



Timor-Leste Petroleum Fund

From Oil to Financial Assets: Planning for A Sustainable Future for Timor-Leste

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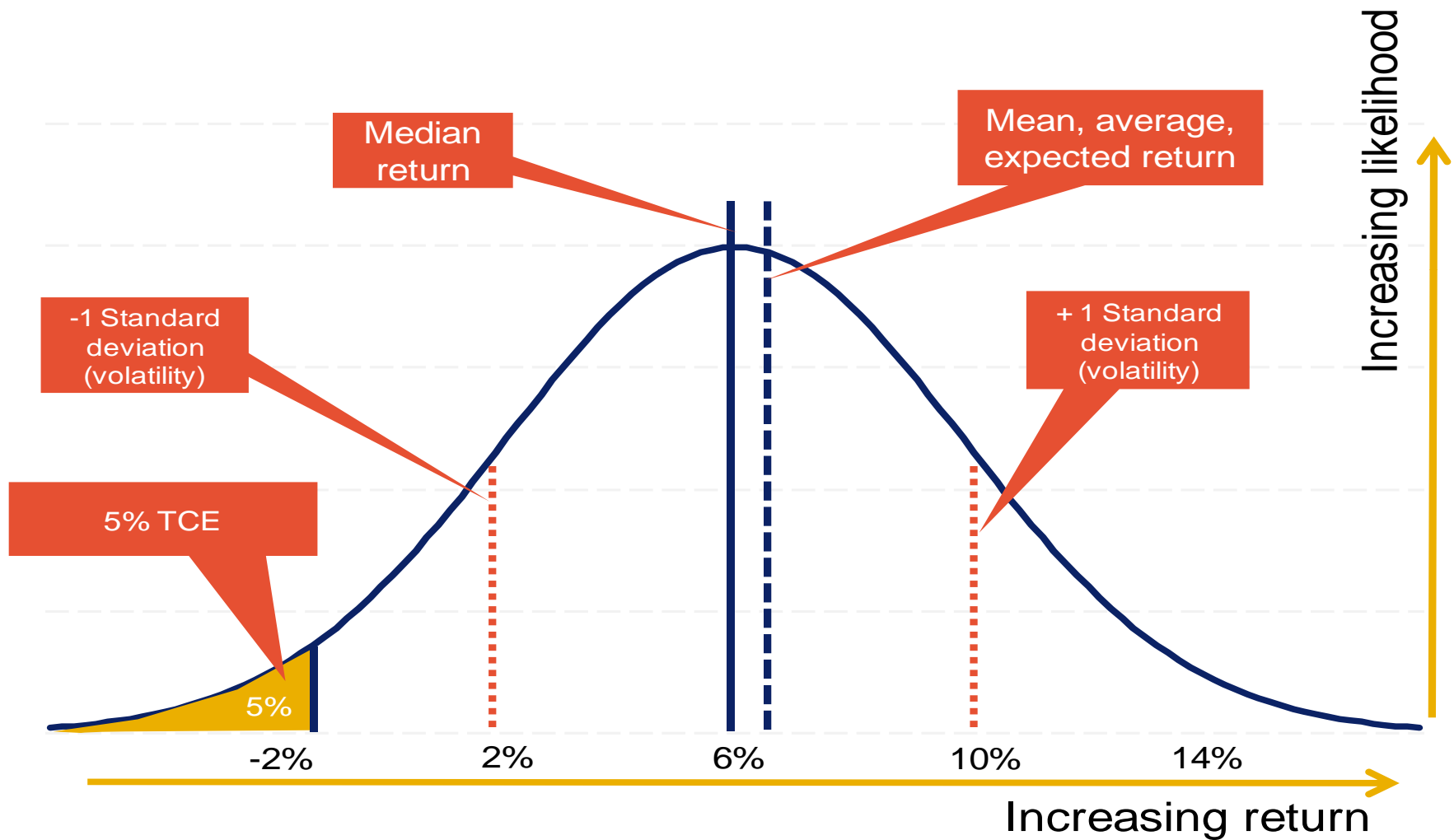
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Agenda

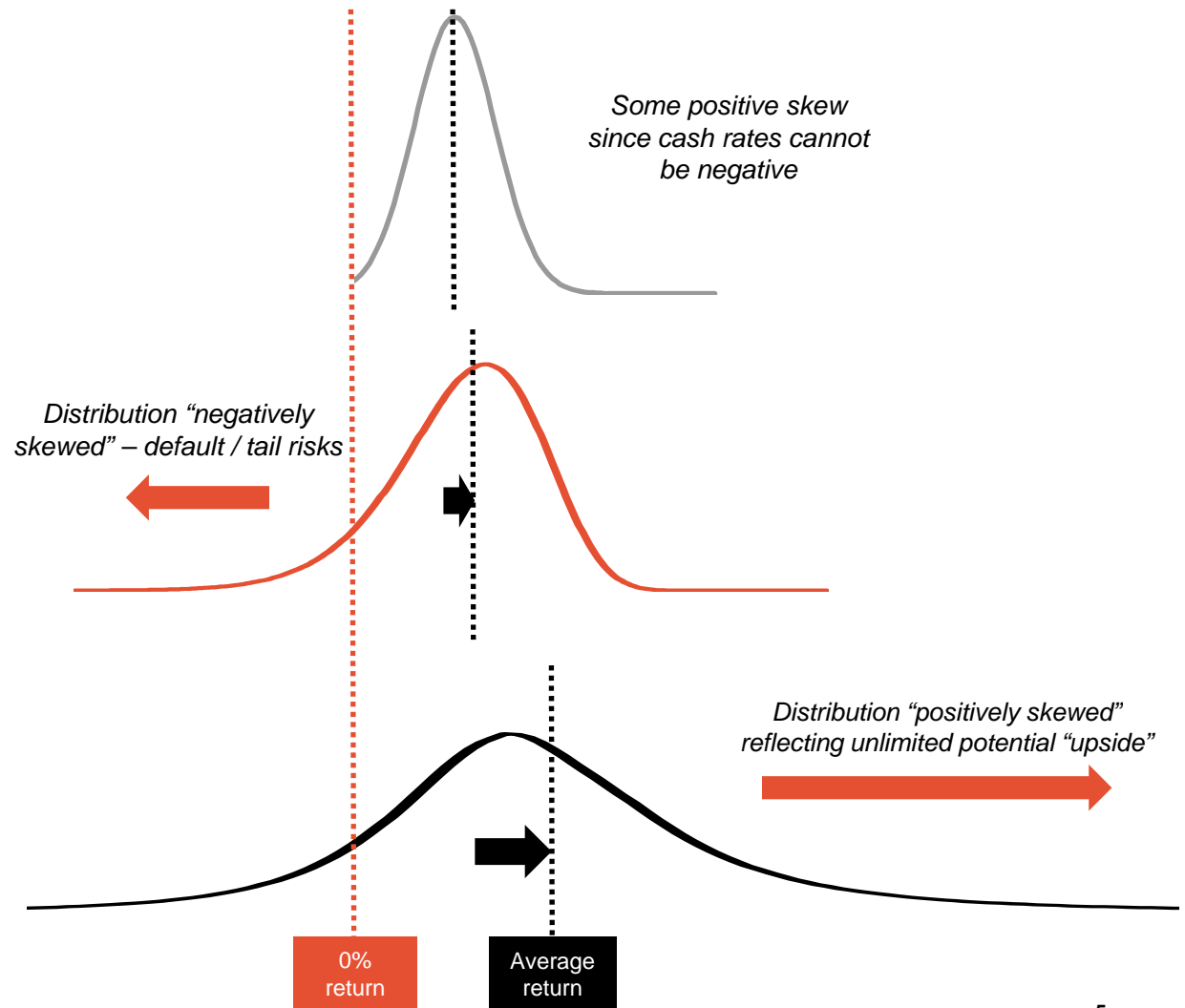
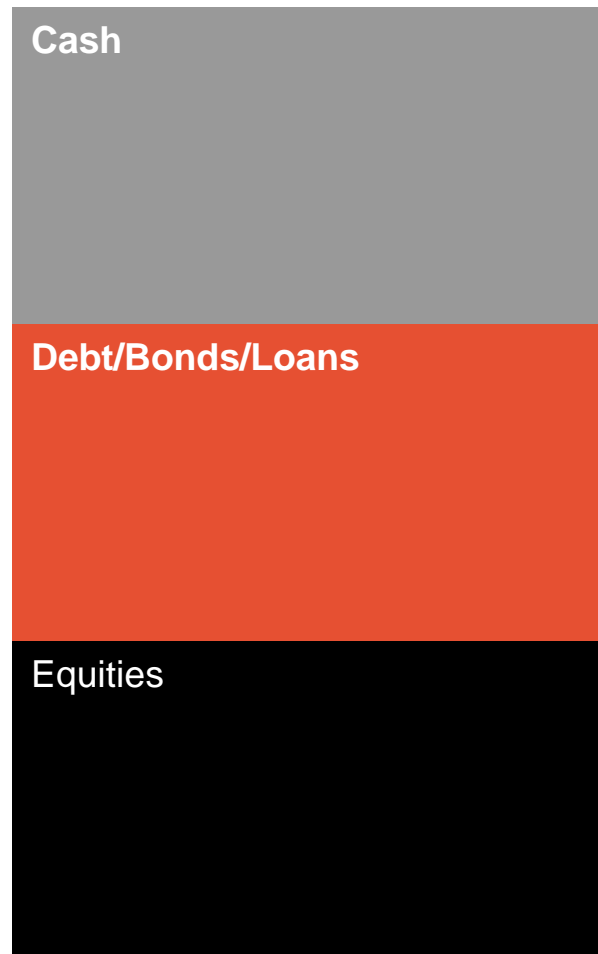
- The Investment world – some concepts
- Impact of different investment strategies – historical analysis
- Impact of different investment strategies – forward-looking analysis
- Key Findings

The Investment world – some concepts

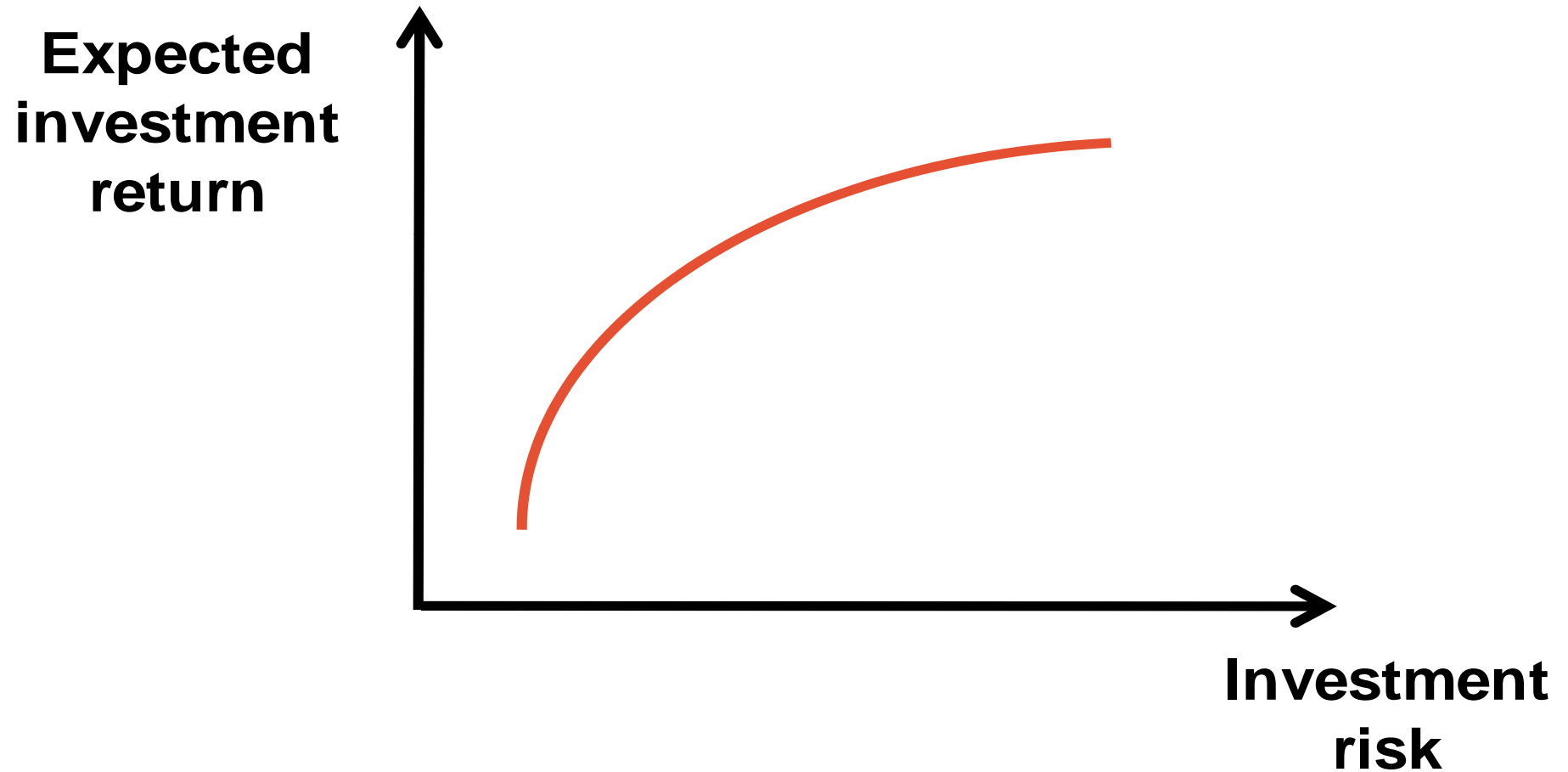
The investment return distribution



Return Profiles



Higher Returns means higher Risk



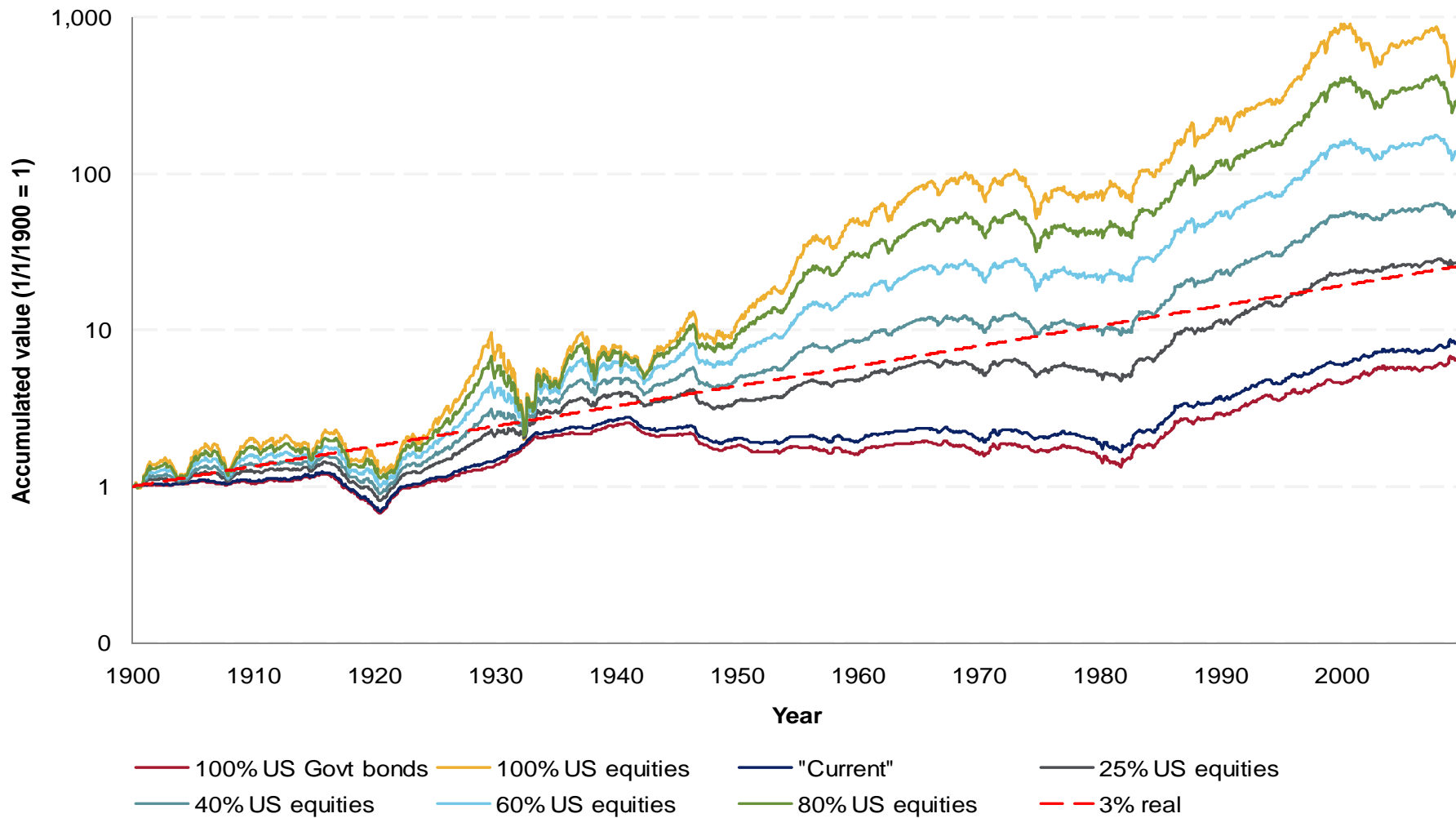
Impact of different investment strategies – historical analysis

Historical risk / return trade-off

Historical performance since 1900	100% US Govt Bonds	Current	25% US Equity	40% US Equity	60% US Equity	80% US Equity	100% US Equity
Average real return (% pa)	2.0	2.2	3.4	4.3	5.5	6.8	8.1
Geometric real return (% pa)	1.7	2.0	3.1	3.8	4.7	5.5	6.1
Standard deviation of return (% pa)	5.2	5.1	6.5	8.8	12.3	16.2	20.2
Information Ratio	0.33	0.39	0.48	0.43	0.38	0.34	0.30
Frequency of negative annual return	9%	9%	12%	20%	27%	30%	30%
Frequency of four consecutive negative quarterly returns	0.9%	0.9%	1.6%	2.5%	2.5%	3.2%	3.2%
1 in 20 year poor outcome (% pa)	-1.6	-0.9	-4.7	-6.2	-11.5	-17.2	-22.1

Long Term Real returns

Real accumulated returns of different strategies since 1900 (log scale)



Historical measures of risk for a range of investment strategies since 1900

Investment Strategy	Range of returns in two out of every three years		Frequency of negative returns (years in every 100)	Poor outcome return (5 years in every 100)	
	% pa	USD millions*		% pa	USD millions*
100% Treasury bonds	-0.2% to 10.2%	-10 to 574	9	Return of -1.6% or worse	Loss of USD 87 million or worse
Current	0.2% to 10.4%	8 to 582	9	Return of -0.9% or worse	Loss of USD 51 million or worse
25% Equities	0.0% to 13.1%	-1 to 733	12	Return of -4.7% or worse	Loss of USD 261 million or worse
40% Equities	-1.3% to 16.2%	-73 to 909	19	Return of -6.2% or worse	Loss of USD 349 million or worse
60% Equities	-3.6% to 21.0%	-201 to 1,178	27	Return of -11.5% or worse	Loss of USD 646 million or worse
80% Equities	-6.1% to 26.2%	-344 to 1,466	29	Return of -17.2% or worse	Loss of USD 964 million or worse
100% Equities	-8.8% to 31.5%	-493 to 1,766	30	Return of -22.1% or worse	Loss of USD 1,240 million or worse

Sources: Federal Reserve, Global Financial Data, Datastream, Towers Watson

* Based on an assumed Petroleum Fund balance of USD 5.6 billion

Impact of the worst four annual returns since 1900 on the Petroleum Fund balance (USD millions)

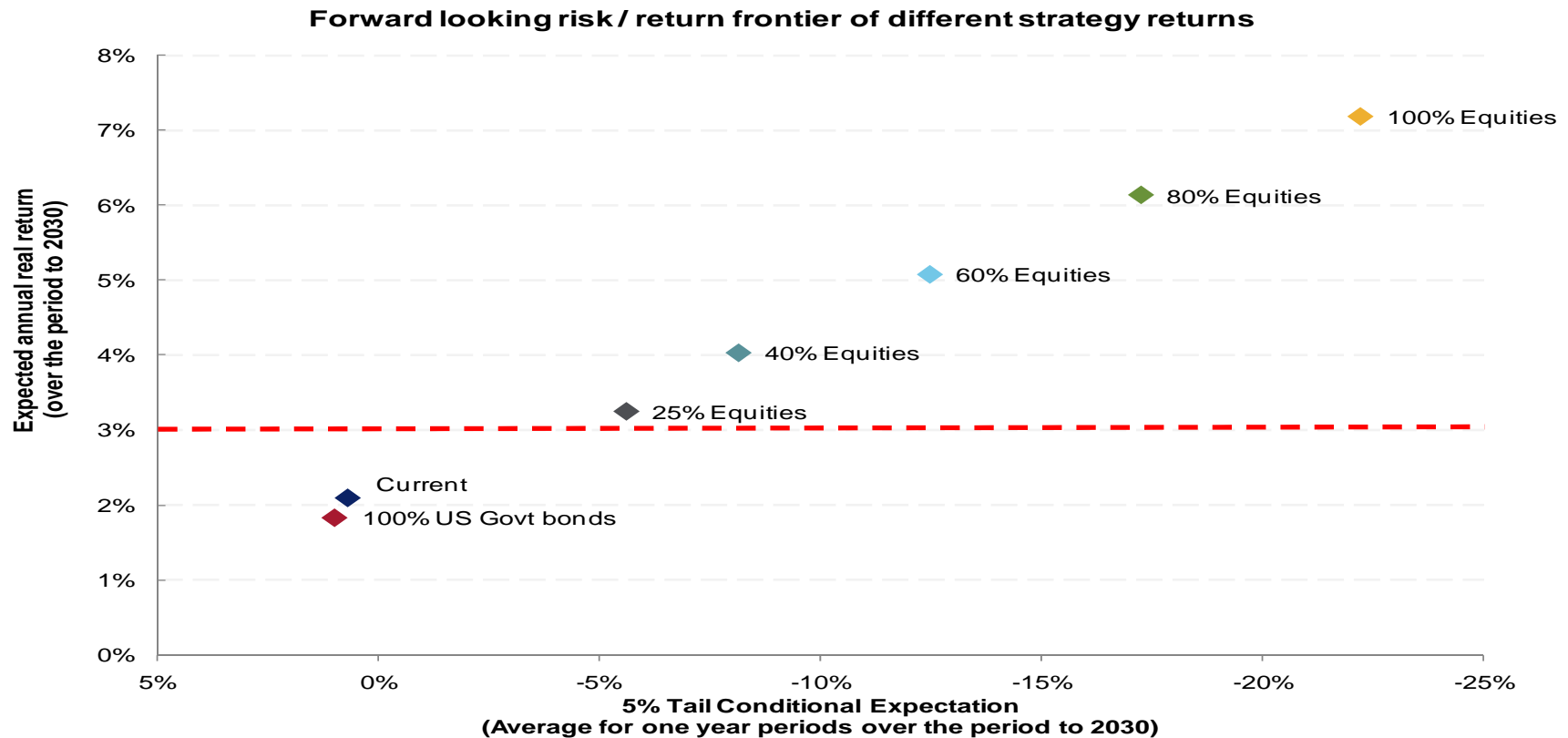
Investment strategy	Worst year	2 nd worst year	3 rd worst year	Year ending 28 February 2009
100% Treasury bonds	1969 -349	1994 -226	1959 -188	331
Current	1969 -349	1994 -209	1966 -152	194
25% Equities	1931 -631	1974 -483	1930 -375	-486
40% Equities	1931 -1,039	1974 -868	1930 -721	-932
60% Equities	1931 -1,559	1974 -1,344	1930 -1,168	-1,400
80% Equities	1931 -2,051	1974 -1,781	1930 -1,596	-1,977
100% Equities	1931 -2,514	1974 -2,181	1930 -2,005	-2,426

Sources: Federal Reserve, Global Financial Data, Datastream, Towers Watson
 Current Petroleum Fund balance assumed to be USD 5.6 billion

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Impact of different investment strategies – forward-looking analysis

Forward-looking risk / return trade-off



There is a clear trade-off between risk and return – strategies with higher allocations to equities are exposed to higher risk of poor and negative returns in the short to medium term, but are expected to outperform less risky portfolios in the long term.

Different targets, different strategies

Investment Strategy	Probability of CPI + 3% pa			Probability CPI + 4% pa			Probability of CPI + 5% pa		
	5 years	10 years	20 years	5 years	10 years	20 years	5 years	10 years	20 years
Current	10%	4%	2%	1%	0%	0%	0%	0%	0%
100% US Treasury Bonds	4%	1%	1%	0%	0%	0%	0%	0%	0%
25% Equities	43%	48%	53%	28%	24%	20%	17%	10%	4%
40% Equities	54%	61%	70%	42%	43%	43%	32%	27%	21%
60% Equities	60%	68%	77%	52%	56%	61%	44%	44%	42%
80% Equities	63%	71%	80%	57%	62%	68%	51%	53%	55%

There is a diminishing marginal benefit from increasing the allocation to equities: increasing the equity allocation from 25 to 40% improves the likelihood of meeting objectives by more than increasing the equity allocation from 60 to 80%

Forward-looking measures of risk for a range of investment strategies

Investment Strategy	Range of returns in two out of every three years		Frequency of negative returns (years in every 100)	Poor outcome return (5 years in every 100)	
	% pa	USD millions*		% pa	USD millions*
100% 0-5 year US Treasury bonds	2.4% to 5.9%	136 to 332	Very rarely	Return of +1.6% or worse	Gain of USD 87 million or worse
Current	2.4% to 6.5%	135 to 363	1	Return of +1.4% or worse	Gain of USD 77 million or worse
25% Equities	-0.4% to 11.6%	-20 to 650	15	Return of -3.0% or worse	Loss of USD 169 million or worse
40% Equities	-1.4% to 14.3%	-80 to 801	17	Return of -4.4% or worse	Loss of USD 246 million or worse
60% Equities	-3.4% to 18.4%	-188 to 1,030	20	Return of -7.1% or worse	Loss of USD 395 million or worse
80% Equities	-5.5% to 22.7%	-310 to 1,272	23	Return of -10.2% or worse	Loss of USD 569 million or worse
100% Equities	-7.8% to 27.1%	-437 to 1,520	25	Return of -13.5% or worse	Loss of USD 756 million or worse

* Based on an assumed Petroleum Fund balance of USD 5.6 billion

Projected real Petroleum Fund balance and investment return in 2015 under different investment strategies

Petroleum Fund balance in 2015 (USD billions, real)	Investment Strategy					
	Current	100% Bonds	25% Equity	40% Equity	60% Equity	80% Equity
95 th percentile	17.2	17.0	18.4	19.5	21.2	23.2
75 th percentile	12.9	12.7	13.5	14.2	15.1	16.1
50 th percentile	10.7	10.6	11.3	11.7	12.2	12.8
25 th percentile	9.1	9.0	9.4	9.6	9.9	10.1
5 th percentile	7.3	7.2	7.3	7.3	7.3	7.1
Difference between 95 th and 5 th percentile	9.9	9.8	11.1	12.2	13.9	16.2
Investment return volatility in 2015 (USD millions, real)	Investment Strategy					
	Current	100% Bonds	25% Equity	40% Equity	60% Equity	80% Equity
95 th percentile	971	893	1,768	2,202	2,948	3,780
75 th percentile	627	582	971	1,149	1,418	1,738
50 th percentile	462	434	578	655	773	884
25 th percentile	318	309	231	230	187	118
5 th percentile	152	163	-267	-440	-724	-1,104
Difference between 95 th and 5 th percentile	819	730	2,035	2642	3,672	4,884

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Projected real Petroleum Fund balance and investment return in 2030 under different investment strategies

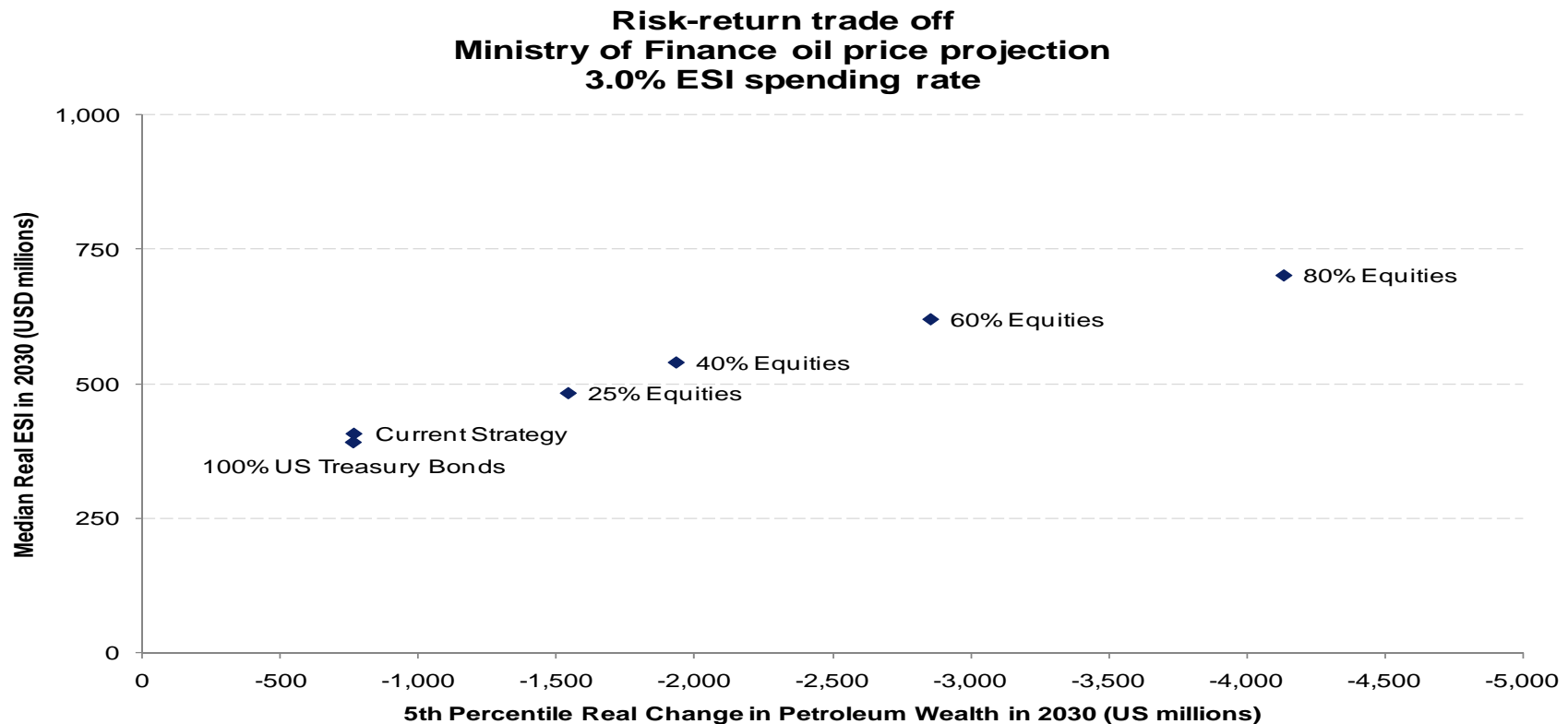
Petroleum Fund balance in 2030 (USD billions, real)	Investment Strategy					
	Current	100% Bonds	25% Equity	40% Equity	60% Equity	80% Equity
95 th percentile	25.5	24.3	31.9	37.6	48.0	63.0
75 th percentile	17.7	17.0	21.4	24.4	29.2	35.0
50 th percentile	13.6	13.1	16.4	18.4	21.3	24.3
25 th percentile	10.7	10.2	12.5	13.8	15.1	16.2
5 th percentile	7.6	7.3	8.6	9.1	9.1	9.0
Difference between 95 th and 5 th percentile	17.9	17.1	23.3	28.5	38.9	53.9
Investment return volatility in 2030 (USD millions, real)	Investment Strategy					
	Current	100% Bonds	25% Equity	40% Equity	60% Equity	80% Equity
95 th percentile	1,480	1,332	2,952	3,972	6,046	9,079
75 th percentile	883	790	1,534	1,968	2,672	3,607
50 th percentile	603	546	856	1,032	1,314	1,584
25 th percentile	402	374	317	343	322	221
5 th percentile	174	184	-382	-670	-1,340	-2,272
Difference between 95 th and 5 th percentile	1,306	1,148	3,334	4,642	7,386	11,351

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Risk-return trade-off for Petroleum Wealth

- The chart below shows the trade-off between long term expected ESI and the risk of a short term drop in Petroleum Wealth (and hence ESI):



The choice of investment strategy is then a trade-off between the expected future level of ESI and the level of potential downside risk over short time periods and will be dependent on the risk tolerance of the key stakeholders and also their target level of future spending.

The ESI spending rule and investment strategy need to be considered in tandem

Key findings

Key Findings

1. Two key policy “levers” - the **spending rule and the investment strategy**.
2. The Key decision is the split between **equity and bonds** – everything else is second order
3. A level of ESI spending will **not** be sustainable unless it is coupled with an investment strategy that expects to achieve a real return consistent with that level of spending.
4. An allocation to equities of **at least** 25% is required to achieve a long term real return of 3% - the current ESI
5. A higher allocation to equities provides a higher long term expected return, but also a higher level of expected **risk**
6. There is a **diminishing marginal benefit** from increasing the allocation to equities.
7. There may be potential diversification benefits from including alternative investments such as real estate, private equity and hedge funds in the portfolio; however allocations to these asset classes also give rise to issues that include the burden on stakeholders’ time, higher fees, liquidity risks and general levels of complexity.
8. Assuming that the current investment strategy is maintained and that the amount transferred to the State Budget in each year is equal to ESI, in 2030 we expect the Petroleum Fund balance will be between USD 7.6 billion and USD 25.5 billion and there is a 5% chance that the real Petroleum Fund balance will be less than USD 7.6 billion.
9. Under the current strategy and spending rule, there is a 5% chance that the ESI in 2020 will be USD 350 million higher or USD 200 million lower than our central estimate of USD 439 million.
10. The “true” underlying currency exposure for Timor-Leste (the major trading partners for Timor-Leste being Indonesia, Singapore and Australia) would tend to suggest that exposure to currencies other than the US dollar would be desirable to preserve the “purchasing power” of the Petroleum Fund.

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Appendix

Key investment terms

- **Equity:** a security representing partial ownership of a company, for example Microsoft shares on the New York Stock Exchange.
 - A portfolio of equities may consist of hundreds of equity stakes in different companies around the world.
- **Bond:** a bond is a loan to a government or company who promises to pay back the lenders some time in the future, for example a US Treasury Bond.
 - A portfolio of bonds may consist of bonds issued by different companies or governments and the time over which the money is repaid may vary from (say) 1 to 30 years.
- **Investment return:** the increase (or decrease) in the value of an investment, plus any income received over a given period. Often expressed as a percentage of the funds invested, for example a 5% return indicates \$5 profit for each \$100 invested.
- **Investment risk:** the uncertainty of the investment return, often measured as 'volatility', though there are many measures of investment risk. It is important to define investment risk in a way that is relevant to the investor's investment objectives.
- **Investment objectives:** what the investor wants to achieve from their investments – may be expressed as target level of return, but be subject to a risk tolerance.

How returns from equities, bonds and cash tend to differ

Example investment return distribution

Cash

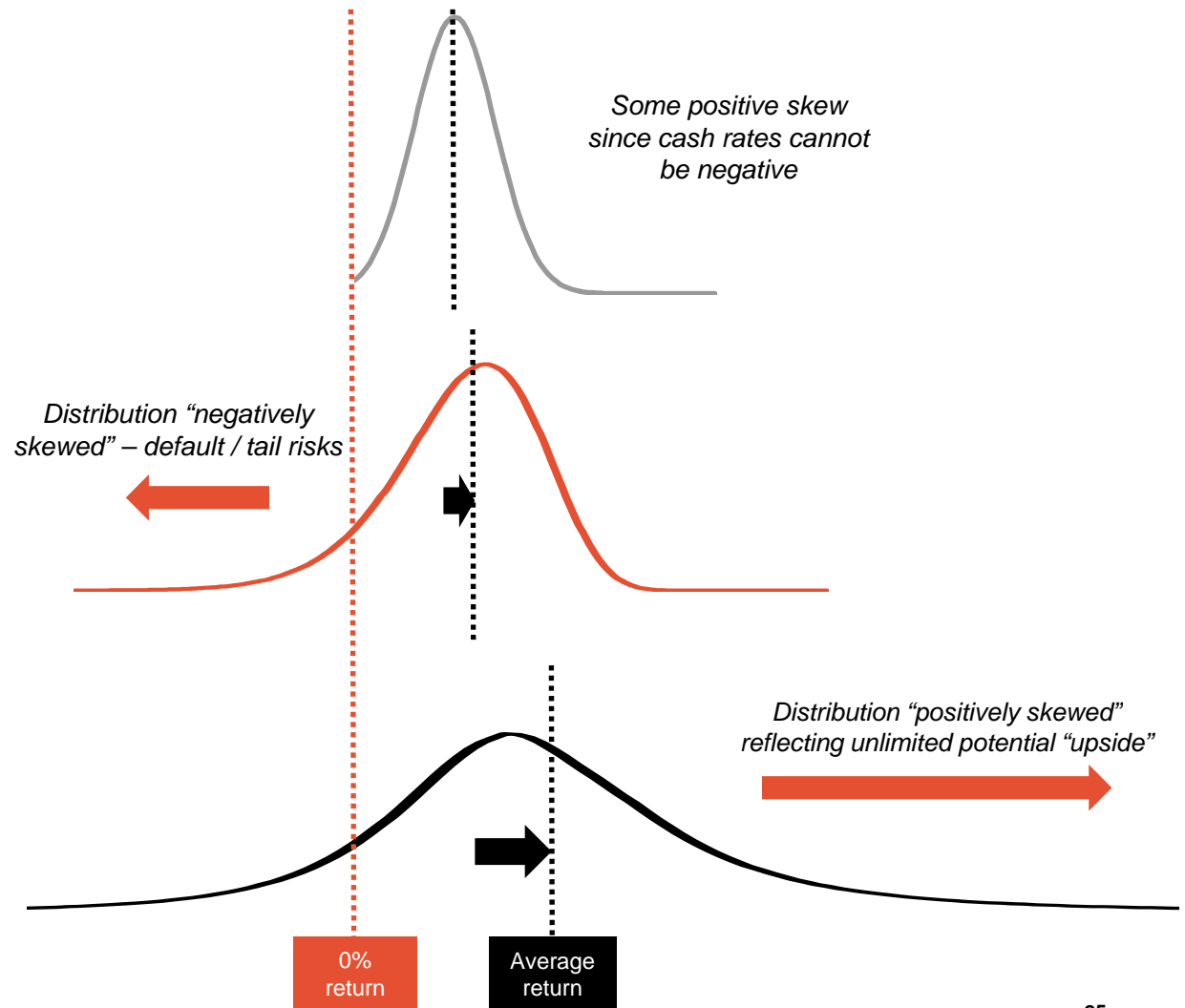
The return reflects the short term interest rates set by the relevant central bank.
Should never be negative (in nominal terms)
Relatively narrow distribution of outcomes

Bonds

Sovereign bonds will be repaid with little or no risk, however interest rate changes affect marked-to-market returns (duration risk).
Corporate bonds will be repaid if the company remains solvent, but may be only partially repaid in the event of default.
This leads to a wider distribution for bonds than for cash, but a higher expected return.

Equities

An equity holding has a claim on corporate profits after bond holders have been paid.
This, combined with uncertainty about economic conditions and corporate profitability means that equity investments are inherently more risky than bonds.
The tails of the distribution are relatively “fat” on both the positive and negative sides.

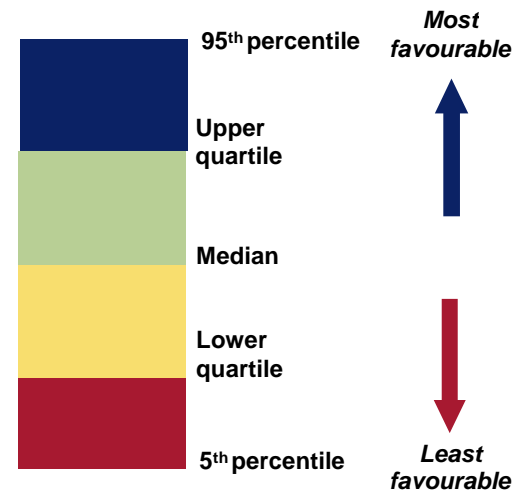


Key statistical terms – the investment return distribution

- **Standard deviation (volatility):** this measure of risk represents the expected variability of returns away from their long run average. The standard deviation is 4% per annum in the example. This means that the investment return will be within +4% or -4% of the average return in about 2 out of every 3 years (i.e. from 2% to 10% per annum).
- **5% TCE:** this more complex measure of risk indicates what the expected investment return is in a poor investment return environment that occurs once every 20 years. In this example the 5% TCE is somewhat worse than -2% per annum.

Interpreting model output

- In presenting our forward-looking analysis, we have ranked the results produced by our stochastic model and have charted the range of likely outcomes, in particular:
 - The median / 50th percentile outcome – in 50 out of every 100 trials we expect an outcome higher than this level and in 50 out of every 100 trials we expect an outcome lower than this;
 - The upper and lower quartiles – in 25 out of every 100 trials we expect an outcome higher than the upper quartile and in 25 out of every 100 trials we expect an outcome lower than the lower quartile; and
 - The 95th and 5th percentile outcomes – in 5 out of every 100 trials we expect an outcome higher than the 95th percentile and in 5 out of every 100 trials we expect an outcome lower than the 5th percentile.



Forward-looking return expectations

- The table below shows the forward-looking expected annualised real return for a range of asset allocations over 1, 3, 5, 10 and 20 year time periods, based on the results produced by our stochastic asset model (portfolios which have a probability of achieving a real return of at least 3% per annum of at least 50% over 20 years have been shaded):

Investment Strategy	Expected annualised real return over:				
	1 year	3 years	5 years	10 years	20 years
Current	2.3%	1.9%	1.7%	1.9%	2.1%
100% US Treasury Bonds	2.0%	1.6%	1.4%	1.7%	1.8%
25% Equities	3.4%	2.8%	2.6%	2.9%	3.1%
40% Equities	4.4%	3.7%	3.5%	3.6%	3.8%
60% Equities	5.8%	4.7%	4.5%	4.5%	4.6%
80% Equities	7.2%	5.7%	5.4%	5.3%	5.3%