Multi-Asset Class Market Report: Hedging the Risk of $200 per Barrel

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Introduction

Investors who believe that oil will not hit $200 per barrel may position themselves to short oil, awaiting a decline in prices that is precipitated by worsening economic conditions or by the elimination of a feared supply shock. Timing the market for an extended drop, however, poses the risk of losses in the event of increasing oil prices. Investors who are not willing to take this risk will want to have a hedging strategy in place. In this report, we describe how investors may use the Barra Integrated Model (BIM) for asset allocation and the development of an informed hedging policy.

For investors to decide about portfolio weightings and hedging strategies, they need to understand the correlation between asset classes. Looking at the historical series of West Texas Intermediate (WTI) crude prices shown in Figure 1, investors might consider the recent spike in prices to be similar to the rise in 2008. Assuming that similar market conditions lead to similar price swings, investors might conclude that the resulting relationships between asset classes are alike in both periods. We show, however, that the correlation between oil prices and equities is actually quite different in 2012. Moreover, the recent correlation structure seems unique when compared to the oil shocks of the last 40 years. It is essential for an investor looking for a hedge to update his hedging policy to react to recent correlations.

The interdependence between higher oil prices and equities is complex in nature[1] and subject to macroeconomic and political uncertainty. Economic expectations and the geopolitical situation are both subject to swift changes. In the case of a regime change, hedging may become inefficient due to a change in correlations and may provide minimal or no protection against increasing oil prices. In this paper, we apply stress testing to provide an example of a robust hedging policy that (1) mitigates the effect of oil prices rising to $200 per barrel; (2) takes the recent changes in correlations into account; and (3) performs well across a number of oil-equity correlation regimes.

Oil Shocks and Investor Optimism

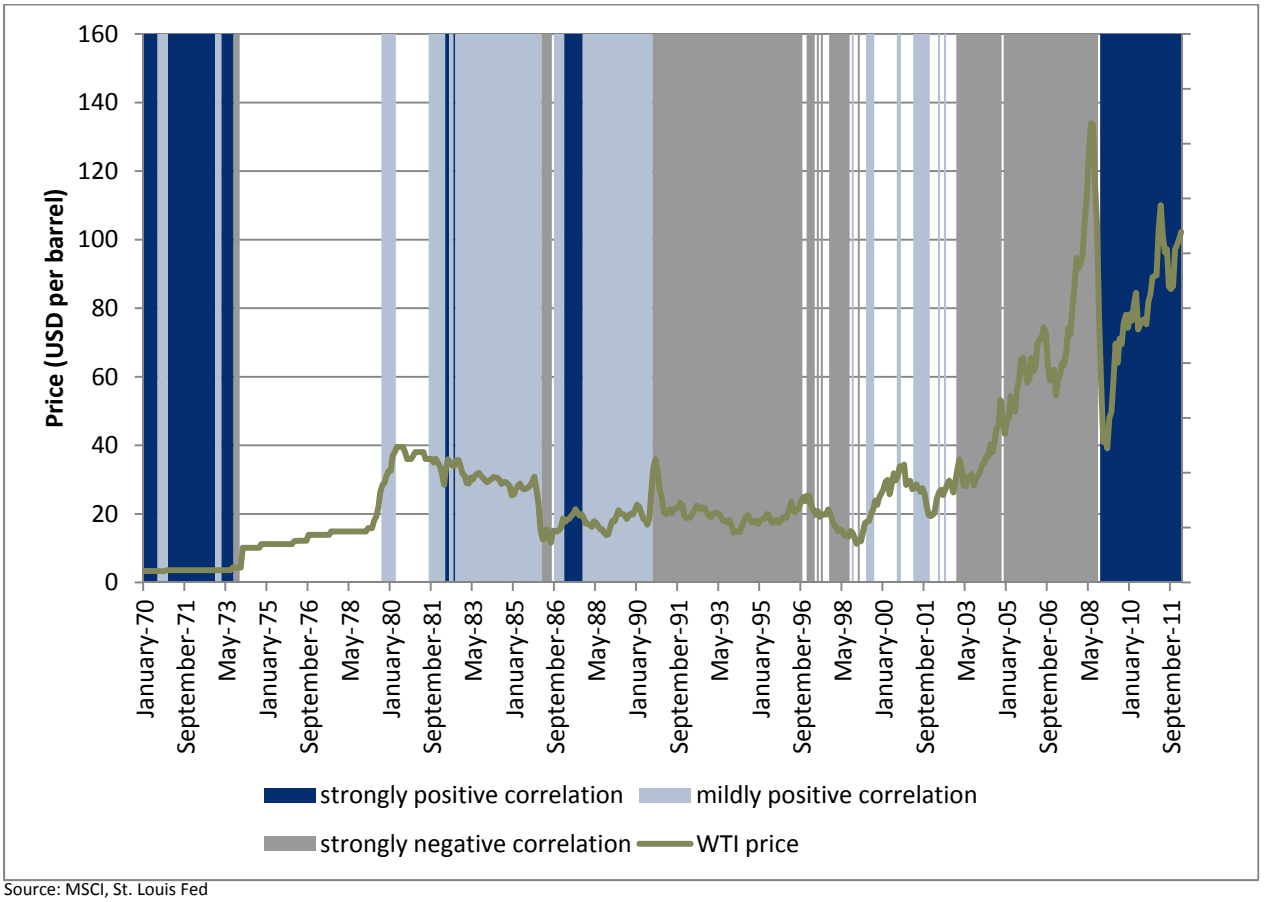
The Brent crude oil price was above $120 by the end of February 2012, having risen by 57 percent in the course of the last two years.

Looking at the historical series of WTI crude prices shown in Figure 1, investors might consider the recent spike in prices to be similar to the rise in 2008. Assuming that similar market conditions lead to similar price swings, investors might conclude that the resulting relationships between asset classes are alike in both periods. We need to look beyond simple returns to correlations.

[1] For a more detailed analysis, see: O. Ruban: The Impact of Macro Factors for Canada Equities. MSCI Quantitative Insight. April 2012 (forthcoming).

In Figure 1, we show periods with positive and negative correlations.[2] The correlation between oil prices and equities is actually quite different in 2008 and 2012.

Figure 1: Historical performance of oil prices under different equity-oil correlation regimes



Source: MSCI, St. Louis Fed

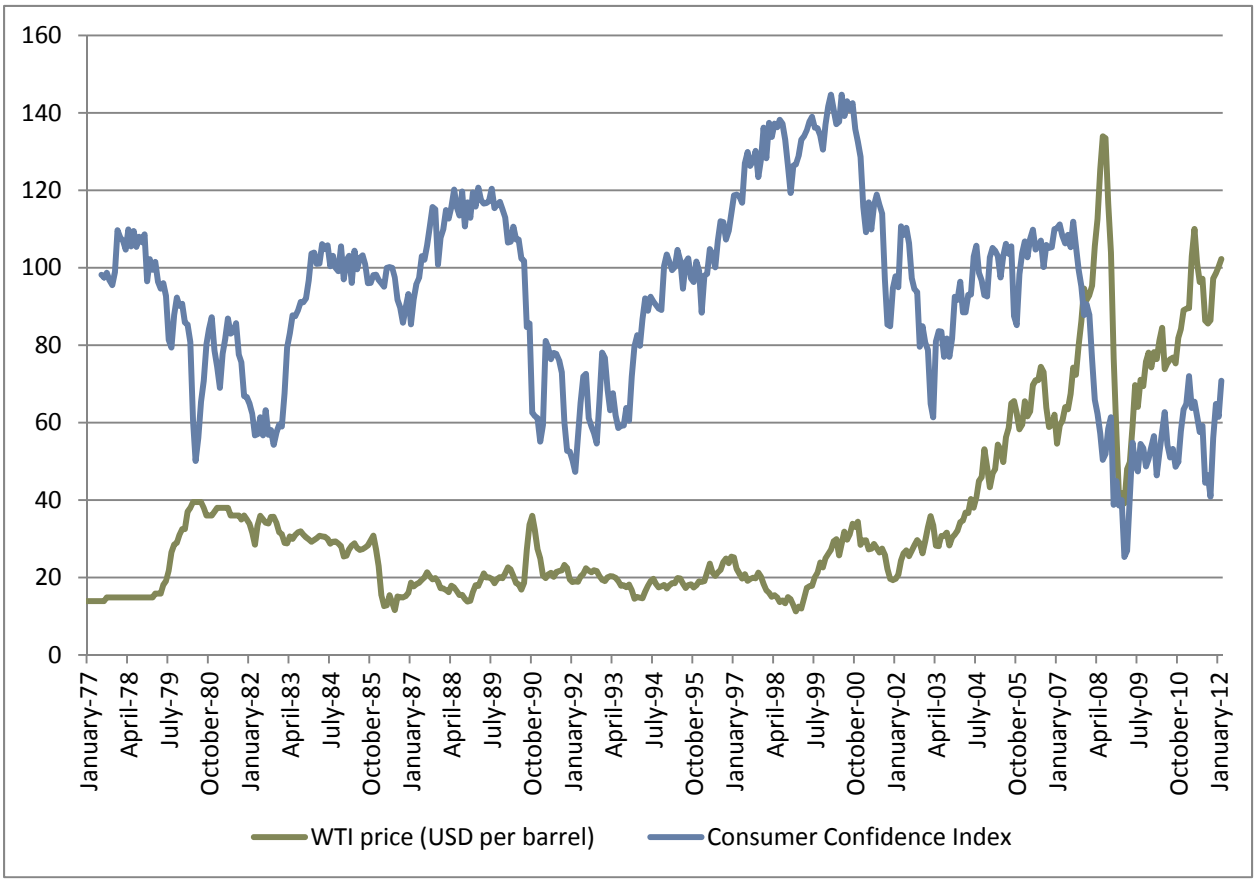
Two effects can drive crude prices up: (1) the expectation of a positive economic environment, which increases expectations of demand for oil, and (2) the threat of decreasing oil supply, often due to geopolitical factors.

When we analyze the correlation between oil and equities today, we find a positive relationship. We might expect that persistent increases in oil prices caused by a supply shock would result in equity declines as costs to corporations and the consumer increase. As we investigate more closely, however, we find that market expectations of an improving economy play a strong role in this correlation.

Figure 2 compares historical oil-equity correlations and economic expectations as measured by the US Consumer Confidence Index.

[2] Oil-equity correlation is the correlation between the excess return of WTI and the excess return of S&P 500. Correlations were calculated with the EWMA methodology with a half life of 23 days. Source: St. Louis FED

Figure 2: Historical performance of oil prices and the US Consumer Confidence Index



Source: St. Louis Fed, University of Wisconsin

Before the 2008 financial crisis, the correlation between oil and equity prices was negative for several years. The depressed economic environment that followed the Lehman collapse in the fall of 2008 resulted in a positive relationship between oil and equities as both fell simultaneously. This positive relationship has continued to strengthen even with the recent rise in oil prices, accompanied by a rise in equity prices.

Today's regime more closely resembles the second part of the 1979 regime, both regimes having a positive correlation between equity and oil price changes. There are also other similarities between the two periods, such as the recent exits from severe recessions, coupled with supply shocks and persistent economic uncertainty. Although the present period and 1979 are similar in the sign of the correlation, there is a notable difference that affects the oil and equity co-movement. In 1979, consumer confidence was headed lower. In 2012, it is improving, albeit in a hesitating fashion. This lends some support to the view that both oil and equity prices will continue to head upward together. This is important because expectations of positive economic conditions are linked to higher crude prices, and therefore a higher correlation between oil and equities.

The change in the correlation structure calls for the update of hedging policy. In the next section, we will show the changes to various equity industries and sectors given present-day stronger correlations. Based on these recent correlation observations, we construct hedging strategies to mitigate portfolio

losses in the case of rising oil prices. We will then impose a severe oil shock and analyze the performance of the different hedging strategies under different regimes.

Asset Allocation for Different Regimes

Metals Become More Correlated to Oil in the Current Regime

Because the relationship between oil and equities has strengthened in recent years, sector- and industry-level allocations need to be reconsidered. In Table 1, we start by exploring the co-movement of oil and equity prices at the industry level.

The following industries[3] have a strong positive correlation to oil prices of 0.49 percent or higher:

- Oil and Gas Exploration and Production
- Oil, Gas and Consumable Fuels
- Energy Equipment and Services

We also see that the Aluminum, Diversified Metals industry has joined the pack as its correlation to oil has increased significantly since 2008.

Our hypothetical investor, who is not part of the "$200 per barrel" camp, may want to consider adding these industries (for example, by buying industry indices) to hedge a possible oil price increase. The increasingly positive correlations in metals stocks indicate that adding metals industry holdings has become a potential hedging tool against oil price spikes. Some industries that have always suffered from higher crude prices and have become still more negatively correlated with oil prices since 2008:

- Airlines
- Food and Staples Retailing
- Telecommunication Services

As a result, these industries usually offer reliable hedging potential.

Other sectors have a mildly negative relationship with oil prices:

- Banks
- Food, Beverage and Tobacco
- Health Care Equipment and Services
- Household and Personal Products
- Insurance

[3] We used the industry specifications of the Barra Global Equity Model (GEM2), which are based on the GICS sector, industry group and industry structure. For more detailed information, see: J. Menchero, A. Morozov, P. Shepard: The Barra Global Equity Model (GEM2), September 2008.

Our investor may also want to consider decreasing his exposure to sectors with negative correlations to oil. One way to implement lower sector holdings is to enter into a short position in the sector index.

Some sectors were and still are uncorrelated with oil prices:

- IT Services and Software
- Internet Software and Services
- Computers, Electronics

These sectors became more or less neutral to oil price changes in 2012:

- Real Estate
- Consumer Durables and Apparel

Finally, other sectors that were uncorrelated in 2008 saw their correlations with oil prices diverge from zero in the current period:

- Utilities
- Chemicals
- Capital Goods

Table 1: Correlation between Brent crude oil price and equity price performance in different industries

	January 2008	January 2012	
Aluminum, Diversified Metals	0.30	0.49	POSITIVE CORRELATION
Energy Equipment and Services	0.47	0.51	
Oil and Gas Exploration and Production	0.62	0.56	
Oil, Gas and Consumable Fuels	0.59	0.49	
Airlines	(0.35)	(0.50)	NEGATIVE CORRELATION
Food and Staples Retailing	(0.23)	(0.45)	
Telecommunication Services	(0.20)	(0.41)	
Automobiles and Components	(0.09)	0.06	OIL PRICE NEUTRAL
Computers, Electronics	(0.09)	0.05	
Construction, Containers, Paper	(0.12)	(0.10)	
Consumer Durables and Apparel	(0.18)	(0.09)	
Diversified Financials	(0.09)	(0.06)	
Internet Software and Services	(0.05)	(0.10)	
IT Services and Software	(0.08)	(0.07)	
Real Estate	(0.18)	(0.09)	
Semiconductors	(0.06)	(0.03)	
Capital Goods	0.05	0.18	FORMERLY OIL PRICE NEUTRAL
Chemicals	(0.06)	0.18	
Media	(0.07)	(0.17)	
Steel	0.07	0.32	
Utilities	0.09	(0.21)	
Banks	(0.18)	(0.21)	OTHER
Biotechnology	(0.14)	(0.22)	
Commercial and Professional Services	(0.14)	(0.14)	
Communications Equipment	(0.11)	(0.12)	
Food, Beverage and Tobacco	(0.12)	(0.34)	
Gold and Precious Metals	0.24	0.14	
Health Care Equipment and Services	(0.14)	(0.22)	
Hotels Restaurants and Leisure	(0.17)	(0.34)	
Household and Personal Products	(0.15)	(0.33)	
Insurance	(0.19)	(0.14)	
Pharmaceuticals and Life Sciences	(0.18)	(0.24)	
Retailing	(0.21)	(0.26)	
Transportation Non-Airline	(0.16)	(0.17)	

Key	Correlation
	smaller than -0.4
	between -0.1 and 0.1
	larger than 0.4

Source: BarraOne, BIM301L risk model . Model portfolios: BRENT_SHIFT factor (*Brent price*) and industry factors of the Barra Integrated Model (*industries*)

Stress Testing Five Different Oil Shock Regimes

As mentioned earlier, the interdependence between higher oil prices and equities is complex, and often influenced by changes in market sentiments and geopolitical events. Stress testing is a tool that can help explore the vulnerabilities of a portfolio during various regimes.

To analyze the effect of different regimes on the oil shock response, we applied correlated stress tests[4] on the MSCI ACWI IMI Index, a broad global equity portfolio. In the following hypothetical stress scenarios, we assume that oil prices continue to rise. To represent the $200 a barrel scenario, we use a 64-percent oil price increase.[5]

In Table 2, the five scenarios incorporate five different oil-equity correlation regimes by specifying different equity price changes in reaction to the oil price change. Scenario (a) models the current regime with equity prices moving based on the recent correlations in reaction to the oil price change. Scenario (e) assumes a correlation breakdown between oil and equity prices, with a decrease of 10 percent in equity prices. Scenarios (b)-(d) describe the intermediate states between Scenario (a) and (e).

Based on the stress testing results in Table 2, as expected the MSCI ACWI IMI Index performs very well under the recent highly positive oil-equity correlation regimes. In the case of a correlation breakdown or negative economic regime shift, however, equity portfolios could suffer significant losses in response to an oil price increase.

Next we analyze the effect of four hedging strategies on the stressed portfolio returns for investors who are not in the "$200 a barrel" camp. Based on the current correlations between industry performance and oil price detailed in Table 1, we can construct hedging strategies to mitigate the effect of increasing oil prices. In Table 2, we used four hedging strategies that added one of the following hedging portfolios to the MSCI ACWI IMI Index portfolio:

- long MSCI AC World Energy Sector Index;
- long MSCI World Index Metals and Mining Industry;
- short MSCI ACWI IMI/Consumer Staples Index;
- short MSCI ACWI IMI/Utilities Index.

The hedging ratio was 20 percent in the case of each strategy.

We measured the performance of the hedged portfolios under the five scenarios of Table 2. Energy sectors and metals sectors seem to be an efficient hedge against oil price changes, as the hedged portfolios outperform the unhedged portfolio. These strategies save investors from the increasing oil prices even in the case of a correlation breakdown. The efficiency of the hedge with the indices incorporating the performance of the consumer staples and utilities industries highly depends on the assumed change in equity prices. These hedging strategies are useful to hedge the risk of increasing oil prices if the market stays within the recent positive oil-equity correlation regime. Should investors face a correlation breakdown, the hedge would slip.

[4] In a correlated stress test, shocks are specified for given market factors which will, in turn, impact other factors based on the BIM factor covariances.

[5] At the time of this writing an additional 64 percent increase in Brent crude would equate to a $200 per barrel price.

Table 2: $200 a barrel: Hypothetical stress testing scenarios and stressed portfolio returns of hedged and unhedged US equity portfolios

	Scenario name	(a)	(b)	(c)	(d)	(e)
Scenario	Oil Price Change	64%	64%	64%	64%	64%
	US Equity Price Change	*	5%	0%	-5%	-10%
No hedge	**MSCI ACWI IMI Index**	21.40%	9.31%	4.61%	-0.09%	-4.79%
20% Hedge	**MSCI AC World Energy Sector**	23.34%	11.20%	6.49%	1.78%	-2.93%
	MSCI World Index Metals and Mining Industry	24.31%	11.90%	7.08%	2.26%	-2.56%
	ACWI IMI/Consumer Staples	23.10%	10.14%	5.10%	0.07%	-4.97%
	ACWI IMI/Utilities	22.44%	9.66%	4.70%	-0.26%	-5.23%

Source: BarraOne. BIM301L risk model.

*: triggered by oil price changes based on recent correlations.

Hedging portfolios: long MSCI AC World Energy Sector Index, long MSCI World Index Metals and Mining Industry, short MSCI ACWI IMI/Consumer Staples, or short MSCI ACWI IMI/Utilities. We applied hedging ratios of 20%

Conclusion

In our hypothetical case study, we develop hedging strategies for investors who want some protection against the effect of oil prices increasing to $200 per barrel.

To devise an appropriate hedging strategy, we must look at how asset classes interact in different historical periods, and not simply rely on looking at previous periods of similar oil-price behavior. The Barra Integrated Model allows investors to construct their own hedges and stress-test those strategies using a set of plausible asset-class relationships. This level of quantitative analysis also helps investors understand how hedges may behave across different scenarios.

Appendix: Barra Integrated Model Risk Report

In the appendix of the papers published in the Multi Asset Class Market Report series, we report the recent cross asset class correlations and asset class volatilities based on the Barra Integrated Model. Last year same month values are included for comparison.

Table A.1: Cross asset class correlations (upper triangle: March 2012*; lower triangle:* March 2011*)*

	Global Equities[1]	USA Equities[2]	Euro Equities[3]	Emerging Market Equities[4]	Small Cap Equities[5]	Global Government Fixed Income[6]	USA Treasuries[7]	USA Corporate Fixed Income[8]	USA Fixed Income High Yield[9]	EMU Government Fixed Income[10]	Commodities[11]
Global Equities[1]	1	0.96	0.95	0.93	0.98	0.07	-0.33	0.33	0.68	0.31	0.52
USA Equities[2]	0.96	1	0.85	0.83	0.96	-0.05	-0.35	0.27	0.64	0.16	0.45
Euro Equities[3]	0.96	0.88	1	0.89	0.92	0.20	-0.29	0.32	0.64	0.46	0.52
Emerging Market Equities[4]	0.92	0.82	0.89	1	0.90	0.11	-0.29	0.37	0.66	0.35	0.53
Small Cap Equities[5]	0.98	0.96	0.92	0.88	1	0.04	-0.34	0.32	0.69	0.27	0.51
Global Government Fixed Income[6]	0.09	0.00	0.13	0.15	0.06	1	0.62	0.48	0.04	0.85	0.06
USA Treasuries[7]	-0.28	-0.29	-0.27	-0.22	-0.29	0.61	1	0.54	-0.21	0.33	-0.26
USA Corporate Fixed Income[8]	0.39	0.34	0.37	0.43	0.38	0.44	0.48	1	0.60	0.41	0.16
USA Fixed Income High Yield[9]	0.68	0.63	0.65	0.65	0.68	0.03	-0.23	0.63	1	0.19	0.47
EMU Government Fixed Income[10]	0.32	0.20	0.38	0.38	0.28	0.86	0.36	0.40	0.18	1	0.25
Commodities[11]	0.50	0.43	0.48	0.48	0.50	0.09	-0.23	0.20	0.47	0.29	1

Source: BarraOne, BIM301L risk model. As of the 15th of the month.

Model portfolios:

1 MSCI All Country Investable Market Index

2 MSCI USA Investable Market Index

3 MSCI Europe Investable Market Index

4 MSCI Emerging Markets Investable Market Index

5 MSCI World Small Cap Index

6 Bank of America Merrill Lynch Global Government Bond II Index

7 Bank of America Merrill Lynch US Domestic Treasury Master Index

8 Bank of America Merrill Lynch US Domestic Corporate Master Index

9 Bank of America Merrill Lynch US High Yield Master II Index

10 Bank of America Merrill Lynch EMU Direct Government Index

11 S&P GSCI Index

Table A.2: Asset class volatilities (annualized)

	March 2011	March 2012
Global Equities[1]	21.05	21.56
USA Equities[2]	21.42	21.14
Euro Equities[3]	22.22	25.76
Emerging Market Equities[4]	25.76	26.41
Small Cap Equities[5]	23.39	23.96
Global Government Fixed Income[6]	7.39	6.70
USA Treasuries[7]	4.67	4.52
USA Corporate Fixed Income[8]	6.57	5.79
USA Fixed Income High Yield[9]	11.94	8.95
EMU Government Fixed Income[10]	13.22	13.08
Commodities[11]	26.72	25.13

Source: BarraOne, BIM301L risk model. As of the 15th of the month.

Model portfolios:

1 MSCI All Country Investable Market Index

2 MSCI USA Investable Market Index

3 MSCI Europe Investable Market Index

4 MSCI Emerging Markets Investable Market Index

5 MSCI World Small Cap Index

6 Bank of America Merrill Lynch Global Government Bond II Index

7 Bank of America Merrill Lynch US Domestic Treasury Master Index

8 Bank of America Merrill Lynch US Domestic Corporate Master Index

9 Bank of America Merrill Lynch US High Yield Master II Index

10 Bank of America Merrill Lynch EMU Direct Government Index

11 S&P GSCI Index

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[1] *As of June 30, 2011, based on eVestment, Lipper and Bloomberg data.*