Global Structured Products

BMO Core Investor 5% Target Volatility Index

Index Brochure

August 28, 2019

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BMO Capital Markets

THE INDEX

DESCRIPTION

The BMO Core Investor™ 5% Target Volatility Index (the "Index") is a proprietary index that is based on the Modern Portfolio Theory approach to asset allocation. This theory suggests how investors can select a portfolio from available assets to maximize expected return for a given amount of risk.

METHODOLOGY CONSTRUCTION

Step 1: Monthly, the Index rebalances to select a new Monthly Unique Portfolio that is the best-performing portfolio over the past six months with volatility equal to or less than 5%.

Step 2: Daily, the Index Calculation Agent monitors the volatility of the Monthly Unique Portfolio over the previous one-month period and adjusts the **exposure** of the Index to the Monthly Unique Portfolio to target a 5% annualized volatility.

QUICK FACTS

Weighting Method	Volatility Targeted
Rebalancing Frequency	Monthly and Daily
Structure	Total Return
Asset Universe	8 ETFs and Cash
Bloomberg Ticker:	BMOICI5
Currency	USD
Annual Index Fee	2.35%
Inception Date	November 15, 2017

The information in this document is qualified in its entirety by the more detailed explanations set forth elsewhere in the applicable Terms Supplement and Disclosure Statement. You should carefully read those documents, including the Risk Factors. Capitalized terms used in this summary shall have the meaning assigned to them in the related Terms Supplement.

KEY CONSIDERATIONS

- The strategy that underlies the Index may not be successful and there are risks associated with the strategy.
- The Index may not approximate its target volatility.
- Because the Index was created in November 2017, it has limited historical information.
- The level of the Index will be reduced by an annual fee.
- The Index may perform poorly during periods characterized by short-term volatility.
- The Index may be partially uninvested.
- Performance of the ETFs composing the Index may offset each other.
- The Index calculation agent has limited ability to impact the level of the Index.
- We have no affiliation with the sponsors of the ETFs underlying the Index and will not be responsible for any of its actions.
- The sponsors of the ETFs may adjust their respective ETFs in a way that affects the level of the Index, and the sponsors have no obligation to consider your interests.

INDEX COMPONENTS

The Index Components represent a diverse range of sectors, asset classes and geographic regions. Each Index Component is listed below together with its cap (maximum weight in the Monthly Unique Portfolio), sector, sector cap, asset class and Bloomberg ticker symbol:

SECTOR CAP*	ASSET CLASS	INDEX COMPONENT	DESCRIPTION	BLOOMBERG SYMBOL	ASSET CAP*
Equities 75%	US Large Cap Equities	SPDR® S&P 500 ETF	This ETF tracks the S&P 500 Index. This ETF invests in a portfolio representing all the stocks in the S&P 500 Index.	SPY UP EQUITY	25%
	US Small Cap Equities	iShares® Russell 2000 ETF	This ETF tracks the performance of the Russell 2000 Index. Its investments are in the smallest 2000 companies from the Russell 3000 Index.	IWM UP EQUITY	30%
	U.S. Equities	iShares® Select Dividend ETF	This ETF tracks the price and yield performance of the Dow Jones Select Dividend Index. The ETF predominantly holds mid and large-cap U.S. stocks. Its investments are selected based on dividend yield.	DVY UQ EQUITY	20%
	International Large/Mid Cap Equities (ex. US and Canada)	iShares® MSCI EAFE ETF	This ETF tracks the performance of the MSCI EAFE Index. Its investments are focused on developed countries across the world, excluding the U.S. and Canada.	EFA UP EQUITY	10%
Fixed Income 75%	U.S. Investment Grade Corporate Debt	iShares® iBOXX Investment Grade ETF	This ETF seeks to track the investment results of an index composed of U.S. dollar-denominated, investment-grade corporate bonds.	LQD UP EQUITY	25%
	Emerging Market Sovereign Debt	PowerShares® Emerging Market Sovereign Debt ETF	This ETF tracks the DBIQ Emerging Market USD Liquid Balanced Index. The index measures the potential returns of a theoretical portfolio of liquid emerging market U.S. dollar-denominated government bonds.	PCY UP EQUITY	5%
	U.S. High Yield Corporate Debt	iShares® iBOXX USD High Yield ETF	This ETF seeks to track the investment results of an index composed of U.S. dollar-denominated, high yield corporate bonds.	HYG UP EQUITY	15%
	U.S. Long Dated Government Bonds	iShares® 20+ Years Treasury Bond ETF	This ETF seeks to track the investment results of an index composed of U.S. Treasury bonds with remaining maturities greater than 20 years.	TLT UQ EQUITY	30%
Cash 15%	Cash	Federal Funds Rate	The federal funds rate is an interest rate that represents the rate at which U.S. banks may lend reserve balances to other depository institutions overnight, on an uncollateralized basis.	FEDL01 INDEX	15%

*In certain scenarios, Index exposure may exceed the sector and asset caps during a given month. See “Daily Rebalancing” for more information.

INDEX PERFORMANCE

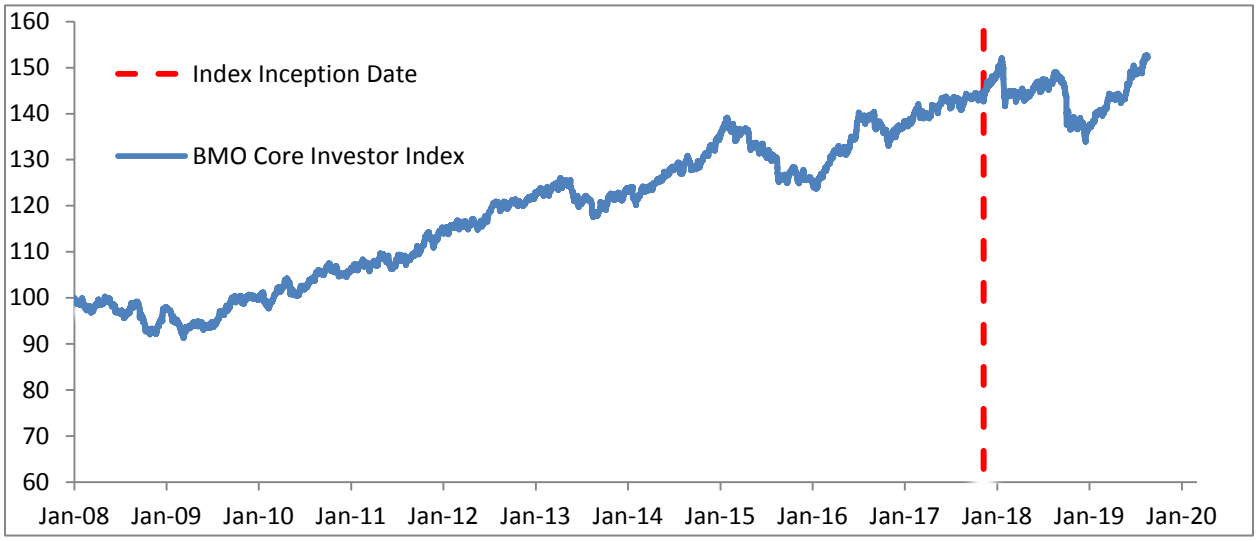
HYPOTHETICAL INDEX RETURN

The Index was launched on November 15, 2017, and accordingly, there is no actual historical data on the Index prior to November 15, 2017. The following graph sets forth the hypothetical daily closing levels of the Index from January 1, 2008 to November 14, 2017 and the actual historical daily closing levels of the Index from November 15, 2017 to August 28, 2019. This hypothetical and historical data on the Index is not indicative of the future performance of the Index or what the value of the CDs may be. Any hypothetical or historical upward or downward trend in the level of the Index set forth below is not an indication that the level of the Index is more or less likely to increase or decrease at any time over the term of the CDs.

The hypothetical back-tested performance of the Index set forth in the graph was calculated using the same selection criteria and methodology that will be used to calculate the Index. The only exception applies to the monitoring of the historical volatility of PCY, which was formed in October 2007, and accordingly, its six month volatility could not be monitored until April 2008. Prior to April 2008, for purposes of constructing this hypothetical historical information, its volatility was only monitored from its inception to each relevant date of measurement.

Please note that the hypothetical back-tested Index data only reflects the application of that methodology in hindsight, since the Index was not actually calculated and published during the indicated period. The hypothetical back-tested Index data cannot completely account for the impact of financial risk in actual trading. There are numerous factors related to the financial markets in general that cannot be, and have not been, accounted for in the hypothetical back-tested Index data, all of which can affect actual performance. Consequently, you should not rely on that data as a reflection of what the actual Index performance would have been had the Index been in existence or in forecasting future Index performance.

Hypothetical historical returns as at August 28, 2019



Annualized return	4.55%
Realized Volatility	5.61%
Sharpe Ratio	0.69

Realized volatility is the daily standard deviation of returns over the indicated period.

The Sharpe Ratio is a measure for calculating risk-adjusted return, calculated as the average return earned in excess of the "risk-free rate."

INDEX RULES

Determining Eligible Portfolios

Each month, on the Reweighting Date, the Index Calculation Agent identifies all possible portfolio combinations that comply with the Index Rules (the "Eligible Portfolios"). The Monthly Unique Portfolio is a hypothetical weighted portfolio of Index Components chosen from among all Eligible Portfolios. The weights applied to each Index Component to determine each Eligible Portfolio (including the Monthly Unique Portfolio) are subject to the following limits:

- Each weight must be 0% or a positive integral multiple of 5%
- The sum of the weights applied to all Index Components must be 100%
- The weight applied to each Securities Component cannot exceed the percentage set forth in the table on page 3 above.
- The sum of the weights applied to all Securities Components in a sector (except Cash) cannot exceed 75%
- The weight applied to the Cash Component cannot exceed 15% (which means that the sum of the weights applied to all Securities Components must be at least 85%)

Monthly Selection and Reweighting of the Monthly Unique Portfolio

On the first Index Business Day of each month (the "Reweighting Date"), the Index Calculation Agent determines all Eligible Portfolios and calculates their performance for the previous 126 Index Business Days (a period of approximately six calendar months, called the "Reweighting Observation Period"). The annualized volatility of each Eligible Portfolio is calculated over the same Reweighting Observation Period. The Monthly Unique Portfolio is the Eligible Portfolio that would have produced the highest overall return on the Index over the Reweighting Observation Period, subject to volatility not exceeding an annualized level of 5%. If no Eligible Portfolio meets these criteria, the limit on volatility is increased by 1% (first to 6%, then to 7% and so on) until a Monthly Unique Portfolio meeting the criteria is found. The "Weights" are the individual weights applied to each Index Component in the Monthly Unique Portfolio.

For a period of up to two Index Business Days following the determination of a Monthly Unique Portfolio on a Reweighting Date (the "Determination Period"), the Index Calculation Agent may, in its sole discretion, continue to use the Monthly Unique Portfolio from the preceding Reweighting Date for purposes of daily rebalancing of volatility and determining the Index Level; provided, however, that the Index Calculation Agent must adopt the most recently determined Monthly Unique Portfolio for such purposes on or before the end of the Determination Period.

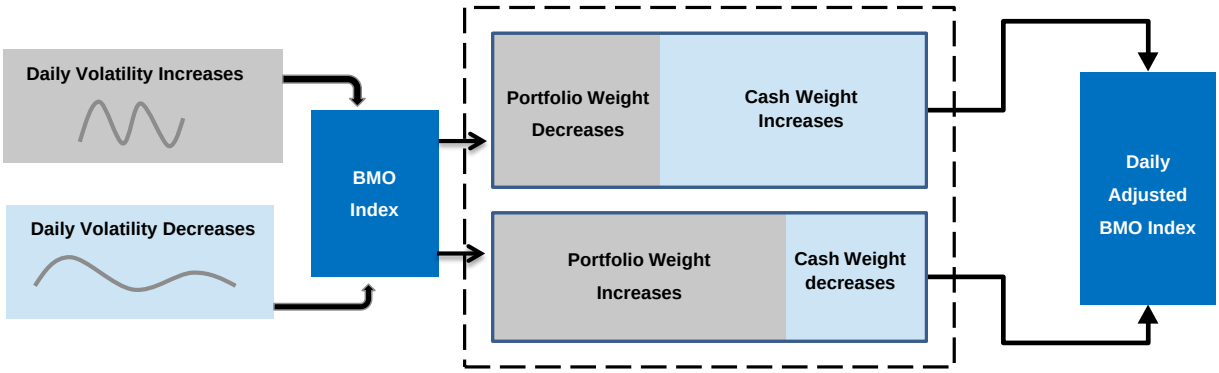
The Index uses volatility to measure a hypothetical portfolio's level of risk, with greater volatility representing higher risk. The Index's volatility is based on fluctuations in the Closing Levels of the weighted Securities Components during the Reweighting Observation Period, with recent fluctuations being weighted more heavily than less recent fluctuations. The calculation of volatility is described in more detail in Appendix A of the applicable Terms Supplement.

Daily Rebalancing

On each Index Business Day between Reweighting Dates, the Index follows a strategy that targets 5% volatility by varying the exposure of the Index to the Monthly Unique Portfolio based on its one-month historical volatility. The aggregate weight of the Securities Components in the Monthly Unique Portfolio adjusted for the variable exposure will range from 0% to 100%, increasing when the volatility of the Monthly Unique Portfolio decreases and decreasing when the volatility increases. If the Monthly Unique Portfolio contains Cash, the exposure can be more than 100% (up to 117.65% when the Cash weight in the Monthly Unique Portfolio is at its Cap of 15%). This scenario may occur when volatility has fallen during a given month, resulting in the Index exposure moving above both the asset and sector caps.

Rebalancing may result in the overall exposure of the Index to certain Index Components exceeding the limits set out above under "—Determining Eligible Portfolios". When the 1-month historical volatility is greater than 5%, the Index will reduce the exposure to the Monthly Unique Portfolio by increasing its exposure to Cash. When the 1-month historical volatility is less than 5%, the Index will increase the exposure to the Monthly Unique Portfolio by reducing its exposure to Cash. However, after daily rebalancing, (i) the overall weight of each Index Component (including Cash in the Monthly Unique Portfolio combined with Cash used for rebalancing) will always be at least 0% (i.e., no Index Component will have a negative weighting), and (ii) the sum of the overall weights of all Security Components will always be 100%. In certain circumstances, these constraints could result in an Index volatility below 5%. Rebalancing changes the extent to which the Monthly Unique Portfolio is represented in the Index, but it does not change the Weights of the Index Components in the Monthly Unique Portfolio.

The following diagram illustrates the effect of daily rebalancing:



Determining the Index Level

The Index Level on an Index Business Day is the Index Level on the previous Index Business Day plus the return on the Index since the previous Index Business Day minus the portion of the annual fee of 2.35% (the "Fee") that has accrued since the previous Index Business Day. The return on the Index since the previous Index Business Day is the sum of the weighted returns on the Index Components since the previous Index Business Day (using the Weights determined on the previous Reweighting Date) after the weighted returns on the Securities Components have been multiplied by the Daily Exposure Factor and the weighted return on the Cash Component (including Cash in the Monthly Unique Portfolio combined with Cash used for daily rebalancing) has been multiplied by one minus the Daily Exposure Factor. The Index Level on each Index Business Day will be reported by the Index Calculation Agent on Bloomberg page BMOICI5.

The Closing Level of each Securities Component, which is used to calculate that Securities Component's return, reflects the 'total return' of that Securities Component, being changes in the price or level of that Securities Component and the reinvestment of any dividends or distributions declared and paid on the Securities Component.

The Index Calculation Agent is bound by the Index Rules in determining the Index Level and, except on the occurrence of certain events, as described in Appendix C of the applicable Terms Supplement, has no discretion in applying the Index Rules to determine the Weights to be applied to the Index Components on each Reweighting Date or, subject to limited discretion to base the Index Level on the previous month's Monthly Unique Portfolio for up to two Index Business Days after a Reweighting Date, as set out above under "—Monthly Selection and Reweighting of the Monthly Unique Portfolio," to change the exposure of the Index to the Monthly Unique Portfolio on each Index Business Day between Reweighting Dates.

ANNEX A: INDEX CALCULATIONS

Calculation of Realized Volatility

Realized Volatility is calculated for every Securities Component for monthly reweighting; and for the portfolio of Securities Components for daily rebalancing, all as described in additional detail above. Both calculations are based on the exponential weighted moving average ("EWMA") approach with an EWMA smoothing factor *l* = 0.94. Calculation of the Realized Volatility for each Securities Component proceeds as follows.

Calculation of Realized Volatility of Eligible Portfolios for Monthly Reweighting (Determination of the Monthly Unique Portfolio)

First, the EWMA of 126 daily returns (from 127 consecutive business days) is calculated as:

$$\mu^{(i)} = \frac{1-l}{1-l^{126}} \sum_{1}^{126} l^{126-t} \left(\frac{S_t^{(i)}}{S_{t-1}^{(i)}} - 1 \right)$$

Then the Realized Volatility is calculated as:

$$\sigma^{(i)} = \frac{1-l}{1-l^{126}} \sum_{1}^{126} l^{126-t} \left(\frac{S_t^{(i)}}{S_{t-1}^{(i)}} - 1 - \mu^{(i)} \right)^2$$

Here:

$\mu^{(i)}$ is the EWMA estimate of the Realized Average of the ith Securities Component returns

$\sigma^{(i)}$ is the EWMA estimate of the Realized Volatility of the ith Securities Component returns

l is the EWMA smoothing parameter (0.94)

t and *t* – 1 are the Index Business Day and the Index Business Day immediately preceding day *t*

$S_t^{(i)}$ is the Closing Level of the ith Securities Component on day *t*

$S_{t-1}^{(i)}$ is the Closing Level of the ith Securities Component on day *t* – 1

Calculation of Realized Volatility of the Monthly Unique Portfolio for Daily Rebalancing

The calculation of the Realized Volatility of the Monthly Unique Portfolio for purposes of daily rebalancing is similar to the calculation of the Realized Volatility of Eligible Portfolios for Monthly Reweighting; however, the return on the Monthly Unique Portfolio is used instead of the Securities Component returns. First, for each of 22 Index Business Days' portfolio value is constructed as:

$$P_t = \sum_{1}^{12} w^{(i)} S_t^{(i)}$$

Then EWMA estimates of the portfolio return realized average and realized volatility are calculated as:

$$\mu = \frac{1-l}{1-l^{21}} \sum_{1}^{21} l^{21-t} \left(\frac{P_t}{P_{t-1}} - 1 \right)$$

$$\sigma = \frac{1-l}{1-l^{21}} \sum_{1}^{21} l^{21-t} \left(\frac{P_t}{P_{t-1}} - 1 - \mu \right)^2$$

Where:

t and *t* – 1 are the Index Business Day and the Index Business Day immediately preceding day *t*

P_t is the portfolio value on Index Business Day *t*

μ is the EWMA of the Realized Average of the daily portfolio returns

σ is the EWMA estimate of the Realized Volatility of the daily portfolio returns

l is the EWMA smoothing parameter (0.94)

$w^{(i)}$ is the Weight of the ith Securities Component after the latest Reweighting Date

Calculation of the Index Level

On each Index Business Day from but excluding the immediately preceding Reweighting Date to and including the next following Reweighting Date, the "**Index Level**" for the Index will be determined as follows:

$$I_t = I_{t-1}\left(1 - Fee\frac{d_t - d_{t-1}}{365}\right)\left(\frac{\sum_1^{12}\frac{w^{(i)}S_t^{(i)}}{S_0^{(i)}}}{\sum_1^{12}\frac{w^{(i)}S_{t-1}^{(i)}}{S_0^{(i)}}}A_{t-1} + \left(1 + r_{t-1}^{ON}\frac{d_t - d_{t-1}}{365}\right)(1 - A_{t-1})\right)$$

$$= I_{t-1}\left(1 - Fee\frac{d_t - d_{t-1}}{365}\right)\left(\frac{\sum_1^{12} w^{(i)}\left(1 + ret_t^{(i)}\right)}{\sum_1^{12} w^{(i)}\left(1 + ret_{t-1}^{(i)}\right)}A_{t-1} + \left(1 + r_{t-1}^{ON}\frac{d_t - d_{t-1}}{365}\right)(1 - A_{t-1})\right)$$

Where:

t is the Index Business Day on which the Index Level is being determined

t-1 is the Index Business Day immediately preceding Index Business Day *t*

I_t is the Index Level on Index Business Day *t*

I_{t-1} is the Index Level on the Index Business Day immediately preceding Index Business Day *t*

Fee is the annual fee (2.35%)

$d_t - d_{t-1}$ is the number of days between Index Business Day *t* and the previous Index Business Day *t* – 1

$w^{(i)}$ is the Weight of the ith Securities Component after the latest Reweighting Date

$S_t^{(i)}$ is the closing level of the ith Securities Component on day *t*

$S_0^{(i)}$ is the closing level of the ith Securities Component on the latest Reweighting Date

A_{t-1} is the Daily Exposure Factor on the previous Index Business Day *t* – 1

r_{t-1}^{ON} is the Canadian overnight repo rate average for Index Business Day *t* – 1

$ret_t^{(i)} = (S_t^{(i)} - S_0^{(i)}) / S_0^{(i)}$ is the ith Securities Component return from the latest Reweighting Date to Index Business Day *t*

The Index Level on any Index Business Day given by this formula reflects the following calculation steps:

1. The **Index Fee** on such Index Business Day will be 2.35% multiplied by the number of calendar days from but excluding the immediately preceding Index Business Day to and including such Index Business Day and divided by 365, with the result being multiplied by the Index Level on the previous Index Business Day;
2. The **Index Level Net of the Fee** on the previous Index Business Day will be the Index Level on the previous Index Business Day less the Index Fee on such Index Business Day;
3. The **Securities Component Return** for each Securities Component on each Index Business Day will be the Closing Level of the Securities Component on such Index Business Day less the Closing Level of the Securities Component on the immediately preceding Reweighting Date, divided by the Closing Level of the Securities Component on the immediately preceding Reweighting Date;
4. The **Relative Weighted Securities Component** for each Securities Component on such Index Business Day will be such Securities Component's Securities Component Return on such Index Business Day plus one with such sum being multiplied by the Weight assigned to such Securities Component on the immediately preceding Reweighting Date;
5. The **Gross Relative Securities Component** on such Index Business Day will be the sum of the Relative Weighted Securities Components for all Securities Components on such Index Business Day;
6. The **Gross Securities Component Quotient** on such Index Business Day will be the ratio of the Gross Relative Securities Component on such Index Business Day to the Gross Relative Securities Component on the previous Index Business Day multiplied by the Daily Exposure Factor determined as of the previous Index Business Day;
7. The **Gross Cash Component Return** on such Index Business Day will be the published Canadian Overnight Repo Rate on the previous Index Business Day multiplied by the number of calendar days from but excluding the immediately preceding Business Date to and including such Index Business Day with the result being divided by 365;
8. The **Gross Cash Component Quotient** on such Index Business Day will be (one plus the Gross Cash Component Return) multiplied by (one minus the Daily Exposure Factor); and
9. The **Index Level** on such Index Business Day will be the Index Level Net of the Fee on such Index Business Day multiplied by the sum of (a) the Gross Securities Component Quotient and (b) the Gross Cash Component Quotient on such Index Business Day, rounded to two decimal places.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