Question – Allegro Technologies Co (ATC)

Allegro Technologies Co (ATC), a listed company based in Europe, has been involved in manufacturing motor vehicle parts for many years. Although not involved in the production of complicated engine components previously, ATC recently purchased the patent rights for $2m to produce an innovative energy saving engine component which would cut carbon-based emissions from motor vehicles substantially.

ATC has spent $5m developing prototypes of the component and undertaking investigative research studies. The research studies came to the conclusion that the component will have a significant commercial potential for a period of five years, after which, newer components would come into the market and the sales revenue from this component would fall to virtually nil. The research studies have also found that in the first two years (the development phase) there will be considerable training and development costs and fewer components will be produced and sold. However, sales revenue is expected to grow rapidly in the following three years (the commercial phase).

It is estimated that in the first year, the selling price would be $1,000 per component, the variable costs would be $400 per component and the total direct fixed costs would be $1,500,000. Thereafter, while the selling price is expected to increase by 8% per year, the variable and fixed costs are expected to increase by 5% per year, for the next four years. Training and development costs are expected to be 120% of the variable costs in the first year, 40% in the second year and 10% in each of the following three years.

The estimated average number of engine components produced and sold per year is given in Table 1.

Year	1	2	3	4	5
Units produced and sold	7,500	20,000	50,000	60,000	95,000

There is considerable uncertainty as to the exact quantity that could be produced and sold and the estimated standard deviation of units produced and sold is expected to be as much as 30%.

Machinery costing $120,000,000 will need to be installed prior to commencement of the component production. ATC has enough space in its factory to manufacture the components and therefore will incur no additional rental costs. Tax allowable depreciation is available on the machinery at 10% straight line basis. It can be assumed that, depending on the written down value, a balancing adjustment will be made at the end of the project, when the machinery is expected to be sold for $40,000,000. ATC makes sufficient profits from its other activities to take advantage of any tax loss relief available from this project.

Initially, ATC will require additional working capital for the project of 20% of the first year's sales revenue. Thereafter every $1 increase in sales revenue will require a 10% increase in working capital.

Although this would be a major undertaking for ATC, it is confident that it can raise the finance required for the machinery and the first year's working capital. The financing will be through a mixture of a rights issue and a bank loan, in the same proportion as the market values of its current equity and debt capital. Any annual increase in working capital after the first year will be financed by internally generated funds.

Largo Co, a company based in South-East Asia, has approached ATC with a proposal to produce some of the parts required for the component at highly competitive rates. In exchange, Largo Co would expect ATC to sign a five-year contract giving Largo Co the exclusive production rights for the parts.

Staccato Innovations Co (SIC) is a listed company involved in the manufacture of innovative engine components and engines for many years. As the worldwide demand for energy saving products has increased, it has successfully developed and sold products designed to reduce carbon emissions. SIC has offered to buy the production rights of the component and the machinery from ATC for $113,000,000 after the development phase has been completed in two-years' time.

Additional data

ATC, Extracts from its latest Statement of Financial Position

	$m
Non-current assets	336
Current assets less current liabilities	74
6% Bank loan	156
Share capital	52
Reserves	202

ATC shares have a face value of $0.50 per share and are currently trading at $3.50 per share. ATC's beta has been quoted at approximately 1.3 over the past year.

SIC, Extracts from its latest Statement of Financial Position

	$m
Non-current assets	417
Current assets less current liabilities	157
5% Loan notes (2016–2018)	92
Share capital	125
Reserves	357

SIC shares have a face value of $1 per share and are currently trading at $3.00 per share. Its loan notes are trading at $102 per $100. SIC's beta has been quoted at approximately 1.8 over the past year.

Other data

Tax rate applicable to ATC and SIC	20%

It can be assumed that tax is payable in the same year as the profits on which it is charged.

Estimated risk-free rate of return	3%
Historic equity market risk premium	6%

Required:

Prepare a report to the Board of Directors of ATC that:

(i) Assesses whether ATC should undertake the project of developing and commercialising the innovative engine component before taking SIC's offer into consideration. Show all relevant calculations. (13 marks)

(ii) Assesses the value of the above project if ATC takes SIC's offer into consideration. Show all relevant calculations (10 marks)

(iii) Discusses the approach taken and the assumptions made for parts (i) and (ii) above. (8 marks)

(iv) Discusses possible implications of ATC entering into a contractual agreement with Largo Co. Include in the discussion suggestions of how any negative impact may be reduced. (5 marks)

Professional marks for format, structure and presentation of the report. (4 marks)

(40 marks)

Answer

Solution

Report to the ATC Board of Directors

Assessment of the investment in the engine component project

This report recommends whether or not ATC would benefit by investing in the engine component project by considering the following alternatives open to it, and explains the approach taken in each case and the assumptions made:

- The value of the project without the SIC offer to buy the project on completion of the two-year development phase.
- The value of the project after taking into account SIC's offer.

The report also considers the possible implications of the offer made by Largo Co on the project.

Approach taken

The approach taken is to estimate the net present value (NPV) of the project based on the given estimates of costs and revenues without the SIC offer (see appendices one and three).

This is followed by a revised estimate of the value of the project, after taking into consideration SIC's offer. This is based on viewing the project as a real option to abandon (put option) the project and using Black-Scholes Option Pricing (BSOP) model to give an estimate of this value (see appendix two).

Assumptions made and initial assessment

In calculating the value of the project, the following assumptions have been made:

- Since this is a new venture for ATC but an ongoing business for SIC, an estimate of the project's risk, as measured by the project's risk-adjusted beta, is made (appendix three, working W4) using SIC's business risk (SIC's asset beta) but ATC's financial risk (project equity beta). This risk-adjusted beta is used to calculate the cost of equity and then the cost of capital (discount rate) for the project (appendix three, working w4).
  - As part of the W4 calculation in appendix three, it is assumed that debt is riskless and has a beta of zero.
  - Unless indicated otherwise, it is assumed that all cash flows occur at the end of the year.
  - The patent purchase cost and the investigative research costs are past costs, and therefore not part of the calculation of the value of the project, which is based on future cash flows.
  - The option for ATC is the opportunity to 'sell' the project to SIC after two years if the cash flows do not appear to be favourable, hence this is a put option to abandon a project. Since the option is exercised after two years, it can be considered to be a 'European' type option and the BSOP model can be applied, together with the put-call parity relationship.

Based on the calculations in the appendices, from the cost and revenue estimates provided, the net present value before considering the SIC option is negative at $9,359,000 approximately (appendix one). However after taking into account the value of the put option, the net present value is positive at $8,087,000 approximately (appendix two). Therefore, it would be beneficial for ATC to undertake the project, if it can decide whether to continue with the project or sell it to SIC for $133,000,000 after a period of two years. However, without this option it should not proceed with the project.

ATC will not actually obtain the value of the option, however the option value takes into account the volatility or uncertainty of the project. In this case, it indicates that the project is worth pursuing because the volatility may result in increases in future cash flows and the project becomes profitable. On the other hand, the project can be abandoned for $113,000,000 in two years if the likelihood of sufficient future cash flows remains doubtful. The value attached to this choice is $17,446,000 approximately (appendix two). In the meantime, ATC can put into place mechanisms to make the production and sales targets more certain and profitable. Therefore, the time ATC has before it needs to make a decision is reflected in the value of the project by considering real options using the BSOP model.

The BSOP model makes several assumptions such as perfect markets, constant interest rates and lognormal distribution of asset prices. It also assumes that volatility can be assessed and stays constant throughout the life of the project, and that the underlying asset can be traded. Neither of these assumptions would necessarily apply to real options. Therefore, the Board needs to treat the value obtained as indicative rather than definitive, and take the assumptions and limitations into consideration before making a final decision.

Implications of the Largo Co offer on the value of the project

From the above discussion, it is evident that the project has a negative net present value if it is not considered in conjunction with an option to abandon. The abandonment option makes the project viable. However, if ATC enters into a five-year contractual agreement with Largo Co then this may make the two-year offer by SIC to buy the project redundant. There is no guarantee that SIC would continue to ask Largo Co to produce the parts and ATC would not be able to honour the contract and keep the SIC's offer open at the same time. ATC would need to consider the impact of the cost savings from the agreement with Largo Co against the possible loss of the option. The Board may also wish to consider how binding the contract would be legally, and also consider the negative impact to ATC's reputation and additional costs if it breaches the contract in future.

In order to mitigate the impact of the issue, the Board may wish to approach Largo Co to discuss the terms of the contract and the provision of possible exclusion clauses. The Board may also want to investigate the reasons behind Largo Co's insistence of a five-year contract and offer alternatives such as asking Largo Co to produce components for other ATC products if this venture should cease. Alternatively the Board may initiate discussions with SIC to consider whether it would be willing to honour the contract should the project be sold to them in two years.

In summary, the initial recommendation is that, based on the projected revenue and cost estimates, the project should be pursued if it taken together with SIC's offer to buy the project after two years. However, on its own it is not worthwhile. The offer by Largo Co may make SIC's offer invalid initially but the Board should consider alternatives, some of which are suggested above.

Appendix 1

Net present value calculation (ignoring SIC offer)

Year	0	1	2	3	4	5
$'000						
Sales revenue (w1)		7,500	21,600	58,300	75,540	129,200
Less:						
Variable costs (w2)		3,000	8,400	22,050	27,780	46,170
Fixed costs		1,500	1,575	1,654	1,736	1,823
Training and development		3,600	3,360	2,205	2,778	4,617
Cash flows before tax		(600)	8,265	32,391	43,246	75,590
Taxation (w3)		2,520	747	(4,078)	(6,249)	(8,718)
Working capital	(1,500)	(1,410)	(3,670)	(1,724)	(5,366)	13,670
Machinery	(120,000)					40,000
Net cash flows	(121,500)	510	5,342	26,589	31,631	120,542
Present values (12%, w4)	(121,500)	455	4,259	18,926	20,102	68,399

Net present value is approximately $(9,359,000)

Appendix 2

Value of put option (incorporating the offer from SIC)
Present value of underlying asset (Pa) = $107,427,000 (approximately)
(This is the sum of the present values of the cash flows foregone in years 3, 4 and 5)
Price offered by Largo Co (Pe) = $113,000,000
Risk-free rate of interest (r) = 3%
Volatility of underlying asset (s) = 30%
Time to expiry of option (t) = 2 years

d1 = [ln(107,427,000/113,000,000) + (0.03 + 0.5 x 0.32) x 2] / [0.3 x 2½] = 0.234
d2 = 0.234 – 0.3x21/2 = -0.190

N(d1) = 0.5 + 0.0925 = 0.5925
N(d2) = 0.5 – 0.0753 = 0.4247

Call value = $107,427,000x0.5925 – $113,000,000x0.4247x$e^{-0.03x2}$ = approx. $18,454,000
Put value = $18,454,000 – $107,427,000 + $113,000,000x$e^{-0.03x2}$ = approx. $17,446,000

Net present value with put option = $17,446,000 – $9,359,000 = approx. $8,087,000

Appendix 3

Workings to support the net present value calculation (Appendix 1)

W1

Year	1	2	3	4	5
Units produced and sold	7,500	20,000	50,000	60,000	95,000
Unit price ($)	1,000	1,080	1,166	1,259	1,360
Sales revenue ($'000)	7,500	21,600	58,300	75,540	129,200

W2

Year	1	2	3	4	5
Units produced and sold	7,500	20,000	50,000	60,000	95,000
Unit variable costs ($)	400	420	441	463	486
Variable costs ($'000)	3,000	8,400	22,050	27,780	46,170

W3

Year	1	2	3	4	5
Cash flows before tax ($'000)	(600)	8,265	32,391	43,246	75,590
Tax allawable dep'n ($'000)	(12,000)	(12,000)	(12,000)	(12,000)	(32,000)
Tax able flows ($'000)	(12,600)	(3,735)	20,391	31,246	43,590
Taxation (20%) ($'000)	(2,520)	(747)	4,078	6,249	8,718

W4
Asset beta of project = 1.8 x (3 x 125)/(3 x 125 + 92 x 1.02 x 0.8) = 1.50
Equity beta: project beta adjusted for financial risk of ATC = 1.5 x (3.5 x 104 + 156 x 0.8)/(3.5 x 104) = 2.014
Cost of euqity = 3& + 2.014 x 6% = 15.08%
WACC (discount rate) = (15.08% x 364 + 6% x 0.8 x 156)/520 = 11.996% approx. 12%.

Marking scheme

	Mark(s)
Part (i) NPV calculation	
Calculation of project equity beta	1
Calculation of discount rate as a result	1
Sales revenue	2
Variable costs	2
Fixed overheads	1
Training and development	1
Taxation	2
Working capital required	2
Present values and NPV	1
Total part (i)	**13**
Part (ii) Option Calculation	
Identify correct asset value	1
Identify correct time to expiry	1
Identify other variables: exercise price, interest rate and volatility	1
d1	2
N(d1)	1
d2 and N(d2)	1
Call value	1
Put value	1
NPV with option value	1
Total part (ii)	**10**
Part (iii) Discussion	
Identify put option correctly	1
Discussing how real options can help with NPV decisions	2–3
Discussion of the limitations of real options	2–3
Discussion of other assumptions and approach	2–3
Max part (iii)	**8**
Part (iv)	
Discussing the difficulty with exercising the option if contract agreed	2–3
Reducing negative impact	2–3
Max part (iv)	**5**
Professional marks (neatness and clarity, structure, report format)	**4**

Note: Credit will be given for alternative, valid points which are not in the solution for parts (iii) and (iv)