

ROYAL BANK OF CANADA

Form FWP

April 03, 2019

Filed Pursuant to Rule 433

Registration Statement No. 333-227001

CoverPageAddedID logoRBCCM1 Capital Markets 0 April 2019 Rules-Based Investment Securities (RBIs)A
New Way to Invest

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

Today's Discussion About Royal Bank of Canada (RBC) & RBC Capital Markets Rules-Based Investment Securities (RBIs) - A New Way to Invest RBC Global Tactical Total Return Index - Risk-Adjusted Global Access RBC Global Tactical Total Return Index - Historical Performance & Analysis Frequently Asked Questions & Considerations RBC Emerging Market Tactical Index - Historical Performance & Analysis RBC Global Tactical Sub-Indices - Historical Performance & Analysis Appendix

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

Part of a Leading Financial Service Provider: Royal Bank of Canada Top 10 One of the largest global banks by market capitalization¹ 11.5% Common Equity Tier 1 Ratio² Aa2 & AA- Credit ratings from Moody's and S&P, respectively³ \$1.3 trillion Total Assets² 16 million Clients served around the globe² 36 Countries of operations² Leading, diversified provider of financial services 10th largest bank globally, 5th largest bank in North America¹ Universal structure with diversified business model² 20-25% of earnings from RBC Capital Markets² Consistently outperforms global peers: 17.6% Return on Equity in 2018² 11% 5-Year Annualized Total Shareholder Return in 2018² By The Numbers Strong Financial Performance Market Capitalization (US\$ Billion)¹ 1 By Market Capitalization, Bloomberg (November 2018)² RBC 2018 Annual Report (November 2018) 3 Based on long-term senior debt ratings, as at November 2018

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

“Our daily focus is on creating valued partnerships with our clients to help achieve their business goals. We are able to do this by maintaining our longstanding record of financial strength and performance. It’s that straightforward.” Doug McGregor, Chairman & CEO, RBC Capital Markets Today. Deep expertise in capital markets, banking, and finance. Recognized by significant corporations, institutional investors, asset managers, private equity firms, and governments around the globe as an innovative, trusted partner. Well-established in the largest, most mature capital markets. Our Presence: Vancouver, Calgary, San Francisco, Los Angeles, Denver, Houston, Chicago, Toronto, Montreal, Atlanta, Boston, New York, Paris, Mumbai, Beijing, Singapore, Sydney, Hong Kong, Frankfurt. Major Trading Hubs: Coverage Offices: Madrid, Tokyo, London, and 33 other cities around the world. An Innovative, Trusted Partner. Top-10 Global Investment Bank. Over 7,300 professionals around the globe. Footprint covers 80% of global investment banking fee pool. Serving 14,700 clients in 115 countries. Operating from 70 offices in 15 countries. By the Numbers. 4 Thomson Reuters Global Investment Banking Review (H1 2018).

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

A Decade of Momentum and Growth Moved up from 16th largest to the 9th largest global investment bank⁷
Ranked as one of the most trusted global investment banks by The Economist Doubled our annual revenue and
increased our global team by 20% (now at more than 7,300 professionals)⁵Grown our debt, equity, and loan
origination businesses, while becoming a recognized corporate finance and M&A advisor Over the last 10
years,RBC Capital Markets... By the Numbers (2008 vs.
2017)^{5,6} 340.3 494.4 3.9 8.1 38.3 83.4 6,090 7,300 +4%Annual +8%Annual +9%Annual +20%Total 16th
Largestin 2008⁷ 9th Largestin 2017⁷ 1.1 2.2 1,433 2,921 +8%Annual +8%Annual 5 RBC Annual Reports
(2008-2017)⁶ Dealogic Analytics (Criteria based on completion date between 1/1/2008 – 12/31/2017) ⁷ Dealogic
Analytics (2008-2017) 2008 2017 2008 2017 2008 2017 2008 2017 2008 2017 2008 2017 2008 2017

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

Quantitative Investment Strategies (“QIS”) at RBC RBC currently offers an extensive range of QIS3 areas of focus: Equities Commodities Multi-AssetRange of fundamental, tactical, technical and allocation strategies, on a variety of timeframes, including intra-dayStrong presence in the Canadian equities and Americas commodities QIS marketIssued over \$4B in notional linked to QIS strategies in AmericasOff-the-shelf strategies, as well as customized to suit client needsOngoing trade-execution, performance reporting and operational support

Liquidity Carry Momentum Volatility Targeting Thematic Factor Driven Tactical Volatility Targeting Fixed Allocation Dynamic Allocation Volatility Targeting COMMODITIES EQUITIES MULTI-ASSET Timing Existing Capabilities

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

A New Risk Management Tool Investment product that potentially provides more efficient access to strategies designed to meet or exceed risk-adjusted benchmark returns Positioned as an alternative to traditional equity and/or fixed income portfolios Differentiated solution for the US market, with some features not available in ETFs and/or mutual funds Key Features Wrapper: Unsecured senior debt obligation of RBC (Note) Unwinds: Redemption daily at indicative note value Maturity: Up to 20 years Linked to: Index developed by RBC Capital Markets designed to try to provide better risk-adjusted returns relative to applicable benchmark- Independently administered, maintained, calculated and verified by an Index Administrator & Calculation Agent Periodic Payments: None; total return investment; investors do not receive any dividends declared by the issuers of the index constituents Taxation 1: Treated as pre-paid cash settled derivatives. Possible capital gain or loss treatment upon sale, redemption or maturity Tracking error: None or minimal to underlying index At maturity: 100% participation in the index for invested funds, with deduction for applicable fees; full principal at risk What are Rules-Based Investment Securities (RBIs)? Linked to a rules-based strategy Alternative to traditional equities & bonds Distinctive features not available in ETFs or mutual funds 1 Taxation: The tax consequences of these RBIs are not certain. No statutory, judicial or administrative authority directly discusses their treatment. Alternative tax treatments are possible. Please see the applicable prospectus (<https://www.sec.gov/Archives/edgar/data/1000275/000114036119006307/formfwp.htm>) for a more complete discussion of the potential tax treatments. Please consult with your tax advisor to discuss your tax consequences.

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

Why consider RBIs now? Systematic Approach to Risk Management Removes emotion from investing Allows clients to focus on long-term investing goals and not near-term market noise Linked to a rules-based strategy (an index) designed to potentially deliver improved risk-adjusted returns Automatically allocates to equities on bullish signals, allocates away from the market and plays defense (cash/fixed income) on bearish signals Transparency Index methodology and notional positions are fully disclosed and easily observable (not a “black box”) The Index Methodology is available to investors upon request, or at the following link https://www.solactive.com/wp-content/uploads/2019/02/Guideline_Global_Tactical_Equity_final.pdf Daily redemptions and monthly performance reporting Efficient Implementation “One-ticket” solution – no need to manually rebalance or execute numerous transactions Treated as pre-paid cash settled derivatives. Possible capital gain or loss treatment upon sale, redemption or maturity | Given the rules, anyone could try to implement a rules-based strategy; but the potential remains for: Emotional bias (i.e. ignoring the rules based on own views) Missed trades (i.e. not properly following the strategy) Difficulty in monitoring positions Higher trading costs than RBC’s institutional trading desk Tracking error to the targeted strategy Customization RBIs’ term and the underlying index strategy can be customized to meet specific investment views, risk tolerances and return expectations

1 Taxation: The tax consequences of these RBIs are not certain. No statutory, judicial or administrative authority directly discusses their treatment. Alternative tax treatments are possible. Please see the applicable prospectus (<https://www.sec.gov/Archives/edgar/data/1000275/000114036119006307/formfwp.htm>) for a more complete discussion of the potential tax treatments. Please consult with your tax advisor to discuss your tax consequences.

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

Index Composition: The RBC Global Tactical Index is comprised of 4 sub-indices, the “Tactical Indices”, which together provide global equity exposure: Rules-Based Strategy Dynamic Allocation: Each sub-index will either be allocated to: Fixed-income: Fed Funds rate or Equity Exposure: Front-month futures contract linked to its respective equity index + Fed Funds Allocation Determination Monthly observations of a tactical trigger (Daily Moving Average (DMA)) Tactical Trigger: On the monthly observation date, if the closing price level (“Spot”) of a Relevant ETF is: Greater than or equal to its 100 DMA (200 DMA for Large Cap US) => Bullish signal => >100% equity exposure for that sub-index Less than its 100 DMA (200 DMA for Large Cap US) => Bearish signal => 100% Fed Funds allocation for that sub-index Rebalancing: Index is rebalanced annually to the Target Weights (see table above) The RBC Global Tactical Equity Total Return Index aims to optimize asset allocation between global equities and fixed-income by observing bullish or bearish trends in the market RBC Global Tactical Equity Total Return Index Global Allocation Sub-Index Name Target Weight Relevant ETF Domestic(60%) RBC Large Cap US Tactical Equity Total Return Index 50% SPY RBC Small Cap US Tactical Equity Total Return Index 10% IWM International(40%) RBC International Developed Tactical Equity Total Return Index 25% EFA RBC Emerging Markets Tactical Equity Total Return Index 15% EEM

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

RBC Global Tactical Index Methodology (Hypothetical Example) SPY200

DMA FedFunds EquityExposure Sub-Index #1U.S. Large CapWeight: 50% IWM100 DMA EFA100

DMA EEM100 DMA Sub-Index #2U.S. Small CapWeight: 10% Sub-Index #3International DevelopedWeight:
25% Sub-Index #4Emerging MarketsWeight: 15% Sub-Index & Weighting Tactical Trigger Monthly

Observation

Dates EquityExposure FedFunds EquityExposure FedFunds FedFunds EquityExposure EquityExposure FedFunds SPYS

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

Index Construction Summary Allocation Determination: Monthly Observations Global
Allocation Sub-Index & Weighting Relevant ETF Tactical Trigger At or above Tactical Trigger Bullish Signal
Equity Exposure Below Tactical Trigger Bearish Signal Fixed-Income Exposure Domestic(60%) RBC Large Cap US
Tactical Equity TR Index 50% SPY 200 DMA S&P 500 Index front-month futures contract2 + Fed Funds Fed
Funds RBC Small Cap US Tactical Equity TR Index 10% IWM 100 DMA Russell 2000 Index front-month
futures contract2 + Fed Funds Fed Funds Int'l(40%) RBC Int'l Developed Tactical Equity TR Index 25% EFA 100
DMA MSCI EAFE Index front-month futures contract2 + Fed Funds Fed Funds RBC Emerging Markets Tactical
Equity TR Index 15% EEM 100 DMA MSCI EM Index front-month futures contract2 + Fed Funds Fed
Funds RBC Global Tactical Equity Total Return Index 2 Futures Contracts: For important details about the futures
contracts used, such as the index levels that they track, their name, exchange they trade on etc., please see the table
describing them at the end of this document on page 55, and refer to the relevant pricing supplement found at
<https://www.sec.gov/Archives/edgar/data/1000275/000114036119006307/formfwf.htm>.

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

Source: Solactive, Bloomberg, RBC Capital Markets Hypothetical Historical Performance Historical Period: December 29, 1995 - March 31, 2019 Any historical analysis presented above is intended solely for illustrative purposes. It relies on historical data and past performance, and does not guarantee future returns. The performance of the RBC Global Tactical Equity Total Return Index shown is hypothetical only. The performance was derived by applying the strategy to the relevant index data. However, there is no actual historical information or an index applying the strategy of the RBC Global Tactical Equity Total Return Index for the indicated period. Performance data does not reflect all the fees that would reduce the performance of a product linked to the RBC Global Tactical Equity Total Return Index. Hypothetical Performance Using Proxies as described on pp. 23, 56-58 Hypothetical Performance of Current Indexes described in Section III (pp. 10-13) 1: See pages 23 and 56-58 for important information regarding the use of Proxies in showing extended hypothetical historical performance.

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

Hypothetical Historical Out-Performance during Market Corrections Historical Period: December 29, 1995 - March 31, 2019 Potential protection against market downturns Dot.com Bubble Drawdown (Mar '00 - Oct '02) MSCI ACWI IMI Net TR -49.2% RBC Global Tactical Equity TR -10.8% Financial Crisis Drawdown (Oct '07 - Mar '09) MSCI ACWI IMI Net TR -58.4% RBC Global Tactical Equity TR -9.1% 1: See pages 23 and 56-58 for important information regarding the use of Proxies in showing extended hypothetical historical performance. Source: Solactive, Bloomberg, RBC Capital Markets Any historical analysis presented above is intended solely for illustrative purposes. It relies on historical data and past performance, and does not guarantee future returns. The performance of the RBC Global Tactical Equity Total Return Index shown is hypothetical only. The performance was derived by applying the strategy to the relevant index data. However, there is no actual historical information or an index applying the strategy of the RBC Global Tactical Equity Total Return Index for the indicated period. Performance data does not reflect all the fees that would reduce the performance of a product linked to the RBC Global Tactical Equity Total Return Index.

Hypothetical Historical Annual Returns Distribution Historical Period: December 29, 1995 - March 31, 2019 Hypothetical outperformance in 11 out of 23 annual periods, including all 7 years where the benchmark return was negative 1: See pages 23 and 56-58 for important information regarding the use of Proxies in showing extended hypothetical historical performance. Source: Solactive, Bloomberg, RBC Capital Markets Any historical analysis presented above is intended solely for illustrative purposes. It relies on historical data and past performance, and does not guarantee future returns. The performance of the RBC Global Tactical Equity Total Return Index shown is hypothetical only. The performance was derived by applying the strategy to the relevant index data. However, there is no actual historical information or an index applying the strategy of the RBC Global Tactical Equity Total Return Index for the indicated period. Performance data does not reflect all the fees that would reduce the performance of a product linked to the RBC Global Tactical Equity Total Return Index.

Hypothetical Historical Difference in Annual Returns Historical Period: December 29, 19951 - March 31, 2019Hypothetical outperformance in 11 out of 23 annual periods, including all 7 years where the benchmark return was negative 1: See pages 23 and 56-58 for important information regarding the use of Proxies in showing extended hypothetical historical performance. Source: Solactive, Bloomberg, RBC Capital Markets Any historical analysis presented above is intended solely for illustrative purposes. It relies on historical data and past performance, and does not guarantee future returns. The performance of the RBC Global Tactical Equity Total Return Index shown is hypothetical only. The performance was derived by applying the strategy to the relevant index data. However, there is no actual historical information or an index applying the strategy of the RBC Global Tactical Equity Total Return Index for the indicated period. Performance data does not reflect all the fees that would reduce the performance of a product linked to the RBC Global Tactical Equity Total Return Index.

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

Hypothetical Historical Performance Metrics Historical Period: December 29, 1995 - March 31, 2019 Potentially improved risk-adjusted returns relative to the benchmark Performance Statistics MSCI ACWI Proxy Net Total Return Index RBC Global Tactical Equity Total Return Index Annualized Returns Since December 29, 1995 6.1% 8.7% 1 Year 2.7% 5.9% 3 Year 11.0% 11.4% 5 Year 6.6% 7.0% 10 Year 11.7% 9.3% 15 Year 6.9% 7.9% Best/Worst Best 3-month Return 45.9% 25.3% Worst 3-month Return -42.4% -13.5% Best 6-month Return 65.2% 34.9% Worst 6-month Return -51.1% -14.2% Best 12-month Return 77.9% 43.2% Worst 12-month Return -51.1% -12.3% Max Drawdown -58.4% -15.2% Period Start 10/31/2007 04/29/2011 Trough Date 03/09/2009 08/08/2011 Period End 05/17/2013 05/03/2013 Duration Under Water 67 months 24 months Longest Drawdown -49.8% -12.7% Period Start 03/27/2000 03/24/2000 Trough Date 10/09/2002 02/13/2003 Period End 01/06/2006 06/17/2003 Duration Under Water 69 months 39 months Additional Statistics Annualized Alpha to Benchmark² N/A 4.7% Beta³ 1 0.43 Sharpe Ratio⁴ 0.31 0.63 Standard Deviation 15.3% 10.6% 1: See pages 23 and 56-58 for important information regarding the use of Proxies in showing extended hypothetical historical performance²: Excess return of the Index once all beta-drive performance has been accounted for³: Expected variability of the Index returns relative to the Benchmark returns⁴: Based on the average of daily excess returns against Fed Funds, annualized with a 252-day factor Source: Solactive, Bloomberg, RBC Capital Markets Any historical analysis presented above is intended solely for illustrative purposes. It relies on historical data and past performance, and does not guarantee future returns. The performance of the RBC Global Tactical Equity Total Return Index shown is hypothetical only. The performance was derived by applying the strategy to the relevant index data. However, there is no actual historical information or an index applying the strategy of the RBC Global Tactical Equity Total Return Index for the indicated period. Performance data does not reflect all the fees that would reduce the performance of a product linked to the RBC Global Tactical Equity Total Return Index.

Hypothetical Monthly Historical Allocation¹ Historical Period: December 29, 1995² - March 31, 2019 Source: Solactive, Bloomberg, RBC Capital Markets Any historical analysis presented above is intended solely for illustrative purposes. It relies on historical data and past performance, and does not guarantee future returns. The allocation was derived by applying the strategy to the relevant index data. However, there is no actual historical information or an index applying the strategy of the RBC Global Tactical Equity Total Return Index. ¹: Allocation shows the hypothetical exposure the Global Tactical Index would have had for each month to the four Tactical Indices. It is meant only to capture whether each sub-index was allocated or not to its relevant Futures for that month, and hence the annual Target Weight (see page 11) for the sub-index is shown. The Global Tactical Index always maintains 100% exposure to the Fed Funds rate. ²: See pages 23 and 56-58 for important information regarding the use of Proxies in showing extended hypothetical monthly historical allocation.³: Average hypothetical allocation based on Target Weights to each Tactical Index over the Historical Period.

Maximum Average Median Minimum Deviation 374% 183% 191% 1% 70% Hypothetical Annual Turnover¹ Historical Period: December 29, 1995 - March 31, 2019 Individual investors may not be likely to complete the transactions required to replicate the Index performance Source: Solactive, Bloomberg, RBC Capital Markets Any historical analysis presented above is intended solely for illustrative purposes. It relies on historical data and past performance, and does not guarantee future returns. The allocation was derived by applying the strategy to the relevant index data. However, there is no actual historical information or an index applying the strategy of the RBC Global Tactical Equity Total Return Index. 1: Annual Turnover measures the total notional transactions measured as a percentage of the Index value performed over the course of a one year period by the Global Tactical Index. This includes changes due to the Annual Rebalance and also those due to the monthly allocation determination done within each of the four Tactical Indices. 2: See pages 23 and 56-58 for important information regarding the use of Proxies in showing extended hypothetical historical annual turnover.

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

RBC Global Tactical Equity Index – Hypothetical Historical Monthly

Returns Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Year 2019 0.2% 0.5% 0.5% 1.3% 2018

Period: December 29, 19951 - March 31, 2019 1: See pages 23 and 56-58 for important information regarding the use of Proxies in showing extended hypothetical historical performance. Source: Solactive, Bloomberg, RBC Capital Markets Any historical analysis presented above is intended solely for illustrative purposes. It relies on historical data and past performance, and does not guarantee future returns. The performance of the RBC Global Tactical Equity Total Return Index shown is hypothetical only. The performance was derived by applying the strategy to the relevant index data. However, there is no actual historical information or an index applying the strategy of the RBC Global Tactical Equity Total Return Index for the indicated period. Performance data does not reflect all the fees that would reduce the performance of a product linked to the RBC Global Tactical Equity Total Return Index.

What is the Proxy Backtest? RBC Capital Markets developed the rules and methodology of the Global Tactical and Tactical Indices described on pages 10-13 with the benefit of hindsight. In other words, the Indices were developed with the benefit of being able to evaluate how the Indices rules would have caused the Indices to perform had it existed during the hypothetical back-tested period. Historical information for the Relevant Futures Contracts, the relevant ETFs, and the relevant Benchmarks is not available for all periods covered by the hypothetical back-tested information. For those periods, the back-tested information is based on the performance of related assets, as described below (in chronological order). Accordingly, the information for these periods may not reflect the performance of the Global Tactical and Tactical Indices had the Relevant Futures Contracts and/or ETFs been available at those times. The term Proxy thus indicates that the Global Tactical and Tactical Indices methodology was applied to the changes in the prices or levels of the related assets of the Relevant Futures, the relevant ETFs, and the relevant Benchmarks for the periods over which historical information the Relevant Futures, and/or the relevant ETFs, and /or the relevant Benchmarks was not available. Relevant Futures Relevant front-month futures contracts available on different trading venues –refer to Appendix II for more details Relevant net total return indices –refer to Appendix II for more details Relevant net total return versions of the Investable Market Indices (IMI) –refer to Appendix II for more details ETFs Relevant price return indices –refer to Appendix III for more details Benchmarks Relevant net total return indices –refer to Appendix IV for more details Relevant net total return versions of the Investable Market Indices (IMI) –refer to Appendix IV for more details

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

What are some differences between RBIs and ETFs? Feature RBIs ETFs Liquidity Daily, through the redemption provisions included in the terms of the RBIs Daily on exchange, subject to market Recourse Issuer credit Value of ETF shares depends on value of the securities that it holds Principal Subject to market and issuer credit risk Typically subject to market risk only Tracking error Typically none or minimal to the underlying index, subject to the fees embedded in the RBI Low Tax Treated as pre-paid cash settled derivatives. Possible capital gain or loss treatment upon sale, redemption or maturity. See the relevant offering documents for a more detailed discussion of potential alternative tax treatment. Investors should consult their tax advisors to determine their own tax treatment of the RBIs¹ Potential exposure to capital gains and losses of portfolio, although creation/redemption mechanism works to minimize this. Dividends and interest income pass through to shareholders Transparency Performance of RBIs is based on the return of the underlying index, minus applicable fees and costs. The underlying index methodology, including the index constituents, is fully transparent and disclosed Generally depends on the returns of a portfolio of securities, which are fully disclosed Investment Strategy Linked to the performance of a rules-based index: the RBC Global Tactical Equity Total Return Index or the RBC Emerging Market Tactical Equity Total Return Index Passive, active, and quantitative strategies are available ¹ Taxation: The tax consequences of these RBIs are not certain. No statutory, judicial or administrative authority directly discusses their treatment. Alternative tax treatments are possible. Please see the applicable prospectus (<https://www.sec.gov/Archives/edgar/data/1000275/000114036119006307/formfwp.htm>) for a more complete discussion of the potential tax treatments. Please consult with your tax advisor to discuss your tax consequences.

Why are futures used for the equity exposure as opposed to the actual index? Most efficient way to gain access to the index
Other access vehicles: ETFs: buying and selling ETFs could be treated differently from a tax perspective (see previous page)
Buying basket of stocks: operationally inefficient and costly to maintain
Options: pricing would not accurately reflect the performance of the strategy in real-time
Why do we observe the tactical trigger ahead of the 3rd Friday of every month? The futures contracts used all expire on the 3rd Friday of each calendar quarter (March, June, September and December)
Market participants typically “roll” from the expiring future into the next expiring future in the week leading up to this expiry
Liquidity is typically highest during this period; therefore, it makes sense to match those windows to help reduce any potential trading and transaction costs of implementing the strategy
Why do we use the 200 DMA for US Large Cap and 100 DMA for the other equity exposures? 200 DMA is typically more appropriate when determining trends in less-volatile indexes, which could be expected to move up or down more slowly. In that case, such indices will stay close to their moving averages. A shorter DMA would increase the risk of false signals. Using a longer-term moving average will include values from further back in time, hence increasing the distance of spot to the moving average, and potentially reducing the risk of false signals
Conversely, a 100 DMA is typically more appropriate when an index moves more quickly, as the distance to its moving average could be high. If that were the case, with a longer DMA, there is a higher risk that large moves are required before the moving average can generate any signal. A shorter moving average would mitigate this by reacting more quickly

RBC Global Tactical Equity Total Return Index Construction Questions

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

Considerations – How is a Moving Average Calculated? What difference does the length make? Example Calculation of MA – Underlying Up 1% Each Day

Closing Price	5 Day MA	10 Day MA
Day 1 100.00		
Day 2 101.00		
Day 3 102.01		
Day 4 103.03		
Day 5 104.06	102.02	
Day 6 105.10	103.04	
Day 7 106.15	104.07	
Day 8 107.21	105.11	
Day 9 108.29	106.16	
Day 10 109.37	107.22	104.62
Day 11 110.46	108.30	105.67
Day 12 111.57	109.38	106.73
Day 13 112.68	110.47	107.79
Day 14 113.81	111.58	108.87
Day 15 114.95	112.69	109.96
Day 16 116.10	113.82	111.06
Day 17 117.26	114.96	112.17
Day 18 118.43	116.11	113.29
Day 19 119.61	117.27	114.42
Day 20 120.81	118.44	115.57

To calculate the moving average (“MA”), add the values for each day and divide by the number of days, e.g. in the table add the values for Day 1-5 (100 +101 +102.01 +103.03 +104.06). This adds to 510.1. Now divide by the number of days, 5, to obtain the average of 102.02. We say “moving” average because on each new day we will drop the oldest Spot and include the latest Spot in its calculation. Hence, the average of the Spot “moves”. We refer to “Closing Price” and “Spot” interchangeably. When the Closing Price is strictly rising (table to the left), the longer MA will always be lower than the shorter MA. This is because, in such a scenario, the longer MA still takes into account the lower, earlier values. E.g. the value for the 10 Day MA (“10DMA”) can first be calculated from Day 10 onwards. Its calculation includes the Period 1-5 values, which are the lowest, whereas the 5DMA ignores these, averaging only the Day 6-10 Closing Price values. When the Spot is strictly falling (table to the right), the opposite holds true – the longer MA will be strictly higher than the shorter MA.

Example Calculation of MA – Underlying Down 1% Each Day

Closing Price	5 Day MA	10 Day MA
Day 1 100.00		
Day 2 99.00		
Day 3 98.01		
Day 4 97.03		
Day 5 96.06	98.02	
Day 6 95.10	97.04	
Day 7 94.15	96.07	
Day 8 93.21	95.11	
Day 9 92.27	94.16	
Day 10 91.35	93.22	95.62
Day 11 90.44	92.28	94.66
Day 12 89.53	91.36	93.72
Day 13 88.64	90.45	92.78
Day 14 87.75	89.54	91.85
Day 15 86.87	88.65	90.93
Day 16 86.01	87.76	90.02
Day 17 85.15	86.88	89.12
Day 18 84.29	86.01	88.23
Day 19 83.45	85.15	87.35
Day 20 82.62	84.30	86.48

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

Considerations – Why use different MA lengths? Example Calculation of MA – Underlying Up 1% Each

Day	Spot	5 Day MA	10 Day MA	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
1	100.00			100.00	101.00	102.01	103.03						
2	104.06	102.02		105.10	103.04	106.15	104.07	107.21	105.11				
3	108.29	106.16	103.37	107.22	104.62								

% Drop Required -2% -4.5% Consider two assets: one that rises 1% each Day (Slow), the other rises 2% (Fast). For the Spots to fall below their respective MAs, the loss on Fast would need to be twice as great as the loss on Slow. For a faster moving index or market, it can thus be more prudent to choose a shorter MA, as it is going to require less of a loss before it triggers. False signals and whipsawing (see page 30) are major risks when using MAs. A shorter MA may help limit the losses from a false signal. A shorter MA would trigger more often than a longer one, but would be expected to show smaller gains or losses each time it does trigger (assuming it's applied to the same market). Example Calculation of MA – Underlying Up 2% Each

Day	Spot	5 Day MA	10 Day MA	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
1	100.00			100.00	102.00	104.04	106.12						
2	108.24	104.08		110.41	106.16	112.62	108.29	114.87	110.45				
3	117.17	112.66	109.51	114.91	109.50								

% Drop Required -4% -9.1% Example on S&P 500 over historical period from December 31, 2007 to December 31, 2011
 100D MA vs 200D MA 100DMA triggers back into market;200DMA stays out 100DMA gets back into market earlier;200DMA stays out longer 100DMA gets false signal;200DMA steers clear 100DMA whipsaws;200DMA does not Source: Bloomberg, RBC Capital Markets

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

Risk Considerations – False Moving Average Signals Consider two ways of observing the tactical trigger used in the RBC Emerging Market Tactical Equity Total Return Index: one using the MXEF Index and the other using the EEM ETF, along with their respective 100-day Moving Average On June 16, 2008, the tactical trigger is observed and the allocation is made on June 18, 2008 An investor would not allocate to equity using the trigger on the MXEF Index, but would be fully exposed to equity using the trigger on the EEM ETF, until the next allocation date (July 16, 2008) If the observation date had been three calendar days earlier (on June 13, 2008), an investor would not have been exposed to equity using either method The performance in each scenario is displayed in the table below Historical Period: April 2, 2007 - December 31, 2009 For illustration purposes only – graph not to scale Historical Period: May 30, 2008 - July 21, 2008 For illustration purposes only – graph not to scale May 30, 2008 – July 21, 2008

Out	In	Out	In	Out	In
Out	Out	Observation Date	06/16/2008	06/13/2008	Allocation Date
07/16/2008	07/15/2008	EM Futures contract	-9.3%	- Fed Funds Rate	0.16%
0.16%	0.16%	Signal on MXEF	OUT	OUT	Return using Trigger on MXEF Index
0.16%	0.16%	Signal on EEM	IN	OUT	Return using Trigger on EEM ETF
-9.1%	0.16%	Source: Bloomberg, RBC Capital Markets			

Considerations – Negative Return Asymmetry versus “Whipsawing” What is the trade-off I make when using this strategy? On the plus side... The Tactical Indices attempt to exit the equity markets and switch to cash, thus avoiding the worst negative returns. Due to the way negative returns impact overall compounded returns, this can be a good long-term strategy. This is because negative returns affect compound returns more strongly than positive ones (“asymmetry”), as discussed below. Depending on the magnitude of the loss avoided, this could make a substantial difference to investment returns. On the minus side... False signals. The signals used to identify when to enter and exit equity exposure can be “false”. Meaning the signals could cause the index to exit the equity exposure, yet equities rise thereafter; and they could also cause the index to re-enter the market when the equity market subsequently falls. When this happens in sequence, the index “buys high and sells low” or gets “whipsawed”, which causes it to underperform versus maintaining the equity or cash exposure throughout. On the minus side... Lagged signals. The moving average signal will react with a lag – by construction, it will only be able to signal to exit market exposure when markets have already fallen and it can only signal to re-enter market exposure when it has already started to rise. The rise and fall required to trigger the signal could be substantial, which in turn could negatively impact investment returns. Overall? When markets exhibit clear and prolonged periods moving in alternate directions (up then down, or vice-versa) this strategy would be expected to work best. When markets move sideways with large swings in either direction, causing not only many false signals, but large ones, the strategy would be expected to work the worst and underperform a buy and hold alternative the most. Over a full-cycle, outperformance is possible (more likely if large down periods are included). Outperformance is likely in a down market only and unlikely in an up market only.

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

Considerations – Return Asymmetry Hypothetical Illustrations Consider the 7 Scenarios below

In Scenario 1, an investment falls by 5%. A \$100 initial investment would now be worth \$95. To recover that loss, the investment must rise by \$5 or in percentage returns by $\$5/\95 or just over 5%

In Scenario 3, after a \$20 or 20% loss to a value of \$80, the required return to get back to \$100 would be $\$20/\80 , or 25%

To recover from a 50% loss, the required return is 100%, or a doubling

By the time a 75% loss is arrived at, even a small additional loss can make a very large difference in required recovery returns: losing \$75 of the initial \$100 requires a fourfold increase to recover; losing just another \$5 (or \$80 in total), requires a fivefold increase to recover

Should such losses materialize in practice, it could take a very long time to recover. Avoiding half of the loss of 50% and suffering only 25% loss would mean an increase of only one third is required to recover, versus a doubling to recover

FedFunds Equity Considerations – Underperformance Potential (“Whipsaw”) Underperformance Scenario #2Rising equity market FedFunds Equity Equity FedFunds Equity Underperformance Scenario #1Declining equity market Underperformance Scenario #3Declining & Rising equity market

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

Other Risks to Consider Credit Risk RBIs are senior unsecured debt obligations of the issuer, Royal Bank of Canada. All payments at maturity, if any, are subject to the credit of the issuer.

Federal Funds Rate The reference rate used is the Federal Funds rate, which may be low and in theory even negative. Thus when the index is allocated to the Federal Funds rate, the scope for gains may be very limited, particularly when the effect of any Index Adjustment Factor applied to the RBIs is included.

No Active Management The index is completely rules-based. Hence, if the strategy underperforms, even if it underperforms significantly, no attempts will be made to change the rules to try to address such underperformance.

Equity Risks The index, via the respective futures, exposes an investor to small capitalization stock risks, emerging market stock risks and foreign securities market stock risks.

Index Specific Risks The index uses moving averages which exposes investors to the risk of the chosen parameters not working well, or at all, going forward. These risks, some of which have been discussed previously, can be associated with, but are not necessarily limited to: (i) the choice of when the signal is observed versus an alternative choice; (ii) the length of the moving average chosen versus another choice; (iii) the frequency at which the signal is observed and acted upon versus alternatives etc. The index may not perform well relative to alternative choices of investment.

The hypothetical performance information that RBC has provided in this document is based on criteria that has been applied retroactively with the benefit of hindsight, and these criteria cannot account for all financial risk that may affect the actual performance of a product linked to the index. Please refer to the relevant pricing supplement (available at <https://www.sec.gov/Archives/edgar/data/1000275/000114036119006307/formfwp.htm>) for a more thorough discussion of risks associated with RBIs. You should only invest in securities linked to the index after carefully reviewing the risk factors set forth in that document.

Hypothetical Historical Performance Historical Period: December 29, 19951 - March 31, 2019 Average Allocation to Emerging Markets: 57%2 Hypothetical Performance Using Proxies Hypothetical Performance of Current Indexes described in Section III (pp. 10-13) 1: See pages 23 and 56-58 for important information regarding the use of Proxies in showing extended hypothetical historical performance. 2: The percentage of months that the Index was allocated to the relevant Futures over the Historical Period. Source: Solactive, Bloomberg, RBC Capital Markets Any historical analysis presented above is intended solely for illustrative purposes. It relies on historical data and past performance, and does not guarantee future returns. The performance of the RBC Emerging Market Tactical Equity Total Return Index shown is hypothetical only. The performance was derived by applying the strategy to the relevant index data. However, there is no actual historical information or an index applying the strategy of the RBC Emerging Market Tactical Equity Total Return Index for the indicated period. Performance data does not reflect all the fees that would reduce the performance of a product linked to the RBC Emerging Market Tactical Equity Total Return Index.

Allocation to Futures Contracts

Hypothetical Historical Annual Returns Distribution Historical Period: December 29, 1995 - March 31, 2019 Hypothetical outperformance in 9 of the 23 annual periods, including 9 out of 11 years where the benchmark return was negative 1: See pages 23 and 56-58 for important information regarding the use of Proxies in showing extended hypothetical historical performance. Source: Solactive, Bloomberg, RBC Capital Markets Any historical analysis presented above is intended solely for illustrative purposes. It relies on historical data and past performance, and does not guarantee future returns. The performance of the RBC Emerging Market Tactical Equity Total Return Index shown is hypothetical only. The performance was derived by applying the strategy to the relevant index data. However, there is no actual historical information or an index applying the strategy of the RBC Emerging Market Tactical Equity Total Return Index for the indicated period. Performance data does not reflect all the fees that would reduce the performance of a product linked to the RBC Emerging Market Tactical Equity Total Return Index.

Hypothetical Historical Difference in Annual Returns Historical Period: December 29, 1995 - March 31, 2019
Hypothetical outperformance in 9 of the 23 annual periods, including 9 out of 11 years where the benchmark return was negative 1: See pages 23 and 56-58 for important information regarding the use of Proxies in showing extended hypothetical historical performance. Source: Solactive, Bloomberg, RBC Capital Markets Any historical analysis presented above is intended solely for illustrative purposes. It relies on historical data and past performance, and does not guarantee future returns. The performance of the RBC Emerging Market Tactical Equity Total Return Index shown is hypothetical only. The performance was derived by applying the strategy to the relevant index data. However, there is no actual historical information or an index applying the strategy of the RBC Emerging Market Tactical Equity Total Return Index for the indicated period. Performance data does not reflect all the fees that would reduce the performance of a product linked to the RBC Emerging Market Tactical Equity Total Return Index.

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

Performance Statistics MSCI EM Proxy Net Total Return Index RBC EM Tactical Equity Total Return Index Annualized Returns Since December 29, 1995 5.2% 8.9% 1 Year -7.3% 3.6% 3 Year 11.7% 12.9% 5 Year 3.9% 7.5% 10 Year 8.5% 7.4% 15 Year 8.1% 9.2% Best/Worst Best 3-month Return 68.9% 42.7% Worst 3-month Return -54.3% -22.8% Best 6-month Return 84.2% 65.5% Worst 6-month Return -61.8% -21.2% Best 12-month Return 113.5% 84.5% Worst 12-month Return -63.0% -27.6% Max Drawdown -65.2% -31.9% Period Start 10/29/2007 07/08/1997 Trough Date 10/27/2008 01/25/1999 Period End 07/19/2017 07/02/1999 Duration Under Water 117 months 24 months Longest Drawdown -65.2% -23.5% Period Start 10/29/2007 01/11/2010 Trough Date 10/27/2008 05/19/2016 Period End 07/19/2017 07/14/2017 Duration Under Water 117 months 90 months Additional Statistics Annualized Alpha to Benchmark² N/A 5.5% Beta³ 1 0.40 Sharpe Ratio⁴ 0.24 0.52 Standard Deviation 18.8% 14.2% Hypothetical Historical Performance Metrics Historical Period: December 29, 1995¹ - March 31, 2019 Potentially improved risk-adjusted returns relative to the benchmark Any historical analysis presented above is intended solely for illustrative purposes. It relies on historical data and past performance, and does not guarantee future returns. The performance of the RBC Emerging Market Tactical Equity Total Return Index shown is hypothetical only. The performance was derived by applying the strategy to the relevant index data. However, there is no actual historical information or an index applying the strategy of the RBC Emerging Market Tactical Equity Total Return Index for the indicated period. Performance data does not reflect all the fees that would reduce the performance of a product linked to the RBC Emerging Market Tactical Equity Total Return Index. ¹: See pages 23 and 56-58 for important information regarding the use of Proxies in showing extended hypothetical historical performance²: Excess return of the Index once all beta-driven performance has been accounted for³: Expected variability of the Index returns relative to the Benchmark returns⁴: Based on the average of daily excess returns against Fed Funds, annualized with a 252-day factor Source: Solactive, Bloomberg, RBC Capital Markets

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Year 2019 0.2% 1.0% 1.2% 2.4% 2018 8.2% -5

Emerging Market Tactical Equity Index – Hypothetical Historical Monthly Returns – Historical Period: December 29, 19951 - March 31, 2019 1: See pages 23 and 56-58 for important information regarding the use of Proxies in showing extended hypothetical historical performance. Source: Solactive, Bloomberg, RBC Capital Markets Any historical analysis presented above is intended solely for illustrative purposes. It relies on historical data and past performance, and does not guarantee future returns. The performance of the RBC Emerging Market Tactical Equity Total Return Index shown is hypothetical only. The performance was derived by applying the strategy to the relevant index data. However, there is no actual historical information or an index applying the strategy of the RBC Emerging Market Tactical Equity Total Return Index for the indicated period. Performance data does not reflect all the fees that would reduce the performance of a product linked to the RBC Emerging Market Tactical Equity Total Return Index.

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

RBC Tactical Equity Total Return Sub-Indices – Hypothetical Historical Performance Historical Period: December 29, 1995 - March 31, 2019 1: See pages 23 and 56-58 for important information regarding the use of Proxies in showing extended hypothetical historical performance. Source: Solactive, Bloomberg, RBC Capital Markets Any historical analysis presented above is intended solely for illustrative purposes. It relies on historical data and past performance, and does not guarantee future returns. The performance of the RBC Global Tactical Equity Total Return Index and the Tactical Indices (together the “Indices”) shown is hypothetical only. The performance was derived by applying the strategy to the relevant index data. However, there is no actual historical information or an index applying the strategy of the Indices for the indicated period. Performance data does not reflect all the fees that would reduce the performance of a product linked to the Indices.

RBC Large Cap US Tactical Equity Index – Hypothetical Historical Performance Historical Period: December 29, 19951 - March 31, 2019Average Allocation to Large Cap US: 72%2 Source: Solactive, Bloomberg, RBC Capital Markets Any historical analysis presented above is intended solely for illustrative purposes. It relies on historical data and past performance, and does not guarantee future returns. The performance of the RBC Large Cap US Tactical Equity Total Return Index shown is hypothetical only. The performance was derived by applying the strategy to the relevant index data. However, there is no actual historical information or an index applying the strategy of the RBC Large Cap US Tactical Equity Total Return Index for the indicated period. Performance data does not reflect all the fees that would reduce the performance of a product linked to the RBC Large Cap US Tactical Equity Total Return Index. Allocation to Futures Contracts 1: See pages 23 and 56-58 for important information regarding the use of Proxies in showing extended hypothetical historical performance. 2: The percentage of months that the Index was allocated to the relevant Futures over the Historical Period.

RBC Large Cap US Tactical Equity Index – Hypothetical Historical Annual Returns Distribution Historical Period: December 29, 1995 - March 31, 2019 Hypothetical outperformance in 6 of the 23 annual periods, including all 5 years where benchmark return was negative 1: See pages 23 and 56-58 for important information regarding the use of Proxies in showing extended hypothetical historical performance. Source: Solactive, Bloomberg, RBC Capital Markets Any historical analysis presented above is intended solely for illustrative purposes. It relies on historical data and past performance, and does not guarantee future returns. The performance of the RBC Large Cap US Tactical Equity Total Return Index shown is hypothetical only. The performance was derived by applying the strategy to the relevant index data. However, there is no actual historical information or an index applying the strategy of the RBC Large Cap US Tactical Equity Total Return Index for the indicated period. Performance data does not reflect all the fees that would reduce the performance of a product linked to the RBC Large Cap US Tactical Equity Total Return Index.

RBC Large Cap US Tactical Equity Index – Hypothetical Historical Difference in Annual Returns Historical Period: December 29, 1995 - March 31, 2019 Hypothetical outperformance in 6 of the 23 annual periods, including all 5 years where benchmark return was negative 1: See pages 23 and 56-58 for important information regarding the use of Proxies in showing extended hypothetical historical performance. Source: Solactive, Bloomberg, RBC Capital Markets Any historical analysis presented above is intended solely for illustrative purposes. It relies on historical data and past performance, and does not guarantee future returns. The performance of the RBC Large Cap US Tactical Equity Total Return Index shown is hypothetical only. The performance was derived by applying the strategy to the relevant index data. However, there is no actual historical information or an index applying the strategy of the RBC Large Cap US Tactical Equity Total Return Index for the indicated period. Performance data does not reflect all the fees that would reduce the performance of a product linked to the RBC Large Cap US Tactical Equity Total Return Index.

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

Performance Statistics S&P 500 Total Return Index RBC Large Cap US Tactical Equity Total Return
Index Annualized Returns Since December 29, 1995 8.8% 9.8% 1 Year 9.5% 9.1% 3 Year 13.6% 13.1% 5
Year 11.1% 7.9% 10 Year 15.7% 10.6% 15 Year 8.6% 8.1% Best/Worst Best 3-month
Return 40.2% 25.6% Worst 3-month Return -40.6% -16.6% Best 6-month Return 54.6% 31.8% Worst 6-month
Return -46.1% -15.2% Best 12-month Return 72.3% 51.4% Worst 12-month Return -47.5% -14.0% Max
Drawdown -55.3% -19.6% Period Start 10/09/2007 07/17/1998 Trough Date 03/09/2009 08/31/1998 Period
End 04/02/2012 03/08/1999 Duration Under Water 54 months 8 months Longest
Drawdown -47.4% -13.1% Period Start 09/01/2000 03/24/2000 Trough Date 10/09/2002 10/12/2000 Period
End 10/23/2006 05/30/2003 Duration Under Water 74 months 38 months Additional Statistics Annualized
Alpha to Benchmark² N/A 4.5% Beta³ 1 0.44 Sharpe Ratio⁴ 0.43 0.63 Standard
Deviation 18.8% 12.8% RBC Large Cap US Tactical Equity Index – Hypothetical Historical Performance
Metrics Historical Period: December 29, 1995¹ - March 31, 2019 Potentially improved risk-adjusted returns relative
to the benchmark Any historical analysis presented above is intended solely for illustrative purposes. It relies on
historical data and past performance, and does not guarantee future returns. The performance of the RBC Large Cap
US Tactical Equity Total Return Index shown is hypothetical only. The performance was derived by applying the
strategy to the relevant index data. However, there is no actual historical information or an index applying the strategy
of the RBC Large Cap US Tactical Equity Total Return Index for the indicated period. Performance data does not
reflect all the fees that would reduce the performance of a product linked to the RBC Large Cap US Tactical Equity
Total Return Index. 1: See pages 23 and 56-58 for important information regarding the use of Proxies in showing
extended hypothetical historical performance²: Excess return of the Index once all beta-driven performance has been
accounted for³: Expected variability of the Index returns relative to the Benchmark returns⁴: Based on the average of
daily excess returns against Fed Funds, annualized with a 252-day factor Source: Solactive, Bloomberg, RBC Capital
Markets

RBC Small Cap US Tactical Equity Index – Hypothetical Historical Performance Historical Period: December 29, 19951 - March 31, 2019 Average Allocation to Small Cap US: 66%2 Hypothetical Performance Using Proxies Hypothetical Performance of Current Indexes described in Section III (pp. 10-13) Source: Solactive, Bloomberg, RBC Capital Markets Any historical analysis presented above is intended solely for illustrative purposes. It relies on historical data and past performance, and does not guarantee future returns. The performance of the RBC Small Cap US Tactical Equity Total Return Index shown is hypothetical only. The performance was derived by applying the strategy to the relevant index data. However, there is no actual historical information or an index applying the strategy of the RBC Small Cap US Tactical Equity Total Return Index for the indicated period. Performance data does not reflect all the fees that would reduce the performance of a product linked to the RBC Small Cap US Tactical Equity Total Return Index. Allocation to Futures Contracts 1: See pages 23 and 56-58 for important information regarding the use of Proxies in showing extended hypothetical historical performance. 2: The percentage of months that the Index was allocated to the relevant Futures over the Historical Period.

RBC Small Cap US Tactical Equity Index – Hypothetical Historical Annual Returns Distribution Historical Period: December 29, 1995 - March 31, 2019 Hypothetical outperformance in 9 of the 23 annual periods, including 5 of 8 years where benchmark return was negative 1: See pages 23 and 56-58 for important information regarding the use of Proxies in showing extended hypothetical historical performance. Source: Solactive, Bloomberg, RBC Capital Markets Any historical analysis presented above is intended solely for illustrative purposes. It relies on historical data and past performance, and does not guarantee future returns. The performance of the RBC Small Cap US Tactical Equity Total Return Index shown is hypothetical only. The performance was derived by applying the strategy to the relevant index data. However, there is no actual historical information or an index applying the strategy of the RBC Small Cap US Tactical Equity Total Return Index for the indicated period. Performance data does not reflect all the fees that would reduce the performance of a product linked to the RBC Small Cap US Tactical Equity Total Return Index.

RBC Small Cap US Tactical Equity Index – Hypothetical Historical Annual Returns Distribution Historical Period: December 29, 1995 - March 31, 2019 Hypothetical outperformance in 9 of the 23 annual periods, including 5 of 9 years where benchmark return was negative 1: See pages 23 and 56-58 for important information regarding the use of Proxies in showing extended hypothetical historical performance. Source: Solactive, Bloomberg, RBC Capital Markets Any historical analysis presented above is intended solely for illustrative purposes. It relies on historical data and past performance, and does not guarantee future returns. The performance of the RBC Small Cap US Tactical Equity Total Return Index shown is hypothetical only. The performance was derived by applying the strategy to the relevant index data. However, there is no actual historical information or an index applying the strategy of the RBC Small Cap US Tactical Equity Total Return Index for the indicated period. Performance data does not reflect all the fees that would reduce the performance of a product linked to the RBC Small Cap US Tactical Equity Total Return Index.

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

Performance Statistics Russell 2000 Total Return Index RBC Small Cap US Tactical Equity Total Return Index Annualized Returns Since December 29, 1995 8.5% 6.3% 1 Year 2.0% 5.5% 3 Year 13.1% 11.2% 5 Year 7.4% 6.4% 10 Year 15.2% 11.4% 15 Year 8.1% 6.7% Best/Worst Best 3-month Return 54.5% 31.5% Worst 3-month Return -47.1% -27.5% Best 6-month Return 72.2% 42.1% Worst 6-month Return -51.6% -28.2% Best 12-month Return 97.9% 62.4% Worst 12-month Return -48.0% -32.3% Max Drawdown -58.9% -42.5% Period Start 07/13/2007 03/09/2000 Trough Date 03/09/2009 02/13/2003 Period End 02/11/2011 01/10/2006 Duration Under Water 43 months 70 months Longest Drawdown -44.1% -42.5% Period Start 03/09/2000 03/09/2000 Trough Date 10/09/2002 02/13/2003 Period End 01/08/2004 01/10/2006 Duration Under Water 46 months 70 months Additional Statistics Annualized Alpha to Benchmark² N/A 1.2% Beta³ 1 0.45 Sharpe Ratio⁴ 0.38 0.32 Standard Deviation 22.5% 15.5% RBC Small Cap US Tactical Equity Index – Hypothetical Historical Performance Metrics Historical Period: December 29, 1995¹ - March 31, 2019 Potentially improved risk-adjusted returns relative to the benchmark Any historical analysis presented above is intended solely for illustrative purposes. It relies on historical data and past performance, and does not guarantee future returns. The performance of the RBC Small Cap US Tactical Equity Total Return Index shown is hypothetical only. The performance was derived by applying the strategy to the relevant index data. However, there is no actual historical information or an index applying the strategy of the RBC Small Cap US Tactical Equity Total Return Index for the indicated period. Performance data does not reflect all the fees that would reduce the performance of a product linked to the RBC Small Cap US Tactical Equity Total Return Index. 1: See pages 23 and 56-58 for important information regarding the use of Proxies in showing extended hypothetical historical performance²: Excess return of the Index once all beta-driven performance has been accounted for³: Expected variability of the Index returns relative to the Benchmark returns⁴: Based on the average of daily excess returns against Fed Funds, annualized with a 252-day factor Source: Solactive, Bloomberg, RBC Capital Markets

RBC Int'l Developed Tactical Equity Index – Hypothetical Historical Performance Historical Period: December 29, 19951 - March 31, 2019 Average Allocation to International Developed Markets: 58%² Hypothetical Performance Using Proxies Hypothetical Performance of Current Indexes described in Section III (pp. 10-13) Source: Solactive, Bloomberg, RBC Capital Markets Any historical analysis presented above is intended solely for illustrative purposes. It relies on historical data and past performance, and does not guarantee future returns. The performance of the RBC International Developed Tactical Equity Total Return Index shown is hypothetical only. The performance was derived by applying the strategy to the relevant index data. However, there is no actual historical information or an index applying the strategy of the RBC International Developed Tactical Equity Total Return Index for the indicated period. Performance data does not reflect all the fees that would reduce the performance of a product linked to the RBC International Developed Tactical Equity Total Return Index. Allocation to Futures Contracts 1: See pages 23 and 56-58 for important information regarding the use of Proxies in showing extended hypothetical historical performance. 2: The percentage of months that the Index was allocated to the relevant Futures over the Historical Period.

RBC Int'l Developed Tactical Equity Index – Hypothetical Historical Annual Returns Distribution Historical Period: December 29, 1995 - March 31, 2019 Hypothetical outperformance in 10 of the 23 annual periods, including all 9 years where benchmark return was negative 1: See pages 23 and 56-58 for important information regarding the use of Proxies in showing extended hypothetical historical performance. Source: Solactive, Bloomberg, RBC Capital Markets Any historical analysis presented above is intended solely for illustrative purposes. It relies on historical data and past performance, and does not guarantee future returns. The performance of the RBC International Developed Tactical Equity Total Return Index shown is hypothetical only. The performance was derived by applying the strategy to the relevant index data. However, there is no actual historical information or an index applying the strategy of the RBC International Developed Tactical Equity Total Return Index for the indicated period. Performance data does not reflect all the fees that would reduce the performance of a product linked to the RBC International Developed Tactical Equity Total Return Index.

RBC Int'l Developed Tactical Equity Index – Hypothetical Historical Annual Returns Distribution Historical Period: December 29, 1995 - March 31, 2019 Hypothetical outperformance in 10 of the 23 annual periods, including all 9 years where benchmark return was negative 1: See pages 23 and 56-58 for important information regarding the use of Proxies in showing extended hypothetical historical performance. Source: Solactive, Bloomberg, RBC Capital Markets Any historical analysis presented above is intended solely for illustrative purposes. It relies on historical data and past performance, and does not guarantee future returns. The performance of the RBC International Developed Tactical Equity Total Return Index shown is hypothetical only. The performance was derived by applying the strategy to the relevant index data. However, there is no actual historical information or an index applying the strategy of the RBC International Developed Tactical Equity Total Return Index for the indicated period. Performance data does not reflect all the fees that would reduce the performance of a product linked to the RBC International Developed Tactical Equity Total Return Index.

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

Performance Statistics MSCI EAFE Proxy Net Total Return Index RBC Int'l Developed Tactical Equity Total Return Index Annualized Returns Since December 29, 1995 4.4% 6.1% 1 Year -3.5% 1.3% 3 Year 7.8% 6.6% 5 Year 2.5% 4.6% 10 Year 8.7% 5.8% 15 Year 5.2% 5.9% Best/Worst Best 3-month Return 47.1% 26.2% Worst 3-month Return -41.2% -15.6% Best 6-month Return 71.9% 48.4% Worst 6-month Return -51.5% -20.2% Best 12-month Return 75.7% 46.2% Worst 12-month Return -53.1% -17.0% Max Drawdown -60.4% -28.9% Period Start 10/31/2007 01/14/2010 Trough Date 03/09/2009 08/30/2012 Period End 06/02/2014 05/29/2014 Duration Under Water 79 months 52 months Longest Drawdown -60.4% -28.9% Period Start 10/31/2007 01/14/2010 Trough Date 03/09/2009 08/30/2012 Period End 06/02/2014 05/29/2014 Duration Under Water 79 months 52 months Additional Statistics Annualized Alpha to Benchmark² N/A 3.2% Beta³ 1 0.32 Sharpe Ratio⁴ 0.20 0.37 Standard Deviation 17.1% 11.3% RBC Int'l Developed Tactical Equity Index – Hypothetical Historical Performance Metrics Historical Period: December 29, 1995¹ - March 31, 2019 Potentially improved risk-adjusted returns relative to the benchmark Any historical analysis presented above is intended solely for illustrative purposes. It relies on historical data and past performance, and does not guarantee future returns. The performance of the RBC International Developed Tactical Equity Total Return Index shown is hypothetical only. The performance was derived by applying the strategy to the relevant index data. However, there is no actual historical information or an index applying the strategy of the RBC International Developed Tactical Equity Total Return Index for the indicated period. Performance data does not reflect all the fees that would reduce the performance of a product linked to the RBC International Developed Tactical Equity Total Return Index. 1: See pages 23 and 56-58 for important information regarding the use of Proxies in showing extended hypothetical historical performance 2: Excess return of the Index once all beta-driven performance has been accounted for 3: Expected variability of the Index returns relative to the Benchmark returns 4: Based on the average of daily excess returns against Fed Funds, annualized with a 252-day factor Source: Solactive, Bloomberg, RBC Capital Markets

Appendix

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

Appendix I RBC Global Tactical Equity Total Return Index Geography Name BBG Ticker RIC Code Large Cap US RBC Large Cap US Tactical Equity Total Return Index RBCELTUT .RBCELTUT Small Cap US RBC Small Cap US Tactical Equity Total Return Index RBCESTUT .RBCESTUT International Developed RBC International Developed Tactical Equity Total Return Index RBCEITUT .RBCEITUT Emerging Market RBC Emerging Market Tactical Equity Total Return Index RBCEETUT .RBCEETUT List of the Tactical Equity Total Return Sub-Indices Geography Name BBG Ticker RIC Code Global RBC Global Tactical Equity Total Return Index RBCEGTUT .RBCEGTUT Geography Future Contracts Exchange Generic Index Large Cap US E-mini S&P 500 Future CME ES1 Index Small Cap US E-mini Russell 2000 Future CME RTY1 Index International Developed MSCI EAFE Future ICE MFS1 Index Emerging Market MSCI Emerging Markets Future ICE MES1 Index List of the Future Contracts

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

Appendix II Futures Contract Proxies used for the Historical Period – From December 29, 1995 to March 31, 2019
Geography Futures Contract Historical Period Large Cap US E-mini S&P 500 Futures (ES1 Index) September 10, 1997 – March 31, 2019
S&P 500 Futures (SP1 Index) December 29, 1995 – September 10, 1997
Small Cap US E-mini Russell 2000 Futures (RTY1 Index) July 11, 2017 – March 31, 2019
Russell 2000 Mini Futures (RTA1 Index) August 20, 2007 – July 11, 2017
Russell 2000 Futures (RL1 Index) December 29, 1995 – August 20, 2007
International Developed MSCI EAFE Futures (MFS1 Index) September 9, 2009 – March 31, 2019
E-mini MSCI EAFE Futures (BL1 Index) March 20, 2006 – September 8, 2009
MSCI EAFE Net Total Return Index (M1EA Index) December 31, 1998 – March 20, 2006
MSCI EAFE IMI Net Index (MIMUEAFN Index) December 31, 1995 – December 31, 1998
Emerging Market MSCI Emerging Markets Futures (MES1 Index) September 9, 2009 – March 31, 2019
MSCI Emerging Markets Futures (LLL1 Index) October 22, 2007 – September 9, 2009
MSCI Emerging Markets Net Total Return (M1EF Index) December 29, 2000 – October 22, 2007
MSCI EM Emerging Markets IMI Net Index (MIMUEMRN Index) December 29, 1995 – December 29, 2000

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

Appendix III ETF Proxies used for the Historical Period – From December 29, 1995 to March 31, 2019
Geography ETF Historical Period Large Cap US SPDR S&P 5000 ETF Trust (SPY US Equity) December 29, 1995 – March 31, 2019
Small Cap US iShares Russell 2000 ETF (IWM US Equity) October 17, 2000 – March 31, 2019
Russell 2000 Index (RTY Index) December 29, 1995 – October 17, 2000
International Developed iShares MSCI EAFE ETF (EFA US Equity) January 15, 2002 – March 31, 2019
MSCI EAFE Index (MXEA Index) December 29, 1995 – January 15, 2002
Emerging Market iShares MSCI Emerging Markets ETF (EEM US Equity) September 3, 2003 – March 31, 2019
MSCI Emerging Markets Index (MXEF Index) December 29, 1995 – September 2, 2009

Edgar Filing: ROYAL BANK OF CANADA - Form FWP

Appendix IV Benchmark Proxies used for the Historical Period – From December 29, 1995 to March 31, 2019

Geography	ETF	Historical Period	Large Cap US	S&P Total Return Index (SPXT Index)	December 29, 1995 – March 31, 2019
Small Cap US	Russell 2000 Total Return Index (RU20INTR Index)	October 17, 2000 – March 31, 2019	International Developed	MSCI EAFE Net Total Return Index (NDDUEAFE Index)	December 31, 1998 – March 31, 2019
	MSCI EAFE IMI Net Index (MIMUEAFN Index)	December 29, 1995 – December 31, 1998	Emerging Market	MSCI Emerging Net Total Return Index (NDUEEGF Index)	December 31, 1998 – March 31, 2019
	MSCI EM Emerging Markets IMI Net Index (MIMUEMRN Index)	December 29, 1995 – December 31, 1998	Global	MSCI ACWI Net Total Return Index (NDUEACWF Index)	December 31, 1998 – March 31, 2019
	MSCI ACWI IMI Net Total Return Index (MIMUAWON Index)	December 29, 1995 – December 31, 1998			

Disclaimer This communication has been generated by employees of RBC Capital Markets' Global Equity Linked Products, and is not a research report or a product of RBC Capital Markets' Research Department. This presentation should not be distributed to or shown to anyone other than the intended audience. This document is for informational purposes only and is not intended to set forth a final expression of the terms and conditions of any offering and may be amended, superseded or replaced in its entirety by subsequent summaries. When making an investment decision, any prospective investor should rely solely on the relevant transaction documentation, which will contain the final terms and conditions of the transaction. The information contained herein has been compiled from sources believed to be reliable by RBC Capital Markets or any of its businesses. Neither RBC Capital Markets nor any of its businesses or representatives has undertaken any independent review or due diligence of such sources. This document shall not constitute a commitment or recommendation to enter into any transaction by any RBC entity. All information, terms and pricing set forth herein is indicative and subject to change without notice. Any opinions expressed herein reflect our judgment at the date and time hereof and are subject to change without notice. The information contained in this document has been internally developed or taken from trade and statistical services and other sources which we deem reliable. Transactions of the type described herein may involve a high degree of risk and the value of such investments may be highly volatile. Such risks may include, without limitation, risk of adverse or unanticipated market developments, risk of issuer default and risk of illiquidity. In certain transactions, counterparties may lose their entire investment or incur an unlimited loss. This brief statement does not purport to identify or suggest all the risks (directly or indirectly) and other significant aspects in connection with transactions of the type described herein, and investors should ensure that they fully understand the terms of the transaction, including the relevant risk factors and any legal, tax, regulatory or accounting considerations applicable to them, prior to transacting. No representation is made concerning the legal, tax, regulatory or accounting implications in any applicable jurisdiction and we are not advising you in respect of such matters. Accordingly you must independently determine, with your own advisors, the appropriateness for you of the transaction before transacting. RBC is acting solely in the capacity of an arm's length contractual counterparty and not in the capacity of your financial adviser or fiduciary. RBC Capital Markets is the global brand name for the capital markets business of Royal Bank of Canada and its affiliates, including RBC Capital Markets, LLC (member FINRA, NYSE and SIPC); RBC Dominion Securities Inc. (member IIROC and CIPF); Royal Bank of Canada - Sydney Branch (ABN 86 076 940 880); RBC Capital Markets (Hong Kong) Limited (regulated by the Securities and Futures Commission of Hong Kong and the Hong Kong Monetary Authority) and RBC Europe Limited (authorized by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and Prudential Regulation Authority.) Royal Bank of Canada has filed a registration statement (including a prospectus) with the SEC for the offerings to which this document relates. Before you invest, you should read those documents and the other documents relating to these offerings that Royal Bank of Canada has filed with the SEC for more complete information about us and these offerings. You may obtain these documents without cost by visiting EDGAR on the SEC website at www.sec.gov. Alternatively, Royal Bank of Canada, any agent or any dealer participating in this offering will arrange to send you the prospectus and any related supplements if you so request by calling toll-free at 1-877-688-2301. ® Registered trademark of Royal Bank of Canada. Used under license. All rights reserved.

Important Information About the Historical Performance of the Index The Index was launched on February 18, 2019. Accordingly, all of the information about the performance of the Index prior to that date is based on hypothetical back-tested information. The hypothetical performance of the Index is based on criteria that have been applied retroactively with the benefit of hindsight; these criteria cannot account for all financial risk that may affect the actual performance of the Index in the future. The future performance of the Index may vary significantly from the hypothetical performance data in this document. For example, not all of the futures contracts and ETFs upon which the Index is based existed during all the periods shown; accordingly, we have used other related financial assets for those periods, when needed. In addition, please note that the back-tested performance of the Index set forth in this document does not reflect the deduction of any fees and charges that would be applicable to a financial instrument that references the Index. For the full Index methodology, please visit the following link: www.solactive.com
