CROSS COUNTRY EVALUATION OF EQUITY RETURN CONCEPT: AN EMPIRICAL STUDY ABOUT THE RELATIONSHIP BETWEEN ACTUAL AND EXPECTED RETURNS

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Abstract

This paper studies the concept of equity returns and sees whether there is a significant difference between the expected return which is calculated through the capital asset pricing model (CAPM) and the actual return given by the stock. For this study, 10 stocks with maximum market capitalization are taken focusing on 12 countries for our research subdivided into developed and developing countries. The period of study is 10 calendar years from 2010 to 2019. The hypothesis being whether the actual stock returns are significantly different from the expected stock return, for the same paired t-test has been deployed on 120 stocks to check the significance. Further evaluation has been done to check whether the expected return is undervalued or overvalued in reference to the actual return. To check whether there is a significant difference between the actual and expected return across the companies, panel regression was used, and then the same was done to check whether there is a significant difference between countries and also whether there is a significant difference on the basis whether the countries are developed or developing. The authors have existing research confined to particular geographies that discuss VAR models.

Keywords: CAPM, Developed and Developing Countries, Equity, Risk-Free Return, Market Return

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1. INTRODUCTION

A capital market is a place where investments of suppliers are channelized to those who are in need of funds. Capital market is a place to improve transactional efficiency, capital markets bring those who hold capital and those who require capital. It is a place where entities can exchange funds with securities. Pricing is the major problem in the capital market. Pricing inequity is similar to that in commodity, it is based on demand and supply. But the factors that impact the price of the capital market are much more complex than that of the commodity market. For calculation of the price,

the capital asset pricing model (CAPM) is a financial solution for many asset pricing problems. The core research question is whether there is a significant difference between the expected return which is calculated through CAPM and the actual return given by the stock across 12 countries.

CAPM is a mathematical concept that helps in estimating the relationship of expected returns for the risk of the same asset. It tells us how much extra return an investor looks for investing in a risky asset by comparing it to the returns he will get in risk-free security. It is used majorly in the field of finance to estimate the return expected from the securities that include risk, hence, this model helps in estimating the risk to invest in security. CAPM has introduced a theoretical explanation of the behavior of securities, it is majorly used to calculate the cost of equity capital of the firm. This model is particularly used for stocks. This model has been very advantageous to several people like prospective shareholders, creditors, financial managers, investors, and potential lenders.

The CAPM faces problems that might reflect the theoretical weakness of the model because of many of its assumptions to make its calculation easy, but some of these assumptions may also lead to difficulties in achieving valid results CAPM.

CAPM is the return an investor expects for a given amount of risk and returns. The risky assets tend to give more returns than the riskless assets with the belief that generally investors are risk-averse and want an additional return for the amount of risk they are taking. Hence, the riskier the asset, the more the return.

Countries which are having the twelve most liquid stock exchanges are selected. Countries have been segregated on the basis of whether the countries are developed or developing according to data provided by the UN as of the year 2019 (UN, 2019). The developed countries included the USA, Japan, the UK, Canada, Germany, and Portugal. The developing countries included India, China, Singapore, Hong Kong, the UAE, and Brazil.

This paper discusses whether there is a significant difference between actual and expected returns given by security. For this, t-test, panel regression, and various tests have been used to understand the relationship better and to infer that whether the results provided by CAPM are overvalued or undervalued as compared to actual returns given by the same stock.

The paper is structured into 6 sections. This section being Introduction, the next section provides an extant review of the literature. Section 3 discusses the research methodology. Section 4 provides details about research analysis and Section 5 provides the findings. Section 6 concludes the paper.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

One of the seminal works in this area comes from Jarrett (2008). A paper discusses if stock markets are efficient then it should be impossible to predict stock returns. In this research paper, it was found that daily effects exist in stock market returns. The focus on capital market efficiency and on the familiarity of these principles in analyzing the performance of Hong Kong and Tokyo stock exchanges. The author concluded that stock returns are predictable and there are explanations for short-term predictability in the market.

A specific to Nigeria study was conducted by Nwude and Agbo (2013). This research paper was on testing that how good CAPM is for determining the required rates of return of Nigerian stocks of conglomerates sector. The objective of this study is to find out the required rate of return of Nigerian Conglomerates sector stocks for a period from 2000 to 2012 and compare them with the actual rates of return in the same periods. The conclusion drawn was that the CAPM, as detailed by Sharpe (1964) (as cited in Nwude and Agbo, 2013), did not give any appropriate forecast of the returns from the conglomerates sector stocks throughout the thirteen-year period of study. The CAPM made 56 under-valuations and 61 overvaluations to form a complete of 117 misappropriations within the thirteen years period of study. Therefore, CAPM was considered not a good predictor of stock return in the conglomerates sector of the Nigerian Stock Exchange.

Another paper, specific to Brazil, was published by Godeiro (2013). The paper was a major addition to the body of knowledge. The paper tests CAPM for stock in the Brazilian stock market by dynamic betas. The sample involves 28 stocks that were traded during the period from January 1, 1995, to March 20, 2012. It was found that the projected betas have a significant increase during times of crisis, representing an increase in non-diversifiable risk during these periods. The increased risk during crisis occurs because of the loss of attractiveness of equities and the fall in their prices. The test methodology of Fama and McBeth (1973) isn't valid for Brazil in the period surveyed, since there was no significant relationship between excess returns and betas, i.e., stocks with higher non-diversifiable risk weren't the stocks with the greatest excess return.

The stocks listed on London Stock Exchange (LSE) were studied by Nwani (2013). The paper observes the relationship between returns and beta of the stocks which are listed on the LSE. A hundred stocks were randomly selected from the calendar years from 1996 to 2013 on monthly basis. The study tries to figure out whether beta has explanatory power in explaining the variation of the stocks selected. The result concluded that beta, as a single explanatory variable, was very insignificant in determining the stock returns for the study period as companies in LSE are not significantly sensitive to the betas, it was inferred that maybe more variables are required to see the exact relationship of variables with the returns.

Another major work from China by Zhang and Meng (2013) covers the relationship of CAPM in the Shanghai Stock Exchange. The result could help Chinese investors to effectively guide the formulation of investment strategies and understand pricing behavior in the Chinese stock market. The results showed that the CAPM doesn't apply to the Chinese stock exchange as it is still in the development phase and doesn't have a strong form of efficiency like that of a mature market. The result concluded that there is a linear relationship between beta and the returns of the company which are listed on the Chinese stock market.

The paper by Zheng and Meng (2013) is a seminal work that talks about Chinese markets. The author used the multivariate test method to perform the empirical test of CAPM in the Chinese stock market. It was found that the null hypothesis that the market proxy is on the mean-variance frontier is rejected. In this paper, some classic literature about the empirical study of CAPM was introduced, and then the multivariate test is selected to be the most appropriate method to solve the research problem of this article, namely the efficiency of Shanghai: a share index as a market proxy. The test result shows that the null hypothesis is rejected, implying that Shanghai is not on the mean-variance frontier.

A multi-exchange study conducted by Raza, Jawaid, and Hussain (2014) tries to validate and check whether CAPM acceptable in 4 different stock exchanges of Asian countries, namely Jakarta Stock Exchange, Kuala Lumpur Stock Exchange, Hang Seng Stock Exchange, and Shanghai Stock Exchange. For the calculation of the same paired sample a t-test was used to check the difference between the expected and actual returns of companies in these countries. The study concluded that CAPM was useful in calculating the returns of the companies in these countries. For long-term investments, results concluded that Shanghai and Jakarta Stock Exchanges were preferred, and for both long-term and short-term investments Kuala Lumpur and Hang Seng Stock Exchanges gave a suitable result.

A research paper written by Pacho (2014), aims to discuss CAPM model validity. CAPM has been discussed in 4 categories, which are the CAPM as a single factor model, supportive evidence of CAPM in multi factors and evidence against it through various literature. It was found that CAPM is a very useful technique for investors to check out the profitability of projects of the companies in which they invest and it is useful for the management to check the returns expected by the project or company in the future.

A comparative study between Indian and American markets was written by Chaudhary (2016). Asset pricing is one of the key research areas in the field of finance. The simple CAPM relates the return of the stocks and portfolios to the market factor captured by beta. CAPM was used on data from the calendar years from 2001 to 2005 in both countries, that is India and the US, to calculate the expected returns for the period. The researcher ran a cross-sectional regression equation about 84 times to test whether the CAPM was applicable or not. Then, it was concluded by the author that in the case of India and the USA, the CAPM model is not able to capture a cross-section of returns. The utility of the findings is that the investors, those who wish to make an investment in financial markets, should consider other factors also in addition to the market factor. The market factor is one of the most common factors which is widely used and made popular by Sharpe (1964). However, the findings suggest that the popular belief paying too much attention to the market factor only should be replaced by well-placed attention to the additional factors.

One such model is the three-factor Fama-French model (Fama & French, 1992). which considers additional factors in the form of size and value effect. This is more important because the financial markets are dynamic and not static, therefore, the investors and financial analysts should also evolve the new and more appropriate methods to assess returns in a better way. The future scope of the present study to incorporate the ideas provided by Fama-French to empirically test the asset pricing model rather than focusing only on the beta factor.

Risk and return analysis play an important role in the most individual decision-making process. A research paper by Poornima and Swathiga (2017) studies the relationship between risk and return of 5 stocks in 2 different sectors (automobile and IT) of the National Stock Exchange (NSE) with the help of CAPM. By analyzing the stocks from 2 different sectors, investors will find it valuable in which sectors to invest. The risk and return analysis linked with any industry reveals the difficulties involved with the particular industry. A study revealed in the research period that the automobile sector showing positive return and low risk as compared to the IT sector showing negative return and high risk. The study of relationship risk and return analysis helps the investor to pick up the securities and sectors based on his risk appetite.

The paper by Shrivastav (2017) discusses empirical examination of the validity of CAPM by examining whether risks of the stocks are related to their expected return of the stock and analyze whether the expected rate of return is linearly related to its beta-systematic risk. The stock return of 15 companies listed on the NSE was analyzed for a period of 5 years from January 2006 to December 2010. Portfolio and cross-sectional analyses were the two methods adopted to test the validity of CAPM. The findings of the study were that the CAPM philosophy of higher returns for higher beta could neither be established for individual stocks nor for the portfolios and the intercept is non-zero in both cases.

A research paper written by Al-Qudah (2017) compared the historical returns in companies listed in Abu Dhabi Securities Exchange (ADX) with the return calculated by CAPM for the same companies and periods. The researcher found that in most of the cases CAPM was unable to forecast the returns of companies that were listed in ADX.

A research paper by Satyaprasad (2018) was performed to check whether the stocks are undervalued or overvalued in India's Stock Exchange for three sectors: FMCG, Pharmaceuticals, and BFSI. For the analysis, various statistical tools were used like mean, standard deviation, coefficient of variation, return, and beta. The adjusted net operating profit, which was a traditional performance evaluation technique, showed how healthy is the financial positions of the company. It was also concluded that value creation ability doesn't have a significant difference during the study period.

A research paper by Zhou and Liu (2018) describes the relationship between the expected return of a security and risk of the same security in the market and provides the equilibrium price to risky assets. Hence, making significantly important to test the validity and applicability of the CAPM in the capital market of China. Monthly data of 100 stocks from January 1, 2007, to February 1, 2018, are taken by the authors and then the time

series and cross-sectional data of the CAPM on the Chinese stock exchange were verified. It was found by the researchers that there was a significant negative correlation between the systematic risk and portfolio return during the study period. The result showed that the systematic risk cannot be explained by the expected return of the portfolio, making it inconsistent with the assumption of CAPM.

Objectives and hypotheses of this study:

1. To check whether there is a significant difference between the actual return and expected returns. For this, a paired t-test is used on every stock for all countries.

H_{01}: There is no significant difference between the actual and expected returns.

H1: There is a significant difference between the actual and expected returns.

2. Whether there is a significant difference in the actual and expected return between the return of developed and developing countries.

H_{02}: There is no significant difference in actual return and expected return based on whether the countries are developed or developing.

H2: There is a significant difference between the actual return and expected return on the basis of whether the countries are developed or developing.

3. To check whether the expected returns of stocks through CAPM are undervalued or overvalued as compared to the actual returns the stocks have given.

4. To investigate is there a difference across companies for every country on the basis of some fixed or variable factors which aren't observed or measured.

These factors vary across countries but not across times. For this, a panel regression is used in which the Hausman test is used. Hausman test is used to check which model is defining the unobserved behavior of the data, whether it is affected by random effects or fixed effects.

H_{03}: Random effect is the preferred model, which means cross-section errors are not related to the errors. This means that the randomness in the actual returns is random and not because of the companies.

H3: Fixed effect is the preferred model; cross-section errors are related to the errors. Hence, making the random effect model inappropriate. This means that the randomness in the actual returns are not random, i.e., fixed and are because of the companies.

5. To study whether there is a difference of expected and actual returns across countries, for this panel regression, the same Hausman test is used.

H_{04}: Random effect is the preferred model, which means cross-section errors are not related to the errors. This means that the randomness in the actual returns is random and not because of the different countries.

H4: Fixed effect is the preferred model; cross-section errors are related to the errors. Hence, making the random effect model inappropriate. This means that the randomness in the actual returns is not random, i.e., fixed and are because of the different countries.

The major objective of the paper is to check the validity of CAPM in 12 countries classified into two parts: developed and developing countries.

3. RESEARCH METHODOLOGY

Data taken for this study are secondary in nature and taken from Bloomberg for a period of 10 calendar years (2010–2019). To compute the return, simple average monthly returns are calculated for all the stocks and indices.

Table 1. Index of developing countries

Developing countries	***Index***
China	Shanghai Composite Index
India	S&P Sensex
Singapore	MSCI Singapore
Hong Kong	Hang Seng Composite Index
UAE	Abu Dhabi Security Market General Index
Brazil	Ibovespa Brasil Sao Paulo Stock Exchange Index

Table 2. Index of developed countries

Developed countries	***Index***
USA	S&P 500 Index
Japan	Nikkei 400
UK	FTSE 100
Canada	S&P/TSX Composite Index
Germany	Deutsche Boerse AG German Stock Index
Portugal	PSI 20 Index

In each country, the most traded index is taken and 10 stocks having the maximum market capitalization in the given index are taken.

The population is all the companies listed in all the 12 countries. For the sample, the top 10 markets capitalized stocks in the given index are chosen indicating that it is representing the market as a whole.

Here is a list of all the stocks taken for each country. The stocks are taken on the basis of the highest market capitalization in the chosen index. The other thing which is considered is that the data of the stock should be available for all the years starting from January 2009. Some stocks were not taken into consideration even after having a high market capitalization because of the reason that the stock data was not available for all the periods for this study. Following is the list of stocks selected for various countries.

Table 3. Stocks of developing countries

China	*India*	*Singapore*	*Hong Kong*	*UAE*	*Brazil*
ICBC	Reliance Industry Limited	DBS Group Holdings Ltd	Tencent Holdings Ltd	First Abu Dhabi Bank PJSC	Petroleo Brasileiro SA (PETR3)
Kweichow Moutai Co Ltd	Tata Consultancy Services Limited	Singapore Telecommunications Ltd	ICBC	Emirates Telecommunication Group Co PJS	Petroleo Brasileiro SA (PETR4)
PetroChina Co Ltd	HDFC Bank Limited	Oversea-Chinese Banking Corp Ltd	Ping an Insurance Group of China Ltd	Abu Dhabi Commercial Bank PJSC	Itau Unibanco Holding SA
Jiangu Hengrui Medicine Co Ltd	Hindustan Unilever Limited	United Overseas Bank Ltd	China Construction Bank Corp	Abu Dhabi Islamic Bank PJSC	Ambev SA
Bank of China Ltd	Housing Development Finance Corporation Limited	Wilmar International Ltd	Agricultural Bank of China Ltd	Aldar Properties PJSC	Banco Bradesco SA (BBDC3)
China Merchants Bank Co Ltd	ICICI Bank Limited	CapitaLand Ltd	China Mobile Ltd	Abu Dhabi National Energy Company PSC	Banco Bradesco SA (BBDC4)
China Life Insurance Co Ltd	ITC Limited	Singapore Technologies Engineering Ltd	HSBC Holdings PLC	National Bank of Ras Al-Khaimah PSC	Vale SA
China Petroleum & Chemical Corp	Kotak Mahindra Bank Limited	Jardine Cycle & Carriage Ltd	Bank of China Ltd	Dana Gas PJSC	Telefonica Brasil SA
Industrial Bank Co Ltd	Infosys Ltd	Keppel Corp Ltd	PetroChina Co Ltd	Abu Dhabi National Hotels	Banco do Brasil SA
Shanghai Pudong Development Bank Co Ltd	State Bank of India	Genting Singapore Ltd	China Merchants Bank Co Ltd	Sharjah Islamic Bank	Itausa-Investiment os Itau SA

Table 4. Stocks of developed countries

USA	*Japan*	*UK*	*Canada*	*Germany*	*Portugal*
Apple Inc	Toyota Motor Corp	Royal Dutch Shell PLC (RDSA)	Royal Bank of Canada	Adidas AG	EDP-Energias de Portugal SA
Microsoft Corp	Nippon Telegraph & Telephone Corp	Royal Dutch Shell PLC (RDSB)	Toronto-Dominion Bank	Daimler AG	Galp Energia SGPS SA
Alphabet Inc (GOOGL)	NTT Docomo Inc	Unilever PLC	Enbridge Inc	Volkswagen AG	Jeronimo Martins SGPS SA
Walmart Inc	Keyence Corp	HSBC Holdings PLC	Bank of Nova Scotia	Allianz SE	EDP Renovaveis SA
Amazon.com Inc	SoftBank Group Corp	BP PLC	Canadian National Railway Co	Siemens AG	Banco Commercial Portugues SA
Procter & Gamble Co Ltd	Sony Corp	AstraZeneca PLC	Brookfield Asset Management Inc	SAP SE	NOS SGPS SA
Berkshire Hathaway Inc	Mitsubishi UFJ Financial Group Inc	BHP Group PLC	Bank of Montreal	Bayer AG	Navigator co SA
JP Morgan Chase & Co	KDDI Corp	GlaxoSmithKlin PLC	SunCor Energy	Bayerisch Motoren Werke AG	Sonae SGPS SA
Johnson & Johnson	Fast Retailing Co Ltd	Diageo PLC	TC Energy Corp	Deutsche Telekom AG	REN-Redes Energeticas Nacionais SGPS SA
Visa Inc	Takeda Pharmaceutical Co Ltd	Rio Tinto PLC	BCE Inc	BASF SE	Corticeira Amorim SGPS SA

Under this paper, the expected return will be calculated by CAPM and then will be compared with actual returns to see the relation between the two returns.

The data is taken for 10 calendar years starting from 2010 to 2019. This paper aims to compare the actual returns given by the companies in the study period and then compare it by the returns which are calculated from CAPM also referred to as expected returns in this paper. So, after calculating the expected and actual returns for all the securities and for all the years, it is then tried to figure out whether there is any distortion or differences between the two returns calculated. And hence to check whether CAPM is a successful method in predicting returns of the securities. Then, it is figured out whether the dispersion of returns differs on the basis of whether the company is in a developed or developing market.

A panel regression will be used to check the effect of fixed variable and random variables on the output, according to country-wise data. Then cross-country evaluation is also done according to countries being developed and developing and panel regression is also used in the cross country evaluation.

CAPM:

$$E(R_{it}) = Rf + \beta * ERP \quad (1)$$

where,

$E(R_{it})$: Expected return of the asset computed through CAPM;

Rf: Risk-free rate of return;

ERP: Equity risk premium, which is calculated by subtracting the risk-free rate from market returns;
β: Beta.

4. RESEARCH RESULTS

4.1. Actual return calculation

Actual return is referred to as the return which an investor has got for investing in the study period. For calculation of actual return, we have used holding period returns (HPR) for calculation of return monthly basis. For calculation of actual return: R_{it} = Actual return; $P_{(t)}$ = Price of security at the end of the month; $P_{(t-1)}$ = Price of security at the beginning of the month.

4.2. Expected return calculation

An expected return is the return that an investor is expecting to get after investing in a particular security on the basis of the risk he is taking by investing in a particular security as compared to investing in the index. We have used CAPM for the calculation of the same.

$$E(R_{it}) = Rf + \beta * (Rm - Rf) \quad (2)$$

where,
$E(R_{it})$ = Expected return;
Rf = Risk-free rate;
Rm = Market return;
β = Beta.

A risk-free rate is referred to as the rate with zero risk. It is referred to the risk-free rate that the investor should expect in a risk-free investment over a time period. For calculation of interest rate for all the 12 countries, we have taken 10 years government yield as a risk-free rate.

Market return refers to the return which is given by the country's index. For calculation of market return, we have used HPR for the same on monthly basis.

Market premium refers to the difference between the return that the market has given as compared to the risk-free rate.

$$Rp = Rm - Rf \quad (3)$$

where,
Rp = Market premium.

Beta is the measure of systematic risk that an investor will face by investing in a single stock as compared to investing in the index. It helps us in calculating a premium or excess return a company should take for investing in that company as compared to the market. It is a coefficient that represents the covariance of stock with return with the variance of the market return. Beta has been taken by using returns of stock and index for 10 years on monthly returns.

Here,

Re = Return of the stock;

Var = Variance, how data points of market returns are spread out of their average value;

Cov = Covariances, refer to how the change in stock's return is related to the index's return.

4.3. Capital asset pricing model (CAPM)

The expected return of the stock is calculated by using CAPM. It can be calculated if we know the risk-free rate, market return, and beta of the security. It tells us that the required rate of return of an asset is equal to the risk-free rate plus its beta into the market premium. Calculation of CAPM can be done by:

$$Required\ return = Risk\_free\ rate + Beta * Equity\ risk\ premium \quad (4)$$

Assumptions of CAPM:

1. Investors are assumed to be rational and risk-averse.
2. Investors are price takers; hence, they do not influence prices.
3. Investors can lend and borrow unlimited money at a risk-free rate of interest.
4. All the trades happen without transaction or taxation costs.
5. Assume that all information is available at the same time to all investors.

4.4. Is there a significant difference between actual return and expected return?

Statistical test

Paired t-test, also known as the dependent sample t-test, is a statistical measure to determine whether the difference between the two samples is zero.

Procedure for t-test

1. Calculate the difference between both samples:

$$d_i = R_{it} - E(R_{it}) \quad (5)$$

where,
d_i = Difference between the actual return and the expected return.

2. Calculate the difference mean:

$$\bar{d} = \frac{\sum d}{n} \quad (6)$$

where,
$\bar{d}$ = Mean of differences;
n = Number of observations.

3. Calculate the standard deviation of the difference:

$$d_s = \sqrt{\frac{\sum_{i=1}^{n}(d_i - d)^2}{n-1}} \quad (7)$$

where,
d_s = Standard deviation of the difference term.

4. Calculate the test statistics:

$$t_c = \frac{\bar{d}}{d} \quad (8)$$

where,
t_c = T-test calculated value.

5. Compare it with the t-statistic value to conclude whether to reject the null hypothesis or fail to reject the null hypothesis.

We have used a 95% confidence interval to calculate whether there is a significant difference between the actual return and the expected return.

T-tabulated value for 120 observations at a 5% confidence interval.

$$t_{t\ at\ 5\%,\ df=119} = 1.980 \quad (9)$$

where,
t_t = T-tabulated;
df = Degrees of freedom, which is calculated by $n-1$. Here n is 120, hence 119 degrees of freedom.

Table 5. Significant t-stats for developing and developed country's companies

Developing countries	*Not significant*	*Developed countries*	*Not significant*
China	8	USA	7
India	7	Japan	9
Singapore	10	UK	9
Hong Kong	9	Canada	7
UAE	10	Germany	9
Brazil	10	Portugal	7

By doing a paired t-test on 10 stocks of all the countries, it was found that all 10 stocks' actual return was not different than expected returns in Singapore, the UAE, and Brazil. In Hong Kong, Japan, the UK, and Germany, 9 out of 10 stocks' actual returns were not different than expected return. For China, 8 out of 10 stocks' actual returns were not different from the expected return, and for the remaining countries, it was 7 of 10 stocks.

5. DISCUSSION

5.1. Is there a significant difference between expected and actual returns in developed and developing countries?

Regression is used to check whether there is a significant difference in expected and actual returns between countries on the basis of whether they are developed or developing countries. Regression is a statistical tool to check whether there is a relationship between a dependent variable with independent variables.

The regression equation for the same can be written as:

$$R_{et} = \alpha_0 + \alpha_1 * E(R_{et}) + \alpha_2 * (Time) + \alpha_3 * (D) + e_t \quad (10)$$

where,
α_0 = Constant;
α_1, α_2, α_3 = Coefficients;
e_t = Error term;
D = Dummy variable.

A dummy variable is a numerical variable, it can either be 0 or 1, which is used where the variable is a categorical variable. This is used to run a regression by converting categorical variable to numerical variable.

In our model, we have taken developing countries as 0 and developed countries as 1.

Table 6. T-stats to check the significant difference between developed and developing countries

Regression statistics	
Multiple R	0.927
R-square	0.860
Adjusted R-square	0.860
Standard error	0.020
Observations	1440.000

ANOVA					
	Df	*SS*	*MS*	*F*	*Significance F*
Regression	3.000	3.366	1.122	2940.722	0.000
Residual	1436.000	0.548	0.000		
Total	1439.000	3.914			

	Coeff.	*Std. error*	*T-stat.*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.001	0.020	0.063	0.950	-0.039	0.041	-0.039	0.041
Developed/Developing	0.001	0.001	0.801	0.423	-0.001	0.003	-0.001	0.003
Time period	0.000	0.000	0.104	0.917	0.000	0.000	0.000	0.000
Expected return	0.989	0.011	93.604	0.000	0.969	1.010	0.969	1.010

From the table, if we see the p-value of developing/developed countries is more than 5%, which is 42.3%. From this, we can conclude that there is no significant difference between expected and actual returns between developed and developing countries.

Now, we try to find whether expected returns through CAPM are undervalued or overvalued as compared to actual returns stocks have given.

5.2. Mispricing of stocks

It is believed that the market is always reflecting a fair price, it basically tells that market will determine the fair price because all the information is taken into account in the stock price and markets are often assumed to be having a strong form of efficiency. So, in this, the actual returns given by the market are from the fair price and the expected returns from CAPM sometimes differ, so hence it is

referred to as mispricing of stock. Mispricing can be either under-pricing in which the actual returns given by the market are more than what was expected, that is from its expected returns, and over-pricing, in which the expected price of the market is more than the expected returns. We have calculated the actual returns and the expected return of the stocks through CAPM:

$$Under\_pricing = Actual\ return > Expected\ return;$$

$$Over\_pricing = Expected\ return > Actual\ return.$$

Given tables show that the percentage of times the stock was calculated under-valued out of the total 120 months.

5.3. Is there a difference across companies for every country on the basis of some fixed or variable factors which aren't observed or measured?

Panel data regression has been used to check whether there is a difference across companies in the same country on the basis of either fixed or variable factors.

Panel data regression is observed on the same cross-sectional unit over several periods of time. We have used balanced panel regression, which means that the data have an equal amount of time observations for every cross-sectional unit.

There are two techniques to analyse panel regression:

1. *Fixed effect* — The intercept in the model is allowed to differ among individuals to reflect the unique feature of individual units.

2. *Random effect* — Random effect says that the difference among the cross-sectional data is because of random factors and not unique factors.

The R software has been used to calculate whether there is a fixed effect or random effect.

Hausman test has been used too. It tells whether the preferred model is of random effect or fixed effect. The hypotheses of Hausman effects are as follows:

H_{05}: Cross-sectional errors are not correlated with the regressors.

H5: Cross-sectional errors are correlated with the regressors.

Hausman test:

$$H = (\beta f - \beta r)[Cov(\beta f - \beta r)]^{-1}(\beta f - \beta r) \quad (11)$$

where,

βf = Coefficient of fixed effect model;

βr = Coefficient of random effect model.

If Chi-square is less than the p-value of 0.05, we reject the null hypothesis and if the p-value is greater than 0.05, we fail to reject the null hypothesis, which means that we accept the alternative hypothesis.

Here we will be going by each country and stating out which model was beneficial for which country on the basis of the Hausman test.

The summarized representation of preferred models for selected countries is provided in the table below. The detailed findings are mentioned post the table.

Table 7. Preferred models for selected countries

Country	*Model preferred*
China	Pooled OLS
India	Pooled OLS
Singapore	Pooled OLS
Hong Kong	Random effects
UAE	Pooled OLS
Brazil	Pooled OLS
USA	Random effects
Japan	Random effects
UK	Pooled OLS
Canada	Pooled OLS
Germany	Pooled OLS
Portugal	Pooled OLS

Pooled OLS regression was calculated and the p-value of the regression was significant, for further analysis fixed effect was ran and the random effect regression. Both the regressions generated significant p-values. Then we calculated a regression regarding which model to be chosen, fixed effect or pooled OLS regression. We ran the regression on R software and we obtained the p-value of 5.216%, which is greater than 5%, hence the p-value is not significant. Therefore, pooled OLS would be preferred. This concludes that there are no unique factors among companies.

For India, for the same reason as China, the p-value was more than 5%, which was 50.11%; hence, pooled OLS will be considered rather than fixed effect variable. Hence, cross-sectional data did not have an impact on the dependent variable.

For Singapore, the regression between the pooled OLS and fixed effect was not significant. The p-value was 72.75%. Hence, concluding that pooled OLS to be the better regression technique, signifying that there is no impact of the random or fixed variable between companies to generate returns.

Hong Kong has a significant p-value for testing whether to use pooled OLS or fixed effect, hence the random effect test was used to check whether the cross-sectional unit differs because of fixed factor or random factors. The random effect model also gave a significant result. Hence, Hausman test was ran to check which model to be preferred, the fixed effect model or random effect model. Chi-square for the Hausman test came out to be around 0.17, giving a p-value of 68.25%. Hence, we fail to reject the null hypothesis. Therefore, the random effect model is preferred, signifying the cross-sectional errors are not correlated with the regressors.

Pooled OLS regression is preferred for the UAE, as the test was not significant. Hence, the fixed effect model is not a good option to choose.

Pooled OLS regression is preferred for Brazil. This signifies that there is no fixed factor that affects the return of the companies.

For companies in the USA, showed significant p-value for both fixed and random effect variables. Hence, Hausman test was ran to check whether to prefer the random effect model or fixed effect model. Hausman test was not significant, Chi-square value came to be around 1.79, leading to the p-value of 18.04%, which is more than 5%. Hence, we fail to reject the null hypothesis. Therefore, the random effect model is the preferred model signifying the cross-sectional unit does not have an effect on the regressors, some random factors affect the dependent variable.

Hausman test was used to check whether the fixed effect model or random effect model is preferred. We concluded that the Hausman test values were not significant, stating that the random effect model to be used as cross-sectional units are not related to the regressors.

Pooled OLS regression was calculated and the p-value of the regression was significant, for further analysis fixed effect was ran and the random effect regression. Both the regression generated a significant p-value. Then, we calculated a regression regarding which model to be chosen, fixed effect or pooled OLS regression. We ran the regression on R software and we obtained the p-value of 81.85%, which is greater than 5%, hence, the p-value is not significant. Therefore, pooled OLS would be preferred. This concludes that there are no unique factors among companies.

For Canada, the regression between the pooled OLS and fixed effect was not significant. The p-value was 68.1%. Hence concluding that pooled OLS to be the better technique.

Pooled OLS regression is preferred for Germany. This signifies that there is no fixed factor that affects the return of the companies.

Pooled OLS regression is preferred for Portugal, as the test was not significant. Hence, the fixed effect model is not a good option to choose.

5.4. Is there a difference between expected and actual returns across countries?

Panel regression has also been used for checking whether there are fixed or variable factors on the basis of whether the country is developed or developing impacting the expected and actual returns of the stocks.

Pooled OLS was used, which showed that the p-value is significant, as the p-value was less than 0.05. Then, fixed effect model was used to check whether there is a difference in countries because of some variable. It was found that the F-statistic value of fixed effect regression was 8859.55. This signifies that the p-value was less than 5%. Hence, to compare whether the fixed effect model is useful or pooled OLS model, a test was ran on R software, which gave the F-value as 1.77, giving a p-value of 5.38%. This concluded that the pooled OLS regression is preferred at a 5% confidence interval. If we take a 10% confidence interval, we can conclude that there are some unique factors affecting the returns across countries throughout the study period, and if the Hausman test is used, it will suggest that the p-value is not significant, concluding that the factors affecting the returns are random across the countries.

6. CONCLUSION

It can be concluded that 85% of the time there is no significant difference between expected and actual returns in the case of top 10 stocks according to market capitalisation in 12 countries at a 95% confidence level. It can also be inferred that there is no significant difference between the actual and expected returns of developed countries as compared to developing countries for a period of 10 years as the p-value was 42.3%.

If we compare whether the actual stocks were overvalued or undervalued as compared to the expected returns, it can be said that almost 50% of the time the expected returns were greater than the actual returns and hence almost 50% times the stock's come out to be overvalued and 50% it comes out to be undervalued.

It was found that there is no significant difference between expected and actual return across companies in the case of Singapore, the UAE, the UK, Brazil, Canada, Germany, and Portugal. There is no difference across companies during the various time on basis of random or fixed effects and in the case of remaining countries, there was a significant difference in returns across companies during various time because of random factors affecting the returns. In the case of difference of returns across countries during various time, it was inferred that there was no significant difference between countries on basis of the random or fixed factors at a 95% confidence interval but there was a significant difference at a 10% confidence interval. Using the Hausman test it was concluded that the difference was because of the random factors across the countries and not because of fixed factors.

The risk-free rate of return is taken as the country's 10 years government bond yield, it is not the correct measure as there are chances of the government defaulting. Beta is assumed to be the same for all time durations. We are only taking the top 10 companies and assuming that it represents the whole universe of stocks listed on that stock exchange.

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APPENDIX

Table A.1. T-stats of companies across countries

China		*India*	
Company	***T-calculated***	***Company***	***T-calculated***
ICBC	0.26	Reliance Industry Limited	0.24
Kweichow Moutai Co Ltd	2.14	Tata Consultancy Services Limited	2.45
PetroChina Co Ltd	-1.37	HDFC Bank Limited	2.84
Jiangu Hengrui Medicine Co Ltd	2.47	Hindustan Unilever Limited	1.55
Bank of China Ltd	0.16	Housing Development Finance Corp. Limited	1.44
China Merchants Bank Co Ltd	1.46	ICICI Bank Limited	0.49
China Life Insurance Co Ltd	0.04	ITC Limited	0.97
China Petroleum & Chemical Corp	-0.34	Kotak Mahindra Bank Limited	2.17
Industrial Bank Co Ltd	1.55	Infosys Ltd	0.79
Shanghai Pudong Development Bank Co Ltd	1.22	State Bank of India	-0.36
Singapore		***Hong Kong***	
Company	***T calculated***	***Company***	***T calculated***
DBS Group Holdings Ltd	1.85	Tencent Holdings Ltd	4.42
Singapore Telecommunications Ltd	-0.74	ICBC	-0.19
Oversea- Chinese Banking Corp Ltd	1.54	Ping an Insurance Group of China Ltd	1.50
United Overseas Bank Ltd	0.67	China Construction Bank Corp	-0.03
Wilmar International Ltd	-0.35	Agricultural Bank of China Ltd	-0.38
CapitaLand Ltd	-0.25	China Mobile Ltd	-0.93
Singapore Technologies Engineering Ltd	0.12	HSBC Holdings PLC	-0.84
Jardine Cycle & Carriage Ltd	1.45	Bank of China Ltd	0.12
Keppel Corp Ltd	0.24	Petro China Co Ltd	-1.22
Genting Singapore Ltd	0.80	China Merchants Bank Co Ltd	1.04
UAE		***Brazil***	
Company	***T calculated***	***Company***	***T calculated***
First Abu Dhabi Bank PJSC	1.32	Petroleo Brasileiro SA (PETR3)	-0.25
Emirates Telecommunication Group Co PJS	0.79	Petroleo Brasileiro SA (PETR4)	-0.11
Abu Dhabi Commercial Bank PJSC	1.27	Itau Unibanco Holding SA	1.06
Abu Dhabi Islamic Bank PJSC	0.60	Ambev SA	0.68
Aldar Properties PJSC	-1.51	Banco Bradesco SA (BBDC3)	0.84
Abu Dhabi National Energy Company PSC	0.07	Banco Bradesco SA (BBDC4)	1.35
National Bank of Ras Al-Khaimah PSC	0.26	Vale SA	0.22
Dana Gas PJSC	0.29	Telephonica Brasil SA	-1.55
Abu Dhabi National Hotels	-0.10	Banco do Brasil SA	1.32
Sharjah Islamic Bank	-0.16	Itausa- Investimentos Itau SA	0.88
USA		***Japan***	
Company	***T calculated***	***Company***	***T calculated***
Apple Inc	2.50	Toyota Motor Corp	0.02
Microsoft Corp	1.43	Nippon Telegraph & Telephone Corp	0.65
Alphabet Inc (GOOGL)	1.69	NTT Docomo Inc	-0.32
Walmart Inc	0.25	Keyence Corp	2.36
Amazon.com Inc	3.17	SoftBank Group Corp	1.23
Procter & Gamble Co Ltd	-0.68	Sony Corp	0.52
Berkshire Hathaway Inc	0.88	Mitsubishi UFJ Financial Group Inc	-1.58
JP Morgan Chase & Co	0.19	KDDI Corp	0.76
Johnson & Johnson	-0.10	Fast Retailing Co Ltd	1.19
Visa Inc	3.02	Takeda Pharmaceutical Co Ltd	-1.26
UK		***Canada***	
Company	***T calculated***	***Company***	***T calculated***
Royal Dutch Shell PLC (RDSA)	-0.20	Royal Bank of Canada	1.39
Royal Dutch Shell PLC (RDSB)	-0.05	Toronto-Dominion Bank	2.17
Unilever PLC	1.45	Enbridge Inc	0.98
HSBC Holdings PLC	-0.35	Bank of Nova Scotia	0.86
BP PLC	-0.53	Canadian National railway Co	2.69
AstraZeneca PLC	0.88	Brookfield Asset Management Inc	2.45
BHP Group PLC	0.22	Bank of Montreal	1.63
GlaxoSmithKline PLC	-0.34	SunCor Energy	0.25
Diageo PLC	1.99	TC Energy Corp	0.15
Rio Tinto PLC	1.23	BCE Inc	1.22
Germany		***Portugal***	
Company	***T calculated***	***Company***	***T calculated***
Royal Dutch Shell PLC (RDSA)	-0.20	Royal Bank of Canada	1.39
Royal Dutch Shell PLC (RDSB)	-0.05	Toronto-Dominion Bank	2.17
Unilever PLC	1.45	Enbridge Inc	0.98
HSBC Holdings PLC	-0.35	Bank of Nova Scotia	0.86
BP PLC	-0.53	Canadian National Railway Co	2.69
AstraZeneca PLC	0.88	Brookfield Asset Management Inc	2.45
BHP Group PLC	0.22	Bank of Montreal	1.63
GlaxoSmithKline PLC	-0.34	SunCor Energy	0.25
Diageo PLC	1.99	TC Energy Corp	0.15
Rio Tinto PLC	1.23	BCE Inc	1.22

Table A.2. Percentage by which actual returns exceeds expected returns in various companies across countries

China		*India*	
Company	***Undervalued (%)***	***Company***	***Undervalued (%)***
ICBC	48.3%	Reliance Industry Limited	50.8%
Kweichow Moutai Co Ltd	62.5%	Tata Consultancy Services Limited	54.2%
PetroChina Co Ltd	39.2%	HDFC Bank Limited	65.8%
Jiangu Hengrui Medicine Co Ltd	55.8%	Hindustan Unilever Limited	54.2%
Bank of China Ltd	50.8%	Housing Development Finance Corporation Limited	59.2%
China Merchants Bank Co Ltd	51.7%	ICICI Bank Limited	48.3%
China Life Insurance Co Ltd	42.5%	ITC Limited	54.2%
China Petroleum & Chemical Corp	48.3%	Kotak Mahindra Bank Limited	58.3%
Industrial Bank Co Ltd	55.8%	Infosys Ltd	56.7%
Shanghai Pudong Development Bank Co Ltd	50.8%	State Bank of India	40.8%
Singapore		***Hong Kong***	
Company	***Undervalued (%)***	***Company***	***Undervalued (%)***
DBS Group Holdings Ltd	55.8%	Tencent Holdings Ltd	69.2%
Singapore Telecommunications Ltd	49.2%	ICBC	45.0%
Oversea- Chinese Banking Corp Ltd	53.3%	Ping an Insurance Group of China Ltd	54.2%
United Overseas Bank Ltd	56.7%	China Construction Bank Corp	45.8%
Wilmar International Ltd	50.8%	Agricultural Bank of China Ltd	45.0%
CapitaLand Ltd	49.2%	China Mobile Ltd	39.2%
Singapore Technologies Engineering Ltd	50.0%	HSBC Holdings PLC	49.2%
Jardine Cycle & Carriage Ltd	54.2%	Bank of China Ltd	44.2%
Keppel Corp Ltd	46.7%	PetroChina Co Ltd	42.5%
Genting Singapore Ltd	51.7%	China Merchants Bank Co Ltd	49.2%
UAE		***Brazil***	
Company	***Undervalued (%)***	***Company***	***Undervalued (%)***
First Abu Dhabi Bank PJSC	54.2%	Petroleo Brasileiro SA (PETR3)	45.8%
Emirates Telecommunication Group Co PJS	50.8%	Petroleo Brasileiro SA (PETR4)	44.2%
Abu Dhabi Commercial Bank PJSC	51.7%	Itau Unibanco Holding SA	49.2%
Abu Dhabi Islamic Bank PJSC	50.8%	Ambev SA	49.2%
Aldar Properties PJSC	38.3%	Banco Bradesco SA (BBDC3)	52.5%
Abu Dhabi National Energy Company PSC	43.3%	Banco Bradesco SA (BBDC4)	51.7%
National Bank of Ras Al-Khaimah PSC	47.5%	Vale SA	56.7%
Dana Gas PJSC	40.8%	Telephonica Brasil SA	44.2%
Abu Dhabi National Hotels	45.8%	Banco do Brasil SA	55.0%
USA		***Japan***	
Company	***Undervalued (%)***	***Company***	***Undervalued (%)***
Apple Inc	55.8%	Toyota Motor Corp	46.7%
Microsoft Corp	57.5%	Nippon Telegraph & Telephone Corp	51.7%
Alphabet Inc (GOOGL)	57.5%	NTT Docomo Inc	55.0%
Walmart Inc	50.8%	Keyence Corp	55.8%
Amazon.com Inc	59.2%	SoftBank Group Corp	53.3%
Procter & Gamble Co Ltd	51.7%	Sony Corp	50.0%
Berkshire Hathaway Inc	50.0%	Mitsubishi UFJ Financial Group Inc	44.2%
JP Morgan Chase & Co	46.7%	KDDI Corp	51.7%
Johnson & Johnson	50.8%	Fast Retailing Co Ltd	55.8%
Visa Inc	67.5%	Takeda Pharmaceutical Co Ltd	43.3%
UK		***Canada***	
Company	***Undervalued (%)***	***Company***	***Undervalued (%)***
Royal Dutch Shell PLC (RDSA)	45.8%	Royal Bank of Canada	55.8%
Royal Dutch Shell PLC (RDSB)	48.3%	Toronto-Dominion Bank	58.3%
Unilever PLC	53.3%	Enbridge Inc	53.3%
HSBC Holdings PLC	46.7%	Bank of Nova Scotia	55.8%
BP PLC	46.7%	Canadian National railway Co	62.5%
AstraZeneca PLC	52.5%	Brookfield Asset Management Inc	60.8%
BHP Group PLC	50.8%	Bank of Montreal	58.3%
GlaxoSmithKline PLC	49.2%	SunCor Energy	51.7%
Diageo PLC	57.5%	TC Energy Corp	47.5%
Rio Tinto PLC	54.2%	BCE Inc	56.7%
Germany		***Portugal***	
Company	***Undervalued (%)***	***Company***	***Undervalued (%)***
Royal Dutch Shell PLC (RDSA)	51.7%	Royal Bank of Canada	47.5%
Royal Dutch Shell PLC (RDSB)	49.2%	Toronto-Dominion Bank	57.5%
Unilever PLC	50.8%	Enbridge Inc	58.3%
HSBC Holdings PLC	51.7%	Bank of Nova Scotia	50.8%
BP PLC	50.0%	Canadian National railway Co	55.0%
AstraZeneca PLC	55.0%	Brookfield Asset Management Inc	55.0%
BHP Group PLC	47.5%	Bank of Montreal	55.8%
GlaxoSmithKline PLC	50.0%	SunCor Energy	55.8%
Diageo PLC	42.5%	TC Energy Corp	50.8%
Rio Tinto PLC	53.3%	BCE Inc	61.7%