Portfolio Rebalancing, Conflicts of Interest of Delegated Investment Management and Seasonality in Canadian Financial Markets

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ABSTRACT

Using Canadian data for the period 1957-2018, this paper provides evidence in support of portfolio rebalancing by professional portfolios managers. We document strong seasonality in returns of Canadian stock and government bond indices. However, the seasonality in the returns of the Canadian government bond index is opposite in direction from that of the Canadian stock index**.** Seasonal strength is observed in equities, especially smaller cap stocks at the beginning of the year, with the rest of the year, especially the second half of the year, showing widespread weakness in relation to January. The opposite is true for government of Canada bonds, as portfolio rebalancing would predict. In addition, this paper provides support of the popular expression "Sell in May and Go Away", as the average performance of risky securities is higher in the November to April period than the May to October period. The opposite is true for government of Canada bonds, which is also consistent with portfolio rebalancing. The paper's findings will be useful not only to institutional investors, but also to individual investors. Understanding the seasonal behavior of financial markets and the inefficiencies bestowed upon them by institutional factors will help investors secure higher returns and better retirement.

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I. Introduction

This paper purports to investigate and address the following questions. Is there a January Effect in stock returns in Canada? How much truth does the popular expression "Sell in May and Go Away" have?[1] Moreover, if the returns of risky securities, such as stocks, exhibit seasonal patterns, how do the returns of risk-free securities, such as government bonds, behave throughout the year? Are seasonal patterns in security returns interlinked? If such patterns exist, what drives them and are there profitable opportunities arising from such behavior of financial securities?

There has been much research in recent years to indicate that there is a distinct seasonal pattern in the equity markets around the world (see Gultekin and Gultekin (1983), Athanassakos and Schnabel (1994), Bouman and Jacobsen (2002), Ogden (2003), L'Her, Masmoudi and Suret (2004), Andrade et al. (2013), Zhang and Jacobsen (2021)). Similarly, research has shown that the returns of high-risk corporate bonds also exhibit seasonality that mirrors that of equities (see Fridson (2000), Chan and Wu (1995), Al-Khazali (2001)). While the government bond market has not been researched as extensively, evidence does exist to indicate that government bond returns also exhibit seasonal behavior which, however, is distinctly different from the seasonal behavior of stocks and high risk corporate bonds (see Ogden (2003) and Chan and Wu (1995)). Returns of stocks and high-risk bonds tend to be strong at the beginning of the year, while government bond returns tend to exhibit strength towards year-end (see Ogden (2003), Athanassakos and Tian (1998)).

[1] See, for example, Luciw (2005), DeCloet (2005) and Tait (2005).

While Athanassakos and Schnabel (1994) and Athanassakos and Tian (1998) also investigated similar questions, the former examining stock returns and the latter government bond returns, they examined these securities' seasonalities as if they were independent of each other. We believe and we will demonstrate in the paper that these seasonalities are interlinked, driven by the same underlying forces. Additionally, we wish to examine these seasonalities with more recent data to assess their persistence in light of so much evidence of their existence with important implications for market efficiency. Does seasonality in Canadian financial markets persist? This is because there is evidence to suggest that after the publication of a predictable return pattern, investors learn about the anomaly and it should disappear (see McLean and Pontiff, 2016). However, the United States seems to be the only nation with a reliable decline in predictability after the publication of an anomaly (see Jacobs and Müller, 2020). Consistent with this, seasonality in U.S. markets seemed to have weakened in recent years (see Dichtl and Drobetz (2014)). If mispricing is due to a behavioral bias, smart arbitrageurs should take advantage of the mispricing, pushing the market toward a more rational outcome. If there are limits to arbitrage, as McLean and Pontiff (2016) argue, arbitrageurs are constrained in their ability to benefit from mispricing.

If markets are efficient such patterns in return behavior should not persist. Yet evidence shows they do (see Andrade et al. (2013), Zhang and Jacobsen (2021)). While many explanations have been proposed for the seasonal behavior of stocks and bonds, a universally accepted and unified theory on why it occurs and with such regularity is yet to emerge.

Tinic, Barone-Adisi and West (1987) provide evidence in support of tax-loss selling as the driving force behind the so-called "January Effect". Athanassakos and Schnabel (1994), using Canadian data, and Cuny et al. (1996), using US data, demonstrate that portfolio rebalancing by professional portfolio managers drives the seasonal behavior of stocks. Ogden (2003) links the seasonality of stocks and bonds to economic activity and to the annual cycle view of the economy. He finds, among other things that "the bulk of annual

mean excess returns on US stocks and bond portfolios are realized in October through March". Bouman and Jacobsen (2002) find support for the adage "Sell in May and Go Away" in equity markets around the globe, but they conclude that this finding, and why it occurs, remains **a puzzle** as a number of possible explanations they investigate, such as data mining and risk explanations, among others, are rejected. While some studies, notably of Ogden (2003), have discussed the opposite seasonal pattern in the returns of stocks and high risk bonds vs. government bonds and linked it to economic activity, no attempt has been made to link this seasonal behavior of stocks/high risk bonds and government bonds to a unified underlying driving force that, as it will be explained later, is conjectured in this paper to be related to the investment decision process of professional portfolio managers who invest in these securities. In fact, Ogden (2003) indicates that some aspects of his findings are consistent with rational behavior, while others are consistent with theories developed by behavioral finance and suggests that more research is necessary to explore such findings. This paper will explore the drivers of security return seasonality in relation to the behavioral explanations.

Other research trying to explain the seasonal pattern of stock returns along these lines has tended to emphasize human psychology and the impact weather variables have on investor behavior. These studies tend to argue that the weather influences the mood and risk taking behavior of investors, which in turn influences stock returns (see Hirshleifer and Shumway (2003), Kamstra, Kramer and Levi (2003) and Cao and Wei (2005)). The latter two papers are more intuitively appealing than the former and can be consistent with the opposite seasonality documented between risky (generally smaller and obscure) stocks and government bonds. However, the weakest months for stock returns are September and October and the strongest months for government bond returns are October and November, which are outside the summer months. In addition, as it will be shown later, the government of Canada bond return seasonality is driven by the second sub-period of our study, when the government of Canada bond market became liquid. As the weather seasonality was the same over our two sub-periods, differential government bond return seasonality cannot be explained by the weather.

Moreover, as Jacobsen and Marquering (2008) conclude, "without any further evidence, the correlation between weather variables and stock returns might be spurious and the conclusion that weather affects stock returns through mood changes of investors is premature". And Kelly and Meschke (2005) show that not only is the Seasonal Affective Disorder not supported by the psychological literature, but that also "econometric specifications of the model reflect the higher returns around the turn of year, mechanically inducing statistical significance".

In this paper, we argue that portfolio rebalancing by portfolio managers (see Haugen (1990), Haugen and Lakonishok (1988), Athanassakos and Schnabel (1994)) drives the seasonal behavior of stocks and risk-free bonds and it is this behavior that contributes to the opposite seasonal pattern of the returns of these securities in the financial markets. In other words, we concentrate on individuals working for institutions, as described by Greenwald et al. (2001), namely, those who have their own agendas, which may not be in line with those of the institutions they work for.[2] Such principal-agent relationship induces portfolio managers to act on their own behalf, trying to maximize their own wealth, as opposed to that of their clients.

As Greenwald et al. (2001) explain, portfolio managers exhibit herd mentality. They are safe when their portfolios look pretty much like everyone else's who invests with the same mandate, as no one loses his/her job because of average performance or holding the same securities as the rest of the peer group. Herding becomes more pronounced towards the end of the year when portfolio managers window dress to spruce up their portfolios by selling stocks that are obscure and have fallen in price and buying up stocks (and other securities, such as government bonds) that have done well and are visible and in the public eye. At the same time portfolio managers lock in good performance by selling risky stocks (whom they bought at the beginning of the year) and moving to lower risk

[2] It is reasonable to assume that portfolio managers, being professionals, are more disciplined and able to resist irrationalities and human psychology biases better than individual investors. However, they do have an incentive to follow self-benefiting behavior.

stocks or risk free securities to affect their Christmas bonus.[3] Window dressing and remuneration-motivated portfolio rebalancing, exacerbated by herding, affects prices and returns of financial securities throughout the year in a predictable way. Risky stocks and high risk bonds are bid up (down) at the beginning of the year (towards year-end), whereas low risk stocks and risk-free bonds are bid up (down) towards year end (beginning of the year).[4] The pattern repeats annually mimicking window dressing and/or the annual performance evaluation cycle of portfolio managers.

Such seasonal behaviour is difficult for the markets to fully eliminate for two reasons. First, it is related to window dressing and/or remuneration-motivated turn-of-the-year portfolio rebalancing by professional portfolio managers who pursue their own interest year in and year out. Second, seasonality is not consistently observed every year. Unless we have a unified theory to help us anticipate seasonal behaviour on a consistent basis, market participants cannot fully arbitrage the seasonal behaviour of financial securities. This is particularly true since professional portfolio managers' survival is based on short term performance metrics (see Brandes (2004, pp. 40 and 42)).

In this paper, for the period 1957-2018 and sub-periods, we examine whether seasonality is present (and persistent over time) in the returns not only of risky securities, but also of risk free securities by looking at Canadian stock and government bond indices that are frequently used in academic and practitioner-based research.

This paper provides evidence in support of the portfolio rebalancing hypothesis. Seasonal strength is observed in the returns of equities, especially smaller stocks at the beginning of the year, with the rest of the year, especially the second half of the year, showing

[3] This is consistent with comments made to the media by market professionals, as the quote that follows indicates. "Going into year-end what you're going to have is some of the portfolio managers locking in some of their nice gains and not putting them at risk four weeks from year end" (Heinzl (2005)).

[4] Baker and Wurgler (2005) find that government bonds commove strongly with "bond-like" stocks. These are large stocks, long listed stocks and stocks of profitable and dividend paying stocks. This finding is consistent with the argument made in this paper that such "bond-like" stocks and risk-free bonds should exhibit similar seasonality which is driven by the trading behavior of professional portfolio managers whose trades are motivated by self-interest.

widespread weakness in relation to January. The opposite is true for the returns of government of Canada bonds, as the portfolio rebalancing hypothesis would predict. This finding is consistent with other Canadian (see Athanassakos and Schnabel (1994)) and US (see Cuny et al. (1996)) studies, which used different databases and methodology to test for the portfolio rebalancing hypothesis. The above studies carried out direct tests of the portfolio rebalancing hypothesis, as they used mutual fund and/or pension fund data in their tests, but they only examined stock return seasonality in relation to the gamesmanship hypothesis. However, as explained earlier, portfolio rebalancing by portfolio managers has implications for both stocks and government bonds. For a convincing case to be made in favor of portfolio rebalancing and the portfolio rebalancing hypothesis, one has to examine not only the behavior of stocks, but also that of government bonds.

In addition, this paper provides support for the expression “Sell in May and Go Away”, as the average performance of risky securities is higher in the November to April period than the May to October period. The opposite is true for risk-free securities. This finding is also consistent with the portfolio rebalancing hypothesis. Had investors invested consistently in risky securities in November to April for the last 60 years and rebalanced their portfolios out of risky securities and into government bonds for the remaining annual period, they would have outperformed the market by a significant margin.

The paper’s findings will be useful to institutional investors since portfolio managers' bonus and quite often survival are tied to their short-term performance vs. their peers who invest with the same mandate (see Brandes (2004, pp. 40 and 42)). The cyclical nature of the securities industry and the high turnover in this industry reinforce such short-term performance evaluation measures (see Athanassakos (2002) and Leitch (2005)). Information, such as the one that is sought after in this paper, will help portfolio managers do better than average throughout the year. It can also be quite useful to individual investors, as well. This is of particular importance in light of fundamental

changes that are taking place in the retirement planning industry. Corporate pension funds that were traditionally structured as defined benefits plans are rapidly changing their structure to defined contributions plans, requiring plan contributors to take personal responsibility for their own financial well-being in retirement. Understanding the seasonal behavior of financial markets and the inefficiencies bestowed upon them by institutional factors will help investors secure higher returns and better retirement.

The rest of the paper is organized as follows: Section II develops the tests of the portfolio-rebalancing hypothesis by examining the seasonal behavior of security returns in Canada; it discusses the testable hypotheses, data and methodology followed and presents the empirical results. Section III concludes the paper and interprets the findings.

II. Seasonality in Returns of Financial Securities

In this section, we will examine the seasonal behavior of security returns, which has been impacted by the trading of institutional investors, in order to provide support for the portfolio rebalancing hypothesis.

II.1. Testable Hypotheses

Prior research has documented seasonality in the returns of small stocks and high-risk bonds. Keim (1983) finds that about half of the annual return of small firms occurs in the month of January. This evidence is corroborated by Blume and Stambaugh (1983) and Haugen and Lakonishok (1988), among others. Fridson (2000) finds evidence consistent with seasonality in high risk bonds that mimics the seasonality in stocks and argues that whatever drives the seasonality of stocks also drives the seasonality of high-risk bonds. Seasonality in high-risk securities is consistent with both portfolio rebalancing and tax loss selling.

In this paper, we argue that if the portfolio rebalancing is correct, we should observe seasonality in the returns not only of risky securities (especially smaller stocks), but also in the returns of risk-free securities. According to portfolio rebalancing, the high returns on risky securities (particularly smaller companies) in the first few months of the year are caused by systematic shifts in the portfolio holdings of professional portfolio managers who "window dress" and/or lock in returns to affect performance-based remuneration. Institutional investors are net buyers of risky securities in the early months of the year when they are less concerned about including well-known, low risk or risk-free securities in their portfolios or they are trying to outperform benchmarks. Towards the later months of the year, portfolio managers divest from lesser-known, risky, or poorly performing stocks and replace them with well-known and less risky stocks with solid recent performance or risk-free securities, such as government bonds. The excess demand for risky securities early in the year bids the prices of these securities up. The opposite happens towards the last few months of the year. Government bonds and safer, larger, well known stocks are bid up, whereas risky, smaller, obscure, less known stocks are bid down. As a result, we would expect to find seasonality not only in risky securities, but also in low risk (the "bond-like" stocks as per footnote #4)) and risk-free securities, as portfolio managers rebalance their portfolios throughout the year. If tax loss selling causes seasonal behaviour in financial markets, we will not expect to find seasonality in government bond returns. This is because tax loss selling is generally associated more with the behaviour of individual investors who tend to hold smaller cap stocks (see Ritter (1988)). At the same time, institutional investors tend to concentrate more on larger, safer and better-known stocks, and risk-free bonds (see Blume and Friend (1986)). Thus, government bonds should not be subject to any buying or selling pressure for the purpose of tax-loss selling.

Our research hypothesis is thus:

H_0[1]: There is no monthly seasonal pattern in the returns of financial securities, namely, small stocks and risk-free bonds.

If portfolio managers invest to outperform benchmark portfolios, they will put their money in risky securities at the beginning of the year and away from risky securities towards year end. As a result, for risky securities, January (or the first few months of the year) returns can be expected to be quite high. In such cases, the second half of the year should be weak in relation to January, as managers would bail out of those securities in order to lock in profits. As they disinvest from those securities, managers would tend to move to less risky or risk-free securities pushing up those less risky securities' prices. As a result, risk-free securities are expected to experience weakness in January (or the first few months of the year) and strength towards the second half of the year in relation to January, as the portfolio rebalancing hypothesis would predict, and, hence, we would expect to reject H_0.

A popular expression in the financial markets, in relation to equity investments, is "Sell in May and Go Away". It is possible that the strength in stock returns in January is actually spread over a few months around this month, as it is not unexpected that some arbitraging will be taking place by those investors not bound by the restrictions or conflicts portfolio managers are facing. Moreover, portfolio rebalancing may not take place all at once in January but spread around the month of January and portfolio rebalancing may not happen all at once in the first month of the year, but also spread around it, namely, in the first and last few months of the year. Such portfolio rebalancing should not only impact risky stocks, but also government bonds consistent with the portfolio rebalancing hypothesis. As a result, we should expect seasonal strength (weakness) in more than the month of January, namely from November until April for risky (risk-free) securities and reversal from May to October.[5]

[5] On the question of why we chose November to April and May to October, we refer to Bouman and Jacobsen (2002) who state "While we lack a formal theory, we do at least have an old market saying to go by. In other words, we have not tried all half-year periods and have only reported the results of the best period we find".

Consequently, the following subsidiary hypothesis will be tested along these lines to test the validity of the expression "Sell in May and Go Away":

H_0^2: There is no semi-annual seasonal pattern in the returns of financial securities, namely, small stocks and risk-free bonds.

Based on the above discussion, we should expect to reject this hypothesis.

II.2. Data

Data from January 1957 to December 2018 are obtained from the Canadian Financial Markets Research Centre (CFMRC) database.[6] This database includes, among other data, stock index (universe equally weighted) total return data, as well as rates of returns on an index of long-term government of Canada bonds (over 10 years).

The CFMRC equal weighted (EW) index return is the average monthly total return for all domestic common equities in the CFMRC database. It is used in this study as a proxy for smaller, higher risk stocks. Long-term government of Canada (GOC) bond return is defined as the return on a long term GOC bond with an approximate term to maturity of 17 years purchased at the end of last month and sold at the end of the current month. More on the descriptions of these series and their construction can be found in Hatch and White (1988).

II.3. Methodology

To test for seasonality in the returns of Canadian financial securities in relation to our H_0^1 hypothesis, the following time-series dummy OLS regressions are run with Newye-West

[6] The CFMRC database starts in January 1957.

estimations that provide significance tests in the presence of heteroskedasticity and autocorrelation:

$$R_{qt} = a_0 + \sum_{j=2}^{12} a_j D_{qt}^{j} + e_{qt} \qquad (1)$$

where, R_{qt} is the total monthly raw return of the CFMRC equally weighted total return index or the government of Canada bond index. D^{j}_{qt} is a dummy variable that is equal to 1 if the current month is month j and equal to zero otherwise. This model identifies the months in which stock returns are unusually high. It tests whether stock or bond returns in a given month (j=2 to 12) are different from a base month, in this study January. The intercept a_0 indicates the average return of stocks or bonds in our sample for the month of January. The rest of the coefficients (a_2 to a_{12}) represent the average difference in returns between January and each of the other months.

Finally, to test hypotheses H_0[2] regressions (1) above are run with only two semi-annual periods, November-April and May-October. The November-April period average return is captured by coefficient a_0 (i.e., the intercept) and the average difference in the May-October period return from that of November-April by coefficient a_2 (i.e., the coefficient for dummy variable for May-October).

II.4. Empirical Results on the Seasonality of Returns of Financial Securities

II.4.1. Summary Statistics

Tables 1 and 2 report the summary statistics of monthly returns of the equally weighted CFMRC index and the government of Canada bond index, while Tables 3 and 4 report summary statistics of semi-annual returns of the equally weighted CFMRC index and the government of Canada bond index. In all tables, summary statistics are reported for the whole sample period and sub-periods. It is interesting to note that while stock returns

have declined on average in the 1988-2013 sub-period from the one before (1957-1987), the opposite is the case for government bonds.

II.4.2. Monthly Stock and Government Bond Return Seasonality

Figures 1 and 2 show the average monthly returns of the equally weighted stock index, as well as of the government of Canada bond index over 1957-2018 and sub-periods. In Figures 1 and 2, we see that the equally weighted index shows high average returns in the month of January and low returns thereafter, particularly in the May to October period.[7] Both sub-periods exhibit similar behaviour, although the strength of January has weakened somewhat in the second sub-period. The government of Canada bond returns exhibit strong returns only in the August to December period. While the strength in the equally weighted stock index returns is consistent throughout our sample, the government of Canada bond index seasonal strength is primarily driven by the second sub-period of our sample. We observe the superior performance of the equally weighted index (smaller stock) returns vs. the government of Canada bond index returns at the beginning of the year and particularly in January. While stocks seem to do better in January and at the beginning of the year, the government of Canada bond index is outperforming the EW stock index in the August to November period, especially in the second sub-period.

To obtain a better picture of the seasonality in the returns of the financial securities examined in this paper and, particularly of their statistical significance, we need to

[7] November and/or December returns tend to also be significantly positive for the equally weighted (EW) stock index employed in this paper. It is quite possible that some arbitrage is taking place by those investors not bound by the constraints or conflicts portfolios managers face. In addition, it is possible that some risk-taking behavior is followed by "desperate", so to speak, portfolio managers who have lagged their benchmarks and are trying to catch up by investing in extremely risky stocks. This behavior is not unlike the behavior of corporate finance managers who in cases of extreme financial distress are willing to forgo positive NPV projects in favor of negative NPV projects as long as these projects have extremely high risk hoping to hit the "jackpot" and escape the predicament their company and themselves are in and in so doing "go for broke", to use a gambling language (see Brealey, Myers and Allen (2006, p. 483)).

examine the difference in returns between January and the rest of the months of the year by means of the dummy OLS regression (1) discussed earlier.

Table 5 reports the results from regression (1). This regression looks not only at the January returns but also at the difference in returns between January and the rest of the months of the year. The results provide support for H_0^1. In Table 5, we see that the equally weighted index shows strength in the month of January and weakness vis-à-vis January thereafter in the second half of the year. This is true in both sub-periods. The government of Canada bond returns exhibit no strength in January, and only returns in November are statistically higher than January for the total sample and the first sub-period (at 5% level of significance). In the second sub-period, both August and November are statistically different from January at the 5% level of significance. While the seasonality in the equally weighted stock index returns is consistent throughout our sample, the government of Canada bond index return seasonal strength is driven primarily by the second sub-period of our sample.

II.4.3. Sell in May and Go Away: Semi-Annual Stock and Government Bond Return Seasonality

As explained in footnote #7, November and/or December returns tend to also be significantly positive for the EW stock index employed in this paper. It is quite possible that some arbitrage is taking place by those investors not bound by the constraints or conflicts portfolios managers face. The fact the January strength has diminished over time for the equally weighted index provides some evidence that arbitrage has indeed taken place. In addition, it is possible that some risk-taking behavior is followed by "desperate", so to speak, portfolio managers who have lagged their benchmarks and are trying to catch up by investing in extremely risky stocks. As a result, months are now grouped into two semi-annual periods based on the popular adage "Sell in May and Go Away", namely November-April and May to October.

Figures 3 and 4 plot the average semi-annual monthly returns of the EW and GOC bond index returns over 1957-2018 and sub-periods. We observe that November to April tends to be a strong semi-annual period for stock returns for the total sample, as well as for both sub-periods examined, whereas May to October tends to be a strong semi-annual period for government of Canada bond returns only in the second sub-period (see footnote #9).

Similar to section II.4.2, to obtain a better picture of the semi-annual seasonality in the returns of the financial securities examined in this paper and, particularly of their statistical significance, we need to examine the difference in returns between November-April and May-October by means of a dummy OLS regression similar to regression (1) discussed earlier, but adapted to the semi-annual application.

Table 6 reports the results from running regression (1), as applied to the semi-annual rather than the monthly seasonality tests. They pertain to tests of semi-annual seasonality in the returns of financial securities and of hypothesis H_0[2]. In Table 6, there is unequivocal evidence that there is a strong November-April semi-annual seasonal pattern in stock returns.[8,] In fact, on average, the annual return of the EW stock index examined in this paper is all realized in November-April, as the average return for May-October is not different from zero. In terms of the government of Canada bond returns, there is a strong semi-annual seasonality in the second half of the annual period (i.e., May-October), which nevertheless is primarily driven by the 1988-2018 sub-period. Changes that took place in the late 70's and early 80's in the contact of monetary policy by the US Fed and the Bank of Canada and, especially, a dramatic increase in the liquidity

[8] This finding is consistent Bouman and Jacobsen (2002), Andrade et al. (2013), and Zhang and Jacobsen (2021). Bouman and Jacobsen (2002), in particular, examine several possible explanations for this finding, such as data mining, the January Effect, risk explanations, shifts in interest rates, sector specific factors, which they all reject. Concerning the usual criticism of such studies, that of data mining, they state, "While we lack a formal theory, we do at least have an old market saying to go by. In other words, we have not tried all half-year periods and have only reported the results of the best period we find". They conclude by stating, "It seems that we have not yet solved this new puzzle".

of the Canadian government bond market helped induce a more severe portfolio rebalancing in and out of government securities by institutional investors in the 1988-2018 sub-period.[9]

The findings in this section have important implications for investors. The average annual rate of return over the last 60 years (1957-2018) would have been 17% had investors gone long in the equally weighted index in November-April and gotten out of risky securities altogether in the May-October semi-annual period and, over that period, invested instead heavily (and exclusively) in government of Canada bonds.[10] It would have been 18% in the 1988-2018 sub-period.

The findings have also implications for ongoing research on the drivers of the return seasonality in financial securities. The seasonality in government bond returns evident in this, as well as in the previous section is not consistent with tax-loss selling. Moreover, lack of seasonality in government bond returns in 1957-1987, when there was strong seasonality in 1988-2018, seems to also be inconsistent with the weather-related explanation of seasonality in financial securities.[11]

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[9] In the late 70's, the Canadian government started to incur large budgetary deficits which resulted in the issuance of a large amount of government of Canada bonds to finance the deficit. This was unlike earlier periods. The increased issuance of government of Canada bonds added to the liquidity of the Canadian government bond market starting in the late 70's. In fact, prior to the late 70's, the Canadian government bond market was so thin that market participants were benchmarking all bonds off a corporate bond, namely the Bell Canada Enterprises bond, which had much higher liquidity than corresponding government of Canada bonds. As a result, there would have been little scope for portfolio rebalancing by professional portfolio managers using government of Canada bonds in the 1957-1987 sub-period of our study.

[10] Not only does this strategy generate a higher return than the market portfolio, but it also encompasses lower risk. In addition, this is a low transaction costs strategy, as it requires entry into and exit out of the market only twice a year.

[11] To complement (and substantiate) the tests (evidence) of portfolio rebalancing, we also made use of the flow of funds data. These data, which are obtained from CANSIM II Table 3780001 of the CANSIM data base of Statistics Canada, are sectoral financial flow of funds and are available quarterly from 1961: Q1 to 2015: Q4. From this database, we extracted total fund flows in stocks and government of Canada bonds by Trusteed Pension Plans, Mutual Funds, Investment Dealers, Insurance Companies and Public Financial Institutions. Prior to 1980's, the Canadian government bond market was extremely illiquid (see footnote #9). At the same time, prior to the 1980's, the Canadian flow of funds data suffered from many shortcomings, such as weak survey coverage, survey questionnaires which were not sufficiently detailed to meet the requirements of the flow of funds accounts and a lack of adequately documented records (see Athanassakos (1988)). As a result, we examined the seasonality of stock and government bond flow of funds data over the 1981: Q1-2015: Q4 period, which coincides with the second sub-period of the study. For stocks, the strongest

III. Additional Tests

III.1 Box and Whisker Plots

A boxplot is a graph that gives the reader an indication of how the values in the data are spread out and displays the range and distribution of data along a number line and provides an indication of symmetry and skewness in the data. A box plot provides information that bar charts do not, such as the median, 25th and 75th percentile, and min/max that are not outliers. A boxplot explicitly separates the points that are considered outliers.

The Box-Whisker plots are plotted in figures 5-8. Figure 5 shows that, visually, January median EW CFMRC index returns are higher than the median returns of every other month of the year in the total sample period and sub periods. In 1957-2018 and 1957-1987, January is the month with the most positive outliers while October is the month with the most negative outliers. For the 1988-2018 sub period, however, while January returns continue to be strong, December returns have also pick up strength. The strength in January and December returns are not driven by positive outliers. In general, August to November is the period in the year with the most negative return outliers in all periods examined.

In Figure 6, we observe that while April to July government of Canada long term bond returns exhibit many negative outliers, August to November returns show many positive outliers for the total sample period and sub period 1957-1987. August to November median returns tend to rise above the returns of earlier months. The bond market appears to be much calmer in the 1988-2018 sub period. In this latter sub period August

quarter of the year is quarter one, while for government of Canada bonds, the strongest quarter of the year is quarter four. This was evident from both the mean and median of the quarterly flow of funds in stocks and government of Canada bonds.

to November returns tend to be higher than in earlier months and exhibit many more positive outliers. Moreover, May is the strongest month of the year while January the weakest.

Figure 7 shows that EW CFMRC index median stock returns are clearly higher in November-April than in May-October in all periods examined.

Finally, Figure 8 shows that government of Canada long term bond returns exhibit many more positive outliers in May-October than in November-April for 1957-2018 and 1957-1978. On the other hand, the May-October bonds' seasonal strength is not driven by as many positive outliers in sub period 1988-2018 as it is for sub period 1957-1978. There is no difference in median bond returns between May to October and November to April in the 1957-1987 period, whereas returns in May to October exceed those for November to April in the 1988 to 2018 period.

III.2 Kruskal-Wallis Tests[12]

Tests of previous sections assume a normal distribution of the residuals, which may not be true given the large discrepancy between mean and median values of the data of this study. As a result, we have decided to also run a non-parametric test for testing whether samples originate from the same distribution, such as the Kruskal-Wallis test.

A significant Kruskal–Wallis test indicates that at least one sample stochastically dominates another sample. The null hypothesis is that the medians of all samples are equal, and the alternative hypothesis is that at least one population median of one sample is different from the population median of another sample.

[12] We also carried out two sample Kolmogorov-Smirnov tests for equality of distribution functions and we find results for equities and long term government bonds that are consistent with the Kruskal-Wallis tests. The only difference is that unlike the Kruskal-Wallis tests, the January EW CFMRC stock index returns are more significantly higher than December returns for the period 1957-2018 (p-value=0.019) and for the period 1957-1987 (p-value=0.018) when compared with the Kruskal-Wallis results.

The results are reported in Tables 7-10. Table 7 shows that the Kruskal-Wallis chi square tests confirm the parametric tests reported earlier, in that January EW CFMRC index returns are statistically higher than the returns of each of the rest of the months of the year in the 1957-2018 period and sub-period 1957-1977. In the 1988-2018 sub period, January returns are statistically higher only for the months of March to November, while there is no significant difference between January and February or December returns. Consistent with the paper's argument, it appears that in the more recent years, investors seem to anticipate the January strength and trade in such a way that January's strength is spread around the month of January.

In Table 8, we observe that the January government of Canada long term bond returns are in general not statistically lower than each of the rest of the months of the year, with the exception of August and November for 1957-2018, October in 1957-1987 and August in 1988-2018.

Table 9 clearly substantiates prior evidence that EW CFMRC index stock returns in November-October are statistically higher than the returns in May-October in the whole sample period and sub periods.

In Table 10, we observe that while May-October government of Canada long term bond returns are not in general statistically higher than the returns of November to April, in the second sub period 1988-2018, the strength of May-October has gathered some momentum (see footnote 9).

In summary, the additional tests carried out in this section are consistent with those presented in previous sections and also support the argument made in the paper that seasonal patterns in equities and bonds are interlinked (in an opposite fashion).

IV. Conclusions and Interpretation of Findings

In this paper, for the period 1957-2018 and sub-periods, we examined whether seasonality was present (and persistent) in the returns not only of risky securities, but also of risk free securities by looking at Canadian stock and government bond indices that are frequently used in academic and practitioner-based research. The validity of the popular expression “Sell in May and Go Away” was also examined. We used such tests as the foundation to support portfolio rebalancing by professional portfolio managers as the determining factor that drives security return seasonality.

This paper’s findings provided evidence in support of portfolio rebalancing. Seasonal strength was observed in Canadian equities, especially smaller stocks at the beginning of the year, with the rest of the year, especially the second half of the year, showing widespread weakness in relation to January. The opposite was true for government of Canada bonds, as portfolio rebalancing would predict. If portfolio managers invest to outperform benchmark portfolios, they will put their money in risky securities at the beginning of the year. For those securities, January (or beginning of the year) returns can be quite high. In such cases, the second half of the year is, in general, weak, as managers bail out of those securities in order to lock in profits. As they disinvest from those securities, managers tend to move to less risky and/or risk-free securities pushing up those securities' prices. As a result, those securities tend to have weak January (or beginning of the year), but a strong second half of the year, as portfolio rebalancing would predict. The evidence provided in this paper is consistent with other Canadian (see Athanassakos and Schnabel (1994)) and US (see Cuny et al. (1996)) studies of portfolio rebalancing, which examined only equities and used different databases and methodology to test for portfolio rebalancing and seasonality in financial markets.

In addition, consistent with the findings of Bouman and Jacobsen (2002), Andrade et al. (2013), and Zhang and Jacobsen (2021), this paper provided support for the expression

"Sell in May and Go Away", as the average performance of risky securities was higher in the November to April period than the May to October period.[13] The opposite was true for risk-free bonds. This evidence is also consistent with portfolio rebalancing. Had investors invested consistently in risky securities in November to April for the last 60 years and rebalanced their portfolios out of risky securities and into government bonds for the remaining annual period, they would have outperformed the market by a significant margin.[14] Unlike US evidence, the "Sell in May and Go Away" phenomenon has not weakened materially over time in Canada. Future research may wish examine the reasons for such discrepancy in findings. Are there more limits to arbitrage or other institutional factors in Canada that prevented the elimination or weakening of the phenomenon?

The paper's findings have implications for ongoing research on the drivers of the return seasonality in financial securities. The seasonality in government bond returns evident in this paper is not consistent with tax-loss selling. Moreover, lack of seasonality in government bond returns in 1957-1987, when there was strong seasonality in 1988-2018, is also inconsistent with the weather-related explanation of seasonality in financial securities.

Finally, the paper's findings would be of usefulness to professional portfolio managers, whose bonus and, indeed, survival are tied to short-term performance vs. their peers who

[13] Doeswijk (2004) attributes the "Sell in May and Go Away" finding to an optimism cycle in the stock market that repeats every year, based on the argument that analysts tend to be optimistic at the beginning of the year and become increasingly pessimistic about earnings from June onwards. While this is true, it is not inconsistent with portfolio rebalancing. This is because, it is not the analysts who drive returns, but rather those who put their money where their mouth is and trade, namely professional portfolio managers. Ackert and Athanassakos (1997), for example, argue that, as portfolio managers rebalance their portfolios at the turn of the year, analysts have a greater incentive to be optimistic early in the year in order to attract new institutional business. As a result, causality runs not from the analysts to professional portfolio managers, but the other way, although there may also be a feedback effect as professional portfolio managers may use analysts' optimistic forecasts as an excuse to invest heavily in equity markets at the beginning of the year.

[14] While this study deals with indices that are not directly tradable, an investor can still invest in financial securities which trade and are highly correlated with those examined from the CFMRC database. There are many exchange-traded funds (ETFs) that mimic small and mid-cap stock portfolios and long-term government bonds, not of course to mention the existence of a larger number of mutual funds that also mimic the series examined in this study.

invest with the same mandate and will help them perform better than average throughout the year. They can also be quite useful to individual investors, as well. This is of particular importance in light of fundamental changes that are taking place in the retirement planning industry now requiring working adults to take personal responsibility for their own financial wellbeing in retirement. Understanding the seasonal behavior of financial markets and the inefficiencies bestowed upon them by institutional factors will help investors secure higher returns and better retirement.

Table 1

Summary Statistics of Monthly Returns for the Equally Weighted (EW) CFMRC Index, for 1957-2018 and Sub-Periods

	EW 57-18		EW 57-87		EW 88-18	
Month	Average	Median	Average	Median	Average	Median
January	4.63%	4.67%	5.76%	5.44%	3.50%	4.14%
February	1.79%	1.45%	0.70%	0.62%	2.89%	2.83%
March	1.57%	0.97%	1.70%	1.38%	1.45%	0.04%
April	1.39%	1.66%	1.11%	1.85%	1.66%	0.95%
May	1.08%	1.47%	0.65%	2.04%	1.51%	0.78%
June	-0.05%	0.24%	0.12%	0.29%	-0.22%	-0.12%
July	0.71%	1.03%	1.44%	2.19%	-0.02%	0.37%
August	0.82%	0.90%	1.91%	2.18%	-0.27%	0.57%
September	-0.31%	0.12%	-0.35%	-0.67%	-0.28%	0.87%
October	-0.83%	0.72%	-1.20%	0.19%	-0.47%	1.14%
November	0.89%	1.75%	2.05%	2.43%	-0.26%	0.45%
December	3.10%	2.92%	3.20%	3.17%	3.00%	2.47%

Table 2

Summary Statistics of Monthly Returns for the Government of Canada Long Term Bonds for 1957-2018 and Sub-Periods

	GOC 57-18		GOC 57-87		GOC 88-18	
Month	Average	Median	Average	Median	Average	Median
January	0.43%	0.23%	0.30%	0.20%	0.57%	0.42%
February	0.53%	0.40%	0.26%	-0.01%	0.79%	0.90%
March	0.06%	0.15%	0.26%	0.45%	-0.14%	-0.04%
April	0.18%	0.32%	0.42%	0.34%	-0.06%	0.18%
May	0.83%	0.80%	0.28%	0.03%	1.38%	1.89%
June	0.26%	0.44%	0.18%	0.43%	0.35%	0.76%
July	0.03%	0.34%	-0.45%	0.21%	0.51%	0.55%
August	1.25%	0.90%	0.95%	0.36%	1.56%	1.60%
September	0.46%	0.39%	0.32%	0.52%	0.60%	0.25%
October	1.17%	0.96%	1.55%	1.20%	0.80%	0.68%
November	1.38%	1.15%	1.61%	0.75%	1.14%	1.45%
December	0.90%	0.55%	0.72%	0.45%	1.08%	0.90%

Table 3

Summary Statistics of Semi-annual Returns for the Equally Weighted (EW) CFMRC Index, for 1957-2018 and Sub-Periods

	EW 57-18		EW 57-87		EW 88-18	
Month	**Average**	**Median**	**Average**	**Median**	**Average**	**Median**
Nov-April	2.23%	1.71%	2.42%	2.14%	2.04%	1.71%
May-Oct	0.24%	0.81%	0.43%	1.16%	0.04%	0.68%

Table 4

Summary Statistics of Semi-Annual Returns for the Government of Canada Long Term Bonds for 1957-2018 and Sub-Periods

	GOC 57-18		GOC 57-87		GOC 88-18	
Month	**Average**	**Median**	**Average**	**Median**	**Average**	**Median**
Nov-April	0.58%	0.36%	0.59%	0.39%	0.56%	0.66%
May-Oct	0.67%	0.62%	0.47%	0.40%	0.87%	0.72%

Figure 1

Average Monthly Returns for the Equally Weighted (EW) CFMRC Index for 1957-2018 and Sub-Periods

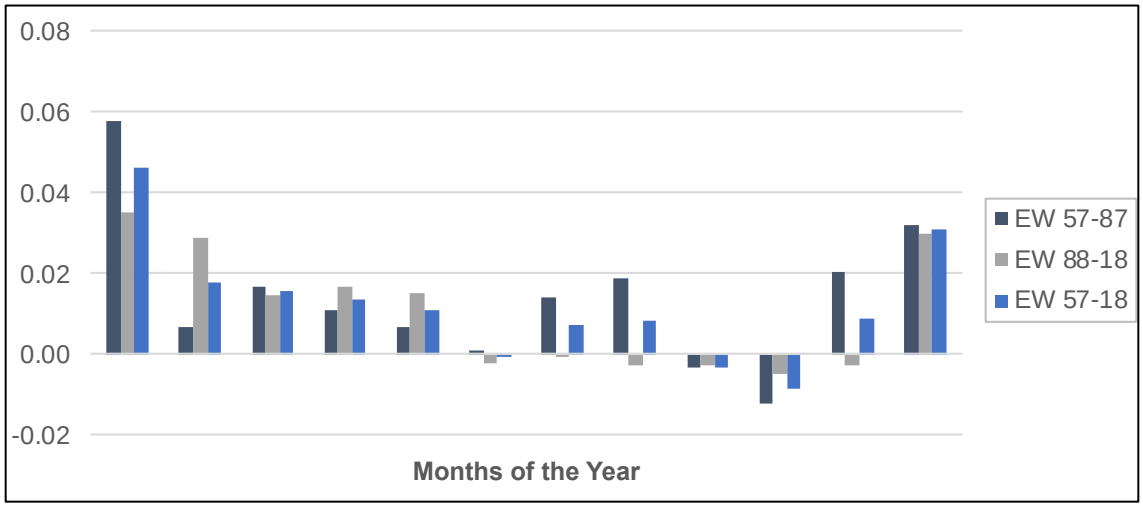


Figure 2

Average Monthly Returns for the Government of Canada Long Term Bonds for 1957-2018 and Sub-Periods

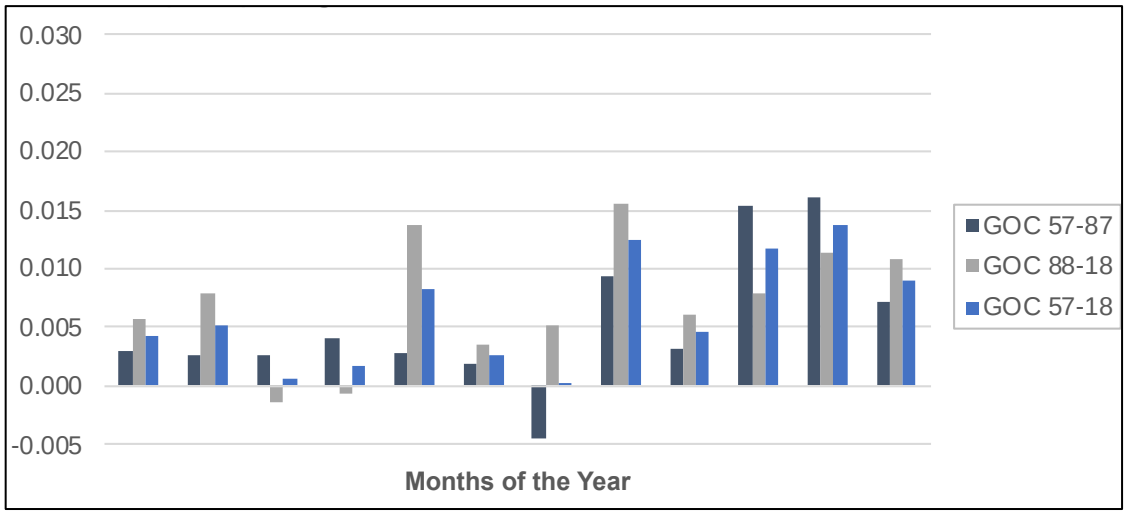


Figure 3

Average Semi-Annual Returns for the Equally Weighted (EW) CFMRC Index for 1957-2018 and Sub-Periods

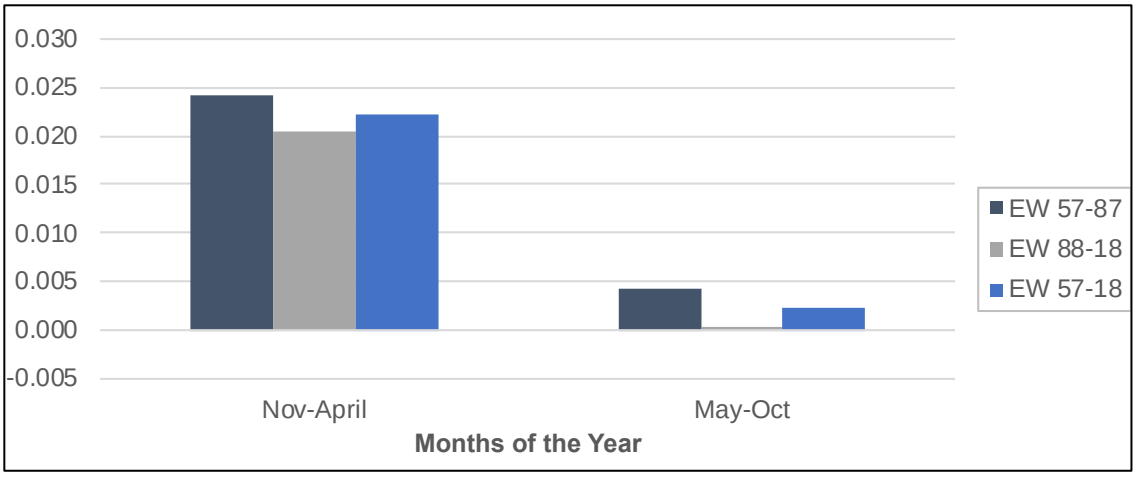


Figure 4

Average Semi-Annual Returns for the Government of Canada Long Term Bonds for 1957-2018 and Sub-Periods

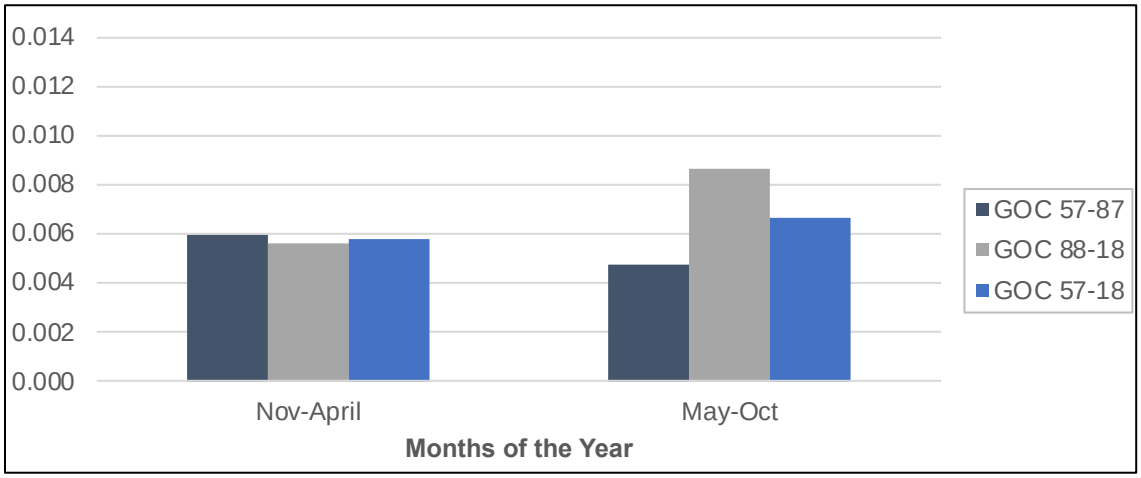


Table 5

Average Monthly Returns for the Equally Weighted (EW) CFMRC Index, and Government of Canada (GOC) Long Term Bonds for the Month of January (and Differences from January) for 1957-2018 and Sub-Periods

This Table's results correspond to the following time-series dummy OLS regressions with Newye-West estimations:

$$R_{qt} = a_0 + \sum_{j=2}^{12} a_j D_{qt}^{j} + e_{qt} \qquad (1)$$

where, R_{qt} is the total monthly return of the CFMRC Equally Weighted Total Return Index or the Government of Canada Bond Index in month t, D^{j}_{qt} is a dummy variable that is equal to 1 if the current month is month j and equal to zero otherwise. This model identifies the months in which stock returns are unusually high. It tests whether stock or bond returns in a given month (j=2 to 12) are different from a base month, in this study January. The intercept a_0 indicates the average return of stocks or bonds in our sample for the month of January. The rest of the coefficients represent the average difference in returns between January and each of the other months. T-statistics are in brackets. ** stands for statistical significance at the 1% level, and * for statistical significance at the 5% level.

Panel A: 1957-2018

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
EW R^2 =0.07 F=5.3**	0.046** (7.17)	-0.028** (-3.10)	-0.031** (-3.35)	-0.032** (-3.55)	-0.035** (-3.88)	-0.047** (-5.13)	-0.039** (-4.29)	-0.038** (-4.17)	-0.049** (-5.41)	-0.055** (-5.98)	-0.037** (-4.09)	-0.015 (-1.68)
GOC R^2 =0.07 F=2.3*	0.004 (1.38)	0.001 (0.21)	-0.004 (-0.84)	-0.003 (-0.57)	0.004 (0.90)	-0.002 (-0.38)	-0.004 (-0.90)	0.008 (1.84)	0.000 (0.06)	0.007 (1.66)	0.009* (2.13)	0.005 (1.05)

Panel B: 1957-1987

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
EW R^2 =0.10 F=3.7**	0.058** (6.19)	-0.051** (-3.85)	-0.041** (-3.09)	-0.047** (-3.53)	-0.051** (-3.88)	-0.056** (-4.29)	-0.043** (-3.28)	-0.039** (-2.93)	-0.061** (-4.64)	-0.070** (-5.29)	-0.037** (-2.82)	-0.026 (-1.95)
GOC R^2 =0.07 F=1.6	0.003 (0.64)	0.000 (-0.05)	0.000 (-0.06)	0.001 (0.18)	0.000 (-0.02)	-0.001 (-0.18)	-0.007 (-1.14)	0.006 (0.99)	0.000 (0.03)	0.012 (1.91)	0.013* (2.02)	0.004 (0.65)

Panel C: 1988-2018

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
EW R^2 =0.08 F=2.8**	0.035** (3.92)	-0.006 (-0.48)	-0.020 (-1.62)	-0.018 (-1.46)	-0.020 (-1.57)	-0.037** (-2.95)	-0.035** (-2.79)	-0.038** (-2.98)	-0.038** (-2.99)	-0.040** (-3.14)	-0.038** (-2.98)	-0.005 (-0.39)
GOC R^2 =0.07 F=1.5	0.006 (1.03)	0.002 (0.36)	-0.007 (-1.17)	-0.006 (-1.04)	0.008 (1.35)	-0.002 (-0.37)	-0.001 (-0.09)	0.010* (2.04)	0.000 (0.06)	0.002 (0.38)	0.006* (1.95)	0.005 (0.85)

Table 6

Average Semi-Annual (Monthly) Returns for the Equally Weighted (EW) CFMRC Index, and Government of Canada (GOC) Long Term Bonds for 1957-2018 and Sub-Periods

This Table's results are from running the regression shown in Table 5 with only two semi-annual periods, November-April and May-October. The November-April period average return is captured by the intercept a_0 and the difference in May-October period average return from the average return in the November-April period is captured by coefficient a_2 (i.e., the coefficient for dummy variable for May-October). T-statistics are in brackets. ** stands for statistical significance at the 1% level, and * for statistical significance at the 5% level.

Panel A: 1957-2018

	Nov-April	May-Oct
EW R^2=.04	.023** (7.14)	-.010** (3.46)
GOC R^2=.00	.006** (3.68)	.001* (2.19)

Panel B: 1957-1987

	Nov-April	May-Oct
EW R^2=.04	.024** (5.62)	-.020** (2.97)
GOC R^2=.00	.006* (2.20)	-.002 (1.76)

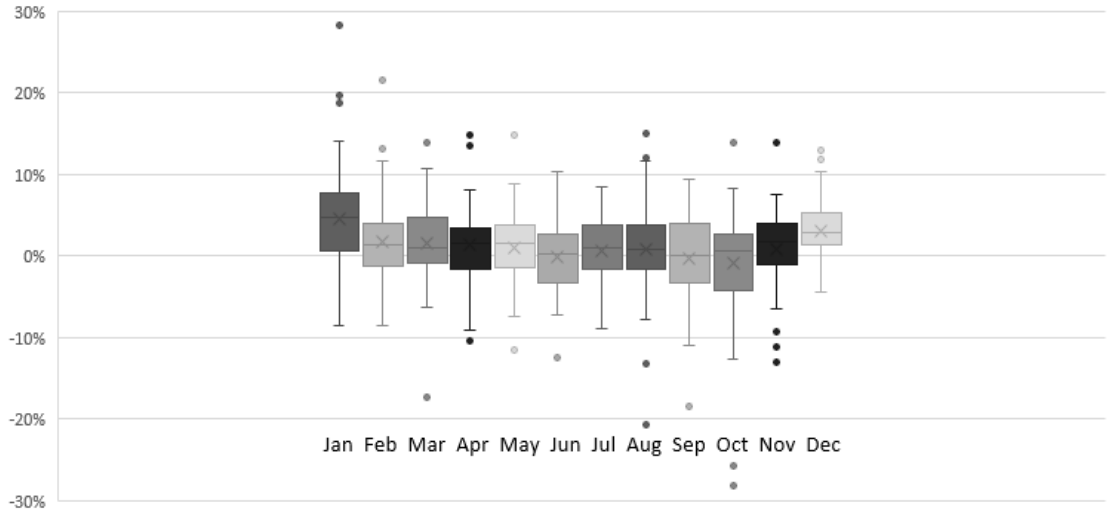
Panel C: 1988-2018

	Nov-April	May-Oct
EW R^2=.05	.021** (4.72)	-.020** (3.40)
GOC R^2=.01	.006** (2.94)	.003** (2.48)

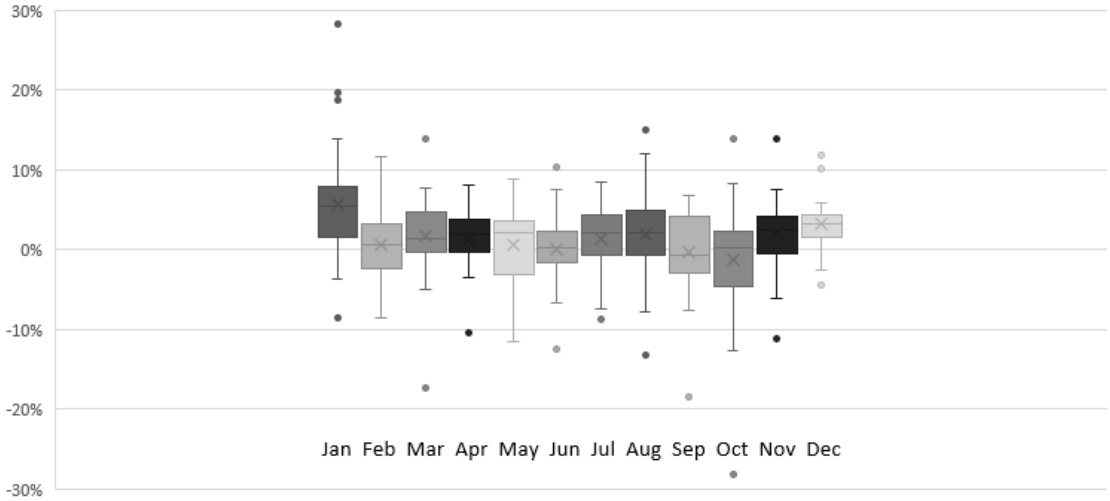
Figure 5

Box – Whisker Plots of EW CFMR Index monthly returns.

Panel A: 1957-2018



Panel B: 1957-1987



Panel C: 1988-2018

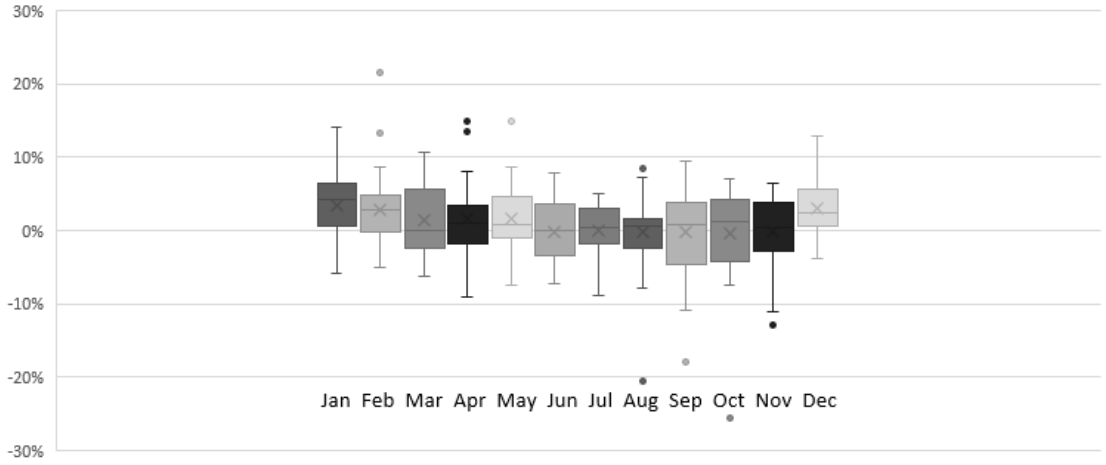
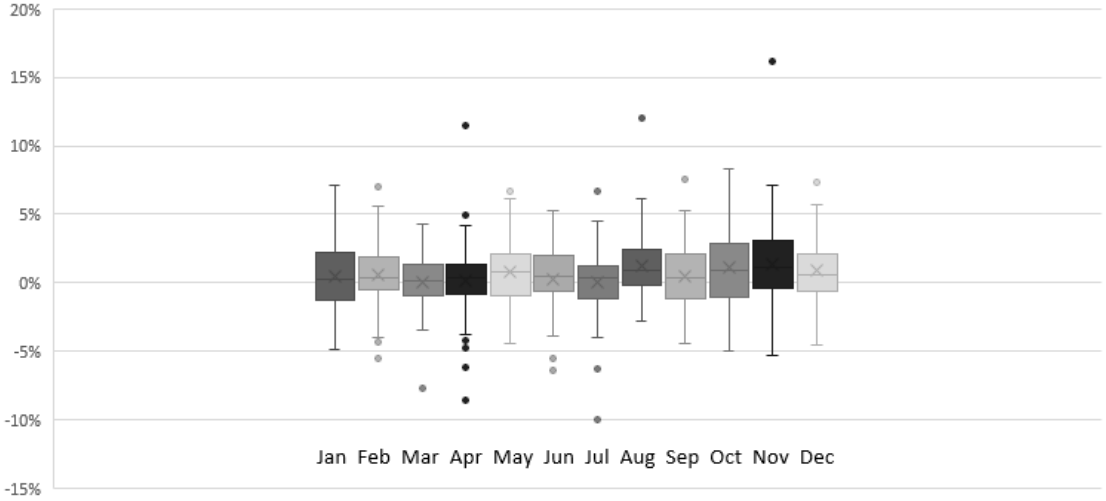


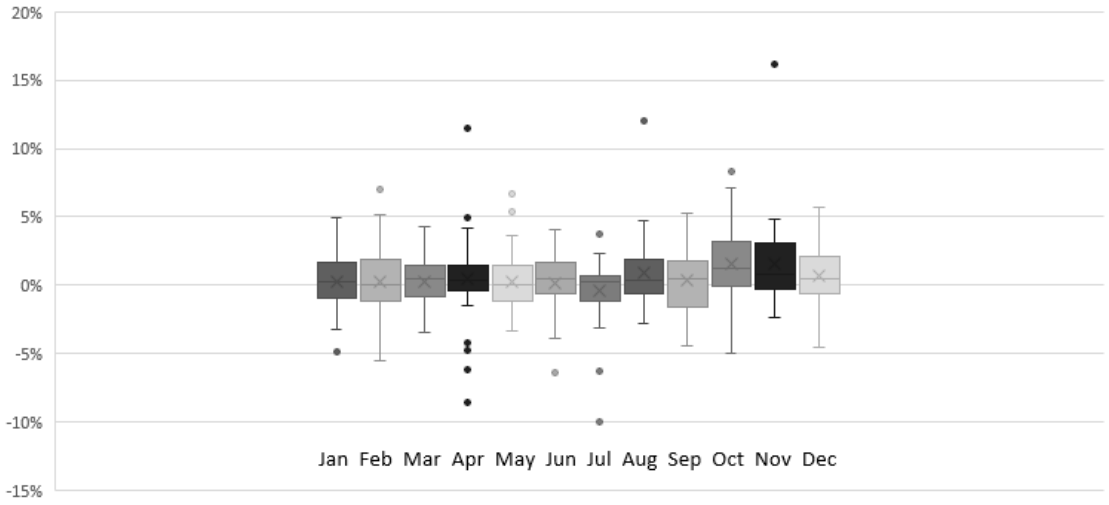
Figure 6

Box- Whisker Plots of Government of Canada long-term bond monthly returns.

Panel A: 1957-2018



Panel B: 1957-1987



Panel C: 1988-2018

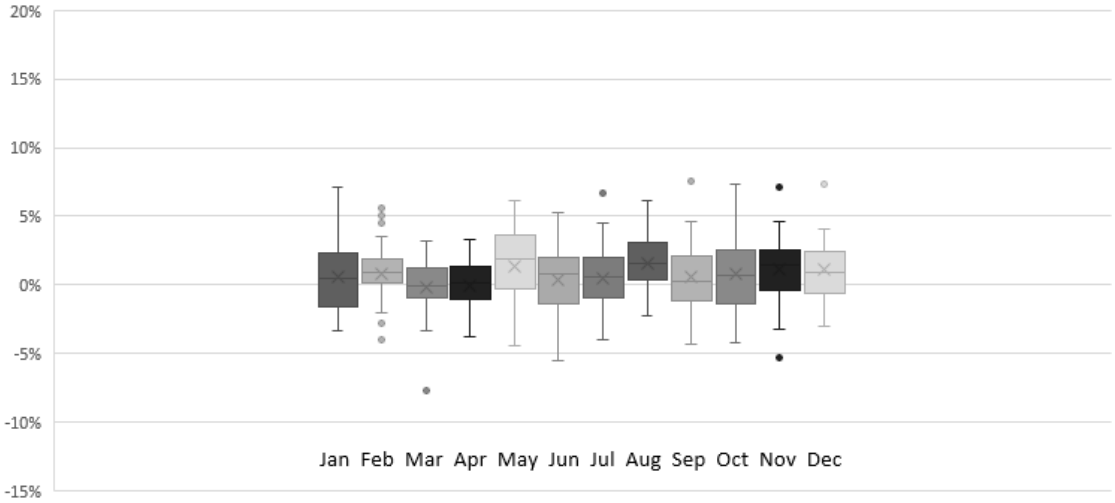
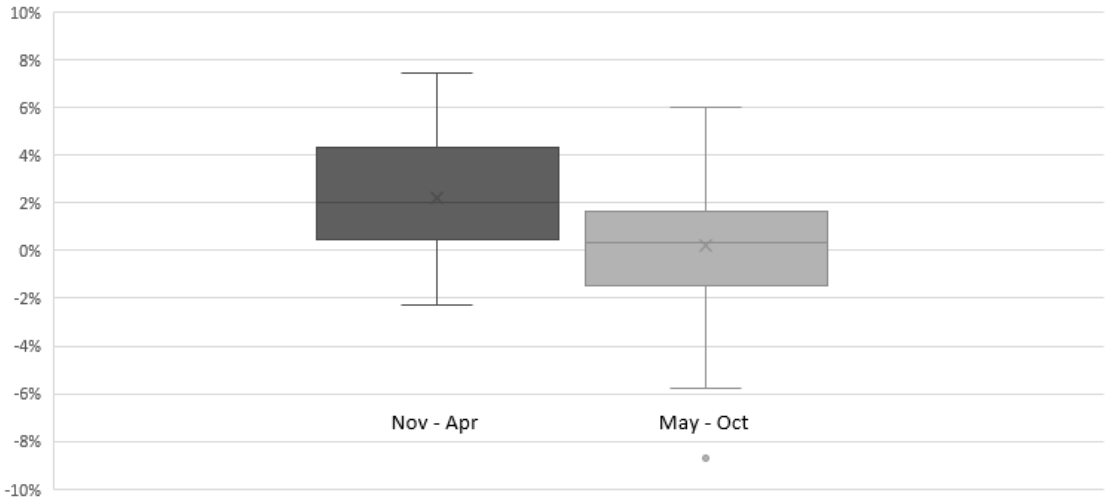


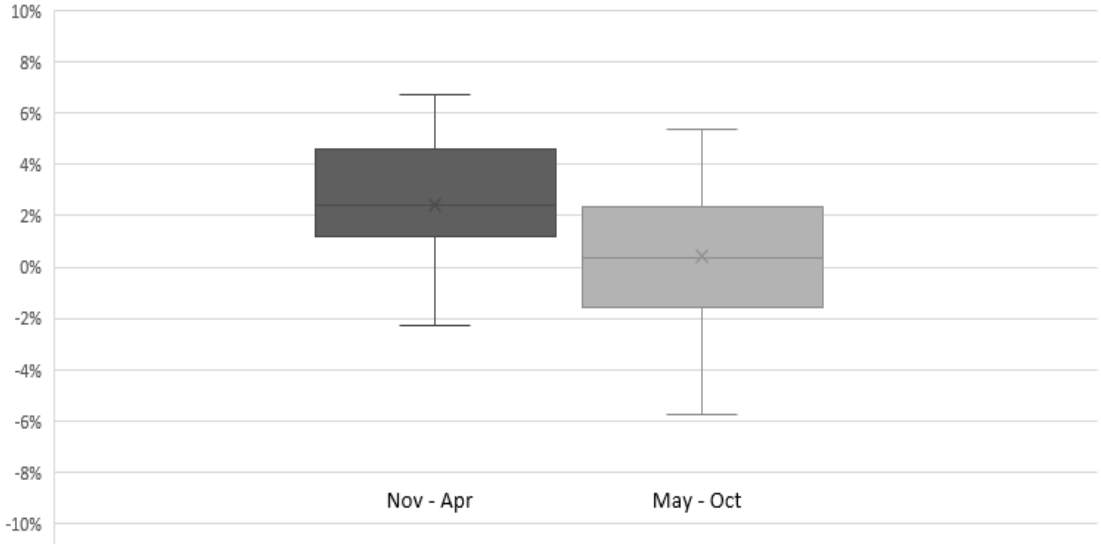
Figure 7

Box – Whisker Plots of EW CFMR Index semi-annual returns.

Panel A: 1957-2018



Panel B: 1957-1987



Panel C: 1988-2018

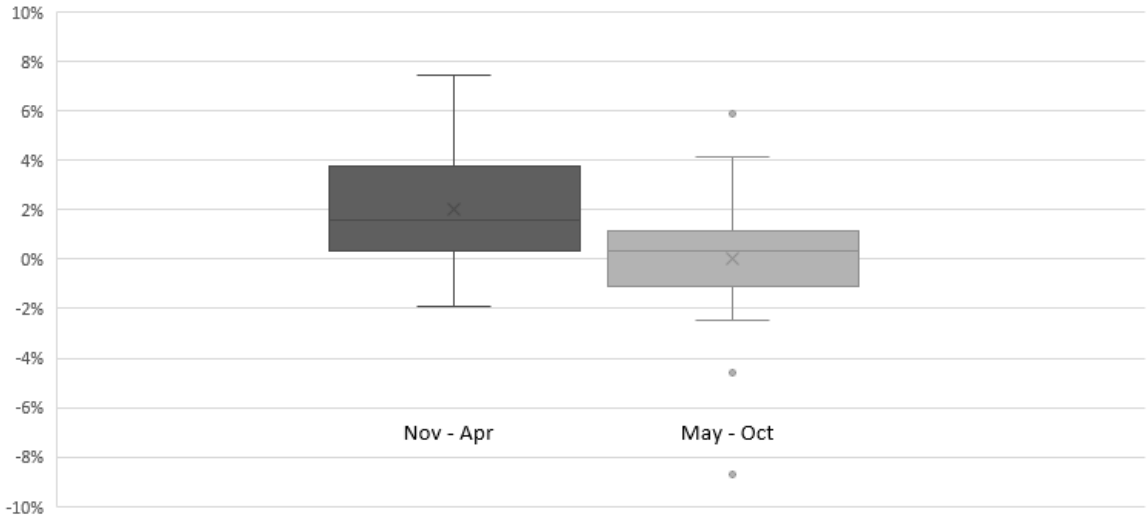
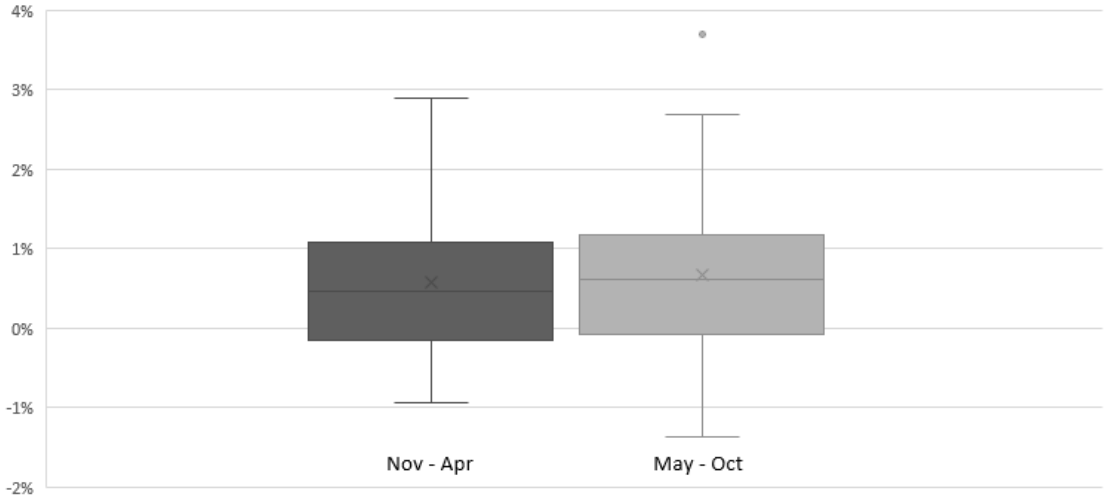


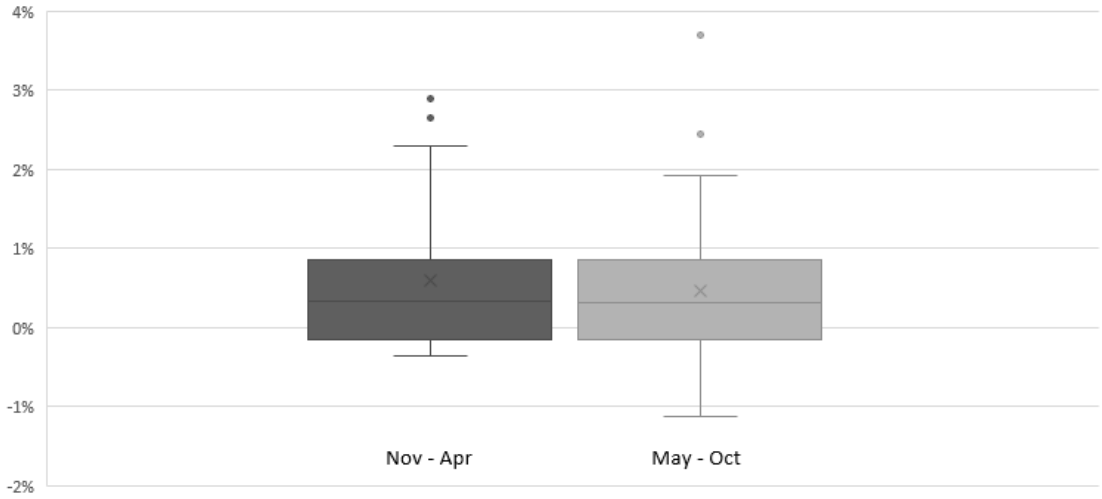
Figure 8

Box- Whisker Plots of Government of Canada long-term bond semi-annual returns.

Panel A: 1957-2018



Panel B: 1957-1987



Panel C: 1988-2018

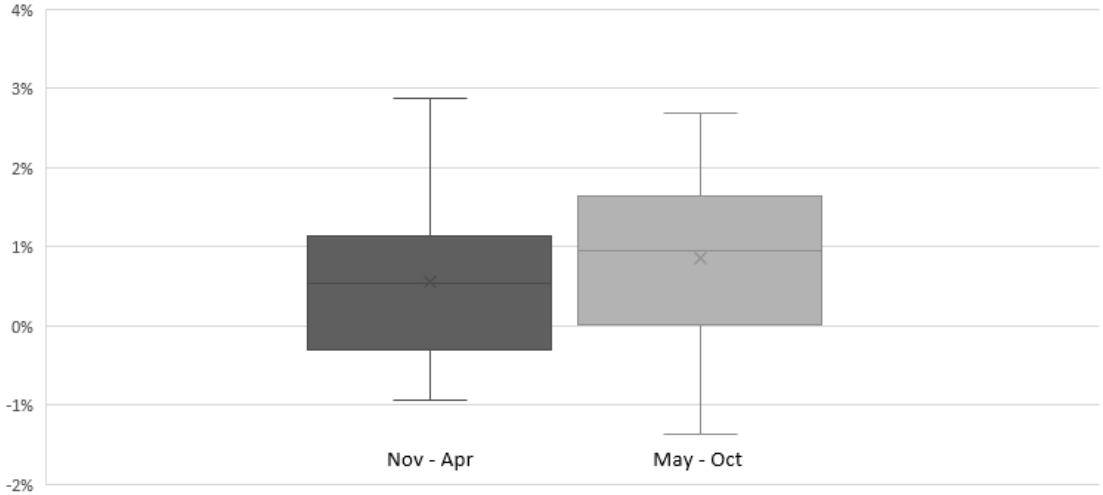


Table 7

Kruskal - Wallis chi-squared tests (p-values) on whether January EW CMRC Index returns are equal to the returns of each month from February to December for the period 1957-2018 and sub-periods.

	1957-2018	**1957-1987**	**1988-2018**
Month	**p-value**	**p-value**	**p-value**
January	-	-	-
February	0.0016	0.0005	0.3492
March	0.0039	0.0106	0.1000
April	0.0010	0.0032	0.0727
May	0.0004	0.0019	0.0621
June	0.0001	0.0010	0.0032
July	0.0001	0.0067	0.0032
August	0.0004	0.0206	0.0048
September	0.0001	0.0004	0.0158
October	0.0001	0.0002	0.0086
November	0.0005	0.0198	0.0083
December	0.0861	0.0798	0.4947

Table 8

Kruskal - Wallis chi-squared tests (p-values) on whether January Government of Canada long-term bond returns are equal to the returns of each month from February to December for the period 1957-2018 and sub-periods.

	1957-2018	1957-1987	1988-2018
Month	**p-value**	**p-value**	**p-value**
January	-	-	-
February	0.7041	0.6676	0.5975
March	0.6102	0.9720	0.5686
April	0.8066	0.7621	0.4947
May	0.3373	0.7621	0.1834
June	0.9602	0.9271	0.9720
July	0.6655	0.4022	0.9048
August	0.0720	0.6073	0.0846
September	0.8769	0.9271	0.8603
October	0.1558	0.0872	0.7091
November	0.0050	0.1165	0.2512
December	0.1904	0.4598	0.3209

Table 9

Kruskal - Wallis chi-squared tests (p-values) on whether November to April EW CFMRC Index returns are equal to the returns of May to October for the period 1957-2018 and sub-periods.

	1957-2018	1957-1987	1988-2018
Semi-Annual Period	**p-value**	**p-value**	**p-value**
November - April	-	-	-
May - October	0.0001	0.0013	0.0006

Table 10

Kruskal - Wallis chi-squared tests (p-values) on whether November to April Government of Canada long-term bond returns are equal to the returns of May to October for the period 1957-2018 and sub-periods.

	1957-2018	**1957-1987**	**1988-2018**
Semi-Annual Period	**p-value**	**p-value**	**p-value**
November - April	-	-	-
May - October	0.5943	0.7463	0.1421

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