Inflation effect on capital budgeting decisions
An analytical study

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Abstract— The capital budgeting results would be unrealistic if the impact of inflation is not correctly factored in the analysis1. A double digit rate of inflation is a common feature in developing countries. Because the cash flows of an investment project occur over a long period of time, a firm should usually be concerned about the impact of inflation on the project’s profitability2. The cash flow estimates will not reflect real purchasing power. Cash flows would be shown at inflated sums and to that extent cause distortion in capital budgeting decisions. Therefore, cash flows should be adjusted to accommodate the inflation factor so that the capital budgeting decisions reflect the true picture.

Keywords- inflation; Consumer price index; wholesale price index; GDP deflator; capital budgeting; nominal value; real value.

I. INTRODUCTION

Business executives do recognize that inflation exists but they do not consider it necessary to incorporate inflation in the analysis of capital investment. The reason is “inflation is expected to raise the revenues and costs of the project in a similar fashion. Hence, net revenues after adjustment for inflation would be equal to net revenues in current terms”3. This line of argument although seems to be convincing, cause distortion for two reasons i.e., (i) Discount rate and (ii) Selling prices and costs. Hence this study is an attempt to analyse the issues in the area of effects of inflation on capital budgeting decisions for optimum utilisation of scarce resources. In discussing how the inflation effects on capital budgeting decisions, this paper has been divided into two parts. In the first part, discussion is about inflation, how to measure the inflation and the effects of inflation on GDP. In the second part, effects on inflation on capital budgeting decisions, comprising how to deal with expected and unexpected inflation while forecasting cash flows and determining the discount rate in particular.

II. OVERVIEW OF INFLATION

Inflation is the rate at which the general level of prices for goods and services is rising, and, subsequently, purchasing power is falling4. For example, a person would like to buy 1 kg of apple for Rs. 50, at the present rate of inflation, say, zero. Now when the inflation rate is 8%, then the person would require Rs. 54 to buy the same quantity of apples. This can be defined as “the change in purchasing power in a currency from period to period relative to some basket of goods and services.”5.

Other Economic concepts related to inflation include:

Deflation – a fall in the general price level;

Disinflation – a decrease in the rate of inflation;

Hyperinflation – an out-of-control inflationary spiral;

Stagflation – a combination of inflation, slow economic growth and high unemployment; and

Reflation – an attempt to raise the general level of prices to counteract deflationary pressures6.

A. MEASURING INFLATION:

The common measures of inflation include: Consumer price indexes (CPIs), Producer price indexes (PPIs) or Wholesale price indexes (WPIs), commodity price indexes, Core price indexes, GDP deflator, Asset Price Inflation and Employment cost index(ECI). Inflation is usually estimated by calculating the inflation rate of a price index.

The Consumer Price Index (CPI) measures prices of a selection of goods and services purchased by a “typical consumer”. The inflation rate is the percentage rate of change of a price index over time. For instance, in January 200X, the Consumer Price Index was 202.416, and in January 20XI it was 211.080. The formula for calculating the annual percentage rate inflation in the CPI over the course of 200X is

\[
\left[ \frac{\text{211.080} - \text{202.416}}{\text{202.416}} \right] \times 100\% = 4.28\%
\]

Producer price indices (PPIs) which measures average changes in prices received by domestic producers for their output. This differs from the CPI in that price subsidization, profits, and taxes may cause the amount received by the producer to differ from what the consumer paid. There is also typically a delay between an increase in the PPI and any eventual increase in the CPI. Producer price index measures
the pressure being put on producers by the costs of their raw materials. This could be "passed on" to consumers, or it could be absorbed by profits, or offset by increasing productivity. In India and the United States, an earlier version of the PPI was called the Wholesale Price Index.

**Commodity price indices**, which measure the price of a selection of commodities. In the present commodity price indices are weighted by the relative importance of the components to the "all in" cost of an employee.

**Core price indices**: because food and oil prices can change quickly due to changes in supply and demand conditions in the food and oil markets, it can be difficult to detect the long run trend in price levels when those prices are included. Therefore most statistical agencies also report a measure of 'core inflation', which removes the most volatile components (such as food and oil) from a broad price index like the CPI. Because core inflation is less affected by short run supply and demand conditions in specific markets, central banks rely on it to better measure the inflationary impact of current monetary policy.

**GDP deflator**: The Gross Domestic Product (GDP) is the key indicator used to measure the health of a country's economy. The GDP of a country is defined as the market value of all final goods and services produced within a country in a given period of time. Usually, GDP is expressed as a comparison to the previous quarter or year. For example, if the year-to-year GDP was up by 3%, it means that the economy has grown by 3% over the last year.

A significant change in GDP, whether increase or decrease, usually reflects on the stock market. The reason behind this is that, a bad economy usually means lower profits for companies, which in turn means lower stock prices. Investors really worry about negative GDP growth. Therefore growth in GDP reflects both on growth in the economy and price changes (inflation). GDP deflator is based on calculations of the GDP. It is based on the ratio of the total amount of money spent on GDP (nominal GDP) to the inflation corrected measure of GDP (constant price or real GDP). It is the broadest measure of the price level. Deflators are calculated by using the following formula:

\[
\text{GDP Deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100
\]

Current price figures measure value of transactions in the prices relating to the period being measured. On the other hand, Constant price figures express value using the average prices of a selected year, this year is known as the base year. Constant price series can be used to show how the quantity or
volume of goods has changed, and are often referred to as
volume measures. The ratio of the current and constant price
series is therefore a measure of price movements, and this
forms the basis for the GDP deflator. The GDP deflator shows
how much a change in the base year's GDP relies upon
changes in the price level. It is also known as the "GDP
implicit price deflator".

Because it isn't based on a fixed basket of goods and
services, the GDP deflator has an advantage over the
Consumer Price Index. Changes in consumption patterns or
the introduction of new goods and services are automatically
reflected in the deflator.

Asset price inflation is an undue increase in the prices
of real or financial assets, such as stock (equity) and real
estate. While there is no widely accepted index of this type,
some central bankers have suggested that it would be better to
aim at stabilizing a wider general price level inflation measure
that includes some asset prices, instead of stabilizing CPI or
core inflation only. The reason is that by raising interest rates
when stock prices or real estate prices rise, and lowering them
when these asset prices fall, central banks might be more
successful in avoiding bubbles and crashes in asset prices.

Employment Cost Index (ECI) are examples of narrow
price indices used to measure price inflation in particular
sectors of the economy.

B. INDIA INFLATION RATE:

The inflation rate in India was last reported at 9.5 percent
in March of 2012. From 1969 until 2010, the average inflation
rate in India was 7.99 percent reaching an historical high of
34.68 percent in September of 1974 and a record low of -11.31
percent in May of 1976. Inflation rate refers to a general rise in
prices measured against a standard level of purchasing power.
The most well known measures of Inflation are the CPI which
measures consumer prices, and the GDP deflator, which
measures inflation in the whole of the domestic economy.

III. INFLATION AND CAPITAL BUDGETING DECISIONS

Capital Budgeting is a process used for project appraisal.
One of its objectives is to forecast expenditure related to asset
and future cash flows accurately, after taking into account all
the factors, likely to affect future expenditure. Inflation is also
one of the factors, which affect a company's expenditure and
cash flows. In practice, inflation is rarely accounted for in
capital budgeting, because it is assumed that with inflation,
both net revenues and the project cost will rise proportionately,
so it will not have much impact. However, this is not true. Inflation influences two aspects: Cash Flows and Discount Rate.

The Rates of returns may be Nominal rate of return or Real
rate of return.

Nominal values are the actual amount of money making up
cash flows. Ex: X deposits Rs. 100 in the State Bank of
India for one year at 10% rate of interest. So he is getting Rs.
110 after one year. Here, Nominal rate of return is 10%. The
Rs 110 is expressed in nominal terms because effect of
inflation is not adjusted.

Real values reflect the purchasing power of the cash flows.
Real values are found by adjusting the nominal values for the
rate of inflation. In the above example, say inflation is
expected to be 7% next year. That means a 7% of inflation
implies that what can be bought for Rs. 1 now can be bought
for Rs. 1.07 next year. The purchasing power of Rs. 110
received next year is Rs. 110 / 1.07 = Rs. 102.80. Real rate of
return is 2.8%. This is in real terms since it is been adjusted
for the effect of inflation.

A. EFFECTS OF INFLATION ON CASH FLOWS:

Often there is a tendency to assume erroneously that,
when, both net revenues and the project cost rise proportionately, the inflation would not have much impact. These lines of arguments seem to be convincing, and it is
correct for two reasons. First, the rate used for discounting
cash flows is generally expressed in nominal terms. It would
be inappropriate and inconsistent to use a nominal rate to
discount cash flows which are not adjusted for the impact of
inflation.

Second, selling prices and costs show different degrees of
responsiveness to inflation.

Estimating the cash flows is a constant challenge to all
levels of financial managers.

This is due to fact that the tax savings on depreciation
charged are based on original costs rather than replacement
costs. Due to this, cash flows after taxes decrease over time. If
depreciation is based on replacement costs then cash flows
after taxes will not decrease over time. This situation can be
explained through following illustration

ABC Ltd is considering a new project for manufacturing of
toys involving a capital outlay of Rs.6 Lakhs. The capacity of
the plant is for an annual production capacity 60000 toys and
the capacity utilization is during the 3 years working life of the
projects indicated below:

<table>
<thead>
<tr>
<th>Year</th>
<th>Capacity Utilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60</td>
</tr>
<tr>
<td>2</td>
<td>75</td>
</tr>
<tr>
<td>3</td>
<td>100</td>
</tr>
</tbody>
</table>

The selling price per toy is Rs.10 and contribution is 40
per cent. The annual fixed costs, excluding depreciation are to
be estimated Rs.28000 per annum. The depreciation is 20 per
cent and straight line method. The rate of inflation is expected
to be 5 per cent.

Therefore, the finance manager should be consistent in
treating inflation as the discount rate is market determined. In
addition to this, a company’s output price should be more than
the expected inflation rate. Otherwise there is every possibility
is to forego the good investment proposal, because of low
profitability. And also, future is always unexpected, what will
be the real inflation rate (may be more or less). Thus, in
estimating cash flows, along with output price, expected
inflation must be taken into account. In dealing with expected
inflation in capital budgeting analysis, the finance manager
TABLE 1: A COMPARISON OF REAL CASH FLOW AND NOMINAL CASH FLOW
(Figures in Rupees)

<table>
<thead>
<tr>
<th>Particulars/ Year</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales Revenue</td>
<td>360000</td>
<td>450000</td>
<td>600000</td>
</tr>
<tr>
<td>Less: Variable Cost</td>
<td>216000</td>
<td>270000</td>
<td>360000</td>
</tr>
<tr>
<td>Depreciation</td>
<td>120000</td>
<td>120000</td>
<td>120000</td>
</tr>
<tr>
<td>Fixed Cost</td>
<td>28000</td>
<td>28000</td>
<td>28000</td>
</tr>
<tr>
<td>Earnings before Tax</td>
<td>(4000)</td>
<td>32000</td>
<td>92000</td>
</tr>
<tr>
<td>Tax @ 50%</td>
<td>--</td>
<td>16000</td>
<td>46000</td>
</tr>
<tr>
<td>Profit after tax</td>
<td>--</td>
<td>16000</td>
<td>46000</td>
</tr>
<tr>
<td>Real Cash flow</td>
<td>116000</td>
<td>136000</td>
<td>166000</td>
</tr>
<tr>
<td>Inflation Adjustment</td>
<td>(1.05)^1</td>
<td>(1.05)^2</td>
<td>(1.05)^3</td>
</tr>
<tr>
<td>Nominal Cash flow</td>
<td>121800</td>
<td>149940</td>
<td>1921666</td>
</tr>
</tbody>
</table>

has to be very careful for correct analysis. A mismatch can cause significant errors in decision making. Therefore the finance manager should always remember to match the cash flows and discount rate as mentioned below.

MATCH UP CASH FLOWS AND DISCOUNT RATE

<table>
<thead>
<tr>
<th>Cash flows</th>
<th>Discount rate</th>
<th>Yields</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Cash flow</td>
<td>Nominal discount rate</td>
<td>Present Value</td>
</tr>
<tr>
<td>Real cash flow</td>
<td>Real discount rate</td>
<td>Present Value</td>
</tr>
</tbody>
</table>

Inflation and Discount Rate: The discount rate has become one of the central concepts of finance. Some of its manifestations include familiar concepts such as opportunity cost, capital cost, borrowing rate, lending rate and the rate of return on stocks or bonds. It is greatly influenced in computing NPV. The selection of proper rate is critical which helps for making correct decision. In order to compute net present value, it is necessary to discount future benefits and costs. This discounting reflects the time value of money. Benefits and costs are worth more if they are experienced sooner. The higher the discount rate, the lower is the present value of future cash flows.

For typical investments, with costs concentrated in early periods and benefits following in later periods, raising the discount rate tends to reduce the net present value. Thus, discount rate means the minimum requisite rate of return on funds committed to the project. The primary purpose of measuring the cost of capital is its use as a financial standard for evaluating investment projects.

B. EFFECTS OF INFLATION ON DISCOUNT RATE:

The opportunity cost of capital or the nominal discount rate (r) is a combination of real rate (K), expected inflation rate (α). This relationship is known as Fisher’s effect, which may be stated as follows:

\[
\text{Nominal discount rate} = (1+\text{Real discount rate}) \times (1+\text{inflation rate}) - 1
\]

\[
r = (1+K) (1+\alpha) -1
\]

Example: if real discount rate is 10% and inflation rate is 7%,

\[
\text{Nominal discount rate} = (1.10) (1.07) - 1 = 0.177 \text{ or } 17.7%
\]

\[
K = \frac{(1+r)}{(1+\alpha)} - 1 = \frac{1.177}{1.07} - 1 = 10\%
\]

Since, r the required rate of return in real terms and the anticipated inflation rate are estimates, it is customary to make a simple addition of the real rate and the inflation rate. Here, the required nominal rate of return that would be used in practice in the calculation would therefore be 17%.

The relationship between the rate of return and inflation in the real world is a tough task to explain than the theoretical relationship described above. Experience shows that deflation of any series of interest rates over time by any popular price index does not yield relatively constant real rates of interest. However, this should not be interpreted as the current rate of interest is properly adjusted for the actual rate of inflation, but only that it will contain some expected rate of inflation. Furthermore, the ability of accurately forecasting the rate of inflation is very rare.

IV. IMPLICATIONS

It is noted from the above analysis that, effects of inflation significantly influence the capital budgeting decision making process. If the prices of outputs and the discount rates are expected to rise at the same rate, capital budgeting decision will not be neutral. The implications of expected rate of inflation on the capital budgeting process and decision making are as follows:

The company should raise the output price above the expected rate of inflation. Unless it has lower Net Present Value which may lead to forego the proposals and vice versa.

If the company is unable to raise the output price, it can make some internal adjustments through careful management of working capital.
With respect of discount rate, the adjustment should be made through capital structure.

V. CONCLUSION

It could be inferred from the above analysis that, effects of inflation are significantly influenced on capital budgeting decision making process. To examine the effects of inflation on cash flows, it is important to note the difference between nominal cash flow and real cash flow. It is the change in the general price level that creates crucial difference between these two. Therefore, the finance manager should take into recognize the effect of inflation. Otherwise possibilities are more to forego the good investment proposal, because of low profitability. Using of the proper discount rate depends on whether the benefits and costs are measured in real or nominal cash flows. To be consistent, the cash flows should match with discount rate. A mismatch can cause significant errors in decision making. There should be consistency in treating the inflation in the cash flows and the discount rate. It is very difficult to take decision, free from effect of inflation as it is highly uncertain.

Therefore, use of GDP deflator may be ideal while taking Capital Budgeting Decisions since, it would be more rational, and scientific and not on pick and choose method. For projects or programs that extend beyond the six-year budget horizon, the inflation assumption can be extended by using the inflation rate for the sixth year of the budget forecast. Alternative inflation estimates, based on credible private sector forecasts, may be used for sensitivity analysis.

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