ACTUARIAL SOCIETY OF SOUTH AFRICA

DEFINED CONTRIBUTION INVESTMENT DECISIONS: USING SMOOTHING TO MEET CONFLICTING OBJECTIVES

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What's to come

1. Trustee Investment Objectives
2. Evaluating typical strategies
3. Constructing a smoothed portfolio
4. Evaluating the smoothed portfolio
5. Conclusion

Trustee Investment Objectives

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1. It is likely to achieve significant growth above inflation at a sustainable level over the long term

   - Long term growth: Pr (annual **real** return over rolling 15 year periods > 5.5%)

2. It is likely to achieve growth at or above inflation consistently over the medium term (1-5 years)

   a. Consistency >4% over 5 years: Pr (annual **real** return over rolling 5 year periods > 4%)

   b. Consistency >4% over 3 years: Pr (annual **real** return over rolling 3 year periods > 4%)

   c. Consistency >0% over 1 year: Pr (annual **real** return over rolling 1 year periods > 0%)

3. It is likely to avoid negative returns (over rolling one-month or one-year periods)

   a. Non-negative annual returns: Pr (one year rolling **nominal** return above 0)

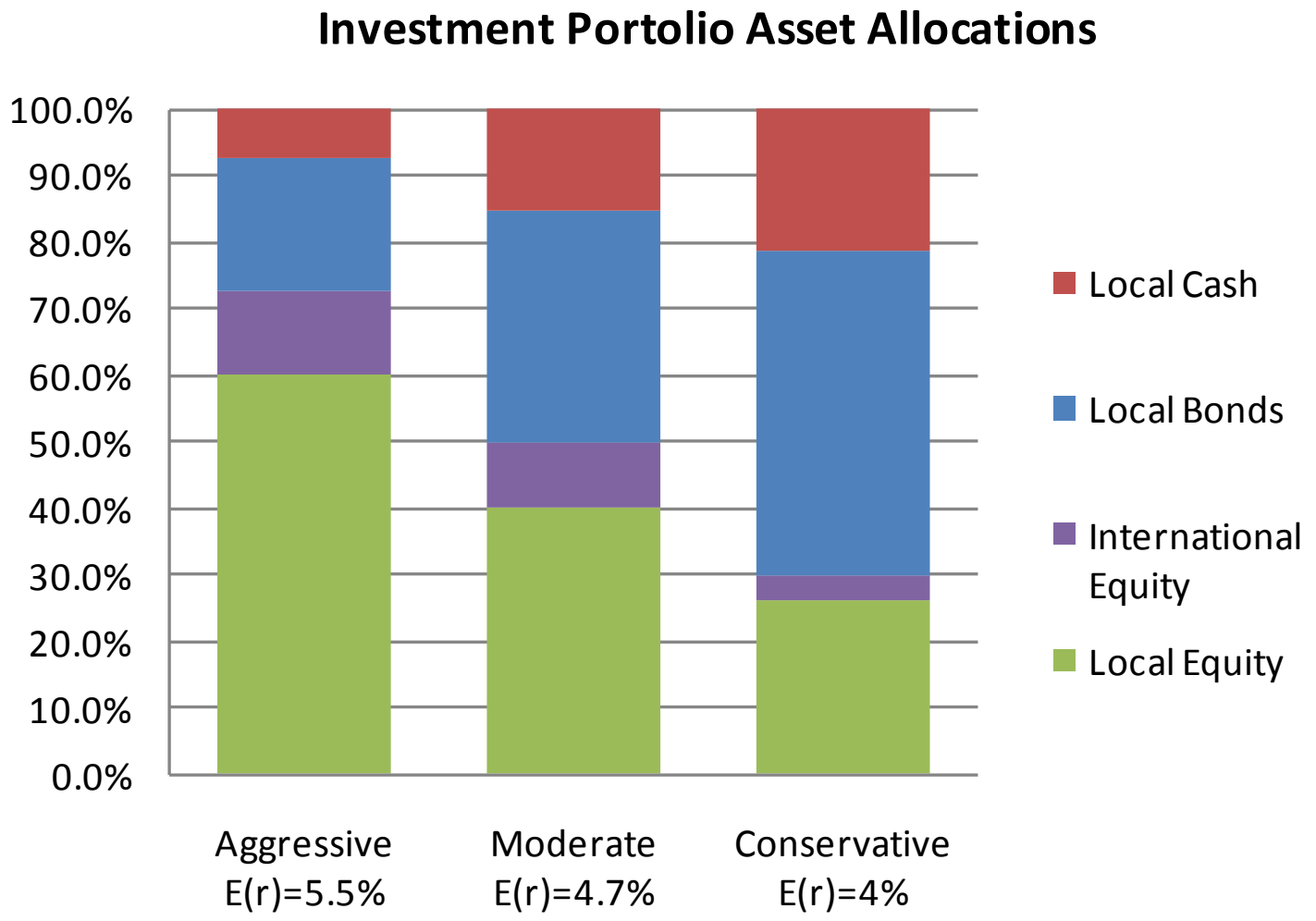
   b. Non-negative monthly returns: Pr (one month rolling **nominal** return above 0)

   c. Expected size of negative returns: mean negative annual **nominal** return

4. It avoids short term fluctuations in asset values for members exiting before retirement and at or close to retirement

   - annual and monthly sharpe ratio & sortino ratio (with a minimum acceptable return of inflation)

Typical strategies considered



Historical analysis results

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Objective |Investment Strategy	Aggressive	Moderate	Conservative
1: Long term growth	**95.68%**	77.74%	52.49%
2: a) Consistency >4% over 5 years	**80.76%**	77.20%	58.67%
b) Consistency >4% over 3 years	**67.87%**	64.94%	54.83%
c) Consistency >0% over 1 year	67.16%	67.80%	**68.44%**
3: a) Non-negative annual returns	87.85%	90.62%	**96.16%**
b) Non-negative monthly returns	64.17%	69.79%	**72.50%**
c) expected size of negative returns	-8.97%	-4.43%	**-2.33%**
4: annual sharpe	1.18	1.55	**1.90**
annual sortino (above inflation)	6.13	9.40	**19.51**
monthly sharpe	0.35	0.43	**0.50**
monthly sortino (above inflation)	0.60	0.77	**0.94**

- Analysis period: 40 years to August 2011

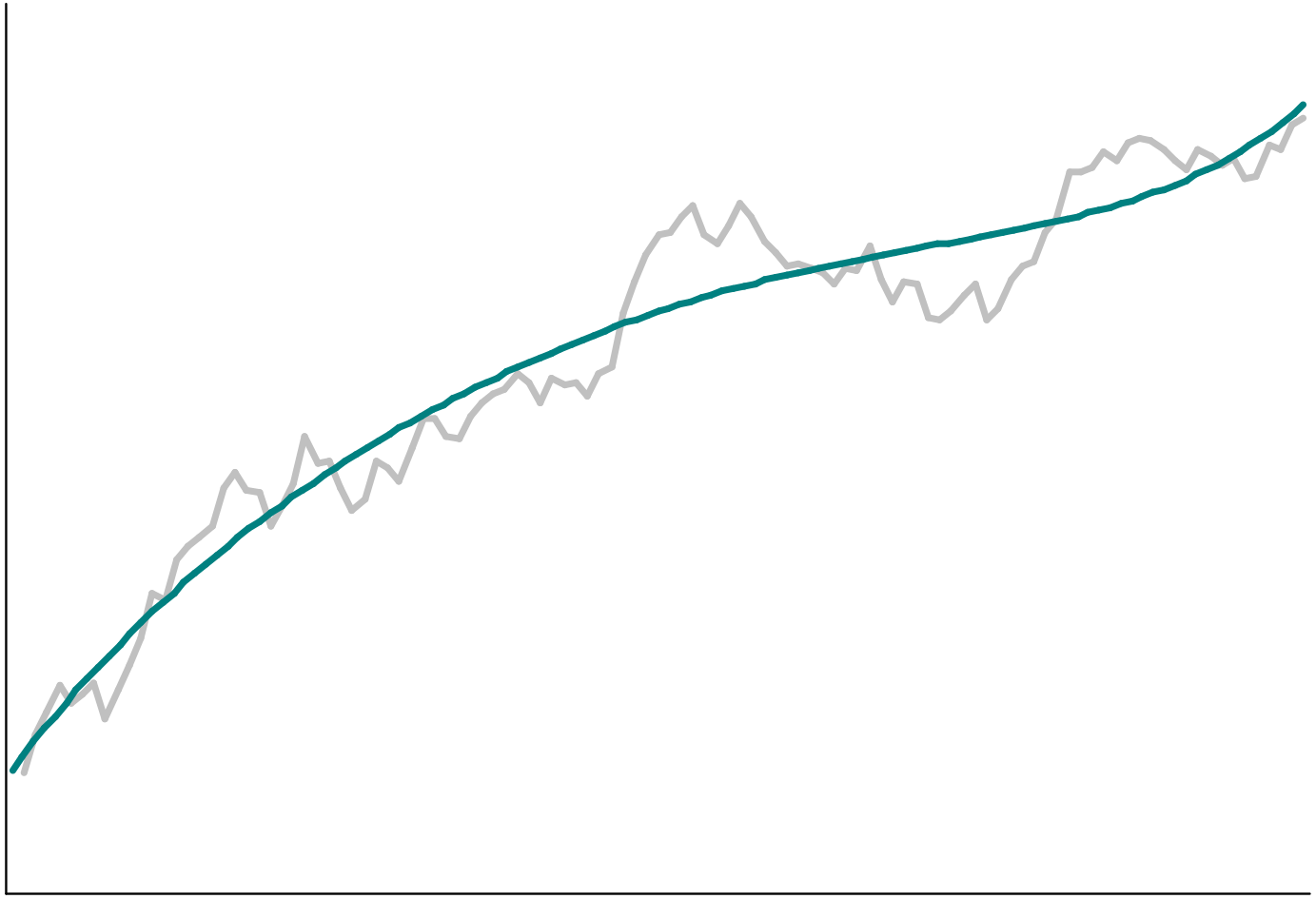
Asset Class	Index
Local Equity	FTSE/JSE All Share TRI
International Equity	MSCI World (in Rands)
Local Bonds	ALBI Total Return
Local Cash	STeFI (AF Money Market Index before 2000)
Inflation	CPI

Projection analysis results

Objective |Investment Strategy	Aggressive	Moderate	Conservative
1: Long term growth	**56.9%**	50.55%	40.15%
2: a) Consistency >4% over 5 years	**61.8%**	60.35%	55.74%
b) Consistency >4% over 3 years	**59.3%**	58.18%	54.57%
c) Consistency >0% over 1 year	64.9%	67.26%	**68.07%**
3: a) Non-negative annual returns	77.4%	82.33%	**85.64%**
b) Non-negative monthly returns	58.5%	60.57%	**62.14%**
c) expected size of negative returns	-7.9%	-5.58%	**-4.26%**
4: annual sharpe	0.79	0.94	**1.05**
annual sortino (above inflation)	6.69	14.93	**21.17**
monthly sharpe	0.24	0.29	**0.33**
monthly sortino (above inflation)	0.44	0.56	**0.65**

- 5000 scenarios, monthly time-steps, 30 year projections
- Barrie & Hibbert (B&H) stochastic-volatility, jump-diffusion (SVDJ) model calibrated to South African market data as at 30 June 2011
- Results are averages across all scenarios

Constructing a smoothed portfolio



Used existing formula for **Absolute Smooth Growth**

Same net **long-term** return as the **aggressive fund** *less 0.2% policy fee*

Formula declares LT real return each month and adjusts for actual reserves

Historical analysis results

Objective |Investment Strategy	Aggressive	Moderate	Conservative	Smoothed Agg
1: Long term growth	95.68%	77.74%	52.49%	**100.00%**
2 a): Consistency >4% over 5 years	80.76%	77.20%	58.67%	**86.70%**
b): Consistency >4% over 3 years	67.87%	64.94%	54.83%	**79.78%**
c): Consistency >0% over 1 year	67.16%	67.80%	68.44%	**79.74%**
3 a): Non-negative annual returns	87.85%	90.62%	96.16%	**99.15%**
b): Non-negative monthly returns	64.17%	69.79%	72.50%	**99.58%**
c): expected size of negative returns	-8.97%	-4.43%	-2.33%	**-0.72%**
4 annual sharpe	1.18	1.55	1.90	**1.90**
annual sortino (above inflation)	6.13	9.40	19.51	**267.16**
monthly sharpe	0.35	0.43	0.50	**1.77**
monthly sortino (above inflation)	0.60	0.77	0.94	**13.36**

Projection analysis results

Objective |Investment Strategy	Aggressive	Moderate	Conservative	Smoothed Agg
1: Long term growth	**56.9%**	50.55%	40.15%	55.00%
2: a) Consistency >4% over 5 years	61.8%	60.35%	55.74%	**61.98%**
b) Consistency >4% over 3 years	59.3%	58.18%	54.57%	**60.38%**
c) Consistency >0% over 1 year	64.9%	67.26%	68.07%	**73.76%**
3: a) Non-negative annual returns	77.4%	82.33%	85.64%	**91.31%**
b) Non-negative monthly returns	58.5%	60.57%	62.14%	**96.50%**
c) expected size of negative returns	-7.9%	-5.58%	-4.26%	**-3.55%**
4: annual sharpe	0.79	0.94	1.05	**1.33**
annual sortino (above inflation)	6.69	14.93	21.17	**318.70**
monthly sharpe	0.24	0.29	0.33	**1.17**
monthly sortino (above inflation)	0.44	0.56	0.65	**14.79**

Conclusion

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1. Smoothing has received criticism for various reasons

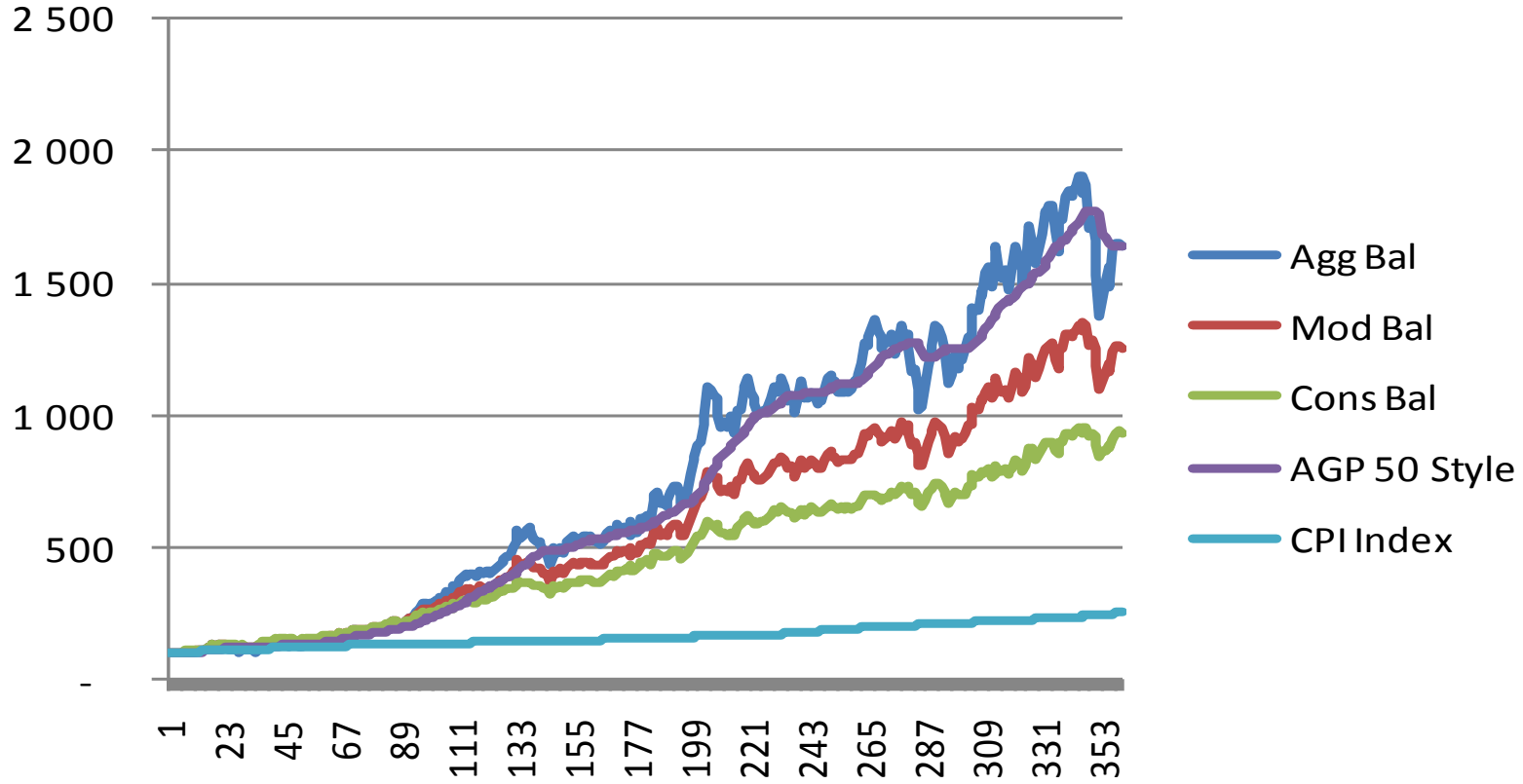
   BUT

2. Smoothing is an efficient and effective tool for achieving the often-conflicting investment aims of retirement fund trustees

   THEREFORE

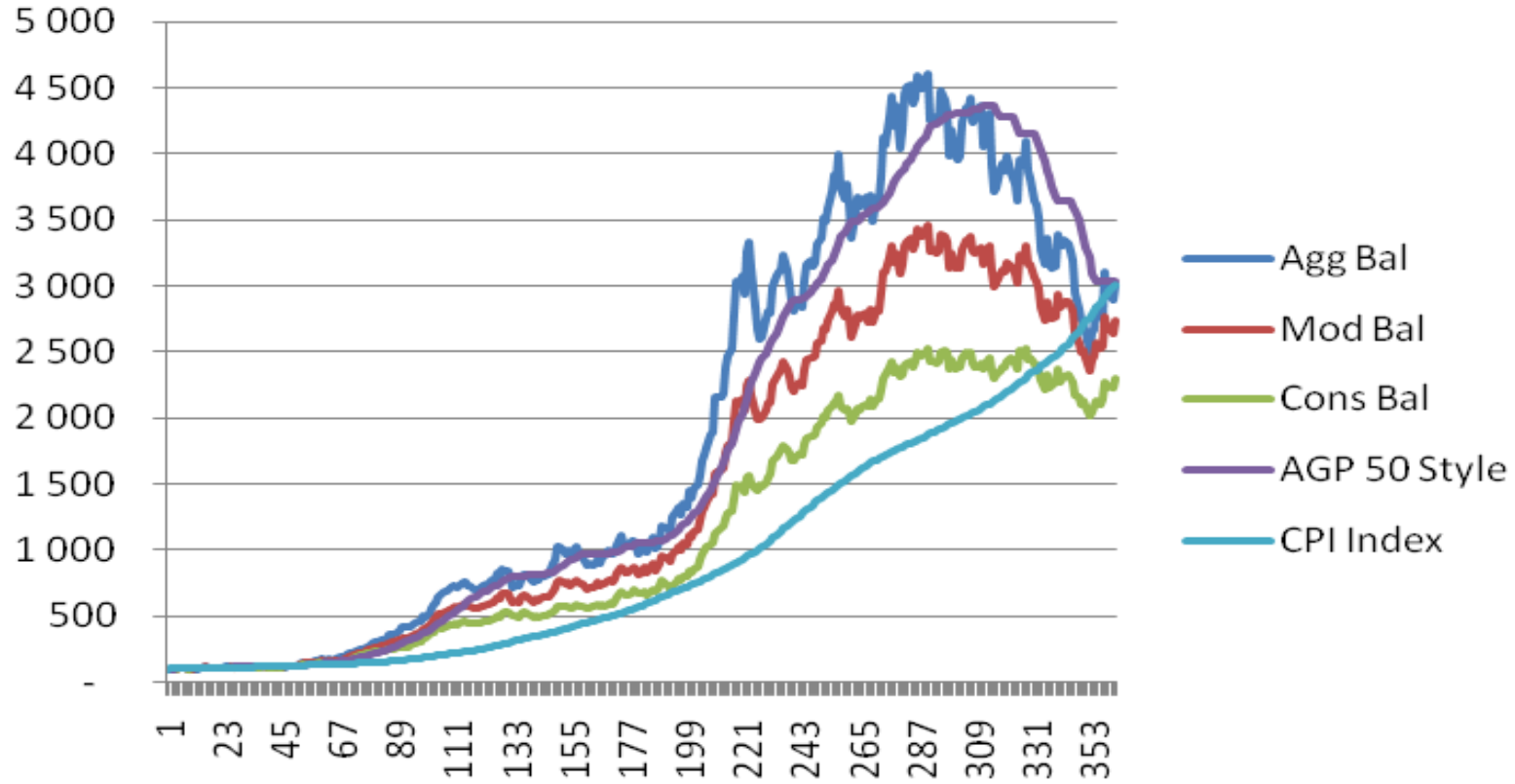
3. Trustees and their advisors should explore whether smoothing can be implemented in a way that manages it's potential drawbacks

Scenarios – "all's well that ends well"



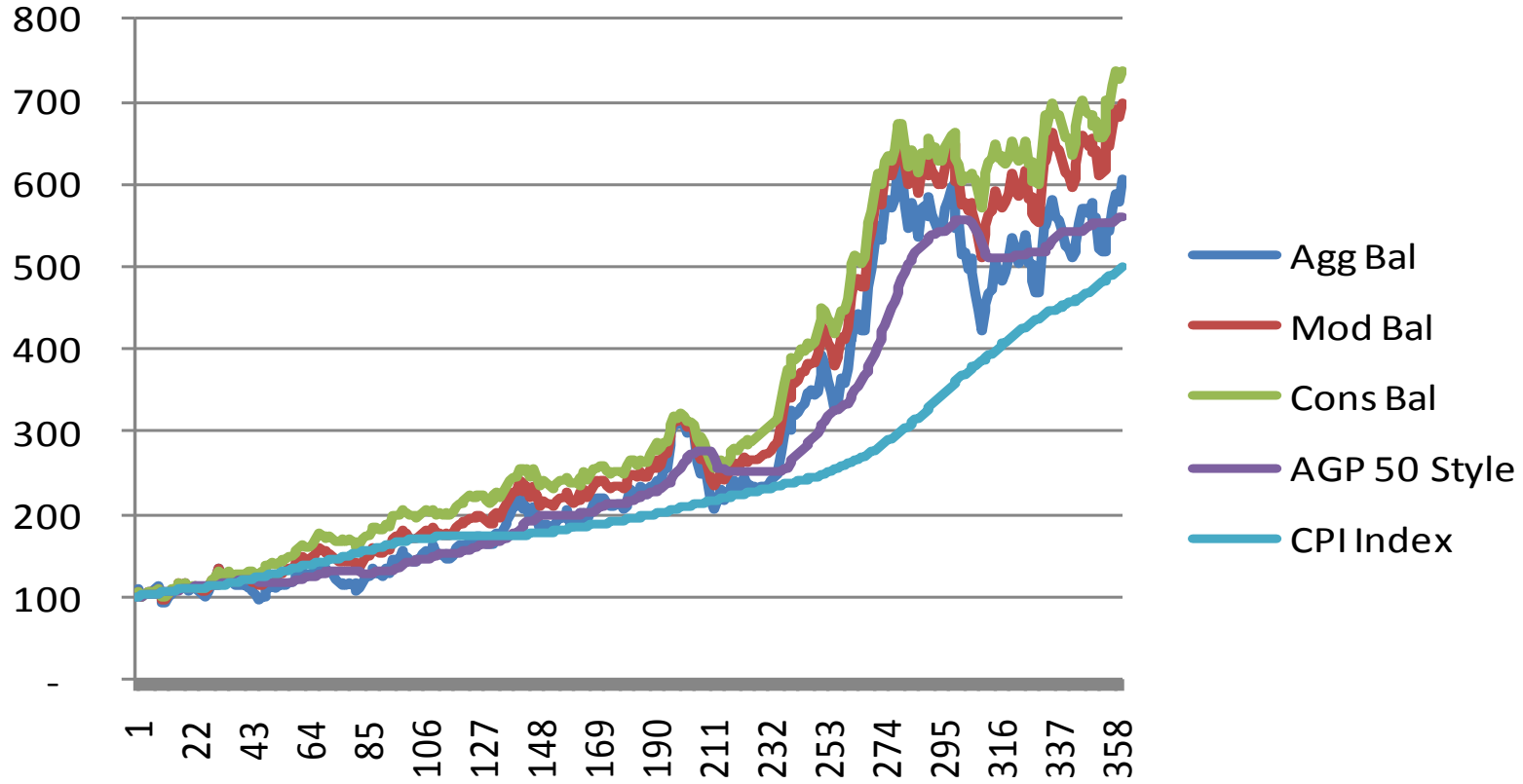
	Local Equity	Int Equity	Local Bonds	Local Cash	Inflation	Final reserve
Average annual return	9.9%	11.7%	6.8%	3.8%	3%	-6%

Scenarios – "what goes up…"



	Local Equity	Int Equity	Local Bonds	Local Cash	Inflation	Final reserve
Average annual return	11.2%	14.8%	9.5%	10.4%	12.5%	-7%

Scenarios – “risk ≠ reward”



	Local Equity	Int Equity	Local Bonds	Local Cash	Inflation	Final reserve
Average annual return	4,4%	7.1%	7.8%	4.9%	5.4%	2%

Constructing a smoothed portfolio

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Bonus formula starts with a monthly bonus = long term real return target, adjusts for reserves

1. When reserves are positive:

- Monthly bonus = Max [(1+annualized rolling 3-year CPI+5.3%)^(1/12)-1 + X, 0.05%]
- Where X is an adjustment to allow for the level of the reserves, taken from the following table:

Reserve	Average three-year CPI is less than or equal to 6%	Average three-year CPI is greater than 6%
0% (incl) to 5%	0.00%	-0.50%
5% (incl) to 10%	0.50%	0.00%
10% (incl) to 15%	0.75%	0.25%
15% (incl) to 20%	1.00%	0.50%
20% (incl) to 25%	1.25%	0.75%
25% (incl) to 30%	1.50%	1.00%
> 30% (incl)	1.75%	1.25%

2. When reserves are negative:

- the monthly bonus is drawn from the following table:

Reserve	Monthly Gross Bonus	Reserve	Monthly Gross Bonus
-2.5% (incl) to 0%	0.49%	-25% (incl) to -20%	-2%
-5.0% (incl) to -2.5%	0.24%	-30% (incl) to -25%	-4%
-7.5% (incl) to -5.0%	0.05%	-35% (incl) to -30%	-8%
-15% (incl) to -7.5%	0%	-40% (incl) to -35%	-10%
-20% (incl) to -15%	-1%	Below -40%	-20%