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The impact of credit ratings on international investment: Evidence from an emerging market

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Abstract

This study examines the influence of sovereign credit ratings on international investments in emerging markets, focusing on Foreign Direct Investment (FDI) and Foreign Portfolio Investment (FPI). Using data from 22 emerging economies spanning 1999 to 2019, we employ OLS and fixed-effects regression models to analyze how credit ratings affect investment flows and market volatility. The findings indicate that sovereign credit ratings significantly impact investor decisions, as these ratings serve as a key metric in assessing investment risk and potential. This research highlights the essential role of credit ratings in enhancing financial stability and promoting economic integration through foreign investments, with implications for growth and trade. The study provides novel insights for investors, policymakers, and rating agencies on the role of credit ratings in emerging market investments, contributing to a deeper understanding of their impact on global economic dynamics.

Keywords: International Investment; Foreign Direct Investment; Foreign Portfolio Investment; Credit Ratings; Credit Rating Agencies; Emerging Markets

1. Introduction

The globalization of markets increased access to information, and the ease of international capital movements have enabled capital owners to explore new investment opportunities in foreign markets (Luo, 2021). From a practical perspective, capital owners confront a difficult and time-consuming procedure to make investment decisions that will reduce their portfolio's risks while maximizing the portfolio's projected return in the global market. In this instance, credit rating agencies play a significant role in meeting the demands of investors and filling in the gaps in their knowledge (White, 2010). Credit rating agencies evaluate the capacity of nations and both public and private entities to fulfill their obligations within specified timeframes, subsequently disseminating their assessments on scheduled dates (Bannier and Hirsch, 2010). Their primary aim is to mitigate information asymmetry and adverse selection in global financial markets. This is especially true when investing in developing or emerging countries, as these markets have a greater risk profile than developed ones. It is commonly stated that developing markets are more vulnerable.

Financial crises periodically afflict countries, sparking in-depth debates about the impact of capital flows in developing nations (Barton et al., 2002). Academics and practitioners agree that enhancing a country's transparency, information management, and risk mitigation measures can potentially boost financial investments, stimulate growth in financial markets, and foster increased integration into the global capital markets. After 1990, there was a notable surge in global financial investments (Singh, 1997). Initially, foreign direct investments in emerging markets were predominantly driven by "unregistered" companies with the primary intent of leveraging cost-effective product assembly for global exports rather than catering to domestic demand. Consequently, capital flows form a natural and integral component of international macroeconomic efficiency.

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The primary objectives of this research are twofold. Firstly, we aim to assess the extent to which credit ratings, provided by agencies such as Moody's, S&P, and Fitch, wield influence over international investments in both emerging and developed markets. Secondly, we seek to understand the susceptibility of emerging markets to credit rating downgrades and upgrades and explore how these rating changes impact foreign investments, with a particular focus on Foreign Direct Investment (FDI) and Foreign Portfolio Investment (FPI). To achieve these objectives and address the research questions, our analysis encompasses 22 emerging economies, with data spanning from 1999 to 2019, resulting in a panel dataset with an annual frequency. We employ a panel regression methodology to investigate the relationships between Foreign Direct Investment (FDI) and Foreign Portfolio Investment (FPI) and their impact on credit ratings. In our examination, we concentrate on panel data analysis using both Fixed and Random Effects models. Additionally, we incorporate control variables in our regression analysis to account for potential external factors that could influence international investments.

The study has several contributions. Firstly, this study makes a significant contribution by showing the impact of credit ratings assigned by rating agencies on capital flows in emerging markets. It addresses a critical gap in the existing literature, providing insights into how these ratings influence investment decisions. This information can help policymakers, investors, and institutions make more informed choices regarding capital allocation and risk management in emerging economies. Secondly, the research highlights a potential risk associated with credit ratings. It points out that financial assets can become unrealistically overvalued in the short term, leading to investors taking on higher risks as they follow the herd in pursuit of high returns. Recognizing this risk is essential for market participants and regulators to understand the dynamics that can lead to market bubbles and abrupt corrections, ultimately impacting financial stability. Thirdly, our research underscores the crucial role of foreign investments as a catalyst for regional integration and the globalization of the world economy. These investments exert a profound influence, not only on economic growth but also on foreign trade and global production structures. Additionally, this impact is often attributed to the infusion of external expertise, technology, and knowledge.

The rest of the paper is organized as follows: Section 2 presents the literature review and proposed hypothesis regarding the foreign portfolio investment. Section 3 describe the methodology and data specification. Section 4 provides the empirical findings. Finally, Section 5 summarizes the empirical results and concludes the study.

2. Literature review

Over the course of the 19th century, extensive research on Foreign Direct Investment (FDI) has significantly enriched the fields of finance, management, and economics. This study contributes by exploring the intricate relationship between FDI and sovereign credit ratings. In the contemporary landscape, the surge in FDI activities over the past two decades underscores its pivotal role in both emerging and established economies, prompting various governments to adopt diverse strategies to attract foreign investments.

2.1. Credit Ratings

Evaluating the potential for a borrower to default on obligations, sovereign ratings are indispensable for governments aiming to tap into international capital markets. Investors frequently lean towards rated securities, choosing them over unrated counterparts, even when the credit risk appears to be comparable (Cantor and Packer, 1995). Rating institutions convey point changes, assessments, and comments through watch lists, focusing on a shorter timeframe (average of three months) compared to medium-term outlooks (Amtenbrink and Heine, 2011). Covering 125 countries, Standard & Poor's, 110 countries for Moody's, and 107 countries for Fitch exemplify the extensive global reach of these rating agencies. Despite varying opinions and disagreements among agencies, these three major entities collectively dominate approximately 95% of the global credit rating market (Zhang and Fred, 2020). Notably, these assessments impact not only national governments but also borrowers of the same nationality, emphasizing the pervasive influence of credit ratings on international capital markets.

The principles guiding the credit rating of countries by credit rating agencies are intricately tied to the economic, political, and social fabric of each nation, shaping its credibility and reliability. In countries with well-developed capital markets, assessing credibility is paramount for informed investment decisions, necessitating ongoing monitoring (Naveed et al., 2020). The determination of a country's risk involves a comprehensive analysis of economic, political, and social indicators, considering their interplay and assigning importance levels to each Qazi and Khan (2021). Studies emphasize the substantial impact of both economic and political factors on country evaluations. Notably, per capita income, government revenue, and changes in real exchange rates positively influence ratings, while the inflation rate exerts a negative impact (Amor et al., 2023). Moreover, a country's default history significantly contributes to its rating determination. The corruption index, measuring both a country's developmental stage and governance quality, is

recognized as both an economic and political variable (Mellios and Paget-Blanc, 2006). The intricacies of analyzing these principles underscore the importance of expertise in economic, political, and social fields.

Emerging Markets, characterized as economies transitioning from developing to developed stages. Defined by the International Monetary Fund, these markets exhibit features of developed economies but do not fully meet the standards. Key indicators encompass low per capita income, uneven income distribution, limited public revenues and investments, a more informal economy, inadequate capital accumulation, and a high reliance on international capital (Igan et al., 2020). Investors are attracted to these markets for portfolio diversification and risk mitigation, seeking increased returns. Developing countries aim for sustainable growth, enhanced investments, global export strength, skilled employment, technological advancement, and environmental sustainability (VanDuzer et al., 2013). The historical context traces development classifications to the industrial revolution, with distinctions among underdeveloped, developing, and developed nations. Various criteria, including national income, GDP, human development index, and industrial infrastructure, guide the categorization of countries by development levels. This classification is conducted by international organizations like the World Bank, International Monetary Fund, and the United Nations Development Program (Appendix 2). The World Bank categorizes countries into "Low income," "Lower-middle income," "Upper-middle income," and "High income" using the World Bank Atlas method. This classification is based on Gross National Income (GNI) per capita: countries with a GNI per capita of $1,035 or less fall into the low-income group, those with a GNI per capita between $1,036 and $4,045 are classified as lower-middle income economies, upper-middle-income economies comprise countries with a GNI between $4,046 and $12,535 per capita, and high-income economies include those with a GNI of $12,536 or more per capita (Appendix 1).

2.2. Empirical Literature for Foreign Direct Investment

Many risk factors simultaneously influence sovereign credit ratings, including political instability, exchange rate volatility, and global economic conditions. Erb et al. (1999) established a strong correlation between bond yields and credit ratings of emerging markets, positing that sovereign ratings serve as a robust proxy for transparency and future sovereign risk. Building on this, (Kim and Wu, 2008) leveraged credit ratings to explore their impact on financial development in emerging markets, uncovering their critical role in shaping financial sectors and influencing various investments, including international banking flows and FDI. Hussain and Kimuli (2012) conducted a comprehensive analysis of factors influencing FDI inflows to developing countries, emphasizing market size, tariff rates, inflation, education, and the availability of a skilled labor force. Notably, market size emerges as the most significant factor, while global connection and a trained labor force stimulate FDI. DEMIRHAN and MASCA (2008) extended the discussion, examining the influence of market size, economic stability, wage levels, infrastructure, openness, composite risk, and tax rates on FDI inflows. Their findings underscore the favorable impact of market size, superior infrastructure, trade openness, and economic stability on FDI. Spatz and Nunnenkamp (2002) categorized FDI determinants into traditional and non-traditional, emphasizing factors such as population, GDP, administrative bottlenecks, and market entry obstacles. They find that traditional market-related characteristics still dominate FDI distribution. In contrast, non-traditional drivers like cost factors and trade openness, while showing the predicted link with FDI, did not become more relevant as globalization progressed.

BRICS nations, Rathnayaka Mudiyanselage et al. (2021) shed light on critical determinants such as market size, trade openness, labor cost, infrastructure facilities, economic stability, and growth prospects. Through panel data estimates, the study reveals potential drivers of FDI inflows in these countries. Meanwhile, scrutiny of macroeconomic drivers of FDI in India uncovers significant impacts from variables including import, export, trade balance, and forex reserves Pillai and Rao's (2013). Investigation into FDI drivers in emerging markets, utilizing the GMM approach, underscores substantial associations between management quality characteristics, governance indicators, and FDI (Abille and Mumuni, 2023). Shifting focus to the Turkish economy, Erdal and Tatoglu (2002) emphasized location-related factors, including market size, trade openness, inflation, exchange rate, interest rate, and infrastructure. Despite offering several location advantages, Turkey faces challenges in attracting higher volumes of FDI, particularly due to issues related to exchange rates and economic stability. Exploration of FDI determinants in China and India highlights the significance of market size, infrastructure, opportunity cost, trade openness, growth rate, policy changes, and inflation (Parashar's (2015). The findings suggest that market size plays a crucial role in both nations, with lower wage rates in China and policy reforms in India playing key roles in shaping FDI inflows.

- *Hypothesis 1: Sovereign credit ratings play a positive role in shaping the dynamics of Foreign Direct Investment across diverse economies*.

2.3. Empirical Literature for Foreign Portfolio Investment

The empirical literature examining Foreign Portfolio Investment (FPI) unfolds a tapestry of intricate relationships and determinants that guide international capital flows. (Garg and Dua, 2014) asserted that capital market liberalization, synonymous with market openness, facilitates the acquisition of local financial products by international investors. Naceur et al. (2008) delved into the effects of stock market liberalization on economic growth and stock market development in Middle East/North Africa nations, uncovering nuanced patterns characterized by short-term negativity and long-term favorability. Umutlu et al. (2010) explored the relationship between financial liberalization and stock return volatility in developing nations, revealing a complex interplay, which is broadening the investment base by including international investors and then enhancing information flow accuracy and reducing stock return volatility. Todea and Pleşoianu (2013) contributed insights into the association between Foreign Portfolio Investment (FPI) and stock market informational efficiency in Central and Eastern Europe, indicating a considerable positive relationship. In contrast, Garg and Dua (2014) focused on India and examined the influence of macroeconomic variables on FPI, revealing a strong and negative link between currency risk and portfolio movements. Ahmad et al. (2015) emphasized the significance of external debts as crucial influencers. Aynur and Orgun (2015) studied macroeconomic and financial factors affecting FPI in Turkey, identifying deposit interest rates, current account balances, and total national income as significant variables positively associated with FPI.

Another side Waqas et al. (2015) analyzed the cross-country relationship between macroeconomic factors and the volatility of Foreign Portfolio Investment (FPI) in South Asian countries, discovering significant and adverse links between inflation and FPI volatility, particularly in China and India. Concurrently, Nnenna (2015)) delved into the influence of macroeconomic factors on FPI in Nigeria, pinpointing statistically significant relationships for variables such as gross domestic product, money supply, interest rate, exchange rate, and inflation. In a complementary perspective, (Idowu, 2015) scrutinized governance metrics, revealing the substantial and adverse impact of internal disputes and corruption on foreign portfolio inflows. Additionally, (Abdioglu et al., 2013) focused on the impact of governance quality on choices made by foreign institutional investors, recognizing the noteworthy influence of governance quality in both the home and host nations. Furthermore, (Min and Bowman, 2015) explored corporate governance, establishing its role in lowering monitoring costs and consequently mitigating investment risk. Lastly, Jain et al. (2017) suggested a negative association between elevated levels of corruption and foreign equity investment, emphasizing the detrimental influence of corruption on investor uncertainty and market engagement.

- *Hypothesis 2: There is a significant association between the confluence of macroeconomic and financial factors and landscape of Foreign Portfolio Investment (FPI*

3. Methodology and sample

3.1. Sovereign ratings data

The study utilizes long-term ratings data provided by the primary rating agencies, namely Standard and Poor's (S&P), Moody's, and Fitch. These agencies were selected for providing sovereign ratings, due to their extensive country coverage throughout the assessment period and the significant impact of their ratings actions on their respective own-country stock markets (Almeida et al., 2017, Hill et al., 2010, Kaminsky and Schmukler, 2002). The dataset covers the period from 1999 to 2019 and encompasses information from 22 emerging market countries, with an annual frequency as illustrated in Appendix 2 . Moreover, Table 1 demonstrates ratings that are transformed from their original ordinal scales into numerical values through a linear conversion method, building on prior linear transformation techniques.

Table 1 Linear Transformation of S&P's, Fitch, and Moody's Ordinal Rating Scales into a Numerical Scale

S&P	Moody's	Fitch	Scale 21	Characterization
AAA	Aaa	AAA	21	Highest quality
AA+	Aa1	AA+	20	High quality
AA	Aa2	AA	19	
AA-	Aa3	AA-	18	
A+	A1	A+	17	Strong payment capacity
A	A2	A	16	
A-	A3	A-	15	
BBB+	Baa1	BBB+	14	Adequate payment capacity
BBB	Baa2	BBB	13	
BBB-	Baa3	BBB-	12	
BB+	Ba1	BB+	11	Likely to fulfil obligations, ongoing uncertainty
BB	Ba2	BB	10	
BB-	Ba3	BB-	9	
B+	B1	B+	8	High credit risk
B	B2	B	7	
B-	B3	B-	6	
CCC+	Caa1	CCC+	5	Very high credit risk
CCC	Caa2	CCC	4	
CCC-	Caa3	CCC-	3	
CC	Ca	CC	2	Near default with possibility of recovery
C	C	C	1	
SD/D		DDD/DD/D	0	Default

Table 2 Descriptive Statistics of Credit Rating Agencies Correlation Matrix

	Descriptive								Correlation		
Rating Agencies	**Obs**	**Mean**	**St. Dev.**	**Min**	**25%**	**50%**	**75%**	**Max**	**Moody's**	**S&P**	**Fitch**
Moody's	440	10.78	3.67	2	8	11	14	18	1	0.97	0.96
S&P	440	10.70	3.44	0	8	11	13	18	0.97	1	0.98
Fitch	440	10.76	3.49	0	8	11	13	18	0.96	0.98	1

Table 2 provides an overview of the variables under consideration. Additionally, the table reveals a total of 440 observations. Interestingly, the means and standard deviations of these variables exhibit a significant degree of similarity. Furthermore, recognizing the potential pitfalls associated with high correlation among independent variables within the regression model, the study conducted a thorough assessment of the inter-variable correlations. Multicollinearity, which can emerge from strong correlations, has the potential to introduce complexities during model fitting and result interpretation. Hence, this correlation analysis was deemed essential (Farrar and Glauber, 1967). Considering the strong correlations between various credit rating measures, it is deemed inappropriate to include all

three of them simultaneously in the regression analysis. As a result, we introduce a grade point average rating for a given country "i" for a given year "t".

$$\mathrm{GPA_{i,t}} = \frac{(\mathrm{SP_{i,t}} + \mathrm{M_{i,t}} + \mathrm{F_{i,t}})}{3} \ldots\ldots (1)$$

3.1.1. Econometric Model

$$\boldsymbol{FDI_{i,t}} = \beta_0 + \beta_1 GPA_{i,t} + \beta_2\, GR_{i,t} + \beta_3 IR_{i,t} + \beta_4\, UR_{i,t} + \beta_5 WSW_{i,t} + \beta_6 TR_{i,t} + \beta_7\, TD_{i,t} + \beta_8 EDS_{i,t} + \beta_9 PR_{i,t} + \varepsilon_{i,t} \ldots\ldots\ldots (2)$$

$$\boldsymbol{FPI_{i,t}} = \beta_0 + \beta_1 GPA_{i,t} + \beta_2\, GR_{i,t} + \beta_3 IR_{i,t} + \beta_4\, UR_{i,t} + \beta_5 WSW_{i,t} + \beta_6 TR_{i,t} + \beta_7\, TD_{i,t} + \beta_8 EDS_{i,t} + \beta_9 PR_{i,t} + \varepsilon_{i,t} \ldots\ldots\ldots (3)$$

Where the $FDI_{i,t}$ represents annual Foreign Direct Investment and FPI, Foreign Portfolio Investment to country i in year t, in million US Dollars. The $GPA_{i,t}$ is a grade point average variable is created by taking credit grade averages for country. All the control variables that measure economic and financial development are in equations (2).

3.2. Control variables

Country economic controls are independent variables traditionally used in cross-country financial development studies that we have included to reduce model misspecification errors from negligence of important variables and to control for other factors that may potentially influence the credit ratings assigned by the rating agencies. In our study, economic controls also play a decisive role in assessing the growing influence of credit ratings offered by independent rating agencies. The variables we consider for evaluating foreign financial investment include GDP growth rates (GR) which are valuable for predicting future financial performance, quantifying annual changes in a variable as a percentage (Osei and Kim, 2020). The inflation rate (IR), which reflects price increases, leads to a decrease in the purchasing power of the currency (Gailliot, 1970). The unemployment rate (UR) is also an important factor for foreign investment, as foreign investors closely analyze a host country's labor market when making decisions (Alalawneh and Nessa, 2020).Wage and salaried workers (WSW) individuals hold paid employment jobs with explicit or implicit employment contracts, receiving a fixed remuneration not tied directly to their employing unit's revenue. Tax revenue (TR) represents compulsory transfers to the central government for public purposes, excluding specific mandatory transfers like fines, penalties, and most social security contributions.

External debt stocks (EDS) category encompasses debt owed to nonresidents and repayable in currency, goods, or services. It includes public, publicly guaranteed, private nonguaranteed long-term debt, use of IMF credit, and short-term debt (with an original maturity of one year or less), along with interest in arrears on long-term debt. Population growth rate (PR) rate calculates the exponential growth of the midyear population from year "t-1" to year "t," expressed as a percentage. It is based on the actual population definition, encompassing all residents regardless of legal status or citizenship. Table 3 illustrates the definitions and symbols associated with these variables.

Table 3 Definitions and formula of the variables

Control Variables	Symbols	Formulas	Explanation of formulas
GDP Growth Rates	GR	$\frac{GDP_2 - GDP_1}{GDP_1} * 100$	GDP- Gross Domestic Product.
Inflation Rates	IR	$\frac{CPI_2}{CPI_1} * 100$	CPI-consumer price index.
Unemployment Rate	UR	$\frac{U}{TLF} * 100$	U-Unemployed people. TLF- Total Labor Force.
Percentage of wage and salaried workers	WSW	$\frac{WSW}{TW} * 100$	WSW- Wage and salaried workers. TW- Total workforce.
Tax revenue (% of GDP)	TR	$\frac{TR}{GDP} * 100$	TR-Tax revenue GDP-Gross Domestic Product.
Trade (% of GDP)	TD	$\frac{X + M}{GDP} * 100$	X-Export.

			I-Import. GDP- Gross Domestic Product
External debt stocks (% of GNI)	EDS	$\frac{LTD + STD + TED}{GNI} * 100$	LTD-Long term debt. STD-Short term debt. TED-Total external debt. GNI- Gross National Income
Population growth (annual %)	PR	$\frac{(P_{present} - P_{past})}{P_{past}} * 100$	$P_{present}$- Present Population. P_{past}- Past Population.

4. Empirical results

In this section, we delve into the panel regression results and their subsequent interpretation. These results serve as the statistical underpinning for testing the research hypotheses, which, in turn, form the basis for the recommendations and conclusions drawn at the culmination of the study. The statistical hypotheses within this research were subjected to testing using a crucial metric, the P-value. This P-value acts as the litmus test, determining whether the presented hypotheses should be embraced or discarded. At a significance level of 10%, a P-value less than or equal to 10% leads to the rejection of the null hypothesis. Similarly, at a 5% significance level, a P-value less than or equal to 5% results in the null hypothesis's rejection. Finally, at a 1% significance level, a P-value less than or equal to 1% signifies the null hypothesis's rejection. Acceptance of the alternative hypotheses equates to the dismissal of the null hypotheses. The appropriateness of the research model's fit is elucidated by the Adjusted R-squared measure.

4.1. Panel data analysis

Table 4 Regression results of OLS analysis for FDI and Log FDI

	FDI		**Log FDI**	
	All variables	**Only significant variables**	**All variables**	**Only significant variables**
GPA	3.5x10 *** (11.05)	1.8x10*** (11.16)	0.10*** (19.19)	0.10*** (1.32)
GR	−1.3x10 (−0.25)		-0.53 (-0.30)	
IR	4.3x10**(2.30)	4.2x10**(2.26)	3.69***	3.70*** (1.34)
UR	−2.1x10(−0.58)		-2.15*(-1.74)	-2.15* (2.43)
WSW	−5.1x109(−0.48)		0.92**(2.50)	0.94*** (1.21)
TR	−1.8x10 ***(−3.80)	-2x10***(-5.61)	-6.18***(-3.90)	-6.16** (-1.32)
TD	−2.5x10***(−4.53)	-2.4x10***(-5.03)	-1.44***(-7.84)	-1.46*** (2.43)
EDS	−2.9x10 ***(−3.77)	-2.9x10***(-3.97)	-1.32***(-5.08)	-1.32*** (3.432)
PR	−1.7x10***(−8.08)	-1.7x10***(-8.46)	-38.33***(-5.30)	-37.93*** (3.76)
Constant	3.5x10***(3.44)	3.3x10***(3.86)	21.17***(3.44)	21.14***(3.86)
R^2	0.41	0.41	0.60	0.60
Adj.- R^2	0.40	0.40	0.60	0.60
DW	0.18	0.18	0.55	0.55
P (F-stat.)	0.000	0.000	0.000	0.000

Notes: ***, **, * means significance at 1%, 5% and 10% respectively, the results were corrected for heteroscedasticity.

The Ordinary Least Squares (OLS) method was employed to estimate the panel data model, and the results are presented in Table 4. This table displays the findings of a model that explores the impact of several crucial macroeconomic factors on Foreign Direct Investment (FDI) in 22 emerging nations over a 20-year period. The results are also discussed and elaborated upon. Table 5 clearly demonstrates that the coefficient associated with average credit ratings (GPA) exerts

not only a positive impact but also bears considerable statistical significance. This underlines the importance of credit ratings as a determinant of FDI, with higher ratings leading to increased FDI. Consequently, these control variables were removed, and a new OLS model was constructed (as shown in Table 5), where all independent variables now exhibit significance. However, the R-squared and adjusted R-squared values remain relatively low, similar to the previous model. As a robustness check, the study employed log (FDI) as the dependent variable in the panel regression. The results demonstrate an improved explanatory power, with an R-squared of 60% and an adjusted R-squared of 60%, indicating a higher degree of model fitness.

4.2. Panel Regression Model with Fixed Effects for FDI

The regressions carried out in this study maintain a consistent dependent variable throughout, and the outcomes are exactly documented in terms of coefficient estimates, t-ratios, and associated p-values in individual rows. These analyses are rounded off with essential summary statistics, including the determination coefficient (R-squared), adjusted R-squared, the Durbin-Watson statistic, and the probability (p-value) associated with the F-statistic, all of which are reported in the final four rows of the respective tables. Notably, the variable representing average credit ratings (GPA) stands out as statistically significant at the 1% level, underscored by a positive coefficient. This implies that a 1% increase in Gross Domestic Product (GDP) corresponds to a substantial increase of 1.1x10^9 in foreign direct investment (FDI) inflows. This result highlights the dominant role of GPA, or credit ratings, in shaping FDI inflows into emerging nations. Importantly, the majority of variables demonstrating statistical significance exert a positive influence on FDI, with the exception of Population Growth Rate. In pursuit of greater robustness, an additional regression was conducted, employing the natural logarithm of FDI as the dependent variable, yielding the results presented in Table 5.

Table 5 Results of fixed-effects regression analysis for FDI and Log FDI

	FDI		**Log FDI**	
	All variables	**Only significant variables**	**All variables**	**Only significant variables**
GPA	$1.1x10^{9}$***(4.17)	$8.6x10^{8}$***(3.79)	0.05***(4.98)	0.05***(5.71)
GR	$-7.4x10^{10}$ (-1.45)		$0.54x10^{10}$ (0.27)	
IR	$1.6x10^{10}$ (1.29)		$0.41x10^{10}$ (0.65)	
UR	$3.5x10^{10}$ (0.56)		-3.50 (-1.41)	
WSW	$2.3x10^{11}$***(7.43)	$2.1x10^{11}$***(7.22)	7.82*** (6.48)	8.06*** (6.83)
TR	$7.4x10^{9}$ (0.10)		10.40*** (3.63)	10.94*** (4.17)
TD	$1.2x10^{10}$ (1.10)		-0.37 (-1.11)	
EDS	$6.9x10^{9}$ -0.70***		-0.53* (-1.97)	
PR	$-8.6x10^{11}$** (-2.50)	$-7x10^{11}$** (-2.17)	-19.00 (-1.40)	-0.70*** (-2.75)
Constant	**$-1.5x10^{11}$*****(-7.02)		**15.45***** (17.49)	14.58***(19.72)
R^2	0.81	0.81	0.81	0.82
Adj.- R^2	0.24	0.24	0.35	0.34
DW	0.51	0.51	1.10	1.08
P (F-stat.)	0.000	0.000	0.000	0.000

Notes: ***, **, * means significance at 1%, 5% and 10% respectively, the results were corrected

4.3. Panel Regression Model with Random Effects for FDI

Table 6 shows similar results obtained from the fixed-effects model. This highlights the statistical significance of GPA in relation to its impact on FDI. However, only a select few variables exhibit statistical significance. As a robustness check, we incorporated the natural logarithm of FDI and re-ran the model. Our observations reveal that GPA, WSW, and TR display positive correlations with the dependent variable, while EDS demonstrates a negative correlation. The overarching trends in these findings align with the results produced by other methodological approaches.

Table 6 Results of random-effects regression analysis for FDI and Log FDI

	FDI		**Log FDI**	
	All variables	**Only significant variables**	**All variables**	**Only significant variables**
GPA	$1.3x10^{10}$***(5.17)	$1.2x10^{9}$***(5.71)	0.07***(8.07)	0.07***(7.46)
GR	$-6.2x10^{10}$ (-1.21)		1.21 (0.57)	
IR	$1.7x10^{10}$ (1.31)		0.73 (1.12)	
UR	$-6.7x10^{9}$ (-0.12)		-4.90** (-2.54)	-5.07***(-2.58)
WSW	$1.1x10^{11}$***(4.7)	$1.2x10^{11}$***(4.91)	2.77***(3.45)	3.43***(3.97)
TR	$-4.9x10^{10}$ (-0.74)		4.75*(1.93)	6.28**(2.49)
TD	$1.9x10^{8}$ (0.02)		-0.96*** (-3.41)	-0.81*** (-2.85)
EDS	$3.3x10^{9}$ (0.51)		-0.72*** (-2.70)	-0.72*** (-2.76)
PR	$-7.3x10^{11}$**(-2.23)	$-6.4x10^{11}$**(-2.01)	-12.97 (-1.07)	
Constant	**$-7.8x10^{10}$*****(-4.08)	$-8.5x10^{10}$*** (-5.34)	**19.03***** (29.54)	18.54*** (29.17)
Hannan-Quinn	22.809	22.805	14.59	15.14
DW	0.51	0.47	1.09	1.09
Hausman test	44.35 (0.000)	28.82 (0.000)	61.25 (0.000)	42.5 (0.000)

Note: ***, **, * means significance at 1%, 5% and 10% respectively

To determine the more suitable panel regression model for modeling FDI between the fixed-effect and random-effect models, we employed both the Chow and Hausman tests. The Chow test statistic for fixed effects yields a value of 10.89 with a corresponding significant value of. This implies that the fixed effects model is better suited for modeling FDI compared to Random Effects. Furthermore, the Hausman test corroborates the suitability of the fixed effects approach, as indicated by the significant value being less than 0.05. In conclusion, with respect to FDI, our final result highlights that credit ratings assigned by rating agencies stand as the most significant variable. Furthermore, based on the analyses and tests conducted, it is evident that the fixed effects approach is more effective.

4.4. Panel Regression Model for Foreign Portfolio Investment

The panel data model was estimated using the Ordinary Least Squares (OLS) approach. The results of a model examining the impact of Foreign Portfolio Investment (FPI) in 22 emerging nations over two decades are presented in the tables below. Initially, the OLS model results were not optimal, as indicated by low R2 and Adjusted R2 values. This suggests that, despite their statistical significance, the independent variables could not explain a significant portion of the variation in the dependent variable. To address this limitation, the dependent variable was changed to the log of FPI. Table 7 reveals that this modification led to higher R2 (40%) and Adjusted R2 (37%) values compared to the previous model, indicating a better model fit. Additionally, it shows that credit rating agencies, Inflation rate, and the percentage of wage and salaried workers are positively correlated with FPI, while Trade (% of GDP) exhibits a negative correlation.

Table 7 Results of OLS regression analysis for FPI and Log FPI

	FPI		**Log FPI**	
	All variables	**Only significant variables**	**All variables**	**Only significant variables**
GPA	$-1.9x10^{8}$ **(-2.45)	$-1.7x10^{8}$**(-2.42)	0.12***(8.84)	0.12***(9.52)
GR	$-2.2x10^{10}$(-0.83)		-3.82 (-0.88)	3.59
IR	$-5.9x10^{9}$ (-0.65)		3.51** (2.51)	(2.68)
UR	$-6.1x10^{9}$ (-0.34)		0.25 (0.08)	
WSW	$5.4x10^{9}$ (1.04)		2.01** (2.01)	1.43 (1.69)
TR	$7.7x10^{7}$ (0.00)		-4.67 (-1.12)	
TD	$5.7x10^{9}$** (2.16)	$5.5x10^{9}$** (2.50)	-1.42*** (-3.24)	-1.76 (-5.19)
EDS	$6.5x10^{9}$ * (1.78)	$6.4x10^{9}$* (1.86)	-0.09 (-0.17)	
PR	$1x10^{11}$ (0.98)		27.38 (1.51)	
Constant	**$-5.8x10^{9}$** (0.236)	$-4.1x10^{9}$ (-1.37)	17.32*** (19.44)	17.23 (26.64)
R^2	0.06	0.06	0.40	0.38
Adj.- R^2	0.04	0.05	0.37	0.37
DW	1.18	1.17	0.92	0.91
P (F-stat.)	0.001	0.000	0.000	0.000

Notes: ***, **, * means significance at 1%, 5% and 10% respectively, the results were corrected for heteroscedasticity.

The results of the Prob. (F-Statistics) test, which yielded a significance level, led to the acceptance of Hypothesis 1 (H1). This result indicates that the simultaneous effect of independent variables on the dependent variable is statistically significant. Moreover, the findings considering only the significant variables revealed that GPA is positively and statistically significant with the dependent variable. Additionally, the R2 and Adjusted R2 values are 38% and 37%, respectively.

4.5. Panel Regression Model with Fixed Effects for FPI

To obtain more accurate results, the study also employed the fixed effects model for FPI. The results of the fixed effects model for FPI are presented in Table 8. The study find that the percentage of wage and salaried workers is negatively correlated with foreign portfolio investment. The variable GPA is statistically significant at a 10% level, and it exhibits a negative correlation with foreign portfolio investment. Furthermore, the unemployment rate is statistically significant at the 10% level, but it has a positive relationship with foreign portfolio investment. This implies that, in contrast to Foreign Direct Investment, investors tend to favor investing in portfolios when developing countries offer the potential for higher returns. However, it's important to note that such investments also carry higher risks.

Table 8 Results of fixed-effects regression analysis for FPI and Log FPI

	FPI		**Log FPI**	
	All variables	**Only significant variables**	**All variables**	**Only significant variables**
GPA	-3.2x10^{8}* (-1.66)	-2.9x10^{8} (-1.60)	0.04* (1.24)	0.03 (0.03)
GR	-6.2x10^{8} (0.01)		-3.20 (-0.62)	
IR	-4.7x10^{8} (-0.05)		0.80 (0.63)	
UR	8.3x10^{10}* (1.75)	5.1x10^{10} (1.19)	-1.95 (-0.27)	
WSW	-7.2x10^{10}*** (-3.09)	-6.5x10^{10}*** (0.01)	5.86* (1.68)	5.44* (1.66)
TR	6.9x10^{10} (1.25)		2.43 (0.30)	
TD	-6.8x10^{9} (-1.06)		0.25 (0.30)	
EDS	-4.5x10^{9} (-0.89)		0.71 (0.96)	
PR	3.4x10^{11} (1.30)		10.96 (0.31)	
Constant	3.7x1010** (2.22)	4.2x10^{10}*** (3.07)	**15.58***** (6.36)	16.65*** (9.02)
R^2	0.21	0.20	0.70	0.69
Adj.- R^2	0.06	0.06	0.06	0.04
DW	1.39	1.38	1.24	1.21
P (F-stat.)	0.000	0.000	0.000	0.000

Notes: ***, **, * means significance at 1%, 5% and 10% respectively, the results were corrected for heteroscedasticity.

Comparing the results in Table 8 with the previous findings, we observe that the model's performance has worsened, suggesting that there is no significant relationship between the dependent and independent variables. Additionally, the Adjusted R-squared value is low, standing at just 1%. In summary, the fixed effects regression analysis indicates that there is no substantial correlation between the credit ratings assigned by rating agencies and Foreign Portfolio Investment.

4.6. Panel Regression Model with Random Effects for FPI

The random effects approach was employed to assess the relationship between the variables. The results of the random effects model are presented in Table 9. The finding shows that there exists a negative correlation between credit agencies and Foreign Portfolio Investment (FPI). This suggests that investors are more inclined to pursue higher returns, even if it entails higher risk, leading them to invest in countries with greater potential for gains. Furthermore, the correlation coefficient for GPA stands at -3.1x108, implying a negative relationship. Notably, most of the control variables do not exhibit statistical significance concerning the dependent variable. Consequently, the reliability of the model's results is questionable.

Table 9 Results of random-effects regression analysis for FPI and Log FPI

	FPI		**Log FPI**	
	All variables	**Only significant variables**	**All variables**	**Only significant variables**
GPA	-3.1x10^{8}***(-2.634)	-3.2x10^{8}***(-3.241)	0.07***(3.563)	0.07*** (3.749)
GR	-1.4x10^{10} (-0.437)		-1.71 (-0.363)	
IR	-3.6x10^{9} (-0.394)		1.42 (1.194)	
UR	1.7x10^{10} (0.710)		1.42 (0.336)	
WSW	-2.5x10^{9} (-0.299)		1.45 (0.844)	
TR	-1.1x10^{9} (-0.034)		-1.04 (-0.174)	
TD	6.7x10^{9}* (1.813)	6.4x10^{9}** (2.123)	-0.67 (-1.089)	
EDS	2.9x10^{9} (0.675)		0.18 (0.288)	
PR	6.8x10^{10} (0.427)		29.32 (1.115)	
Constant	1.7x10^{9} (0.228)	2.5x10^{9} (0.666)	17.97***(13.440)	18.94*** (28.840)
Hannan-Quinn	21.880	21.856	7.60	7.61
DW	1.39	1.34	1.24	1.18
Hausman test	22.09 (0.009)	5.82 (0.054)	11.52 (0.241)	1.61 (0.204)

Notes: ***, **, * means significance at 1%, 5% and 10% respectively, the results were corrected for heteroscedasticity.

As a robustness check, the study employed the log transformation of FPI and re-ran the model, as presented in Table 9. The results indicate that only GPA exhibits a positive correlation with the dependent variable. A comparison with the previous random effects model in Table 10 reveals a notable difference: the coefficient for GPA was negative, while in another table, it is positive. Consequently, it is challenging to assert a strong and consistent correlation between credit ratings and foreign portfolio investments. In order to select the most suitable model, the Hausman test, following a similar approach to the one used for FDI. Firstly, fixed effects did not appear appropriate as the output did not reveal any significant relationship between dependent and independent variables.

Furthermore, the results of the Hausman test, as displayed in Table 10, indicate that the p-value is not statistically significant. This suggests that the random effects approach is more suitable for modeling FPI than fixed effects. In conclusion, credit ratings assigned by rating agencies remain crucial variables, even though certain model outputs are not statistically significant for FPI. Additionally, based on the analyses and tests conducted, the random effects approach emerged as the more effective choice.

Table 10 Summary table for FDI

	Dependent variable	**FDI**		**log FDI**	
	Result	**All variables**	**Only sign. variables**	**All variables**	**Only sign. variables**
Panel Regression	Coefficient	1.8x10^{9}***(0.000)	1.8x10^{9}***(0.000)	0.10***(0.000)	0.10***(0.000)
PR with FE	Coefficient	1.1x10^{9}***(0.000)	8.6x10^{8}***(0.000)	0.05***(0.000)	0.05***(0.000)
PR with RE	Coefficient	1.3x10^{10}***(0.000)	1.2x10^{9}***(0.000)	0.07***(0.000)	0.07***(0.000)

Notes: ***, **, * means significance at 1%, 5% and 10% respectively. P-values are in the parentheses.

Table 11 Summary table for FDI

Models	**Dependent variable**	**FPI**		**ln FPI**	
	Result	**All variables**	**Only sign. variables**	**All variables**	**Only sign. variables**
Panel Regression	Coefficient	-1.9x108**(0.014)	-1.7x108**(0.016)	0.12***(0.000)	0.12***(0.000)
PR with FE	Coefficient	-3.2x108(0.098)	-2.9x108(0.110)	0.04(0.218)	0.03(0.222)
PR with RE	Coefficient	-3.1x108***(0.008)	-3.2x108***(0.001)	0.07***(0.000)	0.07***(0.000)

Notes: ***, **, * means significance at 1%, 5% and 10% respectively. P-values are in the parentheses.

5. Conclusion

The recent trend in the global business landscape highlights the increasing attraction of growing economies for economists and investors, given their heightened market potentials and the consequent attraction of greater foreign investment. This study delves into the nuanced role of rating agencies in shaping foreign investment inflows to developing countries spanning the years 1999 to 2020, employing panel regression models with fixed and random effects. The flow of capital towards rapidly advancing nations, distinguished by their significant market potential, is investigated. However, the factors that drive the appeal of both Foreign Direct Investment (FDI) and Foreign Portfolio Investment (FPI) to these economies are not thoroughly explored or understood.

In the initial phase of the study, we conducted a thorough examination of the interrelation between variables. Notably, the study found a strong connection between the S&P, Moody's, and Fitch variables. So, we decided to use the GPA variable, which is the average of these three, in our models. The study created two distinct models, namely Fixed and Random Effects, for Foreign Direct Investment (FDI) and Foreign Portfolio Investment (FPI). Following comprehensive testing, the Fixed Effect models were identified as the suitable framework to explore the association between credit ratings and foreign direct investment. The results from the Fixed Effect model indicated a positive correlation between credit ratings and FDI, revealing coefficients of $1.1x10^8$ and $8.6x10^8$ for all control variables and only significant variables, respectively. Moreover, the coefficient for log FDI was 0.05, with a p-value of 0.000, highlighting the empirical evidence that credit ratings stand as crucial determinants for FDI. Conversely, empirical findings for FPI were inconclusive, casting doubt on their reliability. The correlation coefficients for FPI were negative, while those for log FPI were positive, leading to the conclusion that there is no discernible relationship between the variables based on Fixed Effects models. Further analysis, including the Hausman test, favored the Random Effects model as more appropriate in this context.

There is still room for expansion of the research in this study. Future research could focus on understanding a country's regional strengths and comparing them with the home countries of international investors. Additionally, delving into sector-specific analysis aims to enhance our understanding of Foreign Direct Investment (FDI) and Foreign Portfolio Investment (FPI) flows in specific industries, along with the factors shaping them. This approach is expected to contribute to a more comprehensive understanding of the drivers behind FDI and FPI in developing countries, shedding light on the influence of liberalization and changes in economic policies.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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Appendix

Appendix 1: Country classifications by income level ($)

Group	July 1, 2020 (new)	July 1, 2019 (old)
Low income	<1,036	<1,026
Lower-middle income	1,036-4,045	1,026-3,995
Upper-middle income	4,046-12,535	3,996-12,375
High income	>12,535	>12,375

Appendix 2: List of emerging market countries studied

Europe and Central Asia	East and South Asia	Latin America and The Caribbean	Africa
Kazakhstan	China	Argentina	Egypt, Arab Rep.
Moldova	India	Brazil	South Africa
Russia	Indonesia	Chile	
Turkey	Malaysia	Colombia	
Ukraine	Pakistan	Costa Rica	
	Philippines	Ecuador	
	Thailand	Mexico	
		Peru	