COMMERCIAL AIRCRAFT: LEASE, FINANCE OR PURCHASE?

A practical case study that investigates which alternative; Leasing, Financing or Buying is financially superior (CDN Tax Version).

Executive Summary:

- The purpose of the paper is to isolate the ownership costs (excluding operating costs) of a typical aircraft acquisition and compare the financial outcomes of leasing, financing (i.e. borrowing) and purchasing
- FINANCE 101 is provided at the end of the case as a primer for those readers' without any finance exposure.
- The primary variables [interest rates, implicit lease rates, risk-adjusted discount rates, tax rates, the firm's credit reputation and tax position] will have a significant impact on which alternative is financially optimal
- Only the after-tax cost of ownership or 'right-of-use' is considered in this case. It is assumed the firm has already examined the revenues and operating expenses and is now just considering which form of financing is least costly.
- The ownership period under consideration is five years. The outcome for a twenty-year period is presented in the CONCLUSIONS section.
- The aircraft is assumed to cost $1 million and has a realisable resale value of $850K five years later. 
- Maintenance and the timing of overhauls impact upon the projected resale value. However, the cost of maintenance and overhauls are identical under all three different ownership alternatives and therefore need not be considered here.
- Purchasing is not financially superior to Leasing or Borrowing simply because lease payments or interest expenses are avoided. Tax considerations and the cost of capital have a significant impact on the outcome of all three alternatives.
- Financial modelling involves estimating the timing and magnitude of actual cash flows and then discounting those cash flows on a risk-adjusted basis back to a present-day valuation. The alternative with the least costly NPV (Net Present Value) is considered financially superior.
- In this scenario, Borrowing was the preferred alternative and was $153K less costly than outright Purchasing (the most costly alternative). All other things being equal, the overall value of the firm would have declined by $153K if the aircraft had been purchased rather than financed.
- The outcome of each aircraft acquisition will vary depending upon the market conditions and the firm's current circumstances. However, the relative risk-profile of a firm to self-finance asset acquisitions compared with that of a large external finance company will be key to which form of funding is superior.

OVERVIEW

Should productive assets be leased or purchased outright? And, if purchased, should the firm pay 100% cash or is it better to borrow (i.e. finance) some of the purchase price instead? While there are numerous legal, risk and operational ramifications to leasing versus ownership, the question as to whether there is an optimal financial solution always depends upon the specific variables in each case. Aircraft in particular are different from most other production equipment because they tend to have long service lives, depreciate little (in nominal terms) over their life-spans and generate substantial CCA[1] deductions. This means that the financial difference between Leasing or Purchasing or Financing an Aircraft can be significant even over a medium-term period and each alternative deserves careful consideration prior to committing to one or the other.

The purpose of the following case analysis, therefore, will be to consider a typical aircraft acquisition under the three alternatives: LEASING, BORROWING (e.g. purchase the aircraft with a 20% deposit and finance the remainder), or via an outright PURCHASE. Under each alternative certain assumptions have been made in order to increase comparability from one alternative to the next. Approximations with respect to interest rates, discount rates, aircraft resale value and tax rates have been made with the goal of being as representative of current market conditions as possible so that the outcome is generally reflective of an actual acquisition. Of course, market conditions change frequently and variables such as borrowing-rates or implicit lease rates will be highly dependent upon the credit worthiness of the acquiring firm as well as the level of security the firm is willing to offer the Lender or Lessor.

COSTS OF "OWNERSHIP" ONLY

It is important at the outset that we make the distinction between the financial analysis that follows here and a more formal full-blown financial project valuation. In the latter case, we would wish to look at the entire gamut of possible Revenues, Operating Expenses *and* Asset Ownership Costs over the entire life of the project. The end result of that type of study would be to give us an understanding of what rate of return the firm is likely to generate from the project. Here, instead, we have made the assumption that there already is a valid business reason to acquire the aircraft in question and the only decision remaining is which alternative, Leasing, Borrowing or Buying, is the most financially advantageous. As such, we are just concerned with "ownership" costs - the net costs we incur in order to have the aircraft available for our use over the life of the project. Our definition of "ownership" costs might be better thought of as the Net Investment in the aircraft, including the tax effects that accrue under the various different finance alternatives. Leasing the aircraft gives us the right-of-use, even though we do not legally "own" it. Note that these costs are in no way contingent upon actually operating the aircraft. The Purchase Price, Lease Payments or Loan Payments plus their related tax effects

[1] CCA stands for Capital Cost Allowance and it is the form of Tax Depreciation that the Canada Customs and Revenue Agency allows as a systematic deduction against taxable income. For a more complete description of CCA and the Tax Shield it generates, see Finance 101 at the end of this case.

will be incurred regardless of whether the aircraft flys 10 hours per year or 1,000. Our goal, therefore, is to determine which alternative enjoys the lowest cost of ownership over the life of the project.

FIVE-YEAR TERM

A five-year project horizon has been selected for two reasons. The first is that this represents a reasonable period to assess the overall financial viability of *most* financial projects. It is long enough to overcome the start-up costs and learning curves required to get another aircraft online and expand the firm's service-base. Further, it is short enough such that one need not be speculating about market conditions in the distant future. If our analysis were of the 'full-project valuation' type we certainly would have expected this project to have generated an overall positive return within the initial five-year term or otherwise we would have concluded the project not to be financially viable. The second reason a five-year term represents a logical cut-off for this assessment is because of the time-value-of-money. Those with some financial training will be quick to realise that the significance of future cash flows (either IN or OUT flows) for any project exponentially diminishes the longer the time period between now and the expected cash realisation. For those readers without any background in finance, you are urged to read the FINANCE 101 section at the end of this case first. In FINANCE 101 we have attempted to provide a basic overview of the financial terms and concepts necessary to understand the comparison between the three ownership alternatives.

Many aircraft operators would balk at the idea of operating a given airframe (new or used) for only five-years and then selling it. This view misses the point of the analysis, however. We are interested in the cost of ownership over a specific period of time under the three different alternatives. As such, we need to examine all the cash flows required in acquiring the aircraft on day zero (i.e. the day prior to the first in the five years of use) as well as its obtainable resale value at the end of the project. The conclusions of the analysis are not invalidated if one chooses *not* to sell the aircraft at the end of five years. Similarly, once the five-year lease term is nearing expiration it is likely that the lessee would have the option of either renewing for another term, or perhaps purchasing the aircraft. A five-year term gives us the ability to consider all the 'ownership' costs including cash inflow from disposing of the aircraft at the end of the period in order to determine whether one alternative is clearly superior. In reality, all productive assets are constantly being compared against their current liquidation value - if the benefits of continued ownership outweighs the liquidation value, then they are retained, otherwise they are sold-off.

For those who remain sceptical of the five-year horizon, the twenty-year "ownership" costs (in terms of both present values, and nominal dollars) have been disclosed in the CONCLUSIONS section.

COMPARABILITY

In order to promote comparability across all three alternatives, some important assumptions are made. For example, it is assumed that the total acquisition cost of the aircraft is $1,000,000 (for simplicity, all amounts referred to in the text and financial analysis are Canadian Dollars) and that the predicted resale value of the aircraft after five-years will be $850,000. It is assumed that the firm has the ability to purchase the aircraft with cash available from its own reserves if it chooses the PURCHASE option 

OPERATING EXPENSES NOT CONSIDERED

By comparing only the 'costs of ownership' we are explicitly ignoring not only operating expenses such as fuel and regular maintenance personnel expenses, etc. but also those future cash outflows that possess a capital quality. Turbine Engine Overhauls or C Inspections, for example, can be very costly and may be treated as a capital expenditure. It may be that the TBO (Time Before Overhaul) on our target aircraft is such that we expect to invest another $300,000 in an engine overhaul just in the 58th month of ownership. Some may believe that this is an additional capital investment in the aircraft and that it should be factored into our overall ownership cash flow analysis. This view would not be correct, however. The $300,000 would need be spent regardless of whether the aircraft was LEASED, or OWNED (either outright or via borrowed funds), and because the cash outflow would be exactly the same in all three alternatives, it will not alter the outcome of our analysis and need not be considered here[2]. When the aircraft is OWNED, such an outflow may be considered an advance against the $850,000 resale inflow due in the 60th month (plus a day). Indeed, when the $850,000 resale projection was estimated, it would have been done expressly with the expectation that a recently overhauled engine was included. Assuming, for example, that the engine(s) reach maximum operating hours just on the final day of the 60th month, and it is therefore not rebuilt prior to resale, it is quite easy to comprehend that the expected realisable resale value will now only be $550,000. When constructing the Net Operating Cash Flow it would be paramount, therefore, that the expected cash costs of such overhauls be included. Indeed, many lease agreements demand that an actual cash payment per hour flown to be paid into an escrow account just so that the required cash be available by the time an overhaul is required.

A seemingly logical conclusion of the foregoing argument is that OWNERSHIP is obviously superior to LEASING because in the former one has to pay-out $300K in month 58 and yet receives $850K back two months later, but in the latter case $300K is paid with absolutely no positive terminal cash return whatever. This conclusion would be erroneous. While the formula will not be presented here, the leasing company also expects to receive $850K once they resell this aircraft and this expected value has been incorporated

[2] Actually, there could be a profound difference in the tax impact that such an expenditure would have under an operating lease versus an owned aircraft scenario. In a real acquisition we would know how many hours were on any given engine, what the TBO was and would be able to predict when the overhaul cash outflow would occur in order to identify the tax effect under the various alternatives. For simplicity, we have ignored those tax effects here.

into reducing the monthly lease payments over the 60 month term[3]. As it is currently calculated, the monthly lease payment is $10,903. If, on the other hand, the leasing company expected to receive the aircraft back with no remaining TBO, the resale value would only be $550,000 and, as a result, the monthly lease payment that would have been applicable to the entire sixty month term would have been $14,648.

COMMON MISCONCEPTIONS

Often people will rationalise the LEASE/BORROW/PURCHASE decision with a generalisation such as 'It must always be less expensive to Purchase the aircraft, if the firm has the funds available, because then the lease costs or interest payments are not incurred.' While this *may* be true for an acquirer that has a large stockpile of tax-loss carry-forwards and a low weighted average cost of capital[4], it often will not be true for a firm that will generate substantial taxable incomes over the entire life of the aircraft ownership/usage. As will be shown in the following financial projections, PURCHASING the aircraft in our given scenario actually generates the least favourable financial outcome. Simply stated, both lease expenses and interest payments on borrowed funds generate tax deductions that effectively reduces total taxable income thereby reducing annual taxes payable. This reduction in taxes has the net effect of immediately lowering the cost of LEASING or BORROWING. Over a given project life, the present value of these tax savings can have a profound impact on the overall financial viability of the ownership alternative selected.

Of course, when PURCHASING an aircraft, a considerable annual tax deduction is earned in the form of CCA (Capital Cost Allowance). CCA is also available when the aircraft has been purchased with BORROWED funds. However, because aircraft tend to retain their nominal resale value, a good deal of the initial financial benefit of CCA is reversed when the aircraft is resold and the proceeds must then, by tax law, be used to reduce the existing UCC (Undepreciated Capital Cost) base[5].

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[3] Sometimes the lease will specify a range of acceptable hours on the engine(s) at the end of the lease. Hours in excess of that range generate a per-hour additional use charge and, conversely, hours under the range provide for a cash refund. For simplicity, we have assumed the leasing company here is just as precise at predicting our total five-year hours as we are and have, therefore, incorporated those hours into the overall lease cost.

[4] The importance of Weighted Average Cost of Capital (WACC) and how it impacts the financing decision will be discussed more fully in the CONCLUSIONS section.

[5] This reversal is called the 'Salvage Value' effect and in our scenario it can be shown that 36% of the initial benefit of CCA tax deductions (in PV terms) is eventually reversed in Year 6 when the $850K resale proceeds are received.

RISK FACTORS AND NONQUANTIFIABLE DIFFERENCES

There are, of course, various aspects of risk inherent in each of the three ownership alternatives that we have made no attempt to quantify here. If, for example, our initial $850K estimate of the five-year resale value turns out to be substantially too high (perhaps as a result of a number of unexpected airworthiness directives or because the aircraft becomes technically obsolete in comparison with newer designs), then the cost of PURCHASING or BORROWING will be much greater than initially projected. Given this outcome, we would have, in hindsight, preferred opting for the LEASE because the Lessor bears the risk of a declining resale value. Conversely, if the aircraft actually appreciates in value over the five years, then it may be possible that we would have preferred to have PURCHASED or BORROWED to acquire the aircraft rather than LEASED.

Remember, however, that risk of Operating Revenues and Non-Ownership Expenses (e.g. maintenance, fuel, insurance costs, overhaul expenses, landing fees/permits etc.) being different than initially expected are not considered here as the choice of which of the three ownership alternatives is selected will not alter these revenues or expenses.

There are other differences between the three ownership alternatives that may not be quantified into a financial model. The assumption of new debt, for example, will change the Debt/Equity ratio of the firm and this may have an impact upon existing banking convenants. The annual impact on the firm's income statement will be different under each of the three different alternatives. The income statement, in turn, may be bound to various contractual agreements and these differences may be sufficient to alter the firm's ability to declare dividends or change its borrowing capacity.

FINANCIAL MODELS

The financial models under each of the three different alternatives are presented below. A summary of all the significant assumptions is presented first followed by a Cash Flow Analysis under each ownership alternative. As is explained in the FINANCE 101 section at the end of the case, projection of actual Cash Inflows and Outflows are at the very core of any project evaluation. Specifically, the risk-adjusted Discounted Cash Flows is what we are most concerned with (rather than Nominal Cash Flows). These discounted values are presented here as the NPV (Net Present Value) of each alternative. And, as we are considering the *COSTS* of ownership all our NPV's will be negative (representing Net Cash Outflows). Given the specific variables applicable to this individual case, there is a significant difference of $153K in the least costly ownership option (which is BORROWING at an NPV of -$180,954) compared to the most costly option (PURCHASING at an NPV of -$333,928). The reasons for this difference and the ramifications of a change in some of the assumed variables are discussed in the CONCLUSIONS section that follows.

SUMMARY

Given the current variables, then, the financially optimum ownership alternative would be BORROWING which only incurred a NPV Cost of $180,954. LEASING generated a relatively close outcome of $249,109 and the worst financial alternative would be PURCHASING at an NPV Cost of $333,928. By contrast, it is interesting to see how widely diverse the Nominal Cash Flows were both from the discounted NPV and from the outcomes of the other alternatives:

	BORROWING	LEASING	PURCHASING
Net Present Values	-$180,954	-$249,109	-$333,928
Nominal Cash Flows Yr's 0 to 5	+$1,187	-$371,566	+$162,398

Note that, under the BORROWING and PURCHASING alternatives, the tax savings from CCA are so large during the first five years that the nominal cash flows are actually positive! It is also interesting to observe that the alternative that offers the second-best financial outcome, LEASING, also provides the largest negative nominal cash outflow. Many non-finance people have tremendous difficulty with this concept as well as trying to understand how a project that produces net positive nominal dollars (as counted, for example, in the actual dollars flowing through your firm's bank account over a specific period of time) could generate a negative Net Present Value. This specific issue is explained in FINANCE 101. To be clear, it is the Net Present Value that is important in deciding which alternative is superior. Nominal Cash Flows as a means of assessing financial viability are only useful over short-term projects (e.g. two-years or less) and over longer periods are relatively inconsequential. However, an accurate Nominal Cash Flow Projection must be created first before the Present Values of those cash flows may be derived. Consequently the Nominal Cash Flow Projection is an important first-step in the financial modelling process.

SCENARIO OVERVIEW (all amounts in $CDN)

The goal is to purchase an aircraft currently costing $1,000,000 operate it for five full years and then resell it on the open market. For comparison purposes, we assume the firm currently has the $1 million in cash already available [if it only had $200K, only options A and B would be possible, and if it had no capital to invest, only option B may be possible]. You are wondering, given current interest and tax rates, which of the Lease, Buy or Borrow option is financially superior?

ASSUMPTIONS:

- A Canada-wide average combined Federal/Provincial Corporate Tax Rates of 43.2% has been assumed for comparison purposes
- In all cases it is assumed that the firm has sufficient positive Taxable Income each year in order to use the Tax Shield generated under the various OPTIONS (without the necessity of relying on the Carry-Back/Carry-Forward Rules)
- The 5-Year Fixed Rate of Borrowing is 9.0% for this firm with the acquired aircraft acting as sole security on the loan
- At the end of the 5-Year Term, the aircraft has a Fair Market Value of $850K
- The appropriate WACC (Weighted Average Cost of Capital) with which to assess this acquisition is 15.0% (this will be applied to all the nominal operating cash flows on all three options in order to determine the current Net Present Value (NPV) of the project)
- Cash Flows relating to the Capital Investment of the aircraft (e.g. initial purchase, receipt of resale monies, and repayment of principal on the loan), will be discounted at the risk-adjusted rate of 10.0%.
- In the Financial Models that follow, references to "OPERATING CASH FLOWS" do not refer to or include "OPERATING EXPENSES" (such as Fuel, Personnel, Maintenance or Insurance Expenses) as would be found in the more traditional full-valuation project model. Instead, OPERATING CASH FLOWS will strictly refer to those cash items that pertain to the ownership aspect of the three alternatives (e.g. Interest Expense, or Lease Payments or CCA deductions or the related tax implications of any of these) that would normally be reported on the firm's Income Statement. These OPERATING CASH FLOWS are subject to a higher level of risk than the CAPITAL CASH FLOWS and, as such, are discounted at the firm's WACC.

OPTION A - BORROW:

- Your firm decides to purchase the aircraft with a 20% deposit and borrow $800K
- The applicable CCA Class is Nine with 25% declining depreciation; half-year rule applies and there is no Terminal Loss or Recapture when the aircraft is finally sold (i.e. there are still other aircraft in the CCA class and the UCC remains positive).
- The aircraft is actually sold in the first few days of Tax Year Six. The TOTAL PV derived from the CCA Tax Shield is +$ 138,289 after removal of the $850,000 resale value from the UCC. In nominal terms $312,398 of CCA tax deductions are enjoyed in the first five years. CCA deductions may be continued to be made after the year of disposal. In this specific case, the removal of the $850K from the UCC in year 6 generates a 'reverse tax shield' that continues on to infinity. The PV of this post-year-five negative tax shield is -$76,938
- You will incur an effective annual Interest Expense of 9.0% on the outstanding debt principal.
- You make blended principal & interest payments of $9,983 on the loan at the end of each month, amortized over ten years (note that there is no requirement that the term of the project equal the amortization period of the loan). The terms of the loan are such that the balance may be paid out at the end of five years without penalty.
- At the end of 5 Years, the aircraft is sold to net realisable a total of $850K. The principal then outstanding on the loan is paid out with some of the proceeds.

BORROW TO PURCHASE THE AIRCRAFT: ACTUAL NOMINAL CASH FLOWS

Cash Outflows are Negative, Inflows are Positive

OPERATING CASH FLOWS:	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
Annual Tax Shield From CCA	0	54,000	94,500	70,875	53,156	39,867	312,398
Interest Expense from Blended Loan		-67,134	-62,395	-57,232	-51,600	-45,462	-283,823
Tax Shield on Interest Expense		29,002	26,955	24,724	22,291	19,640	122,612
TOTAL AFTER-TAX OP. CASH FLOWS	0	15,868	59,060	38,367	23,847	14,045	151,187
CAPITAL CASH FLOWS:							
Deposit to Purchase Aircraft	-200,000						-200,000
Principal Payments on Blended Loan		-52,658	-57,397	-62,560	-68,192	-74,330	-315,135
Pay Out Balance of Loan						-484,865	-484,865
Cash Received from Aircraft Sale						850,000	850,000
TOTAL CAPITAL CASH FLOWS	-200,000	-52,658	-57,397	-62,560	-68,192	290,805	-150,000
					Net Nominal Cash Flows		$ 1,187

BORROW TO PURCHASE THE AIRCRAFT: DISCOUNTED CASH FLOWS

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
Net Discounted Operating Cash Flows	0	13,798	44,658	25,227	13,635	6,983	104,301
YR6 to ... $850K reduction in UCC Base (aa)							-76,938
Net Discounted Capital Cash Flows (bb)	-200,000	-47,871	-47,435	-47,002	-46,576	180,567	-208,317
						NPV_{Borrow}	-180,954

aa) Assuming that the aircraft is sold on the first day of tax-year six (cash receipt of $850K is shown here at the end of YR5 for simplicity), the removal of the resale price from UCC Class Nine generates a 'reverse-tax-shield' that decreases all future CCA benefits from year six onwards. The negative amount shown here represents the Present Value of that reverse-tax-shield.

bb) Aircraft Deposit and Loan cash flows have been discounted at the risk-adjusted rate of 10.0%

OPTION B - LEASING:

- This is an Operating Lease.
- 100% financed with no deposit required. At lease-end, the aircraft is simply returned to Lessor (or, optionally, the term may be extended or the aircraft may be purchased for the THEN FMV)
- There are requirements that the engine(s) have a minimum TBO remaining when returned to the Lessor and that additional monies will be due if the airframe incurs more than an maximum predetermined number of operating hours allowed within the lease period. However, for simplicity, we assume these will not apply in our situation.
- The implicit effective annual lease rate is 11.5% with a monthly payment of $10,903 being made at the start of each month.

LEASE THE AIRCRAFT: ACTUAL NOMINAL CASH FLOWS

Cash Outflows are Negative, Inflows are Positive

OPERATING CASH FLOWS:	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
Total Lease Payments	0	-130,833	-130,833	-130,833	-130,833	-130,833	-654,165
Annual Tax Shield From Lease Payments	0	56,520	56,520	56,520	56,520	56,520	282,599
TOTAL AFTER-TAX OP. CASH FLOWS	0	-74,313	-74,313	-74,313	-74,313	-74,313	-371,566

Net Nominal Cash Flows	-371,566

LEASE THE AIRCRAFT: DISCOUNTED CASH FLOWS

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
Net Discounted Operating Cash Flows		-64,620	-56,191	-48,862	-42,489	-36,947	-249,109

NPV_{Lease}	-249,109

OPTION C - PURCHASE:

- The firm Buys the aircraft outright, paying with a $1,000,000 Cash Reserve.
- The Tax Deductible CCA is exactly the same as in OPTION A. The aircraft is actually sold in the first few days of Tax Year Six. The TOTAL PV derived from the CCA Tax Shield is +$ 138,289 after removal of the $850,000 resale value from the UCC (same in OPTION A)
- At the end of 5 Years, the aircraft is sold at FMV to realisable a total of $850K

PURCHASE THE AIRCRAFT: ACTUAL NOMINAL CASH FLOWS

Cash Outflows are Negative, Inflows are Positive

OPERATING CASH FLOWS:	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
Annual Tax Shield From CCA	$ 0	$ 54,000	$ 94,500	$ 70,875	$ 53,156	$ 39,867	$ 312,398
TOTAL AFTER-TAX OP. CASH FLOWS							$ 312,398
CAPITAL CASH FLOWS							
Purchase then Sell Aircraft	$ -1,000,000					$ 850,000	$ -150,000
TOTAL CAPITAL CASH FLOWS							$ -150,000
					Net Nominal Cash Flows		$ 162,398

PURCHASE THE AIRCRAFT: DISCOUNTED CASH FLOWS

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
Net Discounted Operating Cash Flows		$ 46,957	$ 71,456	$ 46,601	$ 30,392	$ 19,821	$ 215,227
YR6 to ... $850K reduction in UCC Base (aa)							$ -76,938
Net Discounted Capital Cash Flows (bb)	$ -1,000,000					$ 527,783	$ -472,217
						$NPV_{Purchase}$	$ -333,928

aa) Assuming that the aircraft is sold on the first day of tax-year six, the removal of the resale price from UCC Class Nine generates a 'reverse-tax-shield' that decreases all future CCA benefits from year six onwards. The negative amount shown here represents the Present Value of that reverse-tax-shield.

bb) Aircraft Purchase and Resale cash flows have been discounted at the risk-adjusted rate of 10.0%

CONCLUSIONS

Given the assumed financial variables, BORROWING is financially superior. The present value cost of borrowing is $68,155 (i.e. -$180,954 + $249,109) better than the leasing alternative and $152,974 (i.e. -$180,954 + $333,928) better than simply purchasing the aircraft outright. Practically speaking, this should mean that, if the firm in question made an error in judgement, and PURCHASED the desired aircraft rather than BORROWED it, the value of the firm has a whole will instantly be $153K less than had the BORROWING alternative been exercised[6]. Why should this be so? A quick and non-technical explanation for this may be gleaned simply by looking at the difference in expected cash flows between BORROWING vs. PURCHASING over the five years:

CASH FLOW COMPARISON - BORROWING vs. PURCHASING

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
Net Operating Cash Flow - BORROWING	0	15,868	59,060	38,367	23,847	14,045	151,187
Op. Cash Inflows LOST by NOT PURCHASING	0	-54,000	-94,500	-70,875	-53,156	-39,867	-312,398
OP. Cash Flow Difference, BORROWING vs. PURCHASING	0	-38,132	-35,440	-32,508	-29,309	-25,822	-161,211
divided by							
Operating Cash Discount Rate	$(1 + 15\%)^0$	$(1 + 15\%)^1$	$(1 + 15\%)^2$	$(1 + 15\%)^3$	$(1 + 15\%)^4$	$(1 + 15\%)^5$	
equals							
Present Value of Op. Cash Flow Differences	0	-33,158	-26,798	-21,374	-16,757	-12,838	-110,925
Net Capital Cash Flows - BORROWING	-200,000	-52,658	-57,397	-62,560	-68,192	290,805	-150,000
Capital Cash Flows Saved by NOT PURCHASING	1,000,000	0	0	0	0	-850,000	150,000
Capital Cash Flow Difference , BORROWING vs. PURCHASING	800,000	-52,658	-57,397	-62,560	-68,192	-559,195	0
divided by							
Capital Cash Flow Discount Rate	$(1 + 10\%)^0$	$(1 + 10\%)^1$	$(1 + 10\%)^2$	$(1 + 10\%)^3$	$(1 + 10\%)^4$	$(1 + 10\%)^5$	
equals							
Present Value of Capital Cash Differences	800,000	-47,871	-47,435	-47,002	-46,576	-347,216	263,900
							152,975
Post Yr5 CCA Cash Differences	(CCA Savings are the exactly the same under both alternatives)						0
				NPV Savings in Borrowing vs. Purchasing			152,975

[6] Ignoring the transaction costs, the firm may be able to correct the error after PURCHASING the aircraft by obtaining an $800,000 Term Loan using the newly acquired aircraft as security.

In compensation for not paying the entire purchase price on day zero, the Borrower will be required to pay interest charges throughout the life of the project on the borrowed funds. These in turn are reduced by the tax shield earned on those interest expenses. Finally, the CCA tax deductions available to the Borrower and the Purchaser are exactly the same (this fact is not easy to detect in the operational cash flows shown above as the BORROWED CCA is netted together with the other operational cash flows). This firm has a hurdle rate, or WACC of 15% that must be earned (think of costs as negative earnings) on all operating cash flows. NPV of the operating funds amounts to -$110,925. So, in exclusive consideration of just those cash flows that impact the income statement (e.g. the operational cash flows), we would thus far need to conclude that BORROWING is *less* advantageous than PURCHASING to the tune of $111K. Therefore, there must be some difference in the BORROWING vs. PURCHASING capital cash flows that compensates for this disadvantage and swings the balance in favour of BORROWING.

It is obvious by scanning the cash flow above that the most significant savings right at day zero is the net $800,000 that is not spent purchasing the aircraft. This firm requires a 10% return on capital assets (which are generally less risky than investments in operations - this is particularly true of capital assets with an active market and which may be liquidated relatively easily). Nominally, through years One to Four, paying down the principal of the loan are the only capital transactions that occur. In Year Five, however, the regular principal pay-down is made (actually via twelve monthly blended payments), plus the repayment of the outstanding balance that remains on the ten-year loan. These nominal cash flows amount to -$74,330 and -$484,865 for a total of -$559,195. At this time (actually, the first day of year-six), we also expect to receive $850,000 from the resale of the aircraft, but since this receipt is the same under both the BORROWING and PURCHASING alternatives, we need not consider it here as the difference nets to zero. The Present Value of just the Year Five net capital cash flows, therefore, amounts to $-\$559{,}195/(1 + 10\%)^5 = -\$347{,}216$ In total, the PV of all the annual capital cash flows of BORROWING compared with PURCHASING amounts to a *positive* $263,900.

On a combined basis, considering the present values of both operating and capital cash flows, BORROWING is superior to PURCHASING by an amount of $152,975 (i.e. -$110,925 + $263,900)

The NPV for the three different "ownership" alternatives can be thought of in an even more practical way. You already know that you require an aircraft for the next five years and have found precisely the model you are looking for on some vendor's apron. Salesperson A walks up to you and says "I can let you have the use of that aircraft for the next five years if you pay me $180,954 right now." Salesperson B notices you admiring the same aircraft, points to it and says "She's yours for the next five years if you write me a cheque for $249,109 today." Similarly, Salesperson C, more magnanimously than the first two makes you the same offer as the first two for exactly the same aircraft except now the cash-only-payable-today price is $333,928. Which Salesperson are you going to deal with? While the complexities of tax considerations and the illusions of nominal cash flows (see FINANCE 101) can sometimes cloud the issue, NPV's are designed to make the alternatives truly comparable such that the best financial outcome may be clearly identified. When you are paying out money, the least negative NPV indicates the best price.

Is this financial magic? Have we finally discovered the free lunch? A $153K savings on a million dollar asset is no small feat, after all. How can the Lender charge the user firm $153K *less* than the firm would have charged itself and still make a profit? These benefits originate from the combination of three different elements. The first is that only a minimal initial up-front investment is required ($200K in this case). Borrowing defers the payments for the use of an asset consistently over some period in the future - and money spent in the future is less valuable than money spent today. The second reason is the fact that 100% of the interest payments are tax deductible. Indeed, if this firm were subject to a zero-percent tax rate (e.g. it either has a large tax-loss carry-forward available, or perhaps it is a not-for-profit flying club that does not incur income taxes), the NPV of the Borrowing alternative would be $223K *more* costly (to -$403,610 to be precise, although we will skip the mathematical proof for brevity) than when taxes are being paid at the highest corporate rate. The Zero-Tax NPV's and Nominal Cash Flows are presented below, although it is useful to note here that under such conditions BORROWING remains the preferred method of financing for the five-year horizon, but slips to the second spot behind LEASING in the twenty-year projection. While it may be counter-intuitive to think in terms of the absence of taxes resulting in *increased* expenses, you have to remember that the 100% deductibility of the interest payments lowers taxable income which, in turn, decreases taxes that otherwise would have been payable for this firm.

Finally, the third reason why BORROWING is so financially attractive in this case has to do with the relative risk-profiles of the Borrower compared with the Lender. For our acquirer firm (the Borrower), its WACC on operating cash flows is 15.0% after-tax. This clearly indicates a high-risk firm where investors will demand large returns in order to be compensated for taking the additional risk. In contrast, the before-tax return required by the Lender is only 9.0% (remember that the Lender still needs to pay income tax on the net positive interest income it earns on its lending activities). This suggests that it can raise investment capital relatively easily without the requirement to pay the investors an undue 'risk-premium'[7]. The Lender (whom we might assume to be a large national bank) will be perceived to be much safer by investors because its holdings are so widely diversified across numerous industries and geographic regions. Consider, for example, a bank that holds billions of dollars in loan receivable assets across a wide array of industries. One of those assets is the $800K aircraft loan we have been investigating. If your firm, as Borrower, defaults on the loan payments, it is not likely that this relatively minor shortfall is going to have any impact on the financial performance of the bank. Conversely, if you own this aircraft along with a small fleet of four other similar aircraft and something happens such that one of them is grounded for six-months, your firm's future viability could very much be in question. There are other reasons, besides diversification, why banks may be able to raise capital much more cheaply than your small aviation firm can, and then pass these savings on in the form of lower lease costs. One is economy of scale - specialising in the process of lending out capital makes these firms highly efficient at what they do. Another is that they may be located in a more favourable tax jurisdiction than you are and

[7] From the data presented, it is difficult to predict what the Lender's (let's assume a large national bank) actual IRR (Internal Rate of Return) may be on such a loan. It would be a gross oversimplification to assume that it is 9.0% simply because this is the lending rate. An approximation of the marginal IRR may be calculated by looking at the differential between borrowing and lending rates and then allowing for taxation.

therefore don't require as high a pre-tax WACC as you do. Another is that they are not exposed to the operational risk of actually running the assets as your small aviation firm is. They only need to make sure you are keeping the asset adequately insured in case of a total loss and, in the event of a loan default, they need to make sure they have an efficient means of repossessing and liquidating the asset in order to recover their investment.

This case has demonstrated the intricacies of choosing the right financing alternative and how much of a real impact the right decision has on the financial well-being of the firm. While this case has clearly had a well-defined optimal solution, this should not be construed to be an all-encompassing endorsement for borrowing. Far from it. Each case will be unique as a result of the fact that all the variables that come into play will be different from company to company as well as over changing market conditions. The firm's WACC and debt capacity are important factors as well as its current cash position and other more intangible elements such as its previous relationships with finance providers. Further, we have not even considered the added complexities (and benefits) that may accrue from the case where the potential Borrower were considering a floating, as opposed to a fixed-rate of interest.

For the sake of completeness, and in answer to those that may have felt the five-year NPV numbers were skewed because we were looking at the ownership costs of a long-term asset for only a small fraction of its economic life-span, a comparison for the twenty-year NPV's and Nominal Dollars will be given below. The mathematical proofs have been omitted for brevity. In each case the assumptions, acquisition cost, all rates, amortization periods and methodology is exactly the same as in the five-year case, except that the resale value of the aircraft after twenty-years has been projected to be $250K. In the twenty-year BORROWING case, it is assumed that the loan payments are allowed to continue over their originally planned ten-year amortization vs. being paid out at the end of five years.

assumes 42.3% firm tax rate:	**BORROWING**	**LEASING**	**PURCHASING**
20 Year NPV	-$508,893	-$422,206	-$714,572
5 Year NPV	-$180,954	-$249,109	-$333,928
Nominal Cash Flow Yr 0 to 20	-$545,676	-$1,349,045	-$319,598
Nominal Cash Flow Yr 0 to 5	+$1,187	-$371,566	+$162,398

The relative positions of the preferred form of financing switches from BORROWING in the five-year horizon to LEASING under the twenty-year time period (LEASING is -$422,206 + $508,893 = $86,687 less expensive in current-day dollars for the twenty-year holding period). Many non-financial people will find this outcome surprising as the after-tax nominal dollar outflow of LEASING during the twenty years is almost 2.5 times *more* than that of BORROWING. In turn, the after-tax nominal cash outflow of BORROWING for the twenty-year horizon is 1.7 times more than PURCHASING. Consistent to both the five-year and twenty-year comparisons, PURCHASING is always the *least* favourable alternative. The reason why, of course, is the time value of money. Most

of the LEASING monies are being spent in the distant future when a dollar is not really worth a dollar (except in nominal terms, of course). Contrast this with the Purchasing NPV where the only real cash outflow occurs in Year 0 when $1 million is spent. Again, this highlights importance of considering the time-value-of-money when conducting any financial planning that encompasses a period longer than one or two years. In this case, if the twenty-year acquirer had decided to PURCHASE the aircraft on the basis that they were saving over a million dollars in nominal cash flow compared to leasing, they would actually be reducing the current value of the firm by $292,366 (i.e. -$714,572 + $422,206)[8].

Note that it becomes more expensive to hold the aircraft for twenty-years rather than five. In fact, the NPV of holding the aircraft for an
additional 15 years on a lease is only $173,097 (i.e. -$422,206 + $249,109) whereas it is $380,644 (-$714,572 + $333,928) more expensive to purchase it[9]. These additional funds may be considered as the incremental costs required to extend the ownership period for another 15 years. Again, it would be a mistake to focus upon the incremental nominal cash required to add fifteen years of ownership onto each alternative. The additional nominal dollars invested in the PURCHASE, $481,996 (i.e. +$162,398 + $319,598), compared with the LEASE $977,479 (i.e. -$371,566 + $1,349,045), for example, would suggest that PURCHASING is a much better twenty-year solution. We know, however, from our examination of twenty-year NPV's that LEASING is, by far, the most financially optimal alternative.

Throughout the case the tax deductibility of lease payments, interest expenses and CCA has been emphasised as an important element in the overall project valuation. The issue is complicated by the fact that the combined federal/provincial tax rate will vary depending upon where the acquiring firm is located, where it earns its revenues, the existence of any tax-loss carry-forwards or the applicability of the small business deduction. In order to present a perspective of both extremes, the following table indicates what the NPV's and Nominal Cash Flows would be in the case of the highest corporate tax rate of 43.2% compared with a firm that enjoys a 0.0% tax rate. The mathematical proofs are omitted for brevity. The comparison includes both the five and twenty-year data under the same general case assumptions that were made above.

5 Year Horizon	**BORROWING**		**LEASING**		**PURCHASING**	
	43.2% Tax	0.0% Tax	43.2% Tax	0.0% Tax	43.2% Tax	0.0% Tax
NPV	-$180,954	-$403,610	-$249,109	-$438,573	-$333,928	-$472,217
Nominal Cash	+$1,187	-$433,823	-$371,566	-$654,165	+$162,398	-$150,000

[8] The astute financial manager will realise, of course, that this $292K in lost value may be regained, at least partially, by arranging for a Sale-Leaseback.
[9] We have assumed that the internal lease rate, borrowing interest rate and income tax rate are all exactly the same over the twenty year period as they were in the five year analysis. In reality, this would never be the case but is important here so that we are comparing apples-to-apples.

A good deal of understanding may be gained from examination of the table above. The first is that, because the only tax benefit in the PURCHASING scenario is derived from the CCA deductions, the total PV of CCA must be $138,289 (i.e. -$333,928 + $472,217). Indeed, this can be proven via a formula provided in FINANCE 101. It is also important to observe that, even in a zero-tax environment, BORROWING would still be the preferred alternative. In fact, even though each alternative is now more expensive by the amount of tax shield no longer available, the ordinal ranking of preferences has not changed: BORROWING -$403,610 followed by LEASING -$438,573 with PURCHASING still in last place at -$472,217.

In a zero-tax environment, the comparative advantage of BORROWING over PURCHASING is now only $68,607 (i.e. -$406,610 + $472,217) in present value savings as compared with the $152,974 (i.e. -$180,954 + $333,928) in the maximum tax world.

Over a TWENTY-YEAR Horizon :
- assumes 10 year loan amortization and resale value of $250K after 20 years, 20 year lease payments of $9,896/month,

20 Year Horizon	**BORROWING**		**LEASING**		**PURCHASING**	
	43.2% Tax	0.0% Tax	43.2% Tax	0.0% Tax	43.2% Tax	0.0% Tax
NPV	-$508,893	-$859,602	-$422,206	-$743,321	-$714,572	-$962,839
Nominal Cash	-$545,676	-$1,147,960	-$1,349,045	-$2,375,080	-$319,598	-$750,000

Still consistent with our earlier findings, PURCHASING remains the least attractive alternative in both the maximum and zero-tax environments. However, in contrast to the five-year comparison, we can see that LEASING becomes the preferred acquisition financing for both the maximum and zero-tax scenarios.

Thus far, all of our projections have been made on the somewhat limited assumption that the acquiring firm will be offered bank financing at an effective rate of 9.0% or lease financing with an implied rate of 11.5%. This may be true for this one particular firm given current market rates, but will , of course, vary from firm to firm and over changing market conditions. So how sensitive are the NPV's we have calculated to changing lease and borrowing rates? This question can be addressed graphically over a wide (but plausible) range of rates. The range considered is 7.0% to 16.9%. The graphs that follow, then, answer the question as to what the NPV's would be of the three financing alternatives if the lease rates and borrowing rates moved in lock-step (e.g. both were 7.0% and then both changed to 7.1% etc.). The two graphs that follow only consider the NPV's of the five-year horizon. The first graph presents the data in the 43.2% corporate tax environment that we have been considering as our base-case throughout the paper. Visually, it is easy to see that BORROWING will remain the superior alternative (i.e. present the least expensive NPV's) over the

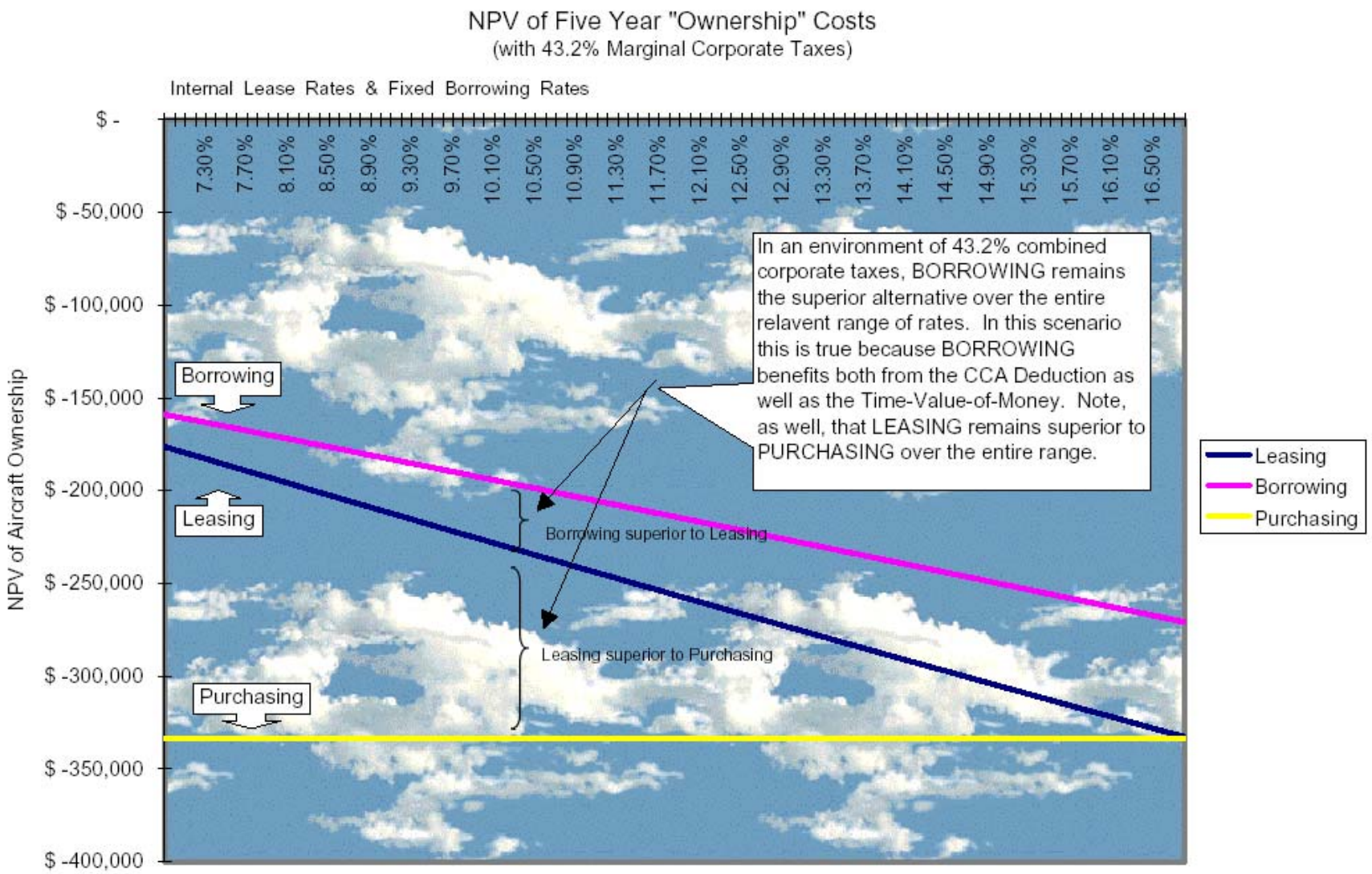
entire relevant range of interest rates. The second, zero-tax, chart is more interesting in that it shows that, at the lower rate range LEASING is the preferred alternative, but this continues only to approximately the 12.71% lease rate. Above this rate (which produces an NPV of
-$472,217) PURCHASING becomes the preferred alternative over the other two.

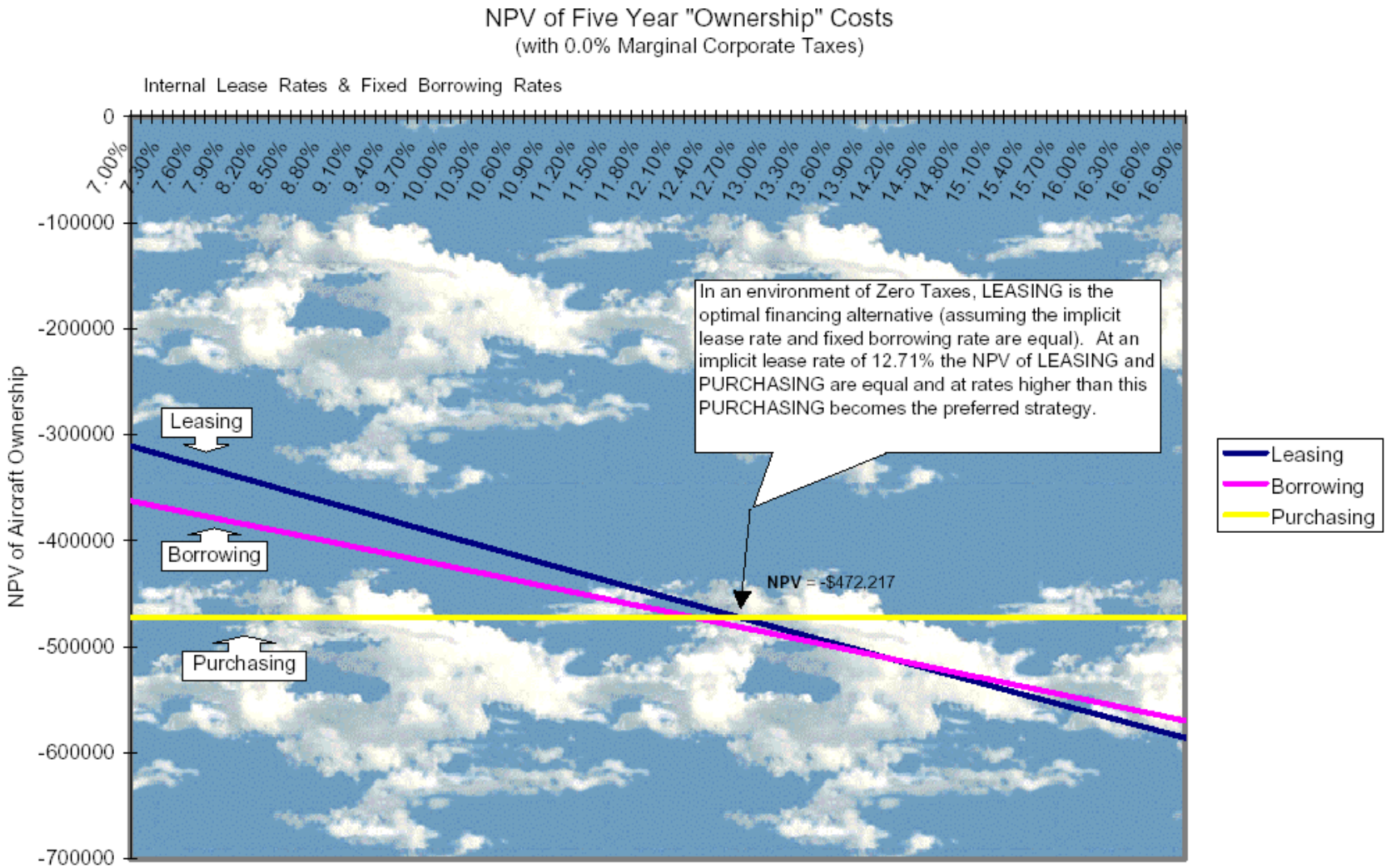
The graphs are something of an abstraction upon reality. Although it is possible, it is unlikely that an acquirer would be able to find a Lender and a Lessor that would be willing to offer exactly the rate of interest. Generally, the Lessor must obtain a higher implicit rate on the lease because he must bear the risk of finding a buyer for the asset at the end of the operating lease. A Lender, of course, is not concerned with the fate of the asset after all the principal and interest payments have been made. Having said that, the relative difference between the lease-rate and the loan-rate will depend upon multiple variables such as the Lessor's and Lender's own internal cost of capital, their relative tax positions and their experience with financing aviation assets.

What can be quickly obtained from the following two graphs is how much the NPV of this acquisition will differ if one Lender, for example, offers a loan at 9.0% (an NPV of -$180,954 in the full-tax world) compared to another Lender who offers 8.5% (an NPV of -$175,406). Similarly, the project has an NPV of -$249,109 under a 11.5% operating lease, but this declines to -$225,164 in a Lessor can be found willing to set the implicit rate at 10.0%

LEASE, FINANCE OR PURCHASE: THE FINAL WORD

Capital asset acquisitions can, in full consideration of all the variables involved, be a complex and intricate process. As this case has shown, however, the due diligence required is well worth the effort as considerable firm value can be added by making the right decision. In this case, the difference between BORROWING, rather than PURCHASING equated to an instant current dollar savings of $153K.


NPV of Five Year "Ownership" Costs
(with 43.2% Marginal Corporate Taxes)
Internal Lease Rates & Fixed Borrowing Rates
NPV of Aircraft Ownership
$ -
$ -50,000
$ -100,000
$ -150,000
$ -200,000
$ -250,000
$ -300,000
$ -350,000
$ -400,000
7.30%
7.70%
8.10%
8.50%
8.90%
9.30%
9.70%
10.10%
10.50%
10.90%
11.30%
11.70%
12.10%
12.50%
12.90%
13.30%
13.70%
14.10%
14.50%
14.90%
15.30%
15.70%
16.10%
16.50%
In an environment of 43.2% combined corporate taxes, BORROWING remains the superior alternative over the entire relavent range of rates. In this scenario this is true because BORROWING benefits both from the CCA Deduction as well as the Time-Value-of-Money. Note, as well, that LEASING remains superior to PURCHASING over the entire range.
Borrowing
Leasing
Purchasing
Borrowing superior to Leasing
Leasing superior to Purchasing
Leasing
Borrowing
Purchasing


NPV of Five Year "Ownership" Costs
(with 0.0% Marginal Corporate Taxes)
Internal Lease Rates & Fixed Borrowing Rates
NPV of Aircraft Ownership
0
-100000
-200000
-300000
-400000
-500000
-600000
-700000
7.00%
7.30%
7.60%
7.90%
8.20%
8.50%
8.80%
9.10%
9.40%
9.70%
10.00%
10.30%
10.60%
10.90%
11.20%
11.50%
11.80%
12.10%
12.40%
12.70%
13.00%
13.30%
13.60%
13.90%
14.20%
14.50%
14.80%
15.10%
15.40%
15.70%
16.00%
16.30%
16.60%
16.90%
In an environment of Zero Taxes, LEASING is the optimal financing alternative (assuming the implicit lease rate and fixed borrowing rate are equal). At an implicit lease rate of 12.71% the NPV of LEASING and PURCHASING are equal and at rates higher than this PURCHASING becomes the preferred strategy.
Leasing
Borrowing
Purchasing
NPV = -$472,217
Leasing
Borrowing
Purchasing

GLOSSARY:

CAPITAL COST ALLOWANCE (CCA): In place of accounting depreciation, CCA is the tax depreciation that the Canada Customs and Revenue Agency allows as a deduction against taxable income in order to amortize the cost of depreciable assets (such as aircraft) over several tax periods. CCA reduces taxes payable. There are multiple classes in which certain types of assets are assigned. Each class has its own rate and specific set of rules.

$$PV\ of\ CCA = (CdT/(d + r)) \times ((1 + r/2)/(1 + r)) - (SdT/(d + r)) \times (1/(1 + r)^n)$$

Where:

C = is Cost or Purchase Price of Asset [$1,000,000]
d = class depreciation rate [25% or .25]
T = Tax rate [43.2% or .432]
r = WACC [15% or .15]
S = Salvage Value or Resale Value [$850,000]

CAPITAL EXPENDITURE: Capital Expenditures may be discerned from Operating Expenses by the fact that the former acquires for the firm something that provides enduring benefits. For example, the purchase of an aircraft is a capital expenditure because the firm may continue to use that aircraft over five, ten, twenty or more years. Conversely, the purchase of a thousand pounds of JET-A fuel is an operating expense because, once the fuel has been used once, it provides no further benefit to the firm.

DEBT/EQUITY RATIO (D/E): The number produced by dividing the firms Total Debt by its Total Equity. The implication is that the higher the firm's D/E ratio becomes, the less remaining borrowing capacity it has.

DISCOUNT RATE: An interest rate that is applicable to a given period of time. Usually expressed an effective annual rate.

DISCOUNTED CASH FLOWS: Nominal Cash Flows that have been adjusted for the Time-Value-of-Money. Usually this implies that these cash flows have been discounted to reflect their Present Value (i.e. what they are worth right now, today). Note, however, that it is possible to Discount Cash Flows to determine what their value is at any given point in time.

DISCOUNTING: The process of adjusting future Nominal Cash Flows into Present Values using an applicable interest rate.

IMPLICIT LEASE RATE: Is the internal interest rate that the Lessor uses to insure that he is obtaining an acceptable rate of return on his investment in the leased asset. Often this rate is not disclosed to the Lessee, but can be calculated if three variables are known; the purchase price of the asset, the length of the lease (and frequency/timing of the lease payments), and what the Lessor expects the asset will recover from the sale of the asset at the end of the lease term.

LIQUIDATION VALUE: As applied to the case above, Liquidation Value is the amount of nominal dollars that would be expected to be received for selling the owned aircraft at any point along the planned period of ownership. The expected Liquidation Value at the end of year five, for example, is the same as the expected Resale Price of $850,000. Note that assets that possess a positive and predictable Liquidation Value over the course of their economic life-spans are much less risky than those that do not.

NET PRESENT VALUE (NPV): Is the cumulative total of all Present Value cash flows, both positive and negative, over the entire project period. In the case above, we have only been considering the 'costs of ownership' therefore the NPV's are negative.

PRESENT VALUE (PV): A nominal cash amount that has been adjusted for the Time-Value-of-Money to reflect what its current worth is today. When dealing with future cash transactions, the process is called discounting. If, for example, someone promises to pay you $121.00 two years from today and the going market interest rate on such a promise is 10% per year, then the PV of that $121 is $\$121/(1 + 10\%)^2 = \$100$.

NOMINAL DOLLARS: The face value of cash not adjusted for the Time-Value-of-Money. For example, twenty years ago deposited one dollar into your savings account and today you do exactly the same thing. Nominally both these cash flows are the same - one dollar. However, if your savings account accrues 10% interest per year, the twenty-year-old dollar is now worth $\$1.00 \times (1 + 10\%)^{20} = \$6.73$ whereas the dollar you deposited today is still just worth a dollar.

RECAPTURE: A function of the CCA system. Recapture occurs when the UCC of a given CCA Class turns negative. Recapture results in an increase in taxable income. In the case above we have specifically assumed that our project is not subject to recapture.

RISK-ADJUSTED DISCOUNT RATE: The concept that the Discount Rate applied to any series of Nominal cash Flows should reflect the relative risk of the underlying cash flows. Risk may be thought to be the probability that the expected cash flows will differ from the planned amount. The greater the risk in the expected cash flows, the higher the risk-adjusted discount rate will need to be. We have applied the concept of a risk-adjusted rate in the aircraft acquisition case. The operations of the acquiring firm are inherently risky and we have applied the firm-wide after-tax WACC rate of 15% to all the cash flows relating to Interest Expense, Tax Shield and Lease Expense. However, the cash flows related to the capital cost of the aircraft (i.e. the purchase payment, in the case of an outright PURCHASE and the payments of principal in the case of BORROWING) have been discounted at a 10% rate because they are substantially less risky. This reduction in risk is a result of the fact that the aircraft always maintains a high positive liquidation value over the course of the project.

SALVAGE VALUE: With respect to CCA, Salvage Value is the same as the Resale Value.

TAX SHIELD: The idea that tax-deductible expenses offers a that lowers taxable income and thereby 'shields' funds that would otherwise have been payable as income tax. For example:

	Case A	Case B
Taxable Income	$ 1,000	$ 1,000
Tax Deductible Expense	$ -	$ -120
Revised Taxable Income	$ 1,000	$ 880
Taxes Payable (@ 43.2%)	$ -432	$ -380
After-Tax Net Income	$ 568	$ 500

Note that, even though an additional $120 in actual cash has been spent in Case B above, as compared with Case A, the After-Tax Net Income is only $68 dollars less in Case B. Note as well that the Total Taxes Payable in Case B is $52 less than Case A. The $52 is the tax shield and may be computed by: Deductible Expense x Tax Rate, or $120 x .432 = $52. The total cash difference of -$68 is explained by the Actual Cash Deductible Expense plus the Tax Shield Savings, or -$120 + $52 = -$68. So even though we incur another $120 in pre-tax expenses, the after-tax cash effect is that this only costs us a net cash outflow of $68.

TERMINAL LOSS: A function of the CCA system. Occurs when there are no further assets left in a specific class, but the UCC balance remains above zero. Technically, a Terminal Loss is the opposite of Recapture. A Terminal Loss results in an decrease in taxable income. In the case above we have specifically assumed that our project is not subject to Terminal Loss.

TIME-VALUE-OF-MONEY: The concept that a unit of currency is not equivalent in different time periods. Clearly, a dollar in 1952 would have purchased a great deal more than it does in 2002 and it will purchase even far less in 2052. Money earns a return. If you have money today, you can lend it out and people will pay you a positive return (i.e. the interest rate) so that they can use it until they repay you. In turn, these positive returns can then be re-loaned and they, in turn, will accrue a positive return. It is because of the fact that money earns a return that makes having money now much more valuable than having money in the future.

UNDEPRECIATED CAPITAL COST (UCC): UCC represents the balance that remains in a specific CCA Class that has yet to be deducted against taxable income. The first time a new asset is acquired for a new CCA Class, and just before the first CCA Deduction is made, the UCC will generally equal the acquisition cost of the asset in question.

WEIGHTED AVERAGE COST OF CAPITAL (WACC): The WACC is represented by a percentage rate that reflects what rate of return the investors of that firm (both debt holders and shareholders combined) require on their combined investment. In the aircraft acquisition case the after-tax WACC was 15.0% This means that every new project taken on by the firm should earn a return of at least 15.0% or else investors will begin selling out their holdings. We can think of the WACC, then, as an appropriate benchmark or hurdle rate upon which all of the financial returns (both Revenues and Costs) can be measured by.

The Importance of Discounting Cash Flows

If we lived in a world of zero inflation and zero interest rates, all financial analysis could be conducted simply by added up net nominal cash flows. A profitable financial undertaking would be any project where the total amount of Cash Inflow exceeded the total Cash Outflow. You would be able to borrow a million dollars at the bank in order to purchase an aircraft, pay no interest over the entire loan period and, at the end of the loan, simply repay the million. In addition, you would be able to purchase a new aircraft today for a million, fly it for twenty years, then replace it with a brand new model that, again, cost exactly a million dollars. Obviously the impracticality of such a world does not even warrant its further consideration. Money has an inherent time-value. Revenues received today are more valuable than if received tomorrow and expenses paid tomorrow are less costly than if paid today.

When cash flows are expected to be incurred is often more important than *How Much* is expected. The truism of this statement is aptly demonstrated in the aircraft acquisition case above where the alternative with the significantly larger nominal cash outflow turned out to be the optimal financial solution both in the five-year horizon and the twenty-year.

Discounting cash flows from different periods can be though of as translating/converting all those amount back to a common point in time (i.e. today, now) so they all have the same Present Value and may be added and subtracted from one and another. If, for example, your bank has promised to pay you $110 one year from now on a 10% investment and, in addition you currently are holding $50 cash, you could imagine that your nominal assets are $160. In reality, however, the interest that you are going to attain on the investment that matures in one year has yet to be earned. Even if you cashed-out your investment today your total combined purchasing power would not be $160. In fact, you need to discount the expected cash inflow of $110 back to today's Present Value so that you know what that investment is worth right now. $110/(1 + 10%)^{1} = $100. So your combined cash assets in terms of Net Present Value is $150, not $160. The $150 represents you actual current purchasing power today, should you decide to cash-out the investment.

How Positive Nominal Cash Flows can generate Negative NPV's

You have $100 dollars to invest and you take it to Bank A. They promise that if you lock-in your $100 for twenty years, they will repay you $110 at the end of that period. Over the entire twenty year period you know that equates to a total 10% return, but you are unsure of how to calculate the effective annual return. The other thing you are certain of, is that the nominal cash flow is positive: -$100 + $110 = +$10. Regardless of what the rate of return is, you know you are going to be up $10, so how bad can it be? On the strength of this analysis, you invest with Bank A.

Then, out of curiosity, you visit Bank's B,C, D & E. Each one of them in turn tells you that, regardless of the amount you invest, for a twenty year lock-in they will pay you an effective rate of 10% *per year* for each of the twenty years! Uh Oh. You dust off the old high school algebra book to find out that a given sum that compounds interest at 10% per year for twenty years is worth (1 + 10%)^{20}. This means that, had you taken your $100 to Bank's B,C, D or E you would have been a *lot* better off. In fact, your $100 would have paid out at $100 x (1 + 10%)^{20} = $672.75! This means, by taking the Bank A deal, you can anticipate a future loss of $562.75 (i.e. $672.75 - $110).

The future loss is a long way off, however. What does your imprudence mean to you today? Right Now? You know that Bank A has promised you $110 and you start wondering how much you would have needed in invest in any of the other banks, offering 10% per year, in order to mature at $110 in twenty years. In other words, what is the Present Value of a cash flow of $110 to be received after twenty years if the applicable interest rate were 10% per year? $110/(1 + 10%)^{20} = $16.35. This means that, in order to be just as well off in twenty years and receive $110, you could have gone to any of Bank's B,C, D & E, invested only $16.35 and had that mature at exactly the same amount as Bank A. So your NET PRESENT VALUE (NPV) of forgoing the other banks and choosing Bank A is $16.35 - $100 = -$83.65 Your NPV is negative because it reflects your Bank A investment in terms of the current value loss. Your nominal dollar return is +$10 but the NPV of your investment is -$83.65.

The other way to consider this issue is to discount your known future loss back to today's present value. You know that you are going to lose $562.75 at the end of twenty years. What is this worth today? $-\$562.75/(1 + 10\%)^{20} = -\$83.65$ Not surprisingly, the two methods arrive at the same negative NPV.

In the aircraft acquisition case there are numerous examples of positive nominal returns that generate negative NPV's. In that case the applicable 'interest rate' with which all the future cash flows are discounted is the firm's WACC (Weighted Average Cost of Capital). The WACC can be thought of as the firm's on internal rate of interest that all of the projects have to be measured against.

Accounting Data must be Adjusted to reflect Actual Nominal Cash Flows

Financial modelling is concerned with the prediction of actual cash in and out flows whereas accounting data is not. A typical accounting income statement, for example will include a number of Revenues and Expenses that do not reflect actual cash transactions. The most commonly cited example is accounting depreciation which is only an apportionment or allocation of the original cost of a capital asset over the periods that are expected to benefit from that asset. For example, it is not uncommon for a $20 million aircraft to be purchased and, because that aircraft is expected to be used over the next twenty years, each year a depreciation expense of $1 million will be recorded in the income statement. Note, however, the actual cash outflow occurred in Year Zero when the $20 million was paid - the $1 million annual allocations do not represent real cash outflows. Note that, in the aircraft acquisition case above, we have made no provision for "depreciation" whatever, exactly for this reason. We have, however, provided for the tax effects of CCA depreciation, because the net effect of CCA is that it reduces tax payable that does actually save us real cash.

Accounting charges for Deferred Taxation are notorious accounting expenses that appear on the income statement but do not represent real cash paid for income tax nor (in many cases) is it likely that they every will be. Conversely, sometimes, in the interest of matching Revenues with the Expenses, the accounting data will accrue Revenues that have not resulted in actual cash inflows and this cash may not be realised for some considerable time to come.

Sometimes large amounts of cash are received in advance of the accounting transaction that would report these as Revenue (e.g. contractual deposits required on large charter contract that becomes payable even prior to acquiring the fleet that will be providing the charter service). In the accounting universe, these Revenues would be deferred on the balance sheet and not reported as income until the charter service had actually begun. In the finance world, however, we are only concerned with the actual receipt and timing of real cash inflows and outflows - when or how those cash flows are recorded in the accounting statements are of little consequence to us.

For all the reasons stated above, care must be taken in constructing a nominal cash flow statement from data that was initially prepared for accounting purposes. Each of the possible cash accrual or deferral that was made for accounting purposes must be fully understood and then eliminated when constructing the actual cash flows.