Is it real or is it nominal?: Pitfalls in the valuation of project cash flows

Profitability evaluation of projects, whether financial or economic, of private projects or public projects, relies on the evaluation of cash flows of the projects, i.e. financial or economic quantities needed and generated by the project. Decisions to undertake the project are normally based on the results of the internal rate of return or the net present value of the resulting cash flows. Likewise, the debt payment capacity of a project is normally measured on the net cash flow coverage of the debt service. As such, the definition and proper measurement of cash flows are extremely important. Nevertheless, they tend to be taken for granted in most evaluations, which, relying on tradition or custom, may perpetuate serious pitfalls. The purpose of this note is to explore the pitfalls resulting from common mistakes made in the denomination of the cash flows: the mixing of real and nominal terms. Even though what follows applies to all types of project evaluations using cash flows, it is specially critical for financial evaluation of private investment projects, where the considerations of financial structure and tax exposure are important variables. Even though there are a myriad of other issues related to project financial evaluation (i.e. variability of cash flows, exposure to foreign exchange risk, etc.), we will only address one issue: mixing of real and nominal values in local currency.

Real versus nominal cash flows

Pitfall Number One: Cash flows expected to occur in the future, expressed in real terms, are often equated with current values.

In the valuation of the cash flows we have two choices: cash flows are all denominated in real or in nominal terms. In the first case, the cash flows are expressed in the currency of purchasing value as of the time of occurrence of the flow and in the second case they are expressed in currency of purchasing value as of the day of the evaluation. For example, a kilowatt/hour of electricity to be sold five years from now, in nominal terms would be valued at the actual price it is expected to cost five years from now, taking into account inflation and technological advances. In real terms it should be valued at that price, deflated by the expected inflation in electricity prices over those years. Unfortunately, to value it in truly real terms requires the forecast of the future price, including the rate of technological change, the competitive situation and **the rate of inflation on electricity prices**, not on the overall inflation level. Most evaluations, to avoid these complex issues, value future cash flows at today's prices and call it a real value. Nevertheless, today's price is neither a real nor nominal value. Do you expect personal computers to cost the same five years from now? If you were to express that future value in dollars of today's purchasing power, it would be far different that today's current value.

Pitfall Number Two: Most evaluations mix nominal with real cash flows.

In addition to the problems of estimating cash flows correctly, another common mistake is the mixing, most of the time unknowingly, of real and nominal cash flows. There is consensus that all cash flows should be expressed in the same way: either all flows are denominated in real terms or all flows are in nominal terms. As most project evaluations, under moderate or high inflation, for the sake of simplicity do the evaluation in real terms,

they tend to mix in some nominal flows. Many cash flows are contractually set, i.e., already expressed in nominal terms and are valued as such, without any attempt to re-express them. For instance, interest payments on debt, depreciation for tax calculation purposes, some fixed royalties, etc.

Profitability Evaluation

Pitfall Number Three. Most evaluations use nominal discount or hurdle rates with real cash flows.

Assuming that we could avoid the two pitfalls mentioned above, in theory, project profitability could be measured over either an all-real or all-nominal net cash flow schedule. Then the issue becomes one of yardstick. to what do we compare the resulting measure of profitability. If we use the Net Present Value approach (i.e discount the resulting net cash flows with a suitable discount rate), the issue becomes which rate to use. If we use the Internal Rate of Return approach (i.e, identifyingthe discount rate that equates the present value of outflows and inflows), the issue is that of the hurdle rate: to what rate do we compare the calculated rate of return? **If real cash flows are used (**i.e. **assuming zero inflation across the board), the discount rate or the hurdle rate, must be a real rate**. Unfortunately, most people are used to thinking in terms of a nominal rate, as that is what it is observed in the market. For instance, the most commonly used discount rate or hurdle rate of 12% must be thought of including either expected inflation or a risk premium or both, because a **truly riskless real** rate of return is considered to be in the range of 2-3% (recall that **any** government securities are risky and one could argue, for instance, that the 6% that the US government pays for its debt is composed of a 3% risk free rate, a 2% expected inflation and a 1% liquidity premium). Using that 12% rate with real cash flows is equivalent to assuming a risk premium of about 9-10%, which may be high for some government guaranteed projects. For private projects, the risk premium will depend on the level of unmitigated project risk.

For nominal cash flows, the discount rate must include both a risk and an inflation premia. (even though this is also not theoretically correct, as one aggregate inflation measure cannot capture the different inflations affecting each cash flow). It is also incorrect to assume that all cash flows can be denominated in nominal terms and then "deflate" the resulting internal rate of return by an assumed global inflation, i.e. say that an internal rate of 25% with an overall inflation of 10% translates into a real return of 15% (to be precise it would translate into 13.6%). In almost all cases, each component of the cash flow will be subjected to a different inflation, some even to no inflation at all (contractually set). It is impossible to capture in a single rate of "deflation" all the variations of inflation over time and in the different cash flows.

Debt Service coverage

Pitfall Number Four: Most evaluations underestimate the debt service capacity of projects and the profitability to shareholders by mixing real with nominal cash flows, particularly debt service and tax payments.

Cash flows are also used in project evaluation to determine the ability of the project to service its debt. In most cases these debt service coverage calculations are also flawed. Most calculations are based on projections of (supposedly) real cash flows, but including contractually specified, i.e. nominal, interest charges and principal amortization payments. A ratio is then calculated which has as a numerator some measure of net cash flow in (supposedly) real terms with a denominator of debt service in nominal terms, thereby, in general, underestimating the debt service capacity. When the time comes to service the debt at the originally agreed upon amounts, there will be, in general, more resources generated, as

most cash flows will have "inflated" as compared with the (supposedly) real, i.e., constant amounts used in the estimation of the cash flows. Obviously, the degree of debt service capacity underestimation, or overestimation in some extreme cases, will depend on the sensitivity of net cash flows to inflation and technological and other changes. This issue is particularly important in the evaluation of private projects and affects not only the debt service coverage but also the profitability to shareholders, which is calculated based on net cash flows after debt service.

A similar, but opposite, problem occurs with the estimation of taxes. In the estimation of taxes, one of the major items, particularly in infrastructure projects, is the depreciation charge. In most cases, this charge is allowed based on historical cost of the assets. By using this nominal amount in a series of (supposedly) real cash flows, the net cash flow is also underestimated.

A better way

There is no truly correct way to denominate the cash flows which is both practical and feasible. The most technically correct solution is to value every cash flow in nominal terms and compare the rate of return to a nominal rate or use it to calculate the Net Present Value. Unfortunately, this requires forecasting values for every cash flow at every point in time and may only be practical in very simple cases. A less accurate solution, but more practical, is to use real rates and real cash flows, making sure the values reflect expected technological advances, competitive pressures, increases in productivity of inputs and outputs, etc., and then deflating all cash flows which by nature are expressed in nominal terms, like depreciation, debt service and other contractually set values.

Proper financial analysis of projects is extremely difficult, but there are a few rules that can significantly improve the process, like trying to avoid the pitfalls stated above, making sure that cash flows are that, cash flows, expressed in economic or financial terms, at the time of occurrence, and not on accounting terms at the time of accrual, closely verifying the quality of the estimates and spending resources in the estimation of those that have a significant impact on the evaluation. This is basically what the markets do in the valuation of a project.

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