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Cross Country Stock Market Integration and Portfolio Diversification Opportunities

Sultan Salahuddin[1], Musarrat Karamat[2] and Aisha Javed[3]

[1st] *PhD Finance, Shaheed Zulfiqar Ali Bhutto Institute of Science & Technology, Karachi, Pakistan*

[2nd] *Assistant Professor at BUITEMS, Quetta, Pakistan*

[3rd] *Assistant Professor at BUITEMS, Quetta, Pakistan*

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Abstract: This study examines Cross country sectoral Stock market integration and diversification opportunities in developed and emerging countries. For this purpose, we select 11 common sectors of 10 developed and 6 emerging countries. Daily data of FTSE sectoral indices from 3rd January 2000 to 29th October 2019 is included for testing the underlying objective. We constructed a panel of the only country-level stock of home country from selected developed and emerging countries denoted with Pjt and find out the relationship with only sectoral data of home country denoted as Pit. Panel cointegration and VECM are applied to test the stock market integration and long & short-run linkages between sectoral and country-level indices to identify international investors' diversification of opportunities. In developed countries, Australia, Finland, Germany, and the USA have long-run diversification opportunities. In emerging countries, only China and Turkey have long-run diversification opportunities and Brazil, Poland, and Turkey in short run.

Keywords: Stock Market Integration; Portfolio Diversification; Aggregated data, Disaggregated data, developed markets, Emerging markets

JEL: G01, G11, G15, F3, F21, F65

2.Introduction

Increasing world globalization enhanced the integration level among various country-level stocks and made global stock market integration more valuable. As a result of increasing globalization, the stock market becomes more integrated and reduces diversification opportunities (Mansourfar, 2010). There is significant research on

stock market integration across countries, but there are mostly unexplored differences in integration between industries or market capitalization groups in a single country (Fedorov and Sarkissian, 2000). As we reported reviewed in various studies, stock market integration has increased within developed, emerging, and frontier market and among cross-classification (Salahuddin et al., 2020).Country-level integration has thoroughly examined, and there has not been much attention paid to analyzing global integration processes at the industry level (Ferreira & Gama, 2010; Ullah, Shaikh, Channar, &Shaikh (2021)

.So, it is vital to identify the new methods and pattern of diversification for international investors. Sectoral linkage has become one of the most discussed issues in creating portfolios (Yilmaz et al., 2015; Sieczka&Hołyst, 2009).

We workedon this idea to explore a new pattern by testing the stock market integration among sectoral stocks/disaggregated data with country-level stock/aggregated data. Carrieri et al. (2004) also suggest the importance of international financial integration at the industry level. Therefore, the International investor should focus on industry-specific variables while diversifying the international portfolios to improve its performance (Emin, 2013). Few other scholars such as Claessens and Schmukler (2007); Khan, Khan, Ullah, Usman, Farhat, 2020);Lucey and Zhang (2010) argued that stock market integration at the disaggregated level and industry-level stock have a different pattern of integration. Because of increasing stock market integration among country-level stock, it is vital to test the stock market integration at the industry level to benefit from international portfolio diversification (Mansourfar et al. (, 2017).

The primary reason for choosing the approach of diversifying the portfolio through sectoral stocks was that not every sector performs in the same way at any given point in time or during each economic cycle. It observed that various sectors might perform differently at different market conditions. No one sector or industry tends to be frequently the top or worst performer (RBC Direct Investing, 2012). There is limited evidence on the identification of diversification opportunities through the sectoral approach.

This study focuses on stock market integration using aggregated and disaggregated data. If the country level stocks highly integrated with world markets, different integration levels exist among various sectors against the country level stock. An international investor could find a new combination of international portfolio diversification within developed and emerging stock markets through this approach. There is very little evidence on stock market integration on the cross country using aggregated and disaggregated data. Our study mainly focuses on the international investors who want to invest in any country for short term and long-term integration.

Our contribution in this field of study follows; first, we use both Developed and Emerging markets as there are limited studies that cover both markets into one study for a more extended period of 19 years. Secondly, we use both Aggregated/ country level and disaggregated/Industry-level data approach where 11 Sectors series for 16 countries and 16 countries level series of developed and emerging countries. Third, we use panel data cointegration and Vector Error Correction Model (VECM) to test the integration, the short and long-run association between industry-level assets because panel methodology is famous and rapidly applied in the finance literature.

2. Literature Review

Many studies on developed and emerging markets stated the stock market integrated at the country level. Graham and Nikkinen (2011) found stock market integration exists between developed and emerging countries. Batareddy et al. (2012) reported long-term relationships between developed and emerging countries in their study of six developed and emerging countries. Papavassiliou (2014) identifies the long-run relationship within the developed market. Hussain Shahzad et al. (2014) explore developed markets that have an impact on Asian

emerging markets. Al Nasser and Hajilee (2016) worked on stock market integration among five selected emerging markets in the U.S., U.K. and Germany (Brazil, China, Mexico, Russia and Turkey). They found short-run and long-run integration exists between developed and emerging countries. Loong and Har (2017) concluded that the integration level is also increasing in Asian emerging markets and that long-run diversification is no longer beneficial within Asian emerging stock markets. Chen, p. (2018) described stock market movement within developed and emerging markets in various factors.

Investigation of the international stock market at the disaggregated level is significant. For example, if a country-level index of the emerging country does not integrate with a developed country, does it mean each sector and company have the same pattern? For that reason, it is important to test the stock market integration at depth using disaggregated data (Emin, D. 2013). We found various studies that focus on aggregated and disaggregated stock market integration; few of them reported in this study. The reviews on the diversification of the sectoral portfolio are limited compared to the vast amount of available literature on international portfolio diversifying stocks. They suggest a small amount of research in this field (Hakim, I., & Masih, M. 2014).

Guglielmo et al. (2019) investigated global and regional stock market integration at both aggregated and disaggregated level using two sub-samples periods (pre-crisis and post-global financial crisis of 2008). Their results reveal that at aggregated and disaggregated different rate of converges is found. There is no convergence found for Basic Materials and Consumer Services in the pre-crisis period and Telecommunications and Utilities in the post-crisis period. Carrieri et al. (2004) agree that it is important to investigate international financial integration at the industry level. To do so, they specifically examine whether integration at the country level (segmentation) precludes segmentation at the industry level (integration). Emin, D. (2013) study sectoral and country-level stock market integration by using 18 different industries and concluded that the oil and gas industry is highly integrated and household goods are least integrated. Their finding reveals that significant differences exist in industry level integration against the country level, which shows that various industries could use for global diversification purposes.

Ozlen, S. (2015) provide evidence regarding sectoral portfolio diversification opportunities. This study's results on the long-run associations between emerging Turkish stock and three developed stock markets (the German, the U.S. and U.K. stock markets) may benefit the portfolio's international diversification. Few studies focus on stock market integration at a disaggregated level and aggregated level like; Hinojales and Park (2011) estimate a DCC model using weekly data for the year 1993-2009. Arvind (2017); Ullah, Shaikh, Channar, & Shaikh (2021) stated that investors could create a portfolio by sectoral allocation and observe sectoral indices' performance. Investors, fund managers, and other market players' success depend on their market integration knowledge. Studies on stock market integration at the sectoral level emphasize the importance of sectoral analysis because it determines whether the crisis's impact on the major indices is consistent at the sectoral level.

Ehling and Ramos (2005) test the performance of portfolio diversification strategies based on country level diversification and industry level diversification. The finding indicates that results are the same in both strategies against the conventional knowledge that country diversification should outperform industry diversification without any constraints. Ahmed et al. (2018), Using a multivariate cointegration and granger causality test, looked at the correlation between sectoral indices on the Colombo stock exchange. The researcher works on a diversified portfolio to reduce the risks and found Colombo stock exchange offers good diversification opportunity to the investors. Kim & Sun (2017) studied dynamic conditional correlations between the Chinese and S&P 500 indexes between 2006 and 2014. They found that correlations among the stocks are varying significantly across sectors and over time.

3. Data

We use daily data of FTSE Sectoral and country-level Indices, all maintained in U.S. dollar. Data contains the last 19 years' daily stock price from 3rd January 2000 to 29th October 2019. Sixteen countries from classifications of developed, emerging markets selected for testing the level of integration and diversification opportunities for international investors. We constructed portfolios of individual sector P_{it} and country-level portfolio of other than base country P_{jt}. The purpose of adopting this method is to determine the stock market integration and identify diversification opportunities using aggregated/country level and disaggregated/disaggregated data by constructing portfolios.

3.1 Developed Countries Portfolios

Eleven common sectors of 10 developed countries are selected based on data availability for testing the stock market integration at the disaggregated/sectoral level. Countries are Australia, Canada, Finland, France, Germany, Italy, Japan, Spain, UK, and the USA. Eleven common sectors are Financial, Utilities, Healthcare, consumer services, Telecom, Industrial, Chemical, Pharma and Bio, Technology, Industrial met, Oil and gas. Portfolio (A) P_{it} constructed by adding only the Financial sector of Australia in the portfolio. At the same time, P_{jt}(A) is a portfolio containing nine other country-level indices of the mentioned countries, excluding Australia. In all panel models. P_{it} used as a dependent variable, and P_{jt}used as an independent variable.

3.2 Emerging Countries Portfolios

Eleven common sectors of six emerging countries are selected based on data availability for testing the stock market integration at the disaggregated/sectoral level. Countries are Brazil, China, India, South Korea, Poland, and Turkey. Eleven common sectors are Financial, Utilities, Healthcare, consumer services, Telecom, Industrial, Chemical, Pharma and Bio, Technology, Industrial met, Oil and gas. Portfolio (A) P_{it} constructed by adding only the Financial sector of Brazil in the portfolio, while P_{jt}(A) is a portfolio containing nine other country-level indices of the mentioned countries. In all panel models. P_{it} used as a dependent variable, and P_{jt} used as an independent variable.

4. Data Analysis Techniques

We have selected sixteen Countries, ten from developed and six from emerging countries, for testing the level of integration and diversification opportunities. We Panel Unit Root Testing, Panel cointegration testing, and VECM in both developed and emerging countries data.

4.1 Panel Unit Root Testing

Unit Root test is necessary to apply a panel cointegration test. If two series have unit Root at level (price data) and Stationarity found on the first level (return data), we can apply panel cointegration. We provide unit root testing on excluding country panels (p_{jt}). Im, Pesaran further confirm panel unit root testing, and Shin (IPS, 2003) and Levin, Lin and Chu (LLC, 2002).

4.2 Panel Cointegration Test

We begin our empirical analysis for a typical investor in any one of the nations, i, with an investment portfolio comprising their own national stock market index and other market indices.

$$P_{it} = \delta_{1i} + \theta_{1i} P_{jt} + u_{it} \qquad \text{Eq-1}$$

4.3Panel VAR/ VECM

Here, we estimate the short-run relationship between the variables using the panel VECM model. Of interest is the relationship portrayed here in equation (2):

$$\Delta P_{it} = \delta_{2i} + \theta_{1i} \sum_{k=1}^{n} \Delta P_{jt-k} + + \varepsilon_{it} \qquad \text{Eq-2}$$

All variables from equation (3) appear in equation (4) in the first differenced form, represented by Δ. The parameters to be estimated are δ and θs. P_{it} is the series of single country sector series use as a dependent variable in the model, P_{jt-k} is the series other than the base country sector, Δdonate the first difference in our study that contains return series. The Error Correction Term (ECT), which is one lag of the residual from equation (1) if significant and negative, confirms a stable long-run relationship between the variables identified. Short-term linkages decide on the significance of the lag value of the return series against a particular country. VECM's short-run and long-run association estimated among sectoral indices of ten developed and six emerging countries.

5. Results

Here we provided empirical analysis including (Panel Unit Root Testing, Panel Cointegration, and VECM) on panel data.

5.1 Panel Unit Root Testing

We used panel P_{jt} for testing the unit root of the series of country-level data of developed countries. At level P_{jt}series contain stock prices that show unit root as according to the test value we are unable to reject the null hypothesis in all developed countries when we convert them into first difference (return series), it shows the stationarity in the data as test value suggest we can reject the null hypothesis of unit root and accept the alternative hypothesis of stationarity that is desirable in our case. When two series have unit root at level and stationary at the first difference, we can apply the panel cointegration test. The below-given table below contains panel ADF, IPS, and LLC test results for the low correlated portfolios (country js), excluding the base country. The tests conducted with drift and no trend for FTSE country-level indices' levels and returns.

Table 1. Panel Unit Root Test Results (Developed Countries)

Developed Country level	LLC Statistics At Levels	LLC Statistics 1st Difference	IPS Statistics At Levels	IPS Statistics 1st Difference	ADF Statistics At Levels	ADF Statistics 1st Difference
Australia	0.92091	-119.478	-0.69299	-113.424	22.8079	1407.23
Canada	0.95187	-119.627	-0.7097	-113.247	22.9232	1412.91
Finland	1.0466	-119.833	-0.15495	-112.999	16.721	1421.17
France	0.6796	-118.553	-0.71147	-112.437	22.9351	1441.15
Germany	0.7177	-117.783	-0.75573	-112.952	23.2171	1422.76
Italy	0.79668	-118.557	-0.76068	-112.977	23.2467	1421.91
Japan	0.74491	-119.983	-0.67031	-113.12	22.6442	1417.08
Spain	0.75061	-117.941	-0.68152	-112.785	22.7261	1428.56
UK	0.77474	-117.501	-0.51975	-112.256	21.3469	1447.88
USA	-0.71475	-119.64	-1.72808	-112.821	24.8109	1427.32

Developed Counties Panel Unit Root Testing shows the price data is non-stationary, and Return data is stationary.

Table2.Panel Unit Root Test Results (Emerging Countries)

Emerging Country level	LLC Statistics At Levels	LLC Statistics 1st Difference	IPS Statistics At Levels	IPS Statistics 1st Difference	ADF Statistics At Levels	ADF Statistics 1st Difference
Brazil	-0.29437	-90.1043	-0.29412	-80.283	8.32255	886.202
China	-0.17282	-90.8469	-0.33292	-80.3629	8.49876	884.351
India	-0.51406	-87.1337	-0.68844	-80.747	9.53525	875.814
Korea	-0.34266	-86.4964	-0.44946	-79.5832	8.94866	903.43
Poland	-0.30317	-86.5708	-0.14359	-80.5794	7.51048	879.46
Turkey	-0.39984	-89.7474	-0.12703	-80.5096	7.40863	881.016

Emerging Countries Panel Unit Root Testing shows the price data is non-stationary, and Return data is stationary.

5.2 Cointegration Results[4]

Co-integration test results shown in the tables indicate more than one long-run co-integrating relationship among the variables in the equation of cointegration mentioned above.

Table 3 Panel Cointegration Tests(Developed Country's Sectors)

	Pedroni Panel Co-integration Statistics							Kao	Johansen Panel Co-integration	
Australia	ADF t-Stat.	Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF	None	1.0000
Financial	1.5634	**-1.6939**	**-2.2435**	**-2.7029**	-0.9357	**-2.2023**	**-2.8102**	**-4.1309**	**62.4400**	**62.8000**
Utilities	0.0789	-0.2992	-0.9900	-1.0701	0.5176	-0.5381	-0.6055	**-2.6484**	**31.8500**	**52.2100**
Healthcare	**-2.4471**	**3.5697**	**6.2517**	**5.4257**	**4.0024**	**7.9626**	**7.0338**	**7.6919**	**27.0500**	**43.6000**
Consumer Services	**1.9913**	-0.8893	-0.7669	-0.9163	-1.3019	-0.9839	-1.1417	**-2.0165**	**39.5900**	**34.5400**
Telecom	0.6559	0.4055	0.4749	0.3162	1.8333	1.6319	1.4371	**-2.2747**	**44.1800**	**45.1100**
Industrial	-0.6114	-0.1393	-1.3084	-1.2944	0.8353	-0.9932	-0.9157	**-2.2747**	**44.1800**	**45.1100**
Chemical	0.8153	-0.3723	-0.9933	-1.0145	0.8399	-0.2617	-0.3645	**-2.5876**	27.2500	**47.1500**
Pharma and Bio	**-2.2898**	**4.2306**	**7.8865**	**7.5329**	**4.4855**	**9.9675**	**9.6889**	**10.4015**	**42.5200**	**61.1200**
Technology	-1.2057	**2.3157**	**3.5023**	**3.0878**	**3.2119**	**4.9316**	**4.4961**	**3.7778**	5.6040	4.7080
Industrial met	1.5586	-0.5015	-0.5826	-0.4277	0.2662	-0.0162	0.1631	-1.8213	22.5800	**37.2300**
Oil and Gas	1.1222	-0.6292	-1.0811	-0.9901	0.7024	-0.3107	-0.2864	**-3.1324**	25.6000	**47.9800**

	Pedroni Panel Co-integration Statistics							Kao	Johansen Panel Co-integration	
Canada	ADF t-Stat.	Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF	None	1.0000
Financial	-0.8469	-0.2686	-1.5132	-1.7261	0.1343	-1.6748	-1.7614	**-3.0730**	**39.5300**	**36.7600**

[4] For discussion on the differences between the techniques see Narayan and Nguyen (2014); Narayan and Smyth (2015)

Utilities	-1.0400	0.0637	-1.0281	-1.2286	0.4337	-0.9638	-1.1114	**-2.4155**	**33.1300**	**37.2600**
Healthcare	0.9162	0.1604	0.1383	0.5880	1.6583	1.2683	1.8090	-1.4256	14.8600	**37.8000**
Consumer Services	**-2.2666**	**1.9799**	**2.3905**	**2.0105**	**2.6818**	**3.3354**	**3.1122**	**2.0930**	18.7600	3.7960
Telecom	-0.7321	-0.0162	-0.7288	-1.0058	0.5578	-0.4459	-0.7626	**-2.0901**	**30.4200**	28.0600
Industrial	0.0679	1.2066	1.7329	1.6339	**2.5253**	**3.0630**	**2.9715**	0.8206	**38.1300**	25.6800
Chemical	0.8135	-0.4977	-0.8927	-1.0634	0.7687	-0.1578	-0.3805	**-2.8338**	**42.5300**	**54.2100**
Pharma and Bio	0.5393	0.3672	0.3047	0.7169	1.8482	1.4637	1.9629	-1.2148	15.0000	**35.7000**
Technology	1.6056	**-3.3726**	**-4.7964**	**-4.2937**	**-1.9067**	**-4.7546**	**-4.1975**	**-6.5750**	**66.9000**	**66.4100**
Industrial met	1.2600	0.0477	0.2887	0.2472	1.4762	1.4691	1.3960	-1.5835	17.1500	**32.2100**
Oil and Gas	0.5709	-0.5551	-1.2947	-1.4991	0.7224	-0.6034	-0.9608	**-3.3690**	**30.0400**	**50.3100**

	Pedroni Panel Co-integration Statistics							**Kao**	**Johansen Panel Co-integration**	
Finland	ADF t-Stat.	Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF	None	1
Financial	**-1.9999**	0.7688	-0.0165	-0.3052	1.9709	0.9550	0.6671	0.0387	16.7500	**30.2200**
Utilities	**2.0466**	-1.3724	-1.4995	**-1.9133**	0.0406	-0.7296	-1.2810	**-3.5924**	**79.3400**	**85.2100**
Healthcare	**2.4137**	**-2.2258**	**-2.0466**	**-1.9103**	-0.9532	-1.5288	-1.3501	**-3.0101**	**37.1500**	**45.3800**
Consumer Services	**2.5254**	**-2.0406**	-1.6220	-1.2968	-0.8201	-0.9077	-0.5431	-1.4000	**54.4000**	**43.5900**
Telecom	**3.8309**	**-11.6968**	**16.8157**	**12.5763**	**9.3951**	**18.9154**	**13.8361**	**15.3252**	**216.8000**	**49.0200**
Industrial	**-1.8013**	1.2826	1.1429	0.7301	**2.3655**	**2.1860**	**1.7453**	1.5450	13.1200	12.7700
Chemical	-1.0797	-0.8210	-1.0105	-0.8767	0.4768	-0.1774	-0.0478	0.2439	28.0200	**41.3200**
Pharma and Bio	**9.7163**	**-9.2922**	**-6.8816**	**-7.1641**	**-7.1476**	**-7.0620**	**-7.3964**	**-9.6129**	**90.0500**	**49.1300**
Technology	1.1733	**-2.7673**	**-3.7943**	**-3.5394**	**-1.2651**	**-3.5611**	**-3.2310**	**-4.9387**	**39.2900**	**47.2000**
Industrial met	**1.6960**	0.5927	1.3466	1.2698	1.1051	2.0855	1.9923	0.5505	22.4700	26.8400
Oil and Gas	1.1234	1.2300	2.1592	**1.8968**	**2.6481**	**3.6550**	**3.3484**	1.1283	7.7880	21.2400

	Pedroni Panel Co-integration Statistics							**Kao**	**Johansen Panel Co-integration**	
France	ADF t-Stat.	Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF	None	1
Financial	**2.3617**	-	-1.4520	-	-0.1075	-0.7680	-1.1390	**-3.4505**	**37.5000**	**52.8900**

Utilities	-0.6633	-1.5307	0.8675	-1.7207	**1.7267**	1.6418	**0.9686**	-0.3806	**47.3300**	**43.6700**
Healthcare	**2.0526**	**-1.6610**	-1.5434	**2.2867**	-0.6303	-1.1633	-1.9900	**-2.6219**	**39.3600**	**42.6200**
Consumer Services	**2.1546**	**-4.5097**	**-5.2488**	**5.0232**	**-3.5356**	**-5.5409**	**-5.3197**	**-7.4670**	**71.8500**	**59.0400**
Telecom	**2.1546**	**-4.5097**	**-5.2488**	**5.0232**	**-3.5356**	**-5.5409**	**-5.3197**	**-10.4208**	**131.5000**	**62.6800**
Industrial	0.5650	1.2868	**2.1408**	1.4263	**1.7772**	**3.3255**	**2.6280**	0.2393	19.8600	13.5100
Chemical	-1.2546	1.2799	1.4243	0.8334	**2.1941**	**2.2615**	**1.7651**	0.5655	15.4900	14.8100
Pharma and Bio	**5.2232**	**-4.7004**	**-3.8062**	**4.5458**	**-3.4699**	**-3.7609**	**-4.6162**	**-5.1625**	**63.8200**	**52.6300**
Technology	-0.0048	**-2.0432**	**-3.6935**	**3.7461**	-0.4181	**-3.2815**	**-3.2884**	**-5.9572**	**51.5800**	**60.0600**
Industrial met	-0.1543	0.8983	0.7663	0.7463	**2.0443**	**1.9685**	**1.8493**	-1.7817	**28.8800**	**36.2200**
Oil and Gas	**3.8683**	**-3.7338**	**-3.3203**	**4.1676**	**-2.8284**	**-3.3253**	**-4.4118**	**-5.4170**	**61.9400**	**53.9100**

	Pedroni Panel Co-integration Statistics							**Kao**	**Johansen Panel Co-integration**	
Germany	ADF t-Stat.	Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF	None	1
Financial	**1.8188**	**-2.1201**	**-2.1248**	**-2.3897**	-1.5669	**-1.8643**	**-2.2610**	**-4.3789**	**48.4000**	**55.2500**
Utilities	-0.5954	1.0031	1.0209	0.6580	**2.0806**	**2.0565**	1.6350	-0.0255	**39.4100**	**38.1200**
Healthcare	**-2.2288**	1.2650	0.4561	0.1937	**2.6225**	1.6178	1.3805	-0.7847	20.3900	**29.4600**
Consumer Services	**3.5911**	**-2.2195**	**-1.7926**	**1.8365**	-0.8355	-1.1580	-1.2951	**-3.6631**	**29.8800**	**49.7100**
Telecom	**3.6141**	**-7.8648**	**-9.4273**	**9.0025**	**-6.0390**	**-10.1703**	**-9.7025**	**-12.1552**	**146.2000**	**64.8100**
Industrial	**1.8233**	1.2641	-1.2632	1.4727	-0.5625	-1.0014	-1.2223	**-3.1406**	**32.0600**	**36.9800**
Chemical	-1.3831	1.0285	0.5923	0.3794	2.2566	1.6018	1.4081	-1.1156	23.7700	28.3300
Pharma and Bio	-0.7103	-0.0696	-1.0264	1.2932	1.2363	-0.2621	-0.4960	**-2.7583**	**27.1900**	**40.5300**
Technology	1.0601	0.9337	**1.7560**	1.4171	0.1091	**1.9589**	1.6453	1.1588	27.0600	11.4400
Industrial met	1.4604	-0.0586	0.1335	0.0743	1.1914	1.1648	1.0774	**-1.7105**	18.7000	**34.8200**
Oil and Gas	-1.0937	1.2738	**-2.7300**	**2.5329**	-0.3825	**-2.6009**	**-2.5650**	**-4.7927**	**50.5500**	**64.3000**

	Pedroni Panel Co-integration Statistics							**Kao**	**Johansen Panel Co-integration**	
Italy	ADF t-Stat.	Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF	None	1

Financial	-1.5833	1.3774	1.3662	1.2902	**2.7160**	**2.8134**	**2.6991**	-0.2440	13.8600	17.8400
Utilities	**2.2294**	-0.8339	-0.6195	-0.8465	0.7421	0.4968	0.2024	**-2.4115**	21.6400	**39.7600**
Healthcare	**3.2745**	-0.9069	-0.2016	-0.1261	0.2719	0.6212	0.7140	-1.2560	18.4600	26.2700
Consumer Services	**1.7581**	-1.4058	-1.3429	-1.1640	0.1468	-0.5013	-0.3070	**-2.7270**	**32.1000**	**40.0900**
Telecom	-0.3460	-1.3376	**-2.1234**	**-2.0123**	0.1226	-1.4671	-1.3610	**-4.0836**	**33.5300**	**34.6400**
Industrial	**4.5584**	**-5.9538**	**-5.5766**	**-4.9467**	**-6.1190**	**-6.2600**	**-5.5592**	**-7.5713**	**75.8900**	**60.8800**
Chemical	**3.1541**	**-3.2860**	**-2.5351**	**-2.3019**	-1.6168	**-1.9319**	**-1.6582**	**-4.0809**	**47.8500**	**60.6100**
Pharma and Bio	**1.8660**	**-2.1859**	**-2.0034**	**-1.9022**	-0.8454	-1.3967	-1.2934	**-2.6365**	**37.9500**	**58.6500**
Technology	**13.3976**	**20.2770**	**14.5171**	**14.8008**	**-17.6610**	**16.2093**	**16.5566**	**17.0891**	**275.4000**	**56.9600**
Industrial met	**3.1277**	**-2.5130**	-1.3979	**-1.7118**	-0.9213	-0.4664	-0.8368	**-3.1058**	**42.5400**	25.2900
Oil and Gas	0.3876	-0.2378	-0.5828	-0.6894	0.9910	0.2782	0.0991	**-2.6085**	26.5800	**39.6400**

	Pedroni Panel Co-integration Statistics							**Kao**	**Johansen Panel Co-integration**	
Japan	ADF t-Stat.	Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF	None	1
Financial	**2.0068**	-0.7279	-0.4246	-0.6474	0.3881	0.3639	0.0963	-1.1308	20.3100	**35.3900**
Utilities	0.0717	**1.7219**	**2.7814**	**1.8593**	1.0376	**3.1982**	**2.0663**	**1.8863**	25.2100	9.3680
Healthcare	1.2215	0.6512	1.3193	0.7021	-0.3240	1.4548	0.7299	0.7208	**29.3700**	19.0000
Consumer Services	0.5505	**-3.9961**	**-7.4842**	**-6.9096**	**-2.9434**	**-8.4798**	**-7.7213**	**-7.9118**	**128.1000**	**47.0800**
Telecom	**2.0092**	**-3.5148**	**-4.1103**	**-4.0045**	**-2.5920**	**-4.2795**	**-4.0830**	**-5.3393**	**51.9100**	**54.0000**
Industrial	**2.0858**	0.3475	1.0601	0.1360	-0.0219	1.2012	0.0389	-0.3792	21.9600	21.4200
Chemical	**1.8088**	-0.0098	0.3857	-0.4289	0.6095	0.9441	-0.0547	-1.3692	23.6800	**31.0500**
Pharma and Bio	1.2508	0.4495	1.1428	0.1150	-0.4387	1.2202	-0.0509	-0.0756	34.9900	21.5700
Technology	**2.2520**	**12.0050**	**16.7969**	**14.9867**	**-10.2519**	**19.1339**	**17.4734**	**19.2862**	**291.9000**	**63.9200**
Industrial met	**2.9422**	-1.4813	-1.1633	-1.5642	**-2.1874**	-1.1494	**-1.6653**	**-1.9289**	**45.3000**	**45.0600**
Oil and Gas	**7.3157**	**-4.6174**	**-3.3365**	**-3.8341**	**-3.1783**	**-3.0269**	**-3.6493**	**-4.9555**	**46.4000**	**52.2100**

	Pedroni Panel Co-integration Statistics							**Kao**	**Johansen Panel Co-integration**	
Spain	ADF t-Stat.	Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF	None	1
Financial	0.0444	0.6751	0.9840	0.7931	**1.7414**	**2.0652**	**1.8680**	-0.9332	15.7300	24.2600
Utilities	0.8639	-0.5183	-0.7886	-0.9363	0.4322	-0.1686	-0.2912	**-2.1380**	**31.8700**	**32.4200**
Healthcare	-1.4363	1.5948	**2.0010**	**1.7891**	**2.3953**	**2.9562**	**2.7951**	1.4828	14.5700	5.2010
Consumer Services	**-1.8345**	1.1974	0.8893	0.6344	**2.5304**	**2.0633**	**1.8402**	-0.0183	24.4900	27.9000

Telecom	0.9539	0.0580	0.2070	0.0219	1.5691	1.4115	1.2060	**-1.9475**	18.2300	**33.4600**
Industrial	0.4023	1.5972	**2.5732**	**2.2700**	**2.1583**	**3.6411**	**3.4720**	1.2106	19.0900	7.6990
Chemical										
Pharma		-								
and Bio	-0.9810	0.1298	-0.0280	-0.1376	-0.1879	0.1238	-0.0425	0.5916	**37.8700**	9.9270
Technology	**4.1537**	- **3.3842**	**-2.9047**	**-2.6777**	**-1.8387**	**-2.4384**	**-2.1639**	**-3.3562**	**38.7300**	**42.9600**
Industrial		-								
met	**3.2992**	1.4284	-1.0462	-0.9405	0.1927	-0.0795	0.0329	**-2.9232**	27.7900	**50.5200**
Oil and		-								
Gas	**1.8794**	0.7255	-0.5001	-0.8724	0.7256	0.4832	0.0266	**-2.6707**	20.8000	**40.2600**

	Pedroni Panel Co-integration Statistics							**Kao**	**Johansen Panel Co-integration**	
UK	ADF t-Stat.	Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF	None	1
Financial	**2.0068**	-0.7279	-0.4246	-0.6474	0.3881	0.3639	0.0963	-1.1308	20.3100	**35.3900**
Utilities	0.0717	**1.7219**	**2.7814**	**1.8593**	1.0376	**3.1982**	**2.0663**	**1.8863**	25.2100	9.3680
Healthcare	1.2215	0.6512	1.3193	0.7021	-0.3240	1.4548	0.7299	0.7208	**29.3700**	19.0000
Consumer										
Services	0.5505	**-3.9961**	**-7.4842**	**-6.9096**	**-2.9434**	**-8.4798**	**-7.7213**	**-7.9118**	**128.1000**	**47.0800**
Telecom	**2.0092**	**-3.5148**	**-4.1103**	**-4.0045**	**-2.5920**	**-4.2795**	**-4.0830**	**-5.3393**	**51.9100**	**54.0000**
Industrial	**2.0858**	0.3475	1.0601	0.1360	-0.0219	1.2012	0.0389	-0.3792	21.9600	21.4200
Chemical	**1.8088**	-0.0098	0.3857	-0.4289	0.6095	0.9441	-0.0547	-1.3692	23.6800	**31.0500**
Pharma										
and Bio	1.2508	0.4495	1.1428	0.1150	-0.4387	1.2202	-0.0509	-0.0756	34.9900	21.5700
Technology	**2.2520**	- **12.0050**	- **16.7969**	- **14.9867**	**-10.2519**	- **19.1339**	- **17.4734**	- **19.2862**	**291.9000**	**63.9200**
Industrial										
met	**2.9422**	-1.4813	-1.1633	-1.5642	**-2.1874**	-1.1494	**-1.6653**	**-1.9289**	**45.3000**	**45.0600**
Oil and										
Gas	**7.3157**	**-4.6174**	**-3.3365**	**-3.8341**	**-3.1783**	**-3.0269**	**-3.6493**	**-4.9555**	**46.4000**	**52.2100**

	Pedroni Panel Co-integration Statistics							**Kao**	**Johansen Panel Co-integration**	
USA	ADF t-Stat.	Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF	None	1
Financial	-0.5819	**2.0324**	**2.8994**	**1.7974**	**3.1453**	**4.4413**	**3.1696**	1.6085	19.4800	22.7100
Utilities	-0.0145	1.3532	**2.1787**	**1.6905**	**2.0558**	**3.4069**	**2.8913**	**2.0236**	22.0400	7.5900
Healthcare	**-2.6318**	**3.1040**	**5.0200**	**4.2198**	**4.2714**	**7.3700**	**6.4564**	**6.5167**	14.7100	10.2500
Consumer										
Services	**-2.6128**	**3.6991**	**6.7888**	**5.9333**	**4.8493**	**9.6402**	**8.6973**	**9.1130**	24.2300	**33.5400**
Telecom	0.9844	- **4.1359**	**-6.7175**	**-5.7064**	**-2.4406**	**-7.0589**	**-5.9290**	**-7.7972**	**84.0100**	**59.7200**
Industrial	**-1.9178**	**3.2448**	**5.4203**	**4.5844**	**4.3427**	**7.7108**	**6.8685**	**5.8454**	14.9800	14.3300
Chemical	**-2.2591**	**2.2839**	**2.9331**	**2.2892**	**3.5218**	**4.6211**	**3.9375**	**2.9197**	12.5400	4.6370

Pharma and Bio	**-2.2042**	**2.5782**	**3.6709**	**2.8463**	**3.8138**	**5.5750**	**4.6134**	**4.0513**	11.8400	4.7710
Technology	**-1.9626**	**3.8596**	**7.0268**	**6.0892**	**4.9828**	**9.7099**	**8.6049**	**8.1726**	22.7900	17.5400
Industrial met	**4.8284**	**2.2514**	-1.3511	-1.3203	-1.4120	-0.8576	-0.8633	**-3.6456**	**30.5900**	**44.7400**
Oil and Gas	0.7588	0.9142	-1.5469	**-1.8167**	-0.8801	-1.6300	**-1.9927**	**-3.6472**	**43.3000**	**50.5400**

All bold values are significant at 5 percent or better, indicating the cointegrating relationship of developed country-level data with each selected developed country's Sectors.

Table 4Panel Cointegration Tests(Emerging Country's Sectors)

	Pedroni Panel Co-integration Statistics							**Kao**	**Johansen Panel Co-integration**	
Brazil	ADF t-Stat.	Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF	None	1
Financial	**4.3427**	**-2.2596**	-1.5022	**-2.3398**	-1.1990	-1.0844	**-2.0459**	**-2.1642**	16.6500	**22.6700**
Utilities	**2.1183**	-1.0430	-0.7609	-1.0835	-0.0539	-0.1789	-0.5814	-1.3683	9.2350	**20.4200**
Healthcare	-0.1610	0.4105	0.9016	0.5923	0.1798	1.0087	0.6328	0.6301	7.3090	5.8980
Consumer Services	**4.7832**	**-2.6379**	-1.5560	**-2.3808**	**-1.8090**	-1.3018	**-2.2240**	**-1.6820**	**21.0100**	**19.4700**
Telecom	0.5073	-1.1401	**-1.7400**	-1.4580	0.0699	-1.3044	-0.9136	**-2.5938**	9.9940	**24.2100**
Industrial	**3.9163**	**-2.3966**	-1.6337	**-2.5676**	**-1.7249**	-1.3849	**-2.5544**	**-1.8987**	**21.8100**	**21.7200**
Chemical	**3.1111**	**-1.7549**	-1.3367	-1.6816	-0.7626	-0.9003	-1.3185	**-2.4933**	13.1600	**25.1200**
Pharma and Bio	**3.1247**	**-1.9884**	-1.3594	-1.6068	-1.0247	-0.9092	-1.2261	**-2.8973**	**36.2600**	**40.3400**
Technology	-0.1175	-1.5254	**-2.8827**	**-2.9352**	-0.7874	**-2.8912**	**-2.9756**	**-4.7545**	**33.9300**	**33.2200**
Industrial met	0.0569	0.5343	0.5238	0.3241	1.4335	1.3177	1.0750	-0.6492	5.9070	16.9000
Oil and Gas	0.8483	-0.0757	-0.0957	-0.2650	0.8383	0.5586	0.3537	-1.3420	7.0590	**19.3300**

	Pedroni Panel Co-integration Statistics							**Kao**	**Johansen Panel Co-integration**	
China	ADF t-Stat.	Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF	None	1
Financial	**-1.8306**	1.0789	-0.9857	-1.2005	-0.8146	-0.9569	-1.2230	**-2.2725**	12.4500	**21.1100**
Utilities	**-3.6809**	**2.6786**	**-2.4357**	**-2.7793**	-1.4578	**-2.1184**	**-2.5298**	**-4.1880**	**22.1400**	**26.5900**
Healthcare	**-7.9889**	**4.9258**	**-2.8878**	**-3.0157**	**-4.4099**	**-3.0172**	**-3.1771**	**-3.9741**	**24.6700**	**23.1300**
Consumer Services	**-6.0695**	**4.7234**	**-3.1632**	**-3.3878**	**-3.5651**	**-2.9983**	**-3.2620**	**-3.7369**	**27.2200**	**24.2600**
Telecom	**-7.0081**	**5.4982**	**-3.4420**	**-4.1900**	**-4.1007**	**-3.2984**	**-4.1930**	**-5.2935**	**38.2800**	**33.6200**
Industrial	**-6.2063**	**-**	**-2.5403**	**-2.5414**	**-2.4213**	**-2.1929**	**-2.1970**	**-3.5652**	**17.5500**	**24.3000**

Chemical	8.0291	-3.7784 -5.5170	-3.4846	-4.0103	-4.6836	-3.5832	-4.2261	-4.6484	57.0500	32.7200
Pharma and Bio	5.6724	-2.9507	-1.7397	-1.8305	-2.5197	-1.6803	-1.8065	-3.2467	20.7200	29.6400
Technology	-1.6311	2.2551	3.5320	3.1692	3.1515	4.9182	4.5036	-3.6217	3.1000	4.1090
Industrial met	7.0050	-4.4399	-2.8946	-2.8605	-3.8061	-2.9735	-2.9401	-3.6217	42.2400	31.6100
Oil and Gas	5.5689	-3.5172	-2.3597	-2.6551	-2.8473	-2.2258	-2.5704	-2.8521	22.8300	25.1700

	Pedroni Panel Co-integration Statistics							Kao	Johansen Panel Co-integration	
India	ADF t-Stat.	Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF	None	1
Financial	0.8069	0.2929	0.6360	0.3519	-1.6836	-0.1571	-0.4252	-0.8506	16.7000	14.7900
Utilities	-4.2177	-2.7435	-1.9648	-2.3851	-2.5208	-2.0107	-2.5227	-2.4596	25.5400	22.9100
Healthcare	-0.7330	0.8060	0.6698	0.5899	1.5378	1.3465	1.2590	-0.5705	7.0540	17.7800
Consumer Services	0.6628	0.1905	0.3556	0.0908	0.2824	0.5657	0.2298	-0.8850	9.2270	16.2800
Telecom	-2.8093	-1.1271	-0.6538	-1.3296	-0.6271	-0.3480	-1.2188	-1.5813	17.2000	21.7000
Industrial Chemical	-1.5567	-0.8260	-0.5894	-0.9705	-2.7416	-1.4780	-1.8399	-1.7067	22.9900	18.9700
Pharma and Bio	-0.1454	1.1626	1.7783	1.2526	0.3899	1.7331	1.0366	0.2609	11.1600	10.3000
Technology	-0.8384	0.7846	0.6572	0.6223	1.4366	1.2756	1.2441	-0.4924	6.5130	16.2500
Industrial met	-3.1823	-1.2198	-0.5500	-0.6028	-0.9084	-0.3481	-0.4370	-1.9098	13.8200	19.1400
Oil and Gas	-4.1260	-1.9715	-1.4029	-1.8534	-1.4035	-1.2060	-1.8164	-2.1631	18.2900	22.0700
	-7.5561	-3.4167	-1.7889	-1.8293	-2.3666	-1.4790	-1.5284	-2.7170	17.6800	25.5800

	Pedroni Panel Co-integration Statistics							Kao	Johansen Panel Co-integration	
South Korea	ADF t-Stat.	Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF	None	1
Financial	3.3657	-1.9293	-1.5204	-2.3326	-1.3809	-1.3530	-2.4248	-2.8332	26.5100	27.5600
Utilities	3.4283	-1.6698	-1.1469	-1.8337	-0.4692	-0.5671	-1.3878	-2.7301	13.8600	24.6400
Healthcare	0.4761	0.5384	0.7009	0.5531	1.4102	1.4779	1.2889	-0.5269	5.1370	17.5000
Consumer Services	5.9031	-4.1560	-2.4954	-3.1881	-3.5725	-2.3982	-3.2553	-2.0822	27.3900	21.4600
Telecom	-7.7778	-13.8553	-10.9674	-9.4953	-11.7888	-12.1973	-10.4469	-11.3515	121.4000	27.4100

Industrial	**4.4950**	**-2.9089**	**-2.0053**	**-2.6014**	**-2.8966**	**-2.1387**	**-2.9352**	**-2.0902**	**28.3800**	**23.2900**
Chemical	**3.2744**	**-1.7523**	-1.3397	**-1.7403**	-1.3096	-1.1677	-1.6017	**-2.1440**	15.5600	**23.8900**
Pharma and Bio	0.3101	0.6116	0.7726	0.6228	1.4150	1.5202	1.3308	-0.4915	6.3600	17.5200
Technology	-1.3698	**2.0241**	**3.0282**	**2.8654**	**2.6132**	**4.0530**	**3.7971**	**2.3021**	2.3480	2.1000
Industrial met	**5.2440**	**-3.1929**	**-2.0324**	**-2.8918**	**-3.7554**	**-2.3378**	**-3.4636**	**-2.3130**	**34.3300**	**25.5200**
Oil and Gas	**2.9775**	-1.2747	-0.9599	**-1.7355**	-1.4865	-1.0874	**-1.9842**	**-2.0310**	**18.5000**	**22.8200**

	Pedroni Panel Co-integration Statistics							**Kao**	**Johansen Panel Co-integration**	
Poland	ADF t-Stat.	Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF	None	1
Financial	**2.6988**	-1.2707	-1.0109	-1.3254	-0.3369	-0.5327	-0.9637	**-2.2347**	11.1300	**20.4800**
Utilities	-0.6030	-0.6782	-1.0353	-1.1770	0.1464	-0.5681	-0.7938	-1.4789	**23.1000**	**24.2900**
Healthcare	**23.4696**	**-41.0129**	**13.5304**	**14.4190**	**-37.1106**	**15.2365**	**16.2907**	**15.9726**	**176.0000**	**22.5200**
Consumer Services	1.3707	-0.9097	-0.8644	-1.5468	0.2857	-0.2022	-1.0205	**-2.7468**	9.6680	**22.2700**
Telecom	0.7773	-0.0183	0.1711	-0.0692	1.1126	1.0385	0.7503	-0.8875	3.2710	14.2900
Industrial	1.5214	**-2.2573**	**-2.8286**	**-3.0241**	-0.9884	**-2.5418**	**-2.7671**	**-4.5416**	**25.6300**	**29.5000**
Chemical	**4.8606**	-1.9088	-0.2799	**-3.1681**	-0.6863	0.4877	**-2.9483**	**-3.9134**	**19.6400**	17.4000
Pharma and Bio	**69.0004**	**356.7457**	**48.3272**	**39.8381**	**331.4551**	**56.5417**	**46.4647**	**43.7410**	**92.1000**	**21.9600**
Technology	**8.0739**	**-6.1904**	**-3.6171**	**-3.7333**	**-4.7457**	**-3.5008**	**-3.6416**	**-3.3499**	**27.9700**	**18.6700**
Industrial met	**5.9337**	**-3.5955**	**-2.2683**	**-2.7734**	**-2.8735**	**-2.0844**	**-2.7747**	**-2.6001**	**24.3600**	**21.3400**
Oil and Gas	**2.0989**	-0.4702	-0.0855	-0.3487	-0.0685	0.2199	-0.1208	-1.1974	7.6410	16.3800

	Pedroni Panel Co-integration Statistics							**Kao**	**Johansen Panel Co-integration**	
Turkey	ADF t-Stat.	Panel v	Panel rho	Panel PP	Panel ADF	Group rho	Group PP	Group ADF	None	1
Financial	**4.0138**	**-1.7026**	-0.9784	-1.3142	-0.8356	-0.5810	-1.0201	**-2.1133**	10.8800	**20.7700**
Utilities	**6.9598**	**-6.5362**	**-4.7642**	**-5.5893**	**-4.9901**	**-4.8409**	**-5.8202**	**-7.2461**	**48.0900**	**23.8300**
Healthcare	**7.4114**	**-8.4048**	**-4.5173**	**-5.4480**	**-6.9946**	**-4.6418**	**-5.7695**	**-4.6487**	**47.0400**	**19.5500**
Consumer Services	**2.3822**	-1.2386	-0.9654	-1.2188	-1.1749	-1.0013	-1.3607	-1.8574	14.2900	**18.3100**
Telecom	**3.3025**	-1.2936	-0.6062	-0.7600	-0.7615	-0.2741	-0.4688	-1.3993	9.9650	**22.5400**
Industrial	**6.1948**	**-3.6874**	**-2.4309**	**-3.3671**	**-2.7196**	**-2.2979**	**-3.4746**	**-3.6649**	**37.7400**	**26.2200**
Chemical	-0.5590	1.0605	1.1633	1.2380	**2.0609**	**2.1591**	**2.2485**	0.4651	1.4970	9.1770
Pharma and Bio Technology	**3.5587**	**-5.2966**	**-5.3952**	**-6.8204**	**-3.8110**	**-5.5810**	**-7.2721**	**-8.6775**	**71.3900**	**24.8100**
Industrial met	**5.8138**	**-3.2502**	**-2.0681**	**-2.7322**	**-3.4527**	**-2.3332**	**-3.2117**	**-3.2364**	**31.8400**	**24.2300**
Oil and Gas	**10.4084**	**-7.4980**	**-4.2482**	**-4.7189**	**-6.0325**	**-4.3001**	**-4.8758**	**-4.9247**	**39.4500**	**23.6700**

All bold values are significant at 5 percent or better, indicating the cointegrating relationship of emerging country-level data with each selected emerging country's Sectors.

5.3 VECM Results

In results of VECM, we identify the long and short-run association among home country sector and country-level portfolios of developed and emerging countries excluding the home country. We found various combinations for long and short-run diversification opportunities for international investors using this approach.

Table 5 VECM Results (Developed Country's Sectors)

Regressors	Intercept	Portfolio ret (-1)	Portfolio ret (-2)	ECT (-1)
Financial	**0.00023200**	**0.21980800**	0.00434900	**-0.00000406**
	0.00006770	0.00444900	0.00444900	0.00000053
Utility	**0.00027200**	**0.15021500**	**-0.01675700**	**-0.00000124**
	0.00006980	0.00458100	0.00458000	0.00000019
Health Care	**0.00058500**	**0.11925500**	-0.00578800	-0.00000009
	0.00006570	0.00431300	0.00431200	0.00000011
Consumer services	**0.00019300**	**0.21230700**	0.00694000	**-0.00000461**
	0.00006600	0.00433200	0.00433200	0.00000079
Telecom	0.00009720	**0.12172800**	0.00401300	**-0.00000340**
	0.00006910	0.00453800	0.00453700	0.00000067
Industrial	**0.00036800**	**0.21956600**	-0.00636000	**-0.00000335**
	0.00006880	0.00451700	0.00451700	0.00000048
Chemical	**0.00035500**	**0.27770700**	**0.01997100**	**-0.00000122**
	0.00008620	0.00566400	0.00566300	0.00000020
Pharma and Bio	**0.00075600**	**0.12487600**	-0.00893700	-0.00000005
	0.00008670	0.00569600	0.00569500	0.00000006
Technology	**0.00082700**	**0.19133700**	0.02064400	**-0.00000140**
	0.00013700	0.01280100	0.01280000	0.00000052
Industrial met	0.00072300	0.36164800	-0.07958400	-0.00000376
	0.00023500	0.01541800	0.01541500	0.00000093
Oil and Gas	**0.00032600**	**0.33293800**	0.00083100	**-0.00000112**
	0.00008050	0.00528900	0.00528800	0.00000017

The error correction term (ECT) is significant and negative for eight sectors means the underlying sector of Australia have a long-run association with developed countries portfolio excluding Australia. There are long-run diversification opportunities for the international investor in case of Healthcare, Pharma & Bio, and Industrial met.Financial, Healthcare, Consumer Services, Telecom, Industrial, Pharma & Bio, Technology, and Industrial met, Oil and Gas are insignificant with developed countries portfolio excluding Australia, which means short-run diversification is possible in these sectors. First-line shows the intercept value, and the second line shows the standard error value, and highlighted values indicate the significance at 5% or more.

Table 6VECM Results (Canada's Sectors)

Regressors	Intercept	Portfolio ret (-1)	Portfolio ret (-2)	ECT (-1)
Financial	**0.00038500**	**0.05439900**	**-0.01283200**	**-0.00000231**
	0.00006260	0.00408700	0.00408600	0.00000034
Utility	**0.00037600**	**0.02901000**	**-0.01494100**	**-0.00000196**
	0.00005460	0.00356500	0.00356400	0.00000026
Health Care	**0.00074300**	0.00519000	**-0.02997700**	**-0.00000057**
	0.00021900	0.01429400	0.01429100	0.00000022
Consumer services	**0.00036400**	**0.02462500**	**-0.01003400**	**-0.00000044**
	0.00005190	0.00338600	0.00338600	0.00000019
Telecom	**0.00032800**	**0.02076700**	**-0.02109200**	**-0.00000123**
	0.00005950	0.00388300	0.00388200	0.00000023
Industrial	**0.00024200**	**0.03085900**	**-0.03139500**	**-0.00000167**
	0.00008320	0.00543100	0.00543000	0.00000044
Chemical	**0.00062700**	**0.04383700**	**-0.03014000**	**-0.00000102**
	0.00009750	0.00636500	0.00636300	0.00000014
Pharma and Bio	**0.00219500**	-0.06159700	-0.06178200	**-0.00000132**
	0.00066800	0.04359300	0.04358400	0.00000062
Technology	-0.00001360	**0.03238400**	0.00086100	**-0.00000431**
	0.00012800	0.00836900	0.00836700	0.00000086
Industrial met	0.00016400	**0.08510800**	**-0.01920300**	**-0.00000243**
	0.00011500	0.00751200	0.00751000	0.00000067
Oil and Gas	**0.00038700**	**0.05356000**	**-0.02747300**	**-0.00000244**
	0.00008230	0.00537700	0.00537600	0.00000033

The error correction term (ECT) is significant and negative for all 11 sectors means the underlying sector of Canada have a long-run association with developed countries portfolio, excluding Canada. There are no long-run diversification opportunities for the international investor in this case. Healthcare and Pharma, and Bio are insignificant with developed countries portfolio excluding Canada, which means short-run diversification is possible in these sectors. First-line shows the intercept value, and the second line shows the standard error value, and highlighted values indicate the significance at 5% or more.

Table 7 VECM Results (Finland's Sectors)

Regressors	Intercept	Portfolio ret (-1)	Portfolio ret (-2)	ECT (-1)
Financial	**0.00048300**	**0.09275800**	**-0.03761900**	**-0.00000204**
	0.00008700	0.00605300	0.00605300	0.00000040
Utility	**0.00049200**	**0.07660300**	**-0.02136600**	**-0.00000141**
	0.00009560	0.00672200	0.00672200	0.00000016
Health Care	**0.00050700**	0.01629700	**0.02716700**	**-0.00000598**
	0.00017800	0.01242100	0.01242100	0.00000111
Consumer services	**0.00062900**	**0.04961500**	**-0.02505600**	**-0.00000391**
	0.00017700	0.01234300	0.01234300	0.00000094
Telecom	-0.00009720	**0.06471800**	**-0.03623200**	**-0.00001340**
	0.00008370	0.00582400	0.00582400	0.00000127
Industrial	**0.00051000**	**0.07492400**	-0.00545100	**-0.00000006**

	0.00009160	0.00637600	0.00637600	0.00000002
Chemical	**-0.00125800**	0.04954300	**0.14922000**	**-0.00036800**
	0.00061100	0.04416900	0.04418300	0.00006620
Pharma and Bio	-0.00000319	**0.01571700**	-0.00061300	**-0.00002420**
	0.00004640	0.00322800	0.00322800	0.00000216
Technology	-0.00007580	**0.05742700**	**-0.07760700**	-0.00327400
	0.00013000	0.00999900	0.00905800	0.00511400
Industrial met	-0.00013500	**0.07559200**	-0.00889000	0.00698700
	0.00015300	0.01076200	0.00965000	0.00634400
Oil and Gas	**0.00183000**	**0.10850600**	-0.05194900	**-0.00000198**
	0.00041700	0.02900100	0.02900000	0.00000042

The error correction term (ECT) is significant and negative for Nine sectors means the underlying sector of Finland have a long-run association with developed countries portfolio, excluding Finland. There are long-run diversification opportunities for the international investor in the case of Technology and Industrial met. Healthcare, Industrial, Chemical, Pharma and Bio, Industrial met, and Oil & Gas are insignificant with developed countries portfolio excluding Finland, which means short-run diversification is possible in these sectors. First-line shows the intercept value, and the second line shows the standard error value, and highlighted values indicate the significance at 5% or more.

Table 8 VECM Results (France's Sectors)

Regressors	Intercept	Portfolio ret (-1)	Portfolio ret (-2)	ECT (-1)
Financial	**0.00024300**	**0.08744100**	**-0.02566200**	**-0.00000826**
	0.00009840	0.00650300	0.00650200	0.00000119
Utility	**286.151100**	**22.8182100**	**16.17099000**	**0.99913500**
	0.10924000	7.32254800	7.32186600	0.00082300
Health Care	**0.00027300**	**-0.03375000**	**-0.02751300**	**-0.00000235**
	0.00006870	0.00453900	0.00453700	0.00000035
Consumer services	0.00003580	**0.05269300**	**-0.04223800**	**-0.00000724**
	0.00007360	0.00486000	0.00485900	0.00000083
Telecom	-0.00009880	-0.00623400	**-0.05558600**	**-0.00000668**
	0.00008040	0.00531400	0.00531300	0.00000075
Industrial	**0.00028900**	**0.04174400**	**-0.03914000**	**-0.00000451**
	0.00008090	0.00534500	0.00534400	0.00000111
Chemical	**0.00041200**	0.00462900	**-0.04140000**	**-0.00000110**
	0.00007690	0.00507800	0.00507700	0.00000026
Pharma and Bio	**0.00029700**	**-0.04114000**	**-0.02653600**	**-0.00000166**
	0.00007820	0.00516500	0.00516400	0.00000018
Technology	0.00003110	**0.07177600**	**-0.03549800**	**-0.00000254**
	0.00010200	0.00673200	0.00673000	0.00000044
Industrial met	**0.00048200**	**0.10487100**	0.00563900	**-0.00000062**
	0.00015700	0.00950700	0.00950500	0.00000020
Oil and Gas	**0.00024100**	0.00528900	**-0.04227900**	**-0.00000291**
	0.00008090	0.00534800	0.00534700	0.00000034

The error correction term (ECT) is significant and negative for all 11 sectors means the underlying sector of France have a long-run association with developed countries portfolio, excluding France. There are no long-run

diversification opportunities for the international investor in this case. Telecom, Chemical, and Industrial met are insignificant with developed countries portfolio excluding France, which means short-run diversification is possible in these sectors. First-line shows the intercept value, and the second line shows the standard error value, and highlighted values indicate the significance at 5% or more.

Table 9 VECM Results (Germany's Sectors)

Regressors	Intercept	Portfolio ret (-1)	Portfolio ret (-2)	ECT (-1)
Financial	0.00011000	**0.04181600**	**-0.02685200**	**-0.00001070**
	0.00009140	0.00605500	0.00605300	0.00000144
Utility	0.00003490	**0.01434800**	**-0.02735000**	**-0.00000203**
	0.00009050	0.00600000	0.00599900	0.00000057
Health Care	**0.00041500**	**0.01315200**	-0.00558400	**-0.00000088**
	0.00006140	0.00406800	0.00406700	0.00000015
Consumer services	0.00002830	**0.06517500**	0.00055100	**-0.00001510**
	0.00007540	0.00499600	0.00499500	0.00000228
Telecom	-0.00005370	**-0.03534100**	**-0.05865700**	**-0.00000933**
	0.00009490	0.00629100	0.00629000	0.00000106
Industrial	**0.00028800**	**0.04206900**	**-0.03355700**	**-0.00000489**
	0.00008460	0.00560600	0.00560500	0.00000084
Chemical	**0.00035500**	**0.02500300**	**-0.01151500**	**-0.00000113**
	0.00008100	0.00537000	0.00536900	0.00000026
Pharma and Bio	**0.00038600**	**0.03486300**	-0.00911600	**-0.00000107**
	0.00007370	0.00488600	0.00488500	0.00000016
Technology	**0.00034900**	**0.02965700**	**-0.02195700**	**-0.00000334**
	0.00009940	0.00658700	0.00658600	0.00000090
Industrial met	0.00020600	0.00877600	**-0.05475400**	**-0.00000271**
	0.00013700	0.00832700	0.00832600	0.00000077
Oil and Gas	**133.226900**	-28.10951000	13.47461000	29.06998000
	0.84339200	55.36230000	50.33301000	25.88891000

The error correction term (ECT) is significant and negative for Ten sectors means the underlying sector of Germany have a long-run association with developed countries portfolio excluding Germany. There are long-run diversification opportunities for the international investor in the case of Oil and Gas. Healthcare, Consumer Services, Pharma & Bio, Industrial met, and Oil &Gas are insignificant with developed countries portfolio excluding Germany, which means short-run diversification is possible in these sectors. First-line shows the intercept value, and the second line shows the standard error value, and highlighted values indicate the significance at 5% or more.

Table 10 VECM Results (Italy's Sectors)

Regressors	Intercept	Portfolio ret (-1)	Portfolio ret (-2)	ECT (-1)
Financial	0.00010800	**0.04607000**	**-0.02471100**	**-0.00001070**
	0.00009140	0.00609000	0.00608900	0.00000144
Utility	0.00003440	**0.01729500**	**-0.02580800**	**-0.00000202**
	0.00009060	0.00603600	0.00603500	0.00000057
Health Care	**0.00041400**	**0.01590900**	-0.00514100	**-0.00000089**
	0.00006140	0.00409200	0.00409100	0.00000015
Consumer services	0.00002630	**0.06822800**	0.00347700	**-0.00001510**
	0.00007540	0.00502500	0.00502400	0.00000230
Telecom	-0.00005240	**-0.03398800**	**-0.05807700**	**-0.00000933**
	0.00009500	0.00632900	0.00632800	0.00000106
Industrial	**0.00028700**	**0.04611000**	**-0.03105900**	**-0.00000491**
	0.00008460	0.00564000	0.00563900	0.00000086
Chemical	**0.00035400**	**0.03090100**	**-0.01156000**	**-0.00000113**
	0.00008100	0.00540200	0.00540100	0.00000026
Pharma and Bio	**0.00038400**	**0.03881500**	-0.00745500	**-0.00000108**
	0.00007370	0.00491500	0.00491400	0.00000016
Technology	**0.00034700**	**0.03326200**	**-0.01888300**	**-0.00000331**
	0.00009940	0.00662700	0.00662500	0.00000091
Industrial met	0.00020600	0.01328800	**-0.05277000**	**-0.00000267**
	0.00013700	0.00833200	0.00833100	0.00000078
Oil and Gas	**-0.00168800**	**0.10538500**	**-0.10419000**	**-0.00002200**
	0.00040700	0.02500100	0.02498400	0.00000547

The error correction term (ECT) is significant and negative for all 11 sectors means the underlying sector of Italy have a long-run association with developed countries portfolio excluding Italy. There are no long-run diversification opportunities for the international investor in this case. Healthcare, Consumer Services, Pharma and Bio, and Industrial met are insignificant with developed countries portfolio excluding Italy, which means short-run diversification is possible in these sectors. First-line shows the intercept value, and the second line shows the standard error value, and highlighted values indicate the significance at 5% or more.

Table 11VECM Results (Japan's Sectors)

Regressors	Intercept	Portfolio ret (-1)	Portfolio ret (-2)	ECT (-1)
Financial	0.00001020	**0.07888200**	**-0.01596300**	**-0.00001720**
	0.00006490	0.00424100	0.00424000	0.00000364
Utility	**0.00022000**	**0.16754500**	**-0.01140800**	**-0.00000338**
	0.00005680	0.00370900	0.00370800	0.00000102
Health Care	**0.00010800**	**0.16063200**	-0.00488500	**-0.00000698**
	0.00005510	0.00360400	0.00360300	0.00000159
Consumer services	0.00002300	**0.23837200**	0.00954600	**-0.00000687**
	0.00007740	0.00506000	0.00505800	0.00000094
Telecom	-0.00007970	0.28984500	-0.00398100	**-0.00003510**
	0.00008690	0.00567700	0.00567500	0.00000526
Industrial	**0.00017000**	**0.34655400**	-0.00357900	**-0.00000539**

	0.00006800	0.00444500	0.00444400	0.00000111
Chemical	**0.00020500**	**0.29698900**	**-0.00899700**	**-0.00000868**
	0.00006960	0.00454800	0.00454700	0.00000155
Pharma and Bio	**0.00022000**	**0.16116800**	**-0.01215800**	**-0.00000580**
	0.00006020	0.00393600	0.00393500	0.00000119
Technology	-0.00012500	**0.36020100**	0.00653900	**-0.00002630**
	0.00007630	0.00498800	0.00498600	0.00000223
Industrial met	0.00014400	**0.35973400**	-0.00764400	**-0.00000798**
	0.00008440	0.00551400	0.00551300	0.00000154
Oil and Gas	**0.00020300**	**0.31600400**	**-0.01647800**	**-0.00002650**
	0.00008390	0.00548600	0.00548500	0.00000309

The error correction term (ECT) is significant and negative for all 11 sectors means the underlying sector of Japan have a long-run association with developed countries portfolio, excluding Japan. There are no long-run diversification opportunities for the international investor in this case. Healthcare, Consumer Services,Telecom, Industrial, Technology, and Industrial met are insignificant with developed countries portfolio excluding Japan, which means short-run diversification is possible in these sectors. First-line shows the intercept value, and the second line shows the standard error value, and highlighted values indicate the significance at 5% or more.

Table 12 VECM Results (Spain's Sectors)

Regressors	Intercept	Portfolio ret (-1)	Portfolio ret (-2)	ECT (-1)
Financial	0.00004360	**0.03968400**	**-0.03886700**	**-0.00000299**
	0.00009580	0.00638700	0.00638600	0.00000073
Utility	**0.00032100**	0.00013800	**-0.04049100**	**-0.00000135**
	0.00007120	0.00474800	0.00474700	0.00000031
Health Care	**0.00064800**	**0.04000700**	**0.01958700**	**-0.00000069**
	0.00008560	0.00570700	0.00570500	0.00000021
Consumer services	**312.296000**	**41.597360**	**36.318350**	**0.999631**
	0.19921800	13.28103000	13.27790000	0.00115100
Telecom	0.00002500	**0.02404600**	**-0.04267400**	**-0.00000393**
	0.00008560	0.00570600	0.00570500	0.00000084
Industrial	**0.00027500**	**0.05008800**	**-0.03600700**	**-0.00000106**
	0.00007600	0.00506500	0.00506400	0.00000041
Chemical				
Pharma and Bio	**0.00046600**	**0.02449700**	**0.03886000**	**-0.00000071**
	0.00011100	**0.00724400**	**0.00721200**	**0.00000030**
Technology	**0.00333900**	-0.11905600	0.13003900	**-0.00002630**
	0.00127700	0.08524600	0.08524200	0.00000811
Industrial met	**0.00019900**	**0.05034800**	**-0.01323300**	**-0.00000181**
	0.00009410	0.00626400	0.00626300	0.00000031
Oil and Gas	**0.00013900**	**0.03246700**	**-0.03208400**	**-0.00000271**
	0.00008970	0.00597900	0.00597800	0.00000046

The error correction term (ECT) is significant and negative for all 11 sectors means the underlying sector of Spain have a long-run association with developed countries portfolio excluding Spain. There are no long-run diversification opportunities for the international investor in this case. Utilities and Technology are insignificant

with developed countries portfolio excluding Spain, which means short-run diversification is possible in these sectors. First-line shows the intercept value, and the second line shows the standard error value, and highlighted values indicate the significance at 5% or more.

Table 13 VECM Results (UK's Sectors)

Regressors	Intercept	Portfolio ret (-1)	Portfolio ret (-2)	ECT (-1)
Financial	0.00002770	**0.05381200**	**-0.02633600**	**-0.00000276**
	0.00008330	0.00543800	0.00543700	0.00000058
Utility	**0.00017100**	**0.01329000**	**-0.02223600**	**-0.00000150**
	0.00005800	0.00378500	0.00378400	0.00000026
Health Care	**0.00021100**	**-0.00813900**	**-0.00831400**	**-0.00000479**
	0.00005870	0.00382800	0.00382700	0.00000074
Consumer services	0.00008170	**0.05254100**	**-0.02878200**	**-0.00000661**
	0.00006110	0.00398500	0.00398500	0.00000095
Telecom	-0.00005030	0.00009560	**-0.05842200**	**-0.00000870**
	0.00008090	0.00527600	0.00527500	0.00000103
Industrial	**0.00014900**	**0.06005700**	**-0.01853200**	**-0.00000393**
	0.00006970	0.00454500	0.00454400	0.00000086
Chemical	**0.00038300**	**0.08015400**	-0.00458800	**-0.00000162**
	0.00008370	0.00546300	0.00546200	0.00000039
Pharma and Bio	**0.00016600**	-0.00562500	**-0.01211500**	**-0.00000500**
	0.00006490	0.00423400	0.00423300	0.00000058
Technology	-0.00007930	**0.06478200**	**-0.03111700**	**-0.00004740**
	0.00010500	0.00682500	0.00682300	0.00000576
Industrial met	0.00034900	**0.11028400**	**0.03342000**	**-0.00000758**
	0.00019400	0.01266800	0.01266500	0.00000157
Oil and Gas	**0.00015700**	**0.03288200**	**-0.02223400**	**-0.00000488**
	0.00007490	0.00489000	0.00488900	0.00000059

The error correction term (ECT) is significant and negative for all 11 sectors. The underlying sector of the UK has a long-run association with developed countries portfolio excluding the UK. There are no long-run diversification opportunities for the international investor in this case. Telecom, Chemical, and Pharma & Bio are insignificant with developed countries portfolio excluding the UK, which means short-run diversification is possible in these sectors. First-line shows the intercept value, and the second line shows the standard error value, and highlighted values indicate the significance at 5% or more.

Table 14 VECM Results (USA's Sectors)

Regressors	Intercept	Portfolio ret (-1)	Portfolio ret (-2)	ECT (-1)
Financial	**0.00028200**	**-0.04216700**	**-0.02111700**	**-0.00000249**
	0.00007840	0.00506900	0.00506800	0.00000049
Utility	**0.00024200**	**-0.01629300**	**-0.01332500**	**-0.00000169**
	0.00005420	0.00350700	0.00350600	0.00000052
Health Care	**0.00031300**	**-0.02414800**	**-0.01518000**	-0.00000002
	0.00004790	0.00309700	0.00309600	0.00000009
Consumer services	**0.00031100**	**-0.01957700**	**-0.02179900**	0.00000008
	0.00005690	0.00367800	0.00367700	0.00000009

Telecom	0.00000973	**-0.02148300**	**-0.02049300**	**-0.00000571**
	0.00006050	0.00391300	0.00391200	0.00000066
Industrial	**0.00029300**	**-0.01522600**	**-0.02010400**	-0.00000019
	0.00006140	0.00397300	0.00397200	0.00000018
Chemical	**0.00037800**	**-0.02314100**	**-0.02544800**	**-0.00000047**
	0.00006940	0.00448800	0.00448700	0.00000020
Pharma and Bio	**0.00024900**	**-0.02962800**	**-0.01778000**	-0.00000021
	0.00005370	0.00347200	0.00347100	0.00000014
Technology	**0.00026800**	**-0.01830000**	**-0.01228600**	-0.00000008
	0.00007750	0.00501200	0.00501100	0.00000021
Industrial met	0.00018300	-0.00431900	**-0.02506200**	**-0.00000455**
	0.00011000	0.00710200	0.00710100	0.00000076
Oil and Gas	**0.00029000**	**-0.02949500**	**-0.01816400**	**-0.00000213**
	0.00007410	0.00479600	0.00479500	0.00000031

The error correction term (ECT) is significant and negative for six sectors. The USA's underlying sector has a long-run association with developed countries portfolio, excluding the USA. There are long-run diversification opportunities for the international investor in Healthcare, Consumer Services, Industrial, Pharma & Bio, and Technology. Industrial met is the only sector that is insignificant with developed countries portfolio, excluding the USA, means short-run diversification is possible in these sectors. First-line shows the intercept value, and the second line shows the standard error value, and highlighted values indicate the significance at 5% or more.

Table 15 VECM Results (Brazil's Sectors)

Regressors	Intercept	Portfolio ret (-1)	Portfolio ret (-2)	ECT (-1)
Financial	**0.00065800**	0.00910900	-0.00584000	**-0.00000160**
	0.00015200	0.00750200	0.00750200	0.00000034
Utility	**0.00036500**	**-0.02134000**	0.00646500	**-0.00000426**
	0.00014100	0.00693800	0.00693800	0.00000106
Health Care	**0.00055300**	-0.00352800	0.00229000	**-0.00000077**
	0.00010500	0.00514400	0.00514400	0.00000021
Consumer services	**0.01798200**	-0.34110300	-0.38098100	**-0.00009990**
	0.00667600	0.32848600	0.32849200	0.00002330
Telecom	-0.00005350	**-0.01899600**	0.00351100	**-0.00001060**
	0.00014200	0.00696600	0.00696600	0.00000294
Industrial	**0.00038900**	-0.00372100	0.01132900	**-0.00000289**
	0.00013000	0.00639300	0.00639300	0.00000066
Chemical	**0.00276400**	0.01407600	0.00400000	**-0.00003740**
	0.00115300	0.05674800	0.05674900	0.00001000
Pharma and Bio	0.00089800	-0.03887200	-0.04933500	**-0.00002100**
	0.00049100	0.03564500	0.03556900	0.00000467
Technology	-0.00033800	**0.05634100**	-0.00777300	**-0.00000966**
	0.00019800	0.01375800	0.01375800	0.00000179
Industrial met	**0.00059900**	**0.01932000**	0.00233500	**-0.00000122**
	0.00018000	0.00887600	0.00887700	0.00000039
Oil and Gas	**0.00059900**	0.01581900	0.00326100	**-0.00000100**
	0.00017900	0.00880200	0.00880200	0.00000028

The error correction term (ECT) is significant and negative for all 11 sectors means the underlying sector of Brazil have a long-run association with emerging countries portfolio, excluding Brazil. There are no long-run diversification opportunities for the international investor in this case. In all 11 sectors, Portfolios ret (-2) are insignificant with emerging countries portfolio excluding Brazil, which means short-run diversification is possible in these sectors. First-line shows the intercept value, and the second line shows the standard error value, and highlighted values indicate the significance at 5% or more.

Table 16 VECM Results (China's Sectors)

Regressors	Intercept	Portfolio ret (-1)	Portfolio ret (-2)	ECT (-1)
Financial	**0.00060600**	**0.10221700**	**0.00591400**	**-0.00000080**
	0.00012200	0.00576700	0.00576700	0.00000013
Utility	**0.00044500**	**0.08391700**	**-0.01481900**	**-0.00000231**
	0.00010900	0.00518100	0.00518100	0.00000030
Health Care	**0.00044500**	**0.08235200**	-0.00469700	**-0.00000240**
	0.00013300	0.00631400	0.00631400	0.00000046
Consumer services	**0.00053600**	**0.10333700**	0.00634800	**-0.00000123**
	0.00012500	0.00589900	0.00589900	0.00000020
Telecom	**0.00032300**	**0.09130400**	**-0.01650800**	**-0.00000382**
	0.00013100	0.00667700	0.00667400	0.00000048
Industrial	**0.00031000**	**0.12613100**	0.00359400	**-0.00000246**
	0.00011600	0.00551200	0.00551300	0.00000051
Chemical	**0.00041800**	**0.12273300**	**0.01500000**	**-0.00000290**
	0.00014400	0.00680000	0.00680100	0.00000041
Pharma and Bio	**0.00046000**	**0.10138300**	-0.00704700	**-0.00000195**
	0.00014700	0.00742500	0.00742400	0.00000041
Technology	**0.00061300**	**0.08733400**	**0.01005800**	-0.00000016
	0.00012700	0.00600200	0.00600200	0.00000015
Industrial met	**0.00073400**	**0.17226200**	0.00688000	**-0.00000053**
	0.00017600	0.00832900	0.00833000	0.00000009
Oil and Gas	**0.00050700**	**0.12679700**	0.00025000	**-0.00000081**
	0.00012700	0.00609600	0.00609500	0.00000013

The error correction term (ECT) is significant and negative for Ten sectors means the underlying sector of China have a long-run association with emerging countries portfolio, excluding China. There are long-run diversification opportunities for the international investor in the case of Technology. Healthcare, Consumer Services, Industrial, Pharma & Bio, Industrial met, and Oil &Gas are insignificant with emerging countries portfolio excluding China. This means short-run diversification is possible in these sectors. First-line shows the intercept value, and the second line shows the standard error value, and highlighted values indicate the significance at 5% or more.

Table 17 VECM Results (India's Sectors)

Regressors	Intercept	Portfolio ret (-1)	Portfolio ret (-2)	ECT (-1)
Financial	**0.000622**	**0.075276**	**0.042971**	**-4.62E-07**
	0.000123	0.005883	0.005883	1.12E-07
Utility	**0.000439**	**0.059467**	**0.036066**	**-1.14E-06**
	0.000132	0.006329	0.006329	2.46E-07

Health Care	**0.000282**	**0.037377**	**0.016257**	**-6.09E-07**
	9.31E-05	0.004466	0.004466	2.14E-07
Consumer services	**0.000725**	**0.069343**	**0.041647**	**-4.55E-06**
	0.000241	0.01158	0.01158	1.33E-06
Telecom	0.000137	**0.050418**	**0.037786**	**-1.69E-06**
	0.000144	0.006904	0.006904	5.45E-07
Industrial	**0.000488**	**0.073782**	**0.036485**	**-3.25E-07**
	0.000116	0.005568	0.005568	8.42E-08
Chemical	**0.000296**	**0.040683**	**0.024179**	**-2.89E-07**
	9.75E-05	0.004674	0.004674	1.06E-07
Pharma and Bio	**0.000331**	**0.065011**	**0.018814**	**-1.73E-06**
	0.000141	0.006743	0.006743	5.92E-07
Technology	**0.000331**	**0.065011**	**0.018814**	**-1.73E-06**
	0.000141	0.006743	0.006743	5.92E-07
Industrial met	**0.000383**	**0.116187**	**0.05781**	**-8.45E-07**
	0.000147	0.00704	0.00704	2.07E-07
Oil and Gas	**0.000259**	**0.072217**	**0.040731**	**-2.83E-06**
	0.000125	0.006007	0.006007	6.69E-07

The error correction term (ECT) is significant and negative for all 11 sectors means the underlying sector of India have a long-run association with emerging countries portfolio, excluding India. Portfolios ret (-1) and Portfolio ret (-1) are also significant in all 11 sectors. There are no long run and short run diversification opportunities for the international investor in this case. First-line shows the intercept value, and the second line shows the standard error value, and highlighted values indicate the significance at 5% or more.

Table 18 VECM Results (South Korea's Sectors)

Regressors	Intercept	Portfolio ret (-1)	Portfolio ret (-2)	ECT (-1)
Financial	**0.00029900**	**0.15498400**	**0.02050400**	**-0.00000210**
	0.00013900	0.00670900	0.00671000	0.00000036
Utility	**388.154400**	**42.509320**	12.566930	**0.998030**
	0.14215900	6.84980700	6.85017500	0.00119600
Health Care	**0.00058300**	**0.07858900**	**0.01668400**	**-0.00000037**
	0.00014300	0.00695500	0.00695500	0.00000016
Consumer services	0.00014500	**0.12315400**	0.01096800	**-0.00000224**
	0.00012500	0.00601500	0.00601500	0.00000050
Telecom	-0.00003980	**0.08547800**	**0.01725800**	**-0.00002440**
	0.00011900	0.00573200	0.00573200	0.00000262
Industrial	**0.00039600**	**0.16064400**	**0.03289900**	**-0.00000101**
	0.00014400	0.00692500	0.00692500	0.00000022
Chemical	**0.00055800**	**0.15017800**	**0.02431900**	**-0.00000074**
	0.00017100	0.00825100	0.00825100	0.00000016
Pharma and Bio	**0.00078100**	**0.09023600**	**0.02895500**	**-0.00000036**
	0.00020300	0.01014500	0.01014300	0.00000014
Technology	**0.00762600**	**0.41449200**	**-0.34771200**	**-0.00000748**

	0.00341800	0.16472300	0.16472200	0.00000295
Industrial met	**0.00031800**	**0.18829600**	0.00729400	**-0.00000096**
	0.00014600	0.00705100	0.00705200	0.00000022
Oil and Gas	**0.00053200**	**0.15590000**	**0.03062900**	**-0.00000069**
	0.00015800	0.00760100	0.00760100	0.00000015

The error correction term (ECT) is significant and negative for all 11 sectors. The underlying sector of South Korea has a long-run association with emerging countries portfolio, excluding South Korea. There are no long-run diversification opportunities for the international investor in this case. Utilities, Consumer Services, and Industrial met are insignificant with emerging countries portfolio excluding South Korea, which means short-run diversification is possible in these sectors. First-line shows the intercept value, and the second line shows the standard error value, and highlighted values indicate the significance at 5% or more.

Table 19VECM Results (Poland 's Sectors)

Regressors	Intercept	Portfolio ret (-1)	Portfolio ret (-2)	ECT (-1)
Financial	**0.00034300**	**0.04467800**	-0.00697700	**-0.00000450**
	0.00012300	0.00591100	0.00591100	0.00000100
Utility	**-0.00045400**	**0.05358800**	0.00596400	**-0.00000819**
	0.00016600	0.01045800	0.01045700	0.00000358
Health Care	-0.00000924	-0.00190200	**-0.00308200**	**-0.00035800**
	0.00002670	0.00128100	0.00128100	0.00002050
Consumer services	0.00014000	**0.03842200**	**-0.01659800**	**-0.00001650**
	0.00014000	0.00672900	0.00672900	0.00000391
Telecom	-0.00013500	**0.03119500**	-0.00363200	**-0.00000774**
	0.00014500	0.00683400	0.00683400	0.00000440
Industrial	**-0.00045600**	0.00499100	-0.01008400	**-0.00001950**
	0.00011000	0.00520300	0.00520300	0.00000525
Chemical	-0.00013300	**0.01569600**	0.00502500	**-0.00007110**
	0.00008380	0.00396200	0.00396200	0.00001720
Pharma and Bio	0.00002630	**-0.00296900**	-0.00029800	**-0.00154500**
	0.00003060	0.00146500	0.00146500	0.00004040
Technology	**0.00082800**	**0.03733200**	0.03324500	**-0.00001870**
	0.00036600	0.01729600	0.01729600	0.00000445
Industrial met	**0.00066300**	**0.07271900**	-0.00485900	**-0.00000293**
	0.00017700	0.00847700	0.00847700	0.00000063
Oil and Gas	**0.00049100**	**0.04098900**	-0.00621300	**-0.00000375**
	0.00013300	0.00639100	0.00639100	0.00000099

The error correction term (ECT) is significant and negative for all 11 sectors means the underlying sector of Poland have a long-run association with emerging countries portfolio, excluding Poland. There are no long-run diversification opportunities for the international investor in this case. Ten sectors excluding consumer services are insignificant with emerging countries portfolio, excluding Poland, which means short-run diversification is possible in these sectors. First-line shows the intercept value, and the second line shows the standard error value, and highlighted values indicate the significance at 5% or more.

Table 20VECM Results (Turkey's Sectors)

Regressors	Intercept	Portfolio ret (-1)	Portfolio ret (-2)	ECT (-1)
Financial	0.00026300	**0.06551300**	0.00118900	**-0.00001590**
	0.00019000	0.01003400	0.01003400	0.00000363
Utility	-0.00009650	-0.01132900	-0.00295900	**-0.00004010**
	0.00012700	0.00670000	0.00670000	0.00000661
Health Care	**0.00024900**	**0.02642400**	0.00485900	**-0.00004080**
	0.00012700	0.00668100	0.00668100	0.00000513
Consumer services	**0.00041400**	**0.04008400**	-0.01444600	**-0.00000862**
	0.00016800	0.00885300	0.00885300	0.00000221
Telecom	**0.00070300**	**0.05423200**	-0.01645800	**-0.00002810**
	0.00034000	0.01818700	0.01818700	0.00000689
Industrial	0.00026000	**0.06693700**	**0.01916900**	**-0.00002220**
	0.00017900	0.00941700	0.00941700	0.00000433
Chemical	**0.00109500**	0.02365300	0.02065900	-0.00000645
	0.00047300	0.02494900	0.02495000	0.00000481
Pharma and Bio				
Technology	-0.00003960	0.01959400	0.00072300	-0.00005140
	0.00015500	0.00814900	0.00814900	0.00000865
Industrial met	0.00057900	0.07916800	-0.00321700	-0.00000916
	0.00019500	0.01026300	0.01026300	0.00000200
Oil and Gas	0.00073500	0.06504300	-0.01030200	-0.00004990
	0.00022400	0.01181400	0.01181500	0.00000701

The error correction term (ECT) is significant and negative for six sectors means the underlying sector of Turkey have a long-run association with emerging countries portfolio, excluding Turkey. There are long-run diversification opportunities for the international investor in Chemical, Pharma & Bio, Technology, Industrial met, and Oil & Gas. Financial, Utilities, Healthcare, Consumer Services, Telecom, Chemical, Pharma & Bio, Technology, Industrial met, and Oil & Gas are insignificant with emerging countries portfolio excluding Turkey, means short-run diversification is possible in the case of these sectors. First-line shows the intercept value, and the second line shows the standard error value, and highlighted values indicate the significance at 5% or more.

6.Conclusion and Discussion

We observe short, and long-run diversification opportunities for international investors within developed and emerging countries using the sector and country-level approach. There are few options in all ten developed and six emerging countries that their 11 common sectors have diversification opportunities against the base country portfolio. In Canada, France, Italy, Japan, Spain, and the UK, no long-run diversification opportunity is available in any sector. In case of Australia, (Healthcare, Pharma & Bio, and Industrial met), In Finland; (Technology, and Industrial met), in Germany; (Oil and Gas), and the USA; (Healthcare, Consumer Services Industrial, Pharma & Bio, and Technology)out of 11 common sectors have diversification opportunities with developed country level portfolio excluding home country.

There are various combinations available for short-run diversification in developed countries. They have short-run diversification against portfolio excluding home country. In case of Australia; (Financial, Healthcare, Consumer Services, Telecom, Industrial, Pharma & Bio, Technology, Industrial met, and Oil & Gas), In case of

Canada; (Healthcare and Pharma & Bio), in Finland; (Healthcare, Industrial, Chemical, Pharma & Bio, Industrial met, and Oil & Gas), in France; (Telecom, Chemical, and Industrial met), in Germany; (Healthcare, Consumer Services, Pharma & Bio, Industrial met, and Oil & Gas), in Italy;(Healthcare, Consumer Services, Pharma and Bio, and Industrial met), in Japan; (Healthcare, Consumer Services, Telecom, Industrial, Technology, and Industrial met), in Spain; (Utilities and Technology), in the UK; (Telecom, Chemical, and Pharma & Bio),in the USA; (Industrial met) have short-run diversification opportunities.

Emerging countries also have few options of long and short-run diversification opportunities. Brazil, India, South Korea, and Poland have no long-run diversification opportunities in emerging countries. In China; (Technology) and Turkey; (Chemical, Pharma & Bio, Technology, Industrial met, and Oil & Gas). Short-run diversification is available in emerging countries except for India. In case of Brazil, (Financial, Utilities, Healthcare, Consumer Services, Telecom, Industrial, Chemical, Pharma and Bio, Technology, Industrial met, Oil and Gas), in China; (Healthcare, Consumer Services, Industrial, Pharma & Bio, Industrial met, and Oil &Gas), in South Korea;(Utilities, Consumer Services, and Industrial met), in Poland; (Healthcare, Industrial, Pharma & Bio, Industrial met, and Oil &Gas), in South Korea;(Utilities, Consumer Services, and Industrial met), in Turkey; (Financial, Utilities, Healthcare, Consumer Services, Telecom, Chemical, Pharma & Bio, Technology, Industrial met, and Oil & Gas).

We can conclude there are short-run diversification opportunities available in developed and emerging countries at a disaggregated level. Still, only a few options are available in case of long-run diversification. Further, this phenomenon can be tested on aggregated and disaggregated levels using more countries and sectors.

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