

The impact of domestic portfolio diversification strategies in Toronto stock exchange on Canadian textile manufacturing industry

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ABSTRACT – REZUMAT

The impact of domestic portfolio diversification strategies in Toronto stock exchange on Canadian textile manufacturing industry

The aim of this research study is to examine the impact of domestic portfolio diversification strategies in Toronto Stock Exchange (TSX) on Canadian textile manufacturing industry in order to obtain attractive investment opportunities. Dissipation of benefits of globally diversified portfolios due to overwhelming convergence among the international and regional stock markets around the globe have given rebirth to the idea of domestic portfolio diversification particularly after the global financial crisis of 2008. Textile industry in Canada is challenging but can achieve higher performance based on Toronto Stock Exchange behavior. Therefore, this is a complex applied research focused on investigating TSX as standalone stock market for domestic diversification opportunities. For this purpose, correlation coefficients, pairwise cointegration, multiple cointegration and causality of sectors in TSX have been examined. The empirical results show that majority of the sectors in TSX do not share high correlation with each other and they are also not highly cointegrated. These empirical findings indicate that TSX presents attractive opportunities for domestic portfolio diversification.

Keywords: TSX, cointegration, Granger causality test, global financial crisis, international diversification of investment portfolios

Impactul strategiilor de diversificare internă a portofoliului de pe piața bursieră din Toronto asupra industriei textile din Canada

Obiectivul acestui studiu de cercetare este de a analiza impactul strategiilor interne de diversificare a portofoliului de pe piața bursieră din Toronto (TSX) asupra industriei textile din Canada, pentru a identifica oportunități investiționale atractive. Disiparea profitului portofoliilor diversificate la nivel global, datorită convergenței semnificative existente între piețele bursiere regionale și internaționale, a condus la renașterea ideii de diversificare internă a portofoliului, în special după criza financiară globală din anul 2008. Industria textilă din Canada reprezintă o provocare, dar se poate obține un nivel mai ridicat de performanță pe baza dinamicii comportamentului Bursei de Valori din Toronto. În consecință, acest studiu reprezintă o cercetare aplicativă complexă focalizată pe investigarea comportamentului TSX ca piață bursieră de sine stătătoare, pentru identificarea oportunităților interne de diversificare a portofoliului. În acest scop, s-au analizat coeficienții de corelație, cointegrarea și relațiile de cauzalitate existente la nivelul sectoarelor de activitate ale TSX. Rezultatele empirice arată că majoritatea sectoarelor din TSX nu indică o corelație semnificativă și, de asemenea, nu prezintă un nivel foarte ridicat de cointegrare. Aceste constatări empirice sugerează faptul că TSX prezintă oportunități atractive pentru diversificarea internă a portofoliului investițional.

Cuvinte-cheie: TSX, cointegrare, testul de cauzalitate Granger, criză financiară globală, diversificarea internațională a portofoliului investițional

INTRODUCTION

Portfolio formation and its management is one of the widely debated and researched topics across the financial fraternity. From investor's view point, choosing stocks for portfolio formation is one of the important decisions. Before the emergence of Modern Portfolio Theory (MPT afterwards) designed by Harry Markowitz in 1952 to use time horizons for financial markets, investments were regarded as standalone securities without realizing the concept of portfolio. MPT introduced a new concept to institutional and individual investors alike in the field of investments by

giving the understanding of correlations among stocks and their prices. This concept enabled the potential investors to look at systematic risk as only priced risk in the context of extremely diversified portfolio while diversifying away standalone risks of other securities by including uncorrelated securities. Following the footsteps of MPT, investors started diversifying their portfolio in the local stock market (also known as domestic diversification) only to use this concept to form a globally diversified portfolio at a later stage. International and cross border diversification opportunities started to see the light of the day in the 1980s when researchers, academicians and

investors started to investigate integration among international stock markets. Global investors perceived the opportunity of investing in the international financial markets while holding a diversified portfolio and minimizing risk as fruitful and luxurious.

The trend of investing in the international stock markets exploded with the rise of emerging stock markets which provided better global diversification opportunities than the global investment opportunities offered by developed stock markets. Globalization, advent of multinational companies, electronic trading and better means of communication reduced blockade to international investment and only escalated and encouraged international portfolio diversification trend. As a result, an overwhelming surge in global diversification of portfolios has been observed. Such rapid, bulk and huge investment in this arena has made international stock markets more integrated while fading away the benefits of international diversification. High degree of integration was realized when most of the international developed and emerging financial stock markets experienced jolts of uncertainty, volatility and stock market crashes after the Asian financial crisis of 1997 and global financial crisis of 2008 which made investors and researchers realized that perhaps international portfolio diversification is not as effective as it used to be. Financial crises are caused by various cause such as: over shooting of markets, excessive leverage of debt and credit booms, miscalculation of risks, the rapid outflow of capital from a country (capital flight), mismatches between asset types, such as investing in short term assets to fund long term assets [1].

Despite the worldwide acceptance of MPT among researchers and practitioners, "under-diversification" is still a relevant phenomenon where investors do not diversify their portfolio to a larger extent.

The government of Canada stated that textile manufacturing industry in Canada comprises of establishments primarily engaged in manufacturing goods and products for traditional and non-traditional textile markets. Traditional textile markets are destined to apparel and accessories; households; furnishings; and floor coverings. Non-traditional markets are defined as technical textiles and "other valued-added textiles". The textile manufacturing industry exhibited limited growth in output between 2011 and 2015 while domestic market for textile goods and products increased by \$1.4 billion between 2011 and 2015. In case of developed countries such as Canada, there is a tendency to support the development of national systems with complex international interactions. Moreover, textile companies in Canada manufacture for a wide variety of technical and niche applications and are integral to the supply chains of the various important industries in this country.

The Canadian government suggested that advances in the global textile industry have resulted in textiles increasingly competing with other materials such as metals, wood, and plastics for applications that have

traditionally been held by these other materials. Therefore, the management of any apparel/textile company has significantly endeavoured to improve, support and expand its activities, both in serving the domestic market and, most of all, with the aim to export and be competitive at the global market.

LITERATURE REVIEW

This literature review surveys the financial literature on financial integration among stock markets. It presents view of proponents and opponents of international financial integration of stock markets. Billio et al. [2] examined diversification opportunities among international stock markets and found that an increase in financial integration at international level would lead to decline in portfolio diversification internationally. These findings give rise to the idea of domestic diversification. However, international portfolio diversification has its advantages and disadvantages. Caporale et al. [3] found that financial integration is followed by financial disintegration. Menon et al. [4] suggested that national economies are responsive to international events and consequences of international events can effectively change the prices of securities in the stock market. Bundoo [5] examined diversification opportunities between US stock market and Southern African stock markets and concluded that stock markets in southern Africa are not cointegrated with the stock markets of US. Moreover, Moerman [6] revealed that sectorial portfolio diversification's benefits outperformed international portfolio diversification's benefits. Therefore, the aim of this empirical research study is to examine the stock market of Toronto Stock Exchange (TSX hereafter) for domestic sectorial diversification opportunities regarding textile industry.

On the other hand, Balli et al. [7] examined ASEAN stock markets for domestic and international sectorial diversification opportunities and reported that domestic diversification outperformed international sectorial diversification. Alam et al. [8] investigated the sectorial performance of conventional and Islamic indices. They found that in short run conventional and Islamic indices follow same patterns of efficiency and perform well. However, Islamic indices remain attractive and proved to be resilient throughout the sample period which lead to a finding that Islamic indices are weakly form efficiency market. As per best of our knowledge, there is no study in recent financial literature which has examined the TSX for domestic sectorial diversification opportunities. It is the first attempt to expose the TSX as standalone stock market to sectorial diversification opportunities. In this study, domestic sectorial integration opportunities will be examined through multiple and pairwise cointegration and granger causality tests among sectors of TSX.

Domestic portfolio diversification opportunities will be examined through the sectors of TSX. It will be

examined if the sectors of TSX are highly correlated or not. Similarly, pairwise and multiple cointegration among sectors will be examined to inspect if sectors offer diversification opportunities or not. Sectors' causality will also be examined through granger causality test. Toronto stock exchange is a thriving stock exchange and is also the largest stock exchange in the world by number of listed companies. TSX presents a great domestic sectorial diversification opportunity for academics as well as domestic institutional and individual investors. According to official statistics, Toronto Stock Exchange is one of the global leaders in diversified industries, including companies involved in relevant areas such as: communications and media, consumer products and services, financial services, industrial products and services (includes also manufacturing companies), and real estate.

DATA AND METHODOLOGY

Toronto Stock Exchange or TSX, hereafter, has been selected to examine the domestic diversification opportunities among sectors. The index is TSX composite. Daily stock prices of the companies have been downloaded from Datastream on sectorial basis. Time period of the data started from December 1st, 2008 and ended on March 8th, 2019 [9–10]. In order to check for the diversification among sectors, price weighted index has been developed. It is developed by calculating the average prices of companies in each sector on daily basis. The return of these average prices is calculated to get returns of price weighted index. Following formula has been used to calculate returns:

$$\text{Returns} = \frac{\text{Index}_t - \text{Index}_{t-1}}{\text{Index}_{t-1}} \times 100 \quad (1)$$

where: Index t is closing index and Index $t-1$ – opening index.

The total number of activity sectors included on TSE is 20 and total number of companies in all 20 sectors for the above-mentioned time period is 356. The exact situation is provided in table 1. To examine domestic diversification opportunities among sectors of TSE, pairwise correlation, cointegration and causality tests have been run and their results are examined. For analytical purposes, the following statistical and econometrics technique have been applied using STATA econometric software.

Correlation matrix

Correlation measures how two stocks are closely related. It captures the movement of two stocks. Its value ranges from +1 to -1. The value +1 indicates that stocks have tandem movements whereas -1 shows that movements of two stocks are not tandem. 0 correlation coefficient indicates that there is no relationship in two stocks. Marokowitz's Modern Portfolio Theory considers correlation as its integral part and states that investor should go for diversification when

Table 1

SECTORS AND NUMBER OF COMPANIES	
Sector	No. of companies
Air Space and Defence	8
Alternative Energy	9
Automobile and Parts	6
Beverages	9
Chemical	12
Construction and Material	23
Electricity	17
Electronic and Electrical Material	21
Fixed line and Telecommunication	3
Food and Drug Retailers	8
Food Producers	22
Forestry and Paper	12
Gas, Water and Multi Utilities	6
General Industries	8
General Retailers	25
Health Care Equipment Services	38
Industrial Engineering	24
Oil Equip and Services	46
Personal Goods	5
Pharmaceutical and Biotechnology	54
Total	356

correlation coefficient between two securities is low. MPT theory used the following equation to measure the portfolio's variance [11]:

$$\sigma^2 p = \omega_2 A \sigma_2 A + \omega_2 \sigma_2 B + 2\omega A \omega B \sigma A \sigma B \rho_{AB} \quad (2)$$

where $\sigma^2 p$ is variance of portfolio, $\omega_2 A$ – weight of a security in portfolio and ρ – correlation coefficient.

Unit root test

Efficient market hypothesis [12] states that stock prices reflect all private and publicly available information. Information efficiency is divided in three main categories, such as: weak form, semi-strong form and strong form [13]. Efficient market hypothesis includes some essential aspects such as: investor rationality, uncorrelated errors, and the assumption that there are no limits to arbitrage [14]. Unit root test is applied to examine the stationarity of the data. Dickey Fuller test is used frequently to examine the stationarity of time series data. It may or may not reveal trend in the data which indicates inefficiency in sectors. Unit root test has null and alternate hypothesis. Its null hypothesis states that data is non stationary:

$$y_t = \rho y_{t-1} + \mu t \quad (3)$$

where y – sector index for a given day, y_{t-1} – sector index for previous day, ρ – co-efficient and μt – error term.

Johansen's multivariate co integration test

If two sectors have tandem movements and are showing the tendency of moving together, they are said to be integrated. To examine the equilibrium relationship in short run and long run among non-stationary indices of all sectors, Johansen's Multivariate Co-integration Test will be examined as follows:

$$\lambda \text{ trace} = -T \sum \ln (1 - \lambda_i) \quad (4)$$

where λ_i is estimated eigen value and $\lambda \text{ trace}$ – trace statistic.

Granger Causality Test

This test is used to determine how one sector is impacting the other sector. There may be a unidirectional or bi-directional relationship between two sectors, if they are integrated. Unidirectional sector indicates that one sector is impacting the other sector whereas bi directional relationship among both sectors shows that both are impacting each other.

EMPIRICAL RESULTS

The following table 2 provides descriptive statistics of selected databases based on stock returns. It shows the mean daily return of the sectors. Health care equipment services sector is posting the highest average return which is 0.105% followed by automobile parts sector which posted a return of 0.095%. The table also shows standard deviation value. Standard deviation value shows how volatile the sector is. It shows that highest volatile sector is health care equipment services which is posting standard

deviation value of 4.535 followed by Pharmaceutical and Biotechnology sector with standard deviation value of 2.98. It is important to note the health care equipment services sector is the one with highest return and it is also the most volatile sector as well. The table also shows the minimum and maximum returns for each sector. Interestingly, healthcare services sector is the one which has posted lowest minimum and highest maximum return which is -57.73709% and 51.13089% respectively.

The correlation matrix examines the relationship between two sectors. It shows that if two sectors are related to each other or not? It inspects if two sectors dependent upon each other or not. Correlation's coefficients values range from +1 to -1. +1 coefficient value suggests that there is a strong relationship between two sectors and -1 coefficient value states that two sectors are independent of each other. Airspace and Defence sector does not share strong relationship with any sector. It is not highly correlated with any sector. Similarly, Alternative energy sector is not highly correlated with any sector. It is clear from the table that the correlation coefficients among sectors are extremely low. The general trend from the table shows low correlation coefficient values for all the sectors. It means that all the sectors are not highly correlated with each other, in other words, they are independent of each other. Correlation coefficient results suggest that TSE presents excellent domestic diversification opportunity among sectors because their movements are not tandems. It means that loss of investment in one sector will not put the investment

Table 2

DESCRIPTIVE STATISTICS					
Sector name	Obs.	Mean (%)	Std. dev.	Min (%)	Max (%)
Air Space and Defence	2679	0.055647	1.279235	-15.2679	9.346304
Alternative Energy	2679	0.026001	2.760541	-18.7148	19.74444
Automobile and Parts	2679	0.095963	1.750812	-9.03341	11.50117
Beverages	2679	0.040732	0.8380914	-5.60183	4.894431
Chemical	2679	0.053355	1.517616	-7.71385	6.452939
Construction and Material	2679	0.033793	1.548734	-12.5662	16.35021
Electricity	2679	-0.02469	3.360679	-28.6107	52.5243
Electronic and Electrical Material	2679	0.012184	1.299013	-8.34414	8.115792
Fixed line and Telecommunication	2679	0.038065	0.8373267	-5.75896	7.186808
Food and Drug Retailers	2679	0.041232	0.8114182	-5.01	4.565838
Food Producers	2679	0.034508	0.906451	-5.81748	4.144572
Forestry and Paper	2679	0.045439	1.528355	-9.28537	6.995167
Gas, Water and Multi Utilities	2679	0.010186	1.779282	-9.38685	18.04949
General Industries	2679	0.07842	1.521718	-9.90595	8.653371
General Retailers	2679	0.04426	0.7015473	-3.68192	3.389365
Health Care Equipment Services	2679	0.105062	4.535045	-57.7371	51.13089
Industrial Engineering	2679	0.034942	0.9846312	-4.91691	5.10728
Oil Equip and Services	2679	0.022193	0.9342339	-5.70999	4.631205
Personal Goods	2679	0.06548	2.053176	-23.6146	25.76177
Pharmaceutical and Biotechnology	2679	-0.01149	2.948174	-53.3728	22.57859

at risk in the other sector since there is no strong correlation among activity sectors.

Table 3 provides empirical results on stationarity based on Unit Root Test at Level 0 and Level 1. Co-integration will be examined among sectors. One of the pre-conditions of co-integration test is data must be stationary. Time series grows in value if data is not stationary. In order to run co-integration test, several times series should be stationary at same level. To examine whether times series is stationary or not, Dickey-fuller test has been used. Hypothesis for Dickey-fuller test is data has a unit root which indicates that time series is not stationary. For data to be stationary at 1% level of significance with critical value of -3.430, the t-stat value of time series must be less than critical value with p value less than 5%.

Above table shows that all sectors are non-stationary at level 0 because t-stat value is greater than critical value with p value greater 5 %. The results show that null hypothesis could not be rejected, and time series has unit root hence data is nonstationary. However, all-time series are found to be stationary at first order difference because t stat value is lower than critical value with 0 p value which is lower than 5% which indicates that null hypothesis is rejected, time series is stationary at level 1.

Table 4 provides empirical results on VAR Lag length Selection Criteria. The precondition of co-integration and granger causality test is to determine the lag length, after that, it will be determined if two sectors are integrated or not. VAR lag length test is used to select the lag length for the granger causality test.

Table 3

STATIONARITY CHECK: UNIT ROOT TEST AT LEVEL 0 AND LEVEL 1							
Sector name	1% Critical value	Level 0		Remarks	Level 1		Remarks
		t-stat	prob.		t-stat	prob.	
Air Space and Defence	-3.43	-0.705	0.8454	Non stationary	-51.617	0	Stationary
Alternative Energy	-3.43	-2.742	0.067	Non stationary	-55.124	0	Stationary
Automobile and Parts	-3.43	-1.485	0.5409	Non stationary	-49.192	0	Stationary
Beverages	-3.43	-1.058	0.7315	Non stationary	-52.738	0	Stationary
Chemical	-3.43	-2.059	0.2613	Non stationary	-48.751	0	Stationary
Construction and Material	-3.43	-2.787	0.0602	Non stationary	-56.213	0	Stationary
Electricity	-3.43	-1.206	0.671	Non stationary	-57.134	0	Stationary
Electronic and Electrical Material	-3.43	-2.015	0.2802	Non stationary	-50.9-	0	Stationary
Fixed line and Telecommunication	-3.43	-1.3	0.6292	Non stationary	-52.833	0	Stationary
Food and Drug Retailers	-3.43	-0.392	0.9114	Non stationary	-51.339	0	Stationary
Food Producers	-3.43	-1.717	0.4225	Non stationary	-49.793	0	Stationary
Forestry and Paper	-3.43	-1.998	0.2875	Non stationary	-48.536	0	Stationary
Gas, Water and Multi Utilities	-3.43	-2.362	0.1529	Non stationary	-55.349	0	Stationary
General Industries	-3.43	-0.456	0.9004	Non stationary	-51.315	0	Stationary
General Retailers	-3.43	-0.971	0.7637	Non stationary	-47.805	0	Stationary
Health Care Equipment Services	-3.43	-1.515	0.5258	Non stationary	-52.17	0	Stationary
Industrial Engineering	-3.43	-2.48	0.1204	Non stationary	-47.731	0	Stationary
Oil Equip and Services	-3.43	-2.013	0.2811	Non stationary	-47.012	0	Stationary
Personal Goods	-3.43	-0.44	0.9032	Non stationary	-54.739	0	Stationary
Pharmaceutical and Biotechnology	-3.43	-1.929	0.3185	Non stationary	-51.873	0	Stationary
1% Critical value = -3.430							

Table 4

VAR LAG LENGTH SELECTION CRITERIA								
Lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-82384.9	-	-	-	125.286	61.5881	61.6041	61.6322
1	25600.1	2.20E+05	400	0	1.5e-33*	-18.8192*	-18.4847*	-17.8945*
2	25947.8	695.34	400	0	1.60E-33	-18.7801	-18.1269	-16.9746
3	26178.4	461.17	400	0.019	1.80E-33	-18.6535	-17.6817	-15.9673
4	26432.2	507.56*	400	0	2.00E-33	-18.5442	-17.2537	-14.9773

Note: * indicates lag order selected by the criterion

Five methods are used in the tests when it comes to selecting the lag length number. These methods are LR test Statistics, Final Prediction Error (FPE), Akaike information Criterion (AIC), Schwarz Bayesian information criterion (SBIC) and Hannan-Quinn information criterion (HQIC). Rule of thumb suggests that lag length will be selected which has a support of most tests or methods. It is clear from the table that FPE, AIC, SBIC and HQIC are supporting lag length 2 and it should be selected whereas LR test is supporting lag length 4. Therefore, lag length 1 will be selected for empirical analysis.

Table 5 provides empirical results on Multivariate Johansen's Co-integration Tests. The interpretation of the Johansen's Multivariate Co-integration tests depends on Trace Statistics or Eigen Value. The null hypothesis for Trace Statistics is that there is no co-integration among sectors and alternate hypothesis states that there is minimum one co-integration among sectors. For Eigen value, hypothesis is same as the hypothesis of Trace Statistics as far as null hypothesis is concerned, however, its alternate hypothesis is different than the alternate hypothesis of Eigen value. Alternate hypothesis of Eigen value states that there is only one co-integration exists. For co-integration to exist, Trace Statistics value should be less than critical value for the given rank. The rank represents the number of possible co-integrated equations. Eigen value suggests that no cointegration

exists in two sectors. Similarly, trace statistics value suggests that series are not cointegrated with each other. Pairwise co-integration will be run to examine if individual sectors are co-integrated with each other or not.

Pairwise Co-integration test has been run to examine if one sector is integrated to another sector. If the one sector is integrated to another sector, provided they are statistically significant, then, diversification cannot happen between them. For diversification to happen, a sector must be statistically significant and must not be co-integrated to another sector. If sectors are co-integrated to each other or not. * sign indicates that values are significant. Rank "0" indicates that there is no co-integration and "1" indicates that there is co-integration. Some pairwise co-integration sectors have results which are statistically not significant. One pair is alternative energy sector and gas and water and multi utilities sector, second pair is chemical sector and construction and material sector, third pair is chemical sector and industrial engineering sector and fourth pair is construction material sector and industrial engineering sector. The empirical results revealed that there is no relationship between the pairs mentioned above.

According to our empirical analysis 11 pairs of sectors are co-integrated with each other whereas rest of the pair sectors are not co-integrated with each other. It is clear that most of the pair sectors are significant

and are not co-integrated, as well which can provide a great diversification opportunity. For instance, air space and defence sector are not co-integrated with each other which presents a great diversification opportunity. It means that if a portfolio manager has invested in both above mentioned sector, a loss in one sector can be off-set with the profit in another sector. However, some pair of sectors are co-integrated. For instance, construction material and electricity are co-integrated with each other which means there is no diversification opportunity between these two sectors and perhaps the loss in one sector will also lead to loss in another sector. TSE presents excellent opportunity for diversification because most pair sectors are not statistically significant and have no co-integration with each other.

In order to determine if one sector causes another sector in short run and if the series can be used for forecasting purposes, granger causality test is run. Granger causality test has null and alternate hypothesis. Its null hypothesis states that no granger causality among specific sectors. To prove that there is granger causality

Table 5

MULTIVARIATE JOHANSEN'S CO-INTEGRATION TESTS					
Maximum rank	Parameters	LL	Eigen value	Trace statistic	5% critical value
0	20	25100.42	-	970.2174*	-
1	59	25173.56	0.05314	823.9259	-
2	96	25234.76	0.04466	701.5324	-
3	131	25288.13	0.03906	594.7934	-
4	164	25330.76	0.03133	509.52	-
5	195	25368.57	0.02783	433.9137	-
6	224	25402.51	0.02502	366.0319	-
7	251	25432.01	0.02178	307.0316	-
8	276	25458.07	0.01927	254.902	-
9	299	25482.49	0.01806	206.0736	277.71
10	320	25500.46	0.01332	170.1367	233.13
11	339	25515.96	0.01151	139.1263	192.89
12	356	25530.99	0.01116	109.0598	156
13	371	25544.75	0.01022	81.5424	124.24
14	384	25555.62	0.00808	59.8108	94.15
15	395	25563.5	0.00587	44.044	68.52
16	404	25570.52	0.00523	29.9987	47.21
17	411	25576.33	0.00432	18.3936	29.68
18	416	25580.99	0.00348	9.0602	15.41
19	419	25584.43	0.00256	2.1954	3.76
20	420	25585.52	0.00082	-	-

Note: *indicates co integrated equations

between two sectors, null hypothesis should be rejected when p-value is less than 5%. Like any other test, it has its short coming. For instance, it only gives information about existence or non-existence of Granger causality, but it is silent on coefficient of causality. It is important to remember that relationship between two sectors in granger causality test is unidirectional which means one sector causes another sector but not the other way around. It is clear from the results that some sectors cause other sectors. For instance, air space and defence sector cause alternative energy sector. It also causes beverages sector, forestry and paper, general industries and general retailers sectors respectively. But the relationship is unidirectional. It means that there exists a causality between air and defence sector and sectors it has relationship with, but this relationship is unidirectional not a bidirectional and this relationship only exists in short run. It indicates that a rise or fall in prices of air and defence sector may cause rise or fall in the prices of other sector with whom it shares a unidirectional relationship. But two things are important to note here. Firstly, a rise or fall in the prices of air and defence sector and other sectors with whom it has unidirectional relationship is only established in short run and secondly, the rise and fall in prices of other sectors, with whom air and defence sector shares a relationship, is caused by a rise and fall in prices of air and defence sector since the relationship is unidirectional only. Therefore, diversification is not possible in short run with air and defence sectors and sectors associated with it through a unidirectional relationship.

Similar trend can be observed in other sectors as well. For instance, alternative energy sector causes "food producers" sector and forestry and paper sector causes construction material sector and food and "drug retailers" sectors. Therefore, diversification cannot happen for a portfolio manager in such sectors in short run. However, diversification is possible in such sectors where unidirectional relationship and granger causality do not exist among sectors. For example, Alternative energy sector does not share any unidirectional relationship with any sector other than "food producers" sector. It means portfolio manager, or an investor can diversify the portfolio by investing in alternative energy sector and other sectors as well. This trend is also observable throughout the table. Many sectors in TSE present a fruitful diversification opportunity. All the empirical results suggest that TSE is an attractive stock market for domestic portfolio diversification. It gives fruitful diversification opportunities to investors who invest domestically for diversification and maximize their portfolio wealth without investing in international

stock markets. It is evidenced from the results of multivariate cointegration tests, pairwise cointegration tests and granger causality tests that TSE has ample amount of domestic diversification opportunities in short run and long run. Most of its sectors are not cointegrated to each other which provides an excellent opportunity for investors to maximize their portfolios' value. These findings are line with the findings of previous literature on domestic diversification opportunities.

CONCLUSIONS

In 1952, Harry Markowitz has made a significant contribution to financial economics by introducing the new idea of portfolio selection and diversification. Since then investors started looking investment opportunities and offsetting their risk by diversifying their portfolios regionally and globally. International portfolio diversification started in early 1980s and reached its peak in 2000s resulting in overwhelming financial integration among international and regional stock markets. As a result of extreme convergence among stock markets, benefits of global portfolio diversification started to dissipate, and this notion was further confirmed by Asian financial crisis of 1997 and global financial crisis of 2008. Due to frequent financial crisis, high uncertainty at political arena and extreme integration among financial markets, the idea of domestic portfolio integration started getting attention day by day. Therefore, this study aims to study domestic portfolio diversification opportunities in the TSX. It is a prosperous stock exchange which offers ample amount of diversification opportunities in domestic context. In order to identify diversification opportunities in TSX of Canada, correlation coefficients of the sectors have been examined using correlation tests. Their pairwise and multiple cointegration have also been examined and causality among sectors have also been tested through granger causality test. It is very clear from the results that TSX offers excellent domestic portfolio diversification opportunities. Most of its sector does not share high correlation with each other and they are also not highly cointegrated with each other which means that investors can diversify their portfolio by investing in different sectors and maximize their portfolios' wealth. Future research should focus on predicting the future trends of the sectors of TSX in order to make the investment horizon more certain and avoiding any volatilities in stock prices. Textile industry in Canada is challenging, rather heterogeneous and not very representative but can achieve higher performance based on optimizing investments on Toronto Stock Exchange of Canada.

REFERENCES

- [1] Naeem, M.Z., Spulbar, C., Birau, R., Ejaz, A., Minea, E.L., Imran, A.I., *Disseminating the History of the Major Financial Crises and Their Multidimensional Implications*, In: Revista de Științe Politice. Revue des Sciences Politiques, 2019, 64, 12–34

- [2] Billio, M., Donadelli, M., Paradiso, A., Riedel, M. *Which market integration measure?*, In: Journal of Banking and Finance, 2017, 76, 150–174
- [3] Caporale, G.M., Erdogan, B., Kuzin, V., *Testing stock market convergence: a non-linear factor approach*, In: Empirica, 2015, 42, 481–498
- [4] Menon, N.R., Subha, M.V., Sagar, S., *Cointegration of Indian stock markets with other leading stock markets*, In: Studies in Economics and Finance, 2009, 26, 2, 87–94
- [5] Bundoo, S.K., *Stock market development and integration in SADC (Southern African development Community)*, In: Review of Development Finance, 2017, 7, 64–72
- [6] Moerman, G.A., *Diversification in Euro Area stock markets: Country vs. industry*, In: Journal of International Money and Finance, 2008, 27, 1122–1134
- [7] Balli, F., Balli, H.O., Luu, M.N., *Diversification across ASEAN-wide sectoral and national equity returns*, In: Economic Modelling, 2014, 41, 398–407
- [8] Alam, N., Arshad, S., Rizvi, S.A., *Do Islamic stock indices perform better than conventional counterparts? An empirical investigation of sectoral efficiency*, In: Review of Financial Economics, 2016, 31, 108–114
- [9] Official website of the Toronto Stock Exchange of Canada, Available at: <https://www.tsx.com/> [Accessed April 2019]
- [10] Official website of the government of Canada, Available at: <https://www.ic.gc.ca/> [Accessed April 2019]
- [11] Markowitz, H., *Portfolio Selection*, In: Journal of Finance, 1952, 7, 1, 77–91
- [12] Fama, E., *Random Walks in Stock Market Prices*, In: Financial Analysts Journal, 1965, 21, 5, 55–59
- [13] Spulbar, C., Birau, R., *Emerging Research on Monetary Policy, Banking, and Financial Markets*, In: IGI Global USA, 2019, 322, <http://doi.org/10.4018/978-1-5225-9269-3>
- [14] Spulbar, C., Ejaz, A., Birau, R., Trivedi, J., *Sustainable Investing Based on Momentum Strategies in Emerging Stock Markets: A Case Study for Bombay Stock Exchange (BSE) of India*, In: Scientific Annals of Economics and Business, 2019, XX, X, 1–11, <http://doi.org/10.2478/saeb-2019-0029>

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