Equity Securities

TOPIC 6: MODELLING AND VALUATION

LA TROBE UNIVERSITY

Outcome 6.1

Financial statement forecasting

- You have been provided with the forecast assumptions for Vitex Corporation
- These assumptions have been incorporated into a forecast worksheet
- **Prepare a set of forecast financial statements for Vitex Corp. based on these assumptions.**

Student learning outcomes

6.1 Build a financial model which provides forecast financial statements based on a defined set of forecasting assumptions;

6.2 Demonstrate how to undertake sensitivity analysis of the financial model;

6.3 Demonstrate how to undertake scenario analysis of the financial model.

Outcome 6.1

Financial statement forecasting

- Building the model
  - The first step in building a forecast model is to copy the row titles from the Income Statement and Balance Sheet into a new worksheet
    - *This has already been done for you*
  - Link the cells in the historical columns (i.e. 1999 to 2002) to the appropriate cells in the Income Statement and Balance Sheet
    - In the first cell, type "=", click on the cell you want to copy the information from, and press Enter
    - Repeat for all cells (hint – use copy down and copy right to populate all the cells with appropriate formulae)
  - Link the cells in the Forecast Factor column to the appropriate cells in the Assumptions worksheet
    - *This has already been done for you*

References

- **Sengupta, C. (2003).** *Financial modelling: Using Excel and VBA*. John Wiley and Sons. Chapter 6.

Outcome 6.1

Financial statement forecasting

- Building the model
  - Create formulae in the columns in the Forecast Period to calculate the forecast values for each item on the Income Statement
  - Sales
    - This is equal to the previous year's Sales multiplied by 1 plus the growth rate
    - In Cell F8, enter "=E8*(1+$K8)"
    - Forecast sales for 2003 will be equal to 2002 sales times 1 plus the growth rate
    - The dollar sign allows you to copy this formula across the next 3 columns, so that each forecast is based on the previous year's forecast

Outcome 6.1

Financial statement forecasting

- Building the model
  - Cost of sales, SG&A & Other net (income)/expenses
    - These are all forecast as a percentage of sales
    - In Cell F9, enter "=F$8*$K9"
    - Forecast cost of sales for 2003 will be equal to 2003 sales times the appropriate percent of sales
    - The dollar sign before the K allows you to copy this formula across the next 3 columns, so that each forecast is based on that year's sales
    - The dollar sign before the 8 allows you to copy these formulae down to the SG&A and Other income/expense rows

Outcome 6.1

Financial statement forecasting

- Building the model
  - Interest Expense
    - This is equal to the average Short Term Debt multiplied by the forecast interest rate, plus an assumed constant amount ($13.5, shown in Cell C12 on the Forecast Assumptions worksheet), representing the interest on long-term debt
    - In Cell F18, enter "=E47*$K18+'Forecast Assumptions'!$C12" and copy across the next 3 columns (rather than typing in the name of the Forecast Assumptions worksheet, you can just click on the cell you want to reference, but then you need to add $ signs as shown
    - Because the interest income is based on the previous year's value for Short Term Debt, the last 3 values are equal to 13.5 because Short Term Debt has not yet been entered in the forecast Balance Sheet

Outcome 6.1

Financial statement forecasting

- Building the model
  - Depreciation
    - This is equal to the depreciation rate times the value for Property, Plant and Equipment that year
    - In Cell F13, enter "=F36*$K13"
    - Copy the formula across the next 3 columns
    - The result will be zero, because PP&E has not yet been entered in the forecast Balance Sheet

Outcome 6.1

Financial statement forecasting

- Building the model
  - Gross Operating Income equals Sales minus Cost of Sales. In Cell E10, enter "=F8-F9" and copy across.
  - EBIT equals Gross Operating Income minus Expenses. In Cell F15, enter "=F10-SUM(F12:F14)" and copy across.
  - Pre-tax Income equals EBIT minus interest income and expense. In Cell F19, enter "=F15-SUM(F17:F18)" and copy across.
  - Income Taxes equals to Pre-Tax Income multiplied by the forecast Tax Rate. In Cell F21, enter "F19*$K21" and copy across.
  - Net Income equals Pre-tax Income minus Income Taxes. In Cell F22, enter "=F19-F21" and copy across.
  - Dividends equals Net Income multiplied by the forecast payout ratio. In Cell F24, enter "=F22*$K24" and copy across.
  - Addition to Retained Earnings equals Net Income minus Dividends. In Cell F25, enter "=F22-F24" and copy across.

Outcome 6.1

Financial statement forecasting

- Building the model
  - Interest Income
    - This is the average Cash and Marketable Securities multiplied by the forecast interest rate on cash
    - It needs to be entered as negative amount (because it is a *contra* expense)
    - In Cell F17, enter "=E30*$K17" and copy across the next 3 columns
    - Because the interest income is based on the previous year's value for Cash and Marketable Securities, the last 3 values are zero because Cash and Marketable Securities has not yet been entered in the forecast Balance Sheet

Outcome 6.1

Financial statement forecasting

- Building the model
  - Create formulae in the columns in the Forecast Period to calculate the forecast values for each item on the Balance Sheet
  - All Current Assets are based on a forecast percentage of sales. For example, in Cell F30, enter "=F$8*$K30" and copy across. The $ sign before the 8 allows you to copy these formulae down to the other current assets, so that they are all based on the value of sales in Row 8.
  - Various liabilities are also a forecast percentage of sales. Copy the formulae in Cells F90 to I90 and paste them into Rows 46, 48, 52 and 53.
  - Gross PPE and Other Non-current Assets are equal to the previous year's value times the forecast growth rate. In Cell F36, enter "=E36*(1+$K36)" and copy across. Copy these formulae to Row 40.

Outcome 6.1

Financial statement forecasting

- Building the model
  - Accumulated Depreciation is equal to the previous year's Accumulated Depreciation plus the current year's Depreciation. In Cell F37, enter "=E37+F13" and copy across.
  - Short Term Debt, Long Term Debt and Paid In Capital are forecast to equal the values from 2002. Enter appropriate formulae.
  - Retained Earnings is equal to the previous year's Retained Earnings plus the current year's Addition to Retained Earnings. In Cell F57, enter "=E57+F25" and copy across.
  - Enter formulae to calculate the various totals in the Balance Sheet – Total Current Liabilities, Total Liabilities, Total Shareholders' Equity and Total Liabilities and Shareholders' Equity.

Outcome 6.1

Financial statement forecasting

- Building the model
  - Calculate Discretionary Funding Needed (DFN), which is the amount by which the Balance Sheet is out of balance. It is equal to Total Assets minus Total Liabilities and Shareholders' Equity.
  - Calculate the Cash Flow Statement in the same manner as in the historical model
    - Note that it will not reconcile with the Balance Sheet because the Balance Sheet does not balance
    - *This has already been done*
  - Calculate the financial ratios in the same manner as the historical model
    - *This has already been done*

Outcome 6.1

Financial statement forecasting

- Testing the model
  - It is essential that you test the model thoroughly
  - Check each formula in the model against a manual calculation
  - Change the forecast assumptions and recheck to see that all hard-coded data is limited to the assumptions sheet
- Strengths of the model
  - The model highlights the expected performance of the company according to a set of likely assumptions, which can be used to highlight future problems
  - By changing the forecast assumptions, the effect of various remedies to any problems can be explored
- Limitations of the model
  - The balance sheet remains unbalanced

Outcome 6.1

Balancing the forecast model

- You have been provided with the forecast assumptions for Vitex Corporation
- You have used these assumptions, and historical data, to produce a forecast Income Statement and Balance Sheet, but the Balance Sheet does not balance
- **Modify the model using Short-Term Debt as the "plug" to balance the Balance Sheet.**

Outcome 6.1

Balancing the forecast model

- Balancing the model
  - Short Term Debt will be used to balance the Balance Sheet
  - If Total Assets exceeds Total Liabilities and Shareholders' Equity, additional short-term debt will make up the difference
  - If Total Assets is less than Total Liabilities and Shareholders' Equity, then less debt is required to balance with assets – the change in Short Term Debt will be negative
  - In Cell F47, enter "=F43-F46-F48-SUM(F51:53)-F58" and copy across

Outcome 6.1

Balancing the forecast model

- Testing the model
  - Note that DFN is now zero, indicating the Balance Sheet balances
  - Check that the Balance Sheet balances by manual testing
- Strengths of the model
  - Maintains the flexibility of the previously constructed forecast model
  - Balances the Balance Sheet
- Limitations of the model
  - Short Term Debt might need to be negative to balance the Balance Sheet, which can be confusing
  - If the deposit rates are different from the lending rates, the model may not correctly estimate net interest expense

Outcome 6.1

Changing your assumptions

- Vitex's performance under these assumptions is poor
- Consider its performance if management were able to lower the cost of sales/sales ratio to 50% and slow growth in PPE and other non-current assets to 8% p.a.

- **Modify the model according to the new assumptions.**

Outcome 6.1

Adjusting Short Term Debt

- Modifying the model
  - Short-term Debt must equal
    - Total Assets (less C&MS)
    - Minus Total Liabilities and Shareholders' Equity (less Short Term Debt)

    Or if negative, must be zero
  - In Cell F47, enter the following formula and copy across "=MAX(SUM(F31:F33)+F41+F8*$K30-F46-F48-SUM(F51:F53)-F58,0)"
  - Cash and Marketable Securities must equal
    - Total Liabilities and Shareholders' Equity
    - Less the Total Assets (except C&MS)
    - This enable C&MS to be the new balancing item
  - In Cell F30, enter the following formula and copy across "=F60-SUM(F31:F33)-F41"

Outcome 6.1

Changing your assumptions

- Modifying the model
  - Change the assumptions as described
  - After reviewing the performance of the company under the revised assumptions, restore the original assumptions before continuing.

Outcome 6.1

Adjusting Short Term Debt

- Testing the model
  - Check that the DFN is now zero, indicating the Balance Sheet is in balance
  - Check Short Term Debt does not go negative
  - Check the interest income & expense figures by manual calculation to see that they are based on the new debt and cash figures
- Strengths of the model
  - Maintains the flexibility of the previously constructed model, but is more realistic
  - Balances the Balance Sheet and calculates net interest expense consistent with net debt levels as forecast
- Limitations of the model
  - Cash might still be unrealistically low

Outcome 6.1

Adjusting Short Term Debt

- Assume the desired minimum value for Short Term Debt is zero
- To test this situation, change the forecast growth rate for PPE to 6%
- If what would otherwise be a negative value for Short Term debt needs to increase to zero, Cash & Marketable Securities should be increased accordingly
  - Negative debt is being effectively turned into a cash deposit

- **Modify the model according to the new assumptions.**

Outcome 6.1

Minimum level of cash

- Assume the desired minimum Cash and Marketable Securities (C&MS) is equal to 6.5% of sales
- If necessary, use Short Term Debt to increase cash to the minimum required – i.e. borrow the extra funds required

- **Modify the model according to the new assumptions.**

Outcome 6.1

Minimum level of cash

- Modifying the model
  - Short-term Debt must equal
    - Total Assets (less C&MS)
    - Plus the minimum amount of C&MS (6.5% of Sales)
    - Minus Total Liabilities and Shareholders' Equity (less Short Term Debt)

    Or if negative, must be zero
  - In Cell F47, enter the following formula and copy across "=MAX(SUM(F31:F33)+F41+F8*$K30-(F46+F48+SUM(F51:F53)+F58),0)"

Outcome 6.1

Minimum level of cash

- Testing the model
  - Check to ensure that C&MS is at least 6.5% of Sales
  - Check that the DFN is now zero, indicating the Balance Sheet is in balance
  - Check Short Term Debt does not go negative
  - Check the interest income & expense figures by manual calculation to see that they are based on the new debt and cash figures
- Strengths of the model
  - Maintains the flexibility of the previous model, but is more realistic
  - Balances the Balance Sheet and calculates net interest expense consistent with net debt levels as forecast
- Limitations of the model
  - Dividends are growing more quickly than might be expected

Outcome 6.1

Smoothing dividend growth

- Assume a maximum 40% payout ratio and a maximum dividend per share growth rate

- **Modify the model according to the new assumptions.**

Outcome 6.1

Smoothing dividend growth

- Modifying the model
  - Enter "='Forecast Assumption'!C43" into Cell K25 of the model, to create a link to the maximum DPS growth rate
  - Dividends must be equal to the minimum of 40% of Net Income and 10% per share in excess of the previous year's DPS
  - In Cell F24, enter the following formula and copy across "=MIN(F22*$K24,E24*(1+$K25))"

Outcome 6.1

Smoothing dividend growth

- Testing the model
  - Check to ensure that the maximum DPS growth is 10% and the maximum payout ratio is 40%
- Strengths of the model
  - Maintains the flexibility of the previous model, but is more realistic
  - Balances the Balance Sheet and calculates net interest expense consistent with net debt levels as forecast

Outcome 6.2

Sensitivity analysis

- Calculate the sensitivity of 2006 Net Income, EPS, DPS and your stock's valuation to a change in the forecast growth rate

- **Use the Data Table function to generate the sensitivity analysis.**

Outcome 6.2

Sensitivity analysis

- The structure of the Data Tables need for the sensitivity analysis has been set up in Columns P to U
- In Cells Q5 to T5, enter links to the 2006 Net Income, EPS, DPS and Stock Price in the model
- In Cells P6 to P15, enter values from 1% to 10%, incrementing by 1%
- This column of values is to be used as the inputs into the Sales Growth Rate for the Data Table
- Highlight the range of cells from P5 to T15
- Select Data – What If Analysis – Data Table
- In the Column Input Cell field, enter K8 and press OK
- Check the results by verifying the values for 5% growth

Outcome 6.3

Scenario analysis

- Calculate the effect on Net Income, EPS and ROE estimates for both 2003 and 2006 of both an optimistic and a pessimistic scenario for forecast assumptions
- For the optimistic scenario, assume:
  - Sales growth of 7% p.a.
  - Cost of sales/sales ratio of 49%
  - PPE growth rate of 7% p.a.
- For the pessimistic scenario, assume:
  - Sales growth of 3% p.a.
  - Cost of sales/sales ratio of 51%
  - PPE growth rate of 9% p.a.
- **Use the Scenario function to generate these scenarios.**

Outcome 6.2

Sensitivity analysis

- Calculate the sensitivity of 2006 EBIT to a change in the forecast sales growth rate assumption and a change in the forecast cost of sales/sales ratio
- **Use the Data Table function to generate the sensitivity analysis.**

Outcome 6.3

Scenario analysis

- Select Data – What If Analysis – Scenario Manager
- Click “Add” and enter “Optimistic” as the scenario name
- Enter the references for the cells to be changed
  - These are the cells in the model where Sales Growth, Cost of Sales/Sales and PPE Growth are to be found
  - You can type them in directly, separated by commas, or click the button on the right that allows you do successively select a number of cells by clicking on the first and Control-clicking the rest
- Click OK and then OK again when you get the warning
  - This warning means that the input cells will be replaced by values
  - After you finish with the scenarios, if you want to use the model in the future, you will need to restore the links to the forecasts (you might want to save this version before doing the scenarios analysis)

Outcome 6.2

Sensitivity analysis

- In Cells Q20 to U20, enter values from 40% to 60%, incrementing by 5%
- In Cells P21 to P30, enter values from 1% to 10%, incrementing by 1%
- The above row and column of values are to be used as the inputs into the Cost of Sales/Sales Ratio and Sales Growth Rate, respectively, for the Data Table
- In Cell P20, enter a link to the 2006 EBIT in the model
- Highlight the range of cells from P20 to U30
- Select Data – What If Analysis – Data Table
- In the Row and Column Input Cell fields, enter K9 and K8
- Verify the value for 5% growth and 35% cost of sales/sales

Outcome 6.3

Scenario analysis

- Enter the optimistic values as given in the question
- Add the pessimistic scenario in the same way
- Click on “Summary…”
- Enter the references to the result cells
  - These are the cells in the model containing the calculated values for 2003 and 2006 Net Income, EPS and ROE
  - Again, you can enter the cell addresses, separated by commas, or use the button on the right to click and Control-click the cells
- Click OK
- To make the summary meaningful, you can enter descriptions in the place of the cell references