Invesco Vision Case Study 9: Portfolio evaluation

Considering historical and hypothetical scenarios

As we construct outcome-oriented solutions, it is important to understand how such solutions might perform in various market conditions. Two types of analyses are particularly useful for such exercises. First, we look at how a portfolio would have performed during specific historical periods such as the GFC, Brexit, and the tech crash. Second, we look at how a portfolio would perform under various hypothetical market shocks, such as a 15% decline in global equities or a 100bps interest rate rise. For the purposes of this example, we consider a hypothetical efficient portfolio as compared to an existing portfolio and benchmark.*

Figure C9a focuses on the historical scenario analysis. Historical analyses rely on a set of specific time periods and their associated factor returns. Here, the current portfolio factor exposures are multiplied by the factor returns during the specific historical period so as to estimate what the return would have been during the respective period. It is important to recognize that the resulting performance represents the portfolio's performance given its current positioning and how it would have theoretically performed during such a historical period and not how it actually performed if it existed at the time. The figure demonstrates the selected portfolio's expected performance with blue bars as well as the original portfolio and benchmark expected performance with pink and gray dots, respectively.

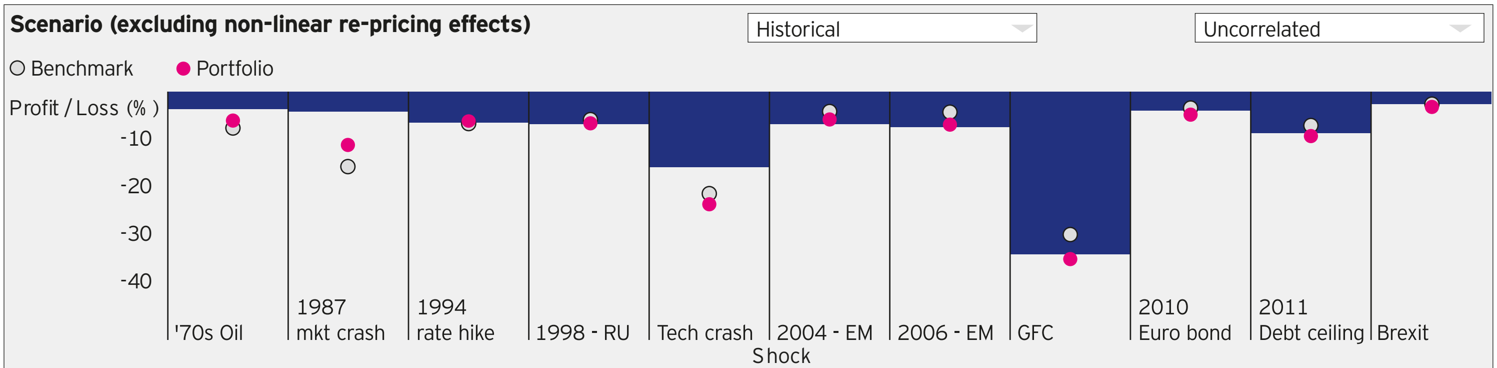
As can be seen in the figure, the selected efficient frontier portfolio seems to do better than the original portfolio and the benchmark under almost all historical scenarios. The outperformance should come as no surprise as the portfolio was specifically optimized to have a lower risk. However, it is interesting to take a closer look at two cases where the selected portfolio did not do as well – 2004 and 2006 EM crises. To help understand why, in these cases the optimized portfolio was diversified away from US equities into a more balanced allocation with increased EM exposure. With emerging markets being at the heart of these historical periods, it should be expected that the optimized portfolios did not do as well as the original portfolios.

Figure C9b goes on to focus on the hypothetical scenario analysis. Here we have the option of performing the analysis in an uncorrelated or correlated mode. The difference between the two approaches is that in the uncorrelated mode only the shocked factors influence the performance of the portfolio, while in the correlated case the specified factor shocks are propagated to the remaining unspecified factors through their factor covariance structure. In this example, we demonstrated the correlated mode. Similar to the historical scenarios the performance of the selected portfolio as well as the original portfolio and the benchmark are shown. In almost every case, the optimized portfolio seems to perform better than both the original portfolio and the benchmark, as we would hope to see.

A particularly useful feature of both types of scenario analysis, shown in the lower part of each figure, is the ability to decompose the projected returns into underlying factor components. This allows us to more accurately determine the driving forces behind the observed performance and use this information to adjust the portfolio as may be desired. A subtle but important point to make here is that the analytics used to estimate a current portfolio's performance, either historically or in a hypothetical scenario, do not include second order pricing effects such as convexity or optionality.

* In this example, we use portfolio information from Case 4 where we compare the Equal Return Portfolio to an existing portfolio and a benchmark.

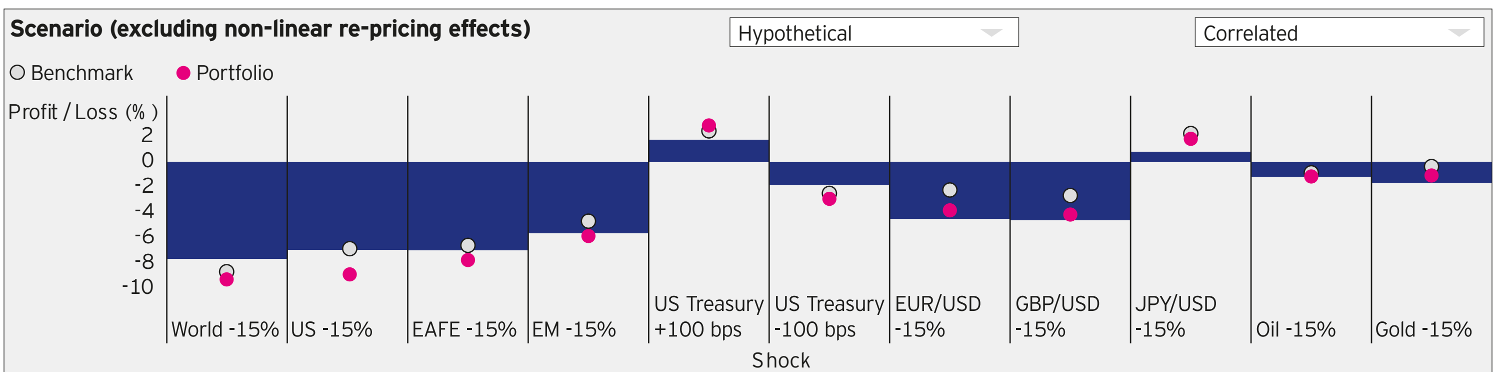
Figure C9a: Historical scenarios
Assuming uncorrelated sensitivities



Contributions to risk

Type	'70s Oil	1987 Mkt crash	1994 Rate hike	1998 RU	Tech crash	2004-EM	2006-EM	GFC	2010 Eurobond	2011 Debt ceiling	Brexit
Rates	-1.48	0.00	-4.21	1.97	8.76	-2.01	0.16	5.20	1.28	3.41	0.83
Inflation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Credit	0.0	0.0	-0.85	-3.01	-2.92	-0.17	-0.45	-14.58	-0.71	-3.41	-0.55
Industry	-2.71	-5.49	-2.11	-6.25	-19.13	-3.66	-6.04	-21.22	-3.28	-7.32	-2.21
Style	0.05	0.04	0.34	-0.42	-0.47	-0.14	-0.30	-0.61	-0.09	-0.19	-0.08
Commodity	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Real Estate	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Private Equity	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hedge Fund	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Currency	0.45	1.55	0.40	1.21	-1.51	-0.81	-0.84	-3.88	-1.34	-1.31	-0.63
X-Currency	0.0	-0.29	-0.04	-0.27	-0.62	0.01	0.03	0.86	0.15	0.14	0.03
Total	**-3.68**	**-4.18**	**-6.46**	**-6.77**	**-15.90**	**-6.79**	**-7.44**	**-34.22**	**-3.99**	**-8.68**	**-2.59**

Figure C9b: Hypothetical scenarios
Assuming correlated sensitivities



Contributions to risk

Type	World -15%	US -15%	EAFE -15%	EM -15%	US Treasury +100 bps	US Treasury -100 bps	EUR/USD -15%	GBP/USD -15%	JPY/USD -15%	Oil -15%	Gold -15%
Rates	0.64	0.64	0.47	0.32	-3.20	3.20	-0.45	0.22	-1.27	0.20	-0.36
Inflation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Credit	-1.60	-1.49	-1.38	-1.07	1.77	-1.77	-0.49	-1.02	0.82	-0.35	-0.17
Industry	-5.79	-5.42	-5.01	-4.05	3.30	-3.30	-1.48	-2.07	2.24	-0.78	-0.44
Style	-0.18	-0.16	-0.17	-0.13	0.06	-0.06	-0.05	-0.05	0.04	-0.02	-0.02
Commodity	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Real Estate	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Private Equity	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hedge Fund	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Currency	-0.70	-0.47	-0.87	-0.66	-0.14	0.14	-2.03	-1.65	-1.04	-0.19	-0.64
X-Currency	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**-7.64**	**-6.91**	**-6.96**	**-5.62**	**1.78**	**-1.78**	**-4.48**	**-4.57**	**0.80**	**-1.14**	**-1.63**

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