Guidelines for Forecasting Financial Statements from Historical Financial Statements for Valuation Purposes

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Abstract
In this teaching note I list some suggestions that might be useful to take into account when forecasting financial statements departing from historical data. The ideas presented in this note are the result of advising undergraduate and graduate students in the course Econ 195.96/295.96 (Crosslisted: PubPol 264.96): Cash Flow Valuation (CFV): A Basic Introduction to an Integrated Market-Based Approach at Duke University during the Fall of 2005 and my previous experience of teaching the subject at Politécnico Grancolombiano in Bogotá, and other universities in Colombia.

The note is divided in four sections: Section One, Analyzing the Historical Financial Statements, is related to the analysis and use of historical information from the financial statements. In Section Two I mention some tips related to the construction of forecasted financial statements. In Section Three I present a list of tips related to the proper way to valuate the cash flows. In Section Four a brief summary is presented.

Keywords: Financial statements, forecasting, net present value (NPV), firm valuation, equity valuation, cost of capital, break even analysis, sensitivity analysis, scenario analysis, cash flow valuation

JEL Classification: D61, G31, H43, M40, M46, D92, E22, E31, M41
"The first law of thermodynamics is essentially the statement of the principle of the conservation of energy for thermodynamical systems. […] the variation in energy of a system during any transformation is equal to the amount of energy that the system receives from its environment." The First Law of Thermodynamics. Thermodynamics, Enrico Fermi.

Introduction

In this teaching note I list some suggestions that might be useful to take into account when forecasting financial statements departing from historical data. The ideas presented in this note are the result of advising undergraduate and graduate students in the course Econ 195.96/295.96 Crosslisted: PubPol 264.96: Cash Flow Valuation (CFV): A Basic Introduction to an Integrated Market-Based Approach at Duke University during the Fall of 2005 and my previous experience of teaching the subject at Politécnico Grancolombiano in Bogotá, and other universities in Colombia.

The note is divided in four sections in addition to this Introduction: Section One, Analyzing the Historical Financial Statements, is related to the analysis and use of historical information from the financial statements. In Section Two I mention some tips related to the construction of forecasted financial statements. In Section Three I present a list of tips related to the proper way to valuate the cash flows. In Section Four a brief summary is presented. In an Appendix I present a list of input variables that might be useful for forecasting purposes.

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1 I thank Professor Joseph Tham of Duke Center for International Development (DCID), Sanford Institute for Public Policy first for asking me to write this guide and second for his suggestions on it and to his students who worked very hard trying to match the financial statements in the final class project.
In forecasting financial statements we could have several approaches. One of them might be to start from the basic variables and forecast items such as number of units of product or service, prices, increase in prices, and the like. Another is to start from the historical financial statements and from them identify some behavior of different items, identify implicit policies, growth rates and so on. Although I prefer the former approach, I will concentrate in hints regarding the later one. This means that I will mention hints related to the second approach.

I will list some guidelines and hints on what, how and why to look in the historical financial statements in order to forecast the financial statements. The list is divided in three categories: one is related to the analysis of retrospective financial statements. The second one is related to the prospective financial statements. Finally, a list of tips regarding the valuation process is presented including a schematic view of the basic procedure for valuation with the most used discounted cash flows methods.

1. **Section One. Analyzing the Historical Financial Statements**

   1.1. **Review your lessons on basic accounting.**

   1.1.1. Accounting in the firm is a closed system that includes the firm and its stakeholders and nothing is lost nor created. This is similar to what happens in Thermodynamics (see epigraph). In this case, the conservation of wealth principle is the basic accounting equation and it means:

   \[
   \text{Total assets} = \text{Total liabilities} + \text{Total equity}
   \]

   1.1.2. We deal with three financial statements: Balance Sheet, Cash Budget and Income Statement. In the Balance Sheet we show historical values (also known as book values). How much belongs to the firm (assets), how much belongs to
financial debt holders and other liabilities holders (liabilities) and finally, in a residual way, how much belongs to equity holders.

1.1.3. Balance sheet accounts (lines or items) are accumulators; these accounts accumulate the value of any transaction made within the firm; for instance, there is an accumulator for cash, another one for fixed assets and so on. This means that the Balance Sheet is a snapshot of the firm in an instant of time. The Income Statement measures the economic activity of the firm during a given period. It shows how much has been sold (revenues) and the costs of the resources used to produce the goods and/or services sold (expenses). The residual of all this is the Net Income that is what the equity holders might receive. Finally, the Cash Budget shows all the cash transactions of the firm. It shows how much cash goes into the firm bank account and how much cash goes out. The cumulated cash remaining is what the firm has as cash in hand at the end of any period. It should be identical to the amount of cash that is listed in the Balance Sheet. The reason to use of these three financial statements is that it makes it easier the checking for consistency process and it allows the analyst to detect mistakes when matching the financial statements. Moreover, the Cash Budget is very powerful tool for the financial management of any firm.

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http://washingtonpost.com/wp-srv/business/longterm/glossary/glossary.htm,

1.2. Fisher Relationship and Inflation Rate

1.2.1. Review the basic idea proposed by Irving Fisher. The Fisher relationship says:

\[(1 + \text{nominal change}) = (1 + \text{real change}) \times (1 + \text{inflation}).\]

1.2.2. Find inflation rates for the years for which there exist historical financial statements.

1.2.3. With the real increase in units calculate the real increase in prices. This can be done deflating the revenues or expenses figures, and discount the real increase in units from the increase calculated for deflated figures. From that nominal increase the real increase can be calculated discounting the inflation rate. Average the real increase in prices and use it in the forecast.

1.2.4. Deflate revenues and expenses, specially cost of goods sold and overhead expenses and find real increase in prices. This real increase in those items includes real increase in prices and/or real growth. Average these historical real increases and use it in the forecast.

1.2.5. If the information for units sold is not available, deflate revenues and costs, specially the cost of goods sold (COGS), overhead expenses and sales and administrative expenses. With these items deflated, calculate the increase in them. This increase includes the increase in units and the real increase in prices. Calculate the average for these increases and use it in the forecast.
1.3. Cost of debt and debt schedule

1.3.1. Look the historical interest rates: cost of debt and marketable securities returns. Do not rely in single and isolated interest rates. The best procedure to determine the cost of debt, for instance, is to divide total financial expenses by total financial debt of the previous period. This might result in a non-constant cost of debt, Kd.

1.3.2. This cost of debt is composed of inflation and real cost of debt (that might include some risk premium). Use historical data to express the cost of debt. Find the risk implicit in the cost of debt as the cost of debt minus the risk free rate. Risk free rate can be estimated as the return of T-Bonds or Treasury Bonds. Calculate the average of this risk Premium.

1.3.3. Deflate the risk free rate and calculate the average of this deflated risk free rate. This is an estimate of the real rate of interest that can be used in the forecasts.

1.3.4. In any case, decompose the historical cost of debt in risk premium, real rate of interest and inflation. Average the risk premium and the real rate in order to use it in your forecast.

1.3.5. If there is not information for the payment of some liabilities (especially financial debt) in the historical financial statements, assume a reasonable period to pay back that debt based on the last interest rate calculated with the historical financial statements. Construct the debt schedule for each loan.

1.4. Depreciation charges

1.4.1. If depreciation is not disaggregated in the historical financial statements and the investment in fixed assets is calculated as the difference between net fixed
assets from one period to the next, there might be an underestimation of the capital investment during the historical period. The correct way to estimate capital investment expenditures in a year $t$ is to calculate it as $(\text{Net fixed assets})_t - (\text{Net fixed assets})_{t-1} + \text{Depreciation}_t$.

1.4.2. Another approach to roughly estimate depreciation charges from historical financial statements is to find the difference between Earnings before Interest, Taxes, Depreciation and Amortization (EBITDA) and Earnings before Interest and Taxes (EBIT). This difference is an upper limit for depreciation charges (it has amortization charges in it). In traded firms this is usual available information.

1.4.3. If historical depreciation charges are not identified, it might be necessary to define a method of depreciation and depart from the last figure for net assets in the latest historical Balance Sheet.

1.4.4. Be careful not to depreciate an asset beyond its book net value.

1.5. Capital investment expenditures. Although capital investment expenditures do not occur as a function of revenues, they can be expressed as the historical average expense as a percent of revenues. It might be better to calculate that percent in terms of deflated or real revenues and adjust for the future domestic or foreign inflation rate.

1.6. Indexes from the Income Statement and/or the Balance Sheet

1.6.1. Find typical and useful indexes such as gross margins, accounts receivables and accounts payable period, inventory turnover, etcetera, based on deflated figures. Use indexes as percentage of revenues for those items that are directly linked to revenues. These are known as variable costs. This is, they depend on
the level of activity the firm has. For instance, the higher the units sold, the higher the revenues and the higher the cost of goods sold (COGS).

1.6.2. Some inputs are not variables, but policies or goals. For instance AR policy, price increase policy, final inventory policy and the like. These can be estimated from historical financial statements.

1.6.3. Do not calculate expenses as a percent of revenues, specially those expenditures that by their nature seem to be fixed costs. Fixed costs do not increase (within some limits) with the level of activity of the firm; examples are staff salaries, rent, depreciation of fixed assets, and similar. It is better to look the historical behavior deflating them and trying to estimated real growth with the deflated figures and later when making the forecast, introduce the inflation effect.

1.6.4. You might be tempted to express all the lines if the financial statements as a percent of revenues. Be careful. For instance, taxes should not be calculated as a percentage of revenues but as a percentage of Earnings before Tax (EBT). To estimate the average tax rate sum all the taxes and divide by the sum of all the EBTs. This will give you a weighted average of the tax rate. Use this weighted average as the tax rate for forecasted financial statements.

1.7. Economic environment and related variables

1.7.1. Identify the “driver” of growth. For instance, if your product or service is bought by end users identify how the target market is increasing. In these cases the “driver” is usually the population and it might be useful to identify the growth rate of population. (It might be necessary to identify which segment of the population is the target population for the product or service). If your
product or service is for firms and not directly to the end user, you need to identify growth rates for those firms and the growth rate the number of those firms is growing. (Eventually, all demands are related to population growth, but specific trends in the specific target market can be identified).

1.7.2. Compare the estimated growth of the “driver” for your demand with the growth rates found in the historical financial statements and assess if they are consistent.

2. **Section Two. Forecasting Prospective Financial Statements**

2.1. **Review your lessons on basic accounting.**

2.1.1. Each transaction in a financial statement has a correspondent transaction in at least one of the three financial statements. For instance, for each transaction in one side of the Balance Sheet, there should be another one on the other side, or another one in the same side but with different sign or a mixture of the two situations and a corresponding transaction(s) in the Cash Budget and/or the Income Statement.

2.1.2. In short, you have to keep valid the basic accounting equation.

2.2. **Fisher Relationship and Inflation Rate**

2.2.1. From the analysis of the historical financial statements you have found estimates of real growth, real increase in prices and risk premium in debt as an average of these historical data. Use these averages as the forecast. Combine them with forecasted or prospective inflation rates to forecast nominal increases in revenues and costs, and nominal interest rates.
2.2.2. Look for estimates for the future inflation rate. The Fed should have an estimate for the future inflation. At least they might have the trend and the behavior of inflation for the near future.

2.2.3. Expected inflation might also be derived from the zero-coupon curve. This is what the market expects regarding future inflation.

2.2.4. Link all the rates that are inflation related, to inflation. For instance, risk free rate should be composed (using Fisher relationship) of real interest rate and inflation rate. Nominal increase in prices should be linked to inflation as well. If this is not done properly, when conducting sensitivity analysis a change in inflation rate will not affect the price increase which is not logical, from the economic point of view.

2.2.5. If foreign exchange currency is used in the financial model, estimate a base exchange rate change using the purchasing parity power model, PPP, (remember the Big Mac Index: The Economist (www.economist.com click the link “Markets & Data” http://www.economist.com/markets/Bigmac/index.cfm). Under purchasing parity power the change in foreign exchange price will be equal to \((1+\text{domestic inflation rate})/(1+\text{Foreign inflation}) - 1\). Use this as a basis from which some deviations can be expected. Be careful using this model because in this case the behavior of value as a function of inflation could result in exotic results. (For instance, if there are revenues in foreign exchange, the higher the domestic inflation, the higher the revenues and this might contradict the usual knowledge that inflation destroys value).
2.2.6. When estimating interest rates, price increases and similar do not mix nominal with real rates. For instance, when using the Capital Asset Pricing Model, CAPM, \( (K_e = R_f + \beta(R_m - R_f)) \) \( R_f \) and \( R_m \) should be either nominal or real. The usual procedure is that for CAPM we use nominal rates because \( \beta \) usually is calculated based on nominal returns.

2.3. **Cost of debt and debt schedule**

2.3.1. With the risk premium for debt estimated from the retrospective financial statements, the estimation of real interest rates and the prospective inflation rates, estimate the future cost of debt.

2.3.2. When preparing a debt schedule use end of year convention. Interest charges are paid at the end of year, not at the beginning.

2.3.3. Make sure that interest payments in the debt schedule are the same you use in the Income Statement and in the Cash Budget. These amounts should go to the cash flow to debt, unless they are not paid (say, they are accrued but not paid therefore increasing the debt balance).

2.3.4. In the case of a loan fully paid in the forecasting period, the sum of principal payments should be identical to the initial debt balance.

2.3.5. The same, the present value of the payments at the cost of debt for that specific loan should be identical to the initial debt balance.

2.3.6. Principal payment at time \( t \) is equal to the constant payment at time \( t \) minus the interest at time \( t \) calculated as \( K_d \times (\text{Debt}_{t-1}) \).

2.3.7. Debt balance for the last year has to be zero (in case the debt is fully paid during the forecasted period).
2.3.8. The debt balance at any year (or the sum of all debt balances in case there are several loans) should be identical to the total debt in the Balance Sheet.

2.4. Indexes from the Income Statement and/or the Balance Sheet

2.4.1. Expenditures could be determined by defining the amounts to purchase using the cost of goods sold figure and the initial and final inventory: Initial inventory + Purchases − Final Inventory = Cost of goods sold. Depending on the payment of payables policy you can determine the amount of cash paid for that item. The same has to be said for overhead, sales and administrative expenses and the like.

2.4.2. If there exists disaggregate information try to use Pareto’s Law: 20 percent of the causes are responsible of 80 percent of the effects. This can be useful if it is necessary to reduce the number of inputs and/or products in a complex firm, say Wallmart or K-Mart.

2.4.3. Sometimes it might be useful and possible to reduce an apparent large number of products to only one. For instance, it might seem that a tire maker have many references, or that a firm in the printing industry might have not only many different products but what is worse, the products are not predictable because they might take orders from their customers and manufacture what the customer needs. Think of Goodyear. Think of Budweiser or think of Coca-Cola. Think of firms like Apollo (an educational enterprise) that sells many courses and programs. All these firms might be considered as selling a sole and unique product: tons of rubber, tons of paper, gallons of beer or gallons of water (with some concentrate, artificial color and sugar), thousands of tuitions. This insight might make it easier the forecasting
of units sold and there might not be any need to start from dollar amounts from the historical financial statements.

2.4.4. If you list a provision for uncollectible or bad debts it should be subtracted in the Income Statement, reduce the Accounts Receivable, AR in the Balance Sheet and reduce the Revenues from sales in the Cash Budget.

2.5. Balance sheet items

2.5.1. When there is not information for the content or meaning of a given figure in the Balance Sheet, it is better to keep it constant for the forecasting period. Or even you should “disappear” it either paying it out or cashing in it out and this has to be reflected in the Cash Budget.

2.5.2. Do not express items such as equity, new equity investment, cumulated retained earnings, equity repurchase, debt and the like, (they are cumulative items or will cumulate with previous balances) as a percent of any other figure (say, revenues). These items should change as a result of the different transactions recorded in the Income Statement and the Cash Budget. For instance, the amount to be borrowed or the amount to be invested as cash excess will pop up from the Cash Budget. Remind that lines in the Balance Sheet are accumulators; therefore it is not recommended to express and forecast numbers in the Balance Sheet as a percent of say, revenues.

2.5.3. Be sure to recover and pay all the accounts receivables, AR and accounts payable, AP (or any other liability) from the last historical financial statement. If not, keep them constant but you should realize that doing it might reduce value (in the case of say, AR or increase value (in the case of AP).
2.5.4. Do not match the Balance Sheet adding or subtracting any difference between assets and liabilities and equity. This practice might hide some errors that will make difficult and inconsistent the analysis and valuation of the firm.

2.6. Economic environment and related variables

2.6.1. Identify as much variables as possible that might affect forecasts and try to quantify them. Later you might discard some of them either because there is no information or because they are not too relevant. Making this list will give you a broad picture of the firm that you are forecasting. See Basic Information for Firm Valuation in the appendix.

2.6.2. Look for the economic environment and use as much information as possible to estimate future trends in the economy.

3. Section Three. The Valuation Process

3.1. Deriving the Cash Flows

3.1.1. Remember the conservation of cash flows equation: Free cash flow plus tax savings should be identical to cash flow to debt plus cash flow to equity and this is the capital cash flow:

\[ \text{FCF} + \text{TS} = \text{CFD} + \text{CFE} = \text{CCF} \]

3.1.2. The amounts of financial expenses included in the CFD should be the same you include in the Cash Budget. The same in relation with the TS: the amount of the tax savings should be derived from the financial statements and use the same tax rate you use in calculating the taxes in the Income Statement. The CFE should be consistent with the financial statements as well.

3.1.3. The tax rate calculated above should be used for calculating the tax savings and for calculating the traditional WACC


\[ WACC = K_d \times D\% \times (1-T) + Ke \times E\% \]

3.1.4. The previous formulation for WACC is restricted to special conditions such as

3.1.4.1. Taxes are paid the same period as accrued.

3.1.4.2. There is enough EBIT to earn the full tax savings.

3.1.4.3. The only source of tax savings is the interest charges.

3.1.5. A more general formulation of the WACC and that can be used in any case is (assuming that the discount rate of the tax savings, \( \psi \), is Ku, the cost of unlevered equity)

\[ WACC_t = Ku_t - \frac{TS_t}{V_{t-1}} \]

where \( V \) is the value of the firm in period \( t-1 \).

3.1.6. Remember that E\% + D\% = 1. E\%_t is \( \frac{E_{t-1}}{V_{t-1}} \) and D\%_t is \( \frac{D_{t-1}}{V_{t-1}} \). When using these percentages in the WACC or Ke formula, they should be calculated using the previous period values for D, E and V. These values are market value. Market value means the present value of the corresponding cash flows at the proper discount rate.

3.2. Discounting the Cash Flows

3.2.1. Remember the correspondence between cash flows and the proper discount rate.

<table>
<thead>
<tr>
<th>Cash Flow</th>
<th>Discount rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tax Savings, TS</td>
<td>( \psi ) (usually, Ku or Kd)</td>
</tr>
<tr>
<td>Free Cash Flow, FCF</td>
<td>WACC^{FCF}</td>
</tr>
<tr>
<td>Capital Cash Flow, CCF</td>
<td>WACC^{CCF}</td>
</tr>
<tr>
<td>Cash Flow to Equity, CFE</td>
<td>Ke, the cost of levered equity</td>
</tr>
<tr>
<td>Cash Flow to Debt, CFD</td>
<td>Kd, the cost of debt</td>
</tr>
</tbody>
</table>

3.2.2. When \( \psi \) is Ku, WACC^{CCF} is Ku.

3.2.3. When \( \psi \) is Ku, Ke\(_t\) is Ku\(_t\) + (Ku\(_t\) − Kd\(_t\))\times D_{t-1}/E_{t-1} \)
3.2.4. Remember the conservation of value equation:

Value of the firm or levered value of the firm

\[ \text{Value of the firm or levered value of the firm} = \text{Market value of debt} + \text{Market value of equity}. \]

\[ \text{PV(FCF at WACC}^{\text{FCF}}) = \text{PV(CCF at WACC}^{\text{CCF}}) = \text{PV(CFE at Ke)} + \text{PV(CFD at Kd)} \]

3.2.5. The value of the firm and the value of equity is the present value of the future cash flows. This PV at any time \( t \) can be calculated as

\[ \text{PV}_t = \frac{\text{PV}_{t+1} + \text{CF}_{t+1}}{1 + \text{Discount Rate}_{t+1}}. \]

3.2.6. The Net Present Value, NPV, is a measure of the desirability of an investment. It is not the value of the firm. The difference between the value of the firm or the equity and the NPV is the amount invested in each case. The NPV at any time \( t \) can be calculated as

\[ \text{NPV}_t = \frac{\text{PV}_{t+1}}{1 + \text{Discount Rate}_{t+1}} + \text{CF}_t. \]

3.2.7. The NPV for equity and the NPV of the firm are identical if the market value of the debt is identical to its book value.

3.2.8. The Continuing or Terminal Value, TV, is the value of the firm at the end of the forecasting period. According with the definitions we have used above, it is the present value of all the cash flows after period \( N \), the last forecasted period.

3.2.9. The TV is calculated as a perpetuity.

3.2.10. The TV can be calculated as a non-growing or a growing perpetuity.

3.3. Cost of debt and debt value

3.3.1. Remind that for valuation purposes, the relevant debt is financial debt.

Financial debt is any liability that generates the obligation to pay interest.
3.3.2. Use the forecasted cost of debt to calculate the value of Ke, the cost of levered equity (Ke=Ku+(Ku−Kd)×D/E).

3.3.3. In this item I present a conceptual map of the valuation process where the basic discounted cash flows methods are presented. This is a summary of the basic ideas on valuation. Under the assumption that CAPM (Ke = R_f + β×(R_m − R_f)) works and that the discount rate for the tax savings is Ku, I show the sequence of calculations and interactions among the variables, β, values, cash flows and discount rates. We might consider that Ku is the “mother” of everything. Let us see:

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2 I wish to thank the students of the Certificate Course (Specialization) in Finance in the Universidad del Valle, Cali, Colombia (April, 2005) who made possible this graphic summary as a result of their questions and comments.
Identify the firms traded in the stock market and that are similar to the firm you are trying to valuate.

Identify or calculate the βs of those firms

Unlever the βs. Use \( \beta_u = \frac{\beta}{1 + \frac{D_{t-1}}{E_{t-1}}} \). \( \beta_u \) is the β as if the firm had no debt. \( D \) is the market value of debt and \( E \) is the market value of the equity for the traded firm at \( t-1 \).

Calculate the average of \( \beta_u \)’s

With the \( \beta_u \) average calculate \( K_u = R_f + \beta_u \times (R_m - R_f) \)

CCF = CFD + CFE

Market firm value \( V = PV(\text{CCF at } K_u) \)

FCF = CFD + CFE - TS

Levered firm value, \( PV(\text{FCF at } WACC^{\text{FCF}}) \)

WACC\(_{i}^{\text{FCF}} = K_u - \frac{TS_i}{V_{t-1}} \)

WACC\(_{i}^{\text{FCF}} = K_d (1-T)D_{t-1}/E_{t-1} + KeE_{t-1} \)

A VERY SPECIAL case

\( CFE \)

PV(CE at Ke) Market equity value

Levered firm value, \( PV(\text{CFE at } K_e) + \text{Debt} \)

\( K_e = K_u + (K_u - K_d)D_{t-1}/E_{t-1} \)
3.4. Difficult task?

3.4.1. Yes, it is an exercise that requires some time and needs to be done carefully, but once it is done, you can use it over and over. You do not need to start every time from scratch.

3.4.2. With the basic model constructed you can continue increasing the complexities in it. Even you can construct a “fit for all sizes” model with all possible inputs and/or switches for taking into account different scenarios.

3.4.3. The most complex model is for a manufacturing firm because you have to model different classes of inventory: raw material, in-process inventory and finished products inventory. The simplest model is for a trading firm that buys a product to resell it at a different (usually higher) price.

3.4.4. The Discounted Cash Flow method is one among other methods available. The American Society of Appraisers (http://www.appraisers.org/) suggests using several methods, including the DCF; this is the most widely used in the world. The different methods advocated by that society (and by many textbooks) are as difficult as the DCF and not as simple as other methods seem to be. Theoretically, if properly done and considering the proper variables, all methods should give the same result.

4. Section Four. Summary

In this teaching note I have presented some suggestions and tips on what, how and why to look at the historical financial statements in order to make a set of forecasted financial statements in order to value the cash flows resulting from them. These are the result of observation of the different difficulties found by undergraduate and graduate
students both at Duke University, Politécnico Grancolombiano and other Colombian universities.
Appendix

Some basic information that an analyst should at least think about

In this Appendix I indicate some minimum variables to be considered in the forecasting of financial statements. Some of them are not variables \textit{strictu sensu}, but goals and policies.

1. Historical financial statements in order to “discover” some policies, such as inventory, account receivables, account payables, price determination in relation with inflation
2. Depreciation method
3. Tax rate
4. Unlevered cost of equity, \(K_u\) (unlevered beta) and inflation rate linked to it at the time of calculation. Probable you have to find levered betas.
5. Real and nominal growth rate for the economy and the industry.
6. Constant leverage policy for perpetuity
7. Expected inflation rate for last forecasted year and years to perpetuity.
8. Domestic inflation rate for the forecasted period
9. Devaluation rate for foreign exchange used
10. Exchange rate when the forecasting period starts
11. Foreign inflation rate for the countries involved in the project
12. Initial price of output units
13. Growth rate for real output prices
14. Initial price for input units
15. Growth rate for real prices of inputs
16. Overhead expenses in year 0
17. Growth rate for real Overhead expenses
18. Administrative, selling and operations payroll

19. Growth rate for real cost of payroll

20. Growth for real price of fixed assets

21. Sales commission (identify the basis for the calculation: orders, sales, accounts receivable AR, recovery…)

22. Advertising and promotions

23. Real rate of interest

24. Risk premium for cost of debt

25. Nominal Cost of debt Kd.

26. Inventory policy, for instance, months of sales as final inventory

27. AR policy, for instance, percent of sales received immediately, at 30 days, 60 days, …

28. Average AR policy for the industry

29. Payment policy, for instance, percent of payments made immediately, at 30 days, etc.

30. Payout ratio

31. Increase in volume, units

32. Minimum cash balance required for operations

33. Price demand Elasticity for the output

34. Price discount for volume in the inputs

35. Average book leverage for the industry

36. Fraction of sales in foreign exchange

37. Fraction of financing in foreign exchange
Appendix B
Example for estimating real increase in prices

Next we show the value of the minimum wage in Colombia (in Colombian Pesos)

<table>
<thead>
<tr>
<th>Year</th>
<th>Valor del minimum wage mensual</th>
<th>Inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>142.125,00</td>
<td>21.64%</td>
</tr>
<tr>
<td>1997</td>
<td>172.005,00</td>
<td>17.68%</td>
</tr>
<tr>
<td>1998</td>
<td>203.826,00</td>
<td>16.70%</td>
</tr>
<tr>
<td>1999</td>
<td>236.460,00</td>
<td>9.23%</td>
</tr>
<tr>
<td>2000</td>
<td>260.100,00</td>
<td>8.75%</td>
</tr>
<tr>
<td>2001</td>
<td>286.000,00</td>
<td>7.64%</td>
</tr>
<tr>
<td>2002</td>
<td>309.000,00</td>
<td>6.99%</td>
</tr>
<tr>
<td>2003</td>
<td>332.000,00</td>
<td>6.49%</td>
</tr>
<tr>
<td>2004</td>
<td>358.000,00</td>
<td>5.50%</td>
</tr>
<tr>
<td>2005</td>
<td>381.500,00</td>
<td>4.85%</td>
</tr>
</tbody>
</table>

With these data we calculate the nominal increase (with inflation) for the minimum wage. We use the following formulation:

\[
\text{Nominal increase} = \frac{\text{Wage}_t - 1}{\text{Wage}_{t-1}}
\]

For instance, for year 2005

\[
\text{Nominal increase} = \frac{381500}{358000} - 1 = 6.56\%
\]
As we know the nominal increase and the inflation rate, we can calculate the real increase as follows.

\[
\text{Real increase} = \frac{1 + \text{nominal increase}}{1 + \text{inflation rate}} - 1
\]

For instance, for year 2005 we have

\[
\text{Real increase} = \frac{1 + 6.56\%}{1 + 4.85\%} - 1 = 1.63\%
\]

<table>
<thead>
<tr>
<th>Year</th>
<th>Monthly minimum wage</th>
<th>Inflation</th>
<th>Wage increase</th>
<th>Real increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>142,125.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>172,005.00</td>
<td>17.68%</td>
<td>21.02%</td>
<td>2.84%</td>
</tr>
<tr>
<td>1998</td>
<td>203,826.00</td>
<td>16.70%</td>
<td>18.50%</td>
<td>1.54%</td>
</tr>
<tr>
<td>1999</td>
<td>236,460.00</td>
<td>9.23%</td>
<td>16.01%</td>
<td>6.21%</td>
</tr>
<tr>
<td>2000</td>
<td>260,100.00</td>
<td>8.75%</td>
<td>10.00%</td>
<td>1.15%</td>
</tr>
<tr>
<td>2001</td>
<td>286,000.00</td>
<td>7.64%</td>
<td>9.96%</td>
<td>2.15%</td>
</tr>
<tr>
<td>2002</td>
<td>309,000.00</td>
<td>6.99%</td>
<td>8.04%</td>
<td>0.98%</td>
</tr>
<tr>
<td>2003</td>
<td>332,000.00</td>
<td>6.49%</td>
<td>7.44%</td>
<td>0.90%</td>
</tr>
<tr>
<td>2004</td>
<td>358,000.00</td>
<td>5.50%</td>
<td>7.83%</td>
<td>2.21%</td>
</tr>
<tr>
<td>2005</td>
<td>381,500.00</td>
<td>4.85%</td>
<td>6.56%</td>
<td>1.63%</td>
</tr>
</tbody>
</table>

When we calculate the average of the real increase from 1997 we obtain 2.18% and this value might be used in the forecast as the real increase.

We can do a more critical and complex analysis using econometric methods, but that is beyond the purpose of this note. (See Vélez Pareja 2002).

Now assume we have a forecasted inflation as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Forecasted Inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>4.50%</td>
</tr>
<tr>
<td>2007</td>
<td>4.00%</td>
</tr>
<tr>
<td>2008</td>
<td>3.50%</td>
</tr>
<tr>
<td>2009</td>
<td>3.00%</td>
</tr>
<tr>
<td>2010</td>
<td>3.00%</td>
</tr>
<tr>
<td>2011</td>
<td>3.00%</td>
</tr>
<tr>
<td>2012</td>
<td>3.00%</td>
</tr>
<tr>
<td>2013</td>
<td>3.00%</td>
</tr>
</tbody>
</table>

Using the constant average real price increase, we have:
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Ignacio Vélez-Pareja

Now we can construct the nominal increase using Fisher relationship:
Nominal increase = (1+ inflation rate) × (1+ real increase) − 1

For instance, for year 2012

Nominal increase = (1+3.00%) × (1+2.18%) − 1 = 5.24%

Now we can forecast the value of the minimum wage. For instance, for year 2006, we have,
Wage in 2006 = 381,500,00 × (1+6.78%) = 407,354,79

We have to say for the record that the minimum wage for 2006 is 408,000.00.
It is very common the suggestion to calculate the forecast using linear regression. This is not always recommended and we have to be analyze in detail the situation. Let us see the behavior of inflation in Colombia.

<table>
<thead>
<tr>
<th>Year</th>
<th>Inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>22.45%</td>
</tr>
<tr>
<td>1986</td>
<td>20.95%</td>
</tr>
<tr>
<td>1987</td>
<td>24.02%</td>
</tr>
<tr>
<td>1988</td>
<td>28.12%</td>
</tr>
<tr>
<td>1989</td>
<td>26.12%</td>
</tr>
<tr>
<td>1990</td>
<td>32.37%</td>
</tr>
<tr>
<td>1991</td>
<td>26.82%</td>
</tr>
<tr>
<td>1992</td>
<td>25.14%</td>
</tr>
<tr>
<td>1993</td>
<td>22.61%</td>
</tr>
<tr>
<td>1994</td>
<td>22.60%</td>
</tr>
<tr>
<td>1995</td>
<td>19.47%</td>
</tr>
<tr>
<td>1996</td>
<td>21.64%</td>
</tr>
<tr>
<td>1997</td>
<td>17.68%</td>
</tr>
<tr>
<td>1998</td>
<td>16.70%</td>
</tr>
<tr>
<td>1999</td>
<td>9.23%</td>
</tr>
<tr>
<td>2000</td>
<td>8.75%</td>
</tr>
<tr>
<td>2001</td>
<td>7.64%</td>
</tr>
<tr>
<td>2002</td>
<td>6.99%</td>
</tr>
<tr>
<td>2003</td>
<td>6.49%</td>
</tr>
<tr>
<td>2004</td>
<td>5.50%</td>
</tr>
<tr>
<td>2005</td>
<td>4.85%</td>
</tr>
</tbody>
</table>

In the following exhibit we show the inflation rate for each year.

In the case we use lineal regression our forecast for 2009 we world face a deflation problem. Planning offices foresee for the next an stabilization of inflation rate in 3%.
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Ignacio Vélez-Pareja

Regression analysis is very useful, but have to use it correctly.

Bibliographic References