The Role of Gold in a South African Investment Portfolio[1]

by

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This report sets out to evaluate the optimal asset allocation of a theoretical South African investment portfolio able to invest in South African equities, South African bonds, cash and gold. The results of any analysis of this type depend on the inputs used. Therefore, they should be treated as providing an indicative guideline subject to the assumptions specified below, and not as investment advice.

1. Assumptions:

(a) Long run data covering annual returns since 1900 is available for South African equities, bonds and cash.[2] We prefer to use long run data since, when it comes to evaluating markets from a strategic perspective, it is easy to give too much weight to the recent past.
(b) The two-tier gold market was formally abandoned on 13th November 1973. Therefore, our time series for calculating returns on gold begins from that date. This means that the compound annual growth rate (CAGR) used as a proxy for returns in the mean-variance optimisation scenarios incorporates a period when the gold price was adjusting to a free market. Returns on gold are sensitive to the time period from which a sample is drawn, as is the case for any other asset. Using a different time period is likely to yield different results. We have adjusted for this factor by including scenarios where the returns on gold were greater than and less than one standard deviation from the mean CAGR.
(c) The investor has access only to South African equities, bonds, cash and gold (in South African Rand). This means that international assets are explicitly excluded from the portfolio, an assumption that is not unreasonable to the extent that foreign exchange and capital controls persist in South Africa. It also assumes that South African investors have direct access to investment in gold bullion priced in their local currency.
(d) In using the long run data published by Dimson et al, we do not take a view on the outlook for these asset classes. Nor do we take a view on the outlook for returns on gold, other than that implied by the three different scenarios for gold returns described in Assumption (b) and detailed in Table 2 below.
(e) The return correlation matrix is one of the inputs for mean-variance optimisation. We did not have access to the correlation coefficients for the longer run data used in the return and standard deviation vectors; correlations of weekly returns over the five years ending on 2nd July 2004 were used instead. The assumption implicit here is that these correlations are representative of the longer run.
(f) All returns used in this analysis are nominal.
(g) Investors can only be "long" assets; in this sense, the portfolios are described as "constrained".

2. Economic background

The mining industry has historically played a key role in the South African economy. Although this role has diminished proportionately as the manufacturing and service sectors have grown, gold still accounts for a significant share of exports and just short of 3 per cent of gross domestic product.

Over the past couple of decades, the South African economy has been dominated by a secular weakening of its international purchasing power, as illustrated by Figure 1. The implications of this for the Rand gold price are shown in Figure 2.

[1] Please read the disclaimer on the final page of this report.
[2] Elroy Dimson, Paul Marsh and Mike Staunton: *Global Investment Returns Yearbook 2004*. Published by ABN AMRO in February 2004, this report draws on *Triumph of the Optimists* by the same authors, and the ABN AMRO *Millenium Books*.

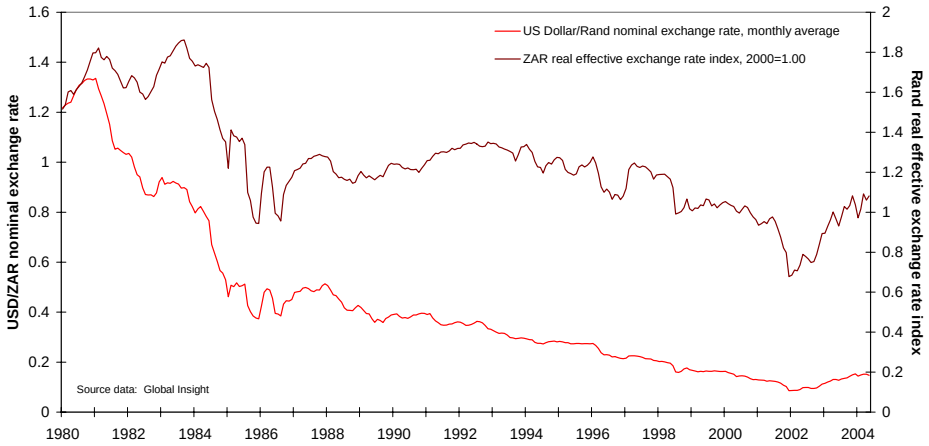

Figure 1

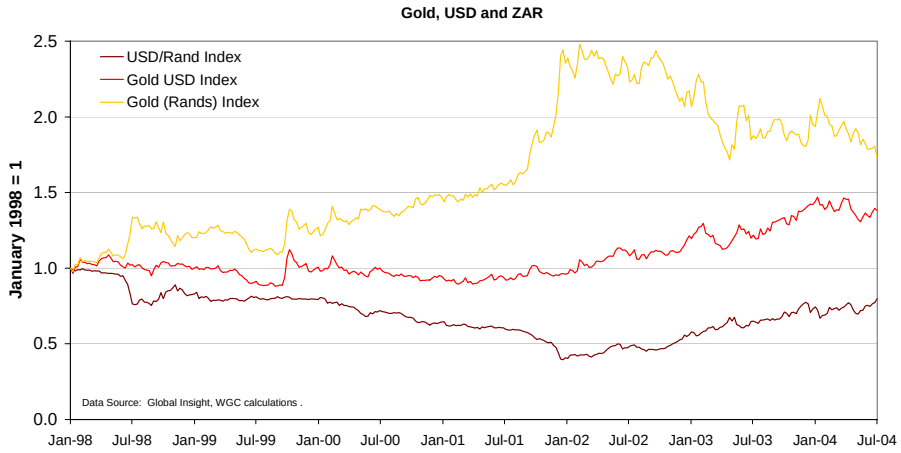

Figure 2

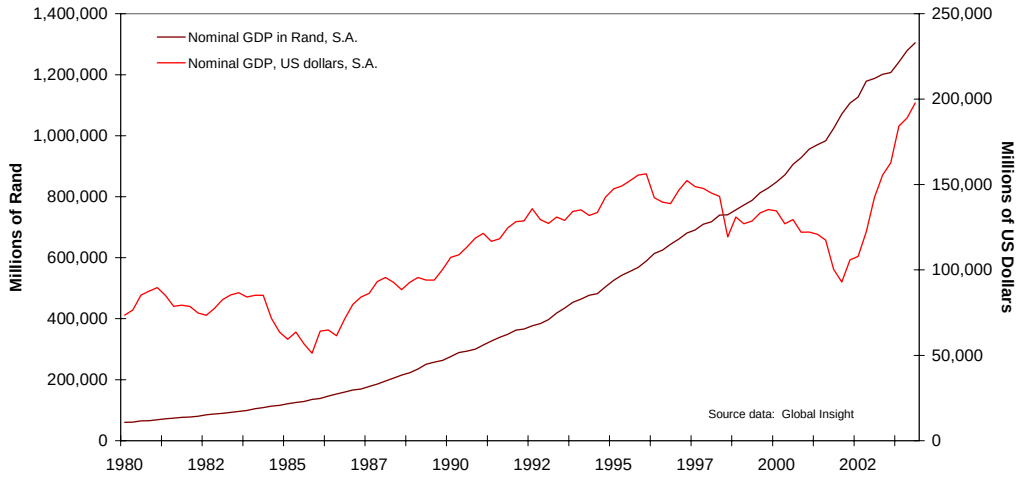

Figure 3

3. Correlation analysis

South Africa remains the largest producer of gold in the world, although this market share has fallen from 66 per cent of global production in 1980 to 14 per cent in 2003. Gold mining companies represent a significant share of the total market capitalisation of companies listed on the Johannesburg Stock Exchange. Given the relationship between movements in the gold price and movements in the share prices of gold mining producers, one would expect there to be a stronger positive relationship between returns on the index as a whole and those on gold than may be the case elsewhere. However, this is not as straightforward as it might seem. If the gold price increases in dollar terms because the dollar has weakened, the Rand price will decline, *ceteris paribus*. At the same time, South African producer costs become less competitive to the extent that these are fixed in local currency terms, placing a squeeze on the margins of domestic gold mining companies relative to producers in other countries. Clearly, the same logic applies to any domestic firms whose main source of revenue is exports, the prices of which are fixed internationally. In the world's major capital markets, there is little relationship between movements in the gold price and returns on equities, although there is some evidence of negative correlation during times of equity market distress in certain markets.[3] The correlation between returns on gold in Rand and those on the FTSE/JSE All Share Index over the past five years, although positive, is very low.

	Cash	Bonds	Equities	Gold
Cash	1.00			
Bonds	0.12	1.00		
Equities	-0.06	-0.05	1.00	
Gold	-0.07	-0.08	0.18	1.00

Table 1: Return correlations - Q3 1999 to Q2 2004[4]

Correlations vary over time. Figure 4 illustrates that the correlation coefficients used for gold and South African equities are dominated by the most recent period during which the relationship between returns on gold (ZAR) and those on South African equities moved into positive territory, whereas previously they had tended not to differ from zero[5], i.e. remaining within the two red lines. Using the correlation coefficients reported in Table 1 may understate allocations to gold as a result.

The lack of correlation between gold and the other assets in the mix goes some way to supporting the argument that gold could be useful as a tool for managing portfolio risk. However, although this is a promising indicator, expected returns and the volatility of those returns also need to be taken into account. This is done by estimating the optimal asset mix for varying degrees of risk, as measured by the standard deviation of overall portfolio returns, using classic mean-variance optimisation.

[3] A full set of statistics covering a range of countries, time periods and frequencies can be viewed or downloaded on http://www.gold.org/value/stats/statistics/investment/index.html .
[4] Cash proxy: 90-day certificate of deposite; Bonds: BEASSA ALBI Index, all maturities; Equities: FTSE/JSE All Share Index, close; Gold: London PM fix, converted from US dollars/fine troy ounce to South African Rand/fine troy ounce using contemporaneous exchange rate. Based on weekly returns.
[5] Using a two-tailed hypothesis test and a significance level of 5%. The test statistic used follows the methodology applied by Smith (2001, 2002).

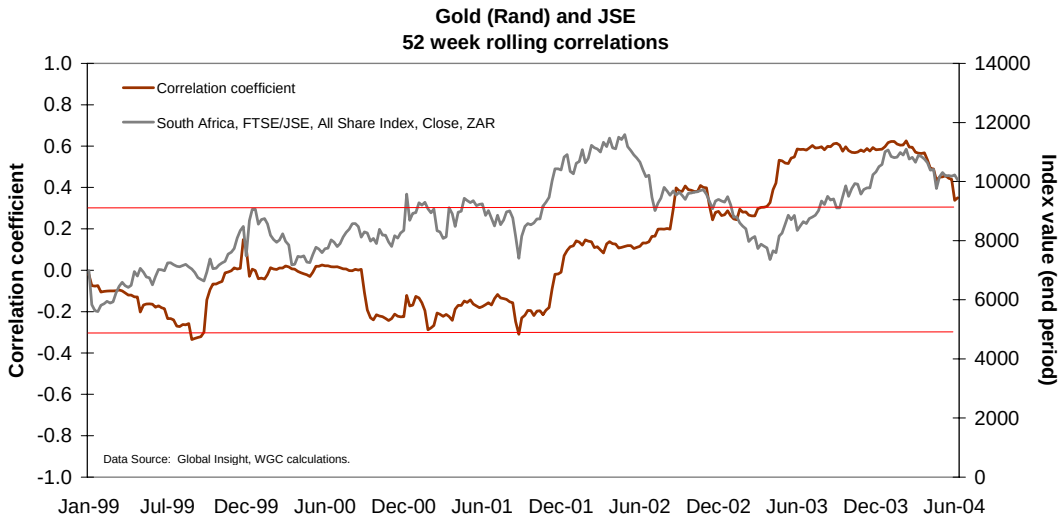

Figure 4

4. Mean-variance optimisation

The inputs for the optimisation analysis are reported in Table 2 below.

Asset type	Expected Return	Standard Deviation
Cash	6.0%	0.058
Bonds	7.0%	0.095
Equities	14.2%	0.233
Gold (Scenario 1)	12.1%	0.239
Gold (Scenario 2)	9.2%	0.239
Gold (Scenario 3)	15.0%	0.239

Table 2

The return correlations reported in Table 1 on the previous page were used as inputs for the correlation matrix.

For ease of reference, the results of the analysis are summarised into low, medium and high risk portfolios for each scenario (see Table 3). We define a low risk portfolio as one with an overall portfolio standard deviation less than or equal to 12 per cent; a medium risk portfolio has an overall portfolio standard deviation greater than 12 per cent but less than or equal to 20 per cent; while a high risk portfolio has an overall standard deviation greater than 20 per cent.

	Low	Medium	High
Scenario One			
Cash	30.2%	0.0%	0.0%
Bonds	30.7%	12.1%	0.0%
Equities	23.5%	58.6%	94.5%
Gold	15.6%	29.4%	5.5%
	100.0%	100.0%	100.0%
Expected return on average portfolio	9.2%	12.7%	14.1%

	Low	Medium	High
Scenario Two			
Cash	31.4%	0.0%	0.0%
Bonds	28.9%	11.0%	0.0%
Equities	19.1%	37.5%	7.9%
Gold	20.7%	51.5%	92.1%
	100.0%	100.0%	100.0%
Expected return on average portfolio	9.7%	13.8%	15.0%
Scenario Three			
Cash	31.7%	0.0%	0.0%
Bonds	32.8%	21.9%	0.6%
Equities	27.4%	67.9%	94.8%
Gold	8.1%	10.2%	4.6%
	100.0%	100.0%	100.0%
Expected return on average portfolio	8.8%	12.1%	13.9%

Table 3

Figure 5 maps efficient portfolios in risk-return space for the three scenarios and the asset allocation of each of these portfolios is shown by scenario and by standard deviation and return in Figures 6 through 11.

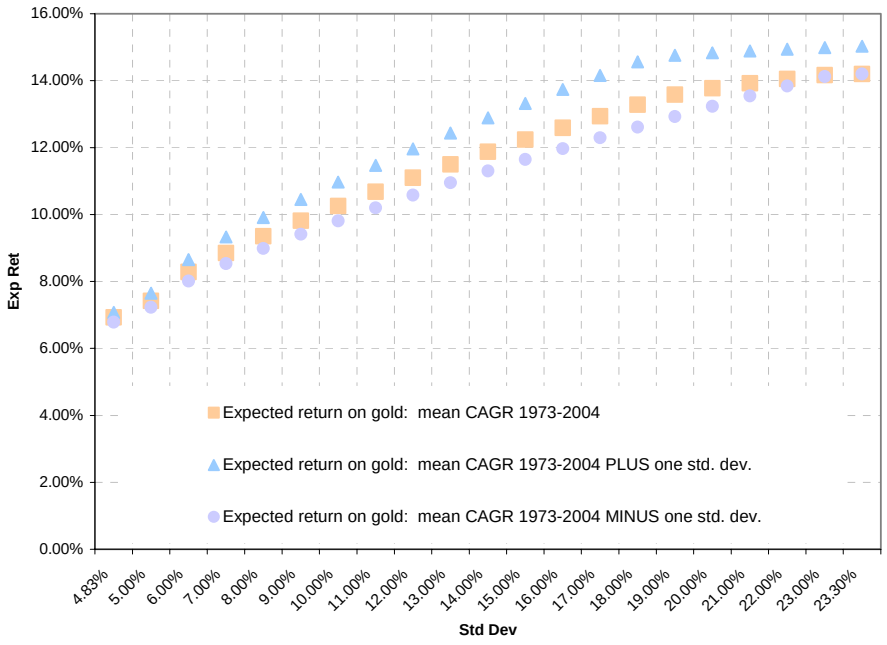

Figure 5

South Africa: Constrained Frontier Portfolios
Scenario 1: gold returns = mean CAGR

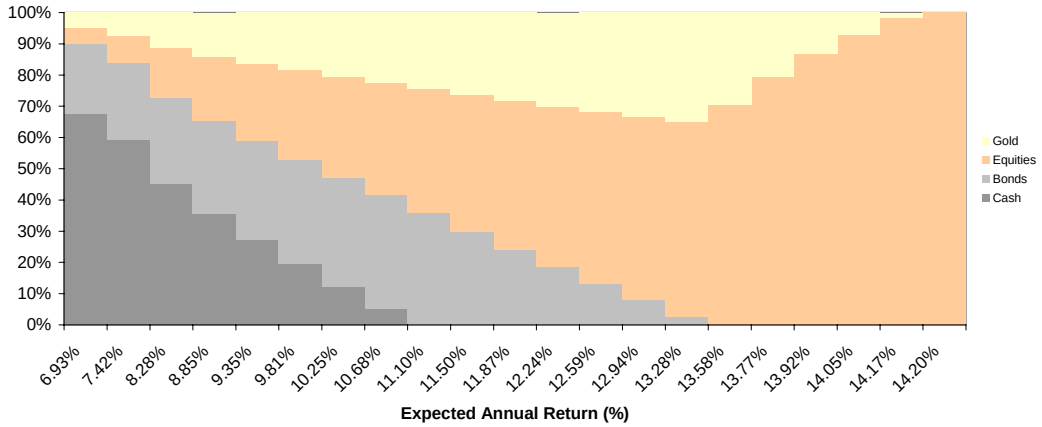

Figure 6

South Africa: Constrained Frontier Portfolios
Scenario 1: gold returns = mean CAGR

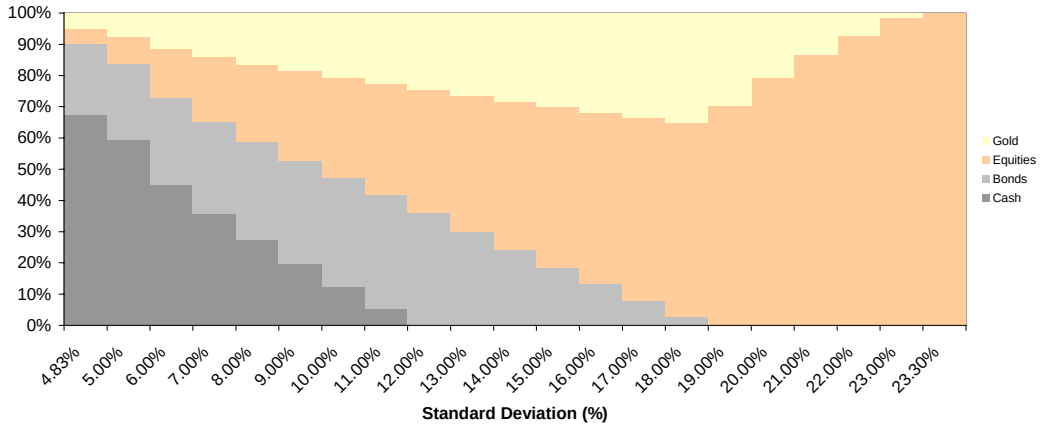

Figure 7

South Africa: Constrained Frontier Portfolios
Scenario 2: gold returns = mean CAGR plus 1 std. dev.

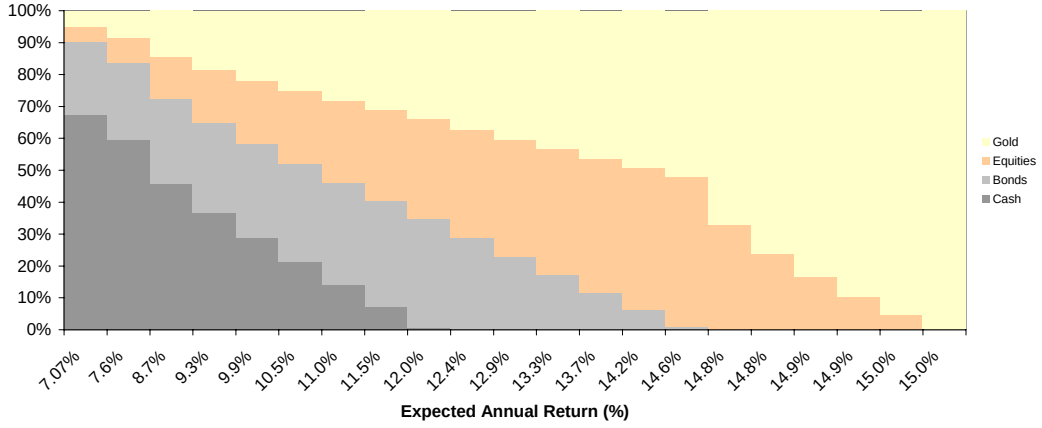

Figure 8

South Africa: Constrained Frontier Portfolios
Scenario 2: gold returns = mean CAGR plus 1 std. dev.

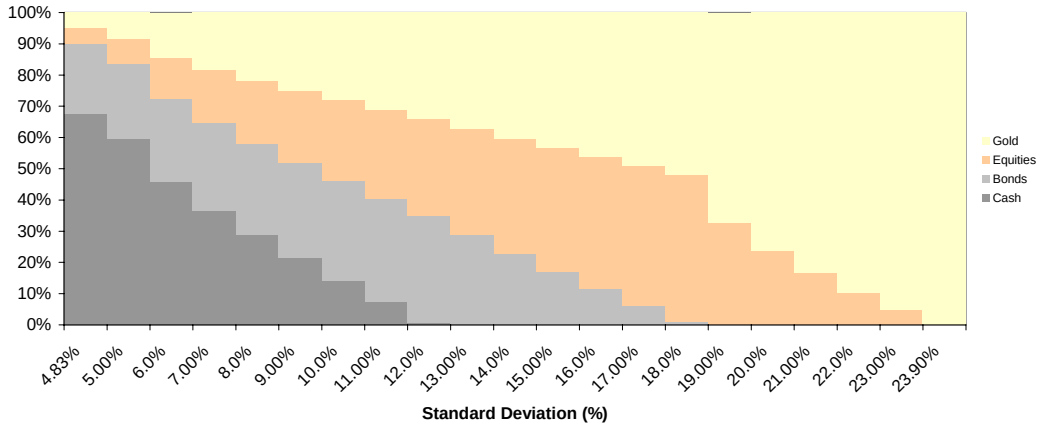

Figure 9

South Africa: Constrained Frontier Portfolios
Scenario 3: gold returns = mean CAGR less 1 std. dev.

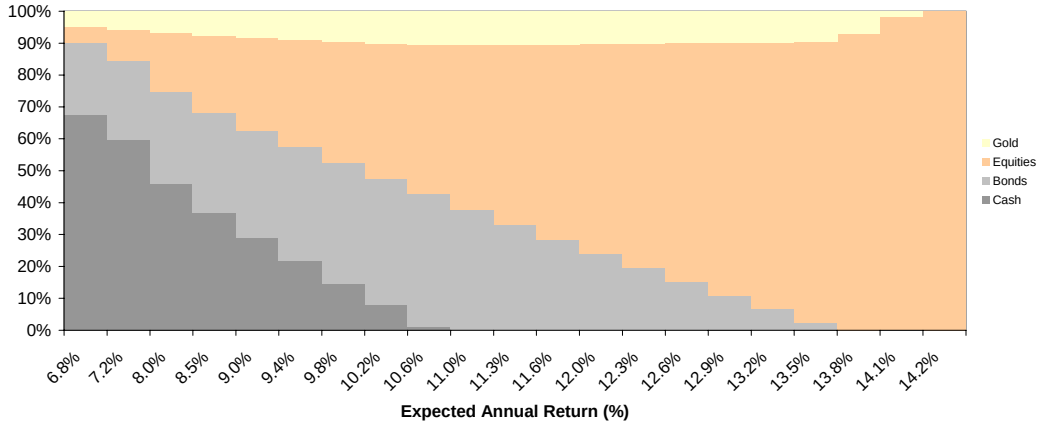

Figure 10

South Africa: Constrained Frontier Portfolios
Scenario 3: gold returns = mean CAGR less 1 std. dev.

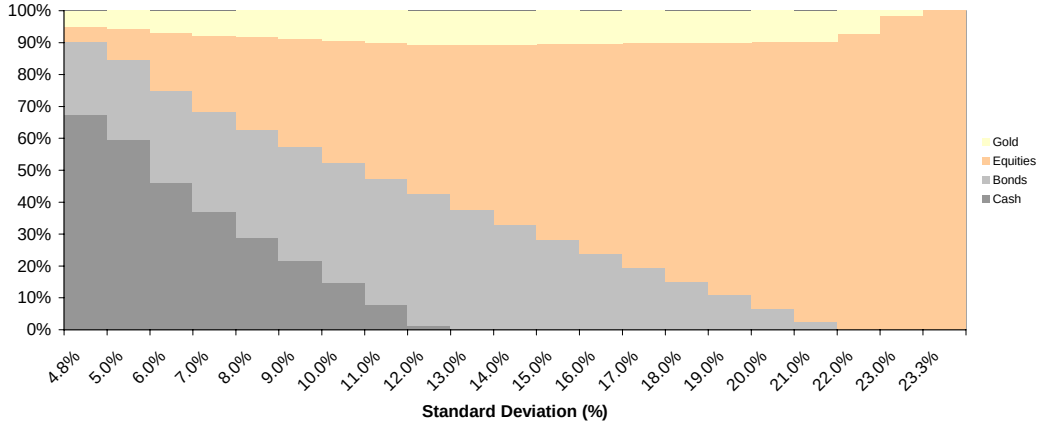

Figure 11

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