



# Implementing Multi Asset Class Momentum Strategies with ETFs

## A diversified approach to momentum strategies using ETFs

ETFs provide a diverse and liquid range of alternatives to implement momentum strategies across multiple asset classes

### Momentum across asset classes

A momentum portfolio across several asset classes is far superior to the traditional 12-1 month equities only momentum both from a risk adjusted and maximum drawdown perspective. In addition, being selective when choosing your portfolio allocation method can definitely reap performance benefits.

### ETF momentum portfolios

In this research we explore the different alternatives available for implementing cross asset class momentum portfolios using ETFs. More specifically we test the momentum strategy in equity developed markets country and sector funds, commodity, currency, strategy, and treasury products. In general we found that ETF portfolios implementing global sector, commodity, currency and treasury momentum strategies have displayed momentum persistency.

### Introducing our Diversified Momentum ETF Portfolio (DMP)

We prove that a multi asset class momentum portfolio implemented with ETFs can provide access to the momentum anomaly and improve the portfolio's risk-adjusted return and maximum drawdown.

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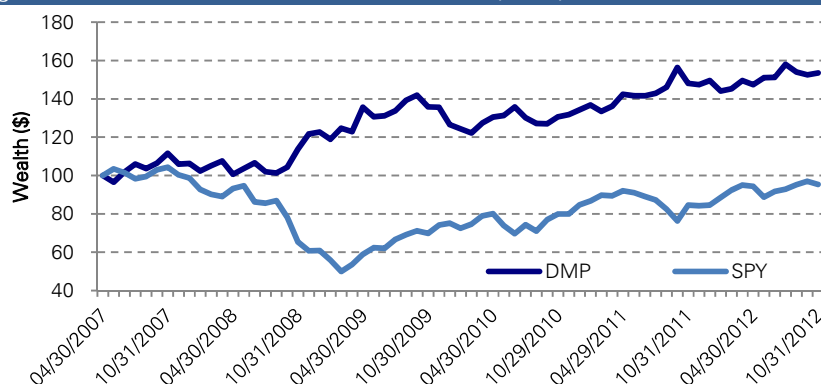
## Date

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Figure 1: Diversified Momentum ETF Portfolio (DMP)



Source: Deutsche Bank, FactSet. \*Backtesting results: SPY is an ETF tracking the performance of the S&P 500 index.

Figure 2: DMP Weights and ETF Constituents for November 2012

Global Sectors (1M) (40%)		Currencies (1M) (10%)		Commodities (12M) (30%)		Treasuries (1M) (20%)	
Long	Short	Long	Short	Long	Short	Long	Short
JXI	IXP	FXF	FXC	CORN	USO	SHV	IEF
IXG	IXN	FXE	CEW	UGA	UNG	SCHO	SCHR
		CYB	FXY	GLD	DBB		

Source: Deutsche Bank

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# Momentum across Asset Classes<sup>1</sup>

A recent report from our colleagues on the Quantitative Strategy team examines the persistency of the momentum anomaly across multiple asset classes. The following is an extract from their report:

*"Equity momentum is likely the most widely discussed and hotly debated factors within academia and by practitioners. However, in this piece we study the persistence of the momentum anomaly across seven different asset classes (e.g. commodities, treasuries, currencies etc.) including non-traditional and more exotic asset classes such as hedge fund, sector, and equity indices. Studying momentum simultaneously and in unison across several asset classes rather than in isolation can uncover the commonalities within pure cross asset momentum strategies.*

*We show that a momentum portfolio across several asset classes is far superior to the traditional 12-1 month equities only momentum both from a risk adjusted and max drawdown perspective. Further, we compare the various portfolio allocation techniques to determine the most optimal way to combine various momentum portfolios derived from multiple asset classes. We explore some simple portfolio allocation methods as well as more elaborate methods such as risk parity based portfolio allocation. Being selective when choosing your portfolio allocation method can definitely reap performance benefits. Finally, we show how to boost performance even further by utilizing the principals of regime shifting and volatility neutralization on portfolio allocation."* (Jussa [2012])

Jussa *et al* [2012] presented the following specific findings across the asset classes examined:

- **Equities only:** 12-1 month momentum has the strongest forecasting ability in predicting next month's returns. Geographically speaking momentum was more persistent in Australasia, Europe, and Asia ex Japan; in terms of markets, developed markets fared much better than emerging markets, as the latter don't seem to present the momentum anomaly. There is also a seasonal effect for equity only momentum portfolios suggesting that momentum is stronger between June and December. On the downside, one of the issues found on equity only momentum strategies is the potential for significant drawdown, however diversifying across other asset class momentum strategies can help to lessen the downside.
- **Equity Indices:** 12 month momentum has the strongest forecasting ability in predicting next month's returns, however other shorter term windows such as 1 month and 3 months also present good results. Region wise, developed market country and sector indices exhibit the momentum anomaly, however emerging markets do not.
- **Hedge Fund Indices:** 12 month momentum shows strong persistency and a similar return patten than the equity-only momentum portfolio, although with less volatility and smaller drawdown. The analysis indicates strong support for

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<sup>1</sup> The commentary for this section is based on the report "Signal Processing: Cross Asset Class Momentum" published on Monday November 5<sup>th</sup>, 2012 by Javed Jussa *et al*.



diversifying traditional equity momentum with hedge fund momentum portfolios.

- **Currencies:** the analysis shows modest momentum results in this asset class; however the correlation of the equity only portfolio with the currency portfolio presents some pockets of low correlation which suggests that currency momentum portfolios may be a good diversifier to standalone equity momentum portfolios.
- **Commodities:** the study shows that the 12 month momentum portfolio performed reasonably well in the analysis period. In addition, the commodity momentum portfolio experienced lower volatility and drawdown than the equity only momentum portfolio with an overall correlation of about 20%. All in all, these characteristics highlight the potential of this asset class as a good diversifier to the standalone equity only momentum portfolios.
- **Treasuries:** momentum performance in this asset class was somewhat modest with some momentum formation windows presenting good results, while others showed reversal patterns. Overall treasuries momentum portfolios have low volatility and low correlation to equity only momentum portfolios making them good candidates for portfolio diversification.

The report also explores different portfolio allocation approaches ranging from naïve methods such as equal weighting to more elaborated ones such as maximum diversification. The results of the study show that being selective on the portfolio allocation can further enhance the risk-adjusted returns of the multi asset class momentum portfolio. For more details please refer to the full report titled *"Signal Processing: Cross Asset Class Momentum"* published on Monday November 5<sup>th</sup>, 2012

In this research we explore the different alternatives available for implementing cross asset class momentum strategies using ETFs<sup>2</sup>. More specifically we test the momentum strategy in equity developed markets country and sector funds, commodity, currency, strategy, and treasury products. We explore different momentum formation windows and identify specific ETF asset classes that provide an adequate opportunity set along with persistent momentum anomaly.

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<sup>2</sup> Whenever we refer to ETFs we refer to both 1940 Investment Company Act funds and 1933 Securities Act trusts.



# ETF Momentum Portfolios

## Methodology

Our methodology involves two parts. The first part deals with selecting the investable universe for each asset class portfolio, while the second part deals with the momentum portfolio construction.

### Defining the investable universe

In order to define our investable universe for each of the asset classes we follow three steps:

- **1) Asset class selection:** based on the findings provided in Jussa *et al* [2012] we selected developed market country and sector funds, commodity, currency, strategy, and treasury products.
- **2) Identify candidates for investable universe:** we just considered long-only US listed ETFs and ETVs (ETNs excluded) without leverage. Furthermore we applied specific minimum size and on exchange liquidity screens for the different asset classes (Figure 3).

Figure 3: Selection Criteria for Investable Universe ETF Candidates

Asset Class	Structure(s)	AUM \$MM	ADV \$MM
Developed Markets - US	ETF	100	1
Developed Markets - Non US	ETF	50	0.5
Global Sectors	ETF	100	1
US Sectors	ETF	100	1
Currency	ETF, ETV	50	0.5
Commodities	ETV	50	0.5
Strategy	ETF, ETV	50	0.5
Treasuries	ETF	100	0.5

Source: Deutsche Bank

Notes: Size is measured by AUM, and on exchange liquidity is measured by ADV in USD.

- **3) Select the investable universe:** our investable universe is constructed by choosing one ETF from the candidate list for each different exposure within an asset class. These will be the ETFs evaluated for membership on each rebalancing. For example, we selected only one ETF country product for each of the 18 different countries in the DM country portfolio universe. In many cases there is only one ETF candidate for each exposure; however in some cases there are multiple candidates and hence further selection criteria is required. Because momentum strategies are by nature more tactical than strategic - which means that some positions will rotate more frequently than in a normal buy-and-hold portfolio – and utilize both long and short positions, we focused on products that have a multi-purpose<sup>3</sup> ETF profile. Therefore products with more favorable scores on AUM, on-exchange liquidity, Bid/Ask spread,

<sup>3</sup> In a previous report we described how some products (the multi-purpose ones) are more suitable than others when it comes to different portfolio functionalities such as risk hedging or shorter term tactical trading. For more details refer to "US ETF Holder Demographics: Understanding ETF Usage" published on March 21<sup>st</sup>, 2012 by Shan Lan *et al*.



Institutional Ownership, Short Interest/Shares Outstanding, TER, and Sharpe ratio were preferred<sup>4</sup>.

### Constructing ETF Momentum Portfolios

In constructing our portfolios we follow almost the same approach presented on Jussa *et al* [2012]. Our momentum scores are constructed by taking the returns of the ETF prices (not the total return) over the 1 month and 12 month formation periods. We form the portfolios at the end of each month and rebalance the portfolio monthly. Our long/short portfolios are constructed by taking the top and bottom quintile ETFs based on the momentum factor. Each ETF is equally weighted within the long and the short portfolios, respectively. We require a minimum of 8 ETFs in each universe.

All candidates were assessed and selected as of the end of September 2012; however for backtesting purposes we considered these ETFs as eligible since their inception and not since when they became eligible. Figure 4 presents a summary of the backtesting time period and investable universe for the different momentum formation windows. In addition, we have included some relevant ETF benchmarks where possible.

Figure 4: Backtesting Details Summary					
Asset Class	ETF Benchmark	Investable Universe		Time Period per Formation Window	
		Min # ETPs	Max # ETPs	1M From	12M From
DM Country	SPY	15	18	4/30/1996	3/31/1997
Global Sectors	SPY	10	10	10/31/2006	09/28/2007
Currency	UUP	9	12	3/30/2007	02/29/2008
Commodity	DBC	9	13	02/28/2007	1/31/2008
Strategy		9	26	6/29/2007	05/30/2008
Treasuries		8	10	12/31/2009	11/30/2010

Source: Deutsche Bank

## Developed Market Countries

Our developed market country investable ETF universe comprised 18 country products; most of them track the same or similar indices than those in the quant team's momentum report (Figure 5). However the momentum anomaly was not as clear in the ETF implementation as it was in the MSCI indices implementation presented in the momentum study. Neither the 1M nor the 12M momentum formation windows were able to generate persistent momentum (Figures 6 and 7). We believe that the main reason for this discrepancy between our colleagues' report and the ETF implementation stems from the six countries which are not implementable through ETFs.

<sup>4</sup> When the number of candidates is large a Z-score approach can be used to find the most suitable ETF.

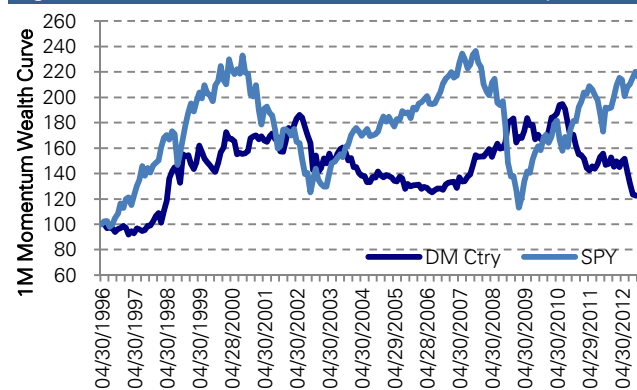


Figure 5: Investable ETF Universe for Momentum Portfolio – DM Country

Exposure	Ticker	ETP Name	Issuer	Listing Dt	Structure	TER	Index	AUM \$MM Oct '12	ADV \$MM YTD Oct '12	Net CF \$MM YTD Oct '12
Australia	EWA	iShares MSCI Australia Index Fund	BlackRock	12-Mar-96	ETF	0.52%	MSCI Australia	2,338.9	58.5	(635.5)
Austria	EWO	iShares MSCI Austria Investable Market Index Fund	BlackRock	12-Mar-96	ETF	0.52%	MSCI Austria Investable Market	64.5	1.4	5.0
Canada	EWC	iShares MSCI Canada Index Fund	BlackRock	12-Mar-96	ETF	0.52%	MSCI Canada	4,430.7	48.3	(329.8)
France	EWQ	iShares MSCI France Index Fund	BlackRock	12-Mar-96	ETF	0.52%	MSCI France	417.5	12.3	127.7
Germany	EWG	iShares MSCI Germany Index Fund	BlackRock	12-Mar-96	ETF	0.51%	MSCI Germany	3,639.5	108.2	856.1
Hong Kong	EWH	iShares MSCI Hong Kong Index Fund	BlackRock	12-Mar-96	ETF	0.52%	MSCI Hong Kong	2,612.7	70.1	429.7
Israel	EIS	iShares MSCI Israel Capped Investable Market Index Fund	BlackRock	28-Mar-08	ETF	0.59%	MSCI Israel Capped Investable Market	81.3	1.0	1.5
Italy	EWI	iShares MSCI Italy Index Fund	BlackRock	12-Mar-96	ETF	0.51%	MSCI Italy	237.9	7.0	128.2
Japan	EWJ	iShares MSCI Japan Index Fund	BlackRock	12-Mar-96	ETF	0.51%	MSCI Japan	4,147.7	135.3	(1,134.3)
Netherlands	EWN	iShares MSCI Netherlands Investable Market Index Fund	BlackRock	12-Mar-96	ETF	0.52%	MSCI Netherlands Investable Market	105.0	1.6	23.9
New Zealand	ENZL	iShares MSCI New Zealand Investable Market Index Fund	BlackRock	2-Sep-10	ETF	0.51%	MSCI New Zealand Investable Market	139.0	1.2	21.8
Norway	NORW	Global X FTSE Norway 30 ETF	Global X Funds	10-Nov-10	ETF	0.50%	FTSE Norway 30	60.4	0.5	8.0
Singapore	EWS	iShares MSCI Singapore Index Fund	BlackRock	12-Mar-96	ETF	0.52%	MSCI Singapore	1,507.3	25.6	(47.4)
Spain	EWP	iShares MSCI Spain Index Fund	BlackRock	12-Mar-96	ETF	0.52%	MSCI Spain	211.2	11.9	103.6
Sweden	EWD	iShares MSCI Sweden Index Fund	BlackRock	12-Mar-96	ETF	0.51%	MSCI Sweden	348.9	6.1	53.7
Switzerland	EWL	iShares MSCI Switzerland Index Fund	BlackRock	12-Mar-96	ETF	0.52%	MSCI Switzerland	633.2	6.0	88.7
UK	EWU	iShares MSCI United Kingdom Index Fund	BlackRock	12-Mar-96	ETF	0.52%	MSCI United Kingdom	1,396.3	23.2	(5.3)
US	SPY	SPDR S&P 500	State Street GA	29-Jan-93	ETF	0.09%	S&P 500	109,025.1	19,604.1	2,413.8

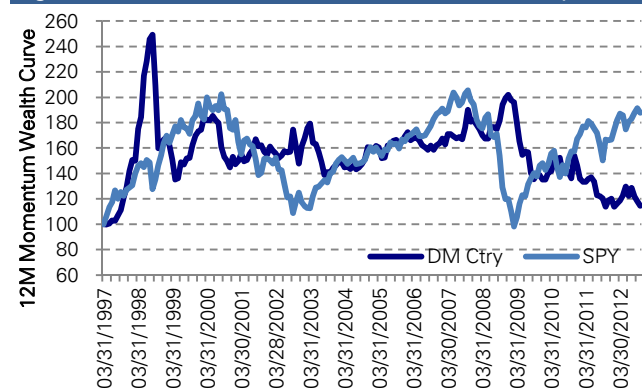
Source: Deutsche Bank, Bloomberg Finance LP, Reuters

Figure 6: 1M Momentum Portfolio – DM Country



Source: Deutsche Bank, FactSet

Figure 7: 12M Momentum Portfolio – DM Country



Source: Deutsche Bank, FactSet

## Global Sectors

For the Global Sectors ETF implementation we selected 10 products which track the GICS Sector indices from the S&P 1200 Global index (Figure 8). The S&P 1200 Global index has more than 95% exposure to Developed Markets, and hence it can be an ideal proxy to the Global Developed Market Sectors momentum portfolio represented by the MSCI World sector index family described in Jussa *et al* [2012].

Momentum was significantly persistent in the 1 month formation window; however this was not true for the 12M formation window (Figures 9 and 10).

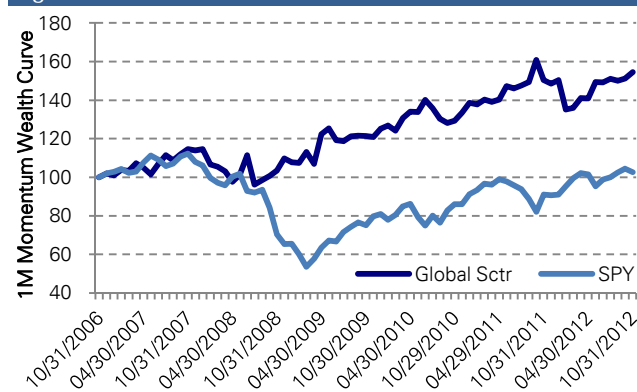


Figure 8: Investable ETF Universe for Momentum Portfolio – Global Sectors

Exposure	Ticker	ETP Name	Issuer	Listing Dt	Structure	TER	Index	AUM \$MM Oct '12	ADV \$MM YTD Oct '12	Net CF \$MM YTD Oct '12
Cons. Discretionary	RXI	iShares S&P Global Consumer Discretionary Sector Index Fund	BlackRock	21-Sep-06	ETF	0.48%	S&P Global 1200 Consumer Discretionary Sector	124.5	1.4	(6.0)
Consumer Staples	KXI	iShares S&P Global Consumer Staples Sector Index Fund	BlackRock	21-Sep-06	ETF	0.48%	S&P Global 1200 Consumer Staples Sector	528.3	3.8	15.3
Energy	IXC	iShares S&P Global Energy Sector Index Fund	BlackRock	16-Nov-01	ETF	0.48%	S&P Global 1200 Energy Sector	1,078.9	6.4	(55.5)
Financials	IXG	iShares S&P Global Financials Sector Index Fund	BlackRock	16-Nov-01	ETF	0.48%	S&P Global 1200 Financials Sector	159.0	1.8	(10.8)
Healthcare	IXJ	iShares S&P Global Healthcare Sector Index Fund	BlackRock	21-Nov-01	ETF	0.48%	S&P Global 1200 Healthcare Sector	605.5	4.1	3.0
Industrials	EXI	iShares S&P Global Industrials Sector Index Fund	BlackRock	21-Sep-06	ETF	0.48%	S&P Global 1200 Industrials Sector	143.8	1.1	(33.7)
Information Technology	IXN	iShares S&P Global Technology Sector Index Fund	BlackRock	16-Nov-01	ETF	0.48%	S&P Global 1200 Information Technology Sector	534.1	4.4	2.2
Materials	MXI	iShares S&P Global Materials Sector Index Fund	BlackRock	21-Sep-06	ETF	0.48%	S&P Global 1200 Materials Sector	484.9	3.7	(10.6)
Telecom. Services	IXP	iShares S&P Global Telecommunications Sector Index Fund	BlackRock	16-Nov-01	ETF	0.48%	S&P Global 1200 Telecommunications Sector	557.4	3.6	104.5
Utilities	JXI	iShares S&P Global Utilities Sector Index Fund	BlackRock	21-Sep-06	ETF	0.48%	S&P Global 1200 Utilities Sector	238.0	1.7	(4.0)

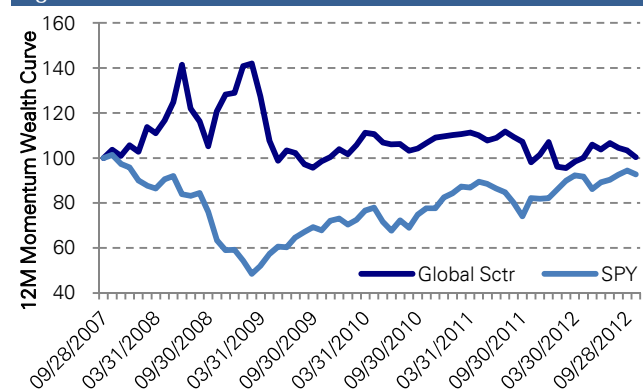
Source: Deutsche Bank, Bloomberg Finance LP, Reuters

Figure 9: 1M Momentum Portfolio – Global Sectors



Source: Deutsche Bank, FactSet

Figure 10: 12M Momentum Portfolio – Global Sectors



Source: Deutsche Bank, FactSet

## Commodities

For commodities we had an investable universe of 13 products from broad commodity baskets to single commodity exposures (Figure 11). Momentum was persistent on both the 1M and the 12M formation windows. However performance was better on the 12M window (Figures 12 and 13).

Figure 11: Investable ETF Universe for Momentum Portfolio – Commodities

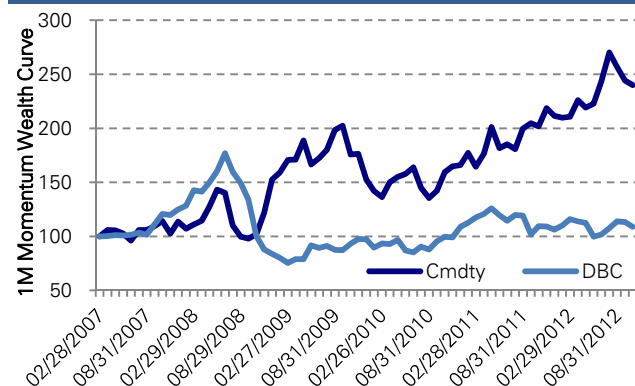
Exposure	Ticker	ETP Name	Issuer	Listing Dt	Structure	TER	Index	AUM \$MM Oct '12	ADV \$MM YTD Oct '12	Net CF \$MM YTD Oct '12
Agriculture	DBA	PowerShares DB Agriculture Fund	Deutsche Bank AG	5-Jan-07	ETV	1.01%	DB Agriculture	1,812.9	30.3	(220.3)
Broad Diversified	DBC	PowerShares DB Commodity Index Tracking Fund	Deutsche Bank AG	3-Feb-06	ETV	0.93%	DBC Commodity	6,527.0	64.8	942.0
Corn	CORN	Teucrium Corn Fund	Teucrium Trading LLC	9-Jun-10	ETV	1.49%	Teucrium Corn Fund Benchmark	55.4	5.3	(26.3)
Crude Oil	USO	United States Oil Fund LP	US Cmnty Funds LLC	3-Apr-06	ETV	0.45%	Futures	1,243.9	318.3	296.0
Energy	DBE	PowerShares DB Energy Fund	Deutsche Bank AG	5-Jan-07	ETV	0.78%	DB Energy	153.8	2.6	10.3
Gasoline	UGA	United States Gasoline Fund	US Cmnty Funds LLC	26-Feb-08	ETV	0.60%	Futures	60.5	3.7	(27.0)
Gold	GLD	SPDR Gold Shares	State Street GA	18-Nov-04	ETV	0.40%	Physical	73,827.8	1,693.6	4,895.6
Industrial Metals	DBB	PowerShares DB Base Metals Fund	Deutsche Bank AG	5-Jan-07	ETV	0.78%	DB Industrial Metals	309.3	3.3	(43.3)
Natural Gas	UNG	United States Natural Gas Fund LP	US Cmnty Funds LLC	18-Apr-07	ETV	0.60%	Futures	1,260.0	201.0	296.6
Palladium	PALL	ETFs Physical Palladium Shares	ETF Securities Ltd	8-Jan-10	ETV	0.60%	Physical	455.8	1.4	120.3
Platinum	PPLT	ETFs Physical Platinum Shares	ETF Securities Ltd	8-Jan-10	ETV	0.60%	Physical	779.5	3.0	84.4
Precious Metals	DBP	PowerShares DB Precious Metals Fund	Deutsche Bank AG	5-Jan-07	ETV	0.79%	DB Precious Metals	378.9	5.8	(108.5)
Silver	SLV	iShares Silver Trust	BlackRock	27-Apr-06	ETV	0.50%	Physical	10,320.5	443.7	415.1

Source: Deutsche Bank, Bloomberg Finance LP, Reuters



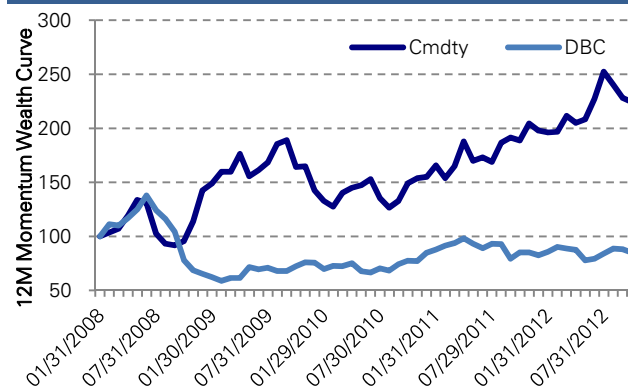


Figure 12: 1M Momentum Portfolio – Commodities



Source: Deutsche Bank, FactSet

Figure 13: 12M Momentum Portfolio – Commodities



Source: Deutsche Bank, FactSet

## Currencies

Our investable universe covers 12 products which track currency baskets and currency pairs (Figure 14). The momentum anomaly can be found more clearly once using a 1M formation window, while when using the 12M window there is no evidence of momentum anomaly (Figures 15 and 16).

Figure 14: Investable ETF Universe for Momentum Portfolio – Currencies

Exposure	Ticker	ETP Name	Issuer	Listing Dt	Structure	TER	Index	AUM \$MM Oct '12	ADV \$MM YTD Oct '12	Net CF \$MM YTD Oct '12
Basket - EM	CEW	WisdomTree Dreyfus Emerging Currency Fund	WisdomTree AM	6-May-09	ETF	0.55%	Active	280.1	2.0	(79.0)
Basket - G10	DBV	PowerShares DB G10 Currency Harvest Fund	Deutsche Bank AG	18-Sep-06	ETV	0.81%	Deutsche Bank G10 Currency Future Harvest	335.5	4.0	32.2
Basket - USD Bear	UDN	PowerShares DB US Dollar Index Bearish Fund	Deutsche Bank AG	20-Feb-07	ETV	0.80%	Deutsche Bank Short US Dollar	97.8	2.5	(5.0)
Basket - USD Long	UUP	PowerShares DB US Dollar Index Bullish Fund	Deutsche Bank AG	20-Feb-07	ETV	0.80%	Deutsche Bank Long US Dollar	858.1	57.8	(991.3)
EURUSD	FXE	CurrencyShares Euro Trust	Rydex Invest.	12-Dec-05	ETV	0.40%	Euro	263.8	142.9	(20.3)
GBPUSD	FXB	CurrencyShares British Pound Sterling Trust	Rydex Invest.	26-Jun-06	ETV	0.40%	British Pound	71.7	4.8	(23.3)
JPYUSD	FXJ	CurrencyShares Japanese Yen Trust	Rydex Invest.	13-Feb-07	ETV	0.40%	Japanese Yen	128.9	31.8	(587.0)
USDAUD	FXA	CurrencyShares Australian Dollar Trust	Rydex Invest.	26-Jun-06	ETV	0.40%	Australian Dollar	585.8	25.4	(207.2)
USDBRL	BZF	WisdomTree Dreyfus Brazilian Real Fund	WisdomTree AM	14-May-08	ETF	0.45%	Active	60.7	1.0	(19.2)
USDCAD	FXC	CurrencyShares Canadian Dollar Trust	Rydex Invest.	26-Jun-06	ETV	0.40%	Canadian Dollar	492.5	7.2	(93.7)
USDCHF	FXF	CurrencyShares Swiss Franc Trust	Rydex Invest.	26-Jun-06	ETV	0.40%	Swiss Franc	333.0	5.3	(94.9)
USDCNY	CYB	WisdomTree Dreyfus Chinese Yuan Fund	WisdomTree AM	14-May-08	ETF	0.45%	Active	246.1	2.4	(207.6)

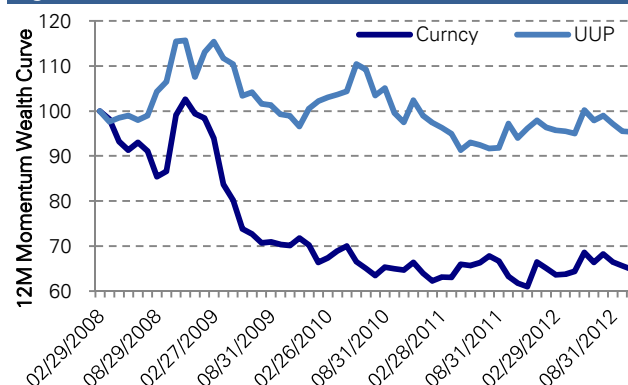
Source: Deutsche Bank, Bloomberg Finance LP, Reuters

Figure 15: 1M Momentum Portfolio – Currencies



Source: Deutsche Bank, FactSet

Figure 16: 12M Momentum Portfolio – Currencies



Source: Deutsche Bank, FactSet



## Strategy

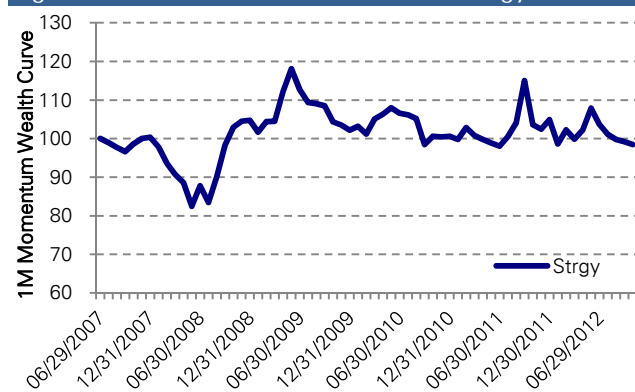
There are just a few ETPs offering access to Hedge Fund replication strategies, therefore we also decided to look at the Strategy-based ETPs as a proxy for Hedge Fund strategies (Figure 17). None of the formation windows (i.e. 1M and 12M), however, resulted in significant evidence of momentum persistency within the Hedge Fund/Strategy ETP segment (Figures 18 and 19).

Figure 17: Investable ETF Universe for Momentum Portfolio – Strategy

Exposure	Ticker	ETP Name	Issuer	Listing Dt	Structure	TER	Index	AUM \$MM Oct '12	ADV \$MM YTD Oct '12	Net CF \$MM YTD Oct '12
Fundamental DM	PXF	PowerShares FTSE RAFI Developed Markets ex-U.S. Portfolio	PowerShares	25-Jun-07	ETF	0.75%	FTSE RAFI Developed Markets ex-U.S.	283.7	1.6	44.1
Fundamental EM	PXH	PowerShares FTSE RAFI Emerging Markets	PowerShares	27-Sep-07	ETF	0.85%	FTSE RAFI Emerging Markets	375.2	2.1	33.2
Fundamental India	EPI	WisdomTree India Earnings Fund	WisdomTree AM	22-Feb-08	ETF	0.83%	WisdomTree India Earnings	1,033.7	51.7	191.0
Fundamental US LC	PRF	PowerShares FTSE RAFI US 1000 Portfolio	PowerShares	19-Dec-05	ETF	0.39%	FTSE RAFI US 1000	1,447.3	4.8	131.5
Fundamental US MC	EZM	WisdomTree MidCap Earnings Fund	WisdomTree AM	23-Feb-07	ETF	0.38%	WisdomTree MidCap Earnings	154.4	0.8	20.8
Fundamental US SC	PRFZ	PowerShares FTSE RAFI US 1500 Small-Mid Portfolio	PowerShares	20-Sep-06	ETF	0.39%	FTSE RAFI US 1500 Small-Mid	447.7	2.2	63.0
HF - Long/Short	CSM	ProShares Credit Suisse 130/30	ProShares	14-Jul-09	ETF	0.95%	Credit Suisse 130/30 Large-Cap	78.6	0.9	(25.0)
HF - Managed Futures	WDTI	WisdomTree Managed Futures Strategy Fund	WisdomTree AM	5-Jan-11	ETF	0.95%	Diversified Trends Indicator	131.7	2.5	(112.5)
HF - Market Neutral	ALT	iShares Diversified Alternatives Trust	BlackRock	16-Nov-09	ETV	0.95%	Active	54.9	0.7	(34.3)
HF - Multi Strategy	QAI	IndexIQ ETF Trust - IQ Hedge Multi-Strategy	IndexIQ Advisors LLC	25-Mar-09	ETF	0.75%	IQ Hedge Multi-Strategy	284.4	1.8	99.0
Multi Factor EM	FEM	First Trust Emerging Markets AlphaDEX Fund	First Trust Ad.	19-Apr-11	ETF	0.80%	Defined Emerging Markets	127.6	1.9	104.2
Multi Factor Intl	FDT	First Trust Developed Markets Ex-US AlphaDEX Fund	First Trust Ad.	19-Apr-11	ETF	0.80%	Defined Developed Markets Ex-US	104.7	1.6	82.8
Multi Factor LC	FEX	First Trust Large Cap Core AlphaDEX Fund	First Trust Ad.	10-May-07	ETF	0.70%	Defined Large Cap Core	343.6	2.5	50.2
Multi Factor LC Growth	FTC	First Trust Large Cap Growth AlphaDEX Fund	First Trust Ad.	10-May-07	ETF	0.70%	Defined Large Cap Growth Opportunities	125.9	0.8	(6.6)
Multi Factor LC Value	FTA	First Trust Large Cap Value AlphaDEX Fund	First Trust Ad.	10-May-07	ETF	0.70%	Defined Large Cap Value Opportunities	266.6	1.5	58.2
Multi Factor MC	FNX	First Trust Mid Cap Core AlphaDEX Fund	First Trust Ad.	10-May-07	ETF	0.70%	Defined Mid Cap Core	305.6	2.3	41.5
Multi Factor SC	FYX	First Trust Small Cap Core AlphaDEX Fund	First Trust Ad.	10-May-07	ETF	0.70%	Defined Small Cap Core	169.8	1.6	35.5
Option	PBP	PowerShares S&P 500 BuyWrite Portfolio	PowerShares	20-Dec-07	ETF	0.75%	CBOE S&P 500 BuyWrite	279.4	2.9	182.9
Risk EM LV	EEMV	iShares MSCI Emerging Markets Minimum	BlackRock	20-Oct-11	ETF	0.25%	MSCI Emerging Markets	578.3	5.0	527.9
Risk Global LV	ACVV	iShares MSCI All Country World Minimum	BlackRock	20-Oct-11	ETF	0.35%	MSCI All Country World	635.7	1.7	600.4
Risk Intl LV	EFAV	iShares MSCI EAFE Minimum Volatility Index Fund	BlackRock	20-Oct-11	ETF	0.20%	MSCI EAFE Minimum Volatility	157.1	1.4	142.4
Risk US HV	SPHB	PowerShares S&P 500 High Beta Portfolio	PowerShares	5-May-11	ETF	0.25%	S&P 500 High Beta	108.2	2.2	81.8
Risk US LV	SPLV	PowerShares S&P 500 Low Volatility Portfolio	PowerShares	5-May-11	ETF	0.25%	S&P 500 Low Volatility	2,722.8	30.5	1,718.6
Technical EM	PIE	PowerShares DWA Emerging Markets Technical Leaders Portfolio	PowerShares	28-Dec-07	ETF	0.90%	Dorsey Wright Emerging Markets Technical Leaders	184.8	1.8	25.7
Technical Intl	PIZ	PowerShares DWA Developed Markets Technical Leaders Portfolio	PowerShares	28-Dec-07	ETF	0.80%	Dorsey Wright Developed Markets Technical Leaders	65.7	0.6	6.9
Technical US	PDP	PowerShares DWA Technical Leaders Portfolio	PowerShares	1-Mar-07	ETF	0.67%	Dorsey Wright Technical Leaders	652.4	5.0	143.0

Source: Deutsche Bank, Bloomberg Finance LP, Reuters

Figure 18: 1M Momentum Portfolio – Strategy



Source: Deutsche Bank, FactSet

Figure 19: 12M Momentum Portfolio – Strategy



Source: Deutsche Bank, FactSet



## Treasuries

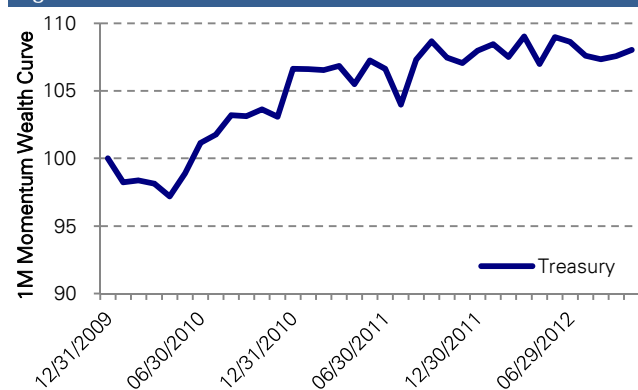
The only Sovereign debt investable in ETF form is the US debt, therefore we adjusted the Sovereign debt momentum portfolio to represent US Sovereign debt from different maturities. In order to lower the interest rate risk, we tried to keep the duration of the ETFs on the lower end, mostly around 5 year or less (Figure 20). Both formation windows (i.e. 1M and 12M) exhibited the momentum anomaly, however the 1M window suggested more momentum persistency (Figures 21 and 22).

Figure 20: Investable ETF Universe for Momentum Portfolio – Treasuries

Exposure	Ticker	ETF Name	Issuer	Listing Dt	Structure	TER	Index	AUM \$MM Oct '12	ADV \$MM YTD Oct '12	Net CF \$MM YTD Oct '12
0-1 Year	SHV	iShares Barclays Short Treasury Bond Fund	BlackRock	12-Jan-07	ETF	0.15%	Barclays Capital U.S. Short Treasury Bond	2,733.0	29.6	143.3
1-10 Year	ITE	SPDR Barclays Intermediate Term Treasury	State Street GA	30-May-07	ETF	0.13%	Barclays Intermediate U.S.	171.5	0.9	(55.1)
1-3 Year	SHY	iShares Barclays 1-3 Year Treasury Bond Fund	BlackRock	26-Jul-02	ETF	0.15%	Barclays Capital U.S. 1-3 Year Treasury Bond	8,524.4	123.9	(2,532.3)
1-3 Year	SCHO	Schwab Short-Term U.S. Treasury ETF	Charles Schwab IM	5-Aug-10	ETF	0.08%	Barclays Capital 1-3 Year Treasury Bond	229.8	2.7	32.8
1-3 Year	VGSH	Vanguard Short-Term Government Bond ETF	Vanguard	23-Nov-09	ETF	0.14%	Barclays US 1-3Yr Government Float Adjusted	210.2	1.5	39.6
1-3 Year	TUZ	PIMCO 1-3 Year U.S. Treasury Index Fund	PIMCO	1-Jun-09	ETF	0.09%	BofA Merrill Lynch 1-3 Year US Inflation-Linked Treasury	122.5	0.7	(20.4)
3-10 Year	SCHR	Schwab Intermediate-Term U.S. Treasury ETF	Charles Schwab IM	5-Aug-10	ETF	0.10%	Barclays Capital 3-10 Year Treasury Bond	211.3	2.7	91.7
3-10 Year	VGIT	Vanguard Intermediate-Term Government Bond ETF	Vanguard	23-Nov-09	ETF	0.14%	Barclays US 3-10Yr Government Float Adjusted	129.2	1.1	46.0
3-7 Year	IEI	iShares Barclays 3-7 Year Treasury Bond Fund	BlackRock	12-Jan-07	ETF	0.15%	Barclays U.S. 3-7 Year Treasury Bond	2,169.6	45.5	(679.7)
7-10 Year	IEF	iShares Barclays 7-10 Year Treasury Bond Fund	BlackRock	26-Jul-02	ETF	0.15%	Barclays Capital U.S. 7-10 Year Treasury Bond	4,631.1	91.6	(273.1)

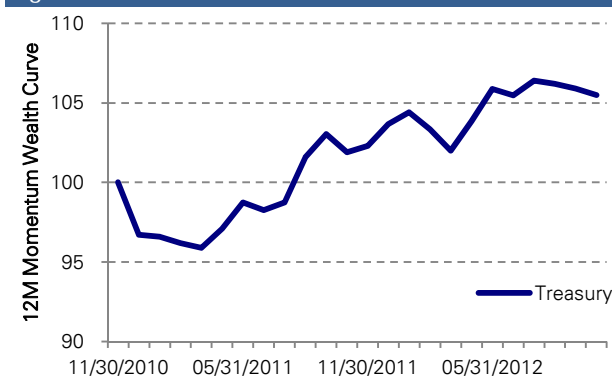
Source: Deutsche Bank, Bloomberg Finance LP, Reuters

Figure 21: 1M Momentum Portfolio – Treasuries



Source: Deutsche Bank, FactSet

Figure 22: 12M Momentum Portfolio – Treasuries



Source: Deutsche Bank, FactSet



# Multi Asset Class Momentum Portfolio

## Summary of ETF momentum portfolios

After evaluating the results of the previous section, we have selected four ETF momentum portfolios which can exploit the momentum anomaly across different asset classes. We believe that momentum strategies within Global Sectors, Currencies, Commodities, and Treasuries can be implemented with ETFs successfully (Figure 23). Moreover, the low or negative correlations among these ETF momentum portfolios can provide additional ways to improve the overall portfolio's risk-adjusted return (Figure 24).

Figure 23: Overall Performance – as of Oct 31<sup>st</sup>, 2012

Asset Class	Mom. Formation Window	From	Annualized Return	Monthly Avg Return	Sharpe Ratio	Annualized Volatility	Skew	Kurtosis
Global Sectors	1M	10/31/2006	7.52%	0.69%	0.52	14.52%	-0.27	2.72
Currencies	1M	3/30/2007	5.21%	0.52%	0.34	15.24%	0.45	1.43
Commodities	12M	1/31/2008	18.54%	1.78%	0.63	29.44%	-0.08	0.69
Treasuries	1M	12/31/2009	2.77%	0.24%	0.59	4.72%	0.43	0.17

Source: Deutsche Bank, FactSet

Figure 24: ETF momentum portfolio correlations – 24 Month Window as of Oct '12

24M Correlations	Global Sectors	Currencies	Commodities	Treasuries
Global Sectors	1.00			
Currencies	0.44	1.00		
Commodities	-0.01	-0.12	1.00	
Treasuries	0.39	-0.05	0.01	1.00

Source: Deutsche Bank, FactSet

## Portfolio Allocation

From all the allocation techniques described on Jussa *et al* [2012] we decided to employ one of the simple asset allocation techniques. More specifically, we apply the Sharpe weighted portfolio allocation scheme in the construction of our Diversified Momentum ETF Portfolio. This technique allocates more weight to portfolios that have been performing well on a risk adjusted basis. Formulaically this can be expressed as follows:

$$w_i = \frac{\text{rank}(\text{sharpe}_i)}{\sum_n \text{rank}(\text{sharpe}_i)}$$

, where i corresponds to each ETF momentum portfolio from a total of n portfolios

We use 6-month Sharpe rankings on each monthly rebalancing as this was the time window that presented the best results in the research.



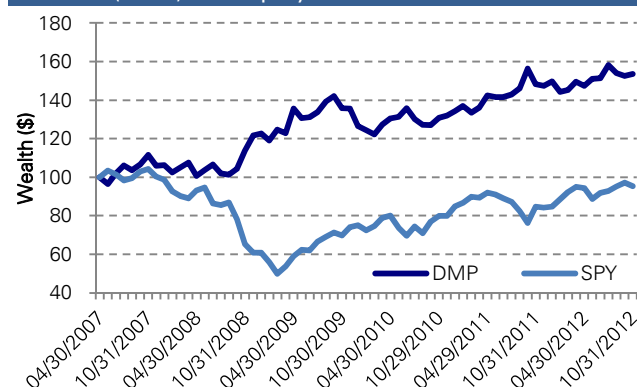
## Diversified Momentum ETF Portfolio (DMP)

Combining the four ETF momentum portfolios according to a Sharpe-ratio weighting approach improves the overall risk-adjusted return of the individual portfolios.

The Diversified Momentum ETF Portfolio (DMP) provides a more stable path of returns with a more discrete maximum drawdown compared to other asset classes such as equities (SPY<sup>5</sup>)

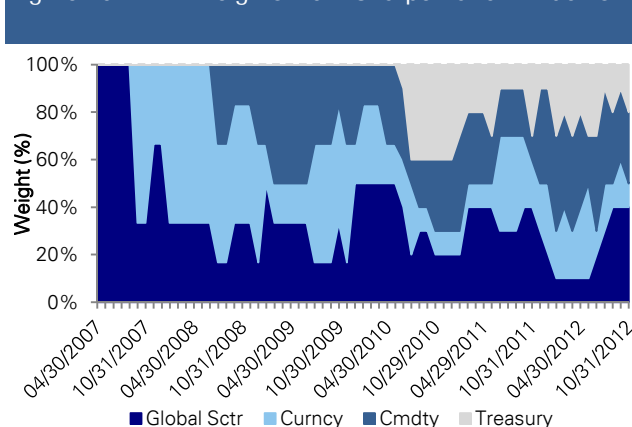
The DMP can tend to underperform the equity market during strong bull markets, but should outperform the market in the long run due to the downside protection provided by the diversification across multiple asset classes.

Figure 25: Wealth curve for Diversified Momentum ETF Portfolio (DMP) and equity benchmark



Source: Deutsche Bank, FactSet

Figure 26: DMP Weights – 6M Sharpe Ratio Windows



Source: Deutsche Bank, FactSet

Figure 27: Overall Performance - DMP and equity benchmark

Portfolio	From	To	Annualized Return	Monthly Avg Return	Sharpe Ratio	Annualized Volatility	Skew	Kurtosis	Max. Draw Down
DMP	04/30/2007	10/31/2012	8.11%	0.71%	0.65	12.43%	0.16	0.06	-13.99%
SPY	04/30/2007	10/31/2012	-0.87%	0.07%	-0.05	18.32%	-0.54	0.51	-52.20%

Source: Deutsche Bank, FactSet

## Current DMP Constituents

Figure 28 presents the current ETF portfolio constituents for the month of November for each ETF momentum portfolio.

Figure 28: DMP Weights and ETF Constituents for November 2012

Global Sectors (1M) (40%)		Currencies (1M) (10%)		Commodities (12M) (30%)		Treasuries (1M) (20%)	
Long	Short	Long	Short	Long	Short	Long	Short
JXI	IXP	FXF	FXC	CORN	USO	SHV	IEF
IXG	IXN	FXE	CEW	UGA	UNG	SCHO	SCHR
		CYB	FXY	GLD	DBB		

Source: Deutsche Bank

<sup>5</sup> SPY is an ETF that tracks the performance of the S&P 500 index.



# Appendix 1

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**Buy:** Based on a current 12-month view of total share-holder return (TSR = percentage change in share price from current price to projected target price plus projected dividend yield), we recommend that investors buy the stock.

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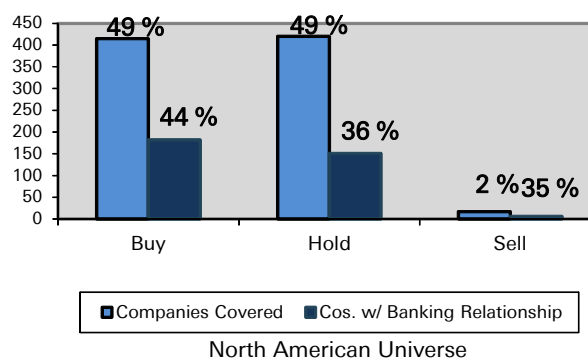
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