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A Comparative Study on the Industrial Augmented Global CAPM and Global CAPM: Evidence from developed markets

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Abstract: The current study is intended to examine the Global CAPM for the estimation of the cost of equity in developed markets. Although the industry risk premium is suggested in the literature to be incorporated as a risk factor it is not empirically evidenced before. The study has included industry risk along with Global risk premium and formulated industrial Global CAPM. Fama- Macbeth cross-sectional regression is employed for the comparative analysis of these models Global CAPM or Industrial Global during timeframe June 2002-July 2017. Slopes are estimated by using 36 months window for each company and standard errors are adjusted by using Newey-West errors method for results robustness. Results suggest that Industrial Global CAPM has more explanatory power in predicting stock returns as compared to Global CAPM in stock markets. The study covers a comprehensive insight to corporate managers, financial analysts, policymakers and individual investors in accessing the cost of equity and align their decisions accordingly.

JEL Classification: G10, G15

Key words: Global CAPM, Industrial Global, Developed markets, Cross-sectional Regression and Cost of Equity

1.0 Introduction

Damodaran (2016) argue that the integral part of almost every strategic business decision is valuation. It is one of the worth seeking elements in finance theory and investors give due consideration to it while making investment and financing decisions. A complex procedure and a great deal of uncertainty are involved in the valuation of assets. This uncertainty increases with the increase in global activities of the firm (Bai & Green, 2020)

The main goal of an organization is to maximize the value of shareholders. Therefore to access the value of the company it is essential to include not only the future cash flows of the company but also consider the accurate discount rate for the estimation of required returns of shareholders. The estimation of the cost of equity is a great challenge for market participants, academics, investors, business analyst and others (Damodaran, 2020).

Empirical Finance shows various models including the dividend discount model, comparative earnings, risk premium, Capital asset pricing theory and Arbitrage pricing theory to estimate the cost of equities. These models have deficiencies in one way or the other. Comparative earnings use book values to compute the cost of equity but equity is market-oriented. The dividend discount model uses a constant growth rate but growth opportunities at the same rate are not available to any firm. The inherent element of risk premium is long term debt but family-oriented businesses avoid debt in their capital structure (Duarte & Rosa, 2015). Capital asset pricing theory (CAPM) is a more advanced and popular model to estimate the cost of equity but it includes relevant risk rather than all market uncertainty (Situm, 2021). Risk factor loadings and risk factors are unknown in Arbitrage pricing theory.

CAPM has a strong theoretical premise and various variants of CAPM including Fama and French's three-factor model and five-factor model have been developed over the time period to estimate equities (Erdinç, 2018). Each model has its limitation for estimation of equities so there is a need to develop a model that gives better results as compared to previous ones. (Harvey et al., 2016) proposed that systematic risk is composed of four factors. These are global risk, emerging market risk, local country risk and corporate industry risk.

Financial markets around the globe are integrated and an investor can invest in any stock market to diversify its portfolio. As a result, a Global CAPM has been developed that encounter all the risks associated with all stock markets but this model is still lacking the adjustment of industry risk premium. The study attempts to fill this gap in the literature and empirically investigate the industry risk premium for explaining the expected return of equities in the Global CAPM environment. Moreover, the study answers the questions. Is Global CAPM with industry risk adjustment better estimates the equities in developed markets? Which model Global CAPM or Global CAPM with industry risk premium (Industrial CAPM) is more appropriate in measuring the cost of equity?

The prime novelty of the study is to extend the capital asset pricing model incorporating risk factors to enhance the predictability of the model theoretically and empirically. This is beneficial for investors, fund managers, stockbrokers and other market participants to improve the quality of decision making while doing investment around the globe. The accuracy for estimation of equities may be increased than before. The current study provides comparative insights for the estimation of equities using Global CAPM and Industrial CAPM in multiple developed developed markets. In line with Fama and French (2015), Fama and Macbeth cross-sectional regression is applied for the computation of estimators in stock markets of Canada, France, Japan, U.S, U.K and Germany.

2.0 Theoretical and Empirical literature of the study

The origin of capital asset pricing theory can be traced from two theories market efficiency and modern portfolio theory. Market efficiency theory generates two other theories including efficient market hypothesis and random walk. According to Samuelson (2016) market is efficient if any information is disseminated in the market and known to investors it is eventually priced in stocks. It is a common observation that information in the market is processed in different ways that result in disagreement in future prices of a company's stocks creating random walk.

Markowitz (1952) uses a statistical technique standard deviation to quantify the risk of security. Markowitz provides the guideline to investors about the best investment strategy while proposing an

efficient frontier curve. Markowitz frontier is comprised of different portfolios and investor can select one of the best portfolios based on risk and return.

Sharpe (1964) develops an econometric model of capital asset pricing theory and measure the relationship between risk and return and report that a linear and positive relationship exists between systematic risk and expected returns of financial securities. Systematic risk arises in response to overall movements of the market named as market risk. Capital asset pricing theory is the most popular and most acceptable theory for the estimation of cost of equity and fair price of individual assets can be assessed in the market.

Most of the studies Filho (2018) on the Berzelian stock market, Hussain and Islam (2017) on the Indian stock market and Wu et al. (2017) on the Pakistan stock market report that CAPM is a tool to properly explain the risk and return relationship in stock markets. There are certain limitations of CAPM that affect its implication worldwide have opened new avenues for the researchers and consequently, extensions of CAPM with three-factor (Fama & French, 1992), four-factor (Fama & French, 1992) and five-factor (Fama & French, 2015) have been introduced over time.

Karolyi and Stulz (2002) argue that investors are interested in real returns of investment. Therefore they measure that portion of risk that contributes to the variance of return. This supports the argument that all the investors have homogeneous expectations for available consumption opportunities as claimed in purchase power parity (Mizioek et al., 2020). The financial markets are not integrated into domestic CAPM but this problem is well addressed in Global CAPM. All the financial markets have the same baskets of securities and purchase power parity theory exists everywhere in the world. Therefore it is possible to develop a single cost of equity model that captures all the risks that are related to all financial markets. To explore the risks associated with all stock markets motivated the practitioners and academicians to initiate working on Global CAPM.

In the early domain of empirical testing of Global CAPM, Stehle (1977) has created the Global portfolio using equally-weighted stock returns of financial markets including Canada, France, Japan, Italy, Belgium, Switzerland, Netherlands, Belgium, UK and the US. Local and Global-CAPM are employed for the estimation of equities. They found statistically significant but positive betas in stock markets. Heston and Rouwenhorst (1994) come up with the findings that the benefit of global diversification exists in Global CAPM because financial markets are integrated. Therefore there is a need to incorporate all the risks that can be derived from purchase power deviations. Machado et al. (2013) have investigated various factors including interest rate, inflation rate, gold price and exchange rate in ICAPM in the Brazilian stock market for 1988 to 2012. The findings of the study show that contribution of all the factors except the exchange rate is statistically significant positive in pricing the equities. Polakow and Flint (2015) have estimated the equities using global risk factors in the equity market of South Africa. Results of the study report that the influence of the global risk factor is positive but moderate to the global risk factor in estimating the cost of equities. However, the stock market is more responsive to international event sub-prime mortgage crises in 2008.

Godeiro et al. (2016) empirically analyze the ICAPM in developed and emerging markets. MSCI world index has been used for computing time-varying beta using the GARCH approach. Inflated but insignificant betas have been observed in emerging markets as compared to developed ones. Furthermore, CAPM in the international framework fails to explain the cross-sectional variation in stock returns. Kam and Trussler (2017) incorporate various models for the estimation of equities and findings of the study support that inter-temporal CAPM exhibit better explanatory power as compared to other models. In the same line, Ejara et al. (2020) investigate Local CAPM, Global CAPM and ICAPM for estimation of individual stocks of 46 countries. The results of the study found that the choice of the model in the estimation of equities affects their valuation in many, but not all, countries.

Recent domain in equity estimation can be traced from the work of Bai and Green (2020). Their study includes industry and country factors in Local as well as Global CAPM for asset pricing in partially

integrated financial markets. Their findings indicate that country factors are determinants of asset pricing before 1996 in the Global framework but after 1996 industry and country factors both are contributed to explaining the variations of stock returns in Local and Global context. Carvalho et al. (2020) find that the equity risk premium in the Brazilian stock market is consistent with the Global risk premium.

The mixed results about Global CAPM motivate the researcher to re-investigate the phenomena of global risk premium by adding new risk adjustment and modify it. Therefore this study is conducted to incorporate the industry risk premium in Global CAPM. This study makes its contribution to the existing literature by proposing Industrial Global CAPM for the estimation of equities in developed countries from 2002 to 2017.

2.1 Conceptual Framework and Hypotheses of the study

Academicians and practitioners rely upon capital asset pricing theory (CAPM) for estimating a firm's equity in the context of the cost of capital. Firstly, it supports the corporation to assign the discount rate by accessing the risk of a particular asset or project. So corporation selects profitable projects having a higher rate of return than risk. Secondly, it also helps the investors to develop a framework that identifies overvalued and undervalued securities and access the risk associating with a particular portfolio.

CAPM with negative beta in stock markets is troublesome. To maintain the level of required cash flows the firm can select zero return projects but practically company avoids this approach. So an alternative solution is proposed in the form of Global CAPM. According to Global CAPM, the same basket of shares for investment is available in different countries as purchase power parity theory holds globally. Global CAPM supports market integration and develops a single model for the cost of equity that encounters all the risks associated with all financial markets. Moreover, the addition of risk factors in CAPM is a way to increase the confidence of investors in market models. Therefore keeping in view the importance of industry risk premium in a Global Context, the current study attempts to incorporate it in Global CAPM for the estimation of equity (Harvey et al., 2016).

2.1 Hypotheses of the study

From the theoretical and empirical literature following hypotheses can be generated for the empirical analysis of the study.

H_1 = There is an impact of Global risk premium on the expected returns of developed markets

H_1 = There is an impact of Global risk premium along with industry risk adjustment on the expected returns of developed markets

3.0 Research Design of the study

3.1 Population of the study

The population of the study is comprised of 23 developed markets listed in MSCI developed market index.

3.2 Sample of the study

The sample of the study is comprised of 6 developed markets that are listed in MSCI developed market index based on their market capitalization. The developed markets included in the study are Canada, Germany, France, UK, the USA and Japan.

3.3 Data Description

Data of non-financial companies listed in developed markets from June 2000- July 2017 have been collected from Bloomberg and Thomson Financial DataStream. The study uses, monthly share prices, adjusted for stock dividends, stock splits, and rights issues, for the sample period running from June 2000 to June 2017. Relevant market indexes have been used as proxy market returns. The three-month risk-free rate has been taken as a proxy of the risk-free rate. Monthly stock returns of all the available stocks, as well as market, are calculated by using the formula $R_t = ln\ ln\ \left(\frac{p_t}{p_{t-1}}\right)$.

4.1 Methodology of the study

The study applies Fama and Macbeth (1973) cross-sectional regressions on the recommendation of Cederburg & O'Doherty (2016), after deriving the time series beta to test the basic risk and return relationship between expected return and systematic beta. The methodology of the study is comprised of different steps. In the first step, the study has computed the excess global return using Morgan Stanley Capital International Index and US three-month t-bill. In the second step time-invariant global market risk is estimated by applying Fama-Macbeth regression using excess global premium as the independent variable.

Cross-sectional regression between independent variable excess global premium and dependent variable mean returns have been applied to examine the variation of returns in developed markets in the third step. In the last step Global model is modified by including industrial risk factor and cross-sectional regression is applied to examine the role of Industrial risk premium in asset pricing.

4.2 Fama-Macbeth Methodology

The study in line with the framework (Cederburg and O'DOHERTY,2016; Fama and French, 2015) Fama and Macbeth (1973) cross-sectional regression is applied to empirically examine the different risk factors for estimating the cost of equity. Fama and Macbeth's cross-sectional regression is comprised of two-step regression. In the first regression, betas are estimated by regressing securities return against risk factors. Risk premium coefficients are determined by regressing portfolio returns against factor exposures.

4.3 Industry Equally Weighted Index

Industry equally weighted index is constructed to incorporate the industry risk premium in Global CAPM. Free float methodology is used to develop the index. Firstly firms are selected based on maximum sector approach and assign weights to these stocks based on free-float adjusted market capitalization (Pereiro, 2001). All those companies are included in the sample that has roughly 90% of the total trading activity and market capitalization and hence the selected sample is a good representative of the overall market.

4.5 Econometric Model for the study

The econometric model of the study is presented as

$$E(R_i) = R_f^G + \beta_i^G \left(R_i^G - R_f^G\right) \text{---------- Global Model}$$

$$E(R_i) = R_f^G + \beta_i^G \left(R_i^G - R_f^G\right) + \beta_i^{IND}\left(R_i^{IND} - R_f^L\right) \text{---------- Industrial Global Model}$$

Where

β_i^G: Beta of the security with respect to the Global market

β_i^{IND}: Beta of the security with respect to the Local Industry

$\left(R_i^G - R_f^G\right)$ Excess Global Market Return

$\left(R_i^{IND} - R_f^L\right)$ Excess Industry Return

5.0 Results and Discussion

Table 1 reports monthly excess average firm return (R_f-R_f), excess global market return (R_G-R_f), and excess industrial return (R_{Ind}-R_f), monthly standard deviation and correlation matrix for all the selected markets. The maximum monthly firm excess return that one can earn is .5% from the US market, while the maximum loss in return has been observed in the German capital market. In the same lines industrial monthly excess return is highest in France, and negative return in the context of the industrial sector has been seen in Japanese stock markets. Monthly deviation in these returns is seen higher in firms of Frankfurt Stock Exchange, Germany which is 15.5%, while Firms of Shanghai stock market is more stable than other developed stock markets. Industrial excess returns are seemed to be less deviated from firms return. The

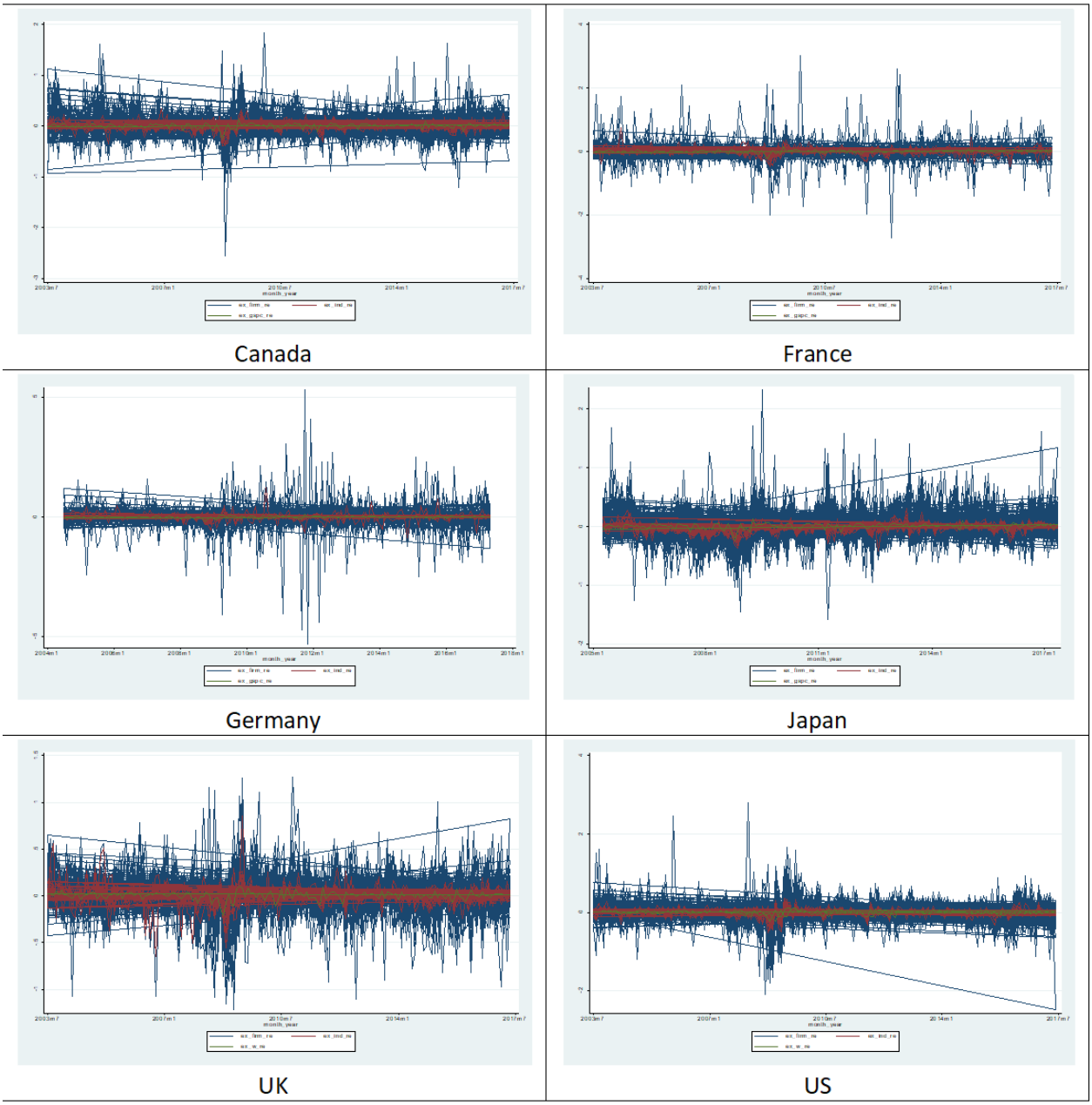
relationship among these three factors is highest in the US stock market, while lowest in France stock market.

Table 1 Descriptive Analysis and Correlation Matrix

Country	Variable	Mean	Std. Dev.	1	2	3
Canada	Excess Firm Return	0.002	0.136	1		
	Excess Global Return	0.004	0.043	0.08*	1	
	Excess Industry Return	0.004	0.067	0.48*	0.13*	1
France	Excess Firm Return	0.003	0.126	1		
	Excess Global Return	0.004	0.043	0.07*	1	
	Excess Industry Return	0.005	0.063	0.35*	0.09*	1
Germany	Excess Firm Return	-0.0001	0.155	1		
	Excess Global Return	0.004	0.043	0.23*	1	
	Excess Industry Return	0.001	0.067	0.27*	0.47*	1
Japan	Excess Firm Return	-0.029	0.105	1		
	Excess Global Return	0.004	0.043	0.13*	1	
	Excess Industry Return	-0.028	0.065	0.60*	0.21*	1
UK	Excess Firm Return	0.002	0.116	1		
	Excess Global Return	0.004	0.043	0.08*	1	
	Excess Industry Return	0.004	0.066	0.41*	0.13*	1
US	Excess Firm Return	0.004	0.115	1		
	Excess Global Return	0.004	0.043	0.42*	1	
	Excess Industry Return	0.004	0.071	0.61*	0.62*	1

Graphical Description of Data

Each graph has been constructed by using the excess industrial risk premium, firm-specific risk premium and global market risk premium. It shows that excess firm risk premium has more volatility with sharp spikes than the excess global and industrial risk premium, although all the returns have sharing the same mean



The results of Table 2 suggest that Global CAPM does not hold over the examined period in all the developed markets. The premium for bearing market risk is positive and significant only for Germany and the USA at 10% and 5% significance levels whereas all others stock markets have insignificant results over the reported period. The global CAPM model is justified in the USA and Germany because these markets are sufficiently integrated and the trend of investors towards internationally diversified portfolios is progressing around the Globe. Therefore Global CAPM can be used in computing the discount rate in Germany and USA stock markets.

Global betas are insignificant at all levels in Canada, France, Japan and U.K. This supports that these markets are partially integrated therefore, betas computed using the world market index are insignificant risk measures in estimating the cost of equities in these developed markets. The investors may

do some adjustments as industry risk while using the Global index to overcome this obstacle. The table reports that the capital asset pricing model cannot be used as a single cost of equity model in all developed countries. The results of the study support the Ejara et al. (2019) study that Global CAPM does not help in explaining the cross-sectional returns of all stock markets.

Table 2 Global CAPM Model:

	β_G	Constant	R^2
Canada	0.0653	0.0059	0.05
	(0.648)	(0.022)	
France	0.0245	0.0058	0.05
	(0.547)	(0.019)	
Germany	0.67*	-0.001	0.1719
	(0.484)	(0.020)	
Japan	0.1359	-0.028*	0.0515
	(0.497)	(0.018)	
UK	0.031	0.006	0.049
	(0.548)	(0.020)	
US	0.961**	0.001	0.214
	(0.701)	(0.024)	

*,**,*** indicates the significance at 10%, 5% and 1%
SE are reported in ()

Industrial Global CAPM results are reported in table 3. Results indicate that industry risk premium is positive and significant in all developed capital markets including Canada, France, Germany, Japan, UK and USA. Industry risk is adjusted in Global CAPM on the basis of an argument that the stock of a particular industry is exposed to all the risks associated with this industry. Previous researches empirically evidenced that industrial returns can predict stock market movements (Wang et al 2020; Lim 2020)

Various potential reasons make industrial risk a systematic factor in asset pricing. According to Hirshleifer et al. (2020), the operating decisions reflect the strategic interactions among participants in the market. These operating decisions of any industry make their cash flows uncertain and as a result stock returns are affected. For instance innovation in competitive industries is obvious. If innovation risk is priced, stocks of competitive industries can earn high returns. Similarly, if the barrier for entry in the market insulates some industries from demand shocks while exposing others, it would expect that stocks with higher barrier risk will earn abnormal returns in stock markets. The demand and supply of a firm in a particular industry are also affected by environmental forces and economic performances. These forces and performances are correlated with their returns (Li et al., 2021).

The significant coefficients of industry risk betas support Bai and Green (2020) that industrial risk explains stock return's variations in stock markets. R-square is higher in almost all the models for all the countries. This indicates that the inclusion of the industrial risk increases the power of the model, which also means that it should be part of the model for the estimation of the cost of equity.

Table 3 **Industrial Global CAPM Model:**

	β_G	β_{Ind}	Constant	R^2
Canada	0.097	0.992***	-0.0007	0.397
	(0.497)	(0.321)	(0.019)	
France	0.041	0.703***	0.0016	0.262
	(0.480)	(0.341)	(0.018)	
Germany	0.2727	0.6843*	-0.0014	0.310
	(0.531)	(0.540)	(0.019)	
Japan	-0.0083	0.9722***	-0.0013	0.407
	(0.397)	(0.273)	(0.017)	
UK	0.022	0.834***	0.0001	0.321
	(0.478)	(0.329)	(0.018)	
US	0.083	0.933***	0.001	0.470
	(0.486)	(0.315)	(0.016)	

*,**,*** indicates the significance at 10%, 5% and 1%
SE are reported in ()

6.0 Conclusion and Policy Implication

The results of the study conclude that Industrial risk premium is an important determinant for the estimation of cost of equity in the Global framework and provides more predictive power to the existing Global CAPM in the developed stock market. Commonly, CAPM has been widely used for estimating the cost of equity despite the debate that it is an inefficient estimator. Different practitioners and academicians attempted for accurate estimation of cost dynamics by modifying CAPM including various factors. In the same line, the study has used industry risk premium that has not been practically evidenced before, in Global CAPM for estimating equities in developed markets.

The findings of the study reveal that all developed stock markets including Canada, France, Germany, Japan, UK and the USA consider industrial factors in asset pricing. These industrial factors in the form of risk premium significantly affect the stock returns. If industry risk is priced, it is very helpful for investors to construct a portfolio with better risk and return characteristics. Moreover, risk diversification across industries is possible along with geographical diversification in portfolios. Although Industrial Global is a great contribution in the literature for estimating the cost of equity in developed markets but still there is a need to modify the research model as well by including other factors to estimate equity cost in all countries. So, future studies should be conducted in the context of modification of Industrial Global CAPM. Moreover, the study should be conducted in emerging markets for comparative analysis.

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