

ROYAL BANK OF CANADA  
Form 424B2  
December 17, 2018

RBC Capital Markets® Filed Pursuant to Rule 424(b)(2)  
Registration Statement No. 333-227001

Pricing Supplement  
Dated December 14,  
2018

To the Product \$1,000,000  
Prospectus Supplement Auto-Callable Contingent Coupon Barrier Notes  
No. CCBN-1, Dated Linked to the Lesser Performing of Two Equity  
September 10, 2018 and Exchange Traded Funds, Due December 17, 2020  
the Prospectus Royal Bank of Canada  
Supplement and the  
Prospectus, Each Dated  
September 7, 2018

Royal Bank of Canada is offering Auto-Callable Contingent Coupon Barrier Notes (the “Notes”) linked to the lesser performing of the shares of two exchange traded funds (each, a “Reference Stock,” and collectively, the “Reference Stocks”). The Notes offered are senior unsecured obligations of Royal Bank of Canada, will pay a quarterly Contingent Coupon at the rate and under the circumstances specified below, and will have the terms described in the documents described above, as supplemented or modified by this pricing supplement.

Reference Stocks	Initial Stock Prices	Coupon Barriers and Trigger Prices*
SPDR S&P Biotech ETF (“XBI”)	\$76.79	\$46.07, which is 60% of its Initial Stock Price
Technology Select Sector SPDR Fund (“XLK”)	\$64.57	\$38.74, which is 60% of its Initial Stock Price

\* Rounded to two decimal places.

The Notes do not guarantee any return of principal at maturity. Any payments on the Notes are subject to our credit risk.

Investing in the Notes involves a number of risks. See “Risk Factors” beginning on page PS-5 of the product prospectus supplement dated September 10, 2018, on page S-1 of the prospectus supplement dated September 7, 2018, and “Selected Risk Considerations” beginning on page P-7 of this pricing supplement.

The Notes will not constitute deposits insured by the Canada Deposit Insurance Corporation, the U.S. Federal Deposit Insurance Corporation or any other Canadian or U.S. government agency or instrumentality. The Notes are not subject to conversion into our common shares under subsection 39.2(2.3) of the Canada Deposit Insurance Corporation Act. Neither the Securities and Exchange Commission (the “SEC”) nor any state securities commission has approved or disapproved of the Notes or determined that this pricing supplement is truthful or complete. Any representation to the contrary is a criminal offense.

Issuer:	Royal Bank of Canada	Stock Exchange Listing:	None
Trade Date:	December 14, 2018	Principal Amount:	\$1,000 per Note
Issue Date:	December 19, 2018	Maturity Date:	December 17, 2020
Observation Dates:	Quarterly, as set forth below.	Coupon Payment Dates:	Quarterly, as set forth below
Valuation Date:	December 14, 2020	Contingent Coupon Rate:	9.50% per annum

Contingent Coupon: If the closing price of each Reference Stock is greater than or equal to its Coupon Barrier on the applicable Observation Date, we will pay the Contingent Coupon applicable to the corresponding Observation Date. You may not receive any Contingent Coupons during the term of the Notes.

Payment at Maturity (if

held to maturity): If the Notes are not previously called, we will pay you at maturity an amount based on the Final Stock Price of the Lesser Performing Reference Stock: For each \$1,000 in principal amount, \$1,000 plus the Contingent Coupon at maturity, unless the Final Stock Price of the Lesser Performing Reference Stock is less than its Trigger Price.

If the Final Stock Price of the Lesser Performing Reference Stock is less than its Trigger Price, then the investor will receive at maturity, for each \$1,000 in principal amount, a cash payment equal to:  
 $\$1,000 + (\$1,000 \times \text{Reference Stock Return of the Lesser Performing Reference Stock})$

Investors in the Notes could lose some or all of their principal amount if the Final Stock Price of the Lesser Performing Reference Stock is below its Trigger Price.

Lesser Performing Reference Stock: The Reference Stock with the lowest Reference Stock Return.

Call Feature: If the closing price of each Reference Stock is greater than or equal to its Initial Stock Price on any Observation Date, the Notes will be automatically called for 100% of their principal amount, plus the Contingent Coupon applicable to the corresponding Observation Date.

Call Settlement Dates: The Coupon Payment Date corresponding to that Observation Date.

Final Stock Price: For each Reference Stock, its closing price on the Valuation Date.

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	Per Note	Total
Price to public <sup>(1)</sup>	100.00%	\$1,000,000
Underwriting discounts and commissions <sup>(1)</sup>	2.25%	\$22,500
Proceeds to Royal Bank of Canada	97.75%	\$977,500

Certain dealers who purchased the Notes for sale to certain fee-based advisory accounts may have foregone some (1) or all of their underwriting discount or selling concessions. The public offering price for investors purchasing the Notes in these accounts was between \$977.50 and \$1,000 per \$1,000 in principal amount.

The initial estimated value of the Notes as of the date of this pricing supplement is \$965.06 per \$1,000 in principal amount, which is less than the price to public. The actual value of the Notes at any time will reflect many factors, cannot be predicted with accuracy, and may be less than this amount. We describe our determination of the initial estimated value in more detail below.

RBC Capital Markets, LLC, which we refer to as RBCCM, acting as agent for Royal Bank of Canada, received a commission of \$22.50 per \$1,000 in principal amount of the Notes and used a portion of that commission to allow selling concessions to other dealers of up to \$22.50 per \$1,000 in principal amount of the Notes. The other dealers may forgo, in their sole discretion, some or all of their selling concessions. See “Supplemental Plan of Distribution (Conflicts of Interest)” below.

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 Two Exchange Traded Funds  
 Royal Bank of Canada

**SUMMARY**

The information in this “Summary” section is qualified by the more detailed information set forth in this pricing supplement, the product prospectus supplement, the prospectus supplement, and the prospectus.

**General:** This pricing supplement relates to an offering of Auto-Callable Contingent Coupon Barrier Notes (the “Notes”) linked to the lesser performing of the shares of two exchange traded funds (the “Reference Stocks”).

**Issuer:** Royal Bank of Canada (“Royal Bank”)

**Trade Date:** December 14, 2018

**Issue Date:** December 19, 2018

**Denominations:** Minimum denomination of \$1,000, and integral multiples of \$1,000 thereafter.

**Designated Currency:** U.S. Dollars

We will pay you a Contingent Coupon during the term of the Notes, periodically in arrears on each Coupon Payment Date, under the conditions described below:

- If the closing price of each Reference Stock is greater than or equal to its Coupon Barrier on the applicable Observation Date, we will pay the Contingent Coupon applicable to that Observation Date.
- If the closing price of any of the Reference Stocks is less than its Coupon Barrier on the applicable Observation Date, we will not pay you the Contingent Coupon applicable to that Observation Date.

You may not receive a Contingent Coupon for one or more quarterly periods during the term of the Notes.

**Contingent Coupon Rate:** 9.50% per annum (2.375% per quarter)

**Observation Dates:** Quarterly, on March 14, 2019, June 14, 2019, September 16, 2019, December 16, 2019, March 16, 2020, June 15, 2020, September 14, 2020 and the Valuation Date.

**Coupon Payment Dates:** The Contingent Coupon, if payable, will be paid quarterly on March 19, 2019, June 19, 2019, September 19, 2019, December 19, 2019, March 19, 2020, June 18, 2020, September 17, 2020 and the Maturity Date.

**Record Dates:** The record date for each Coupon Payment Date will be one business day prior to that scheduled Coupon Payment Date; provided, however, that any Contingent Coupon payable at maturity or upon a call will be payable to the person to whom the payment at maturity or upon the call, as the case may be, will be payable.

**Call Feature:** If, on any Observation Date, the closing price of each Reference Stock is greater than or equal to its Initial Stock Price, then the Notes will be automatically called.

**Payment if Called:** If the Notes are automatically called, then, on the applicable Call Settlement Date, for each \$1,000 principal amount, you will receive \$1,000 plus the Contingent Coupon otherwise due on that Call Settlement Date.

**Call Settlement Dates:** If the Notes are called on any Observation Date, the Call Settlement Date will be the Coupon Payment Date corresponding to that Observation Date.

**Valuation Date:** December 14, 2020

**Maturity Date:** December 17, 2020

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Initial Stock Price: For each Reference Stock, its closing price on the Trade Date, as specified on the cover page of this pricing supplement.

Final Stock Price: For each Reference Stock, its closing price on the Valuation Date.

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Trigger Price and Coupon Barrier:	<p>For each Reference Stock, 60% of its Initial Stock Price, as specified on the cover page of this pricing supplement.</p> <p>If the Notes are not previously called, we will pay you at maturity an amount based on the Final Stock Price of the Lesser Performing Reference Stock:</p> <ul style="list-style-type: none"> <li>· If the Final Stock Price of the Lesser Performing Reference Stock is greater than or equal to its Trigger Price, we will pay you a cash payment equal to the principal amount plus the Contingent Coupon otherwise due on the Maturity Date.</li> <li>· If the Final Stock Price of the Lesser Performing Reference Stock is below its Trigger Price, you will receive at maturity, for each \$1,000 in principal amount, a cash payment equal to: \$1,000 + (\$1,000 x Reference Stock Return of the Lesser Performing Reference Stock)</li> </ul> <p>The amount of cash that you receive will be less than your principal amount, if anything, resulting in a loss that is proportionate to the decline of the Lesser Performing Reference Stock from the Trade Date to the Valuation Date. Investors in the Notes will lose some or all of their principal amount if the Final Stock Price of the Lesser Performing Reference Stock is less than its Trigger Price.</p>
Payment at Maturity (if not previously called and held to maturity):	<p>Not applicable. Payments on the Notes will be made solely in cash.</p>
Stock Settlement:	<p>With respect to each Reference Stock:</p>
Reference Stock Return:	<p><math display="block">\frac{\text{Final Stock Price} - \text{Initial Stock Price}}{\text{Initial Stock Price}}</math></p>
Lesser Performing Reference Stock:	<p>The Reference Stock with the lowest Reference Stock Return.</p>
Market Disruption Events:	<p>The occurrence of a market disruption event (or a non-trading day) as to any of the Reference Stocks will result in the postponement of an Observation Date or the Valuation Date as to that Reference Stock, as described in the product prospectus supplement, but not to any non-affected Reference Stock.</p>
Calculation Agent:	<p>RBC Capital Markets, LLC (“RBCCM”)</p> <p>By purchasing a Note, each holder agrees (in the absence of a change in law, an administrative determination or a judicial ruling to the contrary) to treat the Notes as a callable pre-paid cash-settled contingent income-bearing derivative contract linked to the Reference Stocks for U.S. federal income tax purposes. However, the U.S. federal income tax consequences of your investment in the Notes are uncertain and the Internal Revenue Service could assert that the Notes should be taxed in a manner that is different from that described in the preceding sentence. Please see the section below, “Supplemental Discussion of U.S. Federal Income Tax Consequences,” and the discussion (including the opinion of our counsel Morrison &amp; Foerster LLP) in the product prospectus supplement dated September 10, 2018 under “Supplemental Discussion of U.S. Federal Income Tax Consequences,” which apply to the Notes. RBCCM (or one of its affiliates), though not obligated to do so, may maintain a secondary market in the Notes after the Issue Date. The amount that you may receive upon sale of your Notes prior to maturity may be less than the principal amount.</p>
U.S. Tax Treatment:	<p>The Notes will not be listed on any securities exchange.</p>
Secondary Market:	
Listing Settlement:	

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DTC global (including through its indirect participants Euroclear and Clearstream, Luxembourg as described under “Description of Debt Securities—Ownership and Book-Entry Issuance” in the prospectus dated September 7, 2018).

Terms Incorporated in the Master Note: All of the terms appearing above the item captioned “Secondary Market” on pages P-2 and P-3 of this pricing supplement and the terms appearing under the caption “General Terms of the Notes” in the product prospectus supplement dated September 10, 2018, as modified by this pricing supplement.

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#### ADDITIONAL TERMS OF YOUR NOTES

You should read this pricing supplement together with the prospectus dated September 7, 2018, as supplemented by the prospectus supplement dated September 7, 2018 and the product prospectus supplement dated September 10, 2018, relating to our Senior Global Medium-Term Notes, Series H, of which these Notes are a part. Capitalized terms used but not defined in this pricing supplement will have the meanings given to them in the product prospectus supplement. In the event of any conflict, this pricing supplement will control. The Notes vary from the terms described in the product prospectus supplement in several important ways. You should read this pricing supplement carefully.

This pricing supplement, together with the documents listed below, contains the terms of the Notes and supersedes all prior or contemporaneous oral statements as well as any other written materials including preliminary or indicative pricing terms, correspondence, trade ideas, structures for implementation, sample structures, brochures or other educational materials of ours. You should carefully consider, among other things, the matters set forth in “Risk Factors” in the prospectus supplement dated September 7, 2018 and in the product prospectus supplement dated September 10, 2018, as the Notes involve risks not associated with conventional debt securities. We urge you to consult your investment, legal, tax, accounting and other advisors before you invest in the Notes. You may access these documents on the Securities and Exchange Commission website at [www.sec.gov](http://www.sec.gov) as follows (or if that address has changed, by reviewing our filings for the relevant date on the SEC website):

Prospectus dated September 7, 2018:

<https://www.sec.gov/Archives/edgar/data/1000275/000121465918005973/196181424b3.htm>

Prospectus Supplement dated September 7, 2018:

<https://www.sec.gov/Archives/edgar/data/1000275/000121465918005975/f97180424b3.htm>

Product Prospectus Supplement dated September 10, 2018:

<https://www.sec.gov/Archives/edgar/data/1000275/000114036118038091/form424b5.htm>

Our Central Index Key, or CIK, on the SEC website is 1000275. As used in this pricing supplement, “we,” “us,” or “our” refers to Royal Bank of Canada.

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**HYPOTHETICAL EXAMPLES**

The table set out below is included for illustration purposes only. The table illustrates the Payment at Maturity of the Notes (including the final Contingent Coupon, if payable) for a hypothetical range of performance for the Lesser Performing Reference Stock, assuming the following terms and that the Notes are not automatically called prior to maturity:

Hypothetical Initial Stock Price (for each Reference Stock):	\$100.00*
Hypothetical Trigger Price and Coupon Barrier (for each Reference Stock):	\$60.00, which is 60% of its hypothetical Initial Stock Price
Hypothetical Initial Stock Price:	\$100.00*
Contingent Coupon Rate:	9.50% per annum (or 2.375% per quarter)
Contingent Coupon Amount:	\$23.75 per quarter
Observation Dates:	Quarterly
Principal Amount:	\$1,000 per Note

\* The hypothetical Initial Stock Price of \$100 used in the examples below has been chosen for illustrative purposes only and does not represent the actual Initial Stock Price of any Reference Stock. The actual Initial Stock Price for each Reference Stock is set forth on the cover page of this pricing supplement. We make no representation or warranty as to which of the Reference Stocks will be the Lesser Performing Reference Stock. It is possible that the Final Stock Price of each Reference Stock will be less than its Initial Stock Price.

Hypothetical Final Stock Prices are shown in the first column on the left. The second column shows the Payment at Maturity for a range of Final Stock Prices on the Valuation Date. The third column shows the amount of cash to be paid on the Notes per \$1,000 in principal amount. If the Notes are called prior to maturity, the hypothetical examples below will not be relevant, and you will receive on the applicable Coupon Payment Date, for each \$1,000 principal amount, \$1,000 plus the Contingent Coupon otherwise due on the Notes.

Hypothetical Final Stock Price of the Lesser Performing Reference Stock	Payment at Maturity as Percentage of Principal Amount	Payment at Maturity (assuming that the Notes were not previously called)
\$180.00	102.375%	\$1,023.75*
\$170.00	102.375%	\$1,023.75*
\$160.00	102.375%	\$1,023.75*
\$150.00	102.375%	\$1,023.75*
\$140.00	102.375%	\$1,023.75*
\$125.00	102.375%	\$1,023.75*
\$120.00	102.375%	\$1,023.75*
\$110.00	102.375%	\$1,023.75*
\$100.00	102.375%	\$1,023.75*
\$90.00	102.375%	\$1,023.75*
\$80.00	102.375%	\$1,023.75*
\$70.00	102.375%	\$1,023.75*



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\$60.00	102.375%	\$1,023.75*
\$59.99	59.990%	\$599.90
\$50.00	50.000%	\$500.000
\$40.00	40.000%	\$400.000
\$20.00	20.000%	\$200.000
\$10.00	10.000%	\$100.000
\$0.00	0.000%	\$0.000

\*Including the final Contingent Coupon, if payable.

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Hypothetical Examples of Amounts Payable at Maturity

The following hypothetical examples illustrate how the payments at maturity set forth in the table above are calculated, assuming the Notes have not been called.

Example 1: The price of the Lesser Performing Reference Stock increases by 40% from the Initial Stock Price of \$100.00 to its Final Stock Price of \$140.00. Because the Final Stock Price of the Lesser Performing Reference Stock is greater than its Trigger Price and Coupon Barrier, the investor receives at maturity, in addition to the final Contingent Coupon otherwise due on the Notes, a cash payment of \$1,000 per Note, despite the 40% appreciation in the price of the Lesser Performing Reference Stock.

Example 2: The price of the Lesser Performing Reference Stock decreases by 10% from the Initial Stock Price of \$100.00 to its Final Stock Price of \$90.00. Because the Final Stock Price of the Lesser Performing Reference Stock is greater than its Trigger Price and Coupon Barrier, the investor receives at maturity, in addition to the final Contingent Coupon otherwise due on the Notes, a cash payment of \$1,000 per Note, despite the 10% decline in the price of the Lesser Performing Reference Stock.

Example 3: The price of the Lesser Performing Reference Stock is \$50.00 on the Valuation Date, which is less than its Trigger Price and Coupon Barrier. Because the Final Stock Price of the Lesser Performing Reference Stock is less than its Trigger Price and Coupon Barrier, the final Contingent Coupon will not be payable on the Maturity Date, and we will pay only \$500.00 for each \$1,000 in the principal amount of the Notes, calculated as follows:

Principal Amount + (Principal Amount x Reference Stock Return of the Lesser Performing Reference Stock)  
= \$1,000 + (\$1,000 x -50.00%) = \$1,000 - \$500.00 = \$500.00

\* \* \*

The Payments at Maturity shown above are entirely hypothetical; they are based on prices of the Reference Stocks that may not be achieved on the Valuation Date and on assumptions that may prove to be erroneous. The actual market value of your Notes on the Maturity Date or at any other time, including any time you may wish to sell your Notes, may bear little relation to the hypothetical Payments at Maturity shown above, and those amounts should not be viewed as an indication of the financial return on an investment in the Notes or on an investment in any Reference Stock or the securities represented by any Reference Stock.

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#### SELECTED RISK CONSIDERATIONS

An investment in the Notes involves significant risks. Investing in the Notes is not equivalent to investing directly in the Reference Stocks. These risks are explained in more detail in the section “Risk Factors” in the product prospectus supplement. In addition to the risks described in the prospectus supplement and the product prospectus supplement, you should consider the following:

**Principal at Risk** — Investors in the Notes could lose all or a substantial portion of their principal amount if there is a decline in the trading price of the Lesser Performing Reference Stock between the Trade Date and the Valuation Date. If the Notes are not automatically called and the Final Stock Price of the Lesser Performing Reference Stock on the Valuation Date is less than its Trigger Price, the amount of cash that you receive at maturity will represent a loss of your principal that is proportionate to the decline in the closing price of the Lesser Performing Reference Stock from the Trade Date to the Valuation Date. Any Contingent Coupons received on the Notes prior to the Maturity Date may not be sufficient to compensate for any such loss.

**The Notes Are Subject to an Automatic Call** — If on any Observation Date, the closing price of each Reference Stock is greater than or equal to its Initial Stock Price, then the Notes will be automatically called. If the Notes are automatically called, then, on the applicable Call Settlement Date, for each \$1,000 in principal amount, you will receive \$1,000 plus the Contingent Coupon otherwise due on the applicable Call Settlement Date. You will not receive any Contingent Coupons after the Call Settlement Date. You may be unable to reinvest your proceeds from the automatic call in an investment with a return that is as high as the return on the Notes would have been if they had not been called.

**You May Not Receive Any Contingent Coupons** — We will not necessarily make any coupon payments on the Notes. If the closing price of any of the Reference Stocks on an Observation Date is less than its Coupon Barrier, we will not pay you the Contingent Coupon applicable to that Observation Date. If the closing price of any of the Reference Stocks is less than its Coupon Barrier on each of the Observation Dates and on the Valuation Date, we will not pay you any Contingent Coupons during the term of, and you will not receive a positive return on your Notes. Generally, this non-payment of the Contingent Coupon coincides with a period of greater risk of principal loss on your Notes. Accordingly, if we do not pay the Contingent Coupon on the Maturity Date, you will also incur a loss of principal, because the Final Stock Price of the Lesser Performing Reference Stock will be less than its Trigger Price.

**The Notes Are Linked to the Lesser Performing Reference Stock, Even if the Other Reference Stock Performs Better** — If any the Reference Stocks has a Final Stock Price that is less than its Trigger Price, your return will be linked to the lesser performing of the Reference Stocks. Even if the Final Stock Price of the other Reference Stock has increased compared to its respective Initial Stock Price, or has experienced a decrease that is less than that of the Lesser Performing Reference Stock, your return will only be determined by reference to the performance of the Lesser Performing Reference Stock, regardless of the performance of the other Reference Stock.

**Your Payment on the Notes Will Be Determined by Reference to Each Reference Stock Individually, Not to a Basket, and the Payment at Maturity Will Be Based on the Performance of the Lesser Performing Reference Stock** — The Payment at Maturity will be determined only by reference to the performance of the Lesser Performing Reference Stock, regardless of the performance of the other Reference Stock. The Notes are not linked to a weighted basket, in which the risk may be mitigated and diversified among each of the basket components. For example, in the case of notes linked to a weighted basket, the return would depend on the weighted aggregate performance of the basket components reflected as the basket return. As a result, the depreciation of one basket component could be mitigated by the appreciation of the other basket component, as scaled by the weighting of those basket components. However, in the case of the Notes, the individual performance of each of the Reference Stocks would not be combined, and the depreciation of one

Reference Stock would not be mitigated by any appreciation of the other Reference Stock. Instead, your return will depend solely on the Final Stock Price of the Lesser Performing Reference Stock.

**The Call Feature and the Contingent Coupon Feature Limit Your Potential Return** — The return potential of the Notes is limited to the pre-specified Contingent Coupon Rate, regardless of the appreciation of the Reference Stocks. In addition, the total return on the Notes will vary based on the number of Observation Dates on which the Contingent Coupon becomes payable prior to maturity or an automatic call. Further, if the Notes are called due to the Call Feature, you will not receive any Contingent Coupons or any other payment in respect of any Observation Dates after the applicable Call Settlement Date. Since the Notes could be called as early as the first Observation Date, the total return on the Notes could be minimal. If the Notes are not called, you may be subject to the full downside performance of the Lesser Performing Reference Stock even though your

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potential return is limited to the Contingent Coupon Rate. As a result, the return on an investment in the Notes could be less than the return on a direct investment in the Reference Stocks.

**Your Return May Be Lower than the Return on a Conventional Debt Security of Comparable Maturity** — The return that you will receive on the Notes, which could be negative, may be less than the return you could earn on other investments. Even if your return is positive, your return may be less than the return you would earn if you bought a conventional senior interest bearing debt security of Royal Bank.

**Payments on the Notes Are Subject to Our Credit Risk, and Changes in Our Credit Ratings Are Expected to Affect the Market Value of the Notes** — The Notes are our senior unsecured debt securities. As a result, your receipt of any Contingent Coupons, if payable, and the amount due on any relevant payment date is dependent upon our ability to repay its obligations on the applicable payment dates. This will be the case even if the prices of the Reference Stocks increase after the Trade Date. No assurance can be given as to what our financial condition will be during the term of the Notes.

**There May Not Be an Active Trading Market for the Notes-Sales in the Secondary Market May Result in Significant Losses** — There may be little or no secondary market for the Notes. The Notes will not be listed on any securities exchange. RBCCM and our other affiliates may make a market for the Notes; however, they are not required to do so. RBCCM or any other affiliate of ours may stop any market-making activities at any time. Even if a secondary market for the Notes develops, it may not provide significant liquidity or trade at prices advantageous to you. We expect that transaction costs in any secondary market would be high. As a result, the difference between bid and asked prices for your Notes in any secondary market could be substantial.

**The Initial Estimated Value of the Notes Is Less than the Price to the Public** — The initial estimated value set forth on the cover page of this pricing supplement does not represent a minimum price at which we, RBCCM or any of our affiliates would be willing to purchase the Notes in any secondary market (if any exists) at any time. If you attempt to sell the Notes prior to maturity, their market value may be lower than the price you paid for them and the initial estimated value. This is due to, among other things, changes in the prices of the Reference Stocks, the borrowing rate we pay to issue securities of this kind, and the inclusion in the price to the public of the underwriting discount and the estimated costs relating to our hedging of the Notes. These factors, together with various credit, market and economic factors over the term of the Notes, are expected to reduce the price at which you may be able to sell the Notes in any secondary market and will affect the value of the Notes in complex and unpredictable ways. Assuming no change in market conditions or any other relevant factors, the price, if any, at which you may be able to sell your Notes prior to maturity may be less than your original purchase price, as any such sale price would not be expected to include the underwriting discount and the hedging costs relating to the Notes. In addition to bid-ask spreads, the value of the Notes determined by RBCCM for any secondary market price is expected to be based on the secondary rate rather than the internal funding rate used to price the Notes and determine the initial estimated value. As a result, the secondary price will be less than if the internal funding rate was used. The Notes are not designed to be short-term trading instruments. Accordingly, you should be able and willing to hold your Notes to maturity.

**The Initial Estimated Value of the Notes on the Cover Page of this Pricing Supplement Is an Estimate Only, Calculated as of the Time the Terms of the Notes Were Set** — The initial estimated value of the Notes is based on the value of our obligation to make the payments on the Notes, together with the mid-market value of the derivative embedded in the terms of the Notes. See “Structuring the Notes” below. Our estimate is based on a variety of assumptions, including our credit spreads, expectations as to dividends, interest rates and volatility, and the expected term of the Notes. These assumptions are based on certain forecasts about future events, which may prove to be incorrect. Other entities may value the Notes or similar securities at a price that is significantly different than we do.

The value of the Notes at any time after the Trade Date will vary based on many factors, including changes in market conditions, and cannot be predicted with accuracy. As a result, the actual value you would receive if you sold the Notes in any secondary market, if any, should be expected to differ materially from the initial estimated value of your Notes.

An Investment in the Notes Is Subject to Risks Associated with Specific Economic Sectors— The stocks held by each exchange traded fund to which the Notes are linked are issued by companies engaged in a specific sector of the economy. Accordingly, an investment in the Notes is subject to the specific risks of companies that operate in each of those sectors. An investment in the Notes may accordingly be more risky than a security linked to a more diversified set of securities.

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**Our Business Activities May Create Conflicts of Interest** — We and our affiliates expect to engage in trading activities related to the securities represented by the Reference Stocks that are not for the account of holders of the Notes or on their behalf. These trading activities may present a conflict between the holders' interests in the Notes and the interests we and our affiliates will have in their proprietary accounts, in facilitating transactions, including options and other derivatives transactions, for their customers and in accounts under their management. These trading activities, if they influence the share price or prices, as applicable, of the Reference Stocks, could be adverse to the interests of the holders of the Notes. We and one or more of our affiliates may, at present or in the future, engage in business with the securities represented by the Reference Stocks, including making loans to or providing advisory services. These services could include investment banking and merger and acquisition advisory services. These activities may present a conflict between our or one or more of our affiliates' obligations and your interests as a holder of the Notes. Moreover, we, and our affiliates may have published, and in the future expect to publish, research reports with respect to the Reference Stocks or securities represented by the Reference Stocks. This research is modified from time to time without notice and may express opinions or provide recommendations that are inconsistent with purchasing or holding the Notes. Any of these activities by us or one or more of our affiliates may affect the share price or prices, as applicable, of the Reference Stocks, and, therefore, the market value of the Notes.

**Owning the Notes Is Not the Same as Owning the Securities Represented by the Reference Stocks** — The return on your Notes is unlikely to reflect the return you would realize if you actually owned shares of the Reference Stocks or the securities represented by the Reference Stocks. For instance, you will not receive or be entitled to receive any dividend payments or other distributions on these securities during the term of your Notes. As an owner of the Notes, you will not have voting rights or any other rights that holders of these securities may have. Furthermore, the Reference Stocks may appreciate substantially during the term of the Notes, while your potential return will be limited to the applicable Contingent Coupon payments.

**You Must Rely on Your Own Evaluation of the Merits of an Investment Linked to the Reference Stocks** — In the ordinary course of their business, our affiliates may have expressed views on expected movements in the Reference Stocks or the equity securities that they represent, and may do so in the future. These views or reports may be communicated to our clients and clients of our affiliates. However, these views are subject to change from time to time. Moreover, other professionals who transact business in markets relating to any Reference Stock may at any time have significantly different views from those of our affiliates. For these reasons, you are encouraged to derive information concerning the Reference Stocks from multiple sources, and you should not rely solely on views expressed by our affiliates.

**Management Risk** — The Reference Stocks are not managed according to traditional methods of "active" investment management, which involve the buying and selling of securities based on economic, financial and market analysis and investment judgment. Instead, each Reference Stock, utilizing a "passive" or indexing investment approach, attempts to approximate the investment performance of its underlying index by investing in a portfolio of securities that generally replicate its underlying index. Therefore, unless a specific security is removed from its underlying index, the Reference Stock generally would not sell a security because the security's issuer was in financial trouble. In addition, each Reference Stock is subject to the risk that the investment strategy of its investment advisor may not produce the intended results.

**The Reference Stocks and their Underlying Indices Are Different** — The performance of each Reference Stock may not exactly replicate the performance of its respective underlying index, because these Reference Stocks will reflect transaction costs and fees that are not included in the calculation of its underlying index. It is also possible that the performance of these Reference Stocks may not fully replicate or may in certain circumstances diverge significantly from the performance of their underlying indices due to the temporary unavailability of certain securities in the

secondary market, the performance of any derivative instruments contained in the Reference Stocks, or due to other circumstances. These Reference Stocks may use futures contracts, options, swap agreements, currency forwards and repurchase agreements in seeking performance that corresponds to their underlying indices and in managing cash flows.

During periods of market volatility, securities held by these Reference Stocks may be unavailable in the secondary market, market participants may be unable to calculate accurately their net asset value per share and their liquidity may be adversely affected. This kind of market volatility may also disrupt the ability of market participants to create and redeem shares of the applicable Reference Stock. Further, market volatility may adversely affect, sometimes materially, the prices at which market participants are willing to buy and sell shares of the applicable Reference Stock. As a result, under these circumstances, the market value of shares of these Reference Stocks may vary substantially from the applicable net asset value per share. For all

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of the foregoing reasons, the performance of these Reference Stocks may not correlate with the performance of their underlying indices as well as their net asset value per share, which could materially and adversely affect the value of the Notes in the secondary market and/or reduce the payments on the Notes.

**We and Our Affiliates Do Not Have Any Affiliation with the Advisor or the Sponsors of the Reference Stocks or the Underlying Indices and Are Not Responsible for Their Public Disclosure of Information** — We and our affiliates are not affiliated with the investment advisor or the sponsors of any Reference Stock or their underlying indices in any way and have no ability to control or predict their actions, including any errors in or discontinuance of disclosure regarding its methods or policies relating to the Reference Stocks or the underlying indices. The investment advisor or the sponsors of the Reference Stocks and the underlying indices are not involved in the offering of the Notes in any way and have no obligation to consider your interests as an owner of the Notes in taking any actions relating to the Reference Stocks that might affect the value of the Notes. Neither we nor any of our affiliates has independently verified the adequacy or accuracy of the information about the investment advisor, the sponsors, or the Reference Stocks contained in any public disclosure of information. You, as an investor in the Notes, should make your own investigation into the Reference Stocks.

**The Policies of the Reference Stocks' Investment Advisers or Underlying Indices Could Affect the Amount Payable on the Notes and Their Market Value** — The policies of the Reference Stocks' investment advisers concerning the management of the Reference Stocks, or the index sponsor for each underlying index, concerning the calculation of each underlying index, additions, deletions or substitutions of the securities held by the Reference Stocks could affect the market price of shares of the Reference Stocks and, therefore, the amount payable on the Notes on the maturity date and the market value of the Notes before that date. The amount payable on the Notes and their market value could also be affected if the Reference Stocks' investment advisers or relevant sponsors change these policies, for example, by changing the manner in which an investment adviser manages the Reference Stocks, or if the sponsor changes the manner in which it calculates the applicable index, or if a Reference Stock's investment adviser discontinues or suspends maintenance of a Reference Stock, in which case it may become difficult to determine the market value of the Notes. The Reference Stocks' investment advisers have no connection to the offering of the Notes and have no obligations to you as an investor in the Notes in making its decisions regarding the Reference Stocks.

**Market Disruption Events and Adjustments** — The payment at maturity, each Observation Date and the Valuation Date are subject to adjustment as described in the product prospectus supplement. For a description of what constitutes a market disruption event as well as the consequences of that market disruption event, see "General Terms of the Notes—Market Disruption Events" in the product prospectus supplement.

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#### INFORMATION REGARDING THE REFERENCE STOCKS

Information provided to or filed with the SEC by the Reference Stocks under the Securities Exchange Act of 1934, as amended, and the Investment Company Act of 1940, as amended, can be located through the SEC's website at <http://www.sec.gov>. In addition, information may be obtained from other sources including, but not limited to, press releases, newspaper articles and other publicly disseminated documents. We have not participated in the preparation of, or verified, such publicly available information. None of the forgoing documents or filings are incorporated by reference in, and should not be considered part of, this document.

The following information regarding the Reference Stocks is derived from publicly available information.

We have not independently verified the accuracy or completeness of reports filed by the Reference Stocks with the SEC, information published by them on their websites or in any other format, information about them obtained from any other source or the information provided below.

Each Reference Stock is an investment portfolio maintained and managed by SSgA Funds Management, Inc. ("SSFM"). SSFM is the investment advisor to separate investment portfolios, including the Reference Stocks, each of which are offered by the Select Sector SPDR Trust, a registered investment company. The Notes are not sponsored, endorsed, sold or promoted by the investment adviser. The investment adviser makes no representations or warranties to the owners of the Notes or any member of the public regarding the advisability of investing in the Notes. The investment adviser has no obligation or liability in connection with the operation, marketing, trading or sale of the Notes.

We obtained the information regarding the historical performance of each Reference Stock set forth below from Bloomberg Financial Markets.

The SPDR® S&P® Biotech ETF ("XBI")

The XBI seeks to provide investment results that correspond generally to the price and yield performance, before fees and expenses, of the S&P® Biotechnology Select Industry® Index (the "underlying index"). The underlying index represents the biotechnology sub-industry portion of the Standard & Poor's ("S&P") Total Market Index ("S&P TMI"), an index that measures the performance of the U.S. equity market. The XBI is composed of companies that are in the biotechnology sector. The XBI trades on NYSE Arca under the ticker symbol "XBI."

The XBI utilizes a "replication" investment approach in attempting to track the performance of the underlying index. The XBI typically invests in substantially all of the securities which comprise the underlying index in approximately the same proportions as the underlying index. The XBI will normally invest at least 80% of its total assets in the common stocks that comprise the underlying index.

The S&P® Biotechnology Select Industry® Index

This underlying index is an equal-weighted index that is designed to measure the performance of the applicable portion of the S&P TMI. The S&P TMI includes all U.S. common equities listed on the New York Stock Exchange (the "NYSE") (including NYSE Arca), the NYSE American, the Nasdaq Global Select Market, and the Nasdaq Capital Market. Each of the component stocks in the underlying index is a constituent company within the biotechnology sub-industry portion of the S&P TMI.

To be eligible for inclusion in the underlying index, companies must be in the S&P TMI and must be included in the relevant Global Industry Classification Standard (GICS) sub-industry. The GICS was developed to establish a global standard for categorizing companies into sectors and industries. In addition to the above, companies must satisfy one of the three following combined size and liquidity criteria:

- float-adjusted market capitalization above US\$500 million and float-adjusted liquidity ratio above 90%;
- float-adjusted market capitalization above US\$400 million and float-adjusted liquidity ratio above 150%; or
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for current constituents, float-adjusted market capitalization above US\$300 million and float-adjusted liquidity ratio greater than or equal to 50%.

All U.S. companies satisfying these requirements are included in the underlying index. The total number of companies in the underlying index should be at least 35. If there are fewer than 35 stocks, stocks from a supplementary list of highly correlated sub-industries that meet the market capitalization and liquidity thresholds above are included in order of their float-adjusted market capitalization to reach

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35 constituents. Minimum market capitalization requirements may be relaxed to ensure there are at least 22 companies in the underlying index as of each rebalancing effective date.

Eligibility factors include:

**Market Capitalization:** Float-adjusted market capitalization should be at least US\$400 million for inclusion in the underlying index. Existing index components must have a float-adjusted market capitalization of US\$300 million to remain in the underlying index at each rebalancing.

**Liquidity:** The liquidity measurement used is a liquidity ratio, defined as dollar value traded over the previous 12-months divided by the float-adjusted market capitalization as of the underlying index rebalancing reference date. Stocks having a float-adjusted market capitalization above US\$500 million must have a liquidity ratio greater than 90% to be eligible for addition to the underlying index. Stocks having a float-adjusted market capitalization between US\$400 and US\$500 million must have a liquidity ratio greater than 150% to be eligible for addition to the underlying index. Existing index constituents must have a liquidity ratio greater than 50% to remain in the underlying index at the quarterly rebalancing. The length of time to evaluate liquidity is reduced to the available trading period for IPOs or spin-offs that do not have 12 months of trading history.

**Takeover Restrictions:** At the discretion of S&P, constituents with shareholder ownership restrictions defined in company bylaws may be deemed ineligible for inclusion in the underlying index. Ownership restrictions preventing entities from replicating the index weight of a company may be excluded from the eligible universe or removed from the underlying index.

**Turnover:** S&P believes turnover in index membership should be avoided when possible. At times, a company may appear to temporarily violate one or more of the addition criteria. However, the addition criteria are for addition to the underlying index, not for continued membership. As a result, an index constituent that appears to violate the criteria for addition to the underlying index will not be deleted unless ongoing conditions warrant a change in the composition of the underlying index.

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The Technology Select Sector the SPDR<sup>®</sup> Fund (“XLK”)

The XLK seeks to provide investment results that correspond generally to the price and yield performance, before fees and expenses, of the S&P<sup>®</sup> Technology Select Sector Index. The S&P<sup>®</sup> Technology Select Sector Index measures the performance of the technology sector of the U.S. equity market. The XLK trades on the NYSE Arca under the ticker symbol “XLK.”

The XLK utilizes a “replication” investment approach in attempting to track the performance of the underlying index. The XLK typically invests in substantially all of the securities which comprise the underlying index in approximately the same proportions as underlying index. The XLK will normally invest at least 95% of its total assets in the common stocks that comprise the underlying index.

Eligibility Criteria for Index Components

The stocks included in each Select Sector Index are selected from the universe of companies represented by the S&P 500<sup>®</sup> Index. Standard & Poor’s Financial Services LLC (“S&P”) acts as index calculation agent in connection with the calculation and dissemination of each Select Sector Index. Each stock in the S&P 500<sup>®</sup> Index is allocated to only one Select Sector Index, and the nine Select Sector Indices together comprise all of the companies in the S&P 500<sup>®</sup> Index.

Index Maintenance

Each Select Sector Index was developed and is maintained in accordance with the following criteria:

Each of the component stocks in a Select Sector Index (the “SPDR Component Stocks”) is a constituent company of the S&P 500<sup>®</sup> Index.

The nine Select Sector Indices together will include all of the companies represented in the S&P 500<sup>®</sup> Index and each of the stocks in the S&P 500<sup>®</sup> Index will be allocated to one and only one of the Select Sector Indices.

Each constituent stock of the S&P 500<sup>®</sup> Index is assigned to a Select Sector Index on the basis of that company’s sales and earnings composition and the sensitivity of the company’s stock price and business results to the common factors that affect other companies in each Select Sector Index.

S&P has sole control over the removal of stocks from the S&P 500<sup>®</sup> Index and the selection of replacement stocks to be added to the S&P 500<sup>®</sup> Index. However, S&P plays only a consulting role in the Select Sector Indices.

Each Select Sector Index is calculated by S&P using a modified “market capitalization” methodology. This design ensures that each of the component stocks within a Select Sector Index is represented in a proportion consistent with its percentage with respect to the total market capitalization of that Select Sector Index. However, under certain conditions, the number of shares of a component stock within the Select Sector Index may be adjusted to conform to certain Internal Revenue Code requirements.

Calculation of the Underlying Index

Each Select Sector Index is calculated using the same methodology utilized by S&P in calculating the S&P 500<sup>®</sup> Index, using a base-weighted aggregate methodology. The daily calculation of each Select Sector Index is computed by dividing the total market value of the companies in the Select Sector Index by a number called the index divisor. A SPDR<sup>®</sup> Component Stock which has been assigned to one Select Sector Index may be determined to have undergone a transformation in the composition of its business, and that it should be removed from that Select Sector Index and assigned to a different Select Sector Index. In the event that a SPDR<sup>®</sup> Component Stock’s Select Sector Index assignment should be changed, S&P will disseminate notice of the change following its standard procedure for announcing index changes, and will implement the change in the affected Select Sector Indexes on a date no less than one week after the initial dissemination of information on the sector change to the maximum extent practicable. SPDR<sup>®</sup> Component Stocks removed from and added to the S&P 500<sup>®</sup> Index will be deleted from and added to the appropriate Select Sector Index on the same schedule used by S&P for additions and deletions from the S&P 500<sup>®</sup> Index insofar as practicable.

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#### HISTORICAL INFORMATION

The graphs below set forth the information relating to the historical performance of the Reference Stocks. The information provided in these graphs is for the period from January 1, 2008 through December 14, 2018.

We obtained the information regarding the historical performance of the Reference Stocks in the graphs below from Bloomberg Financial Markets.

We have not independently verified the accuracy or completeness of the information obtained from Bloomberg Financial Markets. The historical performance of any Reference Stock should not be taken as an indication of its future performance, and no assurance can be given as to the prices of the Reference Stocks at any time. We cannot give you assurance that the performance of the Reference Stocks will not result in the loss of all or part of your investment.

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Historical Information for the SPDR® S&P® Biotech ETF (“XBI”)

The graph below illustrates the performance of this Reference Stock from January 1, 2008 to December 14, 2018, reflecting its Initial Stock Price of \$76.79. The red line represents its Coupon Barrier and Trigger Price of \$46.07, which is equal to 60.00% of its Initial Stock Price, rounded to two decimal places.

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Historical Information for the Technology Select Sector the SPDR® Fund (“XLK”)

The graph below illustrates the performance of this Reference Stock from January 1, 2008 to December 14, 2018, reflecting its Initial Stock Price of \$64.57. The red line represents its Coupon Barrier and Trigger Price of \$38.74, which is equal to 60.00% of its Initial Stock Price, rounded to two decimal places.

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#### SUPPLEMENTAL DISCUSSION OF U.S. FEDERAL INCOME TAX CONSEQUENCES

The following disclosure supplements, and to the extent inconsistent supersedes, the discussion in the product prospectus supplement dated September 10, 2018 under “Supplemental Discussion of U.S. Federal Income Tax Consequences.”

Under Section 871(m) of the Code, a “dividend equivalent” payment is treated as a dividend from sources within the United States. Such payments generally would be subject to a 30% U.S. withholding tax if paid to a non-U.S. holder. Under U.S. Treasury Department regulations, payments (including deemed payments) with respect to equity-linked instruments (“ELIs”) that are “specified ELIs” may be treated as dividend equivalents if such specified ELIs reference an interest in an “underlying security,” which is generally any interest in an entity taxable as a corporation for U.S. federal income tax purposes if a payment with respect to such interest could give rise to a U.S. source dividend. However, the IRS has issued guidance that states that the U.S. Treasury Department and the IRS intend to amend the effective dates of the U.S. Treasury Department regulations to provide that withholding on dividend equivalent payments will not apply to specified ELIs that are not delta-one instruments and that are issued before January 1, 2021. Based on our determination that the Notes are not delta-one instruments, non-U.S. holders should not be subject to withholding on dividend equivalent payments, if any, under the Notes. However, it is possible that the Notes could be treated as deemed reissued for U.S. federal income tax purposes upon the occurrence of certain events affecting the Reference Stocks or the Notes, and following such occurrence the Notes could be treated as subject to withholding on dividend equivalent payments. Non-U.S. holders that enter, or have entered, into other transactions in respect of the Reference Stocks or the Notes should consult their tax advisors as to the application of the dividend equivalent withholding tax in the context of the Notes and their other transactions. If any payments are treated as dividend equivalents subject to withholding, we (or the applicable withholding agent) would be entitled to withhold taxes without being required to pay any additional amounts with respect to amounts so withheld.

#### SUPPLEMENTAL PLAN OF DISTRIBUTION (CONFLICTS OF INTEREST)

Delivery of the Notes will be made against payment for the Notes on December 19, 2018, which is the third (3<sup>rd</sup>) business day following the Trade Date (this settlement cycle being referred to as “T+3”). See “Plan of Distribution” in the prospectus dated September 7, 2018. For additional information as to the relationship between us and RBCCM, please see the section “Plan of Distribution—Conflicts of Interest” in the prospectus dated September 7, 2018.

Under Rule 15c6-1 of the Exchange Act, trades in the secondary market generally are required to settle in two business days, unless the parties to any such trade expressly agree otherwise. Accordingly, purchasers who wish to trade the Notes more than two business days prior to the original Issue Date will be required to specify alternative arrangements to prevent a failed settlement.

In the initial offering of the Notes, they will be offered to investors at a purchase price equal to par, except with respect to certain accounts as indicated on the cover page of this document.

The value of the Notes shown on your account statement may be based on RBCCM’s estimate of the value of the Notes if RBCCM or another of our affiliates were to make a market in the Notes (which it is not obligated to do). That estimate will be based upon the price that RBCCM may pay for the Notes in light of then prevailing market conditions, our creditworthiness and transaction costs. For a period of approximately three months after the issue date of the Notes, the value of the Notes that may be shown on your account statement may be higher than RBCCM’s estimated value of the Notes at that time. This is because the estimated value of the Notes will not include the underwriting discount and our hedging costs and profits; however, the value of the Notes shown on your account statement during that period may initially be a higher amount, reflecting the addition of RBCCM’s underwriting discount and our estimated costs and profits from hedging the Notes. This excess is expected to decrease over time

until the end of this period. After this period, if RBCCM repurchases your Notes, it expects to do so at prices that reflect their estimated value.

We may use this pricing supplement in the initial sale of the Notes. In addition, RBCCM or another of our affiliates may use this pricing supplement in a market-making transaction in the Notes after their initial sale. Unless we or our agent informs the purchaser otherwise in the confirmation of sale, this pricing supplement is being used in a market-making transaction.

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## STRUCTURING THE NOTES

The Notes are our debt securities, the return on which is linked to the performance of the Reference Stocks. As is the case for all of our debt securities, including our structured notes, the economic terms of the Notes reflect our actual or perceived creditworthiness at the time of pricing. In addition, because structured notes result in increased operational, funding and liability management costs to us, we typically borrow the funds under these Notes at a rate that is more favorable to us than the rate that we might pay for a conventional fixed or floating rate debt security of comparable maturity. Using this relatively lower implied borrowing rate rather than the secondary market rate, is a factor that reduced the initial estimated value of the Notes at the time their terms were set. Unlike the estimated value included in this pricing supplement, any value of the Notes determined for purposes of a secondary market transaction may be based on a different funding rate, which may result in a lower value for the Notes than if our initial internal funding rate were used.

In order to satisfy our payment obligations under the Notes, we may choose to enter into certain hedging arrangements (which may include call options, put options or other derivatives) on the issue date with RBCCM or one of our other subsidiaries. The terms of these hedging arrangements take into account a number of factors, including our creditworthiness, interest rate movements, the volatility of the Reference Stocks, and the tenor of the Notes. The economic terms of the Notes and their initial estimated value depend in part on the terms of these hedging arrangements.

The lower implied borrowing rate is a factor that reduced the economic terms of the Notes to you. The initial offering price of the Notes also reflects the underwriting commission and our estimated hedging costs. These factors resulted in the initial estimated value for the Notes on the Trade Date being less than their public offering price. See “Selected Risk Considerations—The Initial Estimated Value of the Notes Is Less than the Price to the Public” above.

## VALIDITY OF THE NOTES

In the opinion of Norton Rose Fulbright Canada LLP, the issue and sale of the Notes has been duly authorized by all necessary corporate action of the Bank in conformity with the Indenture, and when the Notes have been duly executed, authenticated and issued in accordance with the Indenture and delivered against payment therefor, the Notes will be validly issued and, to the extent validity of the Notes is a matter governed by the laws of the Province of Ontario or Québec, or the laws of Canada applicable therein, and will be valid obligations of the Bank, subject to equitable remedies which may only be granted at the discretion of a court of competent authority, subject to applicable bankruptcy, to rights to indemnity and contribution under the Notes or the Indenture which may be limited by applicable law; to insolvency and other laws of general application affecting creditors’ rights, to limitations under applicable limitations statutes, and to limitations as to the currency in which judgments in Canada may be rendered, as prescribed by the Currency Act (Canada). This opinion is given as of the date hereof and is limited to the laws of the Provinces of Ontario and Québec and the federal laws of Canada applicable thereto. In addition, this opinion is subject to customary assumptions about the Trustee’s authorization, execution and delivery of the Indenture and the genuineness of signatures and certain factual matters, all as stated in the letter of such counsel dated September 7, 2018, which has been filed as Exhibit 5.1 to Royal Bank’s Form 6-K filed with the SEC dated September 7, 2018. In the opinion of Morrison & Foerster LLP, when the Notes have been duly completed in accordance with the Indenture and issued and sold as contemplated by the prospectus supplement and the prospectus, the Notes will be valid, binding and enforceable obligations of Royal Bank, entitled to the benefits of the Indenture, subject to applicable bankruptcy, insolvency and similar laws affecting creditors’ rights generally, concepts of reasonableness and equitable principles of general applicability (including, without limitation, concepts of good faith, fair dealing and the lack of bad faith). This opinion is given as of the date hereof and is limited to the laws of the State of New York. This opinion is subject to customary assumptions about the Trustee’s authorization, execution and delivery of the

Indenture and the genuineness of signatures and to such counsel's reliance on the Bank and other sources as to certain factual matters, all as stated in the legal opinion dated September 7, 2018, which has been filed as Exhibit 5.2 to the Bank's Form 6-K dated September 7, 2018.

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