Case Studies in Finance (FIN3CSF) – Semester 2, 2016

Tutorial 5 (Case Study 3 – Financial (Project) Modelling and Ethical Issues in Finance)

This case study is a spreadsheet modelling and project analysis and business case planning process representative of the type of project development that a business would go through as part of their capital budgeting / investment decision-making. This case study requires you to conduct and present a number of elements:

- A spreadsheet model of the cash flow valuation of the proposed power station project
- Use of the spreadsheet model to complete an evaluation of the project using various capital budgeting techniques
- Use of the spreadsheet model to complete sensitivity analysis, and potentially scenario analysis, of the project outcomes
- A recommendation regarding the feasibility of the project based on the quantitative and/or qualitative evaluation of the proposed project
- The development of a written business case justifying why approval for the undertaking of the project should be provided by the relevant regulatory authorities and, particularly, State and Federal Governments

Spreadsheet Model Development

The case study information provides all of the details required to develop the project spreadsheet model

- Project is based on the staggered construction of two electricity generating units (Units A and B) and the operation of these units for individual 35-year periods
- Table 1 provides the timeline for the project construction and operation
- The estimated construction costs are outlined in Table 2. This will be a multiple-year construction process, so the time value of construction costs need to be factored into the spreadsheet model structure
- The bullet points associated with the operation of the generating units needs to be used to determine the operating elements (electricity generated and sold) of the power station units for each of the 35 operating years of both of the generating units. Based on electricity generated per unit per year, and the amount expected to be sold (transferred to the electricity grid), this will then be translated into

revenue generation and, deducting operating costs and taxation, net profit and cash flows of the project for the operating period from 2024 to 2060.

- Project operating and maintenance costs are outlined in Table 3. What you should recognise is that the operating costs are relatively low compared to the construction costs and electricity revenue generated. The main explanation for this is the relatively-automated nature of power station plants and small staffing requirements. Also, the cost of the primary input (coal) is built into the electricity tariff price, rather than being incorporated as a cost component.
- These net project cash flows then need to be discounted to present value to facilitate project evaluation

Important aspects to focus on:

- Think about creating an integrated spreadsheet model which will allow for easy manipulation and the conducting of sensitivity / scenario analysis.
- An integrated spreadsheet model should be built around separate cell references to key parameter items, and then operating component and cash flow formula calculations incorporating links to these key parameter items.
- Key model parameters will be elements including: project discount rate, inflation rate, electricity tariff price per megawatt (MW) hour, average capacity factor, in-plant electricity usage, electricity generation loss, taxation rate. May also consider incorporating adjustment factors into formulas with will facilitate ease of conducting sensitivity analysis etc.
- Correct incorporation of the project scheduling and the timing of construction costs and operating activities of the generating units.
- Incorporation of inflation effects on cash flow components in the model, which is particularly important given the long time-frame of the project.
- Project information is in real (inflation-unadjusted) terms as at June 2016, so inflation effects need to be incorporated into cash flows, electricity prices, costs etc. from this point forward.
- Two ways to incorporate inflation effects – 1) through discount rate adjustment or 2) through cash flow adjustment. Whichever approach you take, the outcomes of your project spreadsheet model should be the same.

Model Components needing determination:

1) Discount rate

- Depends on if you create a project spreadsheet model based on real terms or nominal terms

Real terms:

- Real discount rate = indicated real rate of 8.50% per annum
- Annual discount rate factor = (1 + real discount rate)^time value year
- For year 0 (2016) the discount rate factor = (1.085)^0 = 1.000
- For year 1 (2017) the discount rate factor = (1.085)^1 = 1.085
- For year 2 (2018) the discount rate factor = (1.085)^2 = 1.1772 etc.
- Project cash flows should then be presented in real terms for consistency

Nominal terms:

- Nominal discount rate = [(1 + real rate)(1 + annual inflation rate)]
- Annual discount rate factor = (1 + nominal discount rate)^time value year
- For year 0 (2016) the discount rate factor = [(1.085)(1.022)]^0 = 1.0000
- For year 1 (2017) the discount rate factor = [(1.085)(1.022)]^1 = 1.1089
- For year 2 (2018) the discount rate factor = [(1.085)/(1.022)]^2 = 1.2296 etc.
- Project cash flows should then be presented in nominal (inflation-adjusted terms) for consistency

2) Present value of capital expenditure:

PV of annual capital expenditure = Annual capital construction cost / applicable discount rate factor <u>or</u> Annual capital construction cost × 1/(applicable discount rate factor)

PV of total capital expenditure = Σ (PV of annual capital expenditure from 2019-2025)

3) Electricity generated per year

- Assumes 24 hour operation of the generating units for 365 days per year
- The average capacity factor (ACF) incorporates expected operating issues and failures, delays, down-times etc.
- Operation of a 250 MW generating unit at full capacity for an hour should generate 250 MW hours of electricity

Electricity generated per unit per year = Generator capacity × (24 × 365) × Average capacity factor (ACF)

For generating unit A = 250 × 8,760 × 0.90 = 1,971,000 MW hours

4) Electricity available for sale (assumed to be sold) per year

- Losses from maximum expected electricity generation due to i) a proportion used to operate the generating unit itself and ii) a proportion not able to be transferred to the national electricity grid

Annual electricity sold = Annual electricity generated – [Annual electricity generated × (% used-in-station losses + % of electricity not transferred)]

For generating unit A = 1,971,000 – [1,971,000 × (0.05 + 0.10)] = 1,675,350 MW hours

5) Electricity revenue per year

- Calculation of revenue, cost, profit and cash flow components will depend on whether the spreadsheet model is specified in nominal or real terms

Annual nominal electricity revenue = Annual electricity sold × applicable nominal tariff price per MW hour

Annual real electricity revenue = Annual electricity sold × real tariff price per MW hour

6) Operating profit (cash flow) before tax per year

Annual nominal operating profit before tax = Annual nominal electricity revenue – annual nominal operating and maintenance costs

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7) Taxation expenditure per year

Annual nominal taxation expense = Annual nominal operating profit before tax × applicable tax rate for the project (business)

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8) Operating profit after tax (net cash flow) per year

Annual nominal net cash flow = Annual nominal operating profit before tax – annual nominal taxation expense

Annual real net cash flow = Annual real operating profit before tax – annual real taxation expense

9) Present value of net cash flow per year

PV of annual nominal net cash flow = Annual nominal net cash flow / applicable nominal discount factor <u>or</u> Annual nominal net cash flow × 1/(applicable nominal discount factor)

PV of annual real net cash flow = Annual real net cash flow / applicable real discount factor <u>or</u> Annual real net cash flow × 1/(applicable real discount factor)

10) Net present value (NPV) of project

Project NPV = Σ (PV of annual net cash flows from 2024-2060) – PV of total capital expenditure

May want to think about using other project evaluation techniques as well, such as IRR, profitability index, payback period etc.

<u>Sensitivity Analysis</u>

Want you to think about what key elements or parameters will the project NPV be sensitive to, and then conduct some sensitivity analysis of project NPV outcomes around these

- No real correct answer around what factors you focus on and what you think is an appropriate sensitivity change
- Relevant factors could be ACF, electricity tariff price, inflation rate, discount rate, tax rate (dependent on Government policy), electricity generation losses etc.

May also think about doing some scenario analysis

- Such as best or worst operating and market conditions
- Efficient or inefficient operation outcomes

Recommendation Regarding Project Feasibility

Assessment and decision regarding overall project feasibility should be based on consideration of:

- Capital budgeting evaluation outcomes
- Sensitivity and/or scenario analysis
- Potentially non-quantitative (or qualitative) aspects associated with the project

Project Proposal

Requires the development of a written proposal / business case addressed to the relevant Governments justifying why the proposal should be approved for undertaking. For this you should be considering:

- Quantitative and/or qualitative project outcomes
- Other benefits or contributions from the project being undertaken
- Why the project is imperative to the State and National electricity needs in the future?
- Solutions or remedies to any conflicts with Government policy or wider concerns
- Project attractiveness or importance relative to other alternative future electricity provision sources