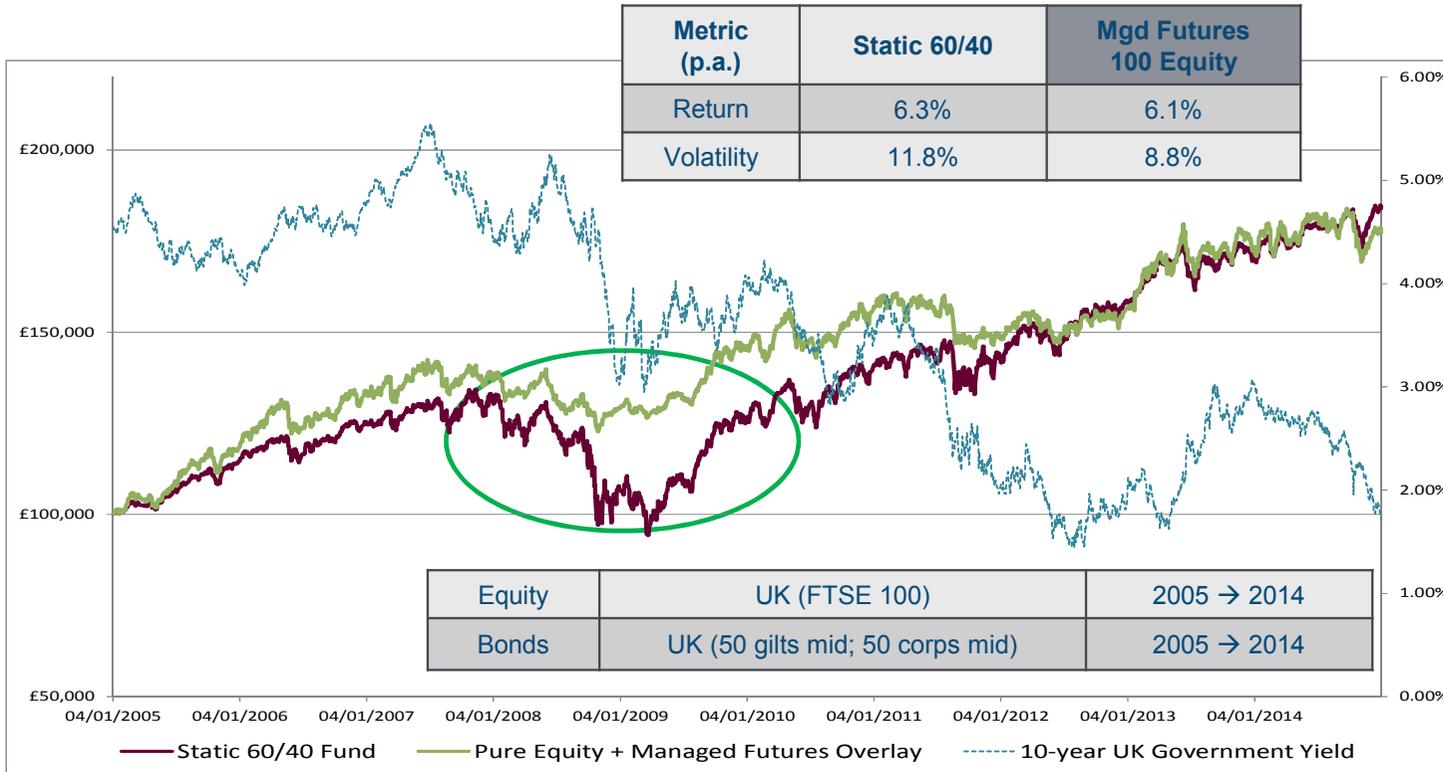
Simple diversification can be supplemented

- There is still a frightening amount of risk in the equity component of the balanced strategy
- **Proposal:** use dynamically managed futures during periods of significant market volatility to quickly reduce equity allocations and exposure to risk during this period, as well as provide a cushion against any large falls in value
- The mechanism has already been in place for life funds at a group level.
- **Rationale:** apply the mechanism to retail funds

**Small (5%) portion of equity portfolio in cash and futures.
Manage overall volatility of the equity portfolio to target.
Aim: Offset losses on the remaining 95% during high volatility periods**

Pension Accumulation

Equity/Bond Diversification vs Dynamic Risk Mgt.



- In a historical period of **falling interest rates** (and rising bond prices), the modelled pure equity fund with managed futures applied (at 12% target volatility) delivered similar returns for lower risk and less volatility.

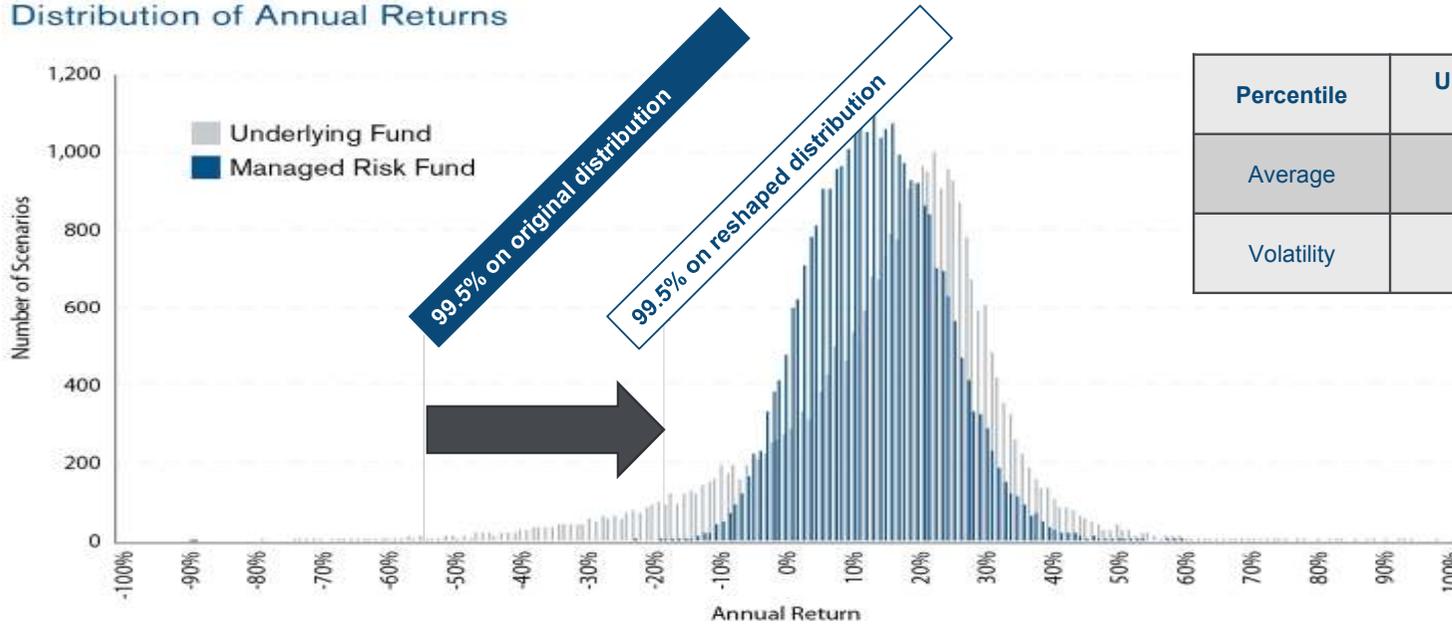
Source: Milliman Financial Strategies Ltd, Bloomberg Data



THESE RESULTS ARE BASED ON SIMULATED OR HYPOTHETICAL PERFORMANCE RESULTS THAT HAVE CERTAIN INHERENT LIMITATIONS. UNLIKE THE RESULTS SHOWN IN AN ACTUAL PERFORMANCE RECORD, THESE RESULTS DO NOT REPRESENT ACTUAL TRADING. ALSO, BECAUSE THESE TRADES HAVE NOT ACTUALLY BEEN EXECUTED, THESE RESULTS MAY HAVE UNDER-OR OVER-COMPENSATED FOR THE IMPACT, IF ANY, OF CERTAIN MARKET FACTORS, SUCH AS LACK OF LIQUIDITY. SIMULATED OR HYPOTHETICAL TRADING PROGRAMS IN GENERAL ARE ALSO SUBJECT TO THE FACT THAT THEY ARE DESIGNED WITH THE BENEFIT OF HINDSIGHT. NO REPRESENTATION IS BEING MADE THAT ANY ACCOUNT WILL OR IS LIKELY TO ACHIEVE PROFITS OR LOSSES SIMILAR TO THESE BEING SHOWN.

Re-shaping Distribution of Returns

Distribution of Annual Returns



Percentile	Underlying Fund	Managed Risk Fund
Average	9.26%	7.82%
Volatility	18.65%	9.36%

Use managed futures to achieve the desired level of volatility



THESE RESULTS ARE BASED ON SIMULATED OR HYPOTHETICAL PERFORMANCE RESULTS THAT HAVE CERTAIN INHERENT LIMITATIONS. UNLIKE THE RESULTS SHOWN IN AN ACTUAL PERFORMANCE RECORD, THESE RESULTS DO NOT REPRESENT ACTUAL TRADING. ALSO, BECAUSE THESE TRADES HAVE NOT ACTUALLY BEEN EXECUTED, THESE RESULTS MAY HAVE UNDER-OR OVER-COMPENSATED FOR THE IMPACT, IF ANY, OF CERTAIN MARKET FACTORS, SUCH AS LACK OF LIQUIDITY. SIMULATED OR HYPOTHETICAL TRADING PROGRAMS IN GENERAL ARE ALSO SUBJECT TO THE FACT THAT THEY ARE DESIGNED WITH THE BENEFIT OF HINDSIGHT. NO REPRESENTATION IS BEING MADE THAT ANY ACCOUNT WILL OR IS LIKELY TO ACHIEVE PROFITS OR LOSSES SIMILAR TO THESE BEING SHOWN.

Pensions Accumulation:

- Over a 1 year time horizon, with no deposits or withdrawals, managed futures can:
 - Reduce losses in tail scenarios
 - Create a small drag on average returns
 - Increase risk adjusted returns

One Year Average Returns		
Percentile	Underlying Fund	Managed Risk Fund
5%	-26.29%	-8.76%
95%	32.26%	25.20%
Average	9.26%	7.82%
Volatility	18.65%	9.36%

Pensions Decumulation:

Over a 30 year time horizon with fixed withdrawals, managed futures can deliver a higher average internal rate of return for the investor

- By addressing the 'sequence of returns' problem

Internal Rates of Return		
Percentile	Underlying Fund	Managed Risk Fund
1%	-20.76%	-0.63%
5%	-6.44%	1.81%
10%	-2.01%	3.08%
25%	3.78%	4.88%
50%	7.39%	6.90%
75%	10.39%	8.98%
90%	13.01%	10.98%
95%	14.45%	12.18%
99%	17.49%	15.51%
Average	6.20%	6.97%

Source: Milliman Financial Risk Management LLC, 2014

The performance data quoted is based on stochastic analysis, is hypothetical, and is not indicative of future results. Current performance may be lower or higher than the performance data quoted above. Investment return and principal value will fluctuate, so that shares, when redeemed, may be worth more or less than their original cost. There is no guarantee that any investment or strategy will achieve its objectives, generate positive returns, or avoid losses.

Application to target date funds and life-style arrangements

- Portfolios of managed futures are structured to engineer a desired volatility for the overall portfolio, notwithstanding periods of higher (or lower) market volatility
- To be clear: such a strategy results in a small loss of upside, for a big reduction in downside. So without adjusting underlying investments, overall average returns are expected to be slightly lower. However with a risk management framework in place, you can then “safely” increase equity allocations to compensate (there is also a small reduction due to charges in the managed futures)
- **Outcome:** a smoother journey enabling the investor to “sleep-well”
- **Intended by-product:** disciplined adherence to the long term strategy

Caveats

The performance shown is historical, for informational purposes only, not reflective of any investment, and does not guarantee future results. Any reference to a market index is included for illustrative purposes only, as it is not possible to directly invest in an index. Indices are unmanaged, hypothetical vehicles that serve as market indicators and do not account for the deduction of management fees or transaction costs generally associated with investable products, which otherwise have the effect of reducing the performance of an actual investment portfolio. The hypothetical results are based on simulated performance results. These results have certain inherent limitations. Unlike results shown in an actual performance record, these do not represent actual trading. Also, because these trades have not actually been executed, these results may have under- or over-compensated for the impact, if any, of certain market factors, such as lack of liquidity. Simulated or hypothetical trading programs in general are also subject to the fact that they are designed with the benefit of hindsight. No representation is being made that any account will or is likely to achieve profits or losses similar to these being shown.

IT
TAKES
VISION.



Thank you

Danny L. Quant, FIA, FSAS

**Principal and Consulting Actuary
Milliman Private Limited
#12-02 Keck Seng Tower
133 Cecil Street
069535 Singapore**

+65 9658 7058

danny.quant@milliman.com