ST. LOUIS CHEMICAL: THE INVESTMENT DECISION

David A. Kunz, Southeast Missouri State University

CASE DESCRIPTION

The primary subject matter of this case concerns the issues surrounding evaluation of capital expenditures. Case provides a systematic approach to evaluating capital expenditures including a review of alternative capital budgeting methods and the relationship between cost of capital and capital budgeting. Secondary issues include cost of capital theory and the advantages and disadvantages of financial leverage. The case requires students to have an advanced knowledge of accounting, finance and general business issues thus the case has a difficulty level of four (senior level) or higher. In particular, an understanding of capital budgeting practices and cost of capital issues are necessary to solve the case. The case is designed to be taught in one class session of approximately 1.25 hours and is expected to require 4-6 hours of preparation time from the students.

CASE SYNOPSIS

St. Louis Chemical is a regional chemical distributor, headquartered in St. Louis. Don Williams, the President and primary owner, began St. Louis Chemical five years ago after a successful career in chemical sales and marketing. The company reported small losses during it first two years of operation but has since reported increasing sales and profits. The growth has required the acquisition of equipment, expansion of storage capacity and increasing the size of the work force.

The unexpected withdrawal of one of St. Louis Chemical's competitors from the region has provided the opportunity to increase its packaged goods sales, in particular, sales of material in 55 gallon drums. However, St. Louis Chemical's 55 gallon drum filling equipment is already operating at capacity. To take advantage of this opportunity, additional equipment must be obtained, requiring a major capital investment. It is estimated that St. Louis Chemical must increase its drum filling capacity by at least 200,000 to 400,000 drums annually. The firm has no systematic capital expenditure evaluation process or an estimate of its cost of capital.

INSTRUCTORS' NOTES

CASE OVERVIEW

As the case opened Don Williams, the President of the St. Louis Chemical, a regional chemical distributor, headquartered in St. Louis is considering the opportunity to increase its packaged goods sales, in particular, sales of material in 55 gallon drums. The company's 55 gallon drum filling equipment is operating at capacity, thus to take advantage of this opportunity, additional equipment must be obtained, requiring a major capital investment. It is estimated that, St. Louis Chemical must increase its drum filling capacity by at least 200,000 to 400,000 drums annually.

Williams is considering two alternatives proposed by the company's engineer. The first is the acquisition and installation of used equipment that will provide the capacity to fill an additional 200,000 fifty-five gallon drums annually. The used equipment will cost $860,000 to acquire and install. The equipment is projected to have an estimated life of three years. The second option is the acquisition and installation of new equipment with the capacity to fill 400,000 drums annually. The new equipment would cost $2,480,000 to acquire and install and have an economic life of seven years. The new equipment is more efficient thus the cost to fill a drum is less than the per drum filling cost of the used equipment. Williams asked Bush to lead the evaluation process. The company does not have a formal evaluation process for capital projects.

Bush thinks the used equipment could be obtained without new bank debt. The acquisition of the new equipment would require new bank borrowing. Bush feels that Williams may be willing to consider using debt if she can convince him of the advantages of using debt in the firm's capital structure. The evaluation of each alternative requires an estimate of the financial benefits associated with each.

The learning objectives of the case include: 1) Introducing students to a systematic approach to capital budgeting decisions 2) Examining how firm's cost of capital is calculated and financial theory regarding a firm's optimum capital structure 3) Examining the relationship between a firm's cost of capital, capital budgeting and long-term financial performance 4) Examining capital expenditure evaluation techniques (NPV, IRR and Cash Payback and 5) Exploring non-financial issues that need to be considered when evaluating capital expenditures.

DISCUSSION QUESTIONS

1. Prepare a presentation for Williams regarding the concept of WACC.

Simply stated the weighted average cost of capital (WACC) is the cost the company is paying to finance its assets and reflects the riskiness of the firm or the firm's assets. As

its name indicates, it is a weighted average of the costs of the various sources of capital (debt and equity) used in the firm's capital structure. What is not so readily apparent by its name is that the WACC is an after-tax cost. In other words, it is calculated using the after-tax cost of each source of capital. Interest paid by a business is tax deductible, thus the cost of debt needs to be converted to an after-tax cost by multiplying the before-tax interest rate by one minus the firm's marginal income tax rate. The firm's WACC is also referred to as the firm's marginal cost of capital or what a firm must pay for its next dollar of capital. Another point that should be made is since the WACC is used by businesses to evaluate possible long-term expenditures (capital projects), only long-term capital sources are included in the calculation. Thus, most firms do not include the cost of short-term debt in the calculation.

To determine WACC, a firm must 1) calculate the cost it must pay for each source of capital and 2) determine the target mix of debt and equity to be used by the firm. The cost of each source of capital and the target capital structure are provided in the case. St. Louis Chemical's before-tax cost of debt is given as 10% and its cost of common equity is given as 16%. St. Louis Chemical's target capital structure is given as 30% debt and 70% equity. For a detailed discussion of how a firm calculates its cost of debt and cost of equity, see Eugene Brigham and Joel Houston's "Fundamentals of Financial Management," 10th edition, Thompson-Southwestern Publishers or a number of other finance textbooks.

2. Calculate St. Louis Chemical's WACC (round to the nearest whole number). What arguments should be made to convince Williams of the advantage of using long-term debt in the firm's capital structure?

WACC formula:

$$WACC = w_d (k_d) (1-t) + w_s (k_s)$$

Where:
w_d = weight of debt in the company's target capital structure
K_d = before-tax cost of debt
t = marginal income tax rate
w_s = weight of equity in the company's target capital structure
k_s = cost of equity

St. Louis Chemical's WACC = .30 (.10) (1-.30) + .70 (.16)
= .021 +.112
= .133 or 13.3% use 13%

The best argument that can be made to convince Williams to use debt capital in its capital structure is to calculate the firm's WACC with and without debt. Without debt, the firm's cost of capital is 16% (cost of capital and cost of equity are the same) and with 30% debt, its cost of capital is 13%. The use of debt lowers St. Louis Chemical's cost of capital because low cost debt capital is substituted for high cost equity capital. Debt has a lower cost than equity because to the holder of debt there is less risk. Debt has less risk because the certainty of payments associated with debt (interest and principal) is greater than the payments associated with equity (dividends and stock appreciation). Debt payments are legal obligations thus are paid before any payment to equity shareholders. Because there is less risk associated with debt, the providers of debt are satisfied with a lower but more certain return. The downside of debt is the fixed nature of the payments, thus the use of debt by a firm increases its financial risk. The more debt a firm has, the greater the financial risk or financial leverage. The introduction of debt into a firm's capital structure will at first cause the WACC to decline, but eventually the use of large amounts of debt will cause the WACC to increase. What businesses attempt to achieve is a capital structure which provides the lowest cost of capital because it is at that point the value of the firm is maximized.

3. Since the used equipment will be financed with internal capital and the new equipment with a bank loan, should the same discount rate be used to evaluate each alternative? Explain.

The discount rate used to evaluate the project reflects the risk level of the project, not the cost of the financing. The cost of capital represents the risk level of the firm's assets, and since both alternatives appear to have the same risk level as the firm's existing assets, the cost of capital should be used to evaluate each alternative.

4. Explain why an accurate WACC is important to a firm's long-term success.

A firm's WACC is used to assess investment decisions. Assets must return at least the firm's cost of capital (what it must pay for the capital to acquire the asset). If an asset's return is less than the WACC, shareholders will not receive their required return. If a firm underestimates its WACC, it may invest in assets (projects) that do not yield the necessary return. If a firm overestimates its WACC, it may not invest in assets that would yield the necessary return (missed opportunities). Either error will result in problems. If the WACC is underestimated, the firm risks losing equity capital as unsatisfied investors take their funds elsewhere or will have difficulty raising capital in the future. If the WACC is overestimated, the firm risks missing profitable growth opportunities. Making investment

decisions based on informal analysis is an unacceptable process and will not result in an effective allocation of the firm's scarce resources.

5. Evaluate the strengths and weaknesses of the NPV, IRR and Cash Payback Period capital expenditure budgeting methods. Prepare a recommendation for Williams regarding the capital budgeting method or methods to use in evaluating the expansion alternatives. Support your answer.

Cash Payback Period is the number of years it takes a firm to recover the original investment. For example, if a capital project requires an investment of $10,000 and is expected to return $5,000 for each of the next four years, the Payback Period would be two years. The advantages of the Payback Period include: 1) easy to calculate and explain, 2) focuses on future cash flows, and 3) places a premium on liquidity (i.e. a quick return of the investment). Disadvantages: 1) ignores time value of money (i.e. a dollar received in year three is assumed to be worth the same as a dollar received today), 2) ignores cash flows beyond the payback period, and 3) does not include an accept/reject feature.

Net Present Value (NPV) method is determined by 1) calculating the present value of the future cash flows (using the WACC as the discount rate) and 2) deducting the project's cost from the present value of the future cash flows. If the present value of the future cash flows exceeds the project's cost, the project is said to have a positive NPV. Stated another way, if the project's value (the present value of its future cash flows) exceeds its cost, the project is a good investment and should be accepted. Advantages of this method include: 1) focuses on future cash flows, 2) takes into account time value of money, 3) considers all cash flows associated with the project, and 4) includes an accept/reject feature. Disadvantages: 1) relatively difficult to explain and calculate, and 2) requires knowledge of a firm's WACC.

Internal Rate of Return (IRR) method is calculated by determining the discount rate that will cause the present value of the future cash flows to equal the project's cost. The discount rate is the project's internal rate of return (IRR). If the IRR exceeds the firm's WACC, the project should be accepted. Advantages of this method include: 1) focuses on future cash flows, 2) takes into account time value of money, 3) considers all cash flows associated with the project, and 4) does not require knowledge of a firm's WACC. Disadvantages: 1) relatively difficult to explain and calculate, and 2) if the project's future cash flows include some years with cash outflows rather than cash inflows, multiple IRRs may result.

Recommendation should include the use of all evaluation methods because each provides valuable information regarding a potential project. Priority should be given to the results of the NPV method because it compares the projects value (the present value of

future cash flows, determined by using the firm's WACC as the discount rate) to the projects cost. If a project's value exceeds its cost, it is a good investment. For a more complete discussion of the superiority of the NPV method over the other techniques, see Eugene Brigham and Joel Houston's "Fundamentals of Financial Management".

6. **Calculate the NPV, IRR and Cash Payback for each alternative by completing Schedules One and Two. For these calculations, assume a WACC of 13%. Based strictly on the results of these methods, should either option be selected? Why? How could the analysis be improved? Solution requires preparation of a spreadsheet.**

See Schedule One and Two for complete calculations. Results are:

Evaluation Method	Used Equipment	New Equipment
Net Present Value (NPV)	$43,795	$190,238
Internal Rate of Return (IRR)	14%	15%
Cash Payback Period	3.00 years	5.29 years

The Cash Payback Period assumes annual operating cash flows are received evenly over the course of the year while the NPV and IRR assume operating cash flows are received at the end of the year. The Cash Payback Period for the used equipment is 3 years. The full amount of the investment is not recovered until the project is terminated. Based on the results of the evaluation methods, the new equipment would be selected because of the higher NPV.

Note: The case includes two schedules which will aid students in preparing the solution, but the schedules can be omitted to provide a more challenging case.

7. **The projected cash flow benefits of both projects did not include the effects of inflation. Future cash flows were determined using a constant selling price and operating costs (real cash flows). The cash flows were then discounted using a WACC that included the impact of inflation (nominal WACC). Discuss the problem with using real cash flows and a nominal WACC when calculating a project's NPV or IRR.**

In general, using "real" future cash flows and a "nominal" WACC will result in an understated NPV and IRR or both will have a downward bias. If inflation is neutral, impacting revenues and costs equally, the NPV and IRR will be underestimated. Because revenues are usually greater than costs, revenues will increase by a greater dollar amount

than costs. The exact impact of combining "real" cash flows and a "nominal" discount rate can only be determined by removing the impact of inflation from the discount rate or adding the impact of inflation to the future cash flows.

8. What other issues should be considered before a final decision regarding the expansion alternatives is made?

The analysis is based on a single point estimate, and it is highly unlikely that future sales volume will exactly equal projected sales. Although both alternatives appear to be highly profitable, it would be beneficial to evaluate profitability at lower sales volumes. At what minimum level of sales will the projects still be acceptable? The point of this question is to illustrate to the students that the financial analysis is only part of the decision-making process.

REFERENCES

Brigham, Eugene & Joel Houston, *(2004). Fundamentals of Financial Management,* (10th edition), South-Western, a Division of Thomson Learning.

Brigham, Eugene & Michael Ehrhardt, (2002). *Financial Management: Theory and Practice,* (10th edition), Harcourt Brace College Publishers.

Schedule One	**Used Equipment**			
	Year 0	Year 1	Year 2	Year 3
Sales Volume (drums)		170,000	190,000	215,000
Selling Price (per drum)		$35.00	$35.00	$35.00
Drum Filling Cost (per drum)		$1.75	$1.75	$1.75
Material Variable Cost (per drum)		$30.50	$30.50	$30.50
Total Variable Cost (per drum)		$32.25	$32.25	$32.25
Tax Rate		30%	30%	30%
WACC		13%	13%	13%
Working Capital (% of Sales)		10%	10%	10%
Required Working Capital ($)		595,000	665,000	752,500
Required Incr. in Working Capital ($)			70,000	87,500
Acquisition Cash Flow	$			
Equipment Costs	860,000			
Increase in WC (10% of sales)	595,000			
Total Project Cost	1,455,000			
Operating Cash Flow Projections		$	$	$
Sales		5,950,000	6,650,000	7,525,000
Variable Costs		5,482,500	6,127,500	6,933,750
Gross Profit		467,500	522,500	591,250
Depreciation Expense		283,800	387,000	129,000
Earnings Before Taxes		183,700	135,500	462,250
Income Taxes		55,110	40.650	138,675
Earnings After Taxes		128,590	94,850	323,575
Depreciation Expense		283,800	387,000	129,000
Operating Cash Flows		412,390	481,850	452,575
Increase in Working Capital		0	(70,000)	(87,500)
Annual Cash Flow		412,390	411,850	365,075
Terminal Cash Flow	$			
Sale of Equipment	50,000			
Book Value	60,200			
Taxable Gain	(10,200)			
Income Taxes	(3,060)			
Cash Flow From Sale of Equipment	53,060		(50,000-3,060)	
Liquidation of Working Capital	752,500			
Terminal Cash Flow	805,560			
	Year 0	Year 1	Year 2	Year 3
Cash Flows ($)	(1,455,000)	412,390	411,850	1,170,635*
* Year 3 Operating Cash Flow and Terminal Cash Flow				
NPV $43,795	**IRR**	14%	**Cash Payback Period**	3.00
	Cash Flow ($)	Cumulative CF ($)		
Year 0	(1,455,000)			
Year 1	412,390	(1,042,610)		
Year 2	411,850	(630,760)		
Year 3	365,075	(265,685)		
End of Year 3 (Terminal CF)	805,560	539,875		

Schedule Two (page 1) **New Equipment**

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Sales Vol.- Total (drums)		170,000	190,000	215,000	235,000	275,000	310,000	370,000
Selling Price ($/per drum)		35.00	35.00	35.00	35.00	35.00	35.00	35.00
Filling Cost ($/per drum)		1.00	1.00	1.00	1.00	1.00	1.00	1.00
Matl. Var. Cost ($/per drum)		30.50	30.50	30.50	30.50	30.50	30.50	30.50
Total Var. Cost($/per drum)		31.50	31.50	31.50	31.50	31.50	31.50	31.50
Tax Rate		30%	30%	30%	30%	30%	30%	30%
WACC		13%	13%	13%	13%	13%	13%	13%
WC as Percent of Sales		10%	10%	10%	10%	10%	10%	10%
Required WC	$595,000	$595,000	$665,000	$752,500	$822,500	$962,500	$1,085,000	$1,295,000
Required Increase in WC			$ 70,000	$87,500	$70,000	$ 140,000	$122,500	$210,000

Acquisition Cash Flow	Year 0
Equipment Costs	2,480,000
Increase in WC	595,000
Total Project Cost	3,075,000

Operating Cash Flow Projections

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Sales	5,950,000	6,650,000	7,525,000	8,,225,000	9,625,000	10,850,000	2,950,000
Variable Costs	5,355,000	5,985,000	6,772,500	7,402,500	8,662,500	9,765,000	11,655,000
Gross Profit	595,000	665,000	752,500	822,500	962,500	1,085,000	1,295,000
Depreciation Expense	347,200	620,000	421,600	322,400	223,200	223,200	223,200
Earnings Before Taxes	247,800	45,000	330,900	500,100	739,300	861,800	1,071,800
Income Taxes	74,340	13,500	99,270	150,030	221,790	258,540	321,540
Earnings After Taxes	173,460	31,500	231,630	350,070	517,510	603,260	750,260
Depreciation Expense	347,200	620,000	421,600	322,400	223,200	223,200	223,200
Operating Cash Flows	520,660	651,500	653,230	672,470	740,710	826,460	973,460
Increase in WC	-	(70,000)	(87,500)	(70,000)	(140,000)	(122,500)	(210,000)
Annual Cash Flows	520,660	581,500	565,730	602,470	600,710	703,960	763,460

Terminal Cash Flow

	Year 7
Sale of Equipment	120,000
Book Value	99,200
Taxable Gain	20,800
Income Taxes	6,240
Cash Flow From Sale	113,760
Liquidation of WC	1,295,000
Terminal Cash Flow	1,408,760

Schedule Two (page 2)

	Years 0	Years 1	Years 2	Years 3	Years 4	Years 5	Years 6	Years 7
Cash Flows ($)	(3,075,000)	520,660	581,500	565,730	602,470	600,710	703,960	2,172,220

NPV	$190,238
IRR	15%
Cash Payback Period	5.29

	Cash Flow ($)	Cumulative CF ($)	
Year 0	(3,075,000)		
Year 1	520,660	(2,554,340)	1.00
Year 2	581,500	(1,972,840)	1.00
Year 3	565,730	(1,407,110)	1.00
Year 4	602,470	(804,640)	1.00
Year 5	600,710	(203,930)	1.00
Year 6	703,960	500,030	0.29
			5.29