Foreign Direct Investment in Pakistan through Principal Component Analysis; during July 2001 till February 2019

Bushra Shamshad

Department of Statistics, University of Karachi

Summary
In this paper we have used Principal component Analysis (PCA); a data reduction technique, to explore graphically the important events that influenced the Foreign Direct Investment (FDI) in Pakistan during July 2001 till February 2019. FDI is the major influential factor in the economy of any country. Through PCA, identification of major influential events can be identified which have a lasting (negative/positive) impact on the economy of Pakistan. Monthly FDI from over 30 countries are considered for analysis. The data is divided in three parts 1) From July 2001 till June 2007, 2) from July 2007 till June 2013, and 3) from July 2013 till February 2019. First two Principal components are considered for analysis as they accounts for 85, 60 and 82 per cent of the total investment made by various countries in the corresponding durations. The analysis reveals the true situation prevailed during every considered period.

Key Words:
Foreign Direct Investment, Principal Component Analysis, Bi-plots, loading plots.

1. Introduction

The present financial system of Pakistan is volatile in nature because the economy is less developed and lacked in domestic consumption. To avoid this cause, Pakistan and other such less developed countries extends trade relations with developed countries of the world in order to make domestic savings for the developmental purposes of economy. Exports and imports loans, remittances and foreign investments are the useful mode in receiving external debt especially in case of less developed countries. For the purpose of analysis, broadly used statistical models with the usage of time series datasets are helpful in analyzing the conditions of external debts and its association with the macroeconomic variables that mainly involves inflation, fiscal policy, public and private asset and also linkage with appreciation and depreciation of local currency along with FDI.

The present study identifies the impact of foreign investment to determine the major events that have had a great impact on the economy of Pakistan. Advanced multivariate technique of PCA is used to graphically represent main investors in three different durations for the data of FDI in Pakistan. PCA is a popular multivariate technique, which transform the correlated set of variables in an orthogonal set having same dimension as of original ones and then allow to select among all, the first few transformed variables. As, the resultant variables (Principal Components; PC's) are arranged in ascending order according to their accounted variability. We have used monthly data of country wise Foreign Direct Investment (FDI) in Pakistan to investigate the number of factors influencing the variation in the FDI in Pakistan, for this we consider data from July 2001 till February-2019. The data is retrieved from SBP website [1]. Thirty countries are considered in the analysis having some contribution in FDI in Pakistan in the above duration.

This paper has the following structure. After a quick introduction of FDI and PCA, the next section presents the literature review followed by application of PCA on FDI in Pakistan in all three duration and an in depth study of the important dates (seen as outliers in score plot) and main investor countries highlighted in bi-plot for each duration in the study.

2. FDI

Durlauf and Blume [2] define investment as formation of resources that generate wealth. In capitalist economies the main focus is on business investment such as in physical capital- building, equipment, and inventories. Investment in the form of nonprofit acquisition of human and intangible capital as well as physical capital is undertaken by governments as well. More simply, it can be defined as the use of wealth to create more wealth in any form, either as an interest, profit or dividend [3]. Investment can be simply defined as placing money in the capital of any business, in order to gain the average dividend or an increase in the value of the capital invested. In other words, an individual can purchase goods and with some physical efforts sell the goods at a higher price in order to gain profit as a result of his business wisdom. In principle, investment should also include upgrading of land or the development of natural resources, and the relevant corrective measure in order to improve the production of goods and services produced for sale as well non market output [3].

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Foreign Direct Investment is the share of a party (non-resident of the host country) into the property of the host country for the purpose of conserving the wealth or earnings as income. Investor doing FDI will then have a lasting interest in the investment in contrast to portfolio investment which covers long-term bonds and corporate equities other than those included in the categories for direct investment and reserves.

We are using a multivariate technique called Principal Component Analysis in order to reduce the original data set into few significant components that accounts maximum variability of the data. The one of the basic purpose of PCA is to plot the multivariate data. In PCA, the score plot can be obtained by plotting the first and second Principal Components (PC's).

The pattern observed in score plot is of main interest, because it identifies the ups and downs of FDI in different months, Such that one can easily identify the time period of any abnormal behavior of FDI as well as the root causes. Next section is a brief overview of Principal Component Analysis.

3. Principal Component Analysis:

PCA transform the original set of variables into an uncorrelated set of new components in such a way that each component contains all the original variables as a linear combination. The dimension of original set and transformed set are same. The components are arranged in ascending order of their variability. This help to extract first few components having greater variability, thus reduce the dimension of the data. It was first developed by Pearson [4], later development was made by Hotelling [5]. Kim & Kim [6] worked on Independent component analysis (ICA) in comparison with PCA, as the principal components obtained are uncorrelated but not necessarily independent except if the original data is from multivariate normal distribution.

Form the above discussion, the main objectives of PCA can be deduce as

- To discover or to reduce the dimensionality of the data set.
- To identify new meaningful underlying variables (factors).
- To plot the multivariate data.

The objectives of PCA include dimension reduction, identifying new and more meaningful factors. Another advantage of PCA is we can explore different hidden pattern or cluster/ groups through plotting first few PC's. PCA is mathematical technique; it is basically an Eigen analysis. Where, eigen values are the explained variances of each transformed variable called Principal Components (PC's) and eigen vectors are the coefficients of PC's-obtained by projecting the multivariate data set on the space spanned by Eigen vectors-. Eigen analysis is carried out on either variance covariance or by using the standardized variance covariance matrix (Correlation matrix). Although, the output obtained by both the matrices give different results, if the variances of the variables of the data set differ much or the measurement of each variable differs then correlation matrix will be used instead of covariance matrix. If the original sets of variables are uncorrelated than the result of PCA is same as that of the original one. For further study see [7], [8], [9].

4. Literature Review

Akpan, Isihak & Asongu [10] used PCA to control the multicollinearity between the variables (indicators of institutional and governance quality of a country) which might affect the model reliability if the model over parameterized. They applied pooled analysis on time series cross sectional technique (OLS). Their main focus was those developing countries receiving more FDI and according to world investment report by the UNCIAD accounted for 52% of the global FDI inflow in 2012. They include two groups; BRICS (Brazil, Russia, India, China, South Africa) and MINT (Mexico, Indonesia, Nigeria and Turkey) both the groups are similar in a way that they have more young population as compared to other developed countries as well as they are well placed geographically to capture large market and take advantage.

Alzaidy, ahmed and Lacheheb [11] worked on the impact of FDI on economic growth and financial development in Malaysia. Duration of their study is from 1975-2014. They used PCA to overcome the multicollinearity between the financial development variables and used first principal component as the representative of financial development in the model.

Lal et al. [12] studied the long run association between financial structure and economic growth by applying Johansen cointegration technique. Financial structure was considered by mean of a weighted average of structure size and structure activity of the financial sector. Fully modified ordinary least square gives significant association among the variables under study.

Khan, Qayyum & Sheikh [13] also studied the relationship between financial development and economic growth in Pakistan. They follow Christopoulos & Tsionas [14] model to establish the relation. They used dummy variable in the model to incorporate effect of financial sector reform introduced by the government of Pakistan in 1980. They also used CUSUM and CUSUMSQ to test the stability for estimated error correction model which indicate that the model are stable.

5. Analysis

We divide the data into three parts. First part is from July-2001 till June-2007. The second part includes FDI in Pakistan during July-2007 till June-2013 and the third and last part include data during July'2013 till February-2019. By the end of fiscal year 2007-2008 General Pervaiz Musharaf steps down from presidency of Pakistan but the government of PML(Q) was aready established after the election in October 2007. Whereas, on 27th Dec 2007, the assassination of Benazir Bhutto took place. We define the first phase as "Musharaf's Govern (MG) Period" (although it is from June 2001 till October 2008). As, we consider data from July 2001 till June 2007 to be MG. July 2007 till June 2013 is the second phase in this study. This phase include assassination of Benazir Bhutto and presidency of Asif Ali Zardari in the election held on 6th September 2008. He took charge as president of Pakistan on September 2008 and complete the tenure till September 2013, having limited presidential powers after 18th amendment enforced in 2010.

The third and the last phase starts when the government changes after election held on 30th July 2013. From Sep 2013 till Sep 2018 Mamnoon Hussain was the president of Pakistan and Prime Minister Nawaz Sharif of PML(N) was from the governing party. In August 2017 Shahid Khaqan Abbasi became the Prime Minister in place of Nawaz Sharif as Supreme Court of Pakistan disqualifies him over the controversy of Panama papers. In July 2013 election Imran Khan became the Prime Minister of Pakistan.

5.1 PCA of FDI

PCA is carried out on Foreign Direct Investment in Pakistan using covariance matrix, the analysis generated through MINITAB, is provided in Table 1. We have considered only the first two principal components from the analysis. The first two PC's explained 84.9%, almost 60% and 82% of the total variation of the original data for durations July 2001 till June 2007, July 2007 till June 2013 and the last duration from July 2013 till February 2019, respectively. In this paper our main focus is to graphically represent FDI in the three eras. The main contributor countries and the important dates are discussed in next sub sections.

5.2 July 2001 till June 2007

The main contributor countries in this duration were UK, USA, UAE, Netherlands and China, in the same order of their contribution in FDI. After the recession of 911, invasion in Iraq and Afghanistan, the policies of UK and USA were not stable. The coefficients of PC1 and PC2 using Covariance matrix are provided in Table 1. In PC1 all the above mentioned five countries are considered as big investors indicating that, FDI in this duration mainly dependent on these countries. PC's can be classified according to the following group of countries.

PC1 = 0.47(USA + UK) + 0.44(UAE) + 0.4(Netherlands + China)

PC2 = 0.87(UAE) – 0.38(China) – 0.22(Netherlands).

PC1 indicates the overall behavior of investment by these countries. PC2 on the other hand, indicates the second factor, that is, of differences in policies of UAE with China and Netherlands.

In Pakistan, countries which were considered as a reason of main inflow of FDI were U-countries (i.e. USA, UK and UAE). The consequences of Asian market crisis, 9/11 attack, invasion in Iraq and Afghanistan changed the geo-strategic circumstances in favor of Pakistan. Khan [15] mentioned the influence of capital inflow in Pakistan as highly dependent on the relationship with major international powers, especially with USA. He also mentioned that changes in the policies of US government not only impact the inflow of FDI but also influence other countries to join the bilateral and multilateral collaboration with Pakistan. As, Pakistan support and joined the "War against Terrorism", international sanctions (consequence of nuclear detonation and freezing of foreign currency accounts of May 1998) were lifted, the economic and military aid increased and the debt got rescheduled.

In 2007, the inflow of FDI reached to US$ 5590 million. The inflow of significant FDI was in financial sector through its privatization, increased the amount from approximately US$930 to US$ 1864 at the end of fiscal year 2007-2008 as compared to last year.

Table 1: First two principal component(s) obtained through PCA on FDI data during (a) July 2001 till June 2007 (b) July 2007 till June 2013 (c) July 2013 till February 2019.

(a) July2001-June2007			**(b) July2007-June2013**			**(c) July2013-Feb2019**		
Eigenvalue	46266	10197	Eigenvalue	7226.8	2668.5	Eigenvalue	9047.6	3059.4
Proportion	0.696	0.153	Proportion	0.434	0.16	Proportion	0.615	0.208
Cumulative	0.696	0.849	Cumulative	0.434	0.594	Cumulative	0.615	0.822
Variable	**PC1**	**PC2**	**Variable**	**PC1**	**PC2**	**Variable**	**PC1**	**PC2**
Australia	0.038	-0.012	Australia	0.004	0.02	Australia	-0.004	0
Bahrain	-0.037	0.022	Bahrain	0.003	0.008	Bahrain	0.003	-0.002
Bangladesh	0.005	-0.002	Bangladesh	0	0	Bangladesh	0	0
Canada	0.006	-0.004	Canada	0	0.006	Canada	0.005	-0.001
China	0.413	-0.38	China	-0.008	-0.056	China	0.991	0.124
Denmark	-0.002	-0.001	Denmark	0	0	Denmark	0	0
Egypt	0	0	Egypt	0.005	0.018	Egypt	0.008	0.007
France	0	0	France	0	0.004	France	0.015	-0.007
Germany	0.041	-0.008	Germany	-0.001	0.02	Germany	-0.001	0.004
Hong Kong	0.016	-0.004	Hong Kong	0.272	-0.013	Hong Kong	-0.018	0.014
Iran	0.018	-0.009	Iran	-0.001	0	Iran	0.002	0
Japan	0.033	-0.009	Japan	0.029	0.036	Japan	-0.001	-0.003
Korea.(South)	0.001	0	Korea.(South)	-0.002	-0.009	Korea.(South)	0	0.006
Kuwait	0.033	-0.012	Kuwait	-0.003	0.002	Kuwait	-0.009	-0.007
Libya	0.005	-0.002	Libya	0	0.009	Libya	0.001	0
Luxembourg	0.007	0.008	Luxembourg	0	-0.002	Luxembourg	0.005	0.003
Malaysia	-0.004	0.003	Malaysia	0.948	-0.142	Malaysia	0.01	0.006
Netherlands	0.426	-0.224	Netherlands	0.008	0.093	Netherlands	0.122	-0.989
Norway	0.013	0.039	Norway	0.111	0.211	Norway	-0.011	-0.018
Oman	0.01	-0.004	Oman	0.026	0.04	Oman	-0.004	-0.001
Qatar	0	0	Qatar	0.001	0.009	Qatar	0.002	-0.003
Saudi Arabia	0.053	-0.079	Saudi Arabia	0.013	0.009	Saudi Arabia	0.009	-0.003
Singapore	0.011	0.001	Singapore	-0.004	0.011	Singapore	0.007	-0.001
South Africa	0	0	South Africa	0	0.001	South Africa	-0.002	-0.001
Sweden	0	0	Sweden	0.005	0.008	Sweden	0.006	-0.001
Switzerland	0.085	-0.041	Switzerland	0.004	0.016	Switzerland	-0.005	-0.011
Turkey	0	0	Turkey	0	0.002	Turkey	-0.016	0.004
U.A.E	0.441	0.872	U.A.E	0.022	0.266	U.A.E	-0.016	-0.012
United Kingdom	0.464	-0.145	United Kingdom	0.007	0.06	United Kingdom	0.026	0.01
United States	0.469	-0.116	United States	0.114	0.919	United States	-0.033	0.071

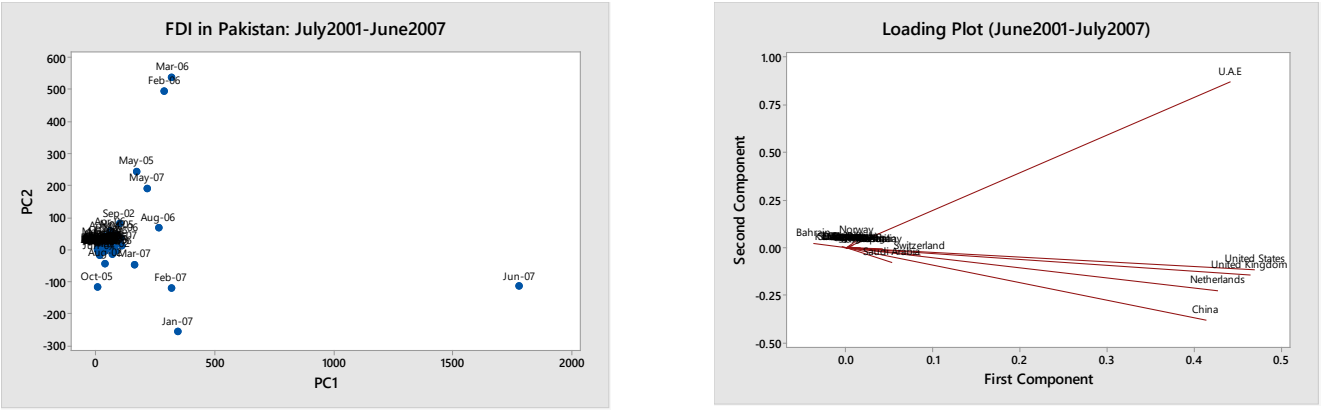


Fig. 1 Score plot(s) of FDI during July 2001 till June 2007.

Score plots in Figure 1 (a) and (b) can be used to explore the important event (labelled as month & year) and corresponding country, respectively that were responsible for the investment in the said period.

In May 2005, the Abu Dhabi Group (ADG) launched Warid telecom (Pvt) Ltd by investing around $400 million in Pakistan. Other investments made by AGD are in banking sector, investing in Bank Alfalah Ltd. and United Bank Ltd [16].

In this year, KESC also got privatized. 71% shares of the company were transferred to a foreign consortium. In June 2005, Etisalat a UAE based company was another main investor, investing $2.6 billion and acquiring 26% stake in Pakistan Telecommunication Company Ltd. (PTCL). The telecommunication and IT sector keep on

attracting FDI during the fiscal year 2006-2007 earning 133.2 million from privatization [17].

During January till April 2006, a growth of 37.3% was noticed from UK exports as compared to the corresponding duration in the last fiscal year. Investment made by UK in fiscal year 2005-2006 was mainly in Petroleum refining, oil and gas exploration, power, communication (telecom and IT), cement and financial business. The Bestway cement made further investment of $140 million at their plant at Chakwal [18].

In exports US comes as a major partner, during July 2006 till January 2007 the exports were 26 % of which 31% exports to US was textile products. On the other hand China is 8th largest export partner, accounts for nearly 3% of the total exports during July 2006 till January 2007 [19].

In February 2007, China Mobile Ltd. formalized the purchase of the remaining 88.86 percent stake in Paktel Ltd. and became the sole owner of the company with 100% shares with an investment of $460 million in May 2007. The company later renamed as CMPak. In the same month, Qatar telecommunication bought 75% shares of Burraq Telecom for $12.3 million.

On June 25, 2007; An Egyptian based Orascom Telecom with 88% stakes of Mobilink in hand acquired the remaining 11.31% for $290 million from a local investor and became the sole owner of Mobilink. In the same month, SingTel; a Singapore based company acquired 30% stake in the Waridtel of Pakistan for $758 million [17].

During the first phase July 2001 till June 2007, the main investment in the country is due to privatization and liberalization of the financial sector. From fiscal year 2002 till 2009, the investment done by United Sates is mainly for security-related matters and economic aid with a very negligible impact on the trade and private inflows [15].

5.3 PCA of FDI (Fiscal year 2007-2013)

According to our analysis the main investors in this duration are Malaysia, US, Hong Kong, UAE and Norway. Malaysia is the leading investor in the first principal component. Whereas, PC2 indicates the influence of investment done mainly from US in Pakistan during FY 2007-2013. PC1 and PC2 along with their accounted and cumulative variation are presented in Table 1. The important dates in this duration as can be seen in the loading plots of PC1 and PC2 (shown in Figure 2) are September 2007, October-December 2007, June 2008, August 2008, Nov-Dec 2008.

PC1 = 0.94(Malaysia) + 0.27(Hong Kong) + 0.11(US + Norway)

PC2 = 0.91(US) + 0.26(UAE) + 0.21(Norway) - 0.14(Malaysia)

In fiscal year 2007-2008, Pakistan received the recorded $5.4 billion, the highest FDI in the country history according to the Board of Investment (BOI). In September 2007, Pakistan's liquid foreign reserves cross $16 billion. According to BOI report 2013-2017, 71% of the total FDI in fiscal year 2007-2008 was mainly from US, Malaysia, Hong Kong, UK, UAE, Netherlands, Saudi Arabia. During fiscal years 2009-2012, FDI from these countries reduced considerably. In 2008, Pakistan was excluded from Emerging Market Index (MSCI) and also from the "War on Terrorism" [20]. The economic instability after the assassination of Benazir Bhutto was evident as there was political uncertainty, security issues as well as another main issue was the energy shortage. November 2008 was considered as end of investment banking. The MSCI Europe Index was dropped 45% and MSCI Asia Pacific Index dropped 43%. In May-July 2009, Pak Army launched operation Rah-e-Rast. During Fiscal year 2008-2013, many incidents took place all over Pakistan. Karachi shut down multiple times due to series of bomb attacks, murders, massive target killing and series of target killings.

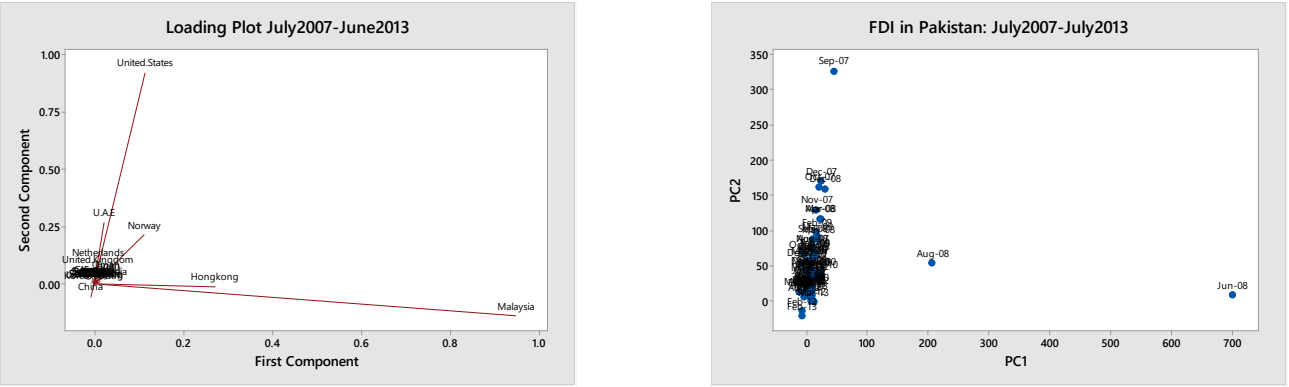


Fig. 2 Loading plot(s) of PC1 and PC2 of FDI in Pakistan during FY2007-2013.

In November 2007, Malaysia and Pakistan signed the first bilateral Free Trade Agreement (FTA), which got approval from the cabinet and was effective from January 2008. The agreement was under multiple tracks for six years. Both the countries are member of OIC. From 2007 till 2010 the trade deficits with Malaysia broaden from $1.07 billion to $1.9 billion. The expansion of trade between the two countries is under expectation [21].

5.4 PCA of FDI (July 2013 till February 2019)

In FY 2007-2013, Pakistan could not get the enough investment from those countries that invested in FY 2001-2007 and failed to get the full advantage of its cooperation in "War on Terrorism" with the US. HSBC, Barclays and Deutsche also exited after making good profit and named it as "strategic realignment", as a result other European and US bank working in Pakistan increased the charges for providing services to importers/exporters [22].

Financial crises, power issues and political instability in the country were main reasons of FDI decline. Which begun to rise with the investment made by China under China-Pak Economic corridor in May 2013.

According to PCA, the main investors contributing in FDI in Pakistan were China, Netherland and Norway. The first two PC's accounts for 82% (see Table 1; last two columns) of the total investment made during July 2013 till February 2019. The important dates in this duration are May 2014 and December 2016, as can be seen in the loading plots represented in Figure 3.

PC1 = 0.99(China) + 0.12(Norway)

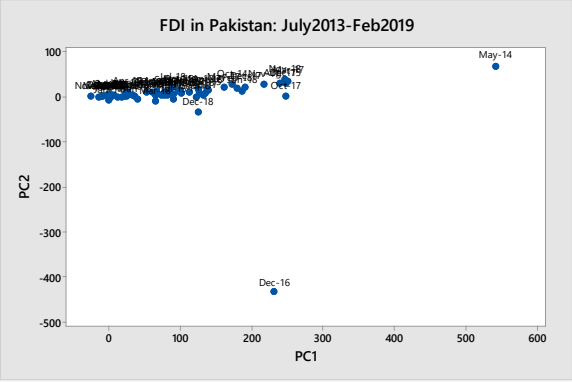
PC2 = 0.12(China) – 0.98(Netherlands)

FDI in May 2014 was a result of an auction of Next Generation Mobile Service (NGMS). In April 2014, Mobilink (Russian owned company), Zong (controlled by Chinese), Telenor (a Norway based company) and Ufone (joint venture of Pakistan government & UAE's company Etisalat) made bids and won 3G and 4G licenses offered in an auction by PTA. The total investment earned through this auction was $1.12 billion. FDI in July till May 2014-2015 dropped to $803 million approximately half as compared to investment made in the same duration in last fiscal year. In June 2015 the total FDI was the lowest of all with -53.9 USD billion.

In December 2016, China had made the first venture in acquisition outside the country. Chinese consortium took up 40% strategic shares in Pakistan Stock Exchange (PSX). A total of 30 % shares was taken by consortium comprised of three Chinese exchange; China Financial Exchange Company Ltd, Shenghai Stock Exchange and Shenzen Stock Exchange. The remaining 10% was half divided in two local financial institutions; Pak-China Investment Company Ltd and Habib Bank Ltd.

Although, China considered as a regular investor in the country, the FDI was not progressing. FDI got positively impacted with a handsome amount of investment made by Netherlands who invested $459.5 million in December 2016. The investment was made in Engro Foods in lieu of getting 51% share in the company.

During July 2016 till January 2017, a sudden increase was recorded in the electronics sector by a Turkish company. In the same period, a 10% growth was noticed with the revival of CPEC, which boost the investment in Pakistan in food, electronics and energy sector. In January 2018, China stood as a single biggest investor with $34 million.



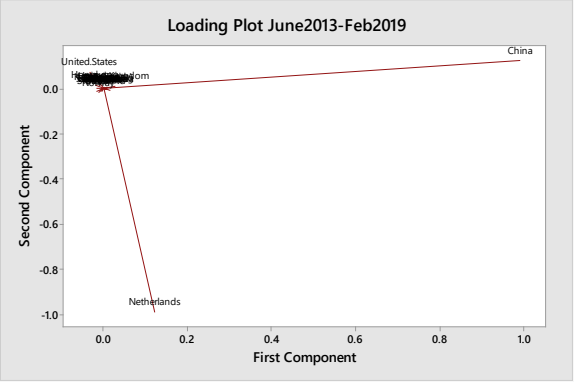


Fig. 3 Score plot(s) of FDI during July 2013 till February 2019.

6. Conclusion

An effort has been made in this paper to identify different aspects and causes of inflow of FDI in Pakistan since 2001. The above Analysis reveals that in inflow of FDI in Pakistan is highly affected not only by social, economic, political circumstances within Pakistan but also international events and policies are also the key factors. The first phase of this study showed that the inflow during FY2001-07 was mainly due to Pakistan's role on "War on Terrorism". Investment made in that duration by main investors disappears in the second phase because the investment was in terms of funding to NGO's, economic aids and military funds. In the second phase the political
instability, law and order situation within country along with the financial crises in international market made investor hesitant to invest in Pakistan. In the third phase China and Netherland came forward and did handsome amount of investment in Pakistan. No one can guarantee the environment and circumstances for investment trend in the country but there must be some measures that government might be taking to attract investors.

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