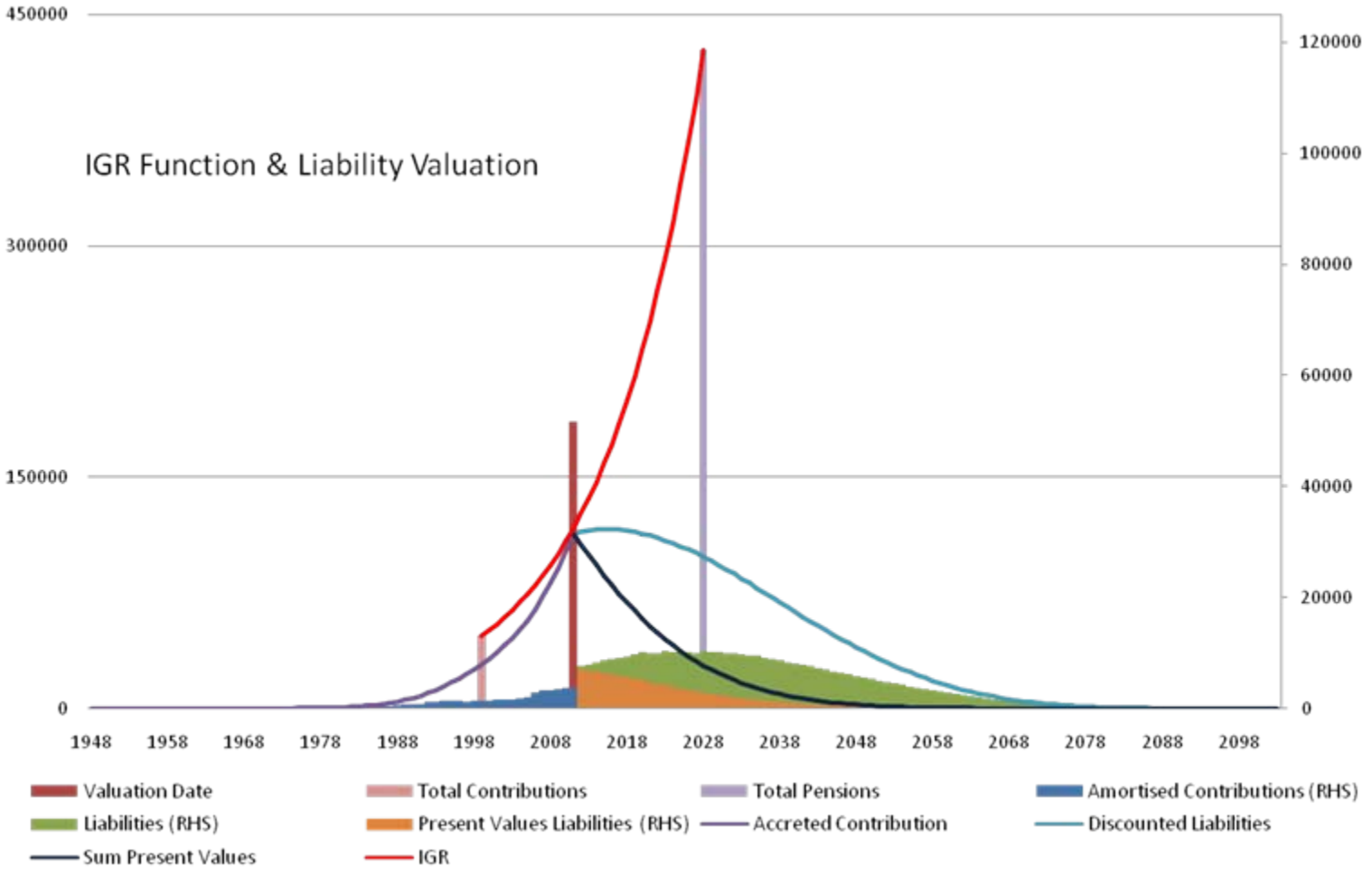
Pension Scheme Valuation



Con Keating

London, March 2013

Con.Keating@BrightonRockGroup.co.uk

The method

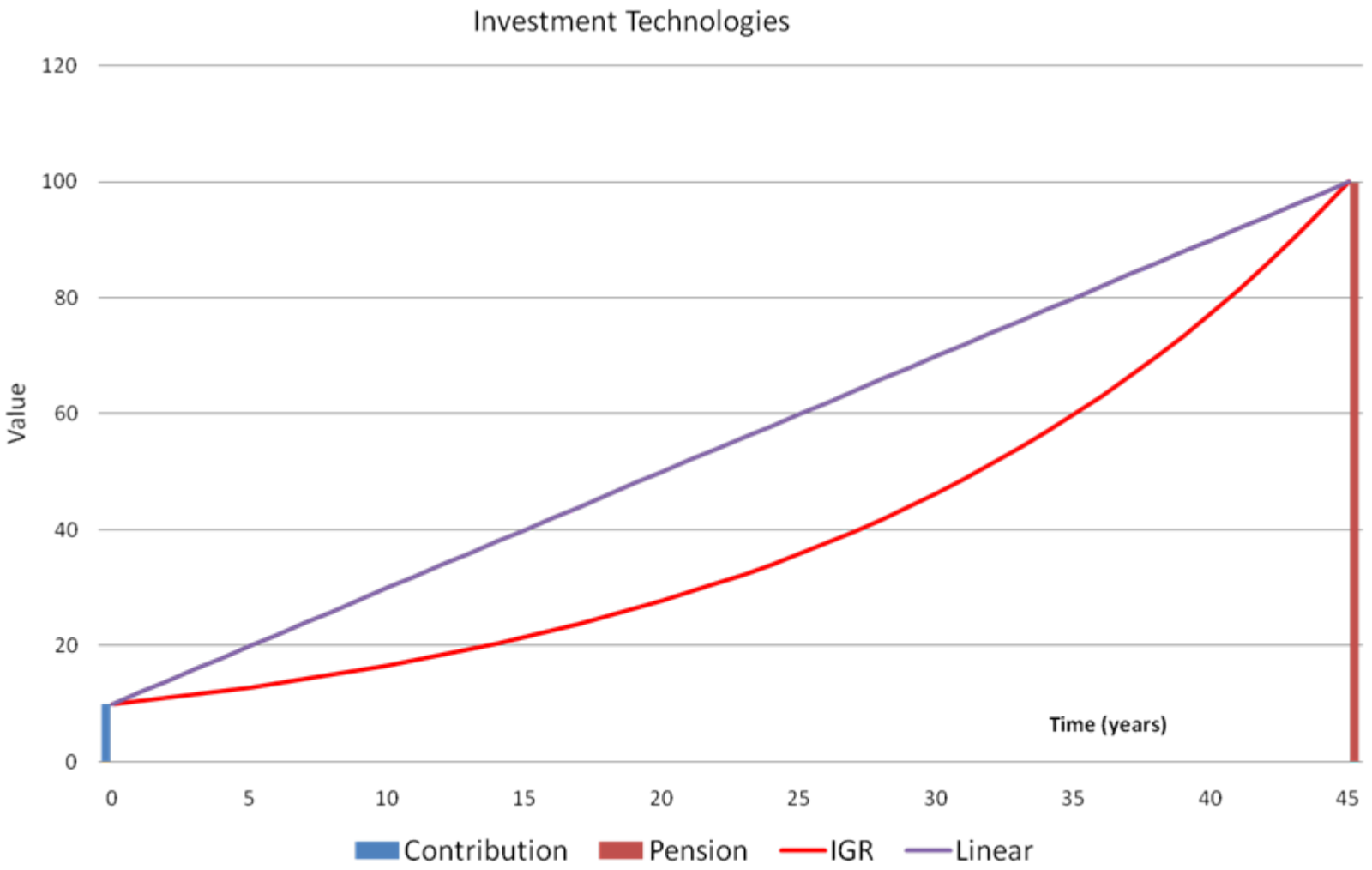
- Start with the primary fair value condition
- **present value of contributions must equal the present value of the promised pensions**
- This defines **the internal growth rate (IGR)** of a scheme
- This is the weighted average cost of capital for a sponsor employer or equivalently the weighted rate of return to pensioners.
- In order to compare apples with apples:
  - **Project Liability Expense Cash-Flows**
  - **Project Asset Income Cash-Flows**
  - **Compare these at the Internal Growth Rate integral to the awards.**
- This produces accurately accurate, stable and unbiased results
- The reported liabilities are accurate and the scheme funding ratio correct

A system is a big black box
Of which we can't unlock the locks,
And what we can find out about
Is what goes in and what comes out.
Perceiving input-output pairs,
Related by parameters,
Permits us, sometimes, to relate
An input, output and a state.
If this relation's good and stable
Then to predict we may be able,
But if this fails us – Heaven forbid!
We'll be compelled to force the lid!

Kenneth Boulding

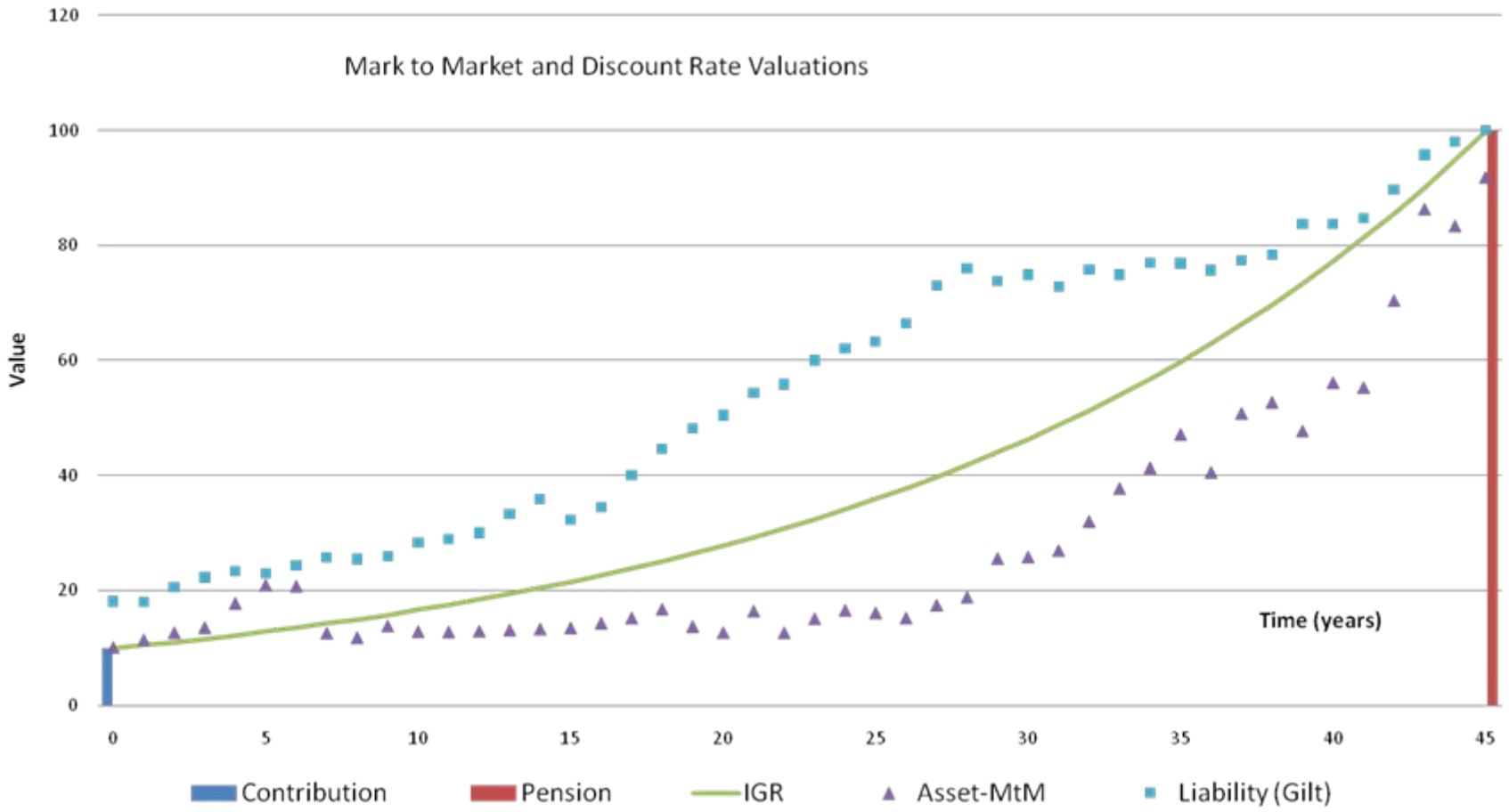
Technologies II

- Many technologies are possible
- Investment (DCF/Sum of Present Values)
- Linear Amortisation, and others



Technology Efficiency

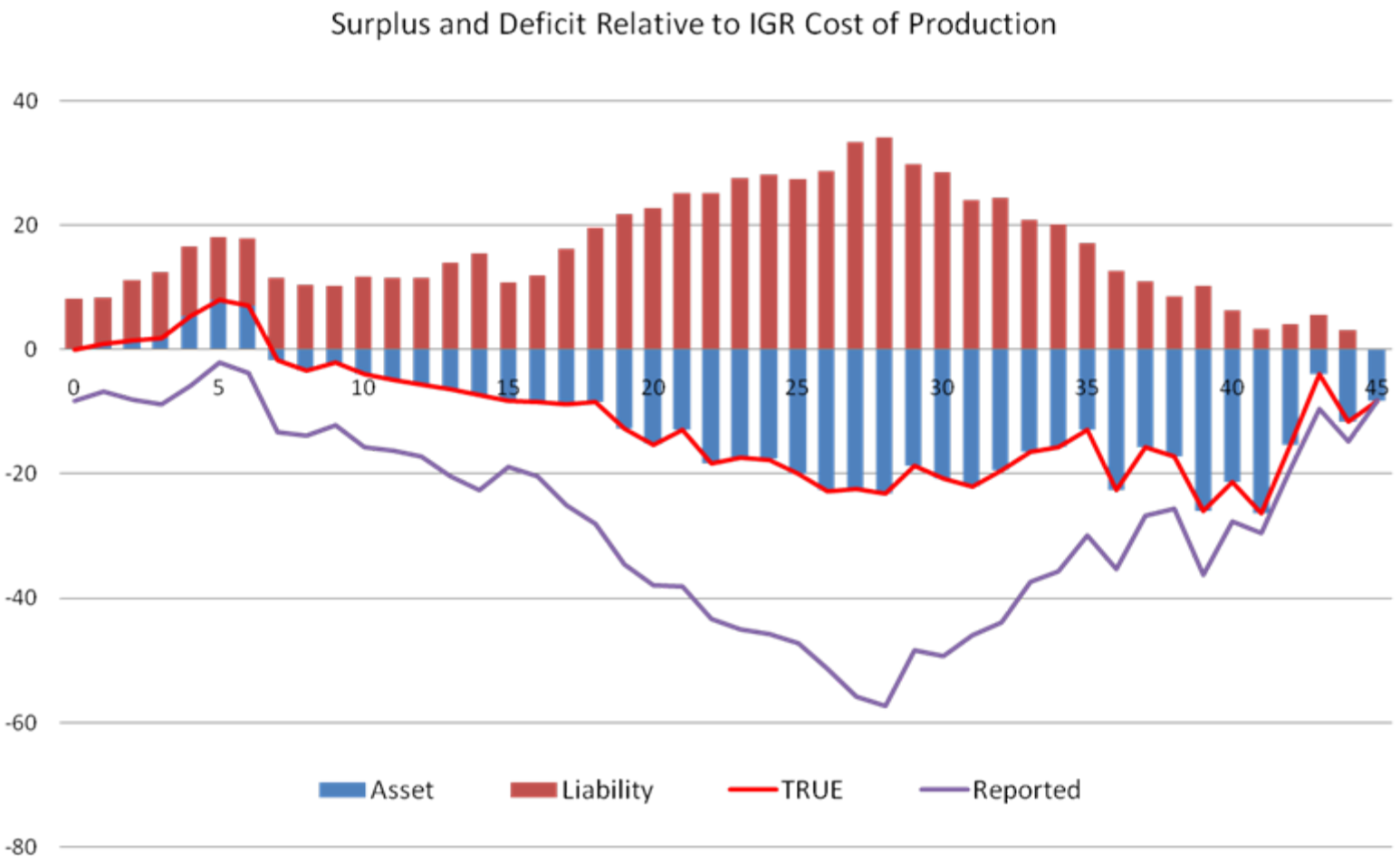
- Different technologies have different efficiencies.
- Mark to market



- Hedging strategies
- MTM Very inefficient

Bias and Volatility

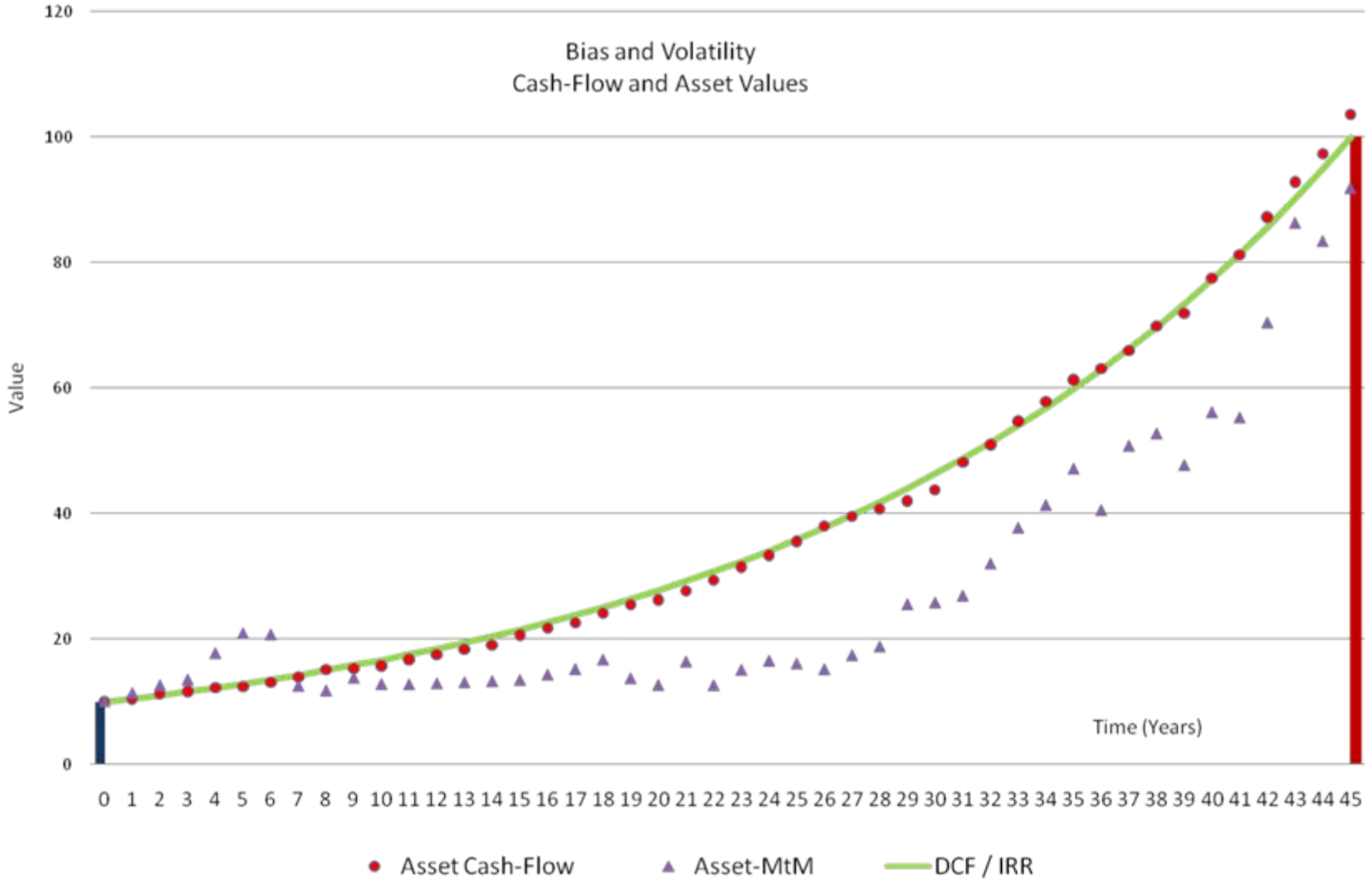
- M-t-M induces substantial bias and volatility



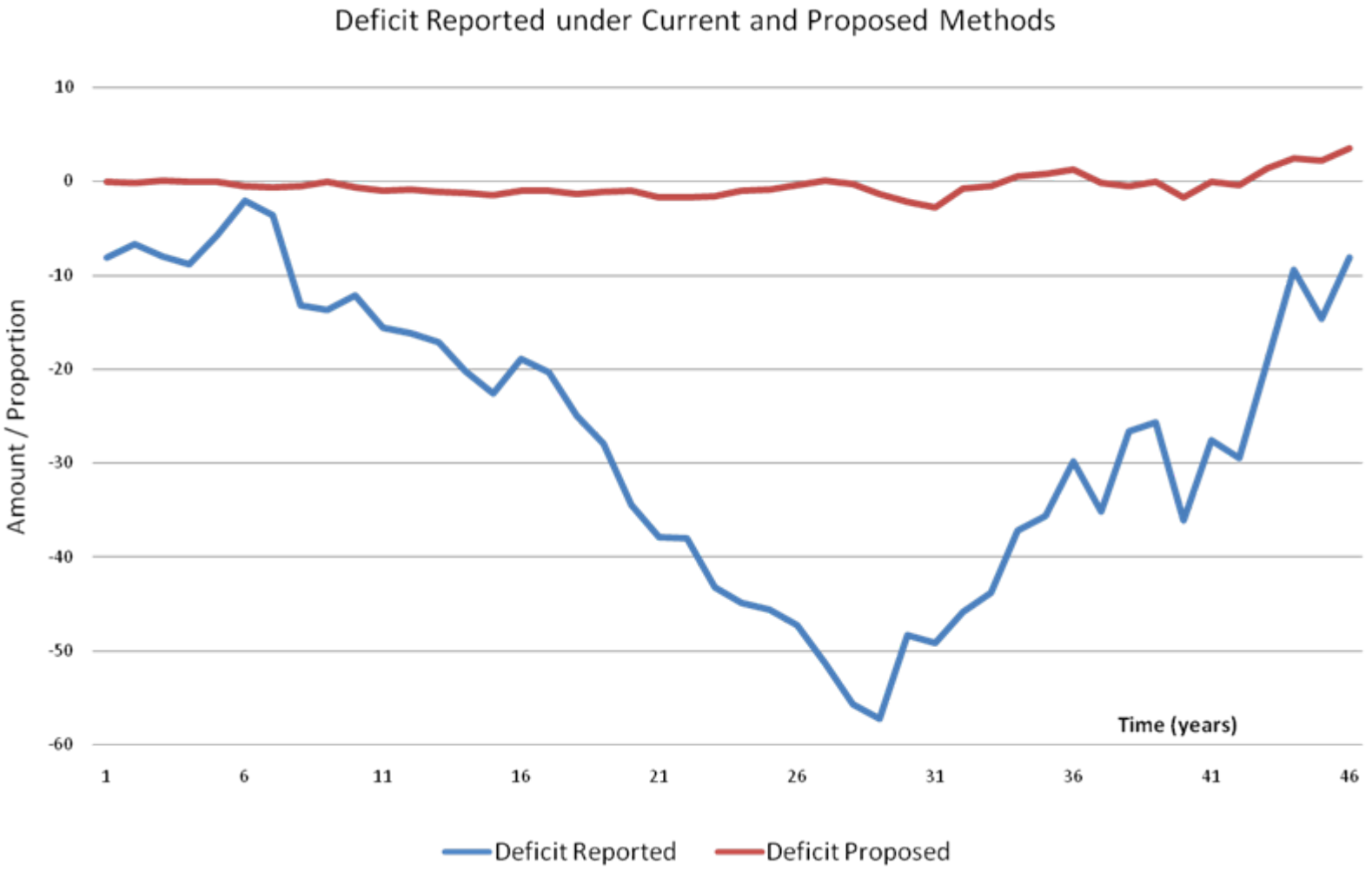
- What use is this for prediction or management?

The proposed method

- With the same input parameters
- Equity dividends are an order of magnitude less volatile than prices

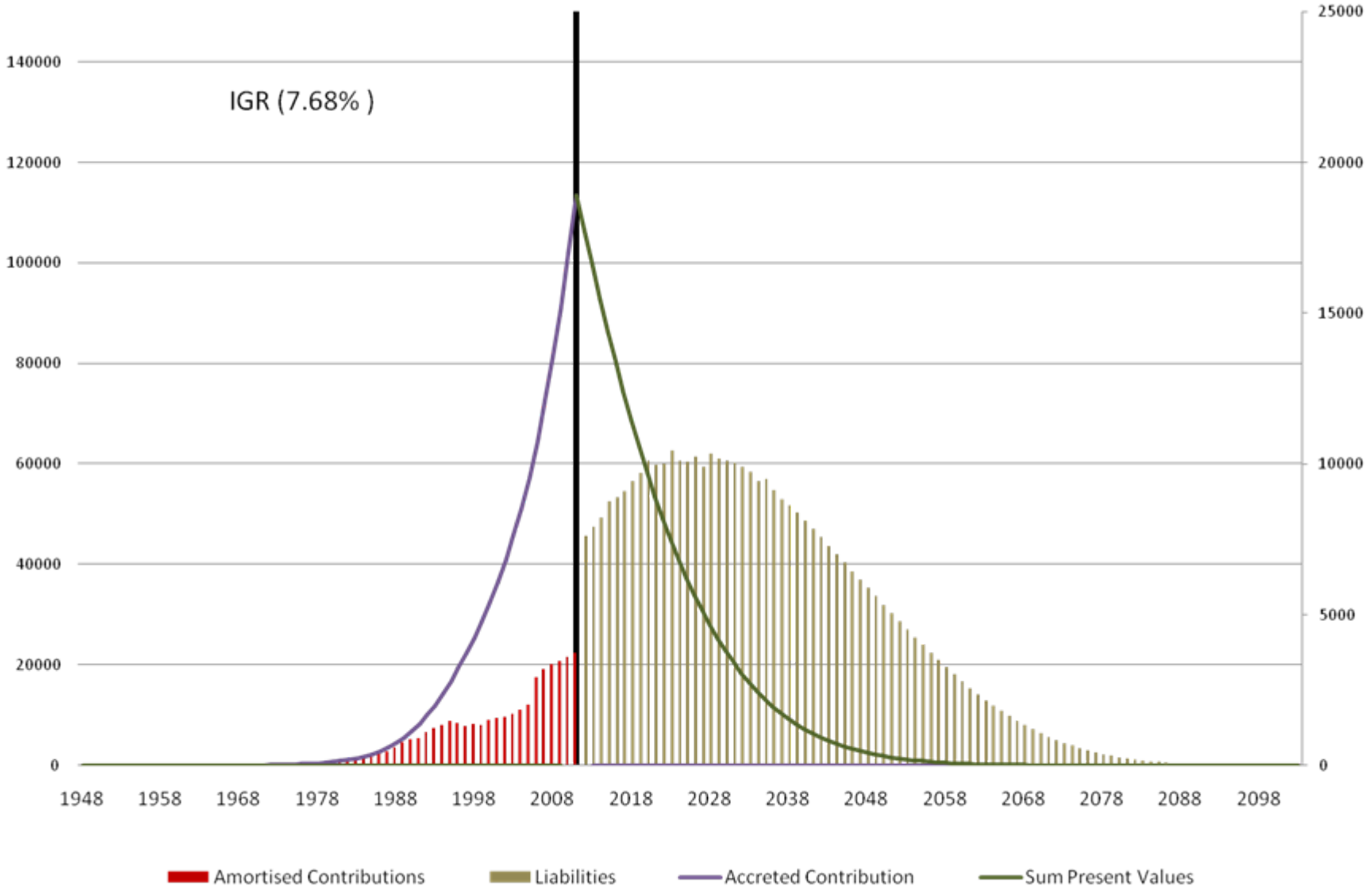


Error and Bias

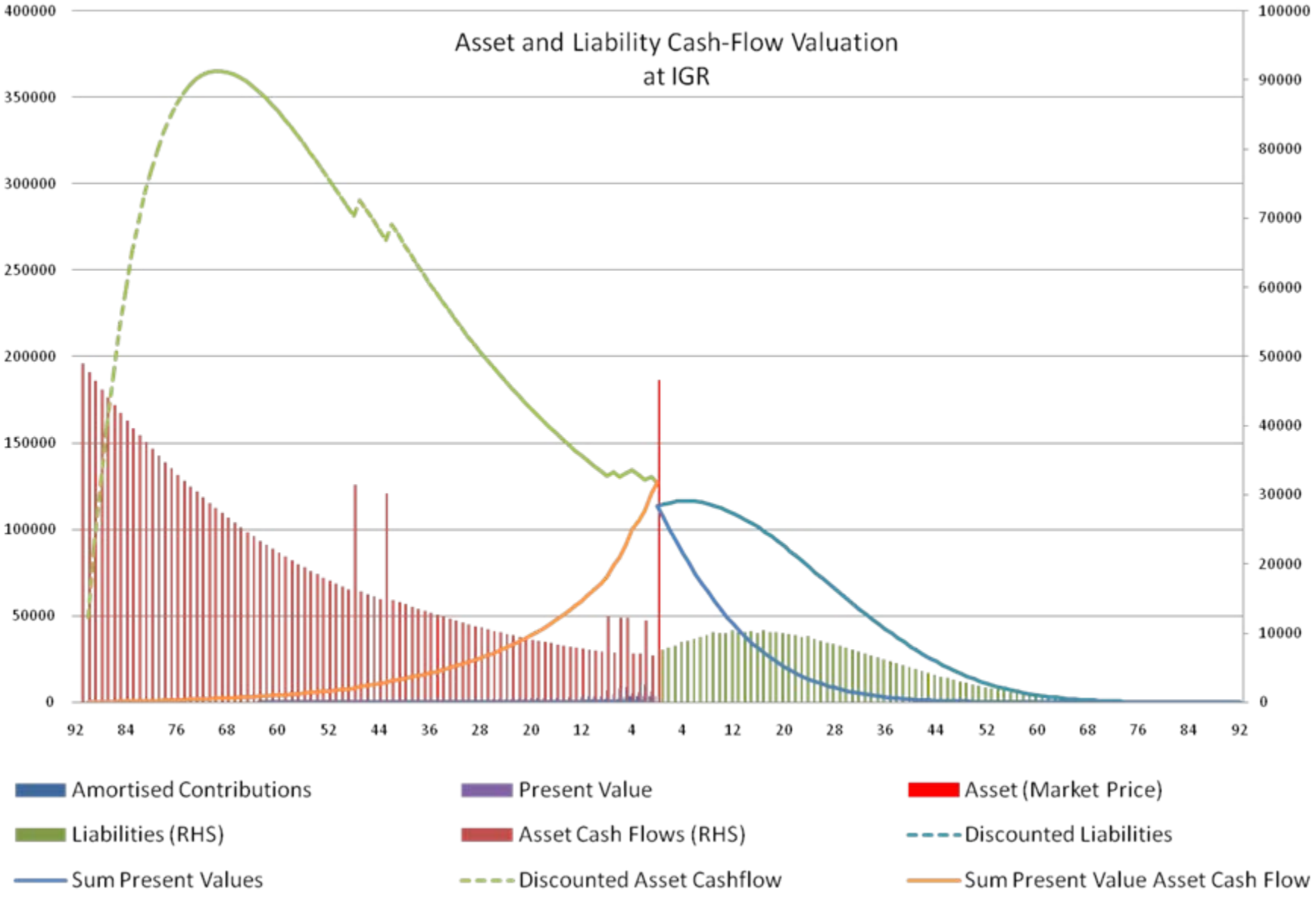


Estimating the IGR

Solve for IGR under Pv(C) = Pv(P)

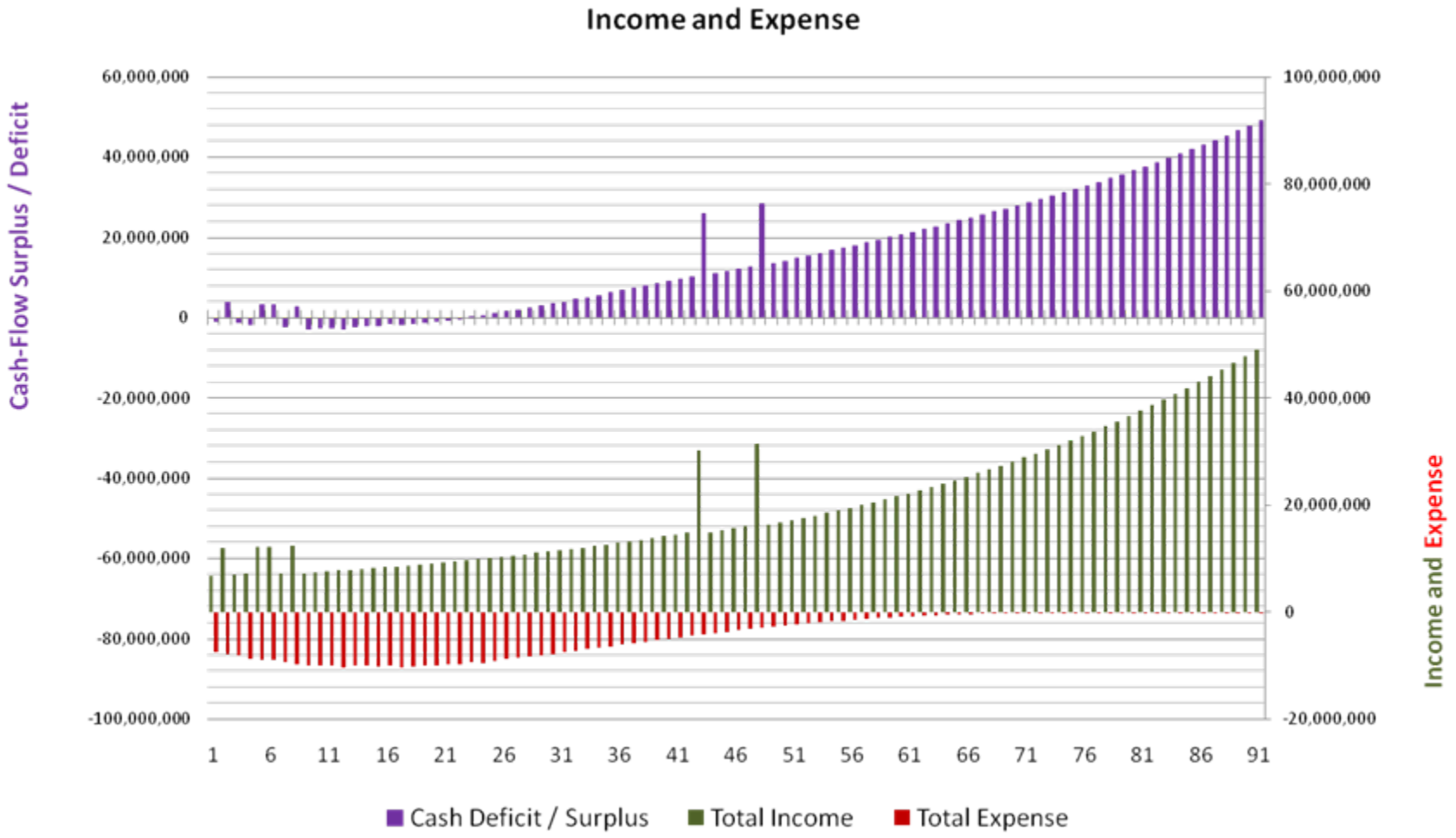


Valuation Illustrative Scheme



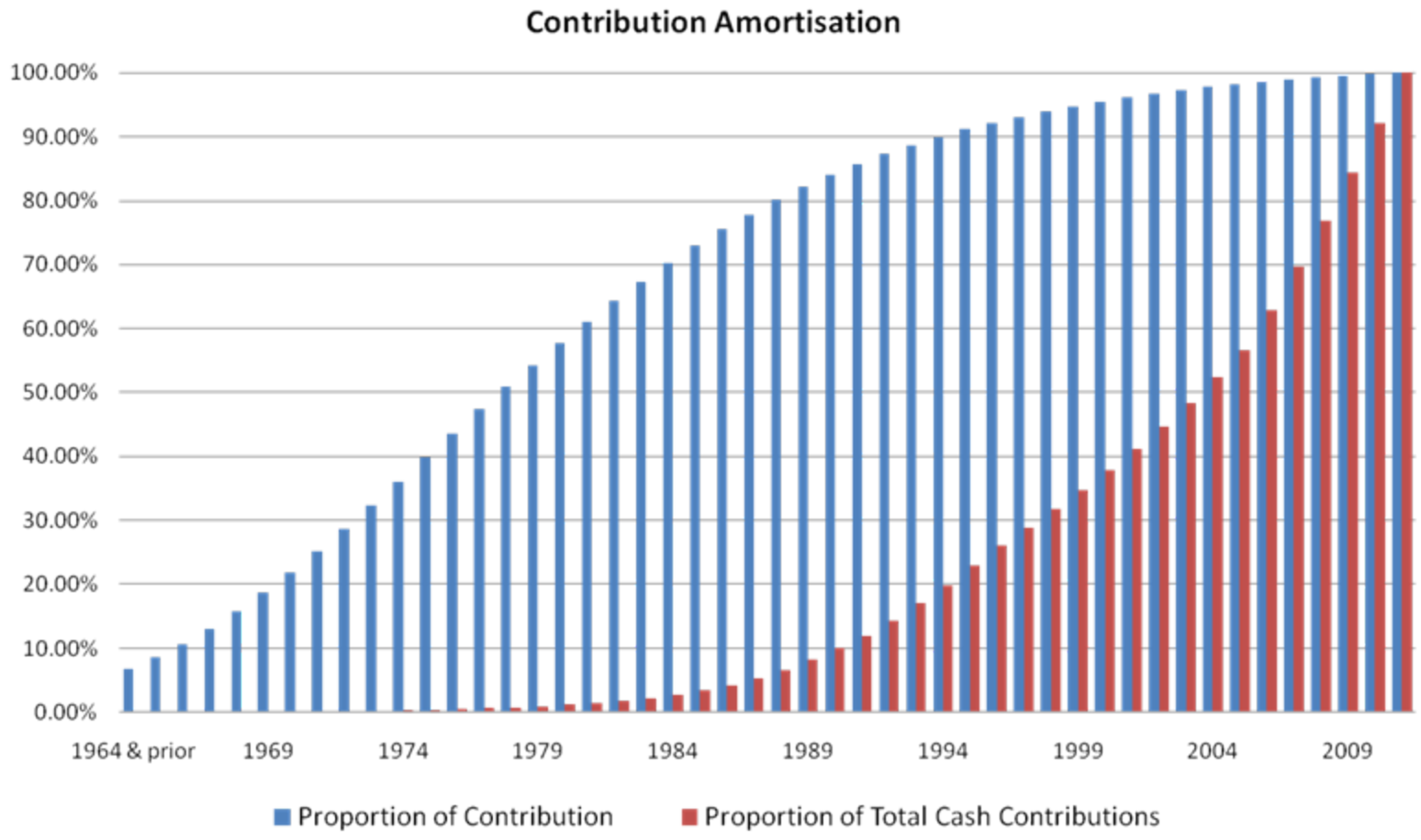
Cash Flow Projections

- Asset cash flows – Bonds contractual and Equities constant real income.

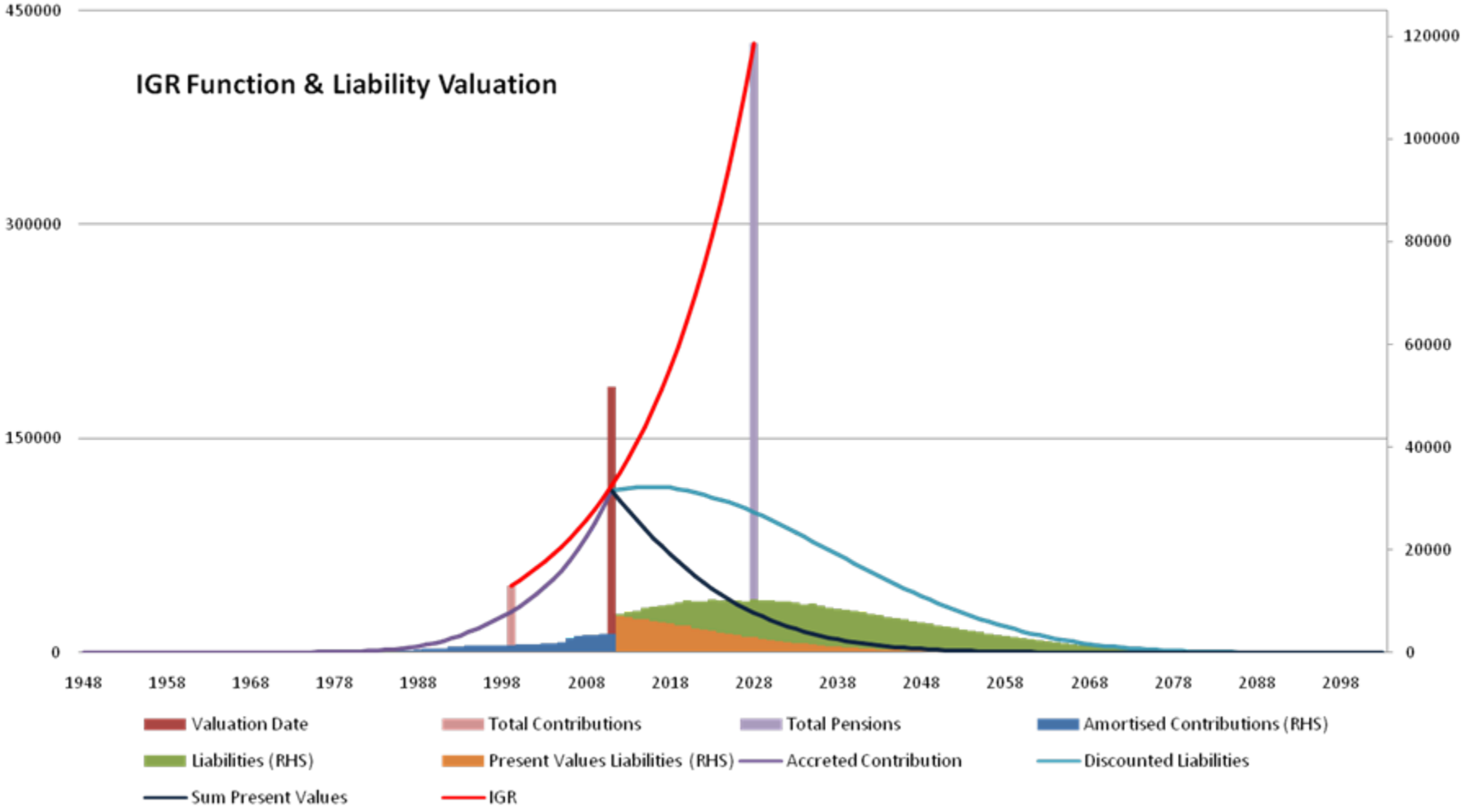


Contributions

- Contributions are amortised as pensions are paid and members die.



Function and Point

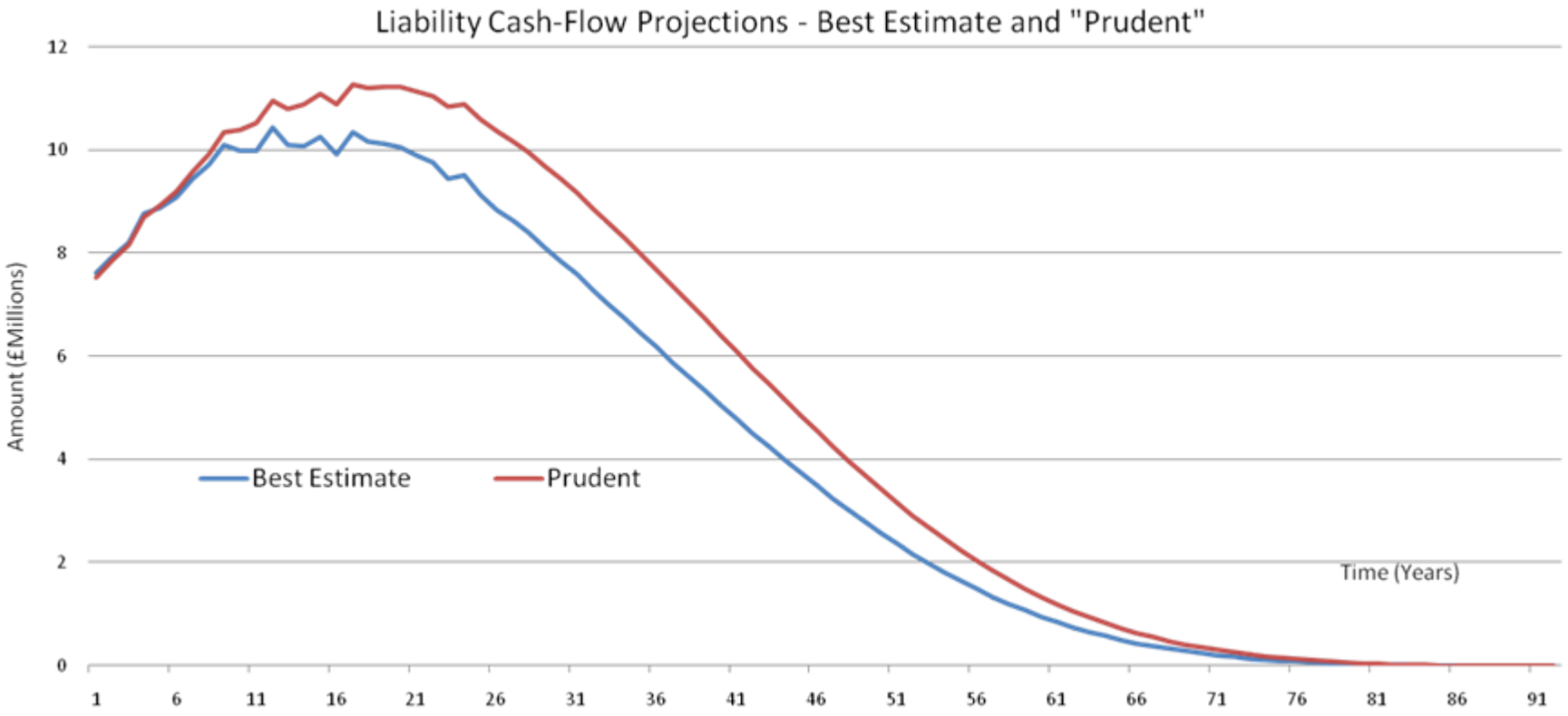


Comparison of Current and Possible Methods

	Assets	Liabilities	Surplus	%
Illustrative Scheme	**132,017,010**	**117,735,917**	**14,218,094**	**112%**
Pensions Act	186,030,788	182,433,905	3,596,884	102%
Accounting	186,030,788	222,631,806	36,601,018	84%
Gilt	341,353,967	222,631,806	118,722,161	153%
Asset Implied	186,030,788	153,468,329	32,562,459	121%

- Apply Prudent Assumptions
- Increase Total Pensions by 15%

Stress Testing



- The IGR increases from 7.68% to 7.91%
- The funding ratio declines from 112% to 105%

Conclusions

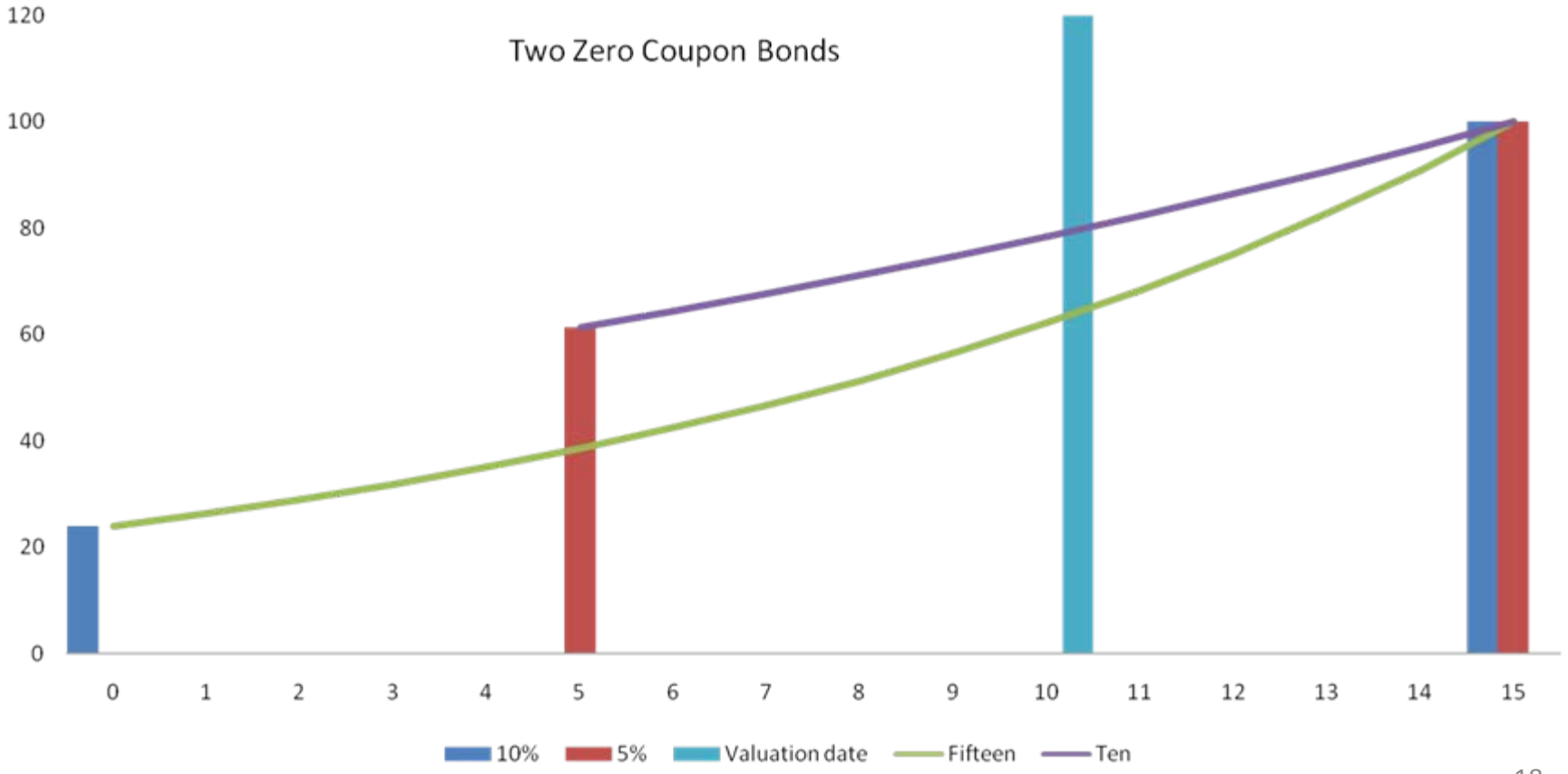
- The proposed method is precise and accurate.
- It is a fair value approach.
- It outperforms all existing and many possible methods
- It is decision and prediction useful.
- It varies only with variation in pension and contribution factors.
- It carries with it incentives for DB scheme provision .
- And long-term investment.
- We next consider some related issues

Market Consistency

- The proposed method is fair value, but it is not market consistent
- We can introduce market consistency with a simple adjustment.
- The illustrative scheme has a surplus of £14.2 million under the IGR
- If we multiply this by a factor [Market value of assets/ IGR value of assets] we have the market consistent surplus of £20 million [14.2 *(186,030/132,218)]
- This factor will be positive everywhere when the cash flow returns from markets are below the IGR on pensions awarded – and they usually are.
- It multiplies the volatility of markets.
- This factor is incredibly volatile – for the statisticians / probabilists, it is technically Cauchy – having no defined mean.
- It will tend to rise as the IGR rises – for a 12.00% IGR the multiple is 2.18 times.
- If we have a scheme with a 12% IGR, in perfect balance and market volatility of 20%, valuation volatility is unbounded.
- The general position is that the closer to balance the worse the reported volatility

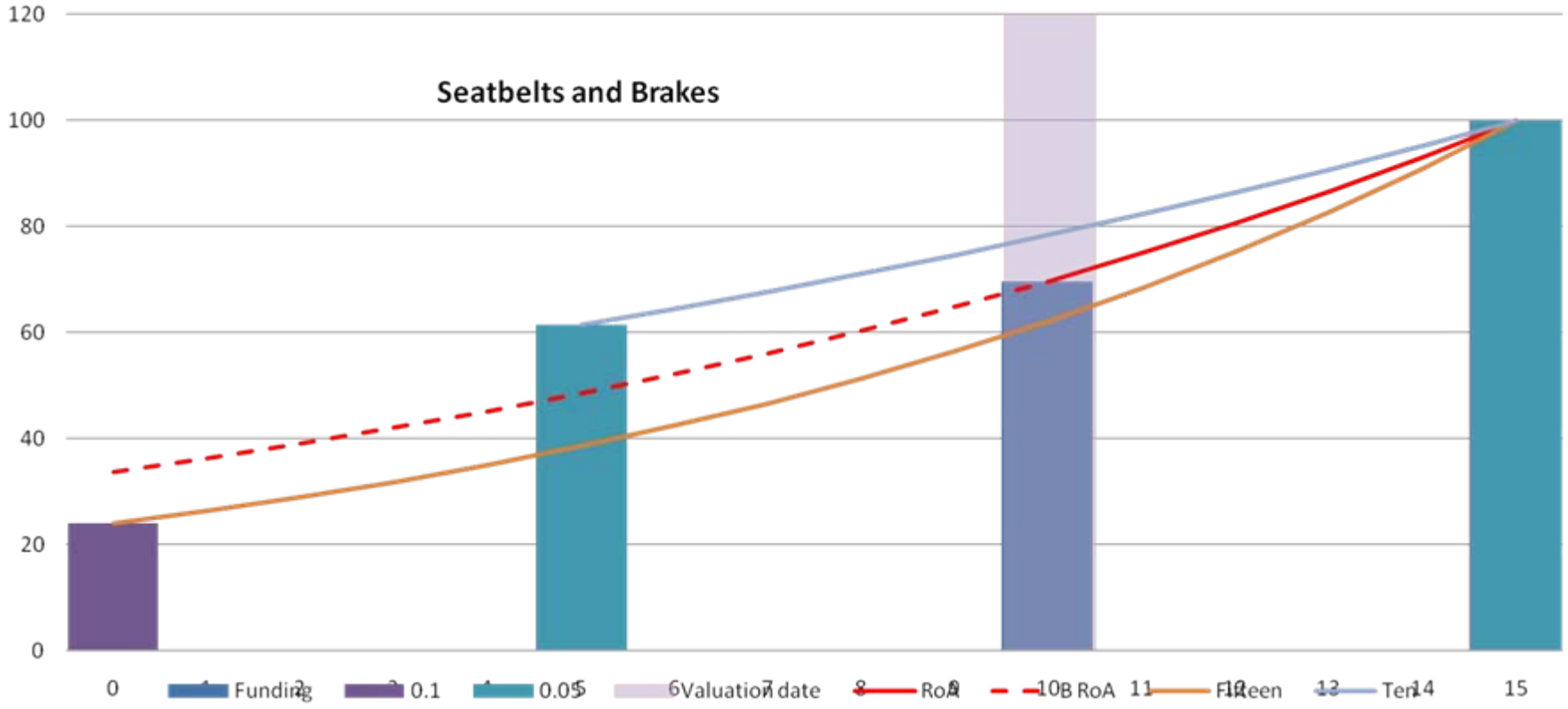
Liability Valuation

- Should two schemes with exactly the same assets and liabilities have the same funding ratio?
- Consider two zero coupon bonds – a 15 year issued at a yield of 10% and a 10 year issued at 5% yield.
- Both are evaluated five years prior to their common maturity at par.



Two views

- When schemes have same assets and liabilities, and this is all, then funding does trump covenant because there is no sponsor support.
- But in the UK support is statutory – funding does not trump covenant.
- We illustrate the consequence for corporate finance where the funding is sufficient to meet liabilities at an expected return on assets of 7.5%.



- The distortions relative to contracted corporate liabilities are everywhere.

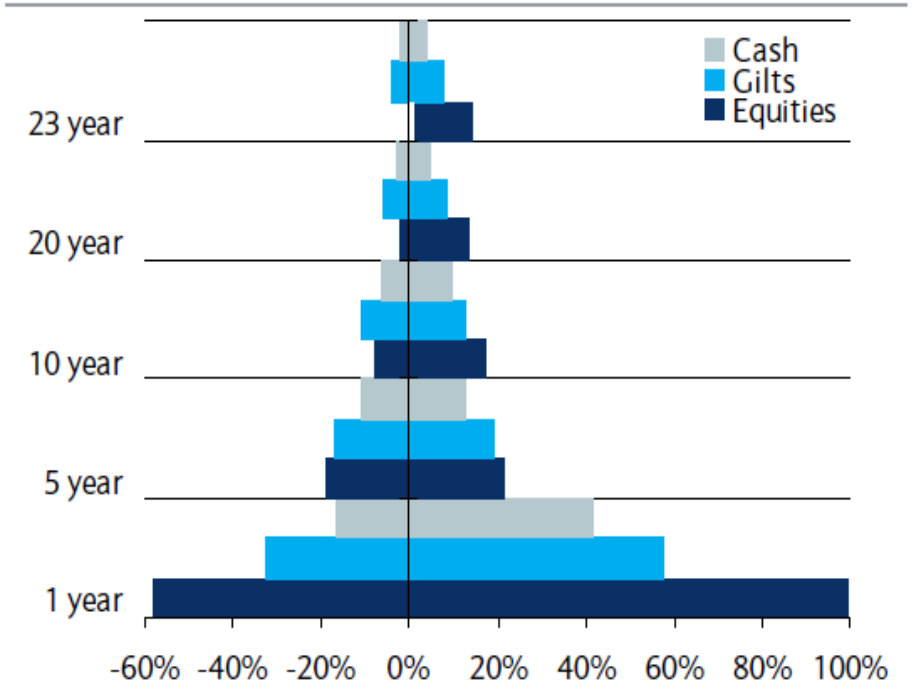
Holistic Balance Sheet

- For a scheme in deficit, we may introduce the IGR deficit into sponsor liabilities
- Here it displaces retained earnings and perhaps equity.
- If it exceeds these, then the sponsor is balance-sheet insolvent.
- However, the pension problem is equitable insolvency.
- Now we need to examine the return on capital of the sponsor employer
- If this exceeds the IGR on the pension (deficit) capital, then the sponsor may be viable.
- In more usual circumstances where the deficit is less than retained and equity, we need also to consider dividend policy
- This approach gives us the traditional asset coverage and service coverage ratios of credit analysis.
- And it informs us of the value of the sponsor covenant to the scheme.

Convergence

- Market prices are driven by fear and greed - Anomalies abound
- Volatility is extremely high.
- Prices drive returns – Beebower, Brinson.
- Market returns are negatively correlated with GDP growth out to about five years
- This violates Arrow Debreu fixed point efficient resource allocation equilibria.
- But as we move to long holding periods, income dominates and volatility declines.
- Long term returns are positively correlated with GDP growth
- In other words, short term market price moves converge to the long-term fundamentals and allocative efficiency

Figure 7: Maximum and minimum real returns over different periods

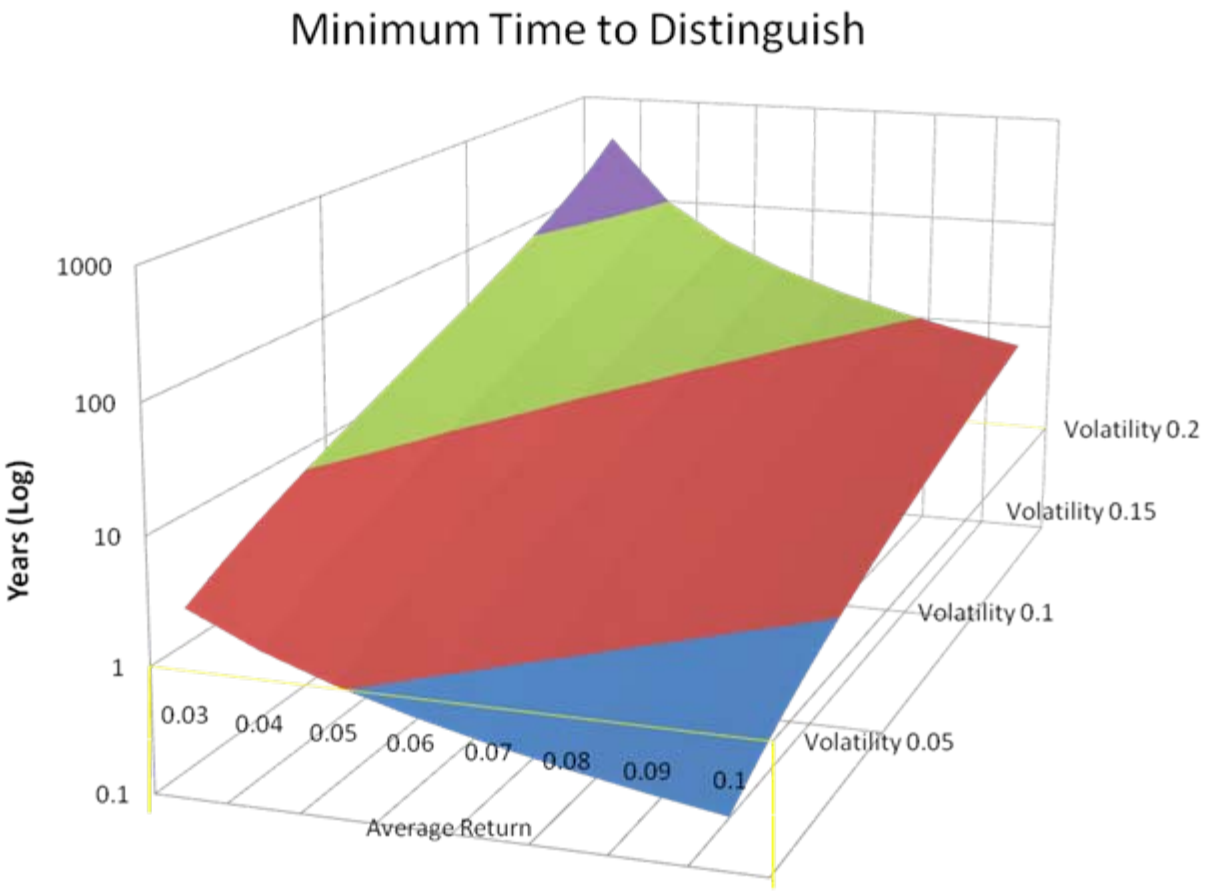


Source: Barclays Capital:

- **But not** if we use them as indicators for short-term management actions
- Such as special contributions and management techniques like LDI which are hedging regulatory and accounting nonsenses.

- The minimum length of time to distinguish signal from noise
- If we assume normality in return, we can estimate these:

How long?



- Only with high return, low volatility strategies are market prices informative. Everywhere else, we are working with noise.