



## **STUDY OF INTERRELATIONSHIP AMONG FDI, GDP AND FOREIGN EXCHANGE RATE FROM 1982 TO 2015 OF G20 COUNTRIES: AN APPLICATION OF PREDICTIVE ANALYTICS TECHNIQUES**

**Dr. Sarmita Guha Ray**

Quantitative Researcher and Faculty, Department of MBA (Finance & System), University of Calcutta, Kolkata, West Bengal

**Cite This Article:** Dr. Sarmita Guha Ray, “Study of Interrelationship among FDI, GDP and Foreign Exchange Rate from 1982 to 2015 of G20 Countries: An Application of Predictive Analytics Techniques”, International Journal of Scientific Research and Modern Education, Volume 2, Issue 1, Page Number 30-41, 2017.

**Copy Right:** © IJSRME, 2017 (All Rights Reserved). This is an Open Access Article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

### **Abstract:**

G20 Countries are identified as one of the most attractive long-term investment destinations. The presence of large domestic market, fairly well developed financial architecture and skilled human resources, it can attract much larger foreign investments than it has done in the past. Its present international investment regime facilitates easy entry of foreign capital in almost all areas subject to specific limits on foreign ownership. Entry options have not only become procedurally simpler, but prospects for higher yields from investment have also become brighter. But further boost to Foreign Direct Investment (FDI) will depend significantly on further liberalization of its foreign investment regime. This study attempts to focus on an insight into G20 countries: Study of interrelationship among FDI, GDP and Foreign Exchange Rate from 1982 to 2015 and forecast of GDP and Foreign Exchange Rate from 2016 to 2019.

**Key Words:** G20 Countries, FDI, GDP & Foreign Exchange Rate etc.

### **1. Introduction:**

Since the unfolding of the 2008 global financial crisis, the G20 has played a major role in coordinating macroeconomic policies of major economies and reviving the world economy. As the world’s primary forum for international economic cooperation, its objectives have been to ensure more sustainable and balanced growth, achieve economic and financial stability and reform the prevailing international financial architecture. In the wake of the crisis, there was a sense of urgency and strong agreement to enact extraordinary policy measures to fend off the collapse of the real sector because of the “collapse of confidence” in the financial sector. The G20 performed spectacularly in this regard: global gross domestic product(GDP) contracted less than expected in 2009 and rebounded faster than expected in 2010(Ahluwalia 2011).These coordinated actions were widely credited for forestalling a second Great Depression, with the G20 declaring victory at their third summit at Pittsburgh in September 2009(“It worked”). Since 2009, Indian Council for Research on International Economic Relations (ICRIER), along with its partners, has been organizing a high level annual conference that brings together academics and key policymakers from G20 member countries and International Financial Institutions (IFIs) to deliberate on a range of issues related to the G20. G-20 Countries are:- As of 2014, Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Republic of Korea, Mexico, Russia, Saudi Arabia, South Africa, Turkey, the United Kingdom, the United States and the European Union make up the G20.

G20 countries are the largest economy in terms GDP in the world. With its consistent growth performance and high-skilled manpower, provides enormous opportunities for foreign investment. Since the beginning of economic reforms in 1991, major reform initiatives have been taken up in the field of investment, trade and financial sector. Enactment of Competition Act, liberalization of Foreign Exchange Management Act (FEMA), and amendments in Intellectual Property Right laws and many other initiatives make G20 attractive for business. G20 countries are the most attractive foreign Direct Investment destination (A.T. Kearney 2007). Also it is the most attractive destination among transnational Corporations for FDI 2007-09 (UNCTAD's World Investment Report, 2007). Though FDI inflows have responded positively to policy changes, there might have been much more had foreign investment not been regulated in some key areas. Till the 1990s, the policy was heavily restrictive with majority foreign equity permitted only in a handful export oriented, high technology industries. Initiated reforms changed the perceptions of foreign investors with foreign investment policy becoming progressively liberal following steady withdrawal of external capital controls and simplification of procedures. While India has an overall market-friendly and liberal policy towards foreign investment, foreign capital still does not enjoy equally easy access in all parts of the economy. The manufacturing sector is still untapped accompanied by lack of access in certain services and agriculture. India's future foreign investment policy faces the critical challenge of increasing access of foreign capital to these segments. Keeping in mind the issues relating to foreign investment, the study aims to achieve the Following objectives:

This study attempts to focus on an insight into G20 countries: Study of interrelationship among FDI, GDP and Foreign Exchange Rate from 1982 to 2015 and forecast of GDP and Foreign Exchange Rate from 2016 to 2019.

The rest of the paper is divided into four sections. Section II presents the literature review on policy regime as a determinant of FDI Section III represents the brief outline of the International Investment Regime i.e. FDI policy. Section IV represents the relationship between FDI and economic policy variables taking following factors into consideration namely, market size, openness (exports and imports), lending rates, debt service ability, strength of legal rights and tax structure followed by the concluding remarks. Section V represents the data and methodology and section VI represents the concluding remarks.

**2. Literature Review:**

**FDI Defined:** In the present era of liberalization, role played by growth of international trade have increasingly influenced FDI and FPI into developing countries. FDI is the largest component of long-term capital flows to developing countries and is expected to remain their dominant source of external finance. Danziger (1997) defines FDI broadly as an investment made by a foreign investor in order to acquire an ongoing interest in an enterprise operating in a country other than the investor's home country. The foreign investor intends to exercise some control over the management of the direct investment enterprise. It is a Greenfield investment if the foreign investor establishes a new venture in the host country. It is merger & acquisition if the foreign investor makes an acquisition of the whole or part of an existing firm or project in the host country is purchased. International Monetary Fund (1996) maintains that foreign direct investment (FDI) is a category of international investment in which a resident entity in one economy (the direct or foreign investor) acquires a lasting interest in an enterprise resident in another economy (the direct investment enterprise). Whether the lasting interest is related to a controlling interest or to potential control is immaterial. It is constituted that the foreign investor should own at least 10% of on overseas direct investment enterprise to control and influence the management of the investment (IMF 1996). FDI in India means investment by non-resident entity/person resident outside India in the capital of the Indian company under Schedule 1 of FEM (Transfer or Issue of Security by a Person Resident outside India) Regulations 2000 (Consolidated FDI Policy Circular, DIPP, 2010).

**Foreign Portfolio Investment (FPI)** on the other hand, is a financial investment made by an investor from one country in the securities markets of another country, seeking purely financial gains in the form of income or capital. Generally, this is a short – term investment in shares, bonds, notes, money market instruments and financial derivatives, and does not imply significant control over or a lasting interest in the enterprises concerned.

**FDI Determinants:**

Table 1: Select Studies on the Determinants of FDI

Author(Year)	Country/Sector	Key Findings
Moosa, Imad A, Cardak, Buly A (2006)	138 countries	Countries with high degree of openness and low country risk attract more FDI
Kok, Reap, Ersoy Bernur A (2009)	Developing countries	Countries should develop policies particular to their own economic structure depending on the FDI determinant.
Neumayer, Eric, Spess, Laura (2005)	Developing countries	Higher number of Bilateral Investment Treaties (BITs) results in more inflows of FDI.
Zheng, Ping (2009)	India and China	Inward FDI is influenced by economic growth, exports, country and political risks/policy liberalization.
Sahoo, Pravakar (2006)	South Asia	Major Determinants of FDI in South Asia are market size, labor force growth, infrastructure index and trade openness.
Peter Montiel, Carmen M.Reinhart (1999)	Emerging Economies	Sterlized intervention in policies increases the capital flows in the form of portfolio investment than FDI. Reduced capital controls increases FDI.
Sung-Hoon Lim (2008)	China	Investment promotion positively affects the attraction of FDI.
Qian Sun, Wilson Tong, Qiao Yu (2002)	China	FDI determinants move through time.Labor quality and infrastructure are important determinants of the distribution of FDI. High labor quality and good infrastructure attract foreign investors. For the country as a whole, political stability and its openness to the foreign world add another important dimention to drawing in foreign capital.
Douglas E. Thomas, Robert Grosse (2001)	Mexico	Economic, socio-political, and geographic factors are hypothesized to be important country-of-origin determinants of FDI into Mexico.

Singh Harinder, Jun, Kwang W(1995)	Developing countries	Political risk, business conditions and macroeconomic policies matter for FDI.
---------------------------------------	-------------------------	-----------------------------------------------------------------------------------

According to the OLI paradigm of Dunning, the presence of ownership-specific competitive (O) advantages in a transnational corporation, the presence of locational advantages (L) in a host country, and the presence of superior commercial benefits internally in a firm (I) are three important set of determinants which influence the FDI inflows. World Association of Investment Promotion Agencies (WAIPS), Newsletter (September-2005) emphasized on Transparency in investment rules and procedures through “e-regulations” system containing detailed, step-by-step, data on national legislation and procedures applicable to the foreign investment operation. It offers online access to forms and is connected to public offices; it also indicates where and how the investor can complain in case of disagreement. As per UNCTAD secretariat report on Investment Policy Developments in G20 countries (2009), 167 policy measures have been undertaken, contained in laws and legislation adopted between 1 October 2008 and 15 June 2009 by the 42 countries surveyed. The various measures taken by most of the G20 countries includes:-

- ✓ Easy entry of foreign investors: by opening up of previously closed sectors of the economy to foreign investment and removing/relaxing sectoral caps for foreign investment. For example 100 % foreign ownership under automatic route was allowed in electricity generation, transmission and distribution in June 1998.
- ✓ Streamlining approval procedures: For example by lowering the threshold for review of investment and acquisition projects, clarifying decentralized responsibilities for approval of foreign investment projects, or relaxing the review procedures for foreign investment in real estate.
- ✓ Facilitation of foreign investment projects: For example, in the form of granting specific incentives to investments in certain areas of a country, or facilitating the operation of companies in Special Economic Zones. Other measures aim at facilitating the operation of foreign investors.
- ✓ China and India ---two emerging economy members of the G20 --- signed BITs, a development reflecting their growing role as capital exporting countries.

Moreover, three of these countries’ International Investment Agreements (IIAs) are South-South agreements, demonstrating the increasing importance of South-South economic cooperation in the field of FDI. Undoubtedly, most of the G20 countries are identified as the fastest growing economy (For example India as well as China) today and has been able to attract substantial foreign investment. However greater investments can flow in with right kind of policy framework.

### **3. Brie Outline of the Regime:**

Among the most favoured destination of FDI of the G20 countries, India’s present policy framework for inward FDI was introduced by the Industrial Policy Statement of July 24, 1991. The foreign investment regime in India has been gradually liberalized by successive governments since the liberalization process commenced in 1991. Attempts have been made to simplify the regime to encourage FDI and to foster competition in the Indian market. Foreign investment, while still controlled, is actively encouraged by the Indian government and amounted to USD 35.1 billion in fiscal year 2009. The policy is reviewed on continued basis and amendments are notified through Press Notes by SIA, DIPP. The present policy allows foreign investors to invest in resident entities through either the automatic route or the government –administered route. Most sectors and activities qualify for the automatic route. This route allows investors to bring in funds without obtaining prior permission from the Government, RBI, or any other regulatory agency. However, invested enterprises are required to inform RBI within 30 days of receipt of funds and also comply with documentation requirements within 30 days of issue of shares to foreign investors.

### **4. Economic and Policy Variables as Determents of FDI of the G20 Countries:**

The direction and magnitude of capital flows between emerging and developed-country markets depend on the relative attractiveness of placing funds in emerging markets vis-a-vis developed-country markets, as well as the ease with which such transactions can be carried out which in turn depends on the liberalization of policy regime. The FDI environment in India has undergone a sea change since the inception of economic reforms in 1991. Like other members of the G20 countries India’s strengths as an investment destination rest on strong fundamentals, including a large and growing market; world-class scientific, technical and managerial manpower, cost-effective and highly skilled labor, an abundance of natural resources, liberal and investor friendly international regime and an independent judiciary. Out of the determinants widely used by researchers, this study examines the economic and policy variables as a determinant of FDI.

### **5. Data and Methodology:**

In order to show the interrelationship between FDI, GDP and FOREIGN EXCHANGE RATE, all data are collected from the World Bank and the period of study is 1982 to 2015. To materialize this interrelationship, we set out two linear regression equation: -

- ✓ Linear regression equation when GDP depends on FDI
- ✓ Linear regression equation when Foreign Exchange Rate depends on FDI.

Added to the above equation FDI has been forecasted from 2016 to 2019 using ARIMA modelling techniques.

The coefficients obtained from these two equations have been applied accordingly on the forecasted FDI data to forecast GDP and Foreign Exchange rate for the time period from 2016 to 2019.

Country Name	1982	1983	1984	1985	1986	1987	1988	1989	1990
Argentina	2.27E+08	1.85E+08	2.68E+08	9.19E+08	5.74E+08	-1.9E+07	1.15E+09	1.03E+09	1.84E+09
Australia	2.36E+09	2.99E+09	3.75E+08	2.06E+09	5.34E+09	5.26E+09	7.38E+09	7.26E+09	8.11E+09
Brazil	2.91E+09	1.61E+09	1.59E+09	1.44E+09	3.45E+08	1.17E+09	2.8E+09	1.13E+09	9.89E+08
Canada	90047128	2E+09	4.75E+09	1.36E+09	2.85E+09	8.11E+09	6.07E+09	6.03E+09	7.58E+09
China	4.3E+08	6.36E+08	1.26E+09	1.66E+09	1.88E+09	2.31E+09	3.19E+09	3.39E+09	3.49E+09
Germany	7.61E+08	1.72E+09	5.3E+08	8.21E+08	2.24E+09	2.12E+09	1.06E+09	7.01E+09	3E+09
European Union	1.3E+10	1.42E+10	8.83E+09	1.52E+10	2.3E+10	3.77E+10	5.59E+10	7.48E+10	9.04E+10
France	1.59E+09	1.73E+09	2.4E+09	2.6E+09	3.26E+09	5.14E+09	8.49E+09	1.03E+10	1.32E+10
United Kingdom	5.41E+09	5.18E+09	-3.5E+08	5.48E+09	8.57E+09	1.59E+10	2.26E+10	3.17E+10	3.35E+10
Indonesia	2.25E+08	2.92E+08	2.22E+08	3.1E+08	2.58E+08	3.85E+08	5.76E+08	6.82E+08	1.09E+09
India	72080000	5640000	19240000	1.06E+08	1.18E+08	2.12E+08	91250000	2.52E+08	2.37E+08
Italy	6.17E+08	1.19E+09	1.32E+09	1.07E+09	-1.7E+08	4.17E+09	6.8E+09	2.17E+09	6.41E+09
Japan	4.4E+08	4.1E+08	-1E+07	6.38E+08	2.26E+08	1.16E+09	-4.8E+08	-1E+09	1.78E+09
Korea, Rep.	69000000	68500000	1.1E+08	2.34E+08	4.6E+08	6.16E+08	1.01E+09	1.12E+09	7.89E+08
Mexico	1.9E+09	2.19E+09	1.54E+09	1.98E+09	2.04E+09	1.18E+09	2.01E+09	2.79E+09	2.55E+09
Russian Federation									
Saudi Arabia	1.11E+10	4.94E+09	4.85E+09	4.91E+08	9.66E+08	-1.2E+09	-3.3E+08	-6.5E+08	1.86E+09
Turkey	55000000	46000000	1.13E+08	99000000	1.25E+08	1.15E+08	3.54E+08	6.63E+08	6.84E+08
United States	1.25E+10	1.05E+10	2.48E+10	2E+10	3.54E+10	5.85E+10	5.77E+10	6.83E+10	4.85E+10
South Africa	3.3E+08	70900000	4.2E+08	-4.5E+08	-5E+07	-1.9E+08	1.58E+08	-2E+08	-7.6E+07
Country Name	1991	1992	1993	1994	1995	1996	1997	1998	1999
Argentina	2.44E+09	4.43E+09	2.79E+09	3.63E+09	5.61E+09	6.95E+09	9.16E+09	7.29E+09	2.4E+10
Australia	4.31E+09	5.7E+09	4.32E+09	5E+09	1.2E+10	6.18E+09	7.63E+09	5.96E+09	3.31E+09
Brazil	1.1E+09	2.06E+09	1.29E+09	3.07E+09	4.86E+09	1.12E+10	1.97E+10	3.19E+10	2.86E+10
Canada	2.87E+09	4.78E+09	4.75E+09	8.22E+09	9.32E+09	9.64E+09	1.15E+10	2.27E+10	2.48E+10
China	4.37E+09	1.12E+10	2.75E+10	3.38E+10	3.58E+10	4.02E+10	4.42E+10	4.38E+10	3.88E+10
Germany	4.75E+09	-2.1E+09	4.01E+08	7.29E+09	1.2E+10	6.43E+09	1.28E+10	2.36E+10	5.59E+10
European Union	7.18E+10	6.88E+10	7.42E+10	7.59E+10	1.21E+11	1.14E+11	1.36E+11	2.6E+11	3.87E+11
France	1.52E+10	2.18E+10	2.08E+10	1.58E+10	2.37E+10	2.2E+10	2.3E+10	2.95E+10	4.6E+10
United Kingdom	1.65E+10	1.66E+10	1.65E+10	1.07E+10	2.17E+10	2.74E+10	3.75E+10	7.47E+10	8.93E+10
Indonesia	1.48E+09	1.78E+09	2E+09	2.11E+09	4.35E+09	6.19E+09	4.68E+09	-2.4E+08	-1.9E+09
India	73537638	2.77E+08	5.5E+08	9.73E+08	2.14E+09	2.43E+09	3.58E+09	2.63E+09	2.17E+09
Italy	2.4E+09	3.1E+09	3.75E+09	2.2E+09	4.84E+09	3.55E+09	3.7E+09	2.63E+09	6.94E+09
Japan	1.29E+09	2.76E+09	1.19E+08	9.12E+08	39332003	2.08E+08	3.2E+09	3.27E+09	1.23E+10
Korea, Rep.	1.18E+09	7.28E+08	5.88E+08	8.09E+08	1.78E+09	2.33E+09	2.84E+09	5.41E+09	9.33E+09
Mexico	4.74E+09	4.39E+09	4.39E+09	1.1E+10	9.53E+09	9.19E+09	1.28E+10	1.28E+10	1.39E+10
Russian Federation		1.16E+09	1.21E+09	6.9E+08	2.07E+09	2.58E+09	4.86E+09	2.76E+09	3.31E+09
Saudi Arabia	1.6E+08	-7.9E+07	1.37E+09	3.49E+08	-1.9E+09	-1.1E+09	3.04E+09	4.28E+09	-7.8E+08
Turkey	8.1E+08	8.44E+08	6.36E+08	6.08E+08	8.85E+08	7.22E+08	8.05E+08	9.4E+08	7.83E+08
United States	2.32E+10	1.98E+10	5.14E+10	4.61E+10	5.78E+10	8.65E+10	1.06E+11	1.79E+11	2.89E+11
South Africa	2.54E+08	3358018	11290546	3.74E+08	1.25E+09	8.16E+08	3.81E+09	5.5E+08	1.5E+09
Country Name	2000	2001	2002	2003	2004	2005	2006	2007	2008
Argentina	1.04E+10	2.17E+09	2.15E+09	1.65E+09	4.12E+09	5.27E+09	5.54E+09	6.47E+09	9.73E+09
Australia	1.49E+10	1.07E+10	1.47E+10	8.99E+09	4.29E+10	-2.5E+10	3.06E+10	4.44E+10	4.52E+10
Brazil	3.3E+10	2.32E+10	1.66E+10	1.01E+10	1.82E+10	1.55E+10	1.94E+10	4.46E+10	5.07E+10
Canada	6.83E+10	2.84E+10	2.45E+10	7.01E+09	1.44E+09	2.55E+10	6.43E+10	1.2E+11	7.01E+10
China	4.21E+10	4.71E+10	5.31E+10	5.79E+10	6.81E+10	1.04E+11	1.33E+11	1.56E+11	1.72E+11
Germany	2.48E+11	5.69E+10	5.12E+10	6.53E+10	-2E+10	5.99E+10	8.74E+10	5.08E+10	3.09E+10
European Union	7.09E+11	3.34E+11	3.83E+11	3.29E+11	3.96E+11	9.46E+11	1.1E+12	1.66E+12	1.08E+12
France	4.14E+10	5.01E+10	5.15E+10	4.23E+10	3.56E+10	8.52E+10	7.89E+10	8.38E+10	6.8E+10
United Kingdom	1.64E+11	5.61E+10	8.98E+10	3.6E+10	8.71E+10	2.53E+11	2.04E+11	2.1E+11	2.53E+11
Indonesia	-4.6E+09	-3E+09	1.45E+08	-6E+08	1.9E+09	8.34E+09	4.91E+09	6.93E+09	9.32E+09
India	3.58E+09	5.13E+09	5.21E+09	3.68E+09	5.43E+09	7.27E+09	2E+10	2.52E+10	4.34E+10
Italy	1.32E+10	1.49E+10	1.47E+10	1.65E+10	1.68E+10	1.96E+10	3.9E+10	4E+10	-9.5E+09
Japan	1.07E+10	4.93E+09	1.16E+10	8.77E+09	7.53E+09	5.46E+09	-2.4E+09	2.16E+10	2.46E+10
Korea, Rep.	1.15E+10	6.52E+09	5.48E+09	7.01E+09	1.33E+10	1.36E+10	9.16E+09	8.83E+09	1.12E+10
Mexico	1.83E+10	3.01E+10	2.4E+10	1.82E+10	2.49E+10	2.6E+10	2.11E+10	3.24E+10	2.91E+10
Russian Federation	2.68E+09	2.85E+09	3.47E+09	7.93E+09	1.54E+10	1.55E+10	3.76E+10	5.59E+10	7.48E+10
Saudi Arabia	-1.9E+09	19640000	-6.1E+08	-5.9E+08	-3.3E+08	1.21E+10	1.83E+10	2.43E+10	3.95E+10
Turkey	9.82E+08	3.35E+09	1.08E+09	1.7E+09	2.79E+09	1E+10	2.02E+10	2.2E+10	1.99E+10
United States	3.5E+11	1.71E+11	1.09E+11	1.11E+11	2.08E+11	1.38E+11	2.94E+11	3.4E+11	3.33E+11
South Africa	9.69E+08	7.27E+09	1.48E+09	7.83E+08	7.01E+08	6.52E+09	6.23E+08	6.59E+09	9.89E+09

Country Name	2009	2010	2011	2012	2013	2014	2015
Argentina	4.02E+09	1.13E+10	1.08E+10	1.53E+10	9.82E+09	5.07E+09	1.2E+10
Australia	2.87E+10	3.52E+10	6.56E+10	5.76E+10	5.46E+10	4.59E+10	3.69E+10
Brazil	3.15E+10	8.85E+10	1.01E+11	8.66E+10	6.92E+10	9.69E+10	7.51E+10
Canada	2.09E+10	2.97E+10	3.83E+10	4.94E+10	6.94E+10	6.54E+10	5.57E+10
China	1.31E+11	2.44E+11	2.8E+11	2.41E+11	2.91E+11	2.68E+11	2.5E+11
Germany	5.67E+10	8.61E+10	9.75E+10	6.55E+10	6.27E+10	9.44E+09	4.62E+10
European Union	4.45E+11	6.02E+11	8.41E+11	7E+11	6.22E+11	4.02E+11	5.15E+11
France	1.84E+10	3.89E+10	4.42E+10	4.15E+10	3.36E+10	7.96E+09	4.42E+10
United Kingdom	1.45E+10	6.67E+10	2.7E+10	4.68E+10	5.45E+10	7.14E+10	5.04E+10
Indonesia	4.88E+09	1.53E+10	2.06E+10	2.12E+10	2.33E+10	2.63E+10	1.55E+10
India	3.56E+10	2.74E+10	3.65E+10	2.4E+10	2.82E+10	3.39E+10	4.42E+10
Italy	1.66E+10	9.94E+09	3.44E+10	34812128	1.95E+10	1.7E+10	7.96E+09
Japan	1.22E+10	7.44E+09	-8.5E+08	5.47E+08	1.06E+10	1.84E+10	-4.2E+07
Korea, Rep.	9.02E+09	9.5E+09	9.77E+09	9.5E+09	1.28E+10	9.27E+09	5.04E+09
Mexico	1.79E+10	2.64E+10	2.36E+10	2.04E+10	4.59E+10	2.57E+10	3.03E+10
Russian Federation	3.66E+10	4.32E+10	5.51E+10	5.06E+10	6.92E+10	2.2E+10	6.48E+09
Saudi Arabia	3.65E+10	2.92E+10	1.63E+10	1.22E+10	8.86E+09	8.01E+09	8.14E+09
Turkey	8.59E+09	9.1E+09	1.62E+10	1.33E+10	1.24E+10	1.25E+10	1.69E+10
United States	1.54E+11	2.59E+11	2.57E+11	2.43E+11	2.77E+11	2.07E+11	3.79E+11
South Africa	7.62E+09	3.69E+09	4.14E+09	4.63E+09	8.23E+09	5.79E+09	1.58E+09

Above four tables show Foreign direct investment, net inflows (BoP, current US\$) data from 1982 to 2015, collected from World bank data database

Country Name	1982	1983	1984	1985	1986	1987	1988	1989	1990
Argentina	8.43E+10	1.04E+11	7.91E+10	8.84E+10	1.11E+11	1.11E+11	1.26E+11	7.66E+10	1.41E+11
Australia	1.94E+11	1.77E+11	1.93E+11	1.8E+11	1.82E+11	1.89E+11	2.36E+11	2.99E+11	3.11E+11
Brazil	2.82E+11	2.03E+11	2.09E+11	2.23E+11	2.68E+11	2.94E+11	3.3E+11	4.26E+11	4.62E+11
Canada	3.14E+11	3.41E+11	3.55E+11	3.65E+11	3.77E+11	4.31E+11	5.07E+11	5.65E+11	5.94E+11
China	2.04E+11	2.29E+11	2.58E+11	3.07E+11	2.99E+11	2.71E+11	3.11E+11	3.46E+11	3.59E+11
Germany	7.74E+11	7.68E+11	7.22E+11	7.3E+11	1.04E+12	1.29E+12	1.4E+12	1.39E+12	1.76E+12
European Union	3.29E+12	3.19E+12	3.06E+12	3.16E+12	4.34E+12	5.37E+12	5.98E+12	6.11E+12	7.58E+12
France	5.87E+11	5.62E+11	5.33E+11	5.55E+11	7.75E+11	9.38E+11	1.02E+12	1.03E+12	1.28E+12
United Kingdom	5.15E+11	4.9E+11	4.61E+11	4.89E+11	6.01E+11	7.45E+11	9.1E+11	9.27E+11	1.09E+12
Indonesia	9.47E+10	8.54E+10	8.76E+10	8.73E+10	8.01E+10	7.59E+10	8.88E+10	1.01E+11	1.14E+11
India	2.04E+11	2.22E+11	2.16E+11	2.37E+11	2.53E+11	2.84E+11	3.02E+11	3.01E+11	3.27E+11
Italy	4.26E+11	4.42E+11	4.36E+11	4.51E+11	6.38E+11	8.03E+11	8.89E+11	9.26E+11	1.18E+12
Japan	1.12E+12	1.22E+12	1.29E+12	1.38E+12	2.05E+12	2.49E+12	3.02E+12	3.02E+12	3.1E+12
Korea, Rep.	8.16E+10	9.05E+10	1E+11	1.04E+11	1.2E+11	1.51E+11	2.02E+11	2.49E+11	2.85E+11
Mexico	1.74E+11	1.49E+11	1.76E+11	1.84E+11	1.29E+11	1.4E+11	1.83E+11	2.23E+11	2.63E+11
Russian Federation								5.07E+11	5.17E+11
Saudi Arabia	1.53E+11	1.29E+11	1.2E+11	1.04E+11	8.7E+10	8.57E+10	8.83E+10	9.53E+10	1.17E+11
Turkey	6.45E+10	6.17E+10	6E+10	6.72E+10	7.57E+10	8.72E+10	9.09E+10	1.07E+11	1.51E+11
United States	3.34E+12	3.64E+12	4.04E+12	4.35E+12	4.59E+12	4.87E+12	5.25E+12	5.66E+12	5.98E+12
South Africa	8.01E+10	8.6E+10	8.52E+10	6.71E+10	7.95E+10	1.04E+11	1.15E+11	1.25E+11	1.12E+11

Country Name	1991	1992	1993	1994	1995	1996	1997	1998	1999
Argentina	1.9E+11	2.29E+11	2.37E+11	2.57E+11	2.58E+11	2.72E+11	2.93E+11	2.99E+11	2.84E+11
Australia	3.26E+11	3.25E+11	3.12E+11	3.23E+11	3.68E+11	4.01E+11	4.36E+11	3.99E+11	3.89E+11
Brazil	6.03E+11	4.01E+11	4.38E+11	5.58E+11	7.86E+11	8.5E+11	8.83E+11	8.64E+11	5.99E+11
Canada	6.1E+11	5.92E+11	5.77E+11	5.78E+11	6.04E+11	6.29E+11	6.53E+11	6.32E+11	6.76E+11
China	3.81E+11	4.25E+11	4.43E+11	5.62E+11	7.32E+11	8.61E+11	9.58E+11	1.03E+12	1.09E+12
Germany	1.86E+12	2.12E+12	2.07E+12	2.21E+12	2.59E+12	2.5E+12	2.22E+12	2.24E+12	2.2E+12
European Union	7.86E+12	8.57E+12	7.81E+12	8.3E+12	9.53E+12	9.74E+12	9.18E+12	9.5E+12	9.49E+12
France	1.28E+12	1.41E+12	1.33E+12	1.4E+12	1.61E+12	1.61E+12	1.46E+12	1.51E+12	1.5E+12
United Kingdom	1.14E+12	1.18E+12	1.06E+12	1.14E+12	1.24E+12	1.31E+12	1.45E+12	1.54E+12	1.57E+12
Indonesia	1.28E+11	1.39E+11	1.58E+11	1.77E+11	2.02E+11	2.27E+11	2.16E+11	9.54E+10	1.4E+11
India	2.75E+11	2.93E+11	2.84E+11	3.33E+11	3.67E+11	4E+11	4.23E+11	4.29E+11	4.67E+11
Italy	1.24E+12	1.32E+12	1.06E+12	1.1E+12	1.17E+12	1.31E+12	1.24E+12	1.27E+12	1.25E+12
Japan	3.54E+12	3.85E+12	4.41E+12	4.85E+12	5.33E+12	4.71E+12	4.32E+12	3.91E+12	4.43E+12
Korea, Rep.	3.32E+11	3.56E+11	3.92E+11	4.59E+11	5.59E+11	6.03E+11	5.6E+11	3.76E+11	4.86E+11
Mexico	3.14E+11	3.64E+11	5.04E+11	5.27E+11	3.44E+11	3.97E+11	4.81E+11	5.02E+11	5.79E+11
Russian Federation	5.18E+11	4.6E+11	4.35E+11	3.95E+11	3.96E+11	3.92E+11	4.05E+11	2.71E+11	1.96E+11
Saudi Arabia	1.31E+11	1.36E+11	1.32E+11	1.34E+11	1.42E+11	1.58E+11	1.65E+11	1.46E+11	1.61E+11
Turkey	1.5E+11	1.58E+11	1.8E+11	1.31E+11	1.69E+11	1.81E+11	1.9E+11	2.69E+11	2.5E+11
United States	6.17E+12	6.54E+12	6.88E+12	7.31E+12	7.66E+12	8.1E+12	8.61E+12	9.09E+12	9.66E+12
South Africa	1.2E+11	1.31E+11	1.34E+11	1.4E+11	1.55E+11	1.48E+11	1.53E+11	1.38E+11	1.37E+11

Country Name	2000	2001	2002	2003	2004	2005	2006	2007	2008
Argentina	2.84E+11	2.69E+11	9.77E+10	1.28E+11	1.65E+11	1.99E+11	2.34E+11	2.89E+11	3.63E+11
Australia	4.15E+11	3.78E+11	3.94E+11	4.66E+11	6.13E+11	6.93E+11	7.47E+11	8.53E+11	1.05E+12
Brazil	6.55E+11	5.59E+11	5.08E+11	5.58E+11	6.69E+11	8.92E+11	1.11E+12	1.4E+12	1.7E+12
Canada	7.42E+11	7.36E+11	7.58E+11	8.92E+11	1.02E+12	1.17E+12	1.32E+12	1.46E+12	1.55E+12
China	1.21E+12	1.33E+12	1.46E+12	1.65E+12	1.94E+12	2.27E+12	2.73E+12	3.52E+12	4.56E+12
Germany	1.95E+12	1.95E+12	2.08E+12	2.51E+12	2.82E+12	2.86E+12	3E+12	3.44E+12	3.75E+12
European Union	8.82E+12	8.92E+12	9.73E+12	1.19E+13	1.37E+13	1.43E+13	1.53E+13	1.77E+13	1.9E+13
France	1.37E+12	1.38E+12	1.5E+12	1.85E+12	2.12E+12	2.2E+12	2.33E+12	2.66E+12	2.92E+12
United Kingdom	1.55E+12	1.54E+12	1.68E+12	1.94E+12	2.3E+12	2.42E+12	2.59E+12	2.97E+12	2.79E+12
Indonesia	1.65E+11	1.6E+11	1.96E+11	2.35E+11	2.57E+11	2.86E+11	3.65E+11	4.32E+11	5.1E+11
India	4.77E+11	4.94E+11	5.24E+11	6.18E+11	7.22E+11	8.34E+11	9.49E+11	1.24E+12	1.22E+12
Italy	1.14E+12	1.16E+12	1.27E+12	1.57E+12	1.8E+12	1.85E+12	1.94E+12	2.2E+12	2.39E+12
Japan	4.73E+12	4.16E+12	3.98E+12	4.3E+12	4.66E+12	4.57E+12	4.36E+12	4.36E+12	4.85E+12
Korea, Rep.	5.62E+11	5.33E+11	6.09E+11	6.81E+11	7.65E+11	8.98E+11	1.01E+12	1.12E+12	1E+12
Mexico	6.84E+11	7.25E+11	7.42E+11	7.13E+11	7.7E+11	8.66E+11	9.65E+11	1.04E+12	1.1E+12
Russian Federation	2.6E+11	3.07E+11	3.45E+11	4.3E+11	5.91E+11	7.64E+11	9.9E+11	1.3E+12	1.66E+12
Saudi Arabia	1.88E+11	1.83E+11	1.89E+11	2.15E+11	2.59E+11	3.28E+11	3.77E+11	4.16E+11	5.2E+11
Turkey	2.67E+11	1.96E+11	2.33E+11	3.03E+11	3.92E+11	4.83E+11	5.31E+11	6.47E+11	7.3E+11
United States	1.03E+13	1.06E+13	1.1E+13	1.15E+13	1.23E+13	1.31E+13	1.39E+13	1.45E+13	1.47E+13
South Africa	1.36E+11	1.22E+11	1.15E+11	1.75E+11	2.29E+11	2.58E+11	2.72E+11	2.99E+11	2.87E+11

Country Name	2009	2010	2011	2012	2013	2014	2015
Argentina	3.34E+11	4.26E+11	5.33E+11	5.49E+11	5.54E+11	5.3E+11	5.83E+11
Australia	9.27E+11	1.14E+12	1.39E+12	1.54E+12	1.56E+12	1.45E+12	1.34E+12
Brazil	1.67E+12	2.21E+12	2.61E+12	2.46E+12	2.47E+12	2.42E+12	1.77E+12
Canada	1.37E+12	1.61E+12	1.79E+12	1.82E+12	1.84E+12	1.78E+12	1.55E+12
China	5.06E+12	6.04E+12	7.49E+12	8.46E+12	9.49E+12	1.04E+13	1.09E+13
Germany	3.42E+12	3.42E+12	3.76E+12	3.54E+12	3.75E+12	3.87E+12	3.36E+12
European Union	1.7E+13	1.69E+13	1.83E+13	1.72E+13	1.8E+13	1.85E+13	1.62E+13
France	2.69E+12	2.65E+12	2.86E+12	2.68E+12	2.81E+12	2.83E+12	2.42E+12
United Kingdom	2.31E+12	2.4E+12	2.59E+12	2.63E+12	2.71E+12	2.99E+12	2.85E+12
Indonesia	5.4E+11	7.55E+11	8.93E+11	9.18E+11	9.13E+11	8.9E+11	8.62E+11
India	1.37E+12	1.71E+12	1.82E+12	1.82E+12	1.86E+12	2.04E+12	2.07E+12
Italy	2.19E+12	2.13E+12	2.28E+12	2.07E+12	2.13E+12	2.14E+12	1.81E+12
Japan	5.04E+12	5.5E+12	5.91E+12	5.96E+12	4.91E+12	4.6E+12	4.12E+12
Korea, Rep.	9.02E+11	1.09E+12	1.2E+12	1.22E+12	1.31E+12	1.41E+12	1.38E+12
Mexico	8.95E+11	1.05E+12	1.17E+12	1.19E+12	1.26E+12	1.3E+12	1.14E+12
Russian Federation	1.22E+12	1.52E+12	2.03E+12	2.17E+12	2.23E+12	2.03E+12	1.33E+12
Saudi Arabia	4.29E+11	5.27E+11	6.7E+11	7.34E+11	7.44E+11	7.54E+11	6.46E+11
Turkey	6.15E+11	7.31E+11	7.75E+11	7.89E+11	8.23E+11	7.99E+11	7.18E+11
United States	1.44E+13	1.5E+13	1.55E+13	1.62E+13	1.67E+13	1.73E+13	1.79E+13
South Africa	2.96E+11	3.75E+11	4.17E+11	3.97E+11	3.66E+11	3.5E+11	3.13E+11

Above four tables show GDP (current US\$) data from 1982 to 2015 ,collected from World bank data database

Country Name	1982	1983	1984	1985	1986	1987	1988	1989	1990
Argentina	2.59E-07	1.05E-06	6.76E-06	6.02E-05	9.43E-05	0.000214	0.000875	0.042334	0.487589
Australia	0.985863	1.110015	1.139519	1.431895	1.495974	1.42818	1.279908	1.264597	1.281057
Brazil	7.77E-11	2.50E-10	8.00E-10	2.68E-09	5.91E-09	1.70E-08	1.14E-07	1.23E-06	2.96E-05
Canada	1.233733	1.232417	1.295067	1.365483	1.3895	1.325992	1.230708	1.183992	1.166775
China	1.892542	1.975675	2.320042	2.936658	3.452792	3.7221	3.7221	3.765108	4.783208
Germany	2.426592	2.553258	2.845942	2.943967	2.171483	1.797392	1.756225	1.880042	1.615733
European Union									
France	6.5721	7.621292	8.7391	8.985225	6.926092	6.010708	5.956942	6.380142	5.445275
United Kingdom	0.572447	0.659725	0.751807	0.779246	0.682197	0.611927	0.56217	0.611173	0.563177
Indonesia	661.4207	909.2648	1025.945	1110.58	1282.56	1643.848	1685.704	1770.059	1842.813
India	9.455132	10.0989	11.36258	12.36875	12.61083	12.9615	13.91708	16.2255	17.5035
Italy	1352.51	1518.848	1756.961	1909.439	1490.81	1296.07	1301.628	1372.093	1198.102
Japan	249.0767	237.5117	237.5225	238.5358	168.5198	144.6375	128.1517	137.9644	144.7925
Korea, Rep.	731.0842	775.7483	805.9758	870.02	881.4542	822.5675	731.4683	671.4558	707.7642
Mexico	0.056402	0.120094	0.167828	0.256872	0.611773	1.378183	2.273105	2.461473	2.812599
Russian Federation									
Saudi Arabia	3.428171	3.454759	3.523811	3.622136	3.70625	3.75	3.75	3.75	3.75
Turkey	0.000163	0.000225	0.000367	0.000522	0.000675	0.000857	0.001422	0.002122	0.002609
United States	1	1	1	1	1	1	1	1	1
South Africa	1.085816	1.1141	1.475277	2.228675	2.285032	2.036033	2.273468	2.622678	2.587321

Country Name	1991	1992	1993	1994	1995	1996	1997	1998	1999
Argentina	0.953554	0.990642	0.998946	0.999008	0.99975	0.999663	0.9995	0.9995	0.9995
Australia	1.283756	1.361648	1.47056	1.367751	1.349033	1.277863	1.34738	1.591828	1.54995
Brazil	0.000176	0.001953	0.038277	0.664684	0.917667	1.0051	1.077992	1.160517	1.813933
Canada	1.145717	1.208725	1.290074	1.365638	1.372441	1.363468	1.384617	1.483463	1.485732
China	5.323392	5.514592	5.761958	8.618743	8.351417	8.314175	8.289817	8.278958	8.27825
Germany	1.659542	1.56165	1.653321	1.622794	1.433133	1.504774	1.734056	1.759668	
European Union									
France	5.642117	5.293816	5.66323	5.552045	4.991483	5.115523	5.836692	5.899516	
United Kingdom	0.567015	0.569774	0.666757	0.653427	0.633668	0.640958	0.610836	0.603824	0.618057
Indonesia	1950.318	2029.921	2087.104	2160.754	2248.608	2342.296	2909.38	10013.62	7855.15
India	22.74243	25.91808	30.49329	31.37374	32.42708	35.43317	36.31329	41.25937	43.05543
Italy	1240.613	1232.406	1573.666	1612.445	1628.933	1542.947	1703.097	1736.207	
Japan	134.7067	126.6513	111.1978	102.2078	94.05958	108.7791	120.9909	130.9053	113.9068
Korea, Rep.	733.3533	780.6508	802.6708	803.4458	771.2733	804.4533	951.2892	1401.437	1188.817
Mexico	3.01843	3.094898	3.115617	3.375117	6.419425	7.599448	7.91846	9.136042	9.560398
Russian Federation			0.991667	2.19075	4.55915	5.120833	5.784833	9.705083	24.6199
Saudi Arabia	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Turkey	0.004172	0.006872	0.010985	0.029609	0.045845	0.081405	0.151865	0.260724	0.418783
United States	1	1	1	1	1	1	1	1	1
South Africa	2.761315	2.852014	3.267742	3.550798	3.627085	4.299349	4.607962	5.528284	6.109484

Country Name	2000	2001	2002	2003	2004	2005	2006	2007	2008
Argentina	0.9995	0.9995	3.063257	2.900629	2.923301	2.903658	3.054313	3.095649	3.144165
Australia	1.724827	1.933443	1.840563	1.541914	1.359753	1.309473	1.327973	1.195073	1.192178
Brazil	1.829423	2.349632	2.920363	3.077475	2.925119	2.43439	2.175327	1.947058	1.833767
Canada	1.48511	1.548761	1.569318	1.401052	1.301019	1.211763	1.134363	1.074099	1.06704
China	8.278504	8.277068	8.276958	8.277037	8.276801	8.194317	7.973438	7.607533	6.948655
Germany									
European Union									
France									
United Kingdom	0.660931	0.694655	0.667223	0.612473	0.54618	0.549998	0.543487	0.499772	0.543966
Indonesia	8421.775	10260.85	9311.192	8577.133	8938.85	9704.742	9159.317	9141	9698.963
India	44.94161	47.18641	48.61032	46.58328	45.31647	44.09998	45.30701	41.34853	43.50518
Italy									
Japan	107.7655	121.5289	125.388	115.9335	108.1926	110.2182	116.2993	117.7535	103.3595
Korea, Rep.	1130.958	1290.995	1251.088	1191.614	1145.319	1024.117	954.7905	929.2573	1102.047
Mexico	9.455558	9.342342	9.655958	10.78902	11.28597	10.89789	10.89924	10.92819	11.12972
Russian Federation	28.12917	29.16853	31.34848	30.69203	28.81374	28.28444	27.19096	25.58085	24.85288
Saudi Arabia	3.75	3.75	3.75	3.75	3.75	3.747083	3.745	3.7475	3.75
Turkey	0.625219	1.225588	1.507226	1.500885	1.425537	1.343583	1.428453	1.302931	1.301522
United States	1	1	1	1	1	1	1	1	1
South Africa	6.939828	8.609181	10.54075	7.564749	6.459693	6.359328	6.771549	7.045365	8.261223

Country Name	2009	2010	2011	2012	2013	2014	2015
Argentina	3.710107	3.896295	4.11014	4.536934	5.459353	8.075276	9.233186
Australia	1.282189	1.090159	0.969463	0.965801	1.035843	1.109363	1.33109
Brazil	1.999428	1.759227	1.672829	1.953069	2.156089	2.352952	3.32799
Canada	1.143101	1.030163	0.989531	0.999188	1.029797	1.106105	1.279098
China	6.831416	6.770269	6.461461	6.312333	6.195758	6.143434	6.227489
Germany							
European Union							
France							
United Kingdom	0.641919	0.647179	0.624141	0.633047	0.639661	0.60773	0.654545
Indonesia	10389.94	9090.433	8770.433	9386.629	10461.24	11865.21	13389.41
India	48.40527	45.72581	46.67047	53.43723	58.59785	61.02951	64.15194
Italy							
Japan	93.57009	87.77988	79.80702	79.79046	97.59566	105.9448	121.044
Korea, Rep.	1276.93	1156.061	1108.292	1126.471	1094.853	1052.961	1131.158
Mexico	13.51348	12.63601	12.42333	13.16946	12.77199	13.29245	15.84827
Russian Federation	31.74036	30.36792	29.38234	30.83983	31.83714	38.37821	60.93765
Saudi Arabia	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Turkey	1.54996	1.502849	1.674955	1.796001	1.903768	2.188542	2.720009
United States	1	1	1	1	1	1	1
South Africa	8.473674	7.321222	7.261132	8.209969	9.655056	10.85266	12.75893

Above four tables show Official exchange rate (LCU per US\$, period average) data from 1982 to 2015, collected from World Bank data database:

The whole process of determining the relationship among FDI, GDP and Foreign Exchange Rate involves application of two predictive analytics techniques i.e. Multiple Linear Regression equation and Time Series Forecasting. Before deploying these two predictive analytics techniques, pairwise correlation among FDI, GDP and Foreign Exchange Rate has been calculated given that all the variables has been converted in numerical format. Multiple Linear Regression equation has been applied under two scenarios:

- ✓ when GDP depends on FDI
- ✓ when Foreign Exchange Rate depends on FDI

Application of Multiple Linear Regression equation has been done through the following steps:-

- ✓ Detection and elimination of outliers of the independent variables i.e. GDP and Foreign Exchange Rate.
- ✓ Checking and replacement of missing value in the whole data set.
- ✓ Application of code for Multiple Linear Regression equation on the whole dataset.
- ✓ Extraction of intercept, coefficients, P-values of T-test and adjusted R squared country-wise and scenarios-wise.

Table showing degree of correlation between FDI and GDP of G20 countries sorted in Largest To Smallest order with :-

- ✓ respective p-value of t-test(lower p-vale of t-test implies lower significance of correlation coefficient and higher p-vale of t-test implies higher significance of correlation coefficient)
- ✓ intercept , coefficient of linear regression equation and Adjusted R squared(implying robustness of linear regression model,desired a higher adjusted R squared) when GDP depends on FDI.

country	correlation coefficient	when GDP depends on FDI				
	FDI vs. GDP	Pr(> t )	Intercept	coefficient of Linear regression equation	Adjusted R square	
Argentina	0.961349157	6.69E-06	1.47E+11		2.01E+01	0.4579
Australia	0.946912671	1.81E-10	2.69E+11		1.82E+01	0.7157
Brazil	0.945027226	> 0.0000000000000002	3.53E+11		2.26E+01	0.8934
Canada	0.942142648	6.73E-07	5.72E+11		1.30E+01	0.5286
China	0.928160075	> 0.0000000000000002	-1.27E+11		3.24E+01	0.9218
Germany	0.910178976	0.0219	1.34E+12		5.72E+01	0.2571
European Un	0.910178976	4.14E-08	6.88E+12		1.02E+01	0.6026
France	0.880153377	1.11E-08	5.97E+11		3.96E+01	0.8859
United Kingd	0.851049382	0.000145	1.21E+12		7.03E+00	0.3476
Indonesia	0.841064373	> 0.0000000000000002	1.38E+11		3.42E+01	0.8841
India	0.78401438	2.76E-15	3.27E+11		3.92E+01	0.8572
Italy	0.776568885	0.018836	6.46E+11		9.88E+01	0.2704
Japan	0.736838543	0.0496	3.62E+12		6.55E+01	0.08752
Korea, Rep.	0.688745931	6.72E-08	2.55E+11		6.92E+01	0.5907
Mexico	0.675113996	8.62E-14	1.79E+11		2.94E+01	0.8231
Russian Fede	0.606090511	8.62E-14	1.79E+11		2.94E+01	0.8231
Saudi Arabia	0.59926229	0.00018	1.95E+11		1.95E+11	0.3391
Turkey	0.562152846	6.96E-12	1.61E+11		3.33E+01	0.7676
United State	0.550934823	4.75E-10	5.09E+12		3.26E+01	0.6982
South Africa	0.339367769	1.19E-05	1.36E+11		2.40E+01	0.4388

Table : 1

Table showing degree of correlation between FDI and Foreign Exchange Rate of G20 countries sorted in Largest To Smallest order with :-

- ✓ respective p-value of t-test(lower p-vale of t-test implies lower significance of correlation coefficient and higher p-vale of t-test implies higher significance of correlation coefficient)
- ✓ intercept , coefficient of linear regression equation and Adjusted R squared(implying robustness of linear regression model,desired a higher adjusted R squared) when GDP depends on FDI.



when FXR depends on FDI						
country	FDI vs. FXR	Pr(> t )	Interce	coefficient of Linear regression equatio	Adjusted R squai	
Mexico	0.878645874	8.41E-12	1.84E+00	3.66E-10	0.7649	
Russian Federation	0.878645874	0.144	2.04E+01	1.79E-10	0.05586	
Turkey	0.76384962	1.47E-07	2.92E-01	8.92E-11	0.5704	
Korea, Rep.	0.721521632	1.47E-06	8.09E+02	3.15E-08	0.5056	
India	0.69725347	4.60E-06	2.70E+01	7.73E-10	0.4701	
South Africa	0.636359363	5.22E-05	3.96E+00	6.67E-10	0.3864	
Brazil	0.583138101	0.000295	7.31E-01	2.07E-11	0.3194	
Indonesia	0.51424049	0.00186	4.55E+03	2.71E-07	0.2415	
Argentina	0.428273837	0.0115	1.07E+00	1.87E-10	0.1579	
China	0.290918842	0.0951	5.70E+00	6.50E-12	0.05603	
Saudi Arabia	0.024088686	0.892	3.72E+00	1.82E-13	-0.03065	
Japan	-0.317461618	0.0673	1.40E+02	-2.10E-09	0.07268	
Germany	-0.355999187	0.161	2.07E+00	-2.66E-11	-2.66E-11	
Italy	-0.365089672	0.15	1.62E+03	-4.01E-08	0.07551	
Canada	-0.381158508	0.0261	1.32E+00	-2.13E-12	0.1186	
Australia	-0.434818075	0.0102	1.42E+00	-4.84E-12	0.1637	
United Kingdom	-0.511860443	0.00197	6.48E-01	-4.27E-13	0.2389	
France	-0.729211094	0.000895	7.47E+00	-9.24E-11	0.5005	

Table : 2

when FXR depends on FDI						
country	FDI vs. FXR	Pr(> t )	Interce	coefficient of Linear regression equatio	Adjusted R squai	
Saudi Arabia	0.024088686	0.892	3.72E+00	1.82E-13	-0.03065	
Germany	-0.355999187	0.161	2.07E+00	-2.66E-11	-2.66E-11	

Table: 3

Linear regression model of the above two countries will be rejected from Table: 2 because they have negative Adjusted R Squared i.e. linear regression model of these countries has no explanatory potential. Only correlation coefficient and respective P-value of t-test will be considered will be considered for these two countries in the scenario where Foreign Exchange Rate depends on FDI. To improve Adjusted R squared of Saudi Arabia and Germany , one new data set has been inserted which is Inflation, GDP deflator (annual %).

when FXR depends on FDI							
country	FDI vs. FXR	Pr(> t )	GDP vs. FXR	Intercept	Coefficient of FDI	Coefficient of Inflation Rate	Adjusted R square
Saudi Arabia	0.024088686	0.9751	0.250066233	3.72E+00	-4.11E-14	2.50E-03	0.02858
Germany	-0.355999187	0.127	-0.883724015	2.33E+00	-3.81E-11	-8.28E-02	4.37E-02

Table: 4

YEAR	Saudi Arabia	Germany	YEAR	Saudi Arabia	Germany
1982	-5.916457519	4.581059	1999	11.24908287	0.317978
1983	-7.807242586	2.807939	2000	11.64484969	-0.44979
1984	-2.344515112	1.989146	2001	-3.410281707	1.277
1985	-5.532510717	2.124726	2002	2.895136444	1.350552
1986	-18.38375135	2.999543	2003	5.704611923	1.206866
1987	3.555430625	1.279664	2004	10.37083296	1.093728
1988	-4.838514453	1.690461	2005	18.26525295	0.620694
1989	7.96412607	2.879067	2006	8.625698062	0.304045
1990	13.06373942	3.396644	2007	4.194657174	1.697387
1991	3.081862279	3.08508	2008	15.32643007	0.838792
1992	-0.808309715	5.286803	2009	-18.93180118	1.756994
1993	-3.071982934	4.135528	2010	17.19135402	0.757704
1994	0.9744016	2.164177	2011	15.576402	1.070477
1995	5.840124367	1.975525	2012	4.025152809	1.502825
1996	7.105563999	0.622077	2013	-1.223004041	2.090241
1997	1.953224964	0.262417	2014	-2.280044118	1.734274
1998	-13.97014014	0.608122	2015	-17.19065448	2.058847

Above four tables show Inflation, GDP deflator (annual %) data from 1982 to 2015, collected from World bank data database:

Since both GDP and Foreign Exchange Rate are dependent on FDI, FDI has been forecasted for 4 years i.e. 2016, 2017, 2018 and 2019 using ARIMA modelling. Before applying ARIMA modelling, the whole data range of FDI from 1982 to 2015 has been stationary. Long term trend has been removed by differentiating and uneven variance has been removed by logarithm of the data range. Stationarity has been checked by ADF test. Then code for ARIMA modelling has been applied to forecast the stipulated time period. MAPE has been extracted from ARIMA model and checked whether it is within the optimum level or not. Intercept and coefficients as derived from Multiple Linear Regression equation has been applied on forecasted FDI and forecasted GDP and Foreign Exchange Rate has been calculated.

Data Source	World Development Indicators			
Last Updated Date	Foreign direct investment, net inflows (BoP, current US\$)			
	17-11-2016			
FORECAST				
Country Name	2016	2017	2018	2019
Argentina	11030732573	11344504870	11658277166	11972049463
Australia	44685083868	46218059607	47751035345	49284011084
Brazil	72621413786	75262281734	77903149681	80544017628
Canada	61395944119	63431329899	65466715679	67502101459
China	2.34015E+11	2.42621E+11	2.51226E+11	2.59832E+11
Germany	76949576487	79339102405	81728628323	84118154242
European Union	8.80544E+11	9.09514E+11	9.38485E+11	9.67455E+11
France	58280176139	59876095352	61472014565	63067933778
United Kingdom	1.23399E+11	1.26883E+11	1.30367E+11	1.33852E+11
Indonesia	15181381615	15754869231	16328356846	16901844462
India	32100402706	33321926216	34543449725	35764973234
Italy	20277333689	20885667013	21494000336	22102333659
Japan	11172026427	11527416855	11882807282	12238197709
Korea, Rep.	12167252406	12558364477	12949476547	13340588617
Mexico	33737212235	34799153038	35861093842	36923034646
Russian Federation	51887963492	54312726561	56737489629	59162252697
Saudi Arabia	17214824746	17799467149	18384109551	18968751954
Turkey	14985155080	15538491673	16091828266	16645164859
United States	3.17035E+11	3.26701E+11	3.36367E+11	3.46033E+11
South Africa	5977817787	6186496148	6395174510	6603852871

Table: 5

Data Source	World Development Indicators			
Last Updated Date	GDP (current US\$)			
	17-11-2016			
FORECAST (on FDI)				
Country Name	2016	2017	2018	2019
Argentina	3.68E+11	3.75E+11	3.81E+11	3.87E+11
Australia	1.08E+12	1.11E+12	1.14E+12	1.17E+12
Brazil	2.00E+12	2.06E+12	2.12E+12	2.18E+12
Canada	1.37E+12	1.39E+12	1.42E+12	1.45E+12
China	7.45E+12	7.73E+12	8.00E+12	8.28E+12
Germany	5.75E+12	5.88E+12	6.02E+12	6.16E+12
European Union	1.59E+13	1.62E+13	1.65E+13	1.68E+13
France	2.91E+12	2.97E+12	3.03E+12	3.10E+12
United Kingdom	2.08E+12	2.10E+12	2.13E+12	2.15E+12
Indonesia	6.58E+11	6.77E+11	6.97E+11	7.17E+11
India	1.58E+12	1.63E+12	1.68E+12	1.73E+12
Italy	2.65E+12	2.71E+12	2.77E+12	2.83E+12
Japan	4.35E+12	4.37E+12	4.40E+12	4.42E+12
Korea, Rep.	1.10E+12	1.12E+12	1.15E+12	1.18E+12
Mexico	1.17E+12	1.20E+12	1.23E+12	1.27E+12
Russian Federation	1.71E+12	1.78E+12	1.85E+12	1.92E+12
Saudi Arabia	3.37E+11	3.48E+11	3.59E+11	3.71E+11
Turkey	6.60E+11	6.79E+11	6.99E+11	7.16E+11
United States	1.54E+13	1.57E+13	1.60E+13	1.64E+13
South Africa	2.79E+11	2.84E+11	2.89E+11	2.94E+11

Table: 6

Table above shows forecasting of GDP on the basis of FDI forecast:

World Development Indicators				
Data Source	Official exchange rate (LCU per US\$, period average)			
Last Updated Date	17-11-2016			
FORECAST (on FDI)				
Country Name	2016	2017	2018	2019
Argentina	3.13E+00	3.19E+00	3.25E+00	3.31E+00
Australia	1.20E+00	1.19E+00	1.19E+00	1.18E+00
Brazil	2.23E+00	2.29E+00	2.34E+00	2.40E+00
Canada	1.19E+00	1.18E+00	1.18E+00	1.17E+00
China	7.22E+00	7.28E+00	7.34E+00	7.39E+00
Germany	2.13E-02	-4.23E-02	-1.06E-01	-1.69E-01
France	2.09E+00	1.94E+00	1.79E+00	1.64E+00
United Kingdom	5.95E-01	5.94E-01	5.92E-01	5.91E-01
Indonesia	8.66E+03	8.81E+03	8.97E+03	9.12E+03
India	5.18E+01	5.28E+01	5.37E+01	5.47E+01
Italy	8.03E+02	7.78E+02	7.54E+02	7.30E+02
Japan	1.17E+02	1.16E+02	1.16E+02	1.15E+02
Korea, Rep.	1.19E+03	1.20E+03	1.22E+03	1.23E+03
Mexico	1.42E+01	1.46E+01	1.50E+01	1.54E+01
Russian Federation	2.96E+01	3.01E+01	3.05E+01	3.09E+01
Saudi Arabia	3.72E+00	3.72E+00	3.72E+00	3.72E+00
Turkey	1.63E+00	1.68E+00	1.73E+00	1.78E+00
South Africa	7.95E+00	8.09E+00	8.23E+00	8.37E+00

Table: 7

Table above shows forecasting of Foreign Exchange Rate on the basis of FDI forecast:

**6. Concluding Remarks:**

After analysing the whole collected data set, pair-wise ( FDI vs. GDP and FDI vs. Foreign Exchange Rate) correlation coefficients with respective p-values of T-test , intercept and coefficients from two Linear regression equations. Now from the point of view of pair-wise correlation coefficients with respective p-values of T-test, European Union has highest correlation coefficients (0.737) between FDI and GDP after considering p-values of T-test and in case of FDI and. Foreign Exchange Rate, it is Saudi Arabia (0.0241). Added to this, FDI vs. Foreign Exchange Rate data sets of some countries (Germany, Italy, Japan, Canada, Australia, United Kingdom and France) are giving negative correlation coefficients implying adverse relationship between FDI and. Foreign Exchange Rate. Coefficients from two linear regression equations have a unique statistical significance. It describes the domination power of FDI on GDP and Foreign Exchange Rate. In respect of linear regression Equation of when GDP depends on FDI with due significance to Adjusted R squared, China has highest coefficient of linear regression equation (32.36719) with Adjusted R squared of 0.9218 and the lowest one (65.53453) is Japan with Adjusted R squared of 0.08752. In respect of linear regression Equation of when GDP depends on Foreign Exchange Rate with due significance to Adjusted R squared, Mexico has highest coefficient of linear regression equation (0.000000003663684) with Adjusted R squared of 0.7649 and the lowest positive one (0.002497348) is Saudi Arabia with Adjusted R squared of 0.02858. But some countries in these equation are giving negative coefficient of linear regression equation which are France ,United Kingdom , Australia , Canada , Italy , Japan and Germany implying negative effect of FDI growth on Foreign Exchange rate. The present study analysis the policy related variables like openness of the economy, foreign exchange reserves, debt service ratio, strength of legal rights, tax policies and economic determinant, that is, GDP to throw light at the possible variables influencing the foreign direct investment inflows in India. The analysis shows that independent variables including GDP, Openness and LR affect the inflows of FDI to India. Among the major reasons which discourage the international investors from investing in India despite of its consistent economic growth includes: 1) Politics and corruption 2) Lack of infrastructure 3) Inadequate Legal system 4) Instability of Indian Social and Political environment 5) Absence of Corporate governance practices 5) Maturity of the financial markets All in all a more open policy frame is required which can be integrated with developing economies policy frame so that India becomes the most attractive destination and actually receive Foreign Direct Investment in the sectors which has potential to grow from foreign capital. Furthermore the integration at National level is required .As sectors which are covered under automatic route are subject to other caveats imposed by State and respective Ministry.

**References:**

1. Agnès Bénassy-Quéré, Maylis Coupet, Thierry Mayer(2005),Institutional determinants of Foreign Direct Investment,CEPII, Working Paper No 2005-05.
2. Aitken, B & Harrison A (1994), Do Domestic firms benefit from Foreign Direct Investment?, Washington, World Bank Research Deptt.
3. A.T. Kearney (2007). FDI Confidence Index 2007, A.T. Kearney

4. Bruce A. Blonigen(2005),A Review of the Empirical Literature on FDI Determinants, ,N B E R Wo r k i n g P a p e r N o . 1 1 2 9 9 . <http://www.nber.org/papers/w11299>
5. Damija, Nidhi(2008),Foreign Institutional Investment in India: An exploratory Analysis of Patterns across firms. Journal of Applied Economic Research, Volume 2
6. Daniele, Vittorio and Marani, Ugo (2006),Do institutions matter for FDI?A comparative analysis for the MENA countries , MPRA Paper No. 2426, Online at <http://mpra.ub.unimuenchen.de/2426/>
7. Danziger, E (1997), Danziger Investment Promotion manual, London FDI International.
8. DIPP(2009),Fact Sheet on FDI , FDI Statistics 2009
9. DIPP(2008), Fact Sheet on FDI , FDI Statistics 2008
10. Dunning J.H., “The Eclectic Model of FDI”, Multinational Enterprise and the Global Economy Reading, Addison Wesley, 1993, pp. 82-95.
11. Fernando Luis Pascoal (2002), Foreign direct investment: its determinants and relevance to developing countries. PhD Dissertation, University of South Africa.
12. Globerman Steven, Shapiro Daniel (2002), Global Foreign Direct investment flows: The role of Governance Infrastructure, World Development Vol.30, No.11, pp 1899-1919.
13. Henley, John S(2004), Chasing the Dragon: Accounting for the underperformance by India by comparison with China in attracting Foreign Direct Investment Journal of International Development,Wiley Interscience Publication
14. Javorcik Beata S., Wei Shang-Jin (2009), Corruption and cross border investment in emerging markets: Firm-level evidence, Journal of International money and Finance. Pp 605-624
15. Kok, Reap, Ersoy Bernur A (2009), Analyses of FDI determinants in developing countries, International Journal of social economics. Vol. 36. pp 105-123.
16. Moosa, Imad A, Cardak, Buly A (2006), The determinants of Foreign Direct Investment: An extreme bound analysis, Journal of Multinational Financial management. Pp 199-211.
17. Neumayer, Eric, Spess, Laura (2005), Do bilateral investment to developing countries? World Development Vol.33, No.10, pp 1567-1585.
18. Neumayer, Eric (2007), Do double taxation treaties increase foreign direct investment to developing countries? Journal of Development Studies 43 (8), 2007, pp. 1501-1519
19. OECD, Protection of 'critical infrastructure' and the role of investment policies relating to national security, OECD Report Available at [www.oecd.org/daf/investment/statistics](http://www.oecd.org/daf/investment/statistics)
20. Palit Amitendu (2009), India's foreign Investment policy, achievement and inadequacies, ifri.org
21. Peter Montiel, Carmen M. Reinhart (1999), Do capital controls and macroeconomic policies influence the volume and composition of capital flows? Evidence from the 1990s, Journal of International Money and Finance, 18 (1999) pp619–635.
22. Prasanna, P. K.(2008). Foreign Institutional Investors: Investment Preferences in India Journal of Administration and Governance (JOAAG), Vol. 3. No. 2
23. Ramkishan S. Rajan, Sunil Rongala and Ramya Ghosh(2008), Attracting Foreign Direct Investment ( FDI ) to India <http://www.freewebs.com/rrajan1/IFDI.pdf>.
24. RBI (2009), Handbook of Statistics on Indian Economy, RBI Publications
25. RBI (2008), Handbook of Statistics on Indian Economy, RBI Publications
26. Sahoo, Pravakar(2006), Foreign Direct investment in South Asia: Policy, Trends, Impact and determinants. ADBInstitute Discussion paper No. 56.
27. Sung Hoon Lim (2008), How investment promotion affects attracting foreign direct investment:Analytical argument and empirical analyses, International Business Review. pp 39-53.
28. Thorsten Beck,Aslh Demirgu,c-Kunt,Vojislav Maksimovic(2002), Financing Patterns Around the World, Policy Research Working Paper. World Bank Research Group.
29. UNCTAD (2002) World investment report: transnational corporations and export competitiveness. UNCTAD, United Nations, New York.
30. United Nations (2009), Investment Policy Review of Burkina Faso ) , Main conclusions and recommendations. New York.
31. UNTACD (2008), International investment rule-making, UNCTAD Series on International Investment Policies for Development.
32. UNTACD (2009) to (2016), World Investment Report 2009 to 2016.
33. UNCTAD (2009), Investment Policy Developments in G-20 Countries, New York.
34. WAIPA (2005), What’s next Strategic views on FDI.WAIPA Newsletter, Issue 3.
35. World Bank (2009).Doing Business 2009, Washington, DC: World Bank.
36. World Economic Forum (2007).Global Competitiveness Index 2007-08, World Economic Forum, Davos.
37. World Bank (2009), World Development Indicators 2009.
38. World Bank (2016), World Development Indicators 2016.