



# Irreversible Investment under Uncertainty: A Study of Nepalese Economy

**Suraj Gaudel**

LA GRANDEE International College, (Affiliated to Pokhara University) Simachaur-8, Pokhara, Nepal

**ABSTRACT**

In most cases investment can often be irreversible. When firms decide about irreversible investment they may have confidence about their perceived probability measures describing future uncertainty. Generally, investment decision of an investor depends on his/her risk taking behavior, technology used and competition among the firms. More specifically, an increase in uncertainty decreases the value of an irreversible investment opportunity in the economy. The purpose of this paper is to analyse investment behavior in Nepal and to support entrepreneurial entry. Thus, increased uncertainty in the entrepreneur's target will decrease the probability of entry in the new industry.

**KEYWORDS**

irreversibility, uncertainty, net present value, sunk cost

**1. Introduction**

In economics investment can be defined as the act of incurring an immediate cost in the expectation of future rewards. It is the value of that part of economy's output at any time period that takes the form of new structures, new producers' durable equipment and changes in inventories (Shapiro, 1974:156). Irreversibility of investment, uncertainty of future rewards and choice of investment timing are the three major characteristics which play vital role in investment decisions (Nishimura, 2004). In fact, determination of the optimal decision of the investor depends on the interaction among these three characteristics of investment. Uncertainty is one of these major factors influencing investment decision as it creates difficulties in making future predictions. Increase in degree of future uncertainty causes increase in threshold value, which means that higher degree of uncertainty leads to less willingness to invest (Pattillo, 1998). Generally, the model specification used and the underlying assumptions with respect to the risk behavior of the investor, the extent of the market competition, characteristics of production technology used and the shape of the adjustment cost are the determinant of nature of relationship between investment and uncertainty (Guiso and Parigi, 1999). Depending on the assumption that the marginal product of capital is convex in price, some authors have said that there is positive relationship between uncertainty and investment if investor is risk neutral, firm is competitive and firm uses a constant returns to scale technology. Under these assumptions, increased uncertainty leads to an increase in the value of marginal unit of capital, these leading to higher investment (Hartman, 1972; Abel, 1983).

If the market is competitive and the technology used is constant return to scale then uncertainty may not necessarily lead to lower investment, even in the presence of irreversibility (Abel & Eberly, 1994; Caballero, 1991). According to Abel and Eberly (1999), relationship between uncertainty and investment can be both positive and negative and it depends on the user cost and hangover effect caused by level of uncertainty. There is positive relationship between uncertainty and investment if level of uncertainty is low and if the level of uncertainty is high then there is negative relationship. According to standard investment theory or option approach of investment firm invest in project only if total present value of future expected cash flows from the investment is greater than the Net Cash Outlays. This approach assumes that investment is reversible and all the expenditure will be recovered in future otherwise firm cannot take the new investment. But in this assumption it is very hard to solve the issues related to expected

stream of profit, discount rate, future inflation, tax rate, depreciation and the like.

Lastly we can conclude that the actual relationship between investment and uncertainty and role played by irreversibility of investment can be varied depending on firm specific circumstances regarding risk behavior of investor, technology used and competition.

**2. Analysis of Nepalese Economy**

Problem related to the choice of optimal investment time caused by irreversibility of investment under uncertainty has become the major area of study for the recent researcher. This paper basically aims at analyzing the effect of uncertainty on the value of irreversible investment opportunities and investment behavior in Nepal. More specifically, an increase in uncertainty reduces the value of irreversible investment opportunities, while the opposite is true for an increase in calculable risk. In this regard, it is also argued that investment is less sensitive to variation in interest rate and tax policy in comparison to volatility and uncertainty over the economic environment. Thus, to design favorable environment for enhancing investment and to analyze the investment behavior in Nepal, macroeconomic data related to Gross Domestic Product (GDP) and its component in terms of aggregate consumption, gross investment and net export for 14 years 2000/01 to 2013/14 have been presented in Table 1.

**Table 1: Consumption of GDP at Current Price in Nepal (Rs. In Millions)**

Fiscal Year	Total Consumption	Percentage	Gross Investment	Percentage	Net Export	Percentage	GDP
2000/01	390017	88.34	95649	22.34	-47147	10.68	441519
2001/02	415843	90.53	93019	20.25	-49420	10.36	459445
2002/03	450090	91.44	105383	23.41	-63243	12.85	492231
2003/04	473685	88.25	131671	24.53	-68607	12.78	535749
2004/05	521301	88.44	159007	26.45	-37796	14.90	589437
2005/06	595327	91.02	175633	26.85	-116676	17.87	654088
2006/07	656374	90.18	208779	28.69	-137326	18.87	727827
2007/08	715470	90.17	247272	30.32	-167084	20.48	815658
2008/09	890642	90.57	312810	31.65	-219799	22.24	988272
2009/10	1056184	88.55	456490	38.27	-324113	27.17	1192774
2010/11	1170030	88.03	519267	37.99	-538343	24.02	1356954
2011/12	1359538	89.03	528889	34.50	-359084	23.51	1527344
2012/13*	1521716	89.90	634645	36.90	-453718	26.81	1692643
2013/14 <sup>†</sup>	1756483	91.08	719057	37.08	-543024	28.16	1978317

R-Revised Estimate of CBS (Central Bureau of Statistics)

P-Preliminary Estimate of CBS

Source: Central Bureau of Statistic, Nepal

Table 1 demonstrates the trend of consumption of GDP (Gross Domestic Product) or national income in Nepal from fiscal year 2000/01 to 2013/14. While analyzing the expenditure based GDP structure at current price it is clear that the consumption expenditure has climbed up to 91.44% from 88.25% within a period of 14 years from FY 2000/01 to 2013/14. The proportion of gross investment also rises from 20.25% to 38.27% during the same period. But the share of net export is found negatively increasing from 10.68% to 28.16%. This type of continuous negative increment in net export has adverse impact on economic growth rate during the review period and this increment also has counteracted the rise in positive share of investment in GDP of the Nepalese economy. Furthermore, the rise in consumption may be due to increase in remittance inflow in each year and the regular price hike in import situation owing to increase in aggregate demand has reduced the flow of productive investment in the domestic economy. Current study shows that share of remittance in Nepal is more than 25% of GDP ("Contribution of Remittance", 2014).

The irreversibility of an investment depends upon the differences between the initial investment and subsequent recover value of that investment. As irreversibility increases, the value of option to postpone investment increases, causing the entrepreneur to become more sensitive to uncertainty. Hence irreversibility is basically a function of both the amount capital at risk and the market frictions created by the specific or fixed amount of the investment.

### 3. Investment Behavior in Nepal

Generally, the investment behavior of the Nepalese economy reveals the flow of huge amount of investment in consumption. The economy is becoming consumption oriented due to remittance inflows and some other non economic factors (such as, political instability, insecurity, social unrest and so on) and thereby causing hopeless plunge in saving and investment. Furthermore, due to increment in consumption, the rate of domestic savings has come down each year. Thus consumption oriented economy of Nepal naturally leads to dependency resulting in the dearth of resources for investment. So it is urgently needed to enhance savings and thereby investment for productive purposes by discouraging unnecessary consumption in the economy. Despite these, the economic growth rate is also less likely to be encouraging in FY 2013/14. Such a decline in GDP against the target is due to slow economic activities in agricultural and non-agricultural sector. Thus to better understand investment behavior it may be important to develop such a suitable model that can enhance investment opportunities in the productive sectors and suggest some measures to minimize the sunk costs or irreversible investment in the economy.

### 4. Investment Decision under Uncertainty:

Uncertainty refers to a situation where there is more than one outcome of a business decision and the probability of outcome is not known nor can it be estimated (Dwivedi, 2009:413). Lack of reliable market information, inadequate past experience and high volatility of the market conditions are the major causes for this unpredictability of outcome. Generally, in the case of complete ignorance under uncertainty, investment decision may be taken by the investors using their own judgments or using any of the rational criteria. But if the investors want to make decision by considering uncertainty then they must have some knowledge about future

market conditions and information about future business environment should be obtained so that they can estimate probability of influence caused by uncertainty. Under this condition, the decision makers use their subjective judgments to assign probability to the outcome and the sum of such probability distribution would be equal to one. In reality, irreversibility and the possibility of delay in investment are very important characteristics of most investment. The ability to delay irreversible investment expenditure can profoundly affect the decision to invest. In this regard, Dixit (1989) argues that uncertainty should influence the likelihood of investment when the investment entails sunk costs that cannot be recovered through disinvestment, and when investors have discretion over the timing of investment. Furthermore, as irreversibility increases, the option value to defer increases, causing the entrepreneur to become more sensitive to uncertainty. Hence increased uncertainty in the entrepreneur's target will decrease the probability of entry in industry.

### 5. Conclusion

From the foregoing analysis, it can be concluded that the entrepreneurs generally recognized the option value associated with delaying investment in the context characterized by intense uncertainty. Furthermore, they mostly evaluate their concerns over uncertainty with respect to the degree of irreversibility associated with their investments. To sum up, uncertainty is an important factor in investment decision. Investment expenditures are sunk costs when they are irreversible or unrecovered. The consumption oriented economy of Nepal results in the dearth of resources for investment. If such a type of economy runs for long time, the investment becomes irreversible. Thus, to attract investment in productive sector, the government should create the congenial environment of investment opportunities and to give assurance to maintain peace and security in the economy.

## REFERENCES

- Abel, A.B. (1983). Optimal Investment under Uncertainty. *American Economic Review*, 73, 228- 233. | Abel, A.B., Eberly, J.C. (1994). A Unified Model of Investment under Uncertainty. *American Economic Review*, 84, 1369-1384. | Abel, A.B., and Eberly, J.C. (1999). The Effect of Uncertainty and Irreversibility on Capital Accumulation. *Journal of Monetary Economics*, 44, 339-377. | Caballero, R.J.(1991). On the Sign of the Investment-Uncertainty Relationship. *American Economic Review*, 81, 279-288. | Contribution of remittance to GDP reaches 25 pct in Nepal. (2014, June 19). Retrieved December 28, 2014, from <http://www.globaltimes.cn/content/866600.shtml> | Dixit, A.K.(1989). Entry and Exit Decisions under Uncertainty. *Journal of Political Economy*, 97, 620-638. | Dwivedi D.N. (2009). *Managerial Economics*, Seventh Edition, New Delhi: Vikash Publishing House. | Guiso, L., and Parigi, G.(1999). Investment and Demand Uncertainty. *Quarterly Journal of Economic*, 114, 185-227. | Hartman, R. (1972). The Effects of Price and Cost Uncertainty on Investment. *Journal of Economic Theory*, 5, 258-266. | Nishimura, K.G. (2004). Irreversible Investment and Knightian Uncertainty. University of Tokyo, December. | Pattillo, C. (1998). Investment, Uncertainty, and Irreversibility in Ghana. IMF Working Papers, 45, 522-553. | Shapiro, E. (1974). *Macroeconomic Analysis*, Third Edition. Harcourt Brace Jovanovich.