Trade Agreements and the Stock Market: the Case of the USMCA

By

Lorrne N. Switzer[1*] and Aman Bajaj[2]

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ABSTRACT

This study investigates the market impact of trade agreement between the US, Mexico and Canada, USMCA, on the stock market returns and volatility spillovers across the respective parties. Event study results show that most sectors within all countries experienced negative abnormal returns around the critical event dates. Multivariate GARCH results show that the U.S. market has the greatest volatility spillover to counterparty markets. USMCA also had a negative impact on the mean returns of the Canadian and Mexican stock markets. No significant evidence of a change in volatility spillover is observed post-USMCA.

Keywords: stock markets returns; volatility spillovers; trade agreements

JEL Codes: G14; G15; G18

*Corresponding Author

[1] Van Berkom Endowed Chair of Small-Cap Equities, and Professor of Finance, John Molson School of Business, Concordia University, 1455 De Maisonneuve Blvd. W., Montreal, Quebec, CANADA H3G 1M8; tel.: 514-848-2960, x2960 (o); 514-481-4561 (home and FAX); E-mail:lorne.switzer@concordia.ca

[2] Graduate Student, John Molson School of Business, Concordia University, 1455 De Maisonneuve Blvd. W., Montreal, Quebec, CANADA H3G 1M8; E-mail: amanbajaj3760@gmail.com.

1. Introduction

Standard trade theory suggests that free movement of goods and capital between countries improves the economic and financial prospects of parties to the agreements In the post World War II period, several regional trade groups emerged to liberalize trade amongst signatory parties as a means to realize such benefits, such as the Association of Southeast Asian Nations (ASEAN), the European Union (EU), and The North American Free Trade Agreement (NAFTA). The NAFTA came into force on January 1, 1994. At that time, NAFTA was a comprehensive free trade agreement which addressed issues such as the protection of intellectual property, dispute settlement, labor provisions, environmental regulations, services trade, and cross-country investment. NAFTA eventually abolished a majority of trade restrictions and formed the basis for tariff-free trade across the three nations. However, throughout his first campaign for President, Trump referred to NAFTA as “the worst trade deal ever” to be signed by the US. [1] His aim for the renegotiations was quite stark: to improve the position of the US economy alone, based on his allegations regarding the "fairness” of its terms to the US. Flores-Macías and Sánchez-Talanquer (2019) argue that while the agreement incorporates mechanisms to that modernize rules, various aspects increase trade and investment uncertainty, with which could have adverse wealth effects for all countries. Wagner, Zeckhauser, & Ziegler (2018) analyze the impact of expected changes in trade and tax policies in the aftermath of Trump’s election on stock price reactions. Their show that changes in expectations about policies rather than the change itself can lead to significant movements in returns and volatilities of stock markets. They do not look at the market impact of USMCA *per se*, which was signed on July 20, 2020 through its various stages from initial negotiations to ratification and its effective date, Nor do they look at the market impact on counterparty nations. This paper provides new evidence on these issues. Specifically, we address the following three questions: How did USMCA affect the

[1] See Waldren, (2017).

equity market returns of U.S., Canada, and Mexico? Was it a win-win outcome or a zero sum game, with the US experiencing gains at the expense of the other countries? Did USMCA impact the linkages of the North American markets? Our results to these questions should be of interest to researchers, policymakers, and investors.

We conduct event studies surrounding various dates from the initial negotiations to final passage of the USMCA, We find that most sectors within all countries experienced negative abnormal. returns surrounding the different event dates. . Conditional covariance results show that the U.S. market has the greatest volatility spillover to counterparty markets. USMCA also had a negative impact on the mean returns of the Canadian and Mexican stock markets. No significant evidence of change in volatility spillover is observed post-USMCA. Overall, the analysis shows that the USMCA was a bad deal for most. The remainder of the paper is organized as follows. In the next section, we provide a some background and an overview of the extant literature. Section 3 describes the data, Section 4 explains the empirical methodology employed, and Section 5 presents the results of the analysis. The paper concludes with a summary in Section 6.

2. Background of USMCA and Literature Review

During the first 100 days of the Trump administration, it was a make-or-break situation for NAFTA as the US president had clear intentions of renegotiating the existing agreement. President Trump’s mercantilist approach to trade policy and the U.S. government's preference for bilateral agreements served as a backdrop for these negotiations. Twenty-five years after the approval of NAFTA, in 2016, the regional scenario could be described as two different bilateral interactions rather than a trilateral agreement. Before the existence of NAFTA, Mexico had proposed a bilateral trade agreement with the U.S., like the one Canada already had i.e., the Canada-U.S. Free Trade Agreement (CUSFTA). At that time, Canada proposed a trilateral agreement to ensure that Mexico does not get a better deal. The Trump administration was pursuant to establish bilateral agreements instead of NAFTA, although this would severely impact regional supply chains, especially in the automotive sector, and reduced the competitiveness of North American manufacturers.

The timeline for the USMCA[2] is as follows.

- May 17, 2017: An official notification from the U.S. President's office was sent to Congress expressing the intent to renegotiate NAFTA.
- August 16, 2017: The official renegotiation began among the three countries. Talks aimed at modernizing NAFTA began in Washington, and a second round took place in September in Mexico.
- August 27, 2018: Several rounds of discussions over a period of one year failed to produce a deal. The U.S. and Mexico resolved their differences to come to common ground and this put Canada under pressure to agree to the new terms.
- September 30, 2018: Negotiations concluded to salvage a trilateral pact. The draft text of the deal was released the next day. However, the deal would still have to be ratified in each country.
- November 30, 2018: The official trade agreement was signed by the delegates of the nations.
- December 10, 2019: The amended version of USMCA is accepted and signed. Members of Congress had voiced concerns over clauses regarding labor and environmental provisions, intellectual property rights, dispute settlement, and rules of origin for steel and aluminum sourced by the automotive industry. This led to certain provisions of USMCA being amended and modified.
- December 19, 2019: The USMCA is approved by the House of Representatives.
- January 16, 2020: The USMCA is approved by the U.S. Senate.
- July 1, 2020: The USMCA formally takes effect.

Some of the most important provisions of the ultimate agreement are as follows :

[2] The following articles have been used as reference for the dates: Thomson Reuters: (TIMELINE-The long bumpy road from NAFTA to USMCA, 2020) and Congressional Research Service: (U.S.-Mexico-Canada (USMCA) Trade Agreement, 2023)

- Dairy and Agriculture – The amount of dairy goods that can be imported to Canada tariff-free was raised and would now allow U.S. farmers to access 3.6% of the Canadian market.

- Automobile – New trade regulations for autos and automotive parts were one of the most important provisions of USMCA. Under NAFTA, vehicles could be sold tariff-free if at least 62.5% of the components were produced in one of the three nations, this number was increased to 75% under USMCA. Furthermore, the regulation establishes minimum wages of USD 16 per hour for laborers working on these vehicles, requiring that 40-45% of the work done on these vehicles is done by a worker earning the stipulated minimum wages.

- Pharmaceuticals – Originally, the USMCA included provisions to extend the eight-year data protection period for a specific class of drugs called 'biologics' to ten years. This would prevent companies from producing generic versions of the drug leading to higher prices. However, this provision was later retracted when the USMCA was amended on December 10, 2019.

- Intellectual Property – The updated agreement increases the copyright period to 70 years after the death of the creator. New items that did not exist in the list when NAFTA was created were also included. The agreement forbids tariffs on digital music, e-books, and other digital products.

- Sunset provision – The USMCA is set to expire in 16 years unless renewed and joint reviews are to be conducted every 6 years.

- Labor – The agreement establishes an investigatory panel that has the authority to look into factories breaching workers' rights and to halt shipments from such factories. Mexico assures to enact labor reforms enabling workers to unionize and protect themselves. These rules will are aimed to increase wages in Mexico and level the playing field between the U.S. and Mexican factories.

A large literature exists looking at how trade agreements affect markets. We focus here on those that address North American markets.

In an early study Thompson (1994) analyses the impact of the Canada - United States 1985 Free Trade Agreement. The author conducts an event study and reports that the market reacted positively to the news of the agreement. The Cumulative Abnormal Return (CAR) for industry portfolios is also estimated to analyze the impact on each sector but does not produce any significant results.

Aggarwal, Long, Moore, & Ervin (1998) look at the sectoral impact ; of the successor to the Canada US-1985 Free Trade agreement on its successor, which includes Mexico as a party the North American Free Trade Agreement (NAFTA) which took effect on January 1, 1994. Firms are classified by SIC codes in the analyses. They document that overall NAFTA significantly increased returns for the sample firms. However, firms in the automotive and telecommunications sector experience negative CARs around the announcement date.[3]

A number of studies have looked at the impact of NAFTA on the integration between the U.S., Canada, and Mexico stock markets. Ewing, Payne & Sowell (2001) find that post NAFTA, an increase in integration of the three markets is observed using ARCH and VAR models. Aggarwal & Kyaw (2005) also provide evidence of increased integration within the three markets after NAFTA.[4]

More recent papers have used an MGARCH framework to analyze the time-varying process of integration. Lahrech & Sylwester, (2013) use a DCC-GARCH model to analyze the impact of NAFTA on the stock markets of U.S., Canada, and Mexico. They use weekly data from December 1988 to July 2006 to test for the stock market linkages between the countries. They report an increase in conditional correlations, post NAFTA for the Canada – Mexico and U.S. – Mexico. relationships but not for the US Canada relationship.

[3] Rather than examining stock market reactions to NAFTA, Caliendo & Parro (2015) estimate a computable general equilibrium model with intermediate goods or input-output linkages & sectoral heterogeneity, and show mixed welfare gains from the trade effects of NAFTA's tariff reductions . They find that Mexico's welfare increased by 1.31%, U.S.'s welfare increased by 0.08%, while Canada's welfare declined by 0.06%. Intra-bloc trade increased by 118% for Mexico, 11% for Canada, and 41% for the U.S.

[4] Darrat & Zhong(2005) and (Fernández-Serrano & Sosvilla-Rivero (2003) also use cointegration models to examine the stock market linkages among the American stock markets with similar results.

3. Data

We use the daily closing price of market indices for our study, the S&P 500 is used for the U.S., the S&P/TSX Composite is used for Canada, and the S&P/BMV IPC index is used for Mexico. We also collect data for 11 sectorial indices for USA and Canada and 9 sectorial indices for Mexico to identify the impact across each sector. The indices used for each country are shown in Table (1).

Insert Table (1) here.

Data for all these indices is obtained from the Thomson Refinitiv DataStream database. The data for the market indices spans over a period of 28 years from November 8, 1991, to February 28, 2020. The WHO declared COVID-19 as a pandemic on March 11, 2020[5], hence we do not consider data after February 2020 in order to control for the impact of the pandemic on the returns and volatility of the sample indices. In tandem with previous studies[6], we clean the data for missing values on dates with no trading activity for each market and retain data only if the information is available on that trading day for each market. This gives us a total of 6773 observations for each market index. Data for the sector indices is collected only from January 1, 2016, onwards for the purpose of the Event Study. To conduct a preliminary analysis of the market indices using summary statistics, we divide the data into the following three periods.

- Full Sample – 11th November 1991 to 28th February 2020 - 6773 Obs
- Pre-USMCA – 4th February 2015 to 15th August 2017 - 608 Obs[7]
- Post-USMCA – 16th August 2017 to 28th February 2020 - 608 Obs

As shown in equation (1) below, we calculate the daily returns as the first difference of the logarithmic closing prices multiplied by 100. R_t is the daily logarithmic return and P_t is the daily closing price.

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[5] (World Health Organisation, 2020)
[6] See e.g .Li, (2007) and Canarella, Miller, & Pollard (2009).
[7] To provide a balanced time period for comparison, we only take 608 observations for the pre-USMCA period.

$$R_t = ln(P_t/P_{(t-1)}) * 100 \quad (1)$$

3.1. Summary Statistics

Figure 1 shows the time plot of the logarithmic returns of the S&P 500 index (panel (A)), the S&P/TSX Composite index (panel (B)), and the S&P/BMV IPC index (panel (C)) respectively from January 2015 to February 2020. The first difference of the logarithmic prices shows properties of volatility clustering which is commonly found in index returns. It is important to note that the clustering across markets seems to be simultaneous, which can indicate the presence of spillover.

[Please insert Figure 1 about here]

Table 2 reports the summary statistics for the country indices. We have divided the sample into three different periods. Panel A shows the summary statistics for the Full sample period, Panel B for the Pre-USMCA period, and Panel C for the post-USMCA period. In order to draw comparable inferences, we only take 608 observations in the pre-USMCA period as we only had 608 observations for the post-USMCA period.

The mean returns and the standard deviation for the full sample period are relatively higher for the Mexican index. The Canadian index is the least volatile of all with a standard deviation of 1.01 and mean returns of 0.02. This risk-return relationship seems to be in congruence with the general finance theory. None of the indices exhibit properties of normality. We also see that all three indices are negatively skewed and are leptokurtic. From panels (B) & (C), we can see that the standard deviation for both U.S. and Mexico are higher in the post-USMCA period, indicating higher volatility in that period. The skewness and kurtosis are relatively higher for all 3 indices in the post-USMCA period.

[Please insert Table 2 about here]

Table 3 reports the summary statistics of the industry indices in each country. The mean returns are highest for the IT sector in Canada followed by that of the U.S. The mean returns are lowest for the Canadian Healthcare sector (-0.16), it also exhibits the highest volatility amongst all sectors across countries with a standard deviation of 3.29. In contrast, 5 out of the 11 Canadian sectors exhibit the lowest volatility which is also the lowest across all 3 countries. Returns for most sectors across the countries is negatively skewed and leptokurtic. None of the sector returns exhibit the property of normality.

[Please insert Table 3 about here]

3.1.1. Augmented Dickey Fuller (ADF) unit root tests

The ADF unit root test was applied to check for stationarity in the returns of the sample indices. Non-stationary data can lead to spurious results and hence it is appropriate to conduct this test prior to any further analyses (Dickey & Fuller, 1979). Based on the ADF test results reported in Tables 3 and 4, all the indices are stationary at the first difference, this indicates that they follow a random walk.

3.1.2. Covariance and Correlation Matrix for Returns of Market Indices

The covariance and correlation among the returns of country indices offer preliminary insight into the impact of USMCA on market linkages. However, these results should not be used to make any concrete inferences. Panel (A) in the table (4) shows the covariance and correlation between the three countries for the full sample period. The correlation between the U.S. and Canadian stock market returns is the highest followed by the correlation between the U.S. and Mexican stock market returns. From panels (B) & (C) in Table 4, we can see that the covariance among markets falls in the post-USMCA period. Similarly, the correlation between the markets has also reduced except for the correlation between U.S. and Canada.

[Please insert Table 4 about here]

4. Methodology

4.1. Event Study

This study uses the event study methodology applied to the sectorial indices for the US, Canada and Mexico to estimate the daily average abnormal returns (AAR) and the cumulative average abnormal returns (CAAR) around four dates identified as key events for USMCA. The abnormal returns (AR) are calculated using the Fama French Five-Factor model (FF model)[8]. The FF model mitigates the issue related to the CAPM model and hence provides robust estimations for event studies (Schimmer, Levchenko, & Müller, 2014). The returns of the S&P 500 are used as a proxy for U.S. market returns, the S&P/TSX Composite is used as a proxy for the Canadian market, and the S&P/BMV IPC index is used as a proxy for the Mexican market. The ARs are calculated based on an estimation window of (-221,-21) i.e., a minimum estimation length of 200 days. The model used for each of the eleven sectors that comprise the equity markets in each country is shown below –

$$E(R_{it}) = R_f + \beta_{m,i}(R_m - R_f) + \beta_{s,i}(R_{SMB}) + \beta_{h,i}(R_{HML}) + \beta_{r,i}(R_{RMW}) + \beta_{c,i}(R_{CMA})$$

In equation (2), $E(R_{it})$ is the expected return of Sector index ‘i’ at time ‘t’. R_f is the risk-free rate and R_m is the market return, $\beta_{m,i}$ represents the sensitivity of sector index ‘i’ to the market factor. R_{SMB} is the return on the Small – Big stock portfolio, $\beta_{s,i}$ represents the sensitivity of sector index ‘i’ to the size factor. R_{HML} is the return on the High – Low growth portfolio, $\beta_{h,i}$ represents the sensitivity of sector index ‘i’ to the growth factor. R_{RMW} is the return on the Robust – Weak operating profitability portfolio, $\beta_{r,i}$ represents the sensitivity of sector index ‘i’ to the operating profitability factor. R_{CMA} is the return on the Conservative – Aggressive investment portfolio, $\beta_{c,i}$ represents the sensitivity of sector index ‘i’ to the investment factor.

The Abnormal returns (AR) and the Cumulative abnormal returns (CAR) for each event date are estimated as follows –

$$AR_{i,\tau} = R_{i,\tau} - E(R_{i\tau}) \quad (3)$$

$$CAR_i(\tau_1, \tau_2) = \sum_{\tau=\tau_1}^{\tau_2} AR_{i,\tau} \quad (4)$$

[8] The Fama French Five-Factor Returns are obtained from the (Kenneth R. French - Data Library, 2022). The Daily U.S. Fama/French 5 Factors are used for the U.S. market, the Daily Developed ex US Fama/French 5 Factors are used for the Canadian market, and Monthly Emerging Fama/French 5 Factors are used for the Mexican market. The monthly factors for the emerging markets are decompounded to obtain the daily factors.

In equations (3) and (4) above, ‘i’ is the event, and ‘τ’ is a day in the event window (τ = 0 is the event date). $R_{i,\tau}$ is the return on the event day ‘τ’ and $E(R_{i\tau})$ represents the expected return which is calculated using the Fama/French Five Factor model.

We aggregate the the average of the estimated ARs and CARs for the various sectors examined to compute the average abnormal returns (AAR) and the cumulative average abnormal returns (CAAR) for the overall market in each country as shown below.

$$AAR_{\tau} = \frac{1}{N}\sum_{i=1}^{N} AR_{i,\tau} \tag{5}$$

$$CAAR\ (\tau_1, \tau_2) = \sum_{\tau=\tau_1}^{\tau_2} AAR_{\tau} \tag{6}$$

Based on the timeline of the implementation of USMCA as explained in Section (1.1) of this study, we identify four key dates as follows:

- 16th August 2017 – As mentioned earlier, the negotiations began on this date. Henceforth we will refer to this event date as “USMCA Negotiation” for the purpose of this study.
- 1st October 2018 – The official USMCA document was published. Henceforth we will refer to this event date as “USMCA Published”.
- 30th November 2018 – The USMCA was ratified by the delegates of the three countries on this date. Henceforth we will refer to this event date as “USMCA Ratified”.
- 10th December 2019 – The amended version was signed. Henceforth we will refer to this event date as “USMCA Amended”.

The null hypothesis is that the AAR and the CAAR are equal to zero for all the key dates i.e., there is no impact of USMCA on the market and sector index returns of the U.S., Canada, and Mexico:

$$H_0: AAR, CAAR = 0 \tag{7}$$

We then calculate various parametric and non-parametric z-statistics and t-statistics to verify the robustness of our results.

4.2. Volatility Transmission/ Spillover

4.2.1. Volatility Transmission

Volatility represents the rate of information flow in a market, clusters in volatility can increase the volatility of returns (Ross, 1989). Hence, analyzing volatility spillover can help us to understand the way information is disseminated across markets. In the absence of volatility transmission, it can be inferred that changes in market fundamentals are the drivers of volatility and would impact the volatility for only that market. However, in the presence of volatility transmission, (Hong, 2001) implies that a single shock can impact the volatility of various markets

There are several advantages to using MGARCH models over their univariate versions for capturing time-varying volatility and volatility transmission processes (e.g. Bauwens, Laurent, & Rombouts (2006) and Canarella, Miller, & Pollard (2009)):

- They eliminate the multi-step estimation procedure by accounting for interdependencies in the conditional variance and the conditional mean equations.
- They boost the effectiveness and power of tests for cross-market spillovers.
- MGARCH models can be used to analyze several issues in portfolio diversification and asset pricing.
- MGARCH models integrate covariances in the estimation procedure which helps to identify the inter-relatedness and response to innovation among variables.

Given light of the aforementioned points and the previous literature[9] that compares the efficiency of various Multivariate GARCH models our estimations are performed using the VAR(1) Asymmetric BEKK GARCH specification.

The model used for analyzing the return and volatility transmission between the U.S., Canadian, and Mexican stock markets can be divided into two parts. The first part is the Mean model which is described as a VAR(1) process. We estimate the Schwarz Information Criterion to select the optimal VAR length that fits best to our data, with results reported in Table 5. [10]

[Please insert Table 5 about here]

The equation for the VAR(1) process is shown below: (8)

$$R_t = \mu + \Gamma_i R_{t-i} + \varepsilon_t$$

Equation (8) can be extended as follows:

$$\begin{bmatrix} r_t^{US} \\ r_t^{CAN} \\ r_t^{MEX} \end{bmatrix} = \begin{bmatrix} \mu^{US} \\ \mu^{CAN} \\ \mu^{MEX} \end{bmatrix} + \begin{bmatrix} \gamma_{11} & \gamma_{12} & \gamma_{13} \\ \gamma_{21} & \gamma_{22} & \gamma_{23} \\ \gamma_{31} & \gamma_{32} & \gamma_{33} \end{bmatrix} \begin{bmatrix} r_{t-1}^{US} \\ r_{t-1}^{CAN} \\ r_{t-1}^{MEX} \end{bmatrix} + \begin{bmatrix} \varepsilon_t^{US} \\ \varepsilon_t^{CAN} \\ \varepsilon_t^{MEX} \end{bmatrix} \quad (9)$$

In equation (9) above, $R_t$is a 3x1 vector of daily returns, where r_t^{US} represents the returns of the S&P 500 index, r_t^{CAN} represents the returns of the S&P/TSX Composite index, and r_t^{MEX} represents the returns of the S&P/BMV IPC index. μ is a 3x1 vector of constants, Γ_i is a 3x3 matrix of parameters and ε_t is a 3x1 vector of error terms or innovation also commonly referred to as "news". The Γ_i matrix provides elements that represent the spillover terms. The diagonal elements represent the own spillover returns i.e., the impact of 't-1' returns on returns of 't'. The off-diagonal elements capture the impact of return spillover across the markets.

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[9] See e.g. Huang, Su, & Li , 2010) and Caporin & McAleer(2012).

[10] The Schwarz Information Criterion (SIC) also known as the Bayesian Information Criterion is a statistical method used to compare different models and select the optimal one. The test considers both the goodness of fit and the model complexity. The criterion helps to avoid overfitted models by selecting the model with the lowest SIC value.

The second part of the GARCH framework is the Covariance model. We model the variance-covariance matrix as proposed by Kroner & Ng (1998). This specification imposes quadratic forms on the coefficients' matrix which ensures a positive definite H_t.[11] The asymmetric BEKK model can be written as follows:

$$H_t = C'C + A'\varepsilon_{t-1}\varepsilon'_{t-1}A + B'H_{t-1}B + G'\eta_{t-1}\eta'_{t-1}G$$

The expanded form of equation (10) can be written as follows:

(10)

$$H_t = \begin{bmatrix} c_{11} & 0 & 0 \\ c_{21} & c_{22} & 0 \\ c_{31} & c_{32} & c_{33} \end{bmatrix}' \begin{bmatrix} c_{11} & 0 & 0 \\ c_{21} & c_{22} & 0 \\ c_{31} & c_{32} & c_{33} \end{bmatrix}$$

$$+ \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}' \begin{bmatrix} \varepsilon_{1,t-1}^2 & \varepsilon_{1,t-1}\varepsilon_{2,t-1} & \varepsilon_{1,t-1}\varepsilon_{3,t-1} \\ \varepsilon_{2,t-1}\varepsilon_{1,t-1} & \varepsilon_{2,t-1}^2 & \varepsilon_{2,t-1}\varepsilon_{3,t-1} \\ \varepsilon_{3,t-1}\varepsilon_{1,t-1} & \varepsilon_{3,t-1}\varepsilon_{2,t-1} & \varepsilon_{3,t-1}^2 \end{bmatrix} \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$$

$$+ \begin{bmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \\ b_{31} & b_{32} & b_{33} \end{bmatrix}' \begin{bmatrix} h_{11,t-1} & h_{12,t-1} & h_{13,t-1} \\ h_{21,t-1} & h_{22,t-1} & h_{23,t-1} \\ h_{31,t-1} & h_{32,t-1} & h_{33,t-1} \end{bmatrix} \begin{bmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \\ b_{31} & b_{32} & b_{33} \end{bmatrix}$$

$$+ \begin{bmatrix} g_{11} & g_{12} & g_{13} \\ g_{21} & g_{22} & g_{23} \\ g_{31} & g_{32} & g_{33} \end{bmatrix}' \begin{bmatrix} \eta_{1,t-1}^2 & \eta_{1,t-1}\eta_{2,t-1} & \eta_{1,t-1}\eta_{3,t-1} \\ \eta_{2,t-1}\eta_{1,t-1} & \eta_{2,t-1}^2 & \eta_{2,t-1}\eta_{3,t-1} \\ \eta_{3,t-1}\eta_{1,t-1} & \eta_{3,t-1}\eta_{2,t-1} & \eta_{3,t-1}^2 \end{bmatrix} \begin{bmatrix} g_{11} & g_{12} & g_{13} \\ g_{21} & g_{22} & g_{23} \\ g_{31} & g_{32} & g_{33} \end{bmatrix}$$

(11)

In equation (10) above, H_t is a 3x3 matrix of variance-covariance, and *C* is a lower triangular matrix of constants. In matrices *A* and *B,* the diagonal elements measure the impact of (t-1) shocks and (t-1) volatility of market 'i' on the conditional variance of the market 'i', whereas the off-diagonal elements measure the cross-market impact of shocks and volatility also referred to as the volatility spillover terms. In matrix *D*, the diagonal parameters measure the impact of own past negative shocks whereas the off-diagonal elements measure the impact of negative shocks in other markets also referred to as the cross-market asymmetric responses. ε_t is a vector of error terms

[11] To analyze stock market integration, both DCC-GARCH and BEKK-GARCH models have been widely used in the literature. Huang, Su, & Li (2010) compare the BEKK and DCC specifications for estimation of covariances and variances. They find that the BEKK model performs better as it relatively has a larger number of parameters which provides an advantage in explaining hidden information in the time-series data. Similarly, Caporin & McAleer, 2012 report that the BEKK model is optimal and preferred over the DCC model to estimate conditional covariances. Based on the inferences of these studies we select the BEKK-GARCH specification for our analysis.

obtained from the VAR(1) model and η_t is a vector that contains the Glosten, Jagannathan, & Runkle (1993) series, which is defined as $\eta_{it} = min[\varepsilon_{it}, 0]$, where $\eta_{it} = \varepsilon_{it}$ if $\varepsilon_{it} < 0$, and 0 otherwise. In simple terms, the model structures the covariances between successive GARCH terms by loading the next period volatilities when the error is negative.

The log-likelihood function can be estimated as follows:

$$L = \sum_{t=1}^{T} L_t \tag{12}$$

$$L_t = \frac{n}{2}\ln(2\pi) - \frac{1}{2}ln|H_t| - \frac{1}{2}\varepsilon'_t H_t^{-1}\varepsilon_t \tag{13}$$

We estimate a total of 3 variations of the BEKK GARCH models for our analysis it is the one explained in equation (10), second, we introduce a dummy variable for USMCA in the mean model and third we introduce a dummy variable for USMCA in both the mean and covariance equations. The results of these models have been explained in Section (5.2) of this paper.

5. Results

5.1. Event Study

Table 6 shows the cumulative average abnormal returns estimated using the Fama French Five-Factor model. As described earlier we will be examining abnormal returns around 4 key event dates i.e., USMCA Negotiation, USMCA Published, USMCA Ratified, and USMCA Amended. Panel (A) shows the CAAR (-2,+2) for the event, USMCA Negotiation. When the negotiations for the USMCA began, we see that both USA and Mexico markets had a significantly negative abnormal return, Canada is the only exception for this event. For the second event shown in panel (B), i.e., USMCA Published, we see that all 3 markets had a significantly negative CAAR (-2,+2) with the U.S. at -3.64%, followed by Mexico at -5.28%, and Canada at -5.93% was at a comparatively bigger loss than the two other countries. Similarly, from panel (C) we see that when the USMCA was ratified, Canada lost the most at -4.06%, followed by the U.S. at -3.99% and Mexico at -0.2%. Furthermore, in panel (D) we see that when the USMCA was amended, Canada again suffered with a significant CAAR(-2,+2) of -4.4% and the USA at -2.28%. Mexico had a positive CAAR(-2,+2) of 0.12%, although statistically insignificant. Test results of several parametric and non-parametric tests are reported in Table (6) along with the abnormal returns for each event to confirm the robustness of these estimations.

[Please insert Table 6 about here]

Figures 2 to 5 plot the Average Abnormal Returns (AAR) in panel (A) and the Cumulative Average Abnormal Returns (CAAR) in panel (B) for the 4 key events across a (-10,+10) window. Similar to the results shown in the previous section, we see that there was no response across Canadian market sectors as a whole, when the USMCA negotiations began, while both USA and Mexico had negative returns. However, for the next three events, Canada was relatively the bigger loser. It is important to note that post amendment of USMCA, Canada's negative abnormal return is almost twice that of the U.S. and Mexico.

[Please insert Figures 2 to 5 about here]

Panels A, B and C of Table 7 shows the results for the U.S., Canadian, and Mexican sector indices; sector indices respectively

[Please insert Table 7 about here]

From Table 7, we see from the abnormal returns of the sector indices that the Real Estate sector suffered the most across all countries, followed by the Consumer Discretionary sector. The tariffs that were imposed by the Trump administration on Canadian steel and lumber hamper the growth of the real estate sector. Although the USMCA would stimulate industrial activity and eventually lead to a reduction in those tariffs, the uncertainty surrounding these tariffs causes the real estate sector to suffer the most. Furthermore, as constraints for the automobile industry were made more severe, this had a direct negative impact on the returns of the Consumer Discretionary sector. Most sectors across countries reported negative cumulative abnormal returns showing that the USMCA was a bad deal for most. As seen previously with the overall country market returns, the Canadian sectors suffered the most.

5.2. Multivariate GARCH model

This section reports the estimated coefficients obtained from our MGARCH models. We use the BFGS algorithm to estimate the second moments in our models. We also report the log-likelihood statistics and the multivariate test results for the Ljung-Box Q statistic for the standardized residuals up to 24 lags.

5.2.1. VAR(1) BEKK-GARCH (1,1) USMCA – Basic Results

From Table 8 we see that the U.S. index returns does not depend on its own lag. The lagged returns of the Canadian and the Mexican index also seem to have no impact on mean returns for the U.S. index. For the Canadian index we see that own lagged returns as well as the lagged returns of the U.S. and Mexican indices have a positive and significant impact. Lastly, for the Mexican index, we see that own lagged returns and lagged returns of the Canadian index have a significant and positive impact on the mean returns. It is surprising to note that the U.S. lagged returns seem to have no impact on the mean returns of the Mexican index.

[Please insert Table 8 about here]

When interpreting the results of the BEKK parametrization, it is important to note that all the squared coefficients will always have a positive effect on the return variance in the next period. Therefore, we focus on the other coefficients to interpret the results of these models. Also due to a large number of parameters, we will only focus on interpreting the results of coefficients that are statistically significant.

We can infer the following from the variance equation. From the ARCH coefficients, we can see that shocks in the Canadian index have a positive and significant impact on the covariance with the returns of the U.S. and Mexican indices in the next period. We further see a significant presence of cross-country GARCH effects for U.S. and Canadian indices. The coefficients of the asymmetry terms show that negative news in the U.S. market significantly impacts the covariance of the U.S. market with both the Canadian and Mexican markets. We see a similar impact of negative news in the Mexican market, i.e., an increase in its covariance with the two other countries. However, we do not see any significant impact of negative news in the Canadian market on its covariance with the two other markets. This could be due to asymmetry in economic factors among the three countries or due to an industry composition effect.

Figure 6 shows the time plot of the conditional volatilities of the S&P 500 index, the S&P/TSX Composite index, and the S&P/BMV IPC index respectively from January 2015 to February 2020. The estimated conditional volatilities for each index are obtained from the VAR(1) BEKK GARCH model. We can see from the graphs that conditional volatility for all three indices increased simultaneously in October 2018 when the USMCA document was published.

[Please insert Figure 6 about here]

A similar impact can be seen on the conditional covariances among the markets from the Figure 7. We can also see a sharp rise in conditional covariances of the index pairs at the end of February, just before COVID-19 was officially declared as a pandemic by WHO.

[Please insert Figure 7 about here]

Figure 8 shows the conditional correlations. It is difficult to make any specific inferences regarding USMCA from this plot as we can see that the conditional correlations for all three index pairs have been widely fluctuating throughout the period plotted on the figure.

[Please insert Figure about here]

5.2.2. Covariance/Correlation Matrix of Conditional Volatility

Insert Table (9) here.

Table (9) presents the covariance and correlation matrix of the conditional volatilities estimated from the VAR(1) BEKK GARCH model. The covariance and correlation in conditional volatility offer insight into the impact of USMCA on volatility spillover between the markets. However, these results should not be used to make any concrete inferences. Panel (A) in the table (9) shows the covariance and correlation for the full sample period. The correlation between the U.S. and Canadian index return volatilities is the highest followed by the correlation between the U.S. and Mexican markets. From panels (B) & (C) in table (9), we can see that the covariance of return volatilities has increased for the pairs of U.S. and Mexico as well as for Canada and Mexico. The covariance between the conditional volatility of the U.S. and Canadian indices has reduced in the post-USMCA period. These results further motivate us to test the impact of USMCA on market volatilities and so we introduce a dummy for USMCA in the mean equation (Table (10)) and the variance equation (Table (11)).

5.2.3. VAR(1) BEKK-GARCH (1,1) with structural change USMCA Dummy in Mean Equation.

In Table 10 we provide results with allowance for structural change in the mean equations, ac capture by dummy variables. We see that with this specification lagged U.S. index returns Canadian returns and Mexican indices do not affect mean returns for the U.S. index. However, lagged returns of the U.S., Canada, and Mexico have a positive and significant impact on the returns of the Canadian index. We also see that the USMCA dummy has a negative and significant coefficient, indicating that mean returns for the Canadian index are lower in the post-USMCA period. We also find a positive and significant impact of lagged returns, except for U.S. lagged returns, on the returns of the Mexican index. The USMCA also had a significant and negative impact on the mean returns of the Mexican index.

The variance equations show that negative news in the U.S. market significantly increases the volatilities of both the Canadian and Mexican indices. Furthermore, negative news in the Mexican market also increases the volatility of the Canadian index but has no impact on the U.S. index.

[Please insert Table 10 about here]

5.2.4. VAR(1) BEKK-GARCH (1,1) with structural change in the mean and variance equations

In Table (11), we report the results of the Multivariate Garch estimates allowing for structural change in both the mean and variance equations, We see that USMCA has a significant and positive impact on the mean returns of the U.S. index, whereas the coefficient for the USMCA dummy is negative and significant for the Mexican index. The USMCA dummy does not have a significant impact on the mean returns of the Canadian index. In the variance equation, we see that the asymmetry term is only significant for spillover from the U.S. index to the Canadian index and is unidirectional. For the GARCH terms, we see that an increase in covariance between the U.S. and Canadian indices causes a statistically significant decrease in the volatility of the Canadian index in the next period. We also see that an increase in covariance between the U.S. and Mexican indices causes a statistically significant decrease in the volatility of the Mexican index in the next period. Introducing the USMCA dummy in the variance equation helps to identify the impact of USMCA on volatility spillover between the markets. Most of the coefficients of the USMCA dummy are negative, but not significant. The USMCA dummy is negative and significant only for the one-period lag of the Canadian index.

6. Conclusion

In this study, we provide new evidence on three questions pertinent to researchere, investors, and policymakers in the context of the USMCA. First, what was the impact of USMCA on the stock market returns of the U.S., Canada, and Mexico? Second, which economic sectors were affected the most, and was it a win-or-lose situation for them? Lastly, did the USMCA have an impact on volatility spillover across the markets?

Our study uses two different methodologies to find answers to these questions. First, we use an Event Study methodology to identify the impact on the returns of the stock markets and the sectors. We collect data for sectorial and market indices from the Thomson Refinitiv DataStream database. We use the Fama French Five-Factor model to estimate the abnormal returns with a minimum estimation window of 200 days. The result of our analysis shows that for 3 out of the 4 key dates identified, Canada relatively had the largest negative abnormal returns, followed by the U.S. The result of the sector indices shows that Real Estate suffered the most. This could be because of the uncertainty regarding import tariffs on lumber and steel. The second biggest losing sector was Consumer Discretionary, this could be due to the tightening of requirements on automobile imports. Most sectors across countries had a negative abnormal return on the key event dates identified.

Lastly, we use a multivariate GARCH model to study the impact of USMCA on linkages between the three markets. We analyze data over a period of 28 years from November 8, 1991, to February 28, 2020. A VAR(1) Asymmetric BEKK GARCH(1,1) parametrization is used to estimate the conditional volatilities. Three variations of this model are estimated i.e., one without a USMCA dummy, one with a USMCA dummy in the mean equation, and lastly, one with the USMCA dummy in the mean and variance equations.

We see from the results of the mean and variance equations of the BEKK GARCH models, that the U.S. market historically has the most influential impact on the returns and volatilities of the two other markets. These results are consistent with that of the previous literature[12]. We also find the presence of cross-country spillover in returns for Canada and Mexico. The mean returns for both Canada and Mexico were negative and statistically significant in the post-USMCA period. We do not find any significant evidence of change in volatility spillover across the markets post-USMCA. Overall, our analysis shows that the USMCA had a negative effect on the returns of the country and sectorial indices, but it does not cause a significant change in the volatility linkages of the three markets. . Since its inception, ongoing trade disputes as a consequence of USMCA have led speculation that the agreement's future is dubious. Whether adverse wealth effects identified in this study could would be consistent with this prognosis should be interpreted with some caution, however. [13]

[12] See e.g. Eun & Shim (1989).
[13] https://www.wsj.com/articles/a-trade-showdown-in-mexico-city-11672961551

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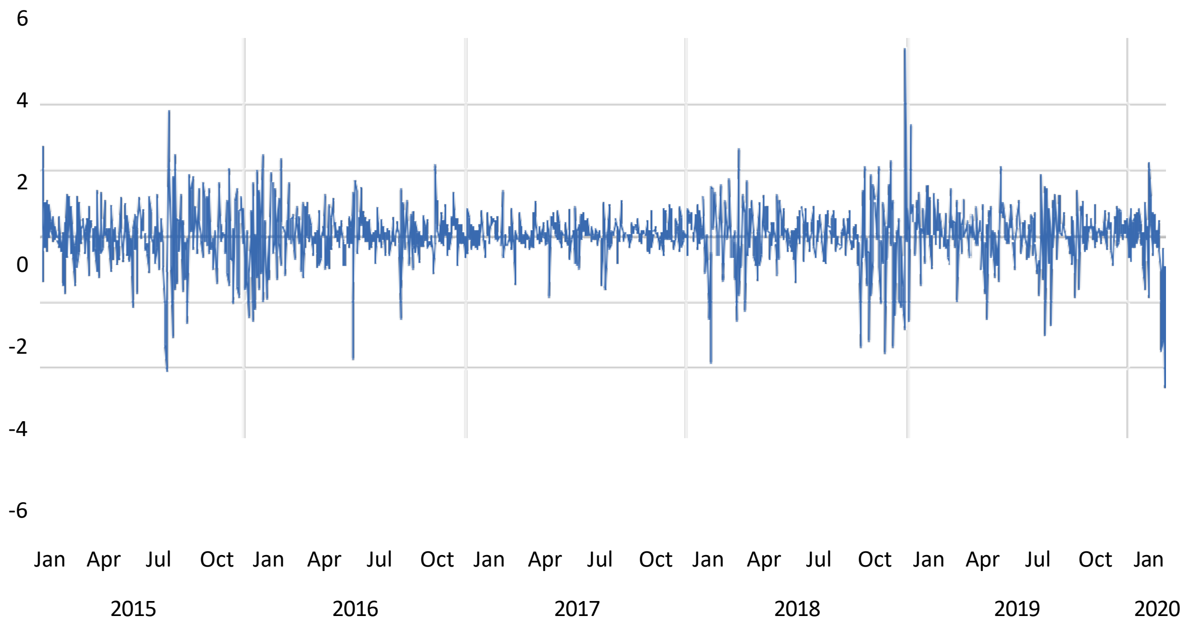
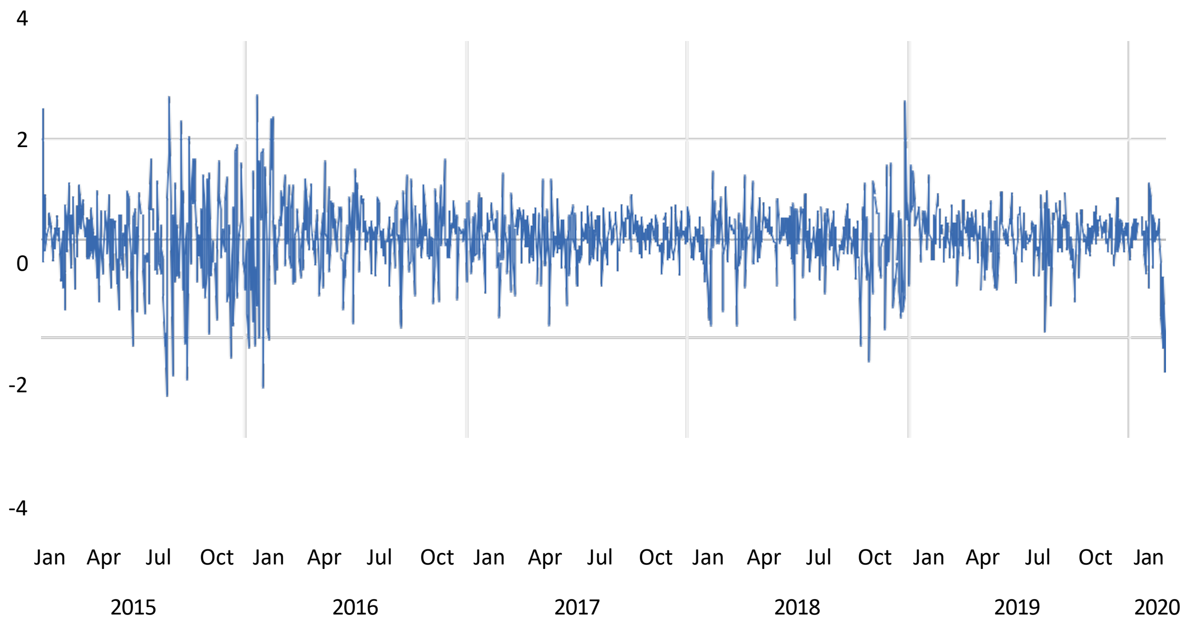
Figure 1: Daily Logarithmic Returns

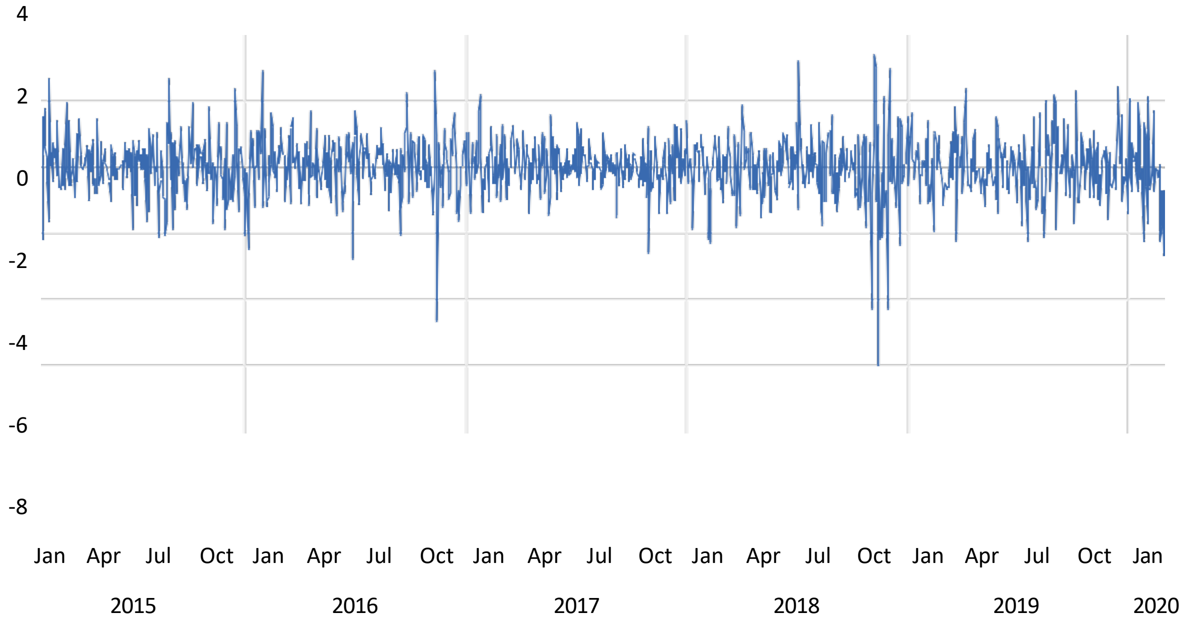
Panel A : S&P 500 Daily Returns



Panel B : S&P/TSX Composite Daily Returns

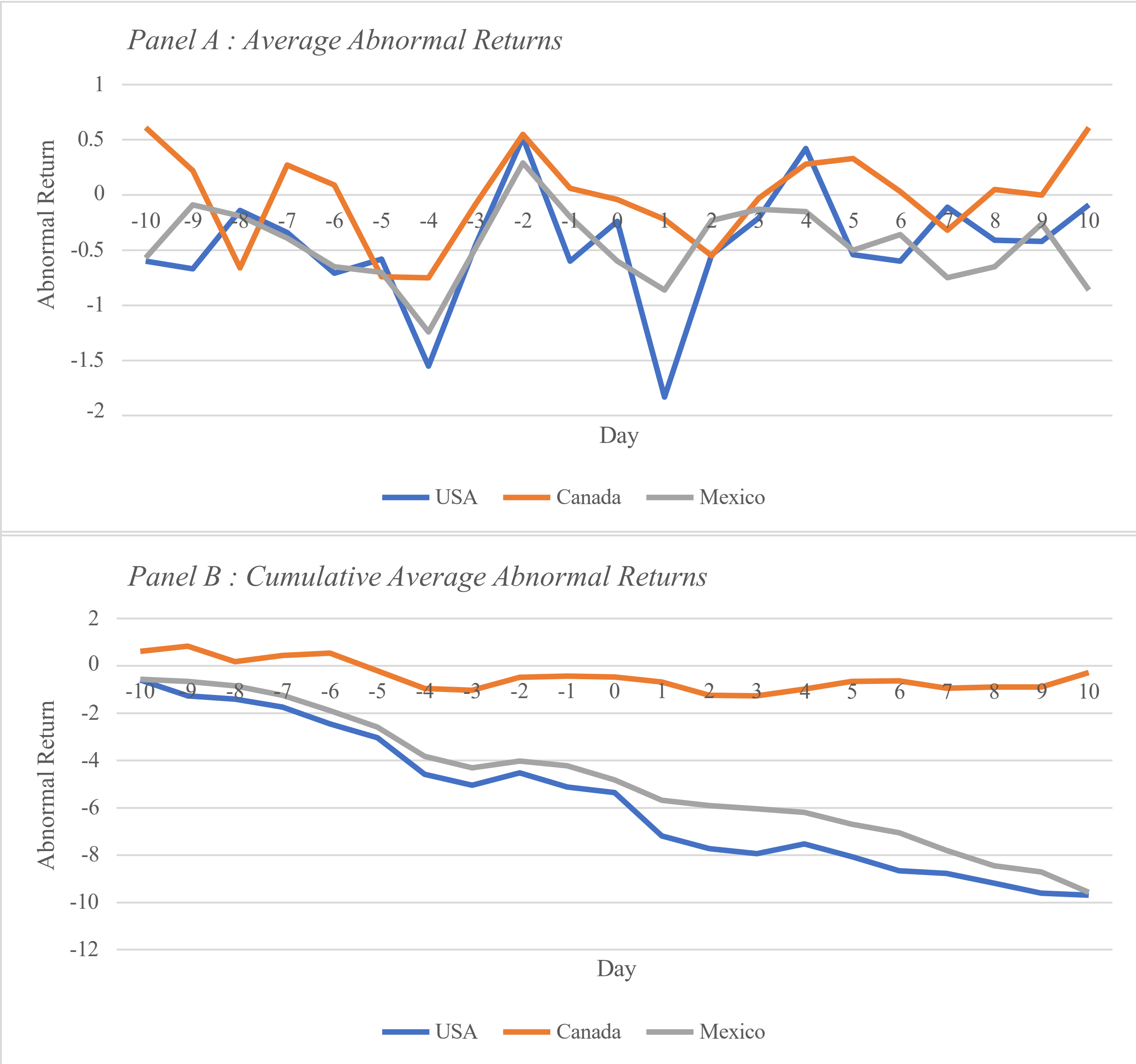


Panel C : S&P/BMV IPC Daily Returns



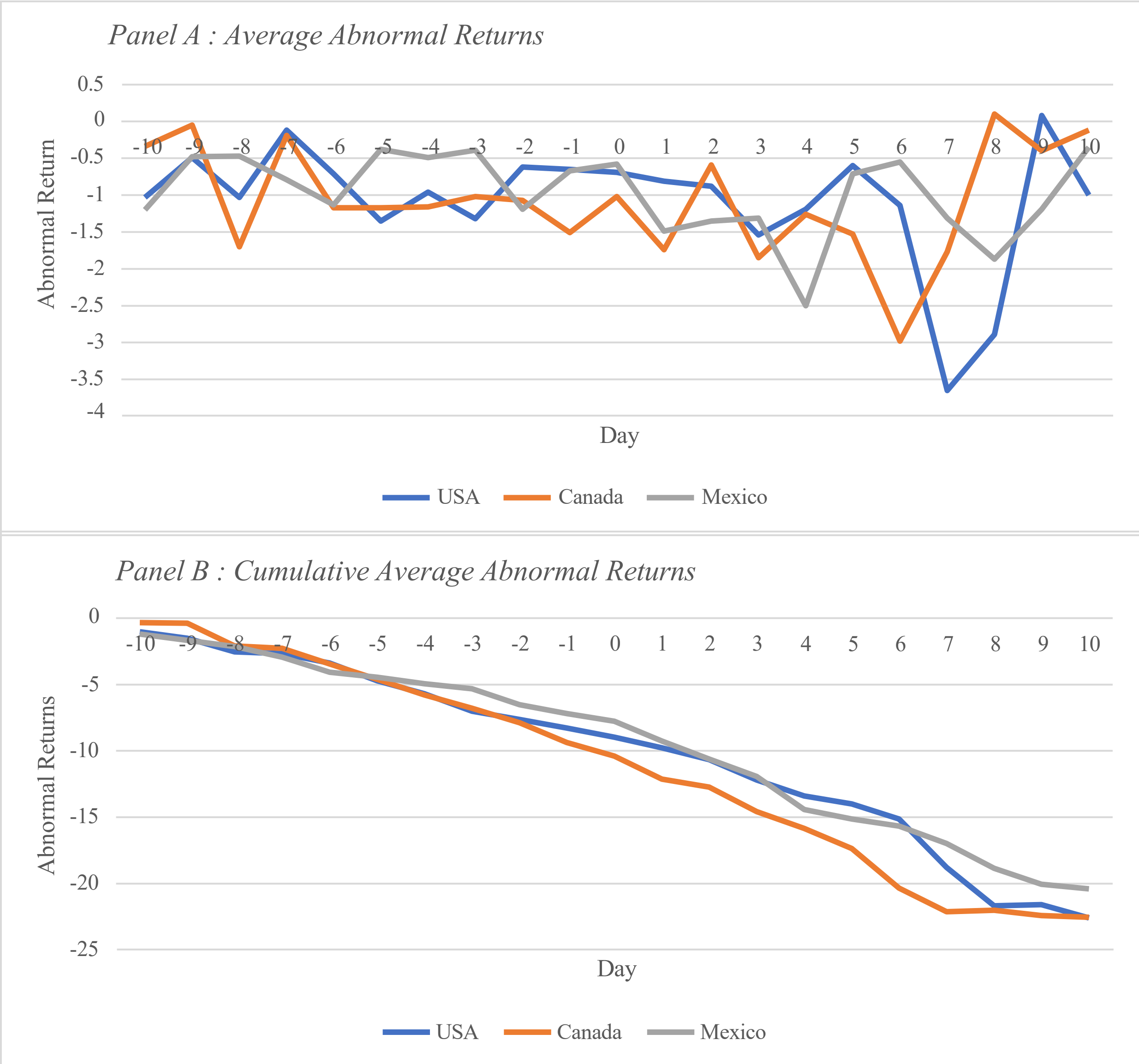
Note: Figure 1 shows the plot of the daily logarithmic returns for the S&P 500, S&P/TSX Composite and the S&P/BMV IPC index from January 2015 to January 2020. The daily logarithmic returns are calculated as follows: $R_t = ln(P_t / P_{(t-1)}) * 100$, where R_t is the daily logarithmic return and P_t is the daily closing price. The time-period is plotted on the X-Axis and the daily logarithmic returns on the Y-Axis.

Figure 2: Event – USMCA Negotiation



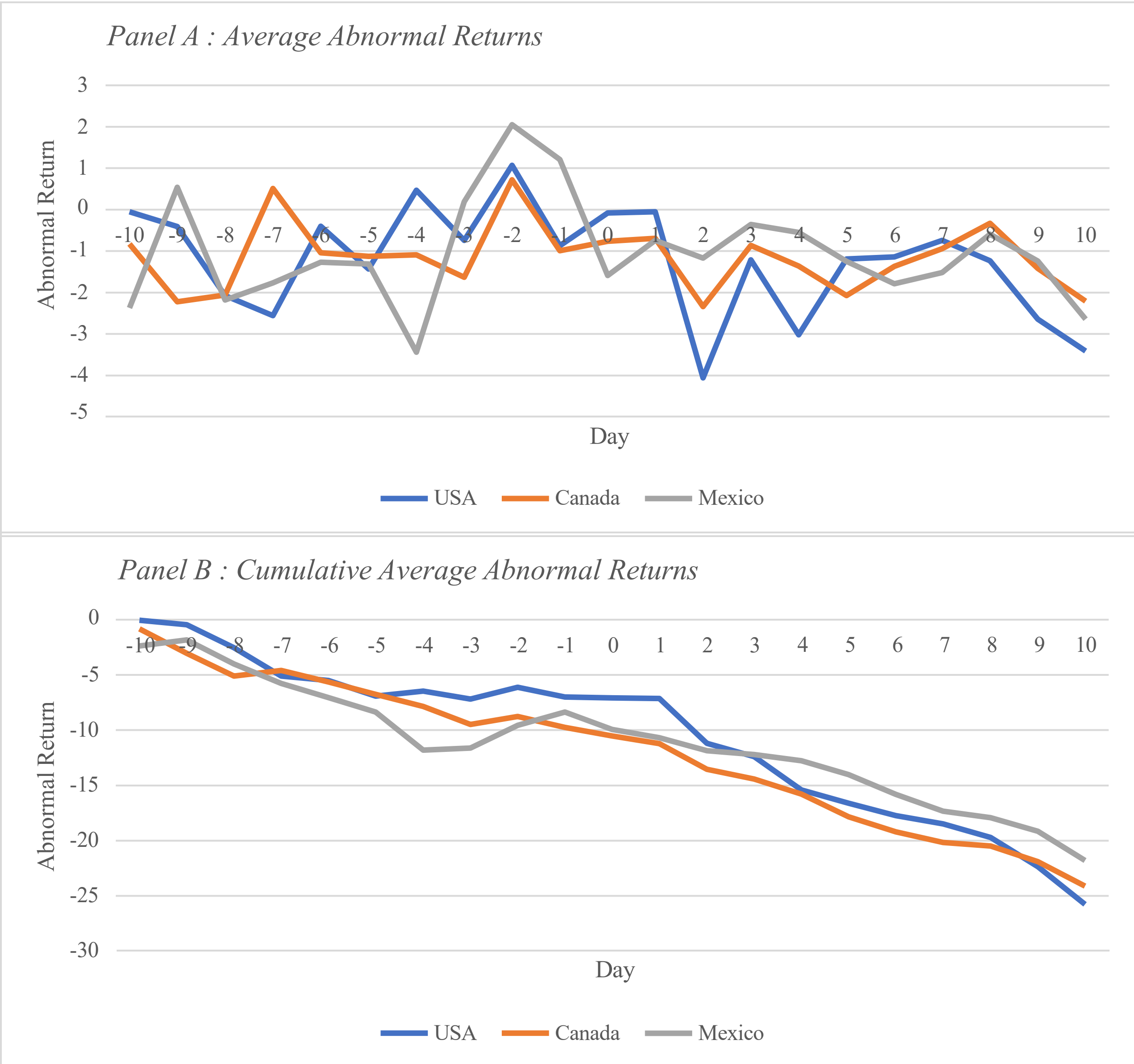
Note: This figure shows the plot of the average abnormal returns (AAR) in panel A and the cumulative average abnormal returns (CAAR) in panel B for the event: USMCA Negotiation, plotted across a (-10,+10) window. The AAR and CAAR are calculated as per the Fama and French Five-Factor Model. The Day is plotted on the X-Axis and the abnormal returns on the Y-Axis.

Figure 3: Event – USMCA Published



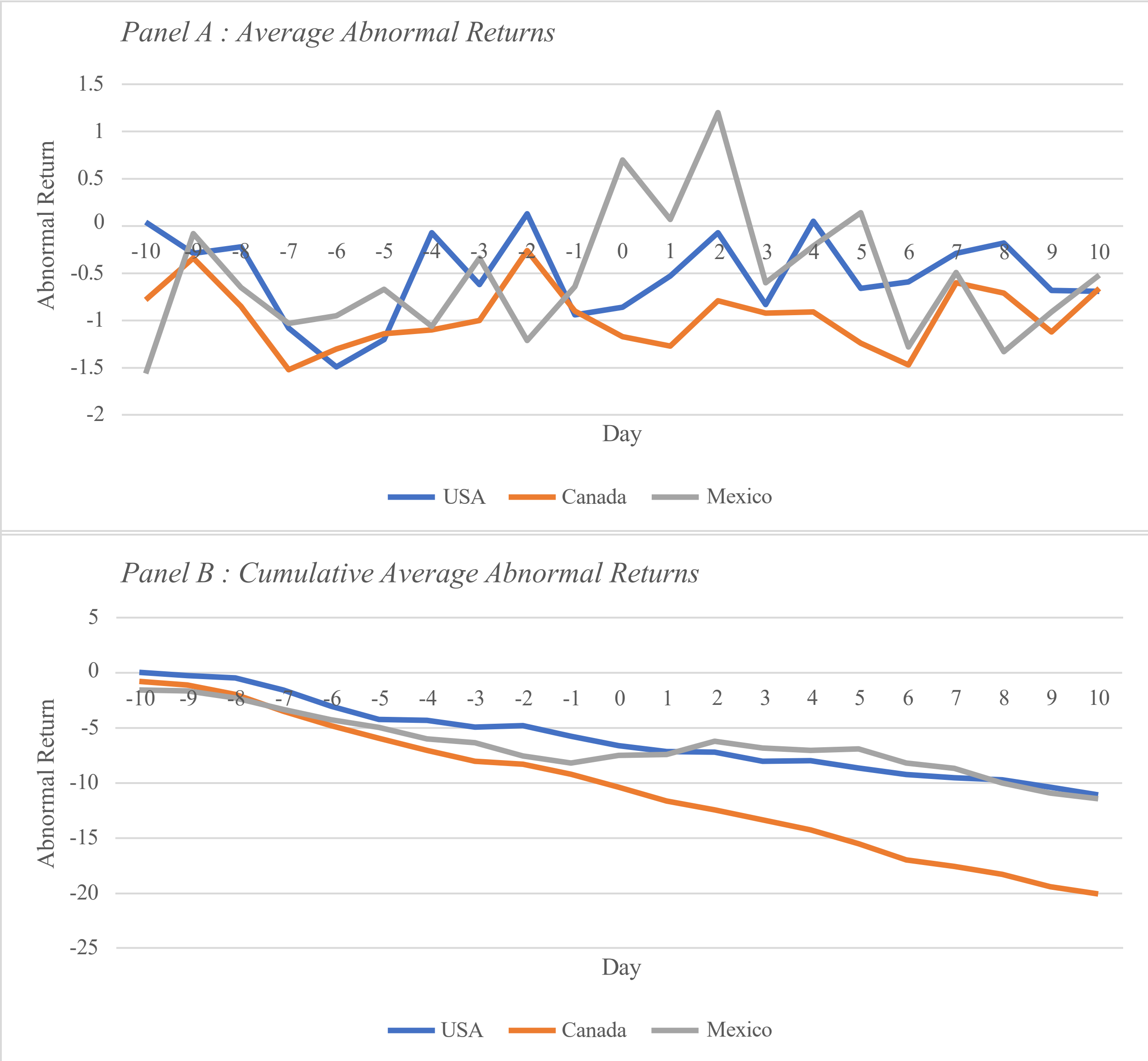
Note: This figure shows the plot of the average abnormal returns (AAR) in panel A and the cumulative average abnormal returns (CAAR) in panel B for the event: USMCA Published, plotted across a (-10,+10) window. The AAR and CAAR are calculated as per the Fama and French Five-Factor Model. The Day is plotted on the X-Axis and the abnormal returns on the Y-Axis.

Figure 4: Event – USMCA Ratified



Note: This figure shows the plot of the average abnormal returns (AAR) in panel A and the cumulative average abnormal returns (CAAR) in panel B for the event: USMCA Ratified, plotted across a (-10,+10) window. The AAR and CAAR are calculated as per the Fama and French Five-Factor Model. The Day is plotted on the X-Axis and the abnormal returns on the Y-Axis.

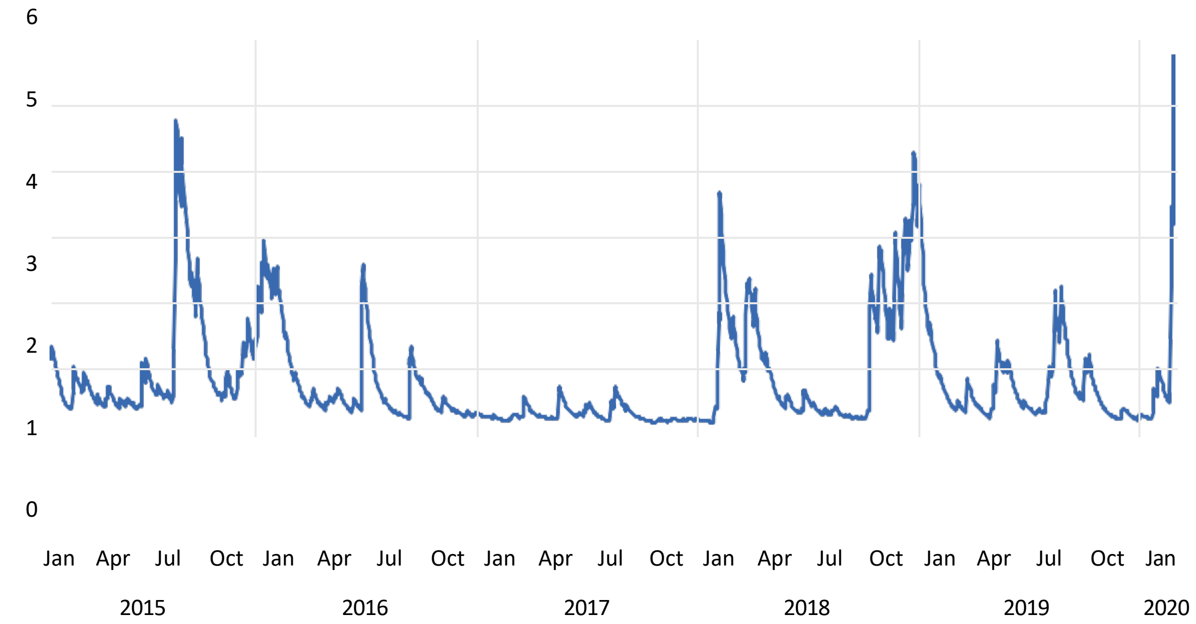
Figure 5: Event – USMCA Amended



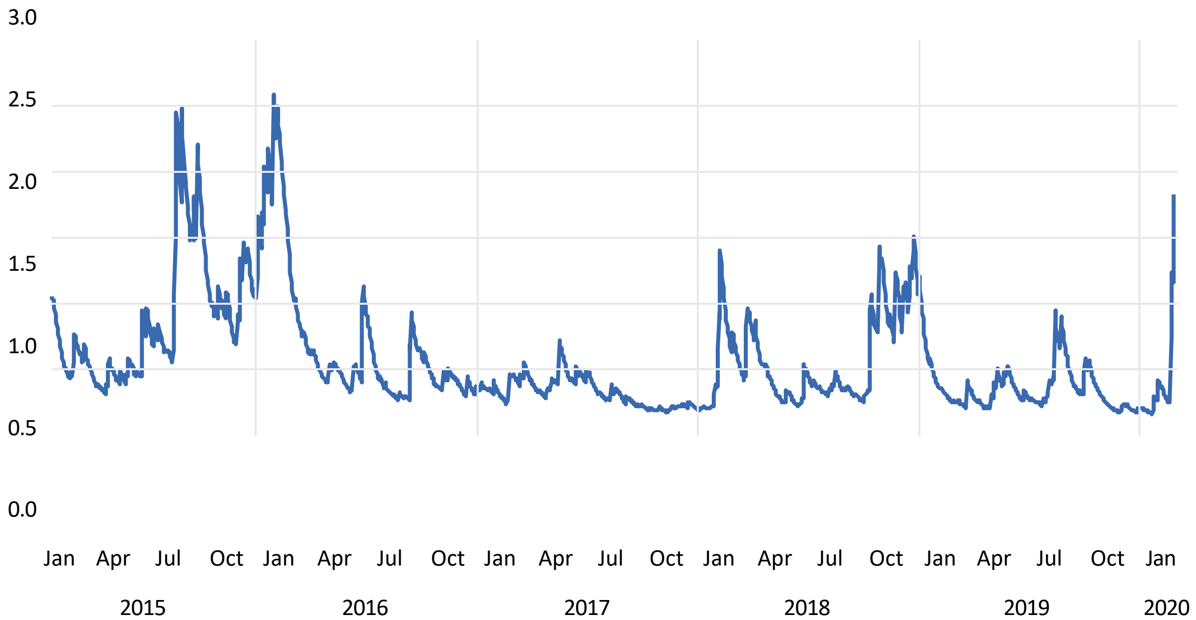
Note: This figure shows the plot of the average abnormal returns (AAR) in panel A and the cumulative average abnormal returns (CAAR) in panel B for the event: USMCA Amended, plotted across a (-10,+10) window. The AAR and CAAR are calculated as per the Fama and French Five-Factor Model. The Day is plotted on the X-Axis and the abnormal returns on the Y-Axis.

Figure 6: Conditional Volatility

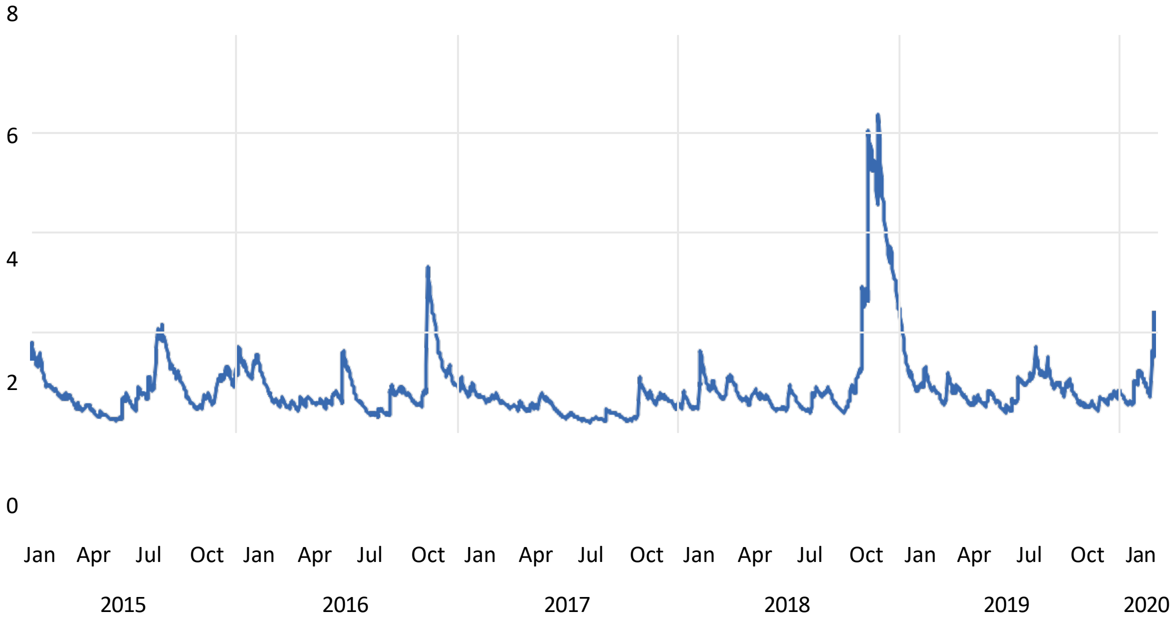
Panel A : S&P 500 Conditional Volatility



Panel B : S&P/TSX Composite Conditional Volatility



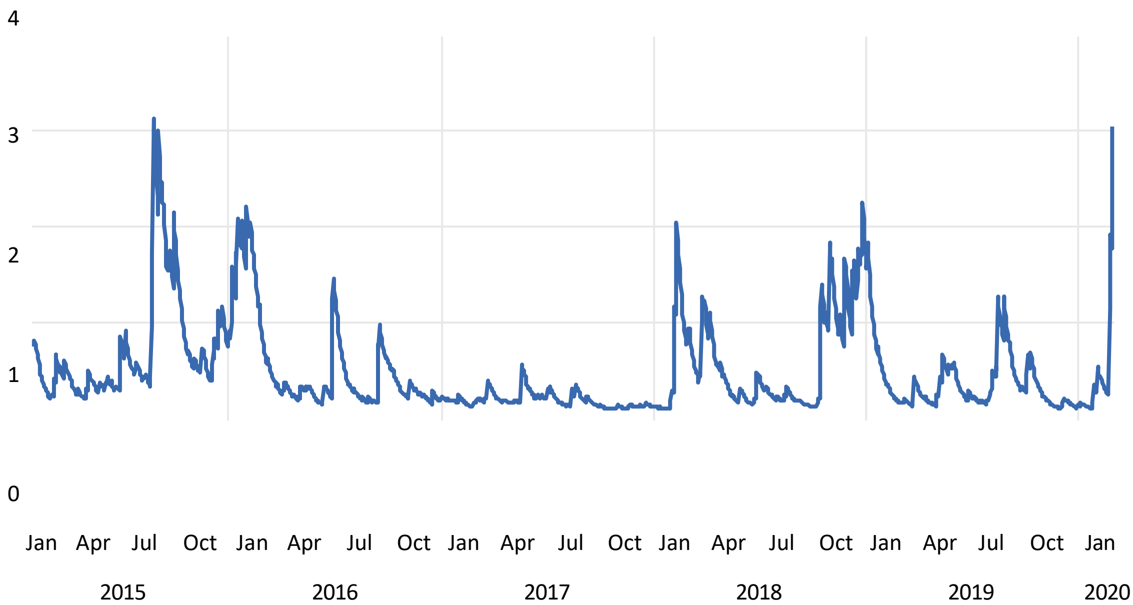
Panel C : S&P/BMV IPC Conditional Volatility



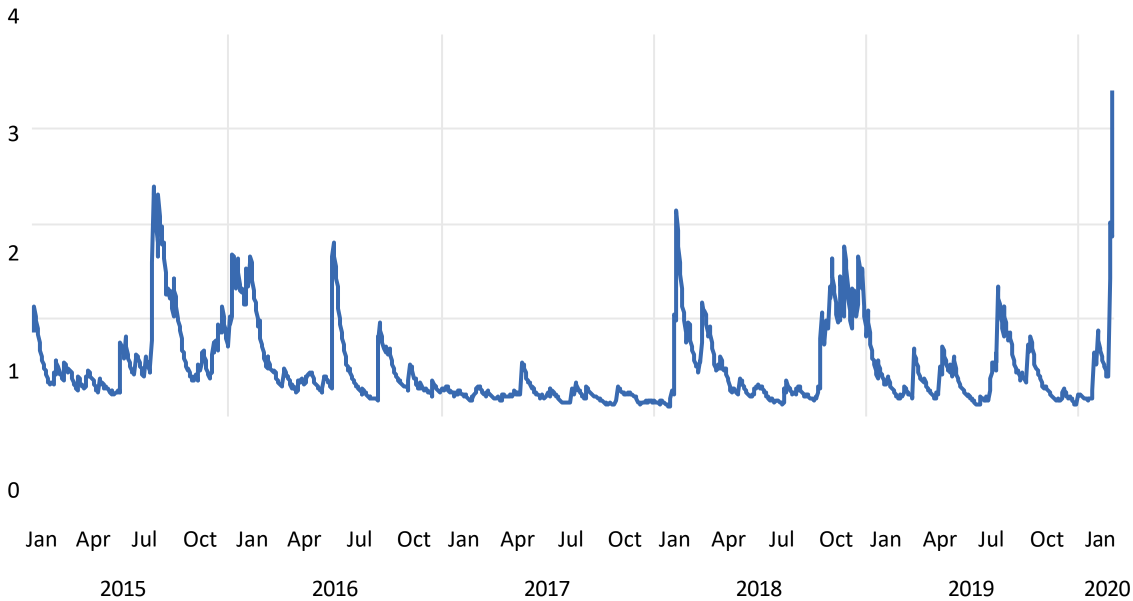
Note: This figure shows the plot of the conditional volatility for the S&P 500, S&P/TSX Composite and the S&P/BMV IPC index from January 2015 to January 2020. The conditional volatility is estimated using the VAR(1) BEKK-GARCH (1,1) w/o USMCA Dummy model. The time-period is plotted on the X-Axis and the conditional volatility on the Y-Axis.

Figure 7: Conditional Covariance

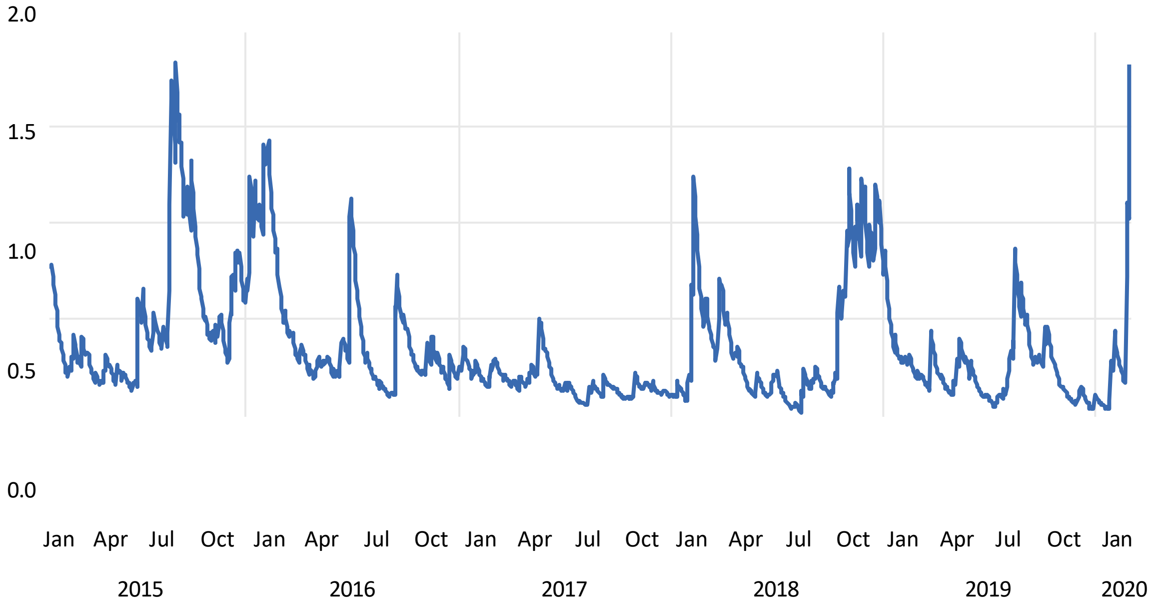
Panel A : S&P 500 & S&P/TSX Composite Conditional Covariance



Panel B : S&P 500 & S&P/BMV IPC Conditional Covariance



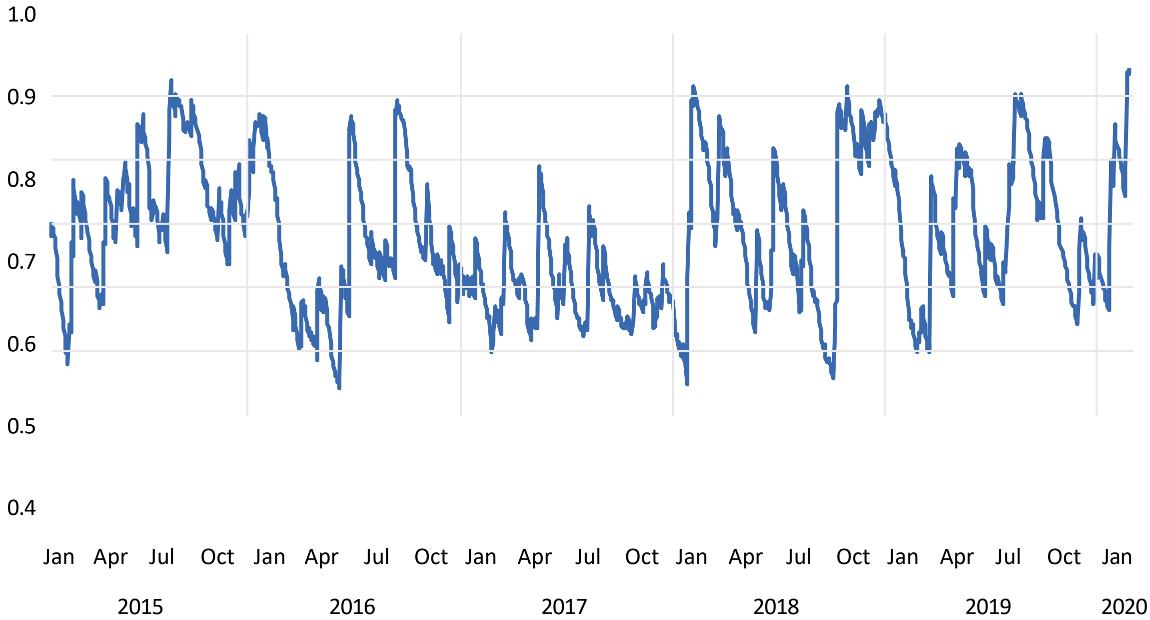
Panel C : S&P/TSX Composite & S&P/BMV IPC Conditional Covariance



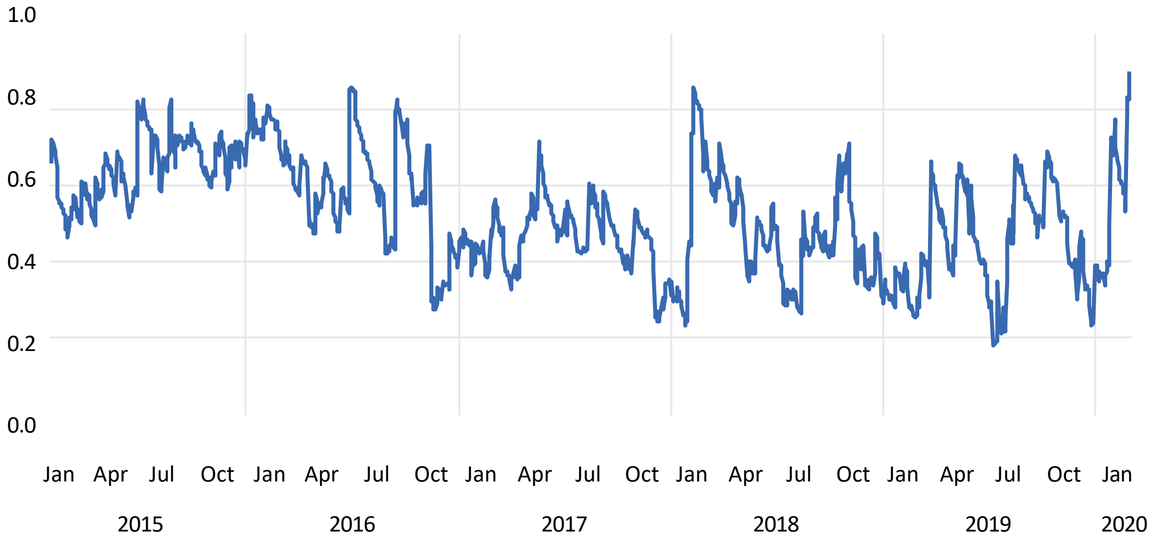
Note: This figure shows the plot of the conditional covariance for the following pairs: S&P 500 & S&P/TSX Composite, S&P 500 & S&P/BMV IPC index, and S&P/TSX Composite & S&P/BMV IPC index from January 2015 to January 2020. The conditional covariance is estimated using the VAR(1) BEKK-GARCH (1,1) w/o USMCA Dummy model. The time-period is plotted on the X-Axis and the conditional covariance on the Y-Axis.

Figure 8: Conditional Correlations

Panel A : S&P 500 & S&P/TSX Composite Conditional Correlation



Panel B : S&P 500 & S&P/BMV IPC Conditional Correlation



Panel C : S&P/TSX Composite & S&P/BMV IPC Conditional Correlation

Note: This figure shows the plot of the conditional correlation for the following pairs: S&P 500 & S&P/TSX Composite, S&P 500 & S&P/BMV IPC index, and S&P/TSX Composite & S&P/BMV IPC index from January 2015 to January 2020. The conditional correlation is estimated using the VAR(1) BEKK-GARCH (1,1) w/o USMCA Dummy model. The time-period is plotted on the X-Axis and the conditional correlation on the Y-Axis.

Table 1: Sectorial Indices for USA, Canada, and Mexico

Industry	Country	Index Name	Index Mnemonic	Index Code
Cons. Disc.	USA	S&P TMI CONS DISCR	S&PTCD1	100734
	Canada	S&P/TSX COMP CONS DISCR	TSX3CD1	48319
	Mexico	S&P/BMV CONS DISCR	MXI1CDS	128773
Cons. Stap.	USA	S&P TMI CONS STAPLES	S&PTCS1	100735
	Canada	S&P/TSX COMP CONS STAPLES	TSX3CS1	48332
	Mexico	S&P/BMV CONS STAPLES	MXI1SPS	128772
Financials	USA	S&P TMI FINANCIALS	S&PTFN1	100737
	Canada	S&P/TSX COMP FINANCIALS	TSX3FN1	48370
	Mexico	S&P/BMV FINANCIAL SVS	MXI1FNS	128770
Healthcare	USA	S&P TMI HEALTH CARE	S&PTHC1	100738
	Canada	S&P/TSX COMP HEALTH CARE	TSX3HC1	48384
	Mexico	S&P/BMV HEALTH CARE	MXI1HCE	128771
Industrials	USA	S&P TMI INDUSTRIALS	S&PTID1	100739
	Canada	S&P/TSX COMP INDUSTRIALS	TSX3ID1	48410
	Mexico	S&P/BMV INDUSTRIALS	MXI1IND	128774
Materials	USA	S&P TMI MATERIALS	S&PTM11	100741
	Canada	S&P/TSX COMP MATERIALS	TSX3M11	48427
	Mexico	S&P/BMV MATERIALS	MXI1MTR	128775
Real Estate	USA	S&P TMI REAL ESTATE	S&PTR11	140551
	Canada	S&P/TSX COMP REAL ESTATE	TSX3R11	140573
	Mexico	S&P/BMV HOUSING	MXHABIT	40783
Telecom	USA	S&P TMI T/CM SVS	S&PTT11	100744
	Canada	S&P/TSX COMP COMM. SERVICES	TSX3T11	48495
	Mexico	S&P/BMV TELECOM SVS	MXI1TLS	128769
Utilities	USA	S&P TMI UTILITIES	S&PTU11	100745
	Canada	S&P/TSX COMP UTILITIES	TSX3U11	48512
	Mexico	DJGL MEXICO UTILITIES	D1MXU1L	132735
Energy	USA	S&P TMI ENERGY	S&PTE11	100736
	Canada	S&P/TSX COMP ENERGY	TSX3E11	48350
IT	USA	S&P TMI IT	S&PTIT1	100740
	Canada	S&P/TSX COMP IT	TSX3IT1	48419

Note: This table shows the indices used for each country in our study. Data for all these indices is obtained from the Thomson Refinitiv DataStream database. The table shows the name, mnemonic code, and the index code for all the sectorial indices.

Table 2: Summary Statistics of Daily Logarithmic Returns of Country Indices

Panel A: Full Sample

	USA	**Canada**	**Mexico**
Mean	0.0298	0.0224	0.0498
Median	0.0574	0.0653	0.0469
Maximum	10.4236	9.3703	12.1536
Minimum	-9.4695	-9.7880	-14.3145
Std. Dev.	1.1372	1.0133	1.4760
Skewness	-0.2783	-0.6691	-0.0062
Kurtosis	11.4186	13.7265	9.8152
Observations	6773	6773	6773
Jarque-Bera	20088.35	32975.71	13107.65
P-Value	0.0000	0.0000	0.0000
ADF	-34.9762	-31.7836	-31.7056
P-Value	0.0000	0.0000	0.0000

Panel B: Pre-USMCA

	USA	**Canada**	**Mexico**
Mean	0.0303	0.0004	0.0347
Median	0.0170	0.0544	0.0496
Maximum	3.8291	2.8965	2.8779
Minimum	-4.0211	-3.1739	-4.6789
Std. Dev.	0.8248	0.7910	0.8112
Skewness	-0.4078	-0.3007	-0.2929
Kurtosis	6.1659	4.7985	5.3580
Observations	608	608	608
Jarque-Bera	270.76	91.11	149.54
P-Value	0.0000	0.0000	0.0000

Panel C: Post-USMCA

	USA	**Canada**	**Mexico**
Mean	0.0298	0.0122	-0.0357
Median	0.0840	0.0617	-0.0492
Maximum	5.6929	2.7557	3.3660
Minimum	-4.5168	-2.7433	-5.9884
Std. Dev.	0.9157	0.5673	0.9323
Skewness	-0.6187	-0.8079	-0.5325
Kurtosis	8.4205	6.3836	7.2555
Observations	608	608	608
Jarque-Bera	783.12	356.17	487.50
P-Value	0.0000	0.0000	0.0000

Note: This table describes the distribution of the daily logarithmic returns for the S&P 500 (USA), S&P/TSX Composite (Canada) and the S&P/BMV IPC (Mexico) indices. The daily logarithmic returns are calculated as follows: $R_t = ln(P_t/P_{(t-1)}) * 100$, where R_t is the daily logarithmic return and P_t is the daily closing price. Panel A shows the summary statistics for the Full sample period, Panel B for the Pre-USMCA period and Panel C for the post-USMCA period. We only take 608 observations in the pre-USMCA period as we only had 608 observations for the post-USMCA period. We also provide the T-statistics and the P-values for the ADF test, which is estimated to check the stationarity of the index daily returns.

Table 3: Summary Statistics of Daily Logarithmic Returns of Sectorial Indices

Panel A: Cons. Disc

	USA	Canada	Mexico
Mean	0.0367	0.0099	0.0345
Median	0.1051	0.0232	-0.0187
Maximum	5.9914	3.2937	5.6354
Minimum	-4.3702	-3.5087	-11.6760
Std. Dev.	0.9472	0.8422	1.0180
Skewness	-0.5145	-0.3994	-1.1336
Kurtosis	7.1712	4.5459	24.2700
Observations	1045	1043	1045
Jarque-Bera	803.70	131.59	19922.65
P-Value	0.0000	0.0000	0.0000
ADF	-31.6667	-30.5164	-27.3804
P-Value	0.0000	0.0000	0.0000

Panel B: Cons. Stap

	USA	Canada	Mexico
Mean	0.0138	0.0231	0.0021
Median	0.0408	-0.0101	0.0250
Maximum	2.8380	3.0693	3.0037
Minimum	-4.0867	-3.1739	-5.2488
Std. Dev.	0.7251	0.7623	0.8406
Skewness	-0.7710	-0.1184	-0.5578
Kurtosis	6.0602	4.0983	6.4983
Observations	1045	1043	1045
Jarque-Bera	511.29	54.86	587.06
P-Value	0.0000	0.0000	0.0000
ADF	-31.4941	-30.5666	-21.2583
P-Value	0.0000	0.0000	0.0000

Panel C: Financials

	USA	Canada	Mexico
Mean	0.0308	0.0246	-0.0138
Median	0.0689	0.0661	0.0215
Maximum	4.4846	3.3524	4.9095
Minimum	-4.9997	-2.7842	-8.9211
Std. Dev.	1.0363	0.6621	1.1174
Skewness	-0.5509	-0.4372	-1.0222
Kurtosis	5.8978	6.0631	10.5669
Observations	1045	1043	1045
Jarque-Bera	418.49	440.97	2675.12
P-Value	0.0000	0.0000	0.0000
ADF	-31.8404	-27.9509	-23.9760
P-Value	0.0000	0.0000	0.0000

Panel D: Healthcare	USA	Canada	Mexico
Mean	0.0284	-0.1679	0.0074
Median	0.0765	-0.1005	0.0000
Maximum	4.6102	16.1423	5.3856
Minimum	-4.5272	-54.6017	-4.3883
Std. Dev.	0.9319	3.2921	0.9512
Skewness	-0.4854	-4.2585	0.2139
Kurtosis	5.4906	75.2204	6.5782
Observations	1045	1043	1045
Jarque-Bera	311.14	229821.60	565.46
P-Value	0.0000	0.0000	0.0000
ADF	-32.1281	-31.0242	-30.4496
P-Value	0.0000	0.0000	0.0000

Panel E: Industrials	USA	Canada	Mexico
Mean	0.0311	0.0491	-0.0105
Median	0.0805	0.0819	-0.0294
Maximum	4.6492	3.3979	4.6061
Minimum	-4.6014	-5.0863	-5.8501
Std. Dev.	0.9711	0.8286	0.8371
Skewness	-0.7091	-0.4073	-0.2374
Kurtosis	6.0901	5.7111	7.3202
Observations	1045	1043	1045
Jarque-Bera	503.35	348.26	822.48
P-Value	0.0000	0.0000	0.0000
ADF	-31.0550	-31.7730	-23.1010
P-Value	0.0000	0.0000	0.0000

Panel F: Materials	USA	Canada	Mexico
Mean	0.0195	0.0340	0.0013
Median	0.0708	0.0523	-0.0037
Maximum	4.3901	6.2565	4.2108
Minimum	-4.6988	-6.9492	-4.2274
Std. Dev.	1.0402	1.3890	1.1020
Skewness	-0.4696	-0.1847	-0.0810
Kurtosis	5.0860	5.3992	3.7583
Observations	1045	1043	1045
Jarque-Bera	227.88	256.09	26.18
P-Value	0.0000	0.0000	0.0000
ADF	-31.4848	-32.5093	-27.6340
P-Value	0.0000	0.0000	0.0000

Panel G: Real Estate			
	USA	**Canada**	**Mexico**
Mean	0.0102	0.0240	-0.0695
Median	0.0700	0.0626	-0.0633
Maximum	3.3507	4.1012	8.8977
Minimum	-5.4864	-3.7547	-6.4156
Std. Dev.	0.8543	0.6459	1.3077
Skewness	-0.8100	-0.3771	0.1890
Kurtosis	6.2060	7.3813	7.2652
Observations	866	1043	1045
Jarque-Bera	465.58	858.95	798.34
P-Value	0.0000	0.0000	0.0000
ADF	-27.6454	-29.0000	-33.9802
P-Value	0.0000	0.0000	0.0000

Panel H: Telecom			
	USA	**Canada**	**Mexico**
Mean	0.0149	0.0163	0.0010
Median	0.0806	0.0597	-0.0093
Maximum	5.2009	2.4068	6.1103
Minimum	-4.9802	-5.0582	-7.8634
Std. Dev.	1.0388	0.6288	1.2291
Skewness	-0.3826	-1.0085	-0.0937
Kurtosis	5.6951	9.3950	5.8808
Observations	1045	1043	1045
Jarque-Bera	341.75	1954.10	362.87
P-Value	0.0000	0.0000	0.0000
ADF	-32.1822	-30.9271	-30.8122
P-Value	0.0000	0.0000	0.0000

Panel I: Utilities			
	USA	**Canada**	**Mexico**
Mean	0.0348	0.0345	0.0153
Median	0.1125	0.0586	0.0545
Maximum	2.5356	3.4637	6.6523
Minimum	-4.7628	-4.9046	-7.4283
Std. Dev.	0.8363	0.6282	1.5194
Skewness	-0.8834	-0.7278	-0.1341
Kurtosis	6.0307	11.0232	5.1856
Observations	1045	1043	1045
Jarque-Bera	535.85	2889.58	211.13
P-Value	0.0000	0.0000	0.0000
ADF	-30.7343	-26.4493	-21.5418
P-Value	0.0000	0.0000	0.0000

Panel J: Energy		
	USA	**Canada**
Mean	-0.0315	-0.0023
Median	-0.0201	0.0226
Maximum	6.3053	5.3181
Minimum	-5.6561	-4.6375
Std. Dev.	1.3689	1.1905
Skewness	-0.1881	0.0674
Kurtosis	4.6452	4.8925
Observations	1045	1043
Jarque-Bera	124.01	156.44
P-Value	0.0000	0.0000
ADF	-32.6617	-32.8487
P-Value	0.0000	0.0000

Panel K: IT		
	USA	**Canada**
Mean	0.0737	0.0847
Median	0.1483	0.1191
Maximum	5.8389	5.2188
Minimum	-5.2543	-5.0994
Std. Dev.	1.1513	1.2022
Skewness	-0.6989	-0.4654
Kurtosis	6.3581	4.8705
Observations	1045	1043
Jarque-Bera	576.10	189.71
P-Value	0.0000	0.0000
ADF	-33.7642	-31.5860
P-Value	0.0000	0.0000

Note: This table describes the distribution of the daily logarithmic returns for the sectorial indices for USA, Canada, and Mexico. The daily logarithmic returns are calculated as follows: $R_t = ln(P_t/P_{(t-1)}) * 100$, where R_t is the daily logarithmic return and P_t is the daily closing price. We also provide the T-statistics and the P-values for the ADF test, which is estimated to check the stationarity of the index daily returns.

Table 4: Covariance/Correlation Matrix of Daily Logarithmic Returns

Panel A: Full Sample

	USA	Canada	Mexico
USA	1.2930	0.7450	0.5830
Canada	0.8584	1.0267	0.5283
Mexico	0.9785	0.7901	2.1784

Panel B: Pre-USMCA

	USA	Canada	Mexico
USA	0.6792	0.7468	0.6081
Canada	0.4864	0.6246	0.5751
Mexico	0.4062	0.3684	0.6569

Panel C: Post-USMCA

	USA	Canada	Mexico
USA	0.8372	0.7850	0.4270
Canada	0.4071	0.3213	0.3966
Mexico	0.3639	0.2094	0.8678

Note: This table reports the covariance and correlation matrix of the daily logarithmic returns of the S&P 500 (USA), S&P/TSX Composite (Canada) and the S&P/BMV IPC (Mexico) indices. Panel A shows the matrix for the Full sample period, Panel B for the Pre-USMCA period and Panel C for the post-USMCA period. We only take 608 observations in the pre-USMCA period as we only had 608 observations for the post-USMCA period. The diagonal values in each matrix represents the own variance, the values above the diagonal values are the correlations and the off-diagonal elements in the lower triangular portion of the matrix are the covariances.

Table 5: VAR Lag Selection Criteria

Lags	SIC
0	8.3229351
1	8.2790115*
2	8.2823995
3	8.2897924
4	8.2988405
5	8.3083094

Note: This table shows the results of the Lag length selection criteria. We use the Schwarz Information Criterion to select the lags for the BEKK GARCH Model.

Table 6: CAAR (-2,+2) for Key USMCA Dates – Countrywide comparison

Panel A: USMCA Negotiation

	USA	Canada	Mexico
CAAR(-2,+2)	-2.69	-0.20	-1.61
Precision Weighted CAAR	-2.84	-0.08	-1.38
pos:neg CAR	0:11	5:6	0:9
Patell Z	-9.93	-0.34	-2.41
	(0.0000)	(0.7317)	(0.0159)
Adjusted Patell Z	-16.53	-0.38	-2.50
	(0.0000)	(0.7011)	(0.0125)
Adjusted StdCSect T	-9.87	-0.63	-4.74
	(0.0000)	(0.5422)	(0.0015)
Generalized Rank T	-7.14	-0.26	-3.71
	(0.0000)	(0.7936)	(0.0003)
Generalized Rank Z	-4.69	-0.24	-3.65
	(0.0000)	(0.8071)	(0.0003)

Panel B: USMCA Published

	USA	Canada	Mexico
CAAR(-2,+2)	-3.64	-5.93	-5.28
Precision Weighted CAAR	-3.84	-6.29	-5.15
pos:neg CAR	0:11	0:11	0:9
Patell Z	-12.45	-15.41	-9.26
	(0.0000)	(0.0000)	(0.0000)
Adjusted Patell Z	-23.28	-17.44	-10.65
	(0.0000)	(0.0000)	(0.0000)
Adjusted StdCSect T	-11.51	-7.41	-9.97
	(0.0000)	(0.0000)	(0.0000)
Generalized Rank T	-8.14	-5.13	-5.45
	(0.0000)	(0.0000)	(0.0000)
Generalized Rank Z	-4.75	-4.79	-4.97
	(0.0000)	(0.0000)	(0.0000)

Panel C: USMCA Ratified

	USA	Canada	Mexico
CAAR(-2,+2)	-3.99	-4.06	-0.25
Precision Weighted CAAR	-4.25	-4.35	-0.46
pos:neg CAR	0:11	0:11	3:6
Patell Z	-11.85	-9.76	-0.81
	(0.0000)	(0.0000)	(0.4159)
Adjusted Patell Z	-24.09	-11.94	-0.93
	(0.0000)	(0.0000)	(0.3548)
Adjusted StdCSect T	-10.47	-6.18	-0.53
	(0.0000)	(0.0001)	(0.6125)
Generalized Rank T	-8.19	-4.94	-0.76
	(0.0000)	(0.0000)	(0.4469)
Generalized Rank Z	-4.51	-4.33	-0.71
	(0.0000)	(0.0000)	(0.4798)

Panel D: USMCA Amended			
	USA	**Canada**	**Mexico**
CAAR(-2,+2)	-2.28	-4.40	0.12
Precision Weighted CAAR	-1.89	-5.38	0.07
pos:neg CAR	1:10	1:10	4:5
Patell Z	-7.35	-13.35	0.02
	(0.0000)	(0.0000)	(0.9807)
Adjusted Patell Z	-13.93	-18.84	0.03
	(0.0000)	(0.0000)	(0.9763)
Adjusted StdCSect T	-10.80	-6.20	0.09
	(0.0000)	(0.0001)	(0.9319)
Generalized Rank T	-7.75	-5.00	-0.15
	(0.0000)	(0.0000)	(0.8771)
Generalized Rank Z	-4.41	-3.84	-0.13
	(0.0000)	(0.0001)	(0.8949)

Note: This table presents the cumulative average abnormal returns (CAAR) for a (-2+2) window estimated as per the Fama French Five-Factor Model. The event day is denoted as day 0. The estimation window is (-21,-221) with a minimum length of 200 days. Panel A shows the estimated CAAR's around the "USMCA Negotiation" event, Panel B for the "USMCA Published" event, Panel C for the "USMCA Ratified" event, and Panel D for the "USMCA Amended" event. The key events have been explained in detail in the methodology section. P-values for parametric and non-parametric significance tests are provided in parenthesis.

Table 7: CAR (-2,+2) for Key USMCA Dates – Sector comparisons

Panel A: USA				
Industry	**Negotiation**	**Published**	**Ratified**	**Amended**
Cons. Disc.	-3.90***	-5.95***	-3.19***	-1.49**
Cons. Stap.	-2.04**	-4.58***	-4.60***	-3.28***
Financials	-2.54***	-4.21***	-6.94***	-0.80
Healthcare	-2.69***	-3.43***	-2.71***	-2.46***
Industrials	-3.29***	-2.91***	-4.89***	-1.34
Materials	-1.75**	-4.91***	-3.93***	-1.11
Real Estate	-1.86	-4.67***	-3.81**	-6.20***
Telecom	-3.84**	-3.37*	-4.79**	-3.27***
Utilities	-0.88	-1.87	-2.57	-4.27***
Energy	-4.81***	-1.53	-3.60**	0.53
IT	-1.97**	-2.63***	-2.84***	-1.34*
Panel B: Canada				
Industry	**Negotiation**	**Published**	**Ratified**	**Amended**
Cons. Disc.	-0.05	-7.18***	-3.17**	-4.54***
Cons. Stap.	0.29	-6.66***	-2.25	-6.23***
Financials	-0.01	-6.69***	-5.27***	-5.08***
Healthcare	-0.18	-4.62	-6.73	2.89
Industrials	-0.93	-6.20***	-6.24***	-3.86***
Materials	-0.58	-4.92***	-1.27	-3.85*
Real Estate	0.86	-7.02***	-5.09***	-8.91***
Telecom	0.13	-6.44***	-4.65***	-5.38***
Utilities	0.20	-5.88***	-3.17***	-6.00***
Energy	-2.21	-2.41	-3.10**	-2.19
IT	0.27	-7.25***	-3.72*	-5.26**
Panel C: Mexico				
Industry	**Negotiation**	**Published**	**Ratified**	**Amended**
Cons. Disc.	-3.87	-2.66	-1.67	-2.72*
Cons. Stap.	-1.10	-5.16***	-1.86	-0.83
Financials	-2.21	-4.56***	3.69***	1.04
Healthcare	-2.74	-5.17***	-3.50**	-1.31
Industrials	-1.20	-4.13***	-1.65	2.73**
Materials	-0.67	-6.08***	-0.35	0.13
Real Estate	-2.55	-5.18**	-0.18	-2.89
Telecom	-0.09	-8.15***	1.38	-0.24
Utilities	-0.02	-6.46**	1.91	5.18

The symbols *, **, *** denote statistical significance at the 0.10, 0.05, 0.01 levels, respectively.
Note: This table presents the cumulative abnormal returns (CAR) for a (-2+2) window estimated as per the Fama French Five-Factor Model. The event day is denoted as day 0. The estimation window is (-21,-221) with a minimum length of 200 days. Panel A shows the estimated CAR's for USA's sectorial indices for the four key event dates, Panel B for Canada's sectorial indices, and Panel C for Mexico's sectorial indices. The key events have been explained in detail in the methodology section.

Table 8: Estimates of VAR(1) BEKK-GARCH (1,1) w/o USMCA Dummy

Variable	Coeff.	Std. Error	T-Stat.	Prob.
Mean Model(USA)				
Constant	0.0360	0.0044	8.1915	0.0000
USA {1}	-0.0168	0.0140	-1.1993	0.2304
CAN {1}	0.0058	0.0156	0.3737	0.7086
MEX {1}	0.0017	0.0051	0.3276	0.7432
Mean Model(CAN)				
Constant	0.0231	0.0064	3.6288	0.0003
USA {1}	0.0539	0.0109	4.9519	0.0000
CAN {1}	0.0382	0.0167	2.2831	0.0224
MEX {1}	0.0133	0.0040	3.3487	0.0008
Mean Model(MEX)				
Constant	0.0423	0.0109	3.8723	0.0001
USA {1}	0.0169	0.0166	1.0161	0.3096
CAN {1}	0.0326	0.0188	1.7383	0.0822
MEX {1}	0.0811	0.0089	9.1103	0.0000
Variance Model				
C(1,1)	0.1193	0.0085	13.9772	0.0000
C(2,1)	0.0567	0.0076	7.4381	0.0000
C(2,2)	0.0415	0.0112	3.7171	0.0002
C(3,1)	0.0550	0.0121	4.5612	0.0000
C(3,2)	-0.0148	0.0146	-1.0145	0.3104
C(3,3)	0.0885	0.0153	5.7807	0.0000
A(1,1)	0.0293	0.0338	0.8670	0.3859
A(1,2)	-0.0815	0.0143	-5.6827	0.0000
A(1,3)	-0.1574	0.0217	-7.2471	0.0000
A(2,1)	0.1225	0.0236	5.1909	0.0000
A(2,2)	0.1873	0.0245	7.6475	0.0000
A(2,3)	0.1286	0.0154	8.3408	0.0000
A(3,1)	-0.0007	0.0062	-0.1198	0.9046
A(3,2)	-0.0061	0.0059	-1.0340	0.3012
A(3,3)	0.2139	0.0197	10.8617	0.0000
B(1,1)	0.9580	0.0052	185.4675	0.0000
B(1,2)	-0.0112	0.0044	-2.5371	0.0112
B(1,3)	-0.0054	0.0070	-0.7740	0.4389
B(2,1)	-0.0106	0.0036	-2.9256	0.0034
B(2,2)	0.9720	0.0052	187.9982	0.0000
B(2,3)	-0.0028	0.0067	-0.4178	0.6761
B(3,1)	0.0000	0.0019	-0.0075	0.9940
B(3,2)	-0.0011	0.0017	-0.6314	0.5278
B(3,3)	0.9627	0.0067	143.9405	0.0000
G(1,1)	0.3678	0.0333	11.0280	0.0000
G(1,2)	0.0971	0.0313	3.1001	0.0019
G(1,3)	0.1214	0.0393	3.0897	0.0020
G(2,1)	-0.0169	0.0369	-0.4585	0.6466
G(2,2)	0.1978	0.0482	4.1010	0.0000

G(2,3)	-0.0584	0.0575	-1.0166	0.3094
G(3,1)	0.0035	0.0099	0.3571	0.7210
G(3,2)	0.0232	0.0073	3.1637	0.0016
G(3,3)	0.2206	0.0315	6.9986	0.0000
Log Likelihood	-23970.35			
LB Q(24) test			235.39	0.1741

Note: This table provides the estimates of the VAR(1) Asymmetric BEKK GARCH (1,1) model. We use the BFGS algorithm to estimate the second moments in our models. This table also reports the log-likelihood statistics and the multivariate test results for the Ljung-Box Q statistic for the standardised residuals up to 24 lags. The sample period is from 11th November 1991 to 28th February 2020. The data used is collected from the Thomson Refinitiv DataStream database.

Table 9: Covariance/Correlation Matrix of Conditional Volatility

	USA	Canada	Mexico
Panel A: Full Sample			
USA	4.7158	0.9447	0.5814
Canada	3.7631	3.3646	0.6070
Mexico	3.1918	2.8148	6.3914
Panel B: Pre-USMCA			
	USA	**Canada**	**Mexico**
USA	0.5308	0.9077	0.5761
Canada	0.3241	0.2402	0.5198
Mexico	0.1829	0.1110	0.1898
Panel C: Post-USMCA			
	USA	**Canada**	**Mexico**
USA	0.6665	0.9675	0.6358
Canada	0.2250	0.0811	0.6691
Mexico	0.4883	0.1793	0.8852

Note: This table reports the covariance and correlation matrix of the conditional volatilities of the S&P 500 (USA), S&P/TSX Composite (Canada) and the S&P/BMV IPC (Mexico) indices. The conditional volatility is estimated using the VAR(1) BEKK-GARCH (1,1) w/o USMCA Dummy model. Panel A shows the matrix for the Full sample period, Panel B for the Pre-USMCA period and Panel C for the post-USMCA period. We only take 608 observations in the pre-USMCA period as we only had 608 observations for the post-USMCA period. The diagonal values in each matrix represents the own variance, the values above the diagonal values are the correlations and the off-diagonal elements in the lower triangular portion of the matrix are the covariances.

Table 10: Estimates of VAR(1) BEKK-GARCH (1,1) w/ USMCA Dummy in Mean Eq.

Variable	Coeff.	Std. Error	T-Stat.	Prob.
Mean Model(USA)				
Constant	0.0383	0.0083	4.6219	0.0000
USA{1}	-0.0176	0.0136	-1.2970	0.1946
CAN{1}	0.0061	0.0147	0.4174	0.6764
MEX{1}	0.0017	0.0050	0.3301	0.7413
USMCA	0.0034	0.0237	0.1444	0.8852
Mean Model(CAN)				
Constant	0.0309	0.0077	3.9877	0.0001
USA{1}	0.0532	0.0114	4.6749	0.0000
CAN{1}	0.0386	0.0136	2.8422	0.0045
MEX{1}	0.0130	0.0043	2.9941	0.0028
USMCA	-0.0311	0.0185	-1.6876	0.0915
Mean Model(MEX)				
Constant	0.0593	0.0112	5.2987	0.0000
USA{1}	0.0169	0.0167	1.0100	0.3125
CAN{1}	0.0330	0.0157	2.1005	0.0357
MEX{1}	0.0796	0.0082	9.6692	0.0000
USMCA	-0.1233	0.0370	-3.3317	0.0009
Variance Model				
C(1,1)	0.1196	0.0110	10.9052	0.0000
C(2,1)	0.0571	0.0081	7.0135	0.0000
C(2,2)	0.0422	0.0099	4.2514	0.0000
C(3,1)	0.0561	0.0141	3.9851	0.0001
C(3,2)	-0.0140	0.0121	-1.1511	0.2497
C(3,3)	0.0901	0.0150	6.0004	0.0000
A(1,1)	0.0320	0.0357	0.8941	0.3712
A(1,2)	-0.0788	0.0234	-3.3636	0.0008
A(1,3)	-0.1574	0.0258	-6.1110	0.0000
A(2,1)	0.1206	0.0241	5.0106	0.0000
A(2,2)	0.1806	0.0406	4.4535	0.0000
A(2,3)	0.1244	0.0268	4.6476	0.0000
A(3,1)	-0.0007	0.0056	-0.1297	0.8968
A(3,2)	-0.0059	0.0069	-0.8460	0.3976
A(3,3)	0.2160	0.0218	9.9006	0.0000
B(1,1)	0.9577	0.0074	129.6024	0.0000
B(1,2)	-0.0110	0.0061	-1.8004	0.0718
B(1,3)	-0.0054	0.0084	-0.6448	0.5191
B(2,1)	-0.0104	0.0076	-1.3640	0.1726
B(2,2)	0.9720	0.0075	130.3175	0.0000
B(2,3)	-0.0023	0.0095	-0.2399	0.8104
B(3,1)	0.0000	0.0016	0.0039	0.9969
B(3,2)	-0.0012	0.0020	-0.6056	0.5448
B(3,3)	0.9622	0.0060	159.9443	0.0000
G(1,1)	0.3659	0.0358	10.2277	0.0000
G(1,2)	0.0943	0.0297	3.1728	0.0015

G(1,3)	0.1196	0.0357	3.3531	0.0008
G(2,1)	-0.0143	0.0369	-0.3867	0.6990
G(2,2)	0.2023	0.0481	4.2092	0.0000
G(2,3)	-0.0554	0.0535	-1.0350	0.3007
G(3,1)	0.0032	0.0085	0.3804	0.7037
G(3,2)	0.0240	0.0131	1.8243	0.0681
G(3,3)	0.2206	0.0333	6.6302	0.0000
Log Likelihood	-23960.16			
LB Q(24) test			236.17	0.1651

Note: This table provides the estimates of the VAR(1) Asymmetric BEKK GARCH (1,1) model. We use the BFGS algorithm to estimate the second moments in our models. This table also reports the log-likelihood statistics and the multivariate test results for the Ljung-Box Q statistic for the standardised residuals up to 24 lags. The sample period is from 11th November 1991 to 28th February 2020. The data used is collected from the Thomson Refinitiv DataStream database. In this model we add a dummy variable for USMCA in the mean equation. The USMCA dummy is a binary variable defined as 1 for all dates after 16th August 2017 and 0 otherwise.

Table 11: Estimates of VAR(1) BEKK-GARCH (1,1) w/ USMCA Dummy in Mean & Variance Eq.

Variable	Coeff.	Std. Error	T-Stat.	Prob.
Mean Model(USA)				
Constant	0.0323	0.0070	4.5995	0.0000
USA{1}	-0.0212	0.0112	-1.8987	0.0576
CAN{1}	0.0037	0.0098	0.3795	0.7043
MEX{1}	0.0035	0.0053	0.6624	0.5077
USMCA	0.0411	0.0170	2.4155	0.0157
Mean Model(CAN)				
Constant	0.0285	0.0067	4.2754	0.0000
USA{1}	0.0513	0.0095	5.4100	0.0000
CAN{1}	0.0371	0.0121	3.0520	0.0023
MEX{1}	0.0161	0.0050	3.2337	0.0012
USMCA	0.0086	0.0139	0.6212	0.5345
Mean Model(MEX)				
Constant	0.0492	0.0107	4.5904	0.0000
USA{1}	0.0130	0.0157	0.8243	0.4098
CAN{1}	0.0352	0.0181	1.9394	0.0524
MEX{1}	0.0756	0.0097	7.7709	0.0000
USMCA	-0.0887	0.0334	-2.6592	0.0078
Variance Model				
C(1,1)	0.1437	0.0133	10.8273	0.0000
C(2,1)	0.0528	0.0100	5.2577	0.0000
C(2,2)	0.0620	0.0119	5.2191	0.0000
C(3,1)	0.0755	0.0130	5.8043	0.0000
C(3,2)	0.0290	0.0132	2.1880	0.0287
C(3,3)	0.0820	0.0145	5.6687	0.0000
A(1,1)	0.0795	0.0365	2.1776	0.0294
A(1,2)	-0.0125	0.0272	-0.4596	0.6458
A(1,3)	-0.0115	0.0292	-0.3927	0.6946
A(2,1)	0.0138	0.0427	0.3239	0.7460
A(2,2)	0.2008	0.0496	4.0503	0.0001
A(2,3)	-0.0093	0.0648	-0.1437	0.8858
A(3,1)	-0.0038	0.0071	-0.5283	0.5973
A(3,2)	-0.0048	0.0064	-0.7427	0.4577
A(3,3)	0.1668	0.0308	5.4179	0.0000
B(1,1)	0.9359	0.0103	90.6402	0.0000
B(1,2)	-0.0209	0.0085	-2.4602	0.0139
B(1,3)	-0.0179	0.0102	-1.7460	0.0808
B(2,1)	0.0173	0.0110	1.5805	0.1140
B(2,2)	0.9788	0.0107	91.9031	0.0000
B(2,3)	0.0061	0.0118	0.5173	0.6050
B(3,1)	0.0007	0.0018	0.4204	0.6742
B(3,2)	-0.0015	0.0012	-1.2535	0.2100
B(3,3)	0.9681	0.0063	153.1830	0.0000
G(1,1)	0.3680	0.0345	10.6685	0.0000

G(1,2)	0.1254	0.0392	3.1987	0.0014
G(1,3)	0.0184	0.0394	0.4674	0.6402
G(2,1)	0.0304	0.0337	0.9021	0.3670
G(2,2)	0.1170	0.0706	1.6590	0.0971
G(2,3)	0.0631	0.0515	1.2240	0.2210
G(3,1)	-0.0038	0.0085	-0.4527	0.6508
G(3,2)	0.0170	0.0115	1.4825	0.1382
G(3,3)	0.2610	0.0257	10.1516	0.0000
USMCA(1,1)	-0.0194	0.0155	-1.2506	0.2111
USMCA(2,1)	-0.0047	0.0139	-0.3361	0.7368
USMCA(2,2)	-0.0304	0.0086	-3.5505	0.0004
USMCA(3,1)	-0.0184	0.0199	-0.9254	0.3548
USMCA(3,2)	-0.0327	0.0204	-1.6086	0.1077
USMCA(3,3)	0.0149	0.0160	0.9317	0.3515
Log Likelihood	-23919.32			
LB Q(24) test			228.77	0.2628

Note: This table provides the estimates of the VAR(1) Asymmetric BEKK GARCH (1,1) model. We use the BFGS algorithm to estimate the second moments in our models. This table also reports the log-likelihood statistics and the multivariate test results for the Ljung-Box Q statistic for the standardised residuals up to 24 lags. The sample period is from 11th November 1991 to 28th February 2020. The data used is collected from the Thomson Refinitiv DataStream database. In this model we add a dummy variable for USMCA in the mean and variance equation. The USMCA dummy is a binary variable defined as 1 for all dates after 16th August 2017 and 0 otherwise.