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Modeling System to Support the Determination of the Return on Investment (ROI) for PPP projects in Egypt

Ibrahim Abdel Rashid Nosair[1], Ayman Hussien Hosny[2], Mohamed Ahmed El-Mikawi[3], Hossam El-Din Mohamed Bahaa[4]

[1]*Professor, Structural Engineering Department, Faculty of Engineering, Ain Shams University*

[2]*Professor, Structural Engineering Department, Faculty of Engineering, Ain Shams University*

[3]*Assistant Professor, Structural Engineering Department, Faculty of Engineering, Ain Shams University*

[4]*Graduate Student, Structural Engineering Department, Faculty of Engineering, Ain Shams University*

Abstract

Public authorities and governments in many nations ensure to assign the operations management of existing PPP projects and for financing new projects to the private sector. This approach adds a lot of benefits for all parties. These benefits included risks' mitigation, cost savings regarding governmental expenditures, service enhancement, employment opportunities, and improvement in economic indices. This approach called public-private partnership (PPP) (Yescombe, 2007).

Due to their complexity, nature and their long duration, PPP projects are usually more difficult to implement than other procurement models. Previous research studies on several PPP projects indicated that a number of problems exist in the calculations of the project' returns. Additionally, it is explicit that there is a need for an objective, reliable and practical returns' assessment model for PPP projects with regards to the different factors that might affect theses estimated returns. The required model will help decision makers and investors to assess the revenues of PPP projects at their early stages. To apply PPP projects in Egypt successfully, one of the fundamental requirements is to perform and implement a comprehensive analysis of Return on Investment (ROI), to do such analysis; it should include the factors affecting the ROI relating the projects' influences such as; financial, legal, political, social . . . etc.

According to the World Bank report, the private financial participation in Egypt has accounted $219,229.82 Million in the period from 1990 to 2000. This figure has increased to $998,667.36 Million in 2015. (World Bank ,2016)

Keywords

Egypt; Economy; PPP; ROI Factors; Weight; Probability; Correction

1. Introduction

Recently, private sector participating in public–private partnerships (PPP projects) has become increasingly popular as a way of procuring ,operating and maintaining public-sector infrastructure, they involved in different sectors such as transportation (roads, bridges, tunnels, railways, ports), social infrastructure (airports, hospitals, schools,

social housing), public utilities (waste disposal ,water supply, waste water treatment), governments offices and other accommodation, and other specialized services (such as communications networks or defense equipment).

Public Private Partnership (PPP) is a procurement system that has emerged as one of the most important approaches for delivering projects in the recent years .PPP projects are forms of joint efforts or collaborating between public and private sectors for developing, financing, constructing, and operating projects (Yescombe, 2007).

Need to identify and specify all factors associated with the calculations of the ROI of the PPP projects became an important and vital task to implement. Public-private partnerships ended projects have a lot of lessons and experiences to highlight regarding the factors crucial to the projects' success. However, there is no comprehensive study that measures the ROI of a future PPP project, and in absence of such a study, it is extremely difficult for industry personnel, academics and government agencies to accurately and effectively forecast revenues in PPP projects. In addition, analyze and evaluate the effectiveness of PPP projects.

2. Public Private Partnership Projects (PPP)

PPP projects is a long term contractual relationship between the public sector and the private sector for the purpose of having the private sector deliver a project or service traditionally provided by the public sector. PPP projects do not minimize the public sector's responsibility to improve public services, only the methodology for its provision and procurement is different.

Conventionally, the governments are responsible for providing people with the major needs (such as electricity, water sanitation, etc.) the governments are also responsible for building the airports, metro stations and provide highways. It was historically proven that the public sector alone was not capable to provide such projects and services in the manner required.

Public Private Partnership concept describes a wide range of potential relationships between public and private entities in the concern of infrastructure projects and services. PPP projects present a framework that, while involving the private sector acknowledge and structure, the role for public authorities in ensuring that social commitments are met, public sector reforms and private investments achieved.

A strong PPP assigns the roles, commitments, and risks among the public and private partners in an optimal approach. The public partners in a PPP are municipalities, government entities, including ministries or departments. The private partners can be local or international and may include businesses or investors with technical or financial proficiencies relevant to that type of projects. In addition, PPP projects may include nongovernmental organizations or community based organizations that constitute or represent stakeholders directly affected by the project (Shediac, Abouchakra, Hammam, & Najjar, 2008).

Effective PPP projects realize that the public and the private sectors each have certain benefits, relative to the other, in performing specific tasks. The government's contribution to a PPP may take the form of capital for investment, a transfer of assets, or other roles that assist the partnership's methodology. Public authorities provide social responsibility, environmental consciousness and local knowledge. (Yescombe, 2007).

The private sector's role in the partnership is to employ of its expertise in commerce, management, operations, and innovation to manage the business properly and efficiently. A concession contract may articulate the private partner contribution in investment capital. The structure of the partnership should be designed to allocate risks to the partners who are capable to manage those risks and thus minimize costs while implementing the project.

2.1. Commencement of PPP

The term 'public–private partnership' originated in the United States, initially relating to joint public-and private sectors for funding the educational programs, then in the 1950s for similar funding of utilities , but came into wider use in the 1960s refer to public–private joint ventures for urban renewal. It is also used in the United States to refer

to publicly-funded provision of social services by non-public sector bodies, often from the independent (voluntary) sector, as well as public funding of private sector research and development in fields such as technology (Shediac, Abouchakra, Hammam, & Najjar, 2008).

2.2. Needs for PPP Projects

The three main needs that provoke governments to sharing in PPP projects for infrastructure are:

- Attract private capital investment to participate in.

- Increase efficiency and use available resources more effectively.

- Reform public sectors through training, participating, transferring the responsibility.

2.2.1. Attract Private Capital

Due to continuous growing in populations, governments are in accelerant needs to secure adequate financing to develop and maintain infrastructure projects required for its services. Also, increasing requirements in rehabilitation, urbanization, and managing infrastructure, need to expand networks to accommodate new populations. To reach previously not served areas impose a great challenge for governments financially and technically (Yescombe, 2007).

Limited financial capacity in developing countries, drive the desire to attract and mobilize private sector capital for infrastructure investment. If properly structured, PPP projects may be able to mobilize resources from the local, regional, or international private sector which is seeking investment opportunities to another attracted region.

The objective of the private sector in participating PPP projects is to gain benefits from its capacity and experience in managing businesses. The private sector aims to be compensated for its services through fees for services rendered, resulting in an appropriate return on investment.

2.2.2. Increasing Efficiency

The efficient use of scarce resources is a large challenge for governments and public authorities, in which many governments became behind its objectives. The reason is that the public sector typically has few or no incentives for efficiency structured into its organization and processes, thus weakness in efficiently build and operate PPP projects. Injecting such incentives in public sector is difficult, though not impossible, as many countries have improved by developing a government dedication to efficiency while maintaining many critical services within the public domain (Yescombe, 2007).

Private sector injects investment with a clear goal of maximizing profits, which are generated, by increased efficiency in investment and operations. If the PPP is structured in a manner to allow the operator attain this goal, the efficiency of the infrastructure services will surely be enhanced. Improving the efficiency of services and operations, chances of those services are economically sustainable and provided at affordable rates even after achieving the expected profit of the private operators.

2.2.3. **Motivation tool to Sector Reform**

Occasionally, governments consider PPP methodology an objective and commitment to sector reform's agenda. Restructuring and clarifying the roles within a sector is the main subject and target for that reform. Therefore, it is required to reexamine and reallocate the roles of policies and regulations, particularly to mobilize capital and achieve efficiency (Yescombe, 2007).

Implementing a specific PPP transaction enforces strong reform steps to support the needed allocation of sector

roles such as the laws and establishment of separate regulatory bodies. Certainly, reexamination of the regulatory and policy arrangements is critical to the success of a PPP projects.

2.3. Roles of sector in PPP projects

Due to that fact that, private sector had proven its efficiency in managing resources more than the public sector, the private sector assisted the public sector in the reform and the upgrade of infrastructure projects and to bring these infrastructures up to the standards.

Accordingly, the private sector affords the following four principal roles:

- Provide additional capital
- Provide alternative management and implementation skills
- Provide value added to the consumer
- Provide better identification of needs and optimal use of resources.

2.4. The most common sectors in PPP projects

In most cases, governments require outsourcing different types of services to the private sector in order to increase the performance and efficiency of delivery or to decrease the governmental expenses. These sectors are:

- Water and sanitation
- School buildings
- Roads
- Housing
- Power generation
- Refuse disposal
- Pipelines
- Hospitals
- Stadiums
- Airports
- Railways

3. Public Private Partnership (PPP) In Egypt

In Egypt, A legal framework for PPP projects has been issued called the PPP Law (67 for the year 2010). Therefore, a new body has been established at the Ministry of finance called the PPP Central Unit. For establishment of standard PPP Contracts, standardized procedures as well as verify the procurement documents.

3.1. Drivers of Egyptian government to Adopt PPP

It is expected that Egypt will allocate around 5.5 to 7 % of its yearly GDP to finance infrastructure needs which includes new investments for new projects in addition to maintenance of existing projects. This percentage represents almost US$ 13 Billion. The Key challenge is to bridge the gap by accelerating the mobilization of the private capital. Since 2004, Egypt has performed structural reform which necessitates the government to implement infrastructure reform, as a result valued number of PPP projects contracted as shown in figure (1) and currently in different phases of implementation (Ministry Of Fiance, 2014).

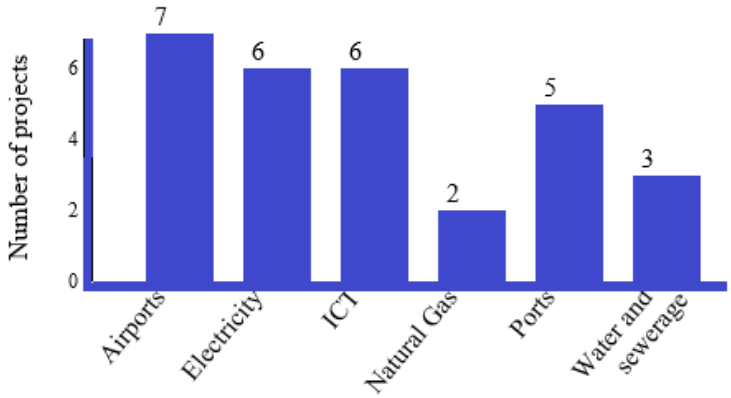


Figure 1. Number of PPP projects in Egypt since 2004

In Egypt, PPP projects seek to provide a new source of capital investment for required infrastructure projects, push to the creation of local long term funding markets, form a new private sector facility management market, reduce the borrowings and associated risks, stimulate job creation and increase the quality of public services to the Egyptian citizen.

Throughout a PPP projects, the Egyptian's government is a very conservative in controlling the delivery of the specified level and standard of services to the end user. Where core social services are involved in PPP projects such as airports, electricity, waste water treatment, the delivery of services to end users will be retained by the public sector professionals.

Compared to last decades in Egypt, the current capital investment in PPP projects in Egypt, as shown in figure (2), became a tangible value. As a result, PPP projects in turn will open up opportunities for the national contracting and financing sectors, including smaller contractors who are expected to considerably benefit from this program. (The Economist, 2015)

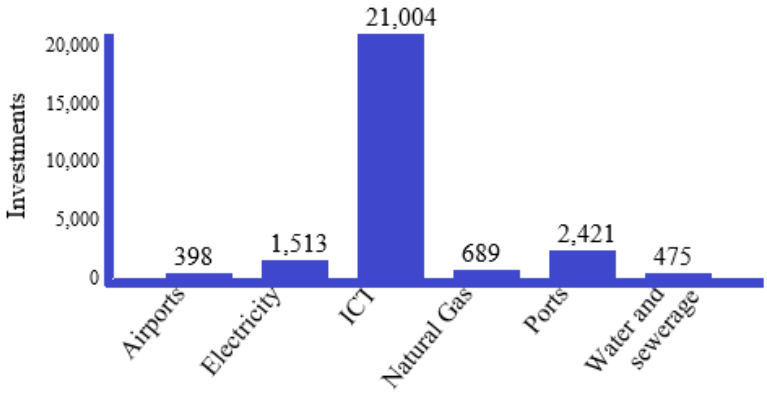


Figure 2. PPP projects in Egypt (US $ Millions)

The key challenge is to cross this financial gap by accelerating the mobilization of private capital. International experience shows that 10-30 % of infrastructure capital needs could come from the private sector through PPP

projects if an appropriate and regulatory framework is established as well as other catalytic measures. It is estimated that Egypt can realistically target the mobilization of 10-15% of its infrastructure needs through PPP projects (Ministry Of Finance, 2014).

4. Return on Investment (ROI)

Return on investment (ROI) is a ratio that calculates the revenues of an investment as a percentage of the original cost. In other words, it measures how much money was made on the investment as a percentage of the purchase price. It clarifies to investors how efficiently each dollar invested in a project gaining how much profit. Investors not only use this methodology to measure how well an investment performed, they also use it to compare the performance of different investments of all types and sizes.

4.1. The Traditional Equation of (ROI)

A performance measure and metric used to evaluate the worthiness and efficiency of an investment or project comparing with another different projects or investments. Return on investment (ROI) estimate the revenues and the outcome of an investment relative to the investment's cost. The return of an investment is divided by the cost of the investment, and the result is a percentage or a ratio (Schmidt, 2017).

The return on investment formula:

ROI = (Revenues – Cost) /Cost (1)

Return on investment is a common used evaluation tool because of its simplicity. In addition, it can be used as a primary assessment of an investment's gains and profitability. If an investor does have a profit and that means positive (ROI), then these ROI values can direct him as to which investments are preferable among others.

4.2. Return on Investment (ROI) Needed Information

The return on investment (ROI) as an evaluating metric is not sufficient basis for selecting an opportunity or project over another. The reason is (ROI) compares costs to revenues but says nothing about unforeseen , uncertainty or any other factors that might affect the results such as (Design Changes, Inflation, interest rate, construction delay, etc.).

The investors and decision makers must take into account the different factors that might affect the return on investment (ROI) outcomes. Therefore, all the factors mentioned above must be considered in calculating Return on Investment (ROI) to obtain an efficient and realistic result or indicators before taking any decision regarding either a new opportunity or comparing two projects.

5. Research Problem

Because of the long duration of the PPP projects as well as the capital costs are very high, variety of factors should be addressed in calculating the return on investment (ROI). Therefore, when assessing PPP projects, it is necessary to identify and analyze the different factors affecting its success.

6. Research Objective

According to the challenges that facing the public and private sectors in constructing and operating PPP projects, different outcomes from traditional evaluation for (ROI) might result. Therefore, the research has two main objectives:

- Identify the main factors affecting the ROI calculations of PPP project in the Egyptian Market and neglecting the other factors having insignificant effect on the ROI calculations.
- Develop a model that might be in form of equation that is able to forecast the Return on Investment (ROI) for PPP projects.

7. Questionnaire

Interviews were conducted and included questions acquiring more elaboration on particular points regarding the objectives of the research. Most interviews involved project managers, project team members, an advisory team, professionals and experts of Public-Private Partnership in Egypt. Resulted that the factors affecting the PPP projects are:

Construction Factors

- Land Acquisition
- Scope changes
- Design changes
- Construction Delay
- Defective Construction

Operation Factors

- Low operating productivity
- Complex system interface
- Accidents and safety issues
- Poor cooperation or coordination

Economic Factors

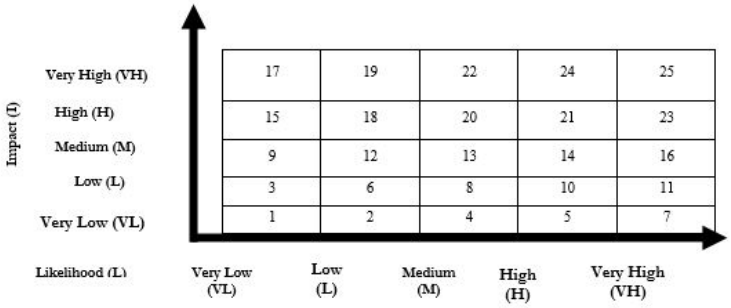
- Tax increases
- Inflation rate
- Exchange rate
- Interest rate
- Cost overrun

Political Factors

- Political Interference
- Unsuitable regulatory policy
- Approval Delays

The researcher has quantified all these tangible factors using questionnaire as a quantitative method. The aim of this questionnaire is to quantify the factors that affect the ROI calculation of the PPP projects. In this questionnaire, and by using the risk rating matrix (Jang, 2011), as a scale to rate the weight for each factor, participants are asked to weigh each factor based on its importance and possibility of happening during the life cycle of the PPP project in Egypt as shown in Table (1):

Table 1: Weight Scale Matrix



7.1. Research Readings

The factors sent to questionnaire' participants must have a sum of "1" in their weight to comply with the traditional equation as shown in Table (2). It is clear that results obtained of the questionnaire have an influential degree and tangible percentage that might change the (ROI) calculated by the original equation.

Table 1. Factor Weight

Factor	Weight	ROUND	%
Land Acquisition	0.019138756	0.019	0.019
Scope changes	0.014354067	0.014	0.014
Design changes	0.019138756	0.019	0.019
Construction Delay	0.057416268	0.057	0.057
Defective Construction	0.043062201	0.043	0.043
Low operating productivity	0.033492823	0.033	0.033
Complex system interface	0.019138756	0.019	0.019
Accidents and safety issues	0.028708134	0.029	0.029
Poor cooperation	0.081339713	0.081	0.081
Tax increases	0.076555024	0.077	0.077
Inflation rate	0.071770335	0.072	0.072
Exchange rate	0.100478469	0.1	0.1
Interest rate	0.09569378	0.096	0.096
Cost overrun	0.081339713	0.081	0.081
Political Interference	0.114832536	0.115	0.115
Unsuitable regulations	0.086124402	0.086	0.086
Approval Delays	0.057416268	0.057	0.057

As shown in figure(3)The economic factors such as inflation rate, cost overrun and interest rate are extremely influential for the PPP projects due to the long duration of the project which were not considered before in the previous studies. There is no doubt that the political factor has a major effect especially in Egypt.

In addition, administrative factors such as poor coordination with the administrative and governmental agencies and approval delays have a high rate weight that influence the calculation of the return on investment (ROI).

To create a model that encompasses all the affecting factors and to obtain an equation that forecasts the return on investment (ROI), the researcher has assembled the detailed affecting factors according to its major discipline

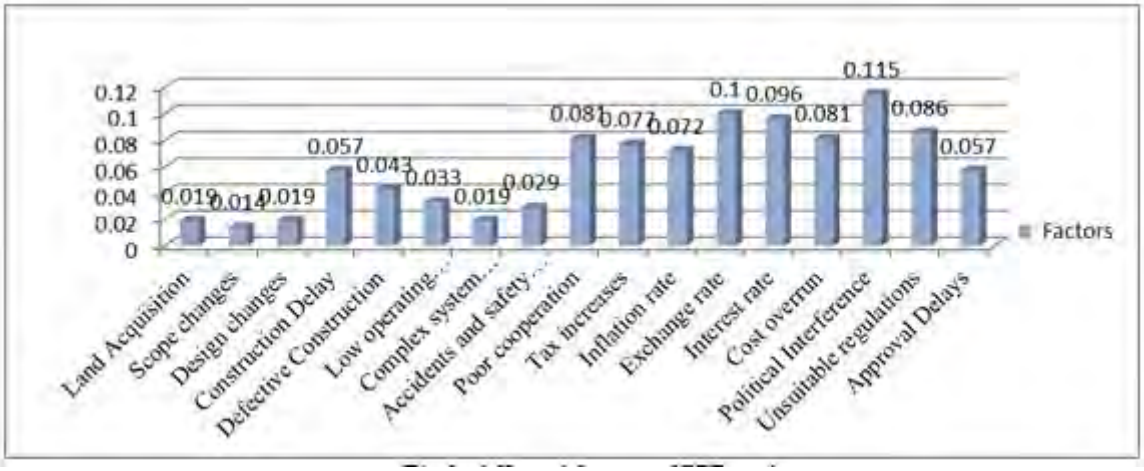


Figure 3. Affected factors of PPP projects

toward four factors as shown in figure (4).

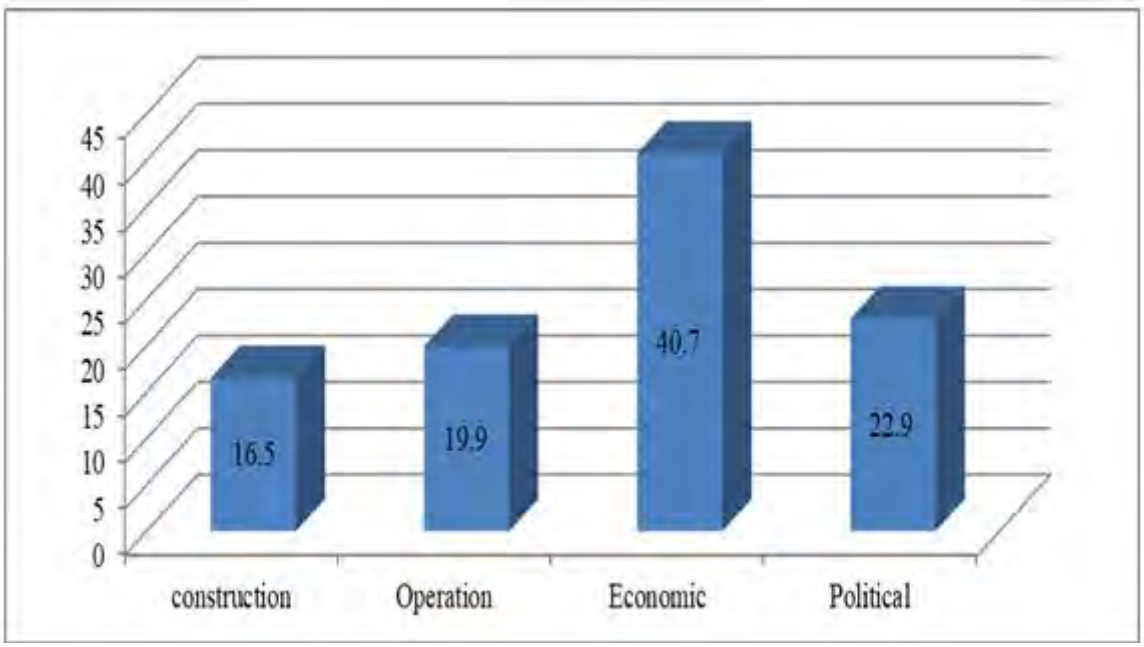


Figure 4. Major Factors Weight

According to the long term PPP projects' relationships, the questions sent to participants extended from year 1985 up to year 2035 figure (5). Asking their perspectives regarding the four major factors, how they had been affected in the past and their expectations of how these factors would be affected in the future according to the current circumstances in Egypt. The scale of these effects and its probability to be happening is grading from 1-100 degrees as shown in table (3).

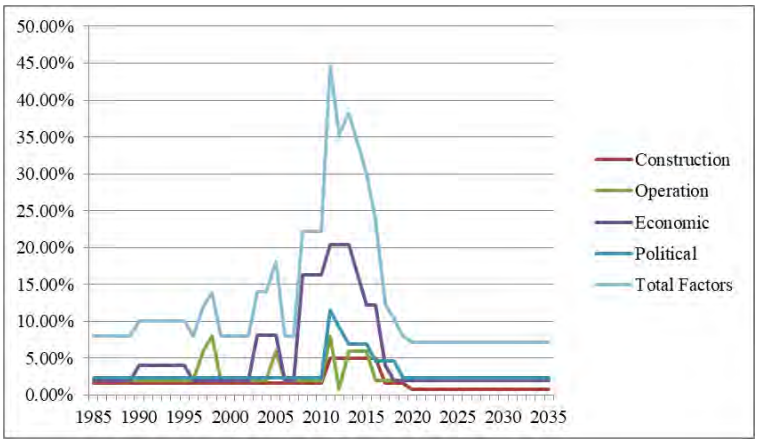


Figure 5. Extended Major Factors Weight

Table 3: Scale of probability

Probability of each affecting factor				
year	Construction	Operation	Economic	Political
1985	10	10	5	10
	10	10	5	10
	10	10	5	10
	10	10	5	10
	10	10	5	10
1990	10	10	10	10
	10	10	10	10
	10	10	10	10
	10	10	10	10
	10	10	10	10
1995	10	10	10	10
	10	10	5	10
	10	30	5	10
	10	40	5	10
	10	10	5	10
2000	10	10	5	10
	10	10	5	10
	10	10	5	10
	10	10	20	10
	10	10	20	10
2005	10	30	20	10
	10	10	5	10
	10	10	5	10
	10	10	40	10
	10	10	40	10
2010	10	10	40	10
	30	40	50	50
	30	4	50	40
	30	30	50	30
	30	30	40	30
2015	30	30	30	30
	30	10	30	20
	10	10	10	20
	10	10	5	20
	10	10	5	10
2020	5	10	5	10
	5	10	5	10
	5	10	5	10
	5	10	5	10
	5	10	5	10
2025	5	10	5	10
	5	10	5	10
	5	10	5	10
	5	10	5	10
	5	10	5	10
2030	5	10	5	10
	5	10	5	10
	5	10	5	10
	5	10	5	10
	5	10	5	10
2035	5	10	5	10

As aforementioned, according to the major factors' weights and the probability of occurrence, one total affected factor obtained that correlates the weight of each factor to its probability as shown in table (4).

Table 4: Weighted Probability Factors

Impact of each affecting factor					
Year /weight	Construction	Operation	Economic	Political	Total
	16.5	19.9	40.7	22.9	100
1985	1.65%	1.99%	2.04%	2.29%	7.97%
	1.65%	1.99%	2.04%	2.29%	7.97%
	1.65%	1.99%	2.04%	2.29%	7.97%
	1.65%	1.99%	2.04%	2.29%	7.97%
	1.65%	1.99%	2.04%	2.29%	7.97%
1990	1.65%	1.99%	4.07%	2.29%	10.00%
	1.65%	1.99%	4.07%	2.29%	10.00%
	1.65%	1.99%	4.07%	2.29%	10.00%
	1.65%	1.99%	4.07%	2.29%	10.00%
	1.65%	1.99%	4.07%	2.29%	10.00%
1995	1.65%	1.99%	4.07%	2.29%	10.00%
	1.65%	1.99%	2.04%	2.29%	7.97%
	1.65%	5.97%	2.04%	2.29%	11.95%
	1.65%	7.96%	2.04%	2.29%	13.94%
	1.65%	1.99%	2.04%	2.29%	7.97%
2000	1.65%	1.99%	2.04%	2.29%	7.97%
	1.65%	1.99%	2.04%	2.29%	7.97%
	1.65%	1.99%	2.04%	2.29%	7.97%
	1.65%	1.99%	8.14%	2.29%	14.07%
	1.65%	1.99%	8.14%	2.29%	14.07%
2005	1.65%	5.97%	8.14%	2.29%	18.05%
	1.65%	1.99%	2.04%	2.29%	7.97%
	1.65%	1.99%	2.04%	2.29%	7.97%
	1.65%	1.99%	16.28%	2.29%	22.21%
	1.65%	1.99%	16.28%	2.29%	22.21%
2010	1.65%	1.99%	16.28%	2.29%	22.21%
	4.95%	7.96%	20.35%	11.45%	44.71%
	4.95%	0.80%	20.35%	9.16%	35.26%
	4.95%	5.97%	20.35%	6.87%	38.14%
	4.95%	5.97%	16.28%	6.87%	34.07%
2015	4.95%	5.97%	12.21%	6.87%	30.00%
	4.95%	1.99%	12.21%	4.58%	23.73%
	1.65%	1.99%	4.07%	4.58%	12.29%
	1.65%	1.99%	2.04%	4.58%	10.26%
	1.65%	1.99%	2.04%	2.29%	7.97%
2020	0.83%	1.99%	2.04%	2.29%	7.14%
	0.83%	1.99%	2.04%	2.29%	7.14%
	0.83%	1.99%	2.04%	2.29%	7.14%
	0.83%	1.99%	2.04%	2.29%	7.14%
	0.83%	1.99%	2.04%	2.29%	7.14%
2025	0.83%	1.99%	2.04%	2.29%	7.14%
	0.83%	1.99%	2.04%	2.29%	7.14%
	0.83%	1.99%	2.04%	2.29%	7.14%
	0.83%	1.99%	2.04%	2.29%	7.14%
	0.83%	1.99%	2.04%	2.29%	7.14%
2030	0.83%	1.99%	2.04%	2.29%	7.14%
	0.83%	1.99%	2.04%	2.29%	7.14%
	0.83%	1.99%	2.04%	2.29%	7.14%
	0.83%	1.99%	2.04%	2.29%	7.14%
	0.83%	1.99%	2.04%	2.29%	7.14%
2035	0.83%	1.99%	2.04%	2.29%	7.14%

7.2. Economical Information

Referred to the analogous information along with the economic data collected such as; Foreign Direct Investment (FDI) indicator for Egypt (OECD, 2016) shown in figure (6), inflation rate in both World and EGYPT (World Bank, 2016) shown in figure (7), we could notice that they are a reflection to the events that had occurred in Egypt, and their impact on the economy regarding both the foreign investments and inflation rates.

7.3. Actual Return on Investment (ROI)

In all projects, the original equation of Return on investment (ROI) doesn't take into account the factors that might affect the final results .Such results could deviate the investors from take the right decision of an opportunity, especially in long term projects as PPP projects.

According to the above results, the researcher concludes a new relationship that considered all these factors to obtain the actual (ROI) shown in figure (8) and according to the following:

Theoretical (ROI) = (Revenues – Cost) /Cost (1)

Figure 6. Foreign DirectInvestment (FDI) indicator for Egypt

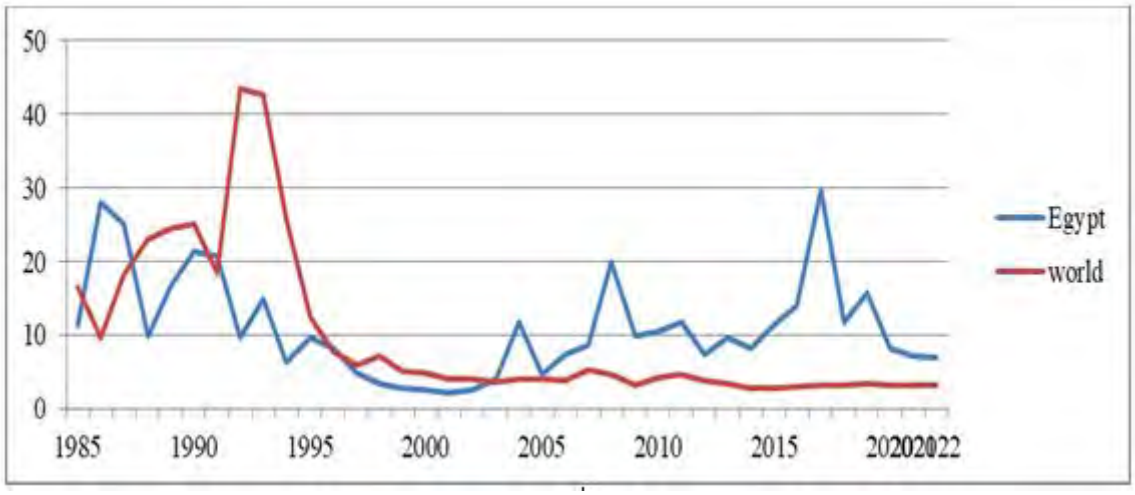


Figure 7. Inflation Rates

Actual (ROI) = K * Theoretical (ROI) (2)

K = 1 – F (3)

K = Correction Factor

F = Affected Factor

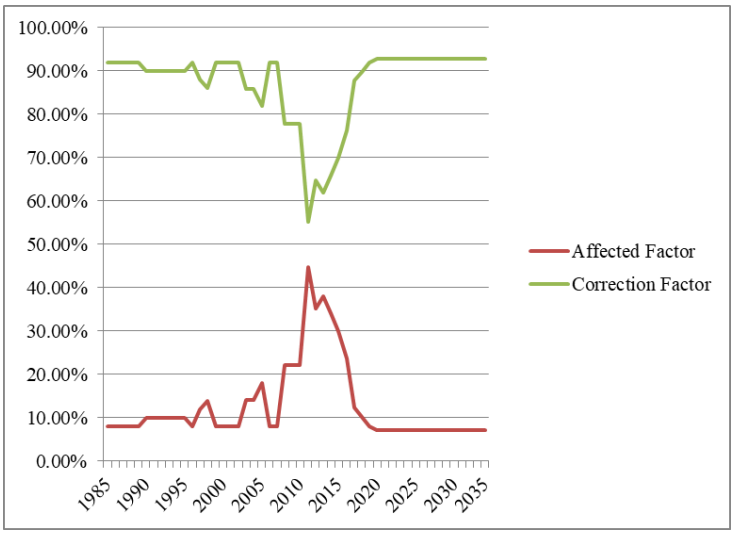


Figure 8. Affected factors Vs. Corrected factors curve

By drawing the correction factor curve and according to the actual events resulting from historical information in EGYPT, we could obtain a Correction Factor Trend Curve figure (9) for actual (ROI) to estimate the forecasting

(ROI) on the basis of a linear equation:

$y = ax + b$ (4)

The trend curve results the following equation:

$y = 6*10^{-5} x + .871$ (5)

y = K = Correction Factor

x = Year of study

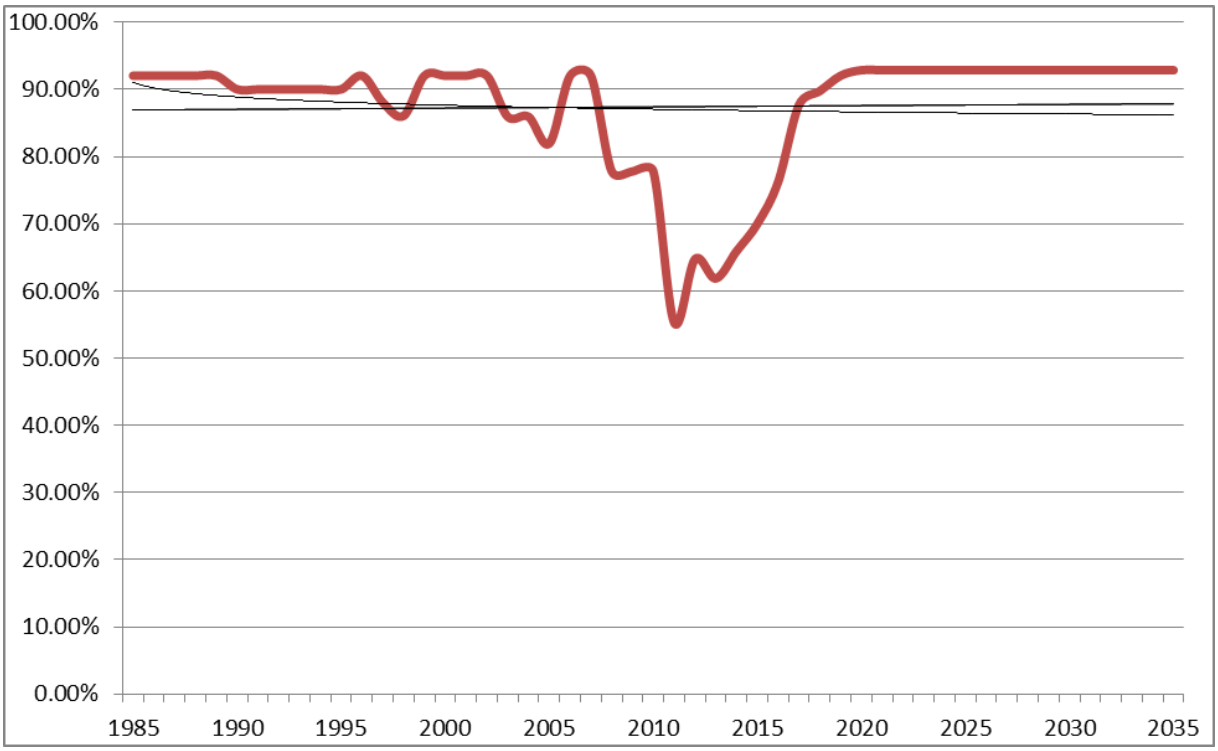


Figure 9. Affected Factors Trend Curve

8. Conclusions

PPP projects have a special nature in terms of study, implementation, and operation. Duo to the long life duration of the project, which may extended more than 20 years, this particular nature requires consideration of all factors that may affect the process of calculating the return on investment (ROI). These factors, if exist at different rates, whether high or low, will certainly affect the decision-maker negatively or positively and thus give results quite different from the traditional equation.

According to the results obtained from the questionnaire, we notice that all the factors mentioned are realistic factors, but different in terms of the phase of the project, whether the project at the phase of design, implementation or operation as shown in figure (5). These factors may also vary according to the other circumstances or influences such as; financial, technical, political, etc. However, in all cases, these factors should be considered as an effective influence to the decision maker. The results of this questionnaire may differ from one industry to another and from one country to another, but it is very impressive and very high.

Finally, the model obtained and the resulted equation are the rationale relationship that correlate the revenues, cost and the factors that might affect them when calculating the return on investment (ROI). Effectively, the right investment' decision would be taken.

9. References

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