



Report

Report on Canadian Economic Statistics 1924–2020

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REPORT ON CANADIAN ECONOMIC STATISTICS 1924–2020

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HIGHLIGHTS OF THE REPORT

The Canadian S&P/TSX Total Return Index posted a gain of 5.60% in 2020, after increasing by 22.88% in 2019 (see Table 1A).

The Government of Canada bond curve sharply decreased and steepened in 2020. Yields decreased 147 basis points at the two-year maturity, decreased 91 basis points at the 10-year maturity, and decreased 43 basis points for long-term bonds (see Table 10).

In U.S. dollars, the S&P 500 returned 18.40% in 2020 after seeing an increase of 31.49% in 2019. In Canadian dollars, the S&P 500 Total Return Index posted a gain of 16.07% in 2020 (see Table 5). The MSCI World, MCSI World ex. U.S., European, and Pacific Basin indices saw changes of 14.20%, 5.96%, 3.84%, and 10.04%, respectively, measured in Canadian dollars (see Table 6).

In 2020 the U.S. dollar depreciated against the Canadian dollar, decreasing 2.56 cents based on the average exchange rate for the last business day of December (see Table 5).

Inflation in 2020 was 0.73%, down from 2.25% in 2019 (See Table 1A).

In 2020, the total return on Government of Canada long bonds was 10.04%, after an increase of 8.80% in 2019 (see Table 1A). After adjusting for inflation, the 91-day T-bill posted a real return of negative 0.19% for 2020, compared to a negative 0.57% real return for 2019 (see Table 1B). The total real rate of return for Government of Canada long bonds was 9.24%, compared to 6.41% in 2019 (see Table 3C).

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INTRODUCTION

This is the forty-fifth Report on Canadian Economic Statistics issued by the Canadian Institute of Actuaries' Committee on Investment Practice. Reports have been published annually since 1977.

This report was prepared by Nexus Risk Management and approved by the Committee on Investment Practice.

The committee welcomes comments and suggestions about this report and the tables within.

DESCRIPTION OF DATA

The primary source of data is the data tables maintained by Statistics Canada. Some statistics, such as the GDP and the wage and salary index, are subject to re-estimation by Statistics Canada over a period of months or years. This report includes revisions to the numbers presented last year, and it is likely that the next issue of these economic tables will contain revisions of some of the figures given here. Appendix B is a list of the data table vectors used, together with the concordance of CANSIM I series to data table vectors. Most Statistics Canada data tables did not start until well after January 1, 1924, the commencement date of the attached tables. For years not covered by Statistics Canada data tables, a variety of data sources was used. The data sources are indicated in the notes to the tables, in Appendix C, and in the Bibliography (Appendix E). In some cases, a lack of data required that approximations be used.

Statistics Canada information is used with the permission of Statistics Canada. Users are forbidden to copy the data and disseminate them, in an original or modified form, for commercial purposes, without the express permission of Statistics Canada. Information on the availability of the wide range of data from Statistics Canada can be obtained from Statistics Canada's Regional Offices, its website at www.statcan.gc.ca, and its toll-free access number, 1-800-263-1136.

Other data have been provided by: S&P Dow Jones Indices; RBC Investor and Treasury Services; MSCI; Bloomberg L.P.; TSX Inc., the Bank of Canada, and the U.S. Federal Reserve. The committee is grateful to these providers for the data used in producing this report. The committee cannot assume responsibility for the quality or accuracy of the data.

APPENDIX B

TITLES AND PERIODICITIES OF CANSIM SERIES USED

<u>CANSIM I</u>	<u>Vector</u>	<u>TITLE</u>
B14007	V122541	Treasury Bill auction average yields (3-month)
–	V122552	Treasury Bill auction average yields (6-month)
–	V122538	Selected Government of Canada benchmark bond yields (2-year)
–	V122539	Selected Government of Canada benchmark bond yields (3-year)
–	V122540	Selected Government of Canada benchmark bond yields (5-year)
–	V122542	Selected Government of Canada benchmark bond yields (7-year)
–	V122543	Selected Government of Canada benchmark bond yields (10-year)
–	V122544	Selected Government of Canada benchmark bond yields (long-term)
B14009	V122558	Government of Canada marketable bonds, average yield (1–3 years)
B14010	V122485	Government of Canada marketable bonds, average yield (3–5 years)
B14011	V122486	Government of Canada marketable bonds, average yield (5–10 years)
B14013	V122487	Government of Canada marketable bonds, average yield (10+ years)
B14019	V80691338	Chartered Bank deposit rates for non-chequable savings deposits
B14045	V80691336	Chartered Bank – five-year Personal fixed-term deposit rate
B14056	V80691341	Chartered Bank – five-year Guaranteed Investment Certificate
–	V111666248	Daily average foreign exchange rates in Canadian dollars–U.S. dollars
C892268 ⁽¹⁾	V466668 ⁽¹⁾	Estimates of Population, both sexes, all ages
C892547 ⁽¹⁾	V466965 ⁽¹⁾	Estimates of Population, both sexes, 0–17 years
C892565 ⁽¹⁾	V466674 ⁽¹⁾	Estimates of Population, both sexes, 18–64 years
C892577 ⁽¹⁾	V466686 ⁽¹⁾	Estimates of Population, both sexes, 65 years and over
–	V41690973	Consumer Price Index, 2005 basket; All-items
–	V79311153	Employment and average weekly earnings: Industrial aggregate, seasonally adjusted
–	V2062811	Labour Force Survey estimates: both sexes, 15 years and over, seasonally adjusted
–	V122553	Government of Canada real-return bonds, long-term
–	V733833	Canada Mortgage and Housing Corporation, conventional mortgage lending rate, 5-year term
–	V62305783 ⁽²⁾	GDP, expenditure-based, market prices at current prices, in millions of dollars, seasonally adjusted

Notes:

Unless indicated, data series are reported monthly.

(1) reported annually

(2) reported quarterly

APPENDIX C

SOURCES AND METHODS FOR EACH TABLE

TABLES 1A–1D AND TABLES 2A–2B

CONSUMER PRICE INDEX:

Statistics Canada V41690973

December 1923 to December 2020

Method: Change in December–December period.

COMMON STOCK INDEX:

Prices:

Urquhart & Buckley H641
(Corporate Composite)

December 1923 to December 1946

B4202 (TSE Corporates)

December 1946 to December 1956

S&P/TSX Total Return Index

December 1956 to December 2020

Dividend Yield, Annual Averages:

Ibbotson & Sinquefeld (1977)

January 1923 to December 1933

Urquhart & Buckley H617

January 1934 to December 1955

CANSIM B4245/V122628

January 1956 to December 2015

Method:

1956 and earlier:

December purchase–December sale, plus dividends. The dividend yield used is a 12-month average. For the period January 1926 to December 1933, Standard and Poor's U.S. dividend yields were used (Ibbotson and Sinquefeld, 1977). The values were adjusted by subtracting the average difference, .17%, between the Standard and Poor's dividend yield index and the S&P/TSX dividend yield index over the period January 1956 to December 1965. For the period January 1924 to December 1925, the average Standard and Poor's yield over the period January 1926 to December 1928 was used, 5.05%, reduced by the .17% correction.

1957 and later:

December to December ratio of the S&P/TSX Total Return Index.

GOVERNMENT OF CANADA LONG BOND INDEX (OVER 10-YEAR TERM):

Bank of Canada (1979)

December 1923 to December 1936

CANSIM B14013/V122487

December 1936 to December 2020

Method:

Assume purchase of a bond with 18 years to maturity in December, sell after one year.

CONVENTIONAL MORTGAGE INDEX:

CANSIM B14024/V122497

December 1951 to November 2017

Statistics Canada V733833

December 2017 to December 2020

Method:

Assume a 25-year mortgage with interest rate fixed for five years (25 years for calendar year 1969 and earlier) is bought on December 31 and sold on the subsequent December 31 at then current yields. No allowance is made for administration expenses.

91-DAY TREASURY BILLS:

CANSIM B14007/V122541

January 1934 to December 2020

Method:

Assume purchase on January 1, rolled over quarterly until December 31.

GOVERNMENT OF CANADA REAL-RETURN BOND INDEX (LONG-TERM):

Statistics Canada V122553

November 1991 to December 2020

Method:

Assume purchase of a real-return bond with 28 years to maturity in December, sell after one year.

PER CAPITA PRODUCTIVITY INDEX:**GNP; GDP:**

Firestone	1923–1927	(GNP)
CANSIM D31295	1926–1947	(GNP)
CANSIM D20031	Q4 1947 to Q4 1960	(GDP)
CANSIM D14840/V498086	Q4 1960 to Q4 1981	(GDP)
CANSIM Table 380-0064	Q4 1981 to Q4 2017	(GDP)
Statistics Canada V62305783	Q4 2017 to Q4 2020	(GDP, expenditure-based; Canada; seasonally adjusted at annual rates)

EMPLOYED:

Urquhart & Buckley C51	1923–1953
CANSIM D755002	December 1953 to December 1965
CANSIM D767286	December 1966 to December 1975
Statistics Canada V2062811	December 1976 to December 2020

Method:

Change in ratio of fourth-quarter GNP or GDP to December employed. For 1923–1953, the year-end number of employed was estimated as the geometric mean of the current and following year values; for 1966–1975, it was ratioed up by 3.31% to give continuity from 1975 to 1976. For 1923–1947, the year-end GNP was calculated as the geometric mean of the current and following year values.

WAGE AND SALARY INDEX:

Urquhart and Buckley D1	1923–1940
Canadian Statistical Review	1939–1962
CANSIM D1439	December 1961 to January 1983
CANSIM L57711	January 1983 to January 1991
CANSIM L186863/V1597104	January 1991 to December 2000
Statistics Canada V79311153	January 2001 to December 2020

Method:

Change in December–December period. For 1923–1961, the year-end index was estimated as the geometric mean of the current and following year values. CANSIM D1439 and CANSIM L57711 were linked as at January 1983. CANSIM I L186863 continued as CANSIM II V1597104; hence, CANSIM I L57711 and CANSIM II V1597104 were linked as at January 1991. CANSIM V1597104 and Statistics Canada V79311153 were linked as at January 2001.

NOTES:

1. The S&P/TSX Total Return Index and the S&P 500 Index are applicable to the last business day in December, while other series in this report are based on monthly, quarterly, or annual averages. All values are given as an effective rate (i.e., compounded annually).
2. Table 2A, headed “Average Nominal Annual Percentage Rates of Change/Return”, contains means and standard deviations. These refer to the annualized returns over five- and 10-year periods. The mean is a geometric mean of the applicable five- and 10-year annualized returns for the period. The standard deviation is the sample standard deviation of the non-overlapping annualized observations and is based on the arithmetic mean.
3. The table headed “Standard Deviations of Nominal Annual Percentages Rates of Change/Return” consists of standard deviations of one-year returns during the period indicated, again using the arithmetic mean.

TABLES 3A–3C**FEDERAL BONDS (OVER 10-YEAR TERM):**

CANSIM B14013/V122487	January 1936 to December 2020
Method:	TABLE 3A 12-month average of yields to maturity
	TABLE 3B Assume purchase of a bond with 18 years to maturity in December, sell after one year. Rate is effective.
	TABLE 3C As for TABLE 3B, but adjusted for CPI.

CONVENTIONAL MORTGAGES:

CANSIM B14024/V122497	January 1951 to November 2017
Statistics Canada V733833	December 2017 to December 2020
Method:	TABLE 3A 12-month average of current mortgage rates
	TABLE 3B Assume purchase of a 25-year mortgage, sell after one year. The interest rate is assumed fixed for five years (25 years if 1969 or earlier). Rate is effective.
	TABLE 3C As for TABLE 3B, but adjusted for CPI.

FIVE-YEAR GUARANTEED INVESTMENT CERTIFICATES:

CANSIM B14023	January 1964 to October 1980
CANSIM B14056/V122526	November 1980 to September 2019
Statistics Canada V80691341	October 2019 to December 2020
Method:	TABLE 3A 12-month average of GIC current rates
	TABLE 3B Assume purchase of a 5-year GIC in December, sell after one year. Rate is effective.
	TABLE 3C As for TABLE 3B, but adjusted for CPI.

NON-CHEQUABLE SAVINGS DEPOSITS:

CANSIM B14019/V122493	January 1968 to September 2019
Statistics Canada V80691338	October 2019 to December 2020
Method:	TABLE 3A 12-month average of non-chequable savings deposit rates
	TABLE 3B Use exp (12-monthly average of rates convertible monthly) – 1.
	TABLE 3C As for TABLE 3B, but adjusted for CPI.

REAL-RETURN BOND INDEX (LONG-TERM):

Statistics Canada V122553	November 1991 to December 2020
Method:	TABLE 3A 12-month average of (real) yields to maturity
	TABLE 3B Assume purchase of a bond with 28 years to maturity in December, sell after one year. Rate is effective, real.
	TABLE 3C As for TABLE 3B, but adjusted for CPI.

CORPORATE BONDS (“A” CURVE, 20-YEAR TERM):

BLOOMBERG C28720Y Index	January 1993 – December 2020
Method:	TABLE 3A 12-month average of (real) yields to maturity
	TABLE 3B Assume purchase of a bond with 20 years to maturity in December, sell after one year. Rate is effective.
	TABLE 3C As for TABLE 3B, but adjusted for CPI.

TABLES 4A–4C**91-DAY TREASURY BILLS:**

CANSIM B14007/V122541	January 1936 to December 2020
Method:	TABLE 4A Average of 12-monthly values on semi-annual basis
	TABLE 4B Assume January 1 purchase, quarterly rollover until December 31
	TABLE 4C As for TABLE 4B, but adjusted for CPI.

1- TO 3-YEAR CANADA BONDS:

CANSIM B14009/V122558	January 1949 to December 2020
Method:	TABLE 4A Average of 12-monthly values
	TABLE 4B Assume a bond is bought in December with two years to maturity, sell after one year. Rate is effective.
	TABLE 4C As for TABLE 4B, but adjusted for CPI.

3- TO 5-YEAR CANADA BONDS:

CANSIM B14010/V122485	January 1951 to December 2020
Method:	TABLE 4A Average of 12-monthly values
	TABLE 4B Assume a bond is bought in December with four years to maturity, sell after one year. Rate is effective.
	TABLE 4C As for TABLE 4B, but adjusted for CPI.

5- TO 10-YEAR CANADA BONDS:

CANSIM B14011/V122486	January 1951 to December 2020
Method:	TABLE 4A Average of 12-monthly values
	TABLE 4B Assume a bond is bought in December with seven and a half years to maturity, sell after one year. Rate is effective.
	TABLE 4C As for TABLE 4B, but adjusted for CPI.

10-PLUS-YEAR CANADA BONDS:

CANSIM B14013/V122487	January 1936 to December 2020
Method:	TABLE 4A Average of 12-monthly values
	TABLE 4B Assume a bond is bought in December with 18 years to maturity, sell after one year. Rate is effective.
	TABLE 4C As for TABLE 4B, but adjusted for CPI.

TABLE 5**EXCHANGE RATES:**

CANSIM V37432	January 1951 to April 2017
Statistics Canada V111666248	May 2017 to December 2020

Method:

Closing spot exchange rates were used up to April 2017. From May 2017, daily average exchange rates on the last business day were used instead, following the changes Bank of Canada made to its number, frequency, and calculation methodology of its published FX rates (www.bankofcanada.ca/2016/12/bank-canada-announces-details-forthcoming-changes/). Only end of December rates are shown in Table 5. Monthly rates can be found in Appendix A.

APPENDIX D

DESCRIPTION OF METHODOLOGIES

In the case of the Consumer Price Index (CPI), the tabulated annual change is the ratio of indices in successive Decembers, expressed as a percentage. The indices for January to November inclusive are ignored. For some series, such as the GNP, the CANSIM series is quarterly, and the ratio of fourth-quarter indices is used.

For federal long-term bonds, it is assumed that a purchase is made in December of a newly issued 18-year bond with a redemption yield corresponding to then current yield rates. The coupon is collected semi-annually, and the bond is sold in the following December, just after the second coupon payment, at a price corresponding to then current yield rates. The total yield (capital gain plus coupon) is tabulated in these economic tables. The formula used is an extension of the one derived in Appendix II of Boyle, Brooks-Hill, and Paterson (1974). The formula for the bond value index, B_n , assuming the coupon is reinvested at the average rate for the year, is:

$$B_n = B_{n-1} \left[v^{34} + .5r_{n-1} \left\{ \ddot{a}_{\overline{35}|} + v^{35} + .25(r_{n-1} + r_n) \ddot{a}_{\overline{36}|} \right\} \right]$$

where r_{n-1} is the coupon rate on new 18-year bonds in December of year $n-1$, r_n is the coupon rate on new 18-year bonds in December of year n and v^{34} , v^{35} , $\ddot{a}_{\overline{35}|}$, $\ddot{a}_{\overline{36}|}$ and are calculated at the six-monthly coupon rate $.5r_n$. The mid-year coupon is assumed to be reinvested in an 18-year bond at the rate $.5(r_{n-1} + r_n)$. For instance, for the year 2006 one can obtain from Appendix A the values for B14013/V122487, $r_{n-1} = 4.04\%$ and $r_n = 4.11\%$. Hence, the formula produces $B_n / B_{n-1} = 1.0322$ in agreement with the return presented in Table 1A, 3.22%.

For real-return bonds, the formula used is analogous to that above for long-term bonds. It assumes purchase is made in December of a newly issued real-return bond with 28 years to maturity, at current yields. The coupon is collected semi-annually, and the bond is sold in the following December, just after the second coupon payment, at a price corresponding to then current yields for real-return bonds. Inflation adjustments to both principal and coupon interest are assumed, using a reference CPI from the second month prior to the assumed purchase, sale, or coupon payment.

For corporate bonds, the formula used is analogous to that above for long-term bonds. It assumes purchase is made in December of a newly issued corporate bond with 20 years to maturity, at the current yield. The coupon is collected semi-annually, and the bond is sold in the following December, just after the second coupon payment, at a price corresponding to the then current yield for corporate bonds.

Mortgage yields up to and including calendar year 1969 are calculated assuming a 25-year period for both amortization and the period for which interest is fixed.

For calendar years 1970 and later, mortgages are assumed to be amortized over 25 years, and to have an interest rate fixed for five years. This leads to a formula for the mortgage value index:

$$M_n = M_{n-1} \left\{ \left(\ddot{a}_{\overline{9}|} + v^8 a'_{\overline{40}|} \right) + \left(\ddot{a}_{\overline{10}|} + v^9 a''_{\overline{40}|} \right) / a''_{\overline{50}|} \right\} / a'_{\overline{50}|}$$

where v^8 , v^9 , $\ddot{a}_{\overline{9}|}$, and $\ddot{a}_{\overline{10}|}$ are calculated at $.5r_n$; $a'_{\overline{40}|}$ and $a'_{\overline{50}|}$ are calculated at $0.5r_{n-1}$; and $a''_{\overline{40}|}$ and $a''_{\overline{50}|}$ are calculated at $0.25(r_{n-1} + r_n)$. For 2006, Appendix A gives for B14024/V122497 the values $r_{n-1} = 5.60\%$ and $r_n = 5.89\%$. Hence, the formula gives the result $M_n / M_{n-1} = 1.0470$ in agreement with Table 1A. In this formula, it is assumed that semi-annual payments are reinvested at mid-year at the rate $0.25(r_{n-1} + r_n)$. This convenient approximation introduces minimal errors. This formula is consistent with the formula for bonds taking into account the balance outstanding at the end of the term period.

Tables 1B and 2B present rates of return, rates of change, and interest rates net of increases in the CPI. The net rates for each year were calculated as $\{(1 + i_n)/(1 + P_n)\} - 1$, where i_n is the nominal rate for year n (on a year-end to year-end basis) and P_n is the change in the Price Index for the 12 months to the end of year n .

As indicated in the title pages to the tables, it was frequently necessary to combine several series so that statistics could be presented for the full period. Generally, the new series were used from the first year n at which figures were available. The annual percentage change for the last year of the older series is based on the quotient of the older series year-end n and year-end $n - 1$ values. The annual percentage change for the new series is based on the quotient of the new series year-end $n + 1$ and year-end n values.

Tables 3A and 4A present the yields to maturity for the various bonds and other fixed-income investments. For GICs, savings deposits, and mortgages the current rates for new investments are used. Tables 3A and 4A present for each calendar year the average of the rates for each of the 12 months during that year. Tables 3B and 4B present the rates of return, including capital changes, calculated as in Table 1A. Tables 3C and 4C give the rates of return adjusted for inflation.

APPENDIX E

REFERENCES AND BIBLIOGRAPHY

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